ADDENDUM 2

NEW PRINCE GEORGE ELEMENTARY SCHOOL

PRINCE GEORGE COUNTY PUBLIC SCHOOLS
PRINCE GEORGE, VIRGINIA

VIRGINIA DOE PROJECT NUMBER: 074-38-00-100

MOSELEYARCHITECTS

ARCHITECT/ENGINEER — RICHMOND, VIRGINIA

TIMMONS GROUP

CIVIL CONSULTANT — RICHMOND, VIRGINIA

FOOD SERVICE CONSULTANTS STUDIO

FOOD SERVICE CONSULTANT — ASHLAND, VIRGINIA

A/E's Proj. #592926
Set No.

February 12, 2021

ADDENDUM NO. 2 / February 12, 2021

GENERAL:

All planholders are requested to attach this Addendum to the inside front cover of each Project Manual. Please inform all concerned that the Documents are modified by this Addendum.

The following modifications and clarifications are hereby made a part of the Contract Documents and supersede or otherwise modify the provisions of the published *Project Manual* and *Drawings*, dated January 24, 2021; and Addendum No. 01, dated February 3, 2021.

CHANGES TO THE PROJECT MANUAL:

DELETE the previously issued Documents indicated below in their entirety and SUBSTITUTE the revised Documents in their entirety, notes as AD 02, dated 02/12/2021:

A. SECTION 004100 – BID FORM
B. SECTION 012100 – ALLOWANCES
C. SECTION 055000 – METAL FABRICATIONS
D. SECTION 055100 – METAL STAIRS
E. SECTION 085619 – PASS WINDOWS
F. SECTION 101400 – SIGNAGE
G. SECTION 102800 – TOILET AND BATH ACCESSORIES
H. SECTION 122413 – ROLLER WINDOW SHADES
I. SECTION 230514 – VARIABLE SPEED DRIVES
J. SECTION 233113 – METAL DUCTS
K. SECTION 233600 – AIR TERMINAL UNITS
L. SECTION 236423 – AIR COOLED SCROLL WATER CHILLERS
M. SECTION 237313 – MODULAR CENTRAL STATION AIR HANDLING UNITS
N. SECTION 237433 – PACKAGED ROOFTOP UNITS
O. SECTION 271300 – TELECOMMUNICATION CABLING
P. SECTION 271500 – STRUCTURED CABLING
Q. SECTION 275123 – INTERCOMMUNICATION SPECIFICATION
R. SECTION 275124 – SOUND SYSTEM
S. SECTION 281300 – ELECTRONIC SAFETY AND SECURITY ACCESS CONTROL, VIDEO SURVEILLANCE AND INTERCOM ENTRY
T. SECTION 321313 – SITE CONCRETE

MODIFICATIONS TO THE DRAWINGS:

1. ADD new Documents indicated below in their entirety, noted as AD 02, dated 02/12/2021:
    A. DRAWING A5.1.17
    B. DRAWING M5.3

C. DRAWING M5.4

D. DRAWING M7.1

2. DELETE the previously issued Documents indicated below in their entirety and SUBSTITUTE the revised Documents in their entirety, noted as AD 02, dated 02/12/2021:

A. COVER VOLUME 2
B. COVER VOLUME 3
C. DRAWING C4.01
D. DRAWING C4.02
E. DRAWING C4.10
F. DRAWING C6.01
G. DRAWING C6.02
H. DRAWING L1.00
I. DRAWING L1.03
J. DRAWING L1.04
K. DRAWING L2.00
L. DRAWING A1.2.1
M. DRAWING A1.2.2
N. DRAWING A1.2.3
O. DRAWING A1.2.4
P. DRAWING A1.2.5
Q. DRAWING A2.1.1
R. DRAWING A2.1.2
S. DRAWING A2.1.5
T. DRAWING A2.1.6
U. DRAWING A5.1.8
V. DRAWING A6.1.2
W. DRAWING S0.0.1
X. DRAWING S1.1.1
Y. DRAWING S1.1.2
Z. DRAWING S1.1.3
AA. DRAWING S2.1.1
BB. DRAWING S2.1.2
CC. DRAWING S2.1.3
DD. DRAWING S2.2.1
EE. DRAWING S2.2.2
FF. DRAWING S2.2.3
GG. DRAWING S2.3.2
HH. DRAWING S3.01
II. DRAWING M0.2
JJ. DRAWING M3.2

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KK. DRAWING E0.3
LL. DRAWING E2.7.4
MM. DRAWING E5.2

REFER TO SPECIFICATION SECTIONS ATTACHED TO THE END OF THIS ADDENDUM

REFER TO DRAWINGS ATTACHED TO THE END OF THIS ADDENDUM

All other general terms, conditions and specifications shall remain the same.

Bidders must take due notice and be governed accordingly. Acknowledgement of the receipt of this addendum shall be made on your Bid Form. If your bid has already been delivered, return this addendum under a separate cover, referencing the ITB number, due date, and time on the outside of the envelope.

Failure to acknowledge this addendum may result in your bid being declared non-responsive.

BID FORM

TO: Prince George County Public Schools
6602 Courts Drive
Prince George, Virginia 23875

FROM: _____ (Bidder's
_____ Name and
_____ Address)

FOR: New Prince George Elementary School
4700 Romans Rd.
Prince George, VA 23875

Having carefully examined the site, and all of the Bidding and Contract Documents, and in compliance with the "Invitation to Bid" and "Instructions to Bidders", the undersigned proposes to provide all labor, materials, supplies, equipment, services, and perform all Work necessary for the construction of this Project in accordance with the Bid Documents, dated January 24, 2021, prepared by Moseley Architects.

BASE BID PRICE:

The Base Bid Price includes all Work required by and in strict accordance with the Bid Documents for this Project, for the Lump Sum of:

$ _____(Figures only).

LUMP SUM ALLOWANCES: (Reference Section 012100 – Allowances)

1. Allowance No. 1: Interior Signage: $45,000.00
2. Allowance No. 2: Exterior Signage: $10,000.00
3. Allowance No. 3: Fire Lane Striping and Signage: $500.00
4. Allowance No. 4: Instructional Technology Video Components: $185,000.00
5. Allowance No. 5: HVAC System Controls and Building Automation System: $450,000.00
6. Allowance No. 6: Playground and Sports Equipment: **(*AD 02)** $400,000.00

Total Lump Sum Allowances (Items 1 thru ~~18~~ 6) $ 1,090,500 **(*AD 02)** _____(Figures only)

SITEWORK UNIT PRICE ALLOWANCES: (Reference Section 012110 - Sitework Unit Price Allowances)

1. Sitework Unit Price Allowance No. 1: Additional Excavation, ~~off-site disposal and backfill~~ backfill with imported structural fill:

   Provide quantity of 5,000 c.y. at $_____ per c.y. (in-place unit price/measure) =

$_____ (Figures only).

2. Sitework Unit Price Allowance No. 2: Additional Excavation, backfill with screenings:

   Provide quantity of 5,000 c.y. at $_____ per c.y. (in-place unit price/measure) =

   $_____ (Figures only)

3. Sitework Unit Price Allowance No. ~~2~~ 3: Additional Excavation in Trenches:

   Provide quantity of 1,000 c.y. at $_____ per c.y. (in-place unit price/measure) =

   $_____ (Figures only)

4. Sitework Unit Price Allowance No. ~~3~~ 4: Additional Excavation in Footings:

   Provide quantity of ~~750~~ **1,500** c.y. at $_____ per c.y. (in-place unit price/measure) =

   $_____ (Figures only)

5. Sitework Unit Price Allowance No. ~~4~~ 5: Chemical Augmentation with Lime:

   Provide quantity of 1,000 ton of lime at $_____ per ton (in-place unit price/measure) =

   $_____ (Figures only)

6. Sitework Unit Price Allowance No. ~~5~~ 6: Subsurface Drain and Camera Verification, in place (L.F.):

   Provide quantity of 250 l.f. of subsurface drain as detailed by VDOT Std. UD-4 at $_____ per l.f. (in-place unit price/measure) =

   $_____ (Figures only)

7. Sitework Unit Price Allowance No. ~~6~~ 7: VDOT Std. #21B Stone, in place:

   Provide quantity of 750 c.y. of VDOT Std. #21B Stone at $_____ per c.y. (in-place unit price/measure) =

   $_____ (Figures only)

8. Sitework Unit Price Allowance No. ~~7~~ 8: VDOT Std. #57 Stone, in place:

   Provide quantity of 750 c.y. of VDOT Std. #57 Stone at $_____ per c.y. (in-place unit price/measure) =

   $_____ (Figures only)

9. Sitework Unit Price Allowance No. ~~8~~ 9: Woven Geotextile Fabric:

   Provide quantity of 250 s.y. at $_____ per s.y. (in-place unit price/measure) =

   $_____ (Figures only)

Total Sitework Unit Price Allowances (Items 1 thru ~~8~~ 9) $_____(Figures only) **(*AD-01)**

UNIT PRICE ALLOWANCES: (Reference Section 012200 Unit Price Allowances)

1. Unit Price Allowance No. 1 : Additional smoke detectors installed and connected to the fire alarm system:

   Smoke detectors at $_____ per unit x 5 units = $_____(Figures only)

2, Unit Price Allowance No. 2 : Additional duct smoke detectors installed and connected to the fire alarm system:

   Duct smoke detectors at $_____ per unit x 5 units = $_____(Figures only)

3. Unit Price Allowance No. 3 : Additional fire alarm horn/strobes installed and connected to the fire alarm system:

   Horn/Strobes at $_____ per unit x 5 units = $_____(Figures only)

4. Unit Price Allowance No. 4 : Additional fire alarm pull stations installed and connected to the fire alarm system:

   Pull stations/Strobes at $_____ per unit x 5 units = $_____(Figures only)

5. Unit Price Allowance No. 5 : Additional double face exit signs installed and connected to the fire alarm system:

   Double face exit signs at $_____ per unit x 5 units = $_____(Figures only)

6. Unit Price Allowance No. 6 : Additional single face exit signs installed and connected to the fire alarm system:

   Single face exit signs at $_____ per unit x 5 units = $_____(Figures only)

Total Unit Price Allowances (Items 1 through 6) $_____(Figures only)

TOTAL LUMP SUM BID PRICE
(inclusive of Base Bid Price + all Lump Sum Allowances + all Sitework Unit Price allowances + all Unit Price Allowances) =

$_____ Figures only.

ALTERNATE BID PRICE: (Reference Section 012300 – Alternates)

1. Alternate #1 Bid Price – Additive Alternate – Rooftop/Outdoor Classroom. In lieu of the roof system and configuration indicated on Drawing A10.1, provide the roof system, paver system, railings and all work indicated on Drawing A10.5 Roof Plan - Bid Alternate. Provide all work associated with this system in lieu of the Base Bid EPDM system, in strict accordance with the Bid Documents. **(*AD-01)**

   ADD: $_____ (Figures only)

2. Alternate #2 Bid Price – Deductive Alternate – Terrazzo Tile. In lieu of the Resinous Matrix Terrazzo flooring indicated on the Drawings, provide Terrazzo Tile in these locations per Specification Section 096616. This alternate shall not include the locations where the Resinous Matric Terrazzo logos are indicated. Provide all work associated with this system in lieu of the Base Bid Resinous Matrix Terrazzo flooring, in strict accordance with the Bid Documents.

DEDUCT: $_____ (Figures only)

3. Alternate #2 Bid Price – Deductive Alternate – Polished Concrete. In lieu of the Resinous Matrix Terrazzo flooring indicated on the Drawings, provide Polished Concrete in these locations per Specification Section 033543. This alternate shall not include the locations where the Resinous Matric Terrazzo logos are indicated. Provide all work associated with this system in lieu of the Base Bid Resinous Matrix Terrazzo flooring, in strict accordance with the Bid Documents.

   DEDUCT: $_____ (Figures only)

It is the Owner's intent to recommend the award of this Contract by the Prince George County School Board (Owner) to the lowest *responsive and responsible* bidder based upon the Total Bid amount and any bid alternates as the School Board, in its discretion, decides to award, provided the bid does not exceed the funds available. If approved by the Owner, a Notice of Award of the Contract for this project will be given by the Owner to the Contractor.

The undersigned agrees that when payment to the Contractor for additional work authorized is computed on the basis of actual cost of labor and materials, the percentage to be added thereto for the Contractor's overhead and profit shall be no greater than the limits specified.

RECEIPT OF ADDENDA

We acknowledge the receipt of the following Addenda:

Addendum No. _____, dated _____

Addendum No. _____, dated _____

Addendum No. _____, dated _____

Addendum No. _____, dated _____

TIME OF COMPLETION

Based upon a Notice to Proceed within thirty (30) calendar days from the opening of the bid, the undersigned agrees that the Work included in this Contract shall be Substantially Complete no later than July 1, 2022 and finally complete no later than sixty (60) calendar days thereafter. Liquidated Damages in the amount of One Thousand Dollars ($1,000.00) per calendar day for failure to meet Substantial Completion date of the Work will be sought.

In addition, the undersigned agrees that for each consecutive calendar day that the work remains incomplete after the date established for Final completion, the Owner will retain from compensation otherwise to be paid to the Contractor the sum of One Thousand Dollars ($1,000.00) per day. This amount is in addition to the liquidated damages prescribed above.

BID SECURITY

Attached hereto is my bid security for five percent (5%) of the Total Bid, made payable to ~~the~~ ~~New Kent~~ Prince George County Public Schools ~~Board~~, ~~New Kent~~ Prince George County, Virginia.

REGISTRATION

The Undersigned is a licensed Class A Contractor in accordance with Chapter 11, Title 54.1, Code of Virginia, as amended, Certificate No. _____, dated ____/____/____.

Under Section 2.2-4354, Code of Virginia, as amended, an individual Contractor is required to furnish his social security number and a proprietorship, partnership and corporation is required to furnish its employer identification numbers to the Prince George County Public Schools, Prince George County, Virginia. Please indicate this information on this Bid Form as follows:

Social Security Number: _____

Federal Employer Identification Number: _____
By bidding in response to this invitation, the Bidder represents that in preparation and submission of this Bid, the said Bidder did not, either directly or indirectly, enter into any combination or arrangement with any person, firm or corporation or enter into any agreement, participate in any collusion, or otherwise take any action in restraint of free, competitive bidding in violation of Sherman Act (15 U.S.C. Section 1) or Sections 59.1-9.1 through 59.1-9.17 or Sections 59.1-68.6 through 59.1-68.8 of the Code of Virginia.

Legal Name of Bidder (Company) _____

Bidder's (Company) Address _____

_____

_____

Corporate
Seal

Signature: _____
(Signature of person or persons legally authorized to bind bidder (Company) to this Contract)

By: _____
(Typed or printed Name[s] of Person[s] Signing)

Title: _____
(Typed or printed Title[s] of Person[s] Signing)

Telephone Number: _____
(Area Code)

Fax Number: _____

(Area Code)

E-Mail: _____

Indicate on the following blank line whether the bidder is a sole proprietor, a partnership, a corporation or some other legal entity:

_____

A bid by a corporation shall further give the State of incorporation _____ and have the corporate seal affixed in the space provided above.

END OF BID FORM

SECTION 012100 – ALLOWANCES (*AD 02)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to the Contractor. If necessary, additional requirements will be issued by Change Order.

1.3 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At Architect`s request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Architect from the designated supplier.

1.4 SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

C. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

D. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.6 ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.

B. Unless otherwise indicated, Contractor`s costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.

C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner`s storage space as directed.

1.7 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
   1. Include installation costs in purchase amount only where indicated as part of the allowance.
   2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
   3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
   4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor`s handling, labor, installation, overhead, and profit.
   1. Do not include Contractor`s or subcontractor`s indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
   2. No change to Contractor`s indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. Lump Sum Allowance No. 1: Interior Signage - Provide an allowance of $45,000.00 to furnish and install interior signage.

B. Lump Sum Allowance No. 2: Exterior Signage - Provide an allowance of $10,000.00 to furnish and install exterior signage.

C. Lump Sum Allowance No. 3: Fire Lane Striping and Signage – Provide an allowance of ~~$1,500.00~~ **$500.00** to furnish additional fire lane striping and signage as required by the Authority Having Jurisdiction. (*AD 02)

D. Allowance No. 4: Instructional Technology Video Components: Provide an allowance of $185,000.00 to furnish and install (49) 75” Smart Boards and (2) 60” flat-screen monitors in the locations indicated on the Drawings. Provide (7) mobile Smart Boards to be located throughout the school and one ceiling-mounted HD projector to be located in the gymnasium. Furnish and install all mounting hardware or other items required for installation.

E. Allowance No. 5: Lump-Sum Allowance: Include the sum of $450,000.00 to furnish and install the HVAC Controls/Building Automation System. All HVAC Controls and Building Automation System Scope will be part of an allowance. The Contractor shall bid out this scope of work to manufacturers after being awarded the project, where the Owner can select based on their proposals. The allowance shall cover all work specified under Sections 230900 and 230993 and include all wiring and providing power wiring to controls where it's not indicated on electrical drawings but required for systems operation.

F. Lump Sum Allowance No. 6: Playground and Sports Equipment – Provide an allowance of $400,000 to provide playground apparatuses and play surfaces for Pre-K through Kindergarten, and 1st Grade through 5th Grade. Play area locations are indicated on civil drawings. Play surfaces include rubberized surfaces. Provide 4 soccer goals and two exterior, adjustable, basketball hoops at blacktop area. Owner and architect to provide layouts and design. Installation of playground and sports equipment to be provided by playground equipment provider. Grading, surface, preparation, and drainage to be provided by the general contractor. (*AD 02)

END OF SECTION

SECTION 055000 - METAL FABRICATIONS – ADDENDUM NO 2

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 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 metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

C. Coordinate delivery and storage of products to be furnished, but not installed, under this Section, including but not limited to, the following:
   1. Loose steel lintels.
   2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
   3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Metal nosings and treads.
   2. Paint products.
   3. Grout.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
   1. Steel framing and supports for operable partitions.
   2. Steel framing and supports for overhead doors.
   3. Steel framing and supports for countertops.
   4. Steel tube reinforcement for low partitions.
   5. Steel framing and supports for mechanical and electrical equipment.
   6. Steel framing and supports for applications where framing and supports are not specified in other Sections.
   7. Elevator hoist beam.
   8. Steel shapes for supporting elevator door sills.
   9. Shelf angles.
   10. Metal ladders.
   11. Bar gratings.
   12. Miscellaneous steel trim including steel angle corner guards, steel edgings, and loading-dock edge angles.
   13. Metal bollards.
   14. Abrasive metal nosings.
   15. Loose steel lintels.

C. Samples for Verification: For each type and finish of extruded nosing.

D. Delegated-Design Submittal: For installed products indicated to comply with design loads, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1, "Structural Welding Code - Steel."
2. AWS D1.2, "Structural Welding Code - Aluminum."

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design ladders.

B. Structural Performance of Ladders: Ladders and landings shall withstand the effects of loads and stresses within limits and under conditions specified in OSHA 29 CFR 1910, Subpart D, 1910.27, ANSI A14.3, and (for elevator pits) ASME A17.1.

C. Structural Performance of Railings: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
1. Handrails and Top Rails of Guards:
a. Uniform load of 50 lbf/ ft. applied in any direction.
b. Concentrated load of 200 lbf applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.
2. Infill of Guards:
a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
b. Infill load and other loads need not be assumed to act concurrently.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A 36.

C. Steel Tubing: ASTM A 500, cold-formed steel tubing.

D. Steel Pipe: ASTM A 53, Standard Weight (Schedule 40) unless otherwise indicated or required by structural loads.

E. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
   1. Size of Channels: 1-5/8 by 1-5/8 inches unless indicated otherwise.
   2. Material: Hot-rolled steel, ASTM A 1011, structural steel, Grade 33; 0.0677-inch minimum thickness; coated with rust-inhibitive, baked-on, acrylic enamel.

F. Cast Iron: Either gray iron, ASTM A 48, or malleable iron, ASTM A 47, unless otherwise indicated.

G. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.

H. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.

I. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
   1. Provide stainless-steel fasteners for fastening aluminum.
   2. Provide stainless-steel fasteners for fastening stainless steel.
   3. Provide Torx-head or hex head fasteners with center rejection pin where vandal-resistant fasteners are indicated.

B. Wet Areas: For wet or damp areas, including pools, pool pump and treatment rooms, locker rooms, rooms with showers, saunas, kitchens with washes or hoods, whirlpool bath rooms, mechanical rooms with steam piping, and similar spaces, provide Type 304 stainless-steel fasteners or zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5.

C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1.

E. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
   1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

F. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

G. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47 malleable iron or ASTM A 27 cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

H. Post-Installed Anchors: Torque-controlled expansion anchors.
   1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
   2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

I. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
   1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

B. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

F. Concrete: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
   1. Fabricate units from slotted channel framing where indicated.
   2. Furnish inserts for units installed after concrete is placed.

C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

D. Fabricate fence and gate assembly, including steel posts, fence framing, and gate leaves as indicated for mechanical yard and dumpster enclosures.
   1. Provide all fasteners, accessories, and hardware unless indicated otherwise.
   2. Provide bracing and reinforcement as needed to obtain a square, level, and flush operable gate.
   3. Vertical board siding for gate and fence cladding, including fasteners, are specified in Division 06 Section "Rough Carpentry."
   4. Hardware:
      a. Barrel Hinges: Weld-on type with grease fitting, of mild steel with stainless steel pin. Size to suit weight of gate but rated not less than 600 pounds per hinge. Provide four per gate.
      b. Cane Bolts: 36-inch stainless steel and stainless steel brackets, with hanger or combination hanger/bracket to hold bolt in retracted position. Design shall prevent cane from being accidentally withdrawn from lower bracket. Provide one per gate.
      c. Hasp: Stainless steel suitable for any standard size padlock; padlock not in contract.
      d. Pulls: Bent 1/4-inch by 1-inch galvanized steel bar stock welded to frame, or commercial stainless loop pulls. Provide one per gate.
      e. Except for hinges, mount hardware on yard side of gates.
   5. Galvanize all steel framing.

E. Fabricate elevator hoist beam from steel tube or W-section. Coordinate with elevator manufacturer to provide size required for elevator cab weight.

F. Galvanize miscellaneous framing and supports where indicated.

2.7 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.
   1. Provide mitered and welded units at corners.
   2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

C. Galvanize and prime shelf angles located in exterior walls.

D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.8 METAL LADDERS

A. General:
   1. Comply with ANSI A14.3.
   2. For elevator pit ladders, comply with ASME A17.1/CSA B44.
   3. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated.

B. Steel Ladders:
   1. Space siderails 18 inches apart unless otherwise indicated.
   2. Siderails:
      a. Exterior Ladders: Continuous, 5/8-by-2-1/2-inch steel flat bars, with eased edges.
      b. Interior Ladders: Continuous, 1/2-by-2-1/2-inch steel flat bars, with eased edges.
      c. Bend siderails for step-through ladder types, providing not less than 24 inches clear width from 6 inches above the top rung or landing to top of rails.
   3. Rungs: 3/4-inch-diameter steel bars.
   4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
   5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout. In lieu of an applied coating, the Contractor may alternately provide one of the following available products:
      a. Harsco Industrial IKG, a division of Harsco Corporation; “Mebac.”
      b. SlipNOT Metal Safety Flooring; W.S. Molnar Company; “SlipNOT.”
   6. Provide platforms as indicated fabricated from welded or pressure-locked steel bar grating, supported by steel angles. Limit openings in gratings to no more than 1/2 inch in least dimension.
   7. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
   8. Galvanize and prime ladders, including brackets.

2.9 ROOF-TO-ROOF LADDERS

A. General: Roof-to-roof ladders as indicated. Fabricate of open type construction with galvanized steel pipe rails, grating for over-parapet platform, and manufactured non-slip rungs. Include all necessary brackets and fittings for through-wall bolting installation. Prime ferrous metals for field applied paint finish.

B. Non-Slip Rungs: Provide 13 gauge, 1-5/8" width formed steel rung with perforated button as manufactured by McNichols Co.; or formed aluminum rungs with non-slip tread surface equal to "Style LR" rung by Safe-T Metal Co.

C. Steel Gratings: Fabricate pressure-locked or welded steel gratings to provide mark/size as indicated. Provide galvanized finish and plain traffic surface for steel bar gratings. (No field painting of gratings.)

2.10 METAL BAR GRATINGS, GRATING FRAMES AND SUPPORTS

A. Grating: Produce metal bar gratings of description indicated per NAAMM marking system that comply with "Standard Specifications for Metal Bar Grating and Metal Bar Grating Treads" published in ANSI/NAAMM MBG 531 "Metal Bar Grating Manual."

1. Sump Grating: Unless indicated otherwise, provide welded or pressure-locked steel grating W-19-4 or P-19-4 (1 x 1/8 inch) plain surface bearing bar; galvanized. Provide removable units with clamps and fasteners.

B. Frames: Steel frames and supports, where indicated. Fabricate units to sizes, shapes, and profiles indicated and required to receive gratings. Fabricate from structural steel shapes, plates, and steel bars of welded construction. Miter and weld connections for perimeter angle frames. Cut, drill, and tap units to receive hardware, and similar items.

1. Equip units with integrally welded anchors for casting into concrete.
2. Unless otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4-inch thick by 8 inches long.

2.11 OVERHEAD DOOR CHANNEL FRAMES

A. Fabricate steel door channel frames from structural shapes and bars of size and to dimensions indicated. Galvanize frames at exterior doors. Where door head is formed by steel lintel plate or otherwise indicated not to have frame member, provide jambs only.

B. Provide steel strap anchors, 1/8 by 2 inches, with a minimum 6-inch embedment and 2-inch hook, unless otherwise indicated, for securing channel jambs into adjoining concrete or masonry. Weld anchors to frame jambs. Space anchors no more than 12 inches from both bottom and head of frame, and not more than 30 inches on center.

2.12 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize exterior miscellaneous steel trim.

2.13 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 40 steel pipe.

B. Optional Precast Concrete Bollard Caps: Manufacturer standard symmetrically domed reinforced precast concrete units designed to replace manual mounding methods.

2.14 **ABRASIVE METAL NOSINGS (EXTERIOR LOADING DOCK STAIR) (*AD 02)**

A. **For abrasive metal nosings at interior metal pan stairs, refer to Division 5 Section "Metal Stairs". (*AD 02)**

B. Extruded Units: Aluminum, with abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Fabricate units in lengths necessary to accurately fit openings or conditions.
   1. 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:
      a. UPNOVR, Inc. (ACL Industries, Inc.)
      b. American Safety Tread Co., Inc.
      c. Amstep Products.
      d. Armstrong Products, Inc.
      e. Balco, Inc.
      f. Granite State Casting Co.
      g. Nystrom, Inc.
      h. Wooster Products Inc.
   2. Provide ribbed units, with abrasive filler strips projecting 1/16 inch above aluminum extrusion.
   3. Nosings: Square-back units, 2 inches wide, for casting into stair treads and landings.

C. Nosing Length: 8 inches less than tread width unless indicated otherwise.

D. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

E. Apply clear lacquer to concealed surfaces of extruded units.

2.15 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates.

2.16 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches unless otherwise indicated.

C. Galvanize and prime loose steel lintels located in exterior walls.

2.17 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.18 FINISHES, GENERAL

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.19 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153 for steel and iron hardware and with ASTM A 123 for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

C. Shop prime iron and steel items unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
   1. Shop prime with universal shop primer unless indicated.

D. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
   1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   2. Other Items: SSPC-SP 3, "Power Tool Cleaning."

E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.20 ALUMINUM FINISHES

A. As-Fabricated Finish: AA-M12.

B. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fill all holes, including vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

E. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

F. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

G. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
   1. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers` written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for operable partitions and overhead doors securely to, and rigidly brace from, building structure.

C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.
   1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.
   1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.3 INSTALLATION OF ROOF-TO-ROOF LADDERS

A. Position ladder assembly to provide for solid masonry anchorage location. Carefully predrill masonry and install anchorage required. Provide butyl bedding sealant (Division 07 Section “Joint Sealants”) at bracket anchorage to masonry to prevent water infiltration. Provide for and coordinate with coping & roof flashing.

B. Install aluminum ships ladder for roof-to-roof applications indicated. Secure to roof curbs specified in Division 07 Section “Flashing, Sheet Metal and Roofing Accessories;” do not disturb roof membrane and curb assembly water-tightness. Provide corrosion protection coating at aluminum base plate mounting.

3.4 INSTALLING METAL BOLLARDS

A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.

B. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.

C. Fill bollards solidly with concrete, mounding top surface to shed water.
   1. Optionally, install precast bollard caps anchored in wet concrete fill per manufacturer instructions.

3.5 INSTALLING ENCLOSURE FENCE AND GATES:

A. Provide enclosure fence and gate assembly conforming to dimensions and general details indicated, including posts, framing, siding, gate assembly and hardware.

B. Fence and Gate, Steel Frame and Vertical Board Siding Construction:
   1. Steel Fabrications: Steel posts, steel framing, and hardware for fence and gates are work of this Section.
      a. Steel tube-framed gate leaf assembly, member sizes indicated, welded and ground, finished with zinc-rich primer.
      b. Steel posts as indicated, capped, hot-dipped galvanized.

2. Provide indicated gate hardware items. Install receiver cups for each cane bolt as follows:
   a. One in the closed and one in the 90º open position for each gate leaf. Partially core concrete apron slab one-half inch larger than cups, set cups flush with slab in non-shrink, non-metallic grout poured in annular space around cups. Dropping cane bolts in cups shall hold gate leafs in the closed or 90º open position.
3. Board Siding: Composite plastic lumber specified in Division 6 Section "Rough Carpentry."

3.6 INSTALLING NOSINGS

A. Center nosings on tread widths unless otherwise indicated.

B. For nosings embedded in concrete steps or curbs, align nosings flush with riser faces and level with tread surfaces.

3.7 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.8 ADJUSTING AND CLEANING

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 Section “Painting."

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION

SECTION 055100 - METAL STAIRS – ADDENDUM NO 2

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design metal stairs, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
   1. Uniform Load: 100 lbf/sq. ft.
   2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
   3. Uniform and concentrated loads need not be assumed to act concurrently.
   4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
   5. Limit deflection of treads, platforms, and framing members to L/360 unless noted otherwise.

C. Head Clearance: In addition to clearances indicated, maintain other clearances required by the building code, including, but not limited to, a minimum of 80 inches head clearance along all paths of travel (the "walk line") as measured above stair noses and walking surfaces.

1.3 ACTION SUBMITTALS

A. Product Data: For metal stairs and the following:
   1. Paint products.
   2. Grout.
   3. **Abrasive nosing. (*AD 02)**

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. **Fabrication detail shall include abrasive nosing. (*AD 02)**

C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified professional engineer and fabricator.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Fabricator Qualifications: A firm experienced in producing metal stairs similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.
   1. Preassembled Stairs: Commercial class.

D. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1, "Structural Welding Code - Steel."
   2. AWS D1.3, "Structural Welding Code - Sheet Steel."

1.6 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 anchorages for metal stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

C. Coordinate locations of hanger rods and struts with other work so they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.

D. Coordinate with installation of related work, including but not limited to railing systems specified in other Division 5 Sections.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36.

B. Steel Tubing: ASTM A 500 (cold formed) or ASTM A 513.

C. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011, either commercial steel, Type B, or structural steel, Grade 30, unless another grade is required by design loads.

2.3 FASTENERS

A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.

2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.5 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.

1. Join components by welding unless otherwise indicated.
2. Use connections that maintain structural value of joined pieces.

B. Preassembled Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Form exposed work with accurate angles and surfaces and straight edges.

F. Weld connections to comply with the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Weld exposed corners and seams continuously unless otherwise indicated.
5. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.

H. Fabricate joints that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

2.6 STEEL-FRAMED STAIRS

A. Stair Framing:
1. Fabricate stringers of steel sections indicated.
   a. Provide closures for exposed ends of channel and tube stringers.
2. Construct platforms of steel headers and miscellaneous framing members as needed to comply with performance requirements.
3. Weld or bolt stringers to headers; weld or bolt framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.
4. Where stairs are enclosed by gypsum board assemblies, provide hanger rods or struts to support landings from floor construction above or below. Locate hanger rods and struts where they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.
5. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

B. Metal-Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements but not less than 0.067 inch.
1. Steel Sheet: Uncoated hot-rolled steel sheet unless otherwise indicated.
2. Stair Run with Exposed Underside: Directly weld metal pans to stringers; locate welds on top of subtreads where they will be concealed by concrete fill. Do not weld risers to stringers.

3. **Shape metal pans to include nosing integral with riser. Coordinate with abrasive nosing manufacturer to fabricate metal pans with top of integral pan nosing set at proper distance below top of each finished stair surface, to account for abrasive nosing thickness. (*AD 02)**
4. At Contractor`s option, provide stair assemblies with metal-pan subtreads filled with reinforced concrete during fabrication.
5. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.

2.7 **ABRASIVE METAL NOSINGS (*AD 02)**

A. **Extruded Units: Aluminum, with abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Fabricate units in lengths necessary to accurately fit openings or conditions.**
   1. **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:**
      a. **UPNOVR, Inc. (ACL Industries, Inc.)**
      b. **American Safety Tread Co., Inc.**
      c. **Amstep Products.**
      d. **Armstrong Products, Inc.**
      e. **Balco, Inc. (Basis-of-Design: Model WP2J).**
      f. **Granite State Casting Co.**
      g. **Nystrom, Inc.**
      h. **Wooster Products Inc.**
   2. **Provide solid abrasive units, without ribs.**
   3. **Nosings: Square-back units, nominal 2 inches wide and 3/8 inches high, for casting into stair treads and landings.**

B. **Nosing Length: Full length of tread width unless indicated otherwise.**

C. **Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.**

D. **Apply clear lacquer to concealed surfaces of extruded units.**

2.8 STAIR RAILINGS

2.9 Refer to Division 5 Sections "Pipe and Tube Railings" and "Decorative Metal Railings."

2.10 FINISHES

A. Comply with NAAMM`s “Metal Finishes Manual for Architectural and Metal Products” for recommendations for applying and designating finishes.

B. Finish metal stairs after assembly.

C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed products:
   1. Interior Stairs: SSPC-SP 3, “Power Tool Cleaning.”

D. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, “Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel,” for shop painting.
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

F. Field Welding: Comply with requirements for welding in “Fabrication, General” Article.

G. Place and finish concrete fill for treads and platforms to comply with Section 033000 “Cast-in-Place Concrete.”

3.2 INSTALLING METAL STAIRS WITH GROUTED BASEPLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of baseplates.

B. Set steel stair baseplates on wedges, shims, or leveling nuts. After stairs have been positioned and aligned, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use nonmetallic, nonshrink grout unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 ADJUSTING AND CLEANING

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 Section “Painting.”

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION

SECTION 085619 - PASS WINDOWS – ADDENDUM NO 2

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for pass windows.

B. Shop Drawings: Include plans, elevations, sections, details, attachments to other Work, and the following:
   1. Full-size section details of framing members.
   2. Glazing details.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative of security window manufacturer for installation of units required for this Project.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of pass windows and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
   1. Do not modify intended performance or aesthetic effects, as judged solely by Architect, except with Architect`s approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

C. Welding: Qualify procedures and personnel according to the following:
   1. AWS D1.2, "Structural Welding Code--Aluminum."

1.4 DELIVERY, STORAGE, AND HANDLING

A. Pack pass windows in cartons for shipment. Crate glazing separate from frames unless factory glazed.

B. Store crated pass windows on raised blocks to prevent moisture damage.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify pass window openings by field measurements before fabrication and indicate measurements on Shop Drawings.
   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating pass windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.6 COORDINATION

A. Coordinate installation of anchorages for pass windows. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Extrusions: ASTM B 221. Provide alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi ultimate tensile strength and not less than 0.125-inch-thick at any location for main frame and sash members.

B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.

C. Welding Rods and Bare Electrodes: Per AWS specifications for metal alloy welded.

D. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos; formulated for 30-mil thickness per coat.

2.2 WINDOW COMPONENTS

A. Miscellaneous Glazing Materials: Provide material, size, and shape meeting requirements of glazing manufacturers; and compatible with surfaces contacted in installation.

B. Anchors, Clips, and Window Accessories: Stainless steel, hot-dip zinc-coated steel or iron per ASTM B 633; provide sufficient strength to withstand design pressure indicated.

2.3 SLIDING PASS-THRU WINDOW ASSEMBLY

A. Basis-of-Design Product: C. R. Laurence Company "Daisy" D1040A or a comparable product of one of the following:
   1. Creative Industries, Inc.
   2. Nissen & Company, Inc.

B. Components:
   1. Standard profile extruded double channel head and jamb – CRL #D603
   2. Standard top guides – CRL #D652
   3. Standard glazing shoe extrusion – CRL #D610
   4. Standard nylon wheels – CRL #D650
   5. Standard profile extruded lower track – CRL #D602
   6. Sliding Door Plunger Lock – CRL #KML41

C. Framing: Extruded aluminum with Class II, clear satin anodized finish.

2.4 FABRICATION

A. General: Fabricate pass windows to comply with indicated standards. Include a complete system for assembly of components and anchorage of pass windows.

B. Framing: Miter or cope corners the full depth of framing; weld, and dress smooth.

C. Metal Protection: Separate dissimilar metals to protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer.

D. Preglazed Fabrication: Preglaze pass windows at the factory.

2.5 ~~**ALUMINUM FINISHES**~~ **(*AD 02)**

A. ~~**High Performance Organic Finish: 2-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers` written instructions.**~~
   1. ~~**Provide color to match aluminum storefront. One color is required for project.**~~

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of pass windows.

3.2 PREPARATION

A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other security window anchors whose installation is specified in other Sections.

1. Furnish cast-in-place anchors and similar devices to other trades for installation well in advance of time needed for coordinating other work.

3.3 INSTALLATION

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing pass windows to in-place construction. Include threaded fasteners for masonry inserts, security fasteners, and other connectors.

B. Metal Protection: Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended in writing by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

3.4 ADJUSTING

A. Adjust horizontal-sliding windows for smooth operation and a secure enclosure.

B. Remove and replace defective work, including pass windows that are warped, bowed, or otherwise unacceptable.

3.5 CLEANING

A. Clean surfaces promptly after installation of pass windows. Exercise care to avoid damaging the finish. Remove excess glazing and sealant compounds, dirt, and other substances.

END OF SECTION

SECTION 101400 – SIGNAGE – ADDENDUM NO 2

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 ALLOWANCE

A. Directional and room identification panel signage shall be furnished under interior and exterior signage allowances, refer to Division 1 Section "Allowances." Commemorative plaque ~~**and dimensional letter signage**~~ shall be included in the base bid. **(*AD 02)**

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details for signs.
   1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
   2. Signage schedule (sign types) showing typestyles, graphic elements, including tactile characters and Braille, and layout for each sign.
   3. Message schedule as approved by the Owner.
   4. Floor plans showing locations of signs as approved by the Owner, corresponding to the Signage Schedule and Owner-approved Message Schedule.
   5. Wiring Diagrams: Power, signal, and control wiring.

C. Samples for Initial Selection: For each type of sign material indicated that involves color selection.

D. Samples for Verification: For each of the following products and for the full range of color, texture, and sign material indicated, of sizes indicated:
   1. Plaque Casting: 6 inches square including border.
   2. ~~**Dimensional Characters: Full-size Samples of each type of dimensional character (letter, number, and graphic element). Show character style, material, finish, and method of attachment.**~~ **(*AD 02)**
   3. Panel Signs: Full-size Samples of each type of sign required.
   4. Approved samples will not be returned for installation into Project.

E. Signage Schedule: Use same designations indicated on Drawings.

F. Qualification Data: For Installer.

G. Maintenance Data: For signs to include in maintenance manuals.

H. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.

C. Regulatory Requirements: Comply with applicable provisions in the Department of Justice 2010 ADA Standards for Accessible Design.
   1. For additional signs not included in the Standards, comply with ICC/ANSI A117.1 - 2009.

2. Interior Code Signage: Provide signage as required by accessibility regulations and requirements of authorities having jurisdiction. These include, but are not limited to, the following:
   a. Tactile Exit Signs.
   b. Stairway Identification.
   c. Maximum Occupancy Signs.
   d. Accessible Spaces.
   e. Directional Signs.
   f. Permanent Room Identifications.
3. Related Code Signage Sections:
   a. Illuminated Exit Signs: Refer to Division 26.
   b. Identification of Fire- and Smoke-Rated Walls: Refer to Division 9 Section "Painting."

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit installation of signs in exterior locations to be performed according to manufacturers` written instructions and warranty requirements.

B. Field Measurements: Verify recess openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.6 COORDINATION

A. Coordinate placement of anchorage devices with templates for installing signs.

1.7 WARRANTY

A. Special Warranty: Manufacturer`s standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Deterioration of metal and polymer finishes beyond normal weathering.
      b. Deterioration of embedded graphic image color and sign lamination.
   2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Castings: ASTM B 26, of alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated.

B. Aluminum Sheet and Plate: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of Alloy 5005-H32.

C. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of Alloy 6063-T5.

D. Bronze Castings: ASTM B 584, Alloy UNS No. C86500 (No. 1 manganese bronze).

E. Polycarbonate Sheet: Of thickness indicated, manufactured by extrusion process, coated on both surfaces with abrasion-resistant coating:
   1. Impact Resistance: 16 ft-lbf/in. per ASTM D 256, Method A.
   2. Tensile Strength: 9000 lbf/sq. in. per ASTM D 638.
   3. Flexural Modulus of Elasticity: 340,000 lbf/sq. in. per ASTM D 790.
   4. Heat Deflection: 265 deg F at 264 lbf/sq. in. per ASTM D 648.
   5. Abrasion Resistance: 1.5 percent maximum haze increase for 100 revolutions of a Taber abraser with a load of 500 g per ASTM D 1044.

F. Applied Vinyl: Die-cut characters from vinyl film of nominal thickness of 3 mils (0.076 mm) with pressure-sensitive adhesive backing, suitable for exterior applications.

2.2 PLAQUES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Advance Corporation; Braille-Tac Division.
   2. A. R. K. Ramos.
   3. Gemini Incorporated.
   4. Matthews International Corporation; Bronze Division.
   5. Metal Arts; Div. of L&H Mfg. Co.
   6. Mills Manufacturing Company.
   7. Nelson-Harkins Industries.
   8. Southwell Company (The).

B. Cast Plaques: Provide castings free of pits, scale, sand holes, and other defects, as follows:
   1. Plaque Material: Aluminum.
   2. Background Texture: Manufacturer`s standard texture.
   3. Border Style: Raised flat band.
   4. Mounting: Concealed studs, noncorroding for substrates encountered.
   5. Size: For bid purposes, assume one plaque, 36 inches wide by 24 inches high.
   6. Graphics: Custom seal or logo, provided by Owner. For bid purposes, assume one 6-inch diameter seal.
   7. Text and Typeface: Finish raised characters to contrast with background. Typeface as selected by Architect from manufacturer's full range.

2.3 ~~**DIMENSIONAL CHARACTERS**~~ **(*AD 02)**

A. ~~**Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:**~~
   1. ~~**A. R. K. Ramos.**~~
   2. ~~**ASI-Modulex, Inc.**~~
   3. ~~**Charleston Industries, Inc.**~~
   4. ~~**Gemini Incorporated.**~~
   5. ~~**Innerface Sign Systems, Inc.**~~
   6. ~~**Metal Arts; Div. of L&H Mfg. Co.**~~
   7. ~~**Mills Manufacturing Company.**~~
   8. ~~**Mohawk Sign Systems.**~~

B. ~~**Cast Characters: Produce characters with smooth flat faces, sharp corners, and precisely formed lines and profiles, free of pits, scale, sand holes, and other defects. Cast lugs into back of characters and tap to receive threaded mounting studs. Alloy**~~

~~**and temper recommended by sign manufacturer for casting process used and for use and finish indicated. Comply with the following requirements.**~~

1. ~~**Character Material: Aluminum.**~~
2. ~~**Thickness: As indicated.**~~
3. ~~**Color(s): As selected by Architect from manufacturer`s full range.**~~
4. ~~**Mounting: Concealed studs, noncorroding for substrates encountered.**~~

C. ~~**Dimensional Character Sign Schedule:**~~

1. ~~**Sign Type 1 (School Main Entrance):**~~
   a. ~~**Character Size: 16 inch high. Depth shall be manufacturer's standard for height with selected font, approximately 1- to 1-1/2-inches.**~~
   b. ~~**Text/Message: For bid purposes, PRINCE GEORGE ELEMENTARY SCHOOL (28 characters). Confirm final school name with Owner prior to fabrication.**~~
   c. ~~**Location: Exterior, wall mounted at main school entrance.**~~

2.4 PANEL SIGNS (BY ALLOWANCE)

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Acorn Sign Graphics.
2. Allen Industries Architectural Signage
3. APCO Graphics, Inc.
4. ASI-Modulex, Inc.
5. Best Sign Systems Inc.
6. Gemini Incorporated.
7. Innerface Sign Systems, Inc.
8. InPro Corporation
9. Matthews International Corporation; Bronze Division.
10. Mohawk Sign Systems.
11. Nelson-Harkins Industries.
12. Seton Identification Products.
13. Supersine Company (The)

B. Interior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner, complying with the following requirements:

1. Phenolic-Backed Photopolymer Sheet: Provide light-sensitive, water-wash photopolymer face layer bonded to a phenolic base layer to produce a composite sheet with overall, face layer, and base-layer thicknesses, respectively, of 0.160, 0.040, and 0.120 inch.
   a. Available Product: Subject to compliance with requirements, a product that may be incorporated into Work includes, but is not limited to, “Jet-388 (1/8-inch) Phenolic Interior Signage” by JetUSA.
2. PETG-Backed Photopolymer Sheet: Provide light-sensitive, water-wash photopolymer face layer bonded to PETG base layer to produce a composite sheet with overall, face layer, and base-layer thicknesses, respectively, of 0.120, 0.040, and 0.080 inch.
   a. Available Product: Subject to compliance with requirements, a product that may be incorporated into Work includes, but is not limited to, "NovAcryl PT Series Interior Signage” by Nova Polymers.

3. Edge Condition: Square cut.
4. Corner Condition: Square.
5. Mounting: Unframed.
6. Custom Paint Colors: Match Pantone color matching system.
7. Color: As selected by Architect from manufacturer`s full range.
8. Tactile Characters: Characters and Grade 2 Braille raised 1/32 inch (0.8 mm) above surface with contrasting colors.

C. Exterior Tactile Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner, complying with the following requirements:
1. Phenolic-Backed Photopolymer Sheet: Provide exterior grade light-sensitive, water-wash photopolymer face layer bonded to a phenolic base layer to produce a composite sheet with overall, face layer, and base-layer thicknesses, respectively, of 0.160, 0.040, and 0.120 inch.
   a. Available Product: Subject to compliance with requirements, a product that may be incorporated into Work includes, but is not limited to, “Jet-388 EX (1/8-inch) Exterior Signage” by JetUSA.
2. PETG-Backed Photopolymer Sheet: Provide exterior grade light-sensitive, water-wash photopolymer face layer bonded to PETG base layer to produce a composite sheet with overall, face layer, and base-layer thicknesses, respectively, of 0.120, 0.040, and 0.080 inch.
   a. Available Product: Subject to compliance with requirements, a product that may be incorporated into Work includes, but is not limited to, "NovAcryl NovEx Exterior Signage” by Nova Polymers.
3. Edge Condition: Square cut.
4. Corner Condition: Square.
5. Mounting: Unframed.
6. Custom Paint Colors: Match Pantone color matching system.
7. Color: As selected by Architect from manufacturer`s full range.
8. Tactile Characters: Characters and Grade 2 Braille raised 1/32 inch (0.8 mm) above surface with contrasting colors.

D. Exterior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch (1.5 mm) measured diagonally from corner to corner, complying with the following requirements:
1. Aluminum Sheet: 0.050 inch (1.27 mm) thick.
2. Laminated, Aluminum-Faced Sheet: 0.020-inch-thick aluminum sheet laminated to each side of 0.197-inch-thick, corrugated backing with painted edges.
3. Acrylic Sheet: 0.060 inch thick.
4. Fiberglass Sheet: 0.090-inch-thick sheet.
5. Edge Condition: Square cut.
6. Corner Condition: Square.
7. Mounting: Unframed.
   a. Wall mounted.
   b. Manufacturer`s standard noncorroding anchors for substrates encountered.
8. Custom Paint Colors: Match Pantone color matching system.
9. Color: As selected by Architect from manufacturer`s full range.

E. Brackets: Fabricate brackets and fittings for bracket-mounted signs from extruded aluminum to suit panel sign construction and mounting conditions indicated. Factory paint brackets in

color matching background color of panel sign selected by Architect from manufacturer's full range.

F. Tactile and Braille Sign: Manufacturer`s standard process for producing text and symbols complying with Accessibility Guidelines. Text shall be accompanied by Grade 2 Braille. Produce precisely formed characters with square-cut edges free from burrs and cut marks; Braille dots with domed or rounded shape.
   1. Panel Material: Photopolymer.
   2. Raised-Copy Thickness: Not less than 1/32 inch.
   3. Clearance: Maintain a minimum of 3/8-inch clearance between Braille and any surrounding raised areas.

2.5 **EXTERIOR LED SIGN (*AD 02)**

A. **Electronic, RGB Color, Exterior Marquee:**
   1. **Basis of Design Product: Daktronics, Galaxy GT6 x 8 mm. Subject to compliance with requirements, provide basis-of-design or alternate product submitted during bidding, approved by Architect and Owner, and identified by addendum.**
      a. **Contractor shall be responsible for all changes required to adjacent construction due to variations from the basis-of-design indicated in size, mounting, power or communication, or other indicated properties.**
   2. **Size: Basis-of-Design Daktronics GT6 x 8 mm; 2'-11" H by 7'-6" L. Depth as required for two-view back-to-back displays.**
   3. **Configuration: Two-view, with back-to-back displays facing opposite directions.**
   4. **Pixel Spacing: 8 mm.**
   5. **Character Height: 2 inches.**
   6. **Mounting Method: Manufacturer's standard clips.**
   7. **Communication Method: Wired, fiber optic. Provide manufacturer's standard control software allowing content updating from Windows compatible hardware.**

2.6 ACCESSORIES

A. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.7 FABRICATION

A. General: Provide manufacturer`s standard signs of configurations indicated.
   1. Welded Connections: Comply with AWS standards for recommended practices in shop welding. Provide welds behind finished surfaces without distortion or discoloration of exposed side. Clean exposed welded surfaces of welding flux and dress exposed and contact surfaces.
   2. Mill joints to tight, hairline fit. Form joints exposed to weather to exclude water penetration.
   3. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.
   4. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.

2.8 FINISHES, GENERAL

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: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.9 ALUMINUM FINISHES

A. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Apply baked enamel complying with paint manufacturer`s written instructions for cleaning, conversion coating, and painting.

1. Organic Coating: Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm), medium gloss.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Verify that items, including anchor inserts, are sized and located to accommodate signs.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 **PREPARATION (*AD 02)**

A. **Coordinate rough opening size required for LED marquee sign with monument sign installer.**

3.3 INSTALLATION

A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer`s written instructions.

1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.

2. Wall-Mounted Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls, to the right of the right hand door for double active doors. Locate tactile signs to maintain a clear space beyond swing of door, centered on and in front of each sign, of 18 inches by 18 inches.

B. Wall-Mounted Signs: Comply with sign manufacturer`s written instructions except where more stringent requirements apply.

1. Silicone-Adhesive Mounting: Use liquid-silicone adhesive recommended in writing by sign manufacturer to attach signs to irregular, porous, or vinyl-covered surfaces. Use double-sided vinyl tape where recommended in writing by sign manufacturer to hold sign in place until adhesive has fully cured.

2. Signs Mounted on Glass: Provide matching opaque plate on opposite side of glass to conceal mounting materials.

C. Bracket-Mounted Signs: Provide manufacturer`s standard brackets, fittings, and hardware for mounting signs that project at right angles from walls and ceilings. Attach brackets and fittings securely to walls and ceilings with concealed fasteners and anchoring devices to comply with manufacturer`s written instructions.

D. ~~**Dimensional Characters: Mount characters using standard fastening methods to comply with manufacturer`s written instructions for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.**~~ **(*AD 02)**

1. ~~**Projected Mounting: Mount characters at 1/2-inch projection distance from wall surface unless otherwise indicated.**~~

E. Cast-Metal Plaques: Mount plaques using standard fastening methods to comply with manufacturer`s written instructions for type of wall surface indicated.

1. Concealed Mounting: Mount plaques by inserting threaded studs into tapped lugs on back of plaque. Set in predrilled holes filled with quick-setting cement.

3.4 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer`s written instructions. Protect signs from damage until acceptance by Owner.

3.5 **DEMONSTRATION AND TRAINING (*AD 02)**

A. **Provide demonstration and training session for Owner's representatives covering operation and maintenance of electronic LED marquee sign.**

3.6 SIGNAGE SCHEDULE

A. Message Schedule: Room numbering system and specific locations for panel signs shall be the responsibility of the signage contractor. The signage contractor shall meet with representatives of the Owner and develop a message schedule and individual sign layout for each sign required. The message schedule shall be submitted to the Architect for review prior to fabrication of the work. If requested, the Architect will provide the graphics contractor with reproducible floor plan drawings to serve as backgrounds for the graphics contractor's layouts.

END OF SECTION

SECTION 102800 - TOILET AND BATH ACCESSORIES – ADDENDUM NO 2

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:
   1. Construction details and dimensions.
   2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
   3. Material and finish descriptions.
   4. Features that will be included for Project.
   5. Manufacturer`s warranty.

B. Setting Drawings: For cutouts required in other work; include templates, substrate preparation instructions, and directions for preparing cutouts and installing anchoring devices.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
   1. Identify locations using room designations indicated.
   2. Identify products using designations indicated.

D. Maintenance Data: For accessories to include in maintenance manuals specified in Division 1. Provide lists of replacement parts and service recommendations.

1.3 QUALITY ASSURANCE

A. Source Limitations: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise approved by Architect.
   1. All grab bars are considered one “type” and shall be of similar design.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Product Options: Accessory requirements, including those for materials, finishes, dimensions, capacities, and performance, are established by specific products indicated in the Toilet and Bath Accessory Schedule.
   1. Products of other manufacturers with equal characteristics, as judged solely by Architect, may be provided.
   2. Do not modify aesthetic effects, as judged solely by Architect, except with Architect`s approval. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.

D. Accessibility Requirements: Comply with applicable provisions in the Department of Justice 2010 ADA Standards for Accessible Design and ICC/ANSI A117.1, 2009.

1.4 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

C. Coordinate type and location of blocking required for wall-mounted accessories.

1.5 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Mirror Warranty: Manufacturer`s standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
   1. Minimum Warranty Period: 15 years from date of Substantial Completion.

C. Automatic Hand Dryer: Manufacturer`s standard form in which manufacturer guarantees automatic hand dryers to be free from defects in materials and workmanship for indicated period. Warranty shall include factory repair or exchange of defective parts, at manufacturer`s option.
   1. Minimum Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 and Part 3 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Products: Subject to compliance with requirements, available products include, but are not limited to, those listed.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering accessories that may be incorporated into the Work include, but are not limited to, the following:
   1. Toilet and Bath Accessories:
      a. A & J Washroom Accessories, Inc.
      b. American Specialties, Inc.
      c. Bobrick Washroom Equipment, Inc.
      d. Bradley Corporation.
   2. Warm-Air Dryers:
      a. American Dryer, Inc.
      b. **Dyson. (*AD 02)**
      c. Excel Dryer Corporation.
      d. World Dryer.
   3. Infant-Care Products:
      a. American Infant Care Products Inc.
      b. American Specialties, Inc.
      c. Koala Kare division of Bobrick Washroom Equipment, Inc.
      d. Bradley Corporation.
      e. Rubbermaid Commercial Products.
      f. Safe-Strap Company, Inc.
   4. Underlavatory Guards:
      a. Plumberex Specialty Products.
      b. Truebro; IPS Corporation.

2.2 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, with No. 4 finish (satin), in 0.031-inch minimum nominal thickness, unless otherwise indicated.

B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.

C. Steel Sheet: ASTM A 1008, Designation CS (cold rolled, commercial steel), 0.036-inch (0.9-mm) minimum nominal thickness.

D. Galvanized-Steel Sheet: ASTM A 653, with G60 hot-dip zinc coating.

E. Galvanized-Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.

F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

H. Baked-Enamel Finish: Factory-applied, gloss-white, baked-acrylic-enamel coating.

I. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

J. Tempered Mirror Glass: ASTM C 1048, Type I, Kind FT, Quality q3, nominal 6.0 mm thick, with silvering, electroplated copper coating, and protective organic coating complying with FS DD-M-411.

K. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.3 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Logo: One, maximum 1-1/2-inch-diameter, unobtrusive stamped manufacturer logo, as approved by Architect, is permitted on exposed face of accessories. On interior surface not exposed to view or back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer`s name and product model number.

C. Recessed Toilet Accessories: Unless otherwise indicated, fabricate units of all-welded construction, without mitered corners.

D. Framed Glass-Mirror Units: Fabricate frames for glass-mirror units to accommodate glass edge protection material. Provide mirror backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture accumulation.

1. Provide galvanized steel backing sheet, not less than 0.034 inch (0.85 mm) and full mirror size, with nonabsorptive filler material. Corrugated cardboard is not an acceptable filler material.

E. Mirror-Unit Hangers: Provide mirror-unit mounting system that permits rigid, tamper- and theft-resistant installation, one of the following:

1. One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.

2. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.

F. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner`s representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers` written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer`s written recommendations.

3.3 TOILET AND BATH ACCESSORY SCHEDULE

A. The following products make reference to the Toilet Accessories Schedule in the drawings, herein designated as “TA.”

B. Grab Bar TA- A, B, C: Where these designations are indicated, provide stainless-steel grab bar complying with the following:
   1. Products: Available products include the following:
      a. UG2 Series; A & J Washroom Accessories, Inc.
      b. 3700 Series; American Specialties, Inc.
      c. B-5806 Series; Bobrick Washroom Equipment, Inc.
      d. 832 Series; Bradley Corporation.
   2. Stainless-Steel Nominal Thickness: Minimum 0.05 inch.
   3. Mounting: Concealed with manufacturer`s standard flanges and anchors.
   4. Gripping Surfaces: Smooth, satin finish with manufacturer`s standard slip-resistant texture.
   5. Outside Diameter: Minimum 1-1/4 inches, for medium-duty applications.

C. Toilet Tissue (Dual Roll-in-Reserve) Dispenser TA-D: Where this designation is indicated, provide toilet tissue dispenser complying with the following:
   1. Products: Available products include the following:
      a. Model 20030; American Specialties, Inc.
      b. Model B-4288; Bobrick Washroom Equipment, Inc.
      c. Model 5402; Bradley Corporation.
   2. Type: Roll-in-reserve dispenser with hinged front secured with tumbler lockset and theft-resistant spindle. Concealed top roll automatically drops into place when bottom roll is used up.
   3. Mounting: Surface mounted with concealed anchorage.
   4. Material: Stainless steel.
   5. Operation: Non-controlled delivery with manufacturer`s standard spindle.
   6. Capacity: Designed for 5-inch-diameter-core tissue rolls.

D. Sanitary Napkin Disposal Unit (Flip Lid) TA-E: Where this designation is indicated, provide stainless-steel sanitary napkin disposal unit complying with the following:
   1. Products: Available products include the following:
      a. Model B-270 Contura; Bobrick Washroom Equipment, Inc.
      b. Model U591; A & J Washroom Accessories, Inc.

c. Model 20852; American Specialties, Inc.
d. Model 4781-15; Bradley Corporation.

2. Surface-Mounted Type: With seamless exposed walls; self-closing top cover; locking bottom panel with stainless-steel, continuous hinge; and removable, reusable receptacle.

E. Soap Dispenser (Surface Tank) TA-F: Where this designation is indicated, provide soap dispenser complying with the following:

1. Products: Available products include the following:
   a. Model U126; A & J Washroom Accessories, Inc.
   b. Model 0347; American Specialties, Inc.
   c. Model B-2111; Bobrick Washroom Equipment, Inc.
   d. Model 6562; Bradley Corporation.
2. Liquid Soap Dispenser, Vertical-Tank Type: Surface-mounted type, minimum 40-oz. capacity tank with stainless-steel piston, springs, and internal parts designed to dispense soap in measured quantity by pump action; and stainless-steel cover with unbreakable window-type refill indicator.
   a. Soap Valve: Designed for dispensing soap in liquid form.

F. Mirror Unit TA-G: Where this designation is indicated, provide mirror unit complying with the following:

1. Products: Available products include the following:
   a. U700 Series; A & J Washroom Accessories, Inc.
   b. 0600 A Series; American Specialties, Inc.
   c. Model B-290; Bobrick Washroom Equipment, Inc.
   d. Model 780; Bradley Corporation.
2. Stainless-Steel, Angle-Framed Mirror: Fabricate frame from minimum nominal 0.05-inch-thick stainless-steel angles, with square corners mitered, welded, and ground smooth.

G. Paper Towel Dispenser TA- Q: Where this designation is indicated, provide stainless-steel paper towel dispenser complying with the following:

1. Products: Available products include the following:
   a. Model U180; A & J Washroom Accessories, Inc.
   b. Model 0210; American Specialties, Inc.
   c. Model B-262; Bobrick Washroom Equipment, Inc.262 has keyed lock
   d. Model 250-15; Bradley Corporation.
2. Surface-Mounted Type: Sized for minimum of 400 C-fold or 575 multifold paper towels without using special adapters; with hinged front equipped with tumbler lockset; and with refill indicators that are pierced slots at sides or front. Unit shall project no more than 4 inches from wall surface.

H. Robe Hook: Where indicated, provide robe hook complying with the following:

1. Products: Available products include the following:
   a. Model UX112; A & J Washroom Accessories, Inc.
   b. Model 7345; American Specialties, Inc.
   c. Model B-7672; Bobrick Washroom Equipment, Inc.
   d. Model 9124; Bradley Corporation.
2. Double-Prong Unit: Stainless-steel, double-prong robe hook with rectangular wall bracket and backplate for concealed mounting.

I. Mop and Broom Holder with Utility Shelf TA-T: Where this designation is indicated, provide mop and broom holder complying with the following:

1. Products: Available products include the following:
   a. Model UJ41A; A & J Washroom Accessories, Inc.
   b. Model 1315; American Specialties, Inc.
   c. Model B-224 x 36; Bobrick Washroom Equipment, Inc.
   d. Model 9983; Bradley Corporation.
2. 36-inch-Long Unit: Minimum nominal 0.05-inch-thick stainless steel unit with shelf; support brackets for wall mounting; three hooks for wiping rags; four spring-loaded, rubber hat, cam-type, mop/broom holders mounted on front of shelf; and approximately 1/4-inch-diameter, stainless-steel rod suspended beneath shelf for drying rags.

J. Warm-Air Hand Dryer TA-U: Where indicated, provide warm-air dryer complying with the following:
1. Products: Available products include the following:
   a. **"Xlerator," Model XL-SB; Excel Dryer Corporation. (*AD 02)**
   b. **"Airforce" Hand Dryer J-973 ~~KJR-937~~ (120 v), World Dryer Corporation. (*AD 02)**
   c. **"eXtremeAir" GXT Series; GXT9-SS American Dryer. (*AD 02)**
2. **In lieu of one of the above models with recess kit for ADA compliance, manufacturer may provide ADA compliant surface mounted units with less than 4" projection. Available products include the following: (*AD 02)**
   a. **Dyson; Airblade V.**
   b. **Excel Dryer Corporation; ThinAir.**
   c. **World Dryer Corporation; VERDEdri.**
3. Automatic Hand Dryer: Warm-air hand dryer with no-touch operation controlled by electronic sensor and specified cover. Provide semi-recessed unit unless indicated otherwise.
   a. **~~Finish: White-painted metal.~~ (*AD 02)**
   b. **Finish: Satin/brushed stainless steel or brushed nickel. (*AD 02)**
   c. Low Energy Use: Maximum 1100 watt heating element size and 5/8 HP fan motor which provides an outlet air velocity of 10,000 to 16,000 linear feet/minute at the air outlet.
   d. Provide large diameter (1.1 inch or more) or multi-port blower discharge for quiet discharge application.
   e. **Semi-recessed Unit: Manufacturer's recess kit to suit wall construction so that unit protrudes no more than 4" from face of wall. Match brushed/satin stainless-steel dryer finish. Recess shall allow no less than 10 inches of vertical hand room under the dryer discharge, full width of the dryer. (*AD 02)**
4. Voltage: 120 VAC, 15 Amp, 60 Hz, Single Phase.

K. Diaper-Changing Station TA-V: Where this designation is indicated, provide infant-care product complying with the following:
1. Products: Available products include the following:
   a. Model KB200; Koala Kare, Bobrick Washroom Equipment, Inc.
   b. Model U944; A & J Washroom Accessories, Inc.
   c. Model 9012; American Specialties, Inc.
2. Description: Horizontal unit that opens by folding down from stored position and with child-protection strap.
   a. Engineered to support a minimum of 200-lb static load when opened.
   b. Conforms to ADA accessibility requirements.

3. Mounting: Surface mounted, with unit projecting not more than 4 inches from wall when closed.
4. Operation: Pneumatic shock-absorbing mechanism.
5. Material and Finish: FDA-approved high-density polyethylene or polypropylene with reinforced full-length steel hinge mechanism, 11-gage steel mounting plates and hardware.
   a. Color: As selected from manufacturer's full line of available colors.
6. Liner Dispenser: Built in.

L. Underlavatory Guard: Where piping is exposed and not otherwise protected at all accessible sinks, complying with the following:
1. Products: Available products include the following:
   a. Series "Lav Guard 2;" Truebro, IPS Corporation.
   b. Series "Trap Gear;" Plumberex Specialty Products, Inc.
2. Description: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
3. Material and Finish: Antimicrobial, molded plastic, white.

END OF SECTION

SECTION 122413 - ROLLER WINDOW SHADES – ADDENDUM NO 2

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.
   1. Motorized Shade Operators: Include operating instructions.
   2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.

B. Shop Drawings: Show location and extent of roller shades. Include elevations, sections, details, and dimensions not shown in Product Data. Show installation details, mountings, attachments to other work, operational clearances, and relationship to adjoining construction.
   1. Motorized Shade Operators: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
   2. Wiring Diagrams: 110 VAC power source, step-down transformers to 24 VAC, system, and control wiring.

C. Coordination Drawings: Reflected ceiling plans and sections, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
   1. Ceiling suspension system members and attachment to building structure.
   2. Adjacent ceiling-mounted or penetrating items including light fixtures, air outlets and inlets, speakers, sprinklers, recessed shades, and other junctures of acoustical ceilings with adjoining construction.
   3. Shade mounting assembly and attachment.
   4. Size and location of access to shade operators, motors and adjustable components.
   5. Minimum Drawing Scale (Plans): 1/4 inch = 1 foot
   6. Minimum Drawing Scale (Sections – if required): 1-1/2 inch = 1 foot

D. Samples for Initial Selection: For each colored component or light-reducing type of shade indicated.
   1. Include similar Samples of accessories involving color selection.

E. Samples for Verification:
   1. Complete, full-size operating unit not less than 16 inches wide for each type of roller shade indicated.
   2. For the following products:
      a. Shade Material: Not less than 12-inches square, with specified treatments applied. Mark face of material. Mark top and face of material.
      b. Ceiling Recessed Shade Pocket: Full-size unit, not less than 12 inches long. Include closure plate and edge trim to receive acoustical ceiling panel system.

F. Window Treatment Schedule: For each motorized roller shade assembly, identify each shade unit to correspond with designations indicated on Drawings.

G. Product Certificates: For each type of roller shade, signed by product manufacturer.

H. Qualification Data: For Installer.

I. Product Test Reports: For each type of roller shade.

J. Maintenance Data: For roller shades to include in maintenance manuals. Include the following:
   1. Methods for maintaining roller shades and finishes.
   2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.
   3. Operating hardware.
   4. Motorized shade operators.
   5. Control devices.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Source Limitations: Obtain roller shades through one source from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide roller shade band materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
   1. Flame-Resistance Ratings: Passes NFPA 701.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Product Standard: Provide roller shades complying with WCMA A 100.1.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in factory packages, marked with manufacturer and product name, and location of installation using same designations indicated.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 VERTICAL ROLLER SHADES

A. Available Products (Manual): Subject to compliance with requirements, provide one of the following:

1. Caco, Inc.; Serenity Rollease.
2. Castec, Inc.; Rollstar; Manual.
3. Crown Shade Company; Clutch.
4. DFB Sales Inc.; Sol-R-Shade; Manual.
5. Draper; Clutch Operated FlexShade.
6. Hunter Douglas; RB 500; Manual Standard Duty Series.
7. MechoShade; Mecho/5.
8. WT Shade; HeliaRise.

B. Available Products (Motorized): Subject to compliance with requirements, provide one of the following:

1. Caco, Inc.; Serenity Rollease Acmeda Automate.
2. Castec, Inc.; Rollstar; Motorized.
3. Crown Shade Company; Motorized.
4. DFB Sales Inc.; Sol-R-Shade; Motorized.
5. Draper; Motorized FlexShade.
6. Hunter Douglas; RB 500; Automated Series.
7. MechoShade; ElectroShade.
8. Lutron; Sivoia QS.
9. WT Shade; MotoRise.

C. Shade Band Material: PVC-coated fiberglass

D. Shade Band Material – 3% OF Solar Shade: PVC-coated fiberglass.

1. Manufacturer, Style and Pattern: (color to be selected)
   a. "SheerShade Fiberglass Basketweave 2" SP12-90-3 by Lutron.
   b. "SheerWeave" Style 2410 by Phifer
   c. "E Screen 7503" by Mermet USA
2. Fabric Width: 96 inches and as required to align with centers of mullions of continuous fixed glazing applications.
3. Color: (To be selected per project)
4. Material Openness Factor: OF 3%
5. Bottom Hem: Straight
6. Use: Fabric on manual and motorized shades for solar shade function.

E. Shade Band Material – Black-Out Shade: ~~PVC laminated fiberglass with PVC backing~~ Fiberglass with acrylic backing. (*AD 02)

1. Manufacturer, Style and Pattern: (color to be selected)
   ~~a. "Standard 1" BN-903-0 or "Standard 2" BH-100-0 by Lutron.~~ (*AD 02)
   b. "Blackout Premiere" BM-600-0 by Lutron. (*AD 02)
   c. "SheerWeave" Style 7000 ~~7100~~ Blackout Fabric by Phifer. (*AD 02)
   d. "Flocke" by Mermet USA.
2. Fabric Width: 96 inches and as required to align with centers of mullions of continuous fixed glazing applications.

3. Color: (To be selected per project)
4. Material Openness Factor: OF 0%
5. Bottom Hem: Straight
6. Use: Fabric on manual and motorized shades for black-out shade function.

F. Rollers: Electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets; with manufacturer's standard method for attaching shade material. Provide a single roller shade band per roller. Coordinate direction of roll with headbox design.

1. Double-Roller Mounting Configuration: Offset, outside roller over and inside roller under. (Lutron "Dual Mount" is design standard)
2. Inside Roller: (Shade fabric unless directed otherwise)
   a. Position of Clutch Operator: Right side of inside face of shade, as determined by hand of user facing shade from inside, unless otherwise indicated.
   b. Direction of Shadeband Roll: Regular, from back of roller.
3. Outside Roller: (Blackout fabric unless directed otherwise)
   a. Position of Clutch Operator: Right side of inside face of shade, as determined by hand of user facing shade from inside, unless otherwise indicated.
   b. Direction of Shadeband Roll: Regular, from back of roller.
4. Shadeband-to-Roller Attachment: Manufacturer's standard method.

G. Mounting Brackets: Galvanized or zinc-plated steel.

H. Fascia (for applications indicated): L-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; continuous panel concealing front and bottom of shade roller, brackets, and operating hardware and operators. Removable design for access.

I. Pocket-Style Headbox (for applications indicated): U-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; with a bottom cover consisting of slot opening of minimum dimension to allow lowering and raising of shade and a removable or an openable, continuous metal access panel concealing shade roller, brackets, and operating hardware and operators within.

J. Bottom Bar: Steel or extruded aluminum. Provide internal type bottom bar concealed, by pocket of shade material with concealed weight bar as required for smooth, properly balanced shade operation.

K. Shade Operation: Manual or motorized operator, as indicated on Drawings.

2.2 ROLLER SHADE FABRICATION

A. Product Description: Roller shade consisting of a roller, a means of supporting the roller, a flexible sheet or band of material carried by the roller, a means of attaching the material to the roller, a bottom bar, and an operating mechanism that lifts and lowers the shade.

B. Concealed Components: Non-corrodible or corrosion-resistant-coated materials.

1. Lifting Mechanism: With permanently lubricated moving parts.

C. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F:

1. Shade Units Installed between (Inside) Jambs: Edge of shade not more than 1/4 inch from face of jamb. Length equal to head to sill dimension of opening in which each shade is installed. Provide unless indicated otherwise.
2. Shade Units Installed Outside Jambs: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings. Provide for applications indicated.

D. Installation Brackets: Designed for easy removal and reinstallation of shade, for supporting headbox, roller, and operating hardware and for hardware position and shade mounting method indicated.
1. Install in headbox for applications indicated.
2. ~~Site-built gypsum board shade pocket includes space for possible future installation of a second roller shade assembly. Low voltage control wiring for future roller shade assembly will be incorporated under this contract.~~ **(*AD 02)**

E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal non-corrosive to shade hardware and adjoining construction; type designed for securing to supporting substrate; and supporting shades and accessories under conditions of normal use.

F. Exposed Aluminum Finish: For front fascia components or exposed headbox, provide satin finish clear anodized aluminum finish, AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

G. Color-Coated Finish: For metal components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

H. Colors of Metal and Plastic Components Exposed to View: As selected by Architect from manufacturer's full range, unless otherwise indicated.

2.3 MANUAL ROLLER SHADE OPERATOR

A. Manual Shade Operation: Continuous-loop bead-chain, clutch, and cord tensioner and bracket lift operator.

2.4 MOTORIZED ROLLER SHADE OPERATORS

A. General: Provide factory-assembled motorized shade operation systems designed for lifting shades of type, size, weight, construction, use, and operation frequency indicated. Provide operation systems of size and capacity and with features, characteristics, and accessories suitable for Project conditions and recommended by shade manufacturer, complete with electric motors and factory-prewired motor controls, remote-control stations, remote-control devices, power disconnect switches, enclosures protecting controls and all operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with the building electrical system.

B. Comply with NFPA 70.

C. Control Equipment: Comply with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6 with NFPA 70, Class 2 control circuit, maximum 24-V ac or dc.

D. Low-Voltage Electric Motors: UL-approved or -recognized, totally enclosed, insulated motor, complying with NEMA MG 1, with thermal-overload protection, brake, permanently lubricated bearings, and limit switches; sized by shade manufacturer to start and operate size and weight of shade considering service factor or considering Project's service conditions without exceeding nameplate ratings.

1. Service Factor: According to NEMA MG 1, unless otherwise indicated.
2. Motor Characteristics: Single phase, 24 V, 60 Hz.
3. Motor Mounting: Within manufacturer's standard roller enclosure.

E. Remote Controls: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting. Provide the following devices for remote-control activation of shades:

1. Keypad(s) shall be able to electronically set and reconfigure shade open and close limits, shade preset positions, system groups, and system subgroups at the control without rewiring and without access to the Electronic Drive Unit.
2. Wallplate shall attach using no visible means of attachment.
3. Any engraved artwork specified for controls, such as borders and logos, shall be applied in a method designed to resist removal by scratching, cleaning, etc.
4. Manufacturer shall ensure color match of all visible components of control assembly.
5. Keypad(s) shall mount in standard U.S. backboxes in either single-gang or multi-gang installations. Keypad(s) shall be available in “Insert” and “No Insert” models. Manufacturer to supply appropriate wallplate based on ganging and insert options specified.
6. Keypad(s) shall provide an immediate local LED response upon button activation to indicate that a system command has been sent from the keypad. LED will remain lit contingent upon receiving system confirmation of the successful completion of the command.
7. Keypad(s) shall have removable button assemblies that can be replaced in the field to change colors, button configurations, and engraving.
8. Keypad(s) shall have a backlighting option.
9. Keypad(s) shall be capable of simultaneously controlling one or more shades, up to the maximum number of shades in the system.
10. Keypads will provide buttons for selecting the following for one group of shades: full-open, full-close, three programmable preset positions, and raise/lower.

F. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatic-ally stop shade at fully-raised and fully-lowered positions.

G. Operating Function: Stop and hold shade at open, midpoint, and closed positions.

H. Operating Features: Include the following:

1. Group switching with integrated switch control; single face plate for multiple switch cut-outs.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Coordinate with Division 26 Sections for electrical service and connections for motor operators, controls, limit switches, and other powered devices and for system disconnect switches for motorized shade operation.

3.2 ROLLER SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions, and located so shade band is not closer than 2 inches to interior face of glass.

B. Connections: Connect motorized operators to building electrical system.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain roller shades for a period of 12 months following date of Substantial Completion. Refer to Division 1 Section “Demonstration and Training.”

END OF SECTION 122413

SECTION 230514 – VARIABLE SPEED DRIVES **(*AD 02)**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

A. Factory Installed Variable Speed Drive: A drive installed by motorized-equipment manufacturer as a component of equipment utilized to control the speed of a motor.

B. Field-Installed Variable Speed Drive: A drive installed in the field by the contractor to control the speed of a motor not equipped with a factory installed drive.

C. VSD: Variable Speed Drive

1.3 SUBMITTALS

A. Submittals shall include the following information:
   1. Outline dimensions
   2. Conduit entry locations
   3. Weight.

B. Customer connection and power wiring diagrams.

C. Technical product description including but not limited to a complete list of options.

D. Compliance to IEEE 519 – harmonic analysis for particular jobsite including total harmonic voltage distortion and total harmonic current distortion (TDD).

E. The VFD manufacturer shall provide calculations; specific to this installation, showing total harmonic voltage distortion is less than 5%. All VFD's shall include a minimum of 5% impedance reactors.

1.4 QUALITY ASSURANCE

A. VSDs and options shall be UL listed as a complete assembly.

B. The base VSD shall be UL listed for 100 KAIC without the need for input fuses.

C. The VSD shall be tested by the manufacturer.

D. All optional features shall be functionally tested at the factory for proper operation.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use. Comply with UL 508C.

F. Referenced standards:
1. Standard 519-1992, IEEE Guide for Harmonic Content and Control.
2. UL508C
3. ICS 7.0, AC Adjustable Speed Drives
4. IEC 16800 Parts 1, 2 and 3NEC 430.120, Adjustable-Speed Drive Systems
5. IBC 2006 Seismic – referencing ASC 7-05 and ICC AC-156

G. All VSDs installed on this project shall be from the same manufacturer.

H. The VSD enclosure shall be seismically certified and labeled in accordance with the IBC 2006 International Building Code:
1. VSD manufacturer shall provide Seismic Certification and Installation requirements at time of submittal.
2. A Seismic importance factor of 1.5 shall be used and shall be based upon actual shake test data as defined by ICC AC-156. Seismic ratings based upon calculations alone are not acceptable.
3. Certification of Seismic rating must be based on testing done in all three axis of motion by a certified lab.

I. Installations in life safety applications including but not limited to smoke removal and make up air to smoke removal systems shall be included in the seismic approval.

1.5 COORDINATION

A. Coordinate features of VSDs with motors, installed units, and accessory devices. Provide VSDs that meet the requirements indicated in this and other equipment specific specification sections.

B. Confirm that motors controlled by VSDs, provided under this section are designed and labeled for use with variable speed drives, and suitable for use throughout speed range without overheating.

C. Coordinate VSD support with requirements for maintenance and replacement; and installation of accessories.

1.6 Manufacturers

A. Field installed variable speed drives manufacturer shall match factory installed variable speed drives manufacturer. (*AD 02)

PART 2 - PRODUCTS

2.1 FACTORY INSTALLED VARIABLE SPEED DRIVES

A. The VSD shall be enclosed in a UL Listed enclosure.

B. Refer to equipment specific specification sections.

C. Where equipment specific specification sections do not indicate variable speed drive requirements comply with 2.2 below.

2.2 FIELD-INSTALLED VARIABLE SPEED DRIVES

A. Manufacturers

1. Danfoss Graham VLT 6000 Series
2. ABB
3. Cutler-Hammer
4. **Basis of Design –** JCI **(*AD 02)**

B. General

1. Furnish complete variable speed drives (VSDs) as indicated.
2. Drawing schedules, sequences of control, control diagrams, details, or other specification sections may indicate variable speed requirements.
3. All standard and optional features shall be included within the VSD enclosure, unless indicated otherwise. Each VSD shall be housed in a NEMA 1 enclosure, or other NEMA type according to installation and operating conditions.
4. Provide NEMA 3R weatherproof enclosures for drives mounted outside.
5. The UL listing shall allow mounting in a plenum or other air handling compartment. If a NEMA 12 enclosure is required for the plenum rating, the manufacturer shall supply a NEMA 12 rated VSD.
6. Furnish one extra VFD of each size required for this project. Provide to owner during closeout procedure.

C. The VSD shall convert incoming fixed frequency three-phase AC power into a variable frequency and voltage for controlling the speed of three-phase AC motors. The motor current shall closely approximate a sine wave. Motor voltage shall be varied with frequency to maintain desired motor magnetization current. Operation shall be suitable for centrifugal pump and fan control and shall eliminate the need for motor de-rating.

D. With the motor's rated voltage applied to the VSD input, the VSD shall allow the motor to produce full rated power at rated amps, RMS fundamental volts, and speed without using the motor's service factor. VSDs utilizing sine weighted/coded modulation (with or without 3rd harmonic injection) must provide data verifying that the motors will not draw more than full load current during full load and full speed operation.

E. The VSD shall include an input full-wave bridge rectifier and maintain a fundamental power factor near unity regardless of speed or load.

F. The VSD and options shall be tested to ANSI/UL Standard 508. The complete VSD, including all specified options, shall be assembled by the manufacturer and shall be UL-508 certified for the building and drive assembly including options. Assembly of the options by a third-party panel shop is not acceptable. The appropriate UL stickers shall be applied to both the VSD and option panel, in the case where these are not contained in one panel.

G. The VSD shall have DC link reactors on both the positive and negative rails of the DC bus to minimize power line harmonics. VSDs without DC link reactors shall provide a minimum 3% impedance line reactor.

H. The VSD's full load amp rating shall meet or exceed NEC Table 430-150. The VSD shall be able to provide full rated output current continuously, 110% of rated current for 60 seconds and 160% of rated current for up to 0.5 second while starting.

I. The VSD shall be able to provide full torque at any selected frequency from 28 Hz to base speed to allow driving direct drive fans without derating.

J. An automatic energy optimization selection feature shall be provided standard in the VSD. This feature shall automatically and continually monitor the motor's speed and load and adjust the applied voltage to maximize energy savings and provide up to an additional 3% to 10% energy savings.

K. Input and output power circuit switching shall be able to be accomplished without interlocks or damage to the VSD. Switching rate may be up to 1 time per minute on the input and unlimited on the output.

L. An automatic motor adaptation test algorithm shall measure motor stator resistance and reactance to optimize performance and efficiency. It shall not be necessary to run the motor or de-couple the motor from the load to run the test.

M. Galvanic and/or optical isolation shall be provided between the VSD's power circuitry and control circuitry to ensure operator safety and to protect connected electronic control equipment from damage caused by voltage spikes, current surges, and ground loop currents. VSDs not including either galvanic or optical isolation on both analog I/O and discrete I/O shall include additional isolation modules.

N. VSD shall minimize the audible motor noise through the use of an adjustable carrier frequency. The carrier frequency shall be automatically adjusted to optimize motor and VSD efficiencies while reducing motor noise.

O. Protective Features:
   1. Disconnect with drive fusing.
   2. A minimum of Class 20 I^2t electronic motor overload protection for single motor applications and thermal-mechanical overloads for multiple motor applications shall be provided.

3. Protection against input transients, loss of AC line phase, output short circuit, output ground fault, overvoltage, undervoltage, VSD overtemperature and motor overtemperature. The VSD shall display all faults in plain English. Codes are not acceptable.
4. Protect VSD from sustained power or phase loss. The VSD shall provide full rated output with an input voltage as low as 90% of the nominal. The VSD will continue to operate with reduced output with an input voltage as low as 164 V AC for 208/230 volt units, and 313 V AC for 460 volt units.
5. The VSD shall incorporate a motor preheat circuit to keep the motor warm and prevent condensation build up in the stator.
6. VSD package shall include semi-conductor rated input fuses to protect power components.
7. To prevent breakdown of the motor winding insulation, the VSD shall be designed to comply with IEC Part 34-17. Otherwise, the VSD manufacturer must ensure that inverter rated motors are supplied.
8. VSD shall include a "signal loss detection" circuit to sense the loss of an analog input signal such as 4 to 20 mA or 2 to 10 V DC, and shall be programmable to react as desired in such an instance.
9. VSD shall function normally when the keypad is removed while the VSD is running and continue to follow remote commands. No warnings or alarms shall be issued as a result of removing the keypad.
10. VSD shall catch a rotating motor operating forward or reverse up to full speed.
11. VSD shall be rated for 100,000 amp interrupting capacity (AIC).
12. VSD shall include current sensors on all three output phases to detect and report phase loss to the motor. The VSD will identify which of the output phases is low or lost.
13. VSD shall continue to operate without faulting until input voltage reaches 300 V AC on 208/230 volt VSDs, and 539 V AC on 460 volt VSDs.

P. Interface Features:
1. Hand/Start, Off/Stop and Auto/Start selector switches shall be provided to start and stop the VSD and determine the speed reference.
2. The VSD shall be able to be programmed to provide a 24 V DC output signal to indicate that the VSD is in Auto/Remote mode.
3. The VSD shall provide potentiometer speed control. Electronic speed controls are not acceptable.
4. Lockable, alphanumeric backlit display keypad can be remotely mounted up to 10 feet away using standard 9-pin cable.
5. The keypads for all sizes of VSDs shall be identical and interchangeable.
6. To set up multiple VSDs, it shall be possible to upload all setup parameters to the VSD's keypad, place that keypad on all other VSDs in turn and download the setup parameters to each VSD. To facilitate setting up VSDs of various sizes, it shall be possible to download from the keypad only size independent parameters.

7. Display shall be programmable to display in 9 languages including English, Spanish and French.

8. The display shall have four lines, with 20 characters on three lines and eight large characters on one line.

9. A red FAULT light, a yellow WARNING light and a green POWER-ON light shall be provided. These indications shall be visible both on the keypad and on the VSD when the keypad is removed.

10. A quick setup menu with factory preset typical HVAC parameters shall be provided on the VSD eliminating the need for macros.

11. The VSD shall include a standard RS-485 communications port.

12. As a minimum, the following points shall be controlled and/or accessible:

    a. VSD Start/Stop
    b. Speed reference
    c. Fault diagnostics
    d. Meter points
    e. Motor power in HP
    f. Motor power in kW
    g. Motor kW-hr
    h. Motor current
    i. Motor voltage
    j. Hours run
    k. Feedback signal #1
    l. Feedback signal #2
    m. DC link voltage
    n. Thermal load on motor
    o. Thermal load on VSD
    p. Heat sink temperature

13. Four additional Form C 230 volt programmable relays shall be available for factory or field installation within the VSD.

14. LonWorks communication shall be available for factory or field installation within the VSD.

15. Two set-point control interface (PID control) shall be standard in the unit. VSD shall be able to look at two feedback signals, compare with two set-points and make various process control decisions.

16. Floating point control interface shall be provided to increase/decrease speed in response to contact closures.

17. Four simultaneous displays shall be available. They shall include frequency or speed, run time, output amps and output power. VSDs unable to show these four displays simultaneously shall provide panel meters.

18. Sleep mode shall be provided to automatically stop the VSD when its speed drops below set "sleep" level for a specified time. The VSD shall automatically restart when the speed command exceeds the set "wake" level.

19. The sleep mode shall be functional in both follower mode and PID mode.

20. Run permissive circuit shall be provided to accept a "system ready" signal to ensure that the VSD does not start until dampers or other auxiliary equipment are in the proper state for VSD operation. The run permissive circuit shall also be capable of sending an output signal as a start command to actuate external equipment before allowing the VSD to start.

21. The following displays shall be accessible from the control panel in actual units: Reference Signal Value in actual units, Output Frequency in Hz or percent, Output Amps, Motor HP, Motor kW, kW-hr, Output Voltage, DC Bus Voltage, VSD Temperature in degrees, and Motor Speed in engineering units per application (in GPM, CFM, etc.). VSD will read out the selected engineering unit either in a linear, square or cubed relationship to output frequency as appropriate to the unit chosen.

22. The display shall be programmed to read in inches of water column (in-wg) for an air handler application, pressure per square inch (psi) for a pump application, and temperature (°F) for a cooling tower application.

23. VSD shall be able to be programmed to sense the loss of load and signal a no load/broken belt warning or fault.

24. If the temperature of the VSD's heat sink rises to 80°C, the VSD shall automatically reduce its carrier frequency to reduce the heat sink temperature. If the temperature of the heat sink continues to rise the VSD shall automatically reduce its output frequency to the motor. As the VSD's heat sink temperature returns to normal, the VSD shall automatically increase the output frequency to the motor and return the carrier frequency to its normal switching speed.

25. The VSD shall have temperature controlled cooling fans for quiet operation and minimized losses.

26. The VSD shall store in memory the last 10 faults and related operational data.

27. Eight programmable digital inputs shall be provided for interfacing with the systems control and safety interlock circuitry.

28. Two programmable relay outputs, one Form C 240 V AC, one Form A 30 V AC, shall be provided for remote indication of VSD status.

29. Three programmable analog inputs shall be provided and shall accept a direct-or-reverse acting signal. Analog reference inputs accepted shall include two voltage (0 to 10 V DC, 2 to 10 V DC) and one current (0 to 20 mA, 4 to 20 mA) input.

30. Two programmable 0 to 20 mA analog outputs shall be provided for indication of VSD status. These outputs shall be programmable for output speed, frequency, current and power. They shall also be programmable to provide a selected 24 V DC status indication.

31. Under fire mode conditions, the VSD shall be able to be programmed to automatically default to a preset speed.

Q. Adjustments

1. VSD shall have an adjustable carrier frequency in steps of not less than 0.1 kHz to allow tuning the VSD to the motor.

2. Sixteen preset speeds shall be provided.

3. Four acceleration and four deceleration ramps shall be provided. Acceleration and deceleration times shall be adjustable over the range from 0 to 3,600 seconds to base

speed. The shape of these curves shall be automatically contoured to ensure no-trip acceleration and deceleration.

4. Four current limit settings shall be provided.

5. If the VSD trips on one of the following conditions, the VSD shall be programmable for automatic or manual reset: undervoltage, overvoltage, current limit and inverter overload.

6. The number of restart attempts shall be selectable from 0 through 20 or infinitely and the time between attempts shall be adjustable from 0 through 600 seconds.

7. An automatic "on delay" may be selected from 0 to 120 seconds.

R. Service Conditions

1. Ambient temperature, -10 to 40°C (14 to 104°F).

2. 0 to 95% relative humidity, non-condensing.

3. Elevation to 3,300 feet without derating.

4. AC line voltage variation, -10 to +10% of nominal with full output.

5. No side clearance shall be required for cooling of any units. All power and control wiring shall be done from the bottom.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

A. Examination

1. Contractor to verify that job site conditions for installation meet factory recommended and code-required conditions for VSD installation prior to start-up, including clearance spacing, temperature, contamination, dust, and moisture of the environment. Separate conduit installation of the motor wiring, power wiring, and control wiring, and installation per the manufacturer's recommendations shall be verified.

2. The VSD is to be covered and protected from installation dust and contamination until the environment is cleaned and ready for operation. The VSD shall not be operated while the unit is covered.

B. Start-up Service

1. The manufacturer shall provide start-up commissioning of the VSD and its optional circuits by a factory certified service technician who is experienced in start-up and repair services. Sales personnel and other agents who are not factory certified shall not be acceptable as commissioning agents. Start-up services shall include checking for verification of proper operation and installation for the VSD, its options and its interface wiring to the building automation system.

C. WARRANTY: The VSD shall be warranted by the manufacturer for a period of 2 Years from date of substantial completion. The warranty shall include parts, labor, travel costs and living expenses incurred by the manufacturer to provide factory authorized on-site service. The warranty shall be provided by the VSD manufacturer.

D. CLEANING: After completing equipment installation, inspect unit components. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

END OF SECTION 230514

SECTION 233113 - METAL DUCTS **(*AD 02)**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 PERFORMANCE REQUIREMENTS

A. Seal all ducts to seal class A as defined in SMACNA's HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005:

1. Seal all longitudinal joints.
2. Seal all transverse joints.
3. Seal all penetrations.

B. Seal Class: A

C. Duct Construction: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005" and performance requirements and design criteria indicated in "Duct Schedule" Article.

D. Liner Airstream Surfaces: Liner surfaces in contact with the airstream shall comply with ASHRAE 62.1-2007, paragraph 5.5 .

E. CLEANLINESS: All factory fabricated duct shall be cleaned with a non-toxic, biodegradable cleaner/degreaser and shall be shrink wrapped prior to shipment.

1.3 ABBREVIATIONS

A. BAS Building Automation System

B. NRTL Nationally Recognized Testing Laboratory

C. SMACNA Sheet Metal and Air conditioning Contractors' National Association

D. WC Water Column

1.4 DEFINITIONS:

A. Duct System: For the purposes of this section "duct system" shall mean all metal supply, return, and exhaust duct and fittings between the air moving device and the space.

B. Low Pressure: Plus two (2.0) inches WC to minus one (1.0) inches WC

C. Medium Pressure: More than two (2.0) inches WC to plus ten (10.0) inches WC or more than minus one (1.0) inch to minus ten (10.0) inches WC

D. High Pressure: More than plus or minus ten(10.0) inches WC.

1.5 SUBMITTALS

A. Product Data / Documentation: For each of the following:

1. Sheet metal thicknesses.
2. Liners and adhesives.
3. Pre-manufactured ductwork.
4. Sealants and gaskets.
5. Statement of duct seal class. Describe how it will be achieved.
6. VOC content for adhesives and sealants.

B. Submittals during construction:

1. Duct-Cleaning Test Report: Documentation of work performed for compliance with ASHRAE 62.1-2007, Section 7.2.4 - "Ventilation System Start-Up."

1.6 QUALITY ASSURANCE

A. Provide work in compliance with applicable Building Code requirements.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

C. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.

D. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.

E. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

F. ASHRAE Compliance: Comply with applicable requirements in ASHRAE 62.1-2007, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

G. ASHRAE/IESNA Compliance: Comply with applicable requirements in ASHRAE/IESNA 90.1-2007, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 COMMERCIAL KITCHEN GREASE DUCTS

A. Provide factory-built grease duct or field-built grease duct.

B. Factory-Built Grease Ducts:

1. Manufacturers:

a. Hart & Cooley, Inc. (Commercial Products Group)
b. Heat-Fab Inc.
c. Metal-Fab, Inc.
d. Schebler Co. (The).
e. Selkirk Inc.; Selkirk Metalbestos and Air Mate.
f. Van-Packer Co.
g. Duravent (*AD 02)

2. General: Double-wall, factory-fabricated and -insulated grease duct conforming to the requirements of UL 1978.

    a. Provide hood and fan transitions, pipe supports, guides, fittings, cleanout ports, ports for the introduction of fire suppression and wash-down nozzles, expansion joints, and thimbles for penetration of non-fire rated building members as required to meet applicable building code requirements.
    b. Provide all components of the grease duct system.

3. Listings:

    a. Listed and labeled UL-1978 for venting air and grease vapors from commercial cooking operations.

4. Rating:

    a. Continuous operation at 500°F.
    b. Intermittent operation (30 minutes) at 2,000°F.

5. Penetration of rated walls and partitions: Listed to penetrate walls and partitions rated for up to two (2) hours. Fire-stop penetrations in accordance with the manufacturer's instructions. Metal-Fab Model PICPPK fire stop kit or approved equivalent.

6. Listed Clearance to combustibles: 0"

7. Materials:

    a. Inner wall: 0.035" thick type 304 or 316 stainless steel.
    b. Outer wall: 0.025" thick aluminized steel.

        1) Exception: Exposed portions of duct shall be type 304 or type 316 stainless steel finished to match exposed surfaces of grease hood.

    c. Insulation: 4" high temperature ceramic insulation.
    d. Mechanical Joints: Integral flanges on adjoining sections of pipe held together with a stainless steel flange band.
    e. Sealant: Sealed with manufacturer's recommended sealant. Metal-Fab P080 or equivalent.
    f. Supports and Guides: Anchor with minimum 5/8" diameter FM-Stainless Fasteners, FIX Epoxy Anchoring System or equivalent approved by Local Authority Having Jurisdiction.

C. Field-Built Grease Ducts:

1. General: Grease ducts severing Type I hoods shall be constructed of single wall, 16 gauge black steel or 18 gauge stainless steel.
2. Joints: Joints, seams, and penetrations of grease ducts shall be made with a continuous, liquid-tight, weld or braze made on the external surface of the duct system.

a. Joint Types: Duct joints shall be butt joints, welded flange joints with a maximum flange depth of ½ inch or overlapping duct joints installed to prevent accumulation of grease or interference with gravity drainage. The difference in cross-sectional dimensions of overlapping duct sections shall not exceed ¼ inch. The length of overlap shall not exceed 2 inches.
b. Duct-to-hood joints shall be made with continuous internal or external liquid-tight welded or brazed joints. Joints shall be smooth, accessible for inspection, and shall not trap grease.
c. Duct-to-fan connection shall be flanged and gasketed at the base of the fan for vertical discharge fans; flanged, gasketed, and bolted to the inlet of the fan for side-inlet utility fans; and flanged, gasketed, and bolted to the inlet and outlet of the fan for inline fans. Gasket and sealing materials shall be rated for continuous duty at a temperature of not less than 1500°F.

3. Grease duct bracing and supports shall be noncombustible securely attached to the structure. Bolts, screws, rivets and other fasteners shall not penetrate duct walls.
4. Grease ducts shall be constructed and installed so that grease cannot collect in any portion of the duct system. The duct shall slope toward the hood or an approved reservoir in accordance with the applicable mechanical code.
5. Grease duct cleanouts and openings shall comply with the requirements in the applicable mechanical code.

2.2 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 2-1, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 2-2, "Rectangular Duct/Longitudinal Seams" for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005."

2.3 DOUBLE-WALL RECTANGULAR DUCTS AND FITTINGS (PERFORATED LINER)

A. Manufacturers:

1. McGill AirFlow LLC.
2. MKT Metal Manufacturing
3. Sheet Metal Connectors, Inc.

B. Rectangular Ducts: Fabricate ducts with indicated dimensions for the inner duct.

C. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005" based on indicated static-pressure class unless otherwise indicated.

D. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 2-1, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005."

E. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 2-2, "Rectangular Duct/Longitudinal Seams" for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005."

F. Interstitial Insulation: Fibrous-glass liner complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Install spacers that position the inner duct at uniform distance from outer duct without compressing insulation.
2. Coat insulation with antimicrobial coating.
3. Cover insulation with polyester or Mylar film complying with UL 181, Class 1.

G. Inner Duct: Minimum 22 gauge perforated galvanized sheet steel having 3/32-inch- diameter perforations, with overall open area of 23 percent.

H. Formed-on Transverse Joints (Flanges): Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 1-4, "Traverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005."

I. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005."

2.4 LOW PRESSURE SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Chapter 3, "Round, Oval, and Flexible Duct," based on specified static-pressure class unless otherwise indicated.

B. Manufacturers:

1. Eastern Sheet Metal.
2. Lindab Inc.
3. McGill AirFlow LLC.
4. Performance Duct Systems
5. Spiral Manufacturing Co., Inc.

C. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 3-1, "Round Duct Transverse Joints"

1. Transverse Joints in Ducts Equal to or Larger Than 48" in Diameter: Flanged.
2. Gasketed, EPDM, self sealing Joints such as Eastern Tight or Spiro Safe may be used for ducts smaller than 48" in diameter.
3. Flanges may be substituted in ducts smaller than 48" in diameter.

D. Duct support intervals, and other provisions: In accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005."

E. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005."

F. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 3-5, "90º Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005." Adjustable elbows are not permitted.

G. All seam types in FIGURE 3-2 are acceptable where approved by SMACNA.

H. All round duct shall not be less than No. 26 U.S. gauge.

2.5 MEDIUM PRESSURE SINGLE-WALL ROUND AND FLAT OVAL DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

B. Manufacturers:

1. Eastern Sheet Metal.
2. Lindab Inc.
3. McGill AirFlow LLC.
4. Performance Duct Systems
5. Spiral Manufacturing Co., Inc.

C. Flat-Oval Ducts: Dimensions are the inside duct width (major dimension) and inside diameter of the round sides connecting the flat portions of the duct (minor dimension) of the inner duct.

D. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 3-1, "Round Duct Transverse Joints"

1. Transverse Joints in Ducts Equal to or Larger Than 48" in Diameter: Flanged.
2. Gasketed, EPDM, self sealing Joints such as Eastern Tight or Spiro Safe may be used for ducts smaller than 48" in diameter.
3. Flanges may be substituted in ducts smaller than 48" in diameter.

E. Duct support intervals, and other provisions: In accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005."

F. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005."

G. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 3-5, "90º Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005." Adjustable elbows are not permitted.

H. All seam type in FIGURE 3-2 are acceptable where approved by SMACNA.

I. All round duct shall not be less than No. 26 U.S. gauge.

2.6 LOW PRESSURE SINGLE-WALL ROUND AND FLAT OVAL DUCTS AND FITTINGS - EXPOSED

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Chapter 3, "Round, Oval, and Flexible Duct," "FIGURE 3-2 ROUND DUCT LONGITUDINAL SEAMS" "SPIRAL SEAM RL-1" to plus-or-minus 10" WC unless otherwise indicated.

B. Manufacturers:

1. Eastern Sheet Metal.
2. Hamlin Sheet Metal.
3. Linx Industries - Lindab.
4. McGill AirFlow LLC.
5. MKT Metal Manufacturing
6. Semco, Inc.
7. Sheet Metal Connectors, Inc.
8. Spiral Manufacturing Co., Inc.

C. Flat-Oval Ducts: Dimensions are the inside duct width (major dimension) and inside diameter of the round sides connecting the flat portions of the duct (minor dimension) of the inner duct.

D. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 3-1, "Round Duct Transverse Joints"

E. Static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005." And the following:

1. Transverse Joints in Ducts Equal to or Larger Than 48" in Diameter or Flat Oval with a Major Dimension Equal to or Larger Than 48": Flanged.
2. Gasketed, EPDM, self sealing Joints such as Eastern Tight or Spiro Safe may be used for ducts smaller than 48" in diameter.
3. Flanges may be substituted in ducts smaller than 48" in diameter.

F. Longitudinal Seams: Duct shall be spiral according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 3-2, " Round Duct Longitudinal Seams"

G. Tees and Laterals: Tees and laterals shall be created with fittings. Fabricate fittings according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005." Adjustable elbows are not permitted.

H. Static-pressure class: Applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005."

I. Longitudinal seams shall be spiral type.

J. All round duct shall not be less than No. 26 U.S. gauge.

2.7 DOUBLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS (PERFORATED LINER)

A. Manufacturers:

1. Eastern Sheet Metal.
2. Hamlin Sheet Metal.
3. Lindab Inc.
4. McGill AirFlow LLC.
5. Performance Duct Systems
6. Spiral Manufacturing Co., Inc.
7. **Semco, Inc. (*AD 02)**

B. Flat-Oval Ducts: Indicated dimensions are the inside duct width (major dimension) and inside diameter of the round sides connecting the flat portions of the duct (minor dimension) of the inner duct.

C. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Chapter 3, "Round, Oval, and Flexible Duct," based on static-pressure class unless otherwise indicated.

D. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials

involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005."

1. Transverse Joints in Ducts Equal to or Larger Than 48" in Diameter or Flat Oval With a Major Dimension Equal to or Larger Than 48": Flanged.
2. Gasketed, EPDM, self sealing Joints such as Eastern Tight or Spiro Safe may be used for ducts smaller than 48" in diameter.
3. Flanges may be substituted in ducts smaller than 48" in diameter.

E. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 3-2, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005, Third Edition 2005."

F. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 3-5, "90º Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005."

G. Inner Duct: Minimum 22 gauge perforated galvanized sheet steel having 3/32-inch- diameter perforations, with overall open area of 23 percent.

H. Interstitial Insulation: Fibrous-glass liner complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Install spacers that position the inner duct at uniform distance from outer duct without compressing insulation.
2. Coat insulation with antimicrobial coating.
3. Cover insulation with polyester or mylar film complying with UL 181, Class 1.

I. All round duct shall not be less than No. 26 U.S. gauge.

2.8 COMMERCIAL KITCHEN HOOD GREASE EXHAUST DUCTS

A. General: Furnish minimum 16 gage carbon-steel, fully liquid-tight welded and tested.

B. Listings:
1. Listed and labeled UL-1978 for venting air and grease vapors from commercial cooking operations and described in NFPA-96.
2. Listed and labeled BOCA/SBCCI.

C. Rating:
1. Continuous operation at 500° F.
2. Intermittent operation at 2000° F.

D. Penetration of rated walls and partitions: The grease duct shall be listed to penetrate rated walls as noted on life safety drawings. Penetrations shall be fire stopped/blocked in accordance with the manufacturer's instructions. Clearance to combustibles: 0"

2.9 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60 or G90.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M.

D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 316, cold rolled, annealed, sheet. Exposed surface finish shall be No. 4.

E. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

F. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

G. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

H. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.10 DUCT LINER

A. For double wall duct: Not required. All other duct: Provide where indicated on drawings and as follows:

1. All return/transfer ductwork throughout entire project.

2. Media Center/ Library/ Chorus/ Music Spaces: For all VAV boxes, all supply, return, and exhaust ductwork for these systems.

3. Exhaust/ Return Air to all rooftop units and outside air units, from unit inlet to 20' upstream.

4. Discharge ductwork from all rooftop units and outside air units, from unit discharge to 25' downstream.

B. Flexible Elastomeric Duct Liner: Preformed, cellular, closed-cell, sheet materials complying with ASTM C 534, Type II, Grade 1; and with NFPA 90A or NFPA 90B. Foam shall contain or be coated with EPA-approved or EPA-registered antimicrobial additive or paint.

1. Manufacturers:

a. Aeroflex USA, Inc.

b. Armacell LLC.
c. K-Flex USA.

2. Maximum Thermal Conductivity: 0.25 Btu x in./h x sq. ft. x deg F at75 deg F mean temperature when tested according to ASTM C 518.
3. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
4. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.

C. Natural-Fiber Duct Liner: 85 percent cotton, 10 percent borate, and 5 percent polybinding fibers, treated with a microbial growth inhibitor and complying with NFPA 90A or NFPA 90B.

1. Manufacturers:

a. Ductmate Industries, Inc.

2. Maximum Thermal Conductivity: 0.24 Btu x in./h x sq. ft. x deg F at75 deg F mean temperature when tested according to ASTM C 518.
3. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to ASTM E 84; certified by an NRTL.
4. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.

D. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

E. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.

7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

    a. Fan discharges.
    b. Intervals of lined duct preceding unlined duct.
    c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.

F. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.11 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723.

1. Materials: Certified by a NRTL.

B. Tape sealing systems are not permitted.

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
10. Indoor applications: Sealant with VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
11. Maximum Static-Pressure Class: 10-inch wg, positive or negative.
12. Service: Indoor or outdoor.
13. Substrate: Compatible with galvanized sheet steel, stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.

6. Indoor applications: Sealant with VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

2.12 HANGERS AND SUPPORTS

A. Hanger Rods: Galvanized, all-thread.

B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

D. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

E. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

F. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

G. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.13 RESIDENTIAL DRYER VENTING ACCESSORIES

A. Dryer Vent Wall Box: In-wall receptacle to house dryer transition duct.

1. In-O-Vate Technologies, Inc. – Dryerbox
2. American Aldes – Dryer vent box
3. Lambro Industries, Inc. – Dryer wall box
4. Construction Solutions, LLC. – Dryer vent box.
5. Approved equal.

B. Dryer Transition Duct: Provide UL 2158A-listed product.

1. In-O-Vate Technologies, Inc.
2. QuietFlex Manufacturing Co, LP
3. Lambro Industries, Inc.
4. Flexible Technologies, Inc. – Thermaflex
5. Approved equal.

C. Dryer Vent Long Radius Elbows:

1. In-O-Vate Technologies, Inc. – Dryer-Ell
2. Approved equal for long radius elbows for dryer vent.

D. Wall Vent: Aluminum body with backdraft damper. Paint to match.

1. In-O-Vate Technologies, Inc. – Dryer Wall Vent

2. American Aldes – Standard Dryer Wall Hood
3. Approved equal for dryer vent terminations through exterior walls.

E. Roof Vent: Galvanized steel body with backdraft damper.

1. In-O-Vate Technologies, Inc. – Dryer Jack
2. American Aldes - Dryer Roof Cap
3. Approved equal for dryer vent terminations through roofs.

2.14 ACOUSTICAL DUCT WRAP

A. Manufacturer:

1. Kinetics KNM -100RB 1 PSF or equal (for non-plenum use only)
2. Acoustiguard Model LAG 'FR', 1.0 lb. per sq. ft vinyl barrier with reinforced aluminum foil facing (for plenum and non-plenum use)

B. 1.0 pound per square foot surface weight, vinyl barrier for use of wrapping ductwork for breakout noise attenuation. Where plenum rating is required, provide aluminum foil facing and ASTM E84 testing with fame spread index of 10 and smoke level index of 40.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved by Architect in writing.

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005" unless otherwise indicated.

C. Install ducts with fewest possible joints.

D. Install factory-fabricated fittings for changes in direction, size, and shape and for branch connections.

E. Unless otherwise indicated, install ducts vertically or horizontally, and parallel or perpendicular to building lines.

F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building. Maintain clearances for equipment maintenance.

G. Install ducts with a clearance of 1 inch, plus allowance for installation of insulation at specified thickness.

H. Do not route ducts through transformer vaults, electrical equipment rooms, elevator equipment rooms or electrical enclosures.

I. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal

flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

J. Provide fire dampers where ducts pass through fire-rated interior partitions or fire rated exterior walls.

K. Protect duct interiors from moisture, construction debris, dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

3.2 PROTECTION OF WALL AND FLOOR PENETRATIONS OF NON-RATED ASSEMBLIES

A. Where ducts penetrate non-fire-resistance-rated wall or floor assemblies, protect the penetration with one of the following:

1. For a duct that connects not more than two stories vertically, protect the annular space around the penetrating duct with an approved, noncombustible material that resists the free passage of flame and the products of combustion.
2. For a duct that connects not more than three stories, protect the annular space around the penetrating duct with an approved, noncombustible material that resists the free passage of flame and the products of combustion and a fire damper at each floor line.
3. For ducts that penetrate a smoke partition without a smoke damper, protect the annular space around the penetrating duct with an approved, non-combustible materials that resists the free passage of flame and the products of combustion.
4. For ducts that penetrate a non-rated wall, protect the annular space around the penetrating duct with an approved, non-combustible materials that resists the free passage of flame and the products of combustion.

3.3 DUCT LINER APPLICATIONS

A. Duct liner is intended for sound attenuation and not insulation. Duct liner shall not reduce other insulation requirements.

B. Service: All ducts where indicated on drawings

1. Flexible Elastomeric Duct Liner

C. Service: Return-air ductwork.

1. Entire length of return ductwork shall be lined, including plenum connections to terminal units, blower coils, fan coils, and air handling units. Dimensions of ductwork shown on drawings are inside clear.

3.4 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding. Do not weld or grind lined ductwork.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of duct, fittings, hangers, supports, accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.5 INSTALLATION OF COMMERCIAL KITCHEN HOOD EXHAUST DUCT

A. Prior to the use or concealment of any portion of a grease duct system, a leakage test shall be performed. Ducts shall be considered concealed where installed in shafts or covered by coatings or wraps that prevent the ductwork from being visually inspected on all sides.

1. The Contractor shall provide the necessary equipment and perform a grease duct leakage test. A light test shall be performed to determine that all welded and brazed joints are liquid tight. A light test shall be performed by passing a lamp having a power rating of not less than 100 watts through the entire section of ductwork to be tested.
2. The lamp shall be open to emit light equally in all directions perpendicular to the duct walls. A test shall be performed for the entire duct system, including the hood-to-duct connection.
3. The duct work shall be permitted to be tested in sections, provided every joint is tested. For listed, factory-built grease ducts, this test shall be limited to duct joints assembled in the field and shall exclude factory welds.

B. Grease ducts shall be constructed and installed so that grease cannot collect in any portion thereof, and the system shall slope not less than one-fourth unit vertical in 12 units horizontal toward the hood or toward a grease reservoir designed and installed in accordance with the mechanical code. Where horizontal ducts exceed 75 feet in length, the slope shall be not less than one unit vertical in 12 units horizontal.

C. Duct Cleanouts and Openings: Sections of grease ducts that are inaccessible from the hood or discharge openings shall be provided with cleanout openings.

1. Cleanouts and openings shall be equipped with tight-fitting doors constructed of steel having a thickness not less than that required for the duct.
2. Cleanout doors shall be installed liquid tight.
3. Door assemblies including any frames and gaskets shall be approved for the application and shall not have fasteners that penetrate the duct.
4. Gasket and sealing materials shall be rated for not less than 1500°F.
5. Listed door assemblies shall be installed in accordance with the manufacturer's instructions.

D. Horizontal Cleanouts: Cleanouts serving horizontal sections of grease ducts shall:

1. Be spaced not more than 20 feet apart.
2. Be located not more than 10 feet from changes in direction that are greater than 45 degrees.

3. Not be closer than 1 inch from the edges of the duct.
4. Not be located on the bottom of the duct.
5. Have opening dimensions of not less than 12 inches by 12 inches. Where such dimensions preclude installation, the opening shall be not less than 12 inches on one side and shall be large enough to provide access for cleaning and maintenance.
6. Shall be located at grease reservoirs.

E. Do not penetrate fire-rated assemblies except as allowed by applicable building codes and authorities having jurisdiction.

F. Install factory-built grease duct in accordance with manufacturer's instructions.

G. Duct Termination:

1. Termination above the roof: Exhaust outlets that terminate above the roof shall have the discharge opening located not less than 40 inches above the roof surface.
2. Termination through an exterior wall: Exhaust outlets shall be permitted to terminate through exterior walls where the smoke, grease, gases, vapors and odors in the discharge from such terminations do not create a public nuisance or a fire hazard. Such terminations shall not be located where protected openings are required by the building code. Other exterior openings shall not be located within 3 feet of such terminations.
3. Termination location: Exhaust outlets shall be located not less than 10 feet horizontally from parts of the same or contiguous buildings, adjacent buildings and adjacent property lines and shall be located not less than 10 feet above the adjoining grade level. Exhaust outlets shall be located not less than 10 feet horizontally from or not less than 3 feet above air intake openings into any building.

3.6 DUCT SEALING

A. Seal all ducts to seal class A as defined in SMACNA's HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005:

1. Seal all longitudinal joints.
2. Seal all transverse joints.
3. Seal all penetrations.

3.7 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Chapter 5, "Hangers and Supports."

B. Building Attachments: Unless indicated otherwise, provide concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Do not use powder-actuated concrete fasteners for lightweight-aggregate concrete or for slabs less than 4 inches thick.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install

hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and channel supports.

E. Support vertical ducts with channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor or at a maximum intervals of 18 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.8 CONNECTIONS

A. Make connections to equipment with flexible connectors.

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005" for branch, outlet, inlet, and terminal unit connections unless otherwise indicated.

3.9 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply two coats of flat black, latex paint over a compatible galvanized-steel primer.

3.10 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Visually inspect, for proper seal application, all ductwork not tested prior to insulation application. Prepare inspection report.

C. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present. If visible contaminants are present, proceed to sub-paragraph 2 below. If not, no further cleaning shall be required.
2. Test sections of metal duct systems, up to one location per ten thousand (10,000) square feet of building area, or a minimum of two (2) per system, whichever is greater, chosen by the Owner's Representative, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems." Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm. Cut hole in duct and install access door at each location selected. Size shall be as indicated in Division 23 Section "Air Duct Accessories."
3. Duct system shall be considered dirty and in need of cleaning if any test location does not pass the cleanliness test. Cleaning shall be performed in accordance with this specification.

D. Prepare and submit test and inspection reports.

3.11 DUCT CLEANING

A. Clean new duct systems before testing, adjusting, and balancing.

B. Comply with SMACNA "Duct Cleanliness for New Construction Guidelines" dated 2000, for protection, cleaning, and installation methods for all ductwork. Adhere to the requirements for a duct cleanliness level of "C" (advanced level) as detailed in Section 3.

3.12 START UP

A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

3.13 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

B. Ducts Connected to Commercial Kitchen Hoods: Comply with NFPA 96.

1. Exposed to View: Type 304, stainless-steel sheet, No. 4 finish.
2. Concealed: Carbon-steel sheet.
3. Welded seams and joints.
4. Pressure Class: Negative – match or exceed fan static pressure.
5. Seal: Welded seams, joints, and penetrations.
6. SMACNA Leakage Class: 3.

C. Ducts Connected to Dishwasher Hoods:

1. Type 304, stainless-steel sheet.
2. Exposed to View: No. 4 finish.
3. Concealed: No. 2D finish.
4. Welded seams and flanged joints with watertight EPDM gaskets.
5. Negative – match or exceed fan static pressure.
6. Seal: Welded seams, joints, and penetrations.
7. SMACNA Leakage Class: 3.

D. Ducts Connected Serving Locker Rooms, Shower Rooms, and Team Rooms:

1. Aluminum sheet.
2. Exposed to View: Bright finish.
3. Concealed: Mill finish.

E. Acid-Resistant Ducts Connected to Fume Hoods:

1. Type 304 stainless steel sheet.
2. Exposed to view: No. 4 finish
3. Concealed: No. 2D finish.

F. Double-Wall Duct Interstitial Insulation (where indicated):

1. Supply Air Ducts: 1" thickness.

G. Duct Liner Thickness (where indicated):

1. Supply Air Ducts: 1-1/2" thickness and minimum R=5.0.
2. Return Air Ducts: 1" thickness.

H. Transfer Duct Liner (where indicated): 1" thickness.

I. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 4-2, "Rectangular Elbows."

   a. Velocity less than 1500 fpm or lower:

      1) Radius Type RE 1. Centerline radius = 3W/2.
      2) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
      3) Transfer ducts indicated with mitered elbows do not require turning vanes.

   b. Velocity 1500 fpm or Higher:

      1) Radius Type RE 3. Centerline radius = 3w/2 and three vanes.
      2) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 3-4, "Round Duct Elbows."

   a. Minimum centerline radius-to-diameter ratio shall be 1.5 with a maximum of 5 Elbow Segments. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Table 3-1, "Mitered Elbows." Elbows with less than a 90 degree change of direction shall have segments per Table 3-1 in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005".
   b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped, segmented, spiral or pleated. Adjustable elbows not acceptable.
   c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam, segmented, or spiral.

3. Flat Oval Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 3-7, "Flat Oval Ducts" for elbows.

J. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 4-6, "Branch Connections."

   a. Rectangular Main to Rectangular Branch: 45-degree entry.
   b. Rectangular Main to Round Branch: Conical or bellmouth. No flanged or spin-in fittings permitted.

2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 3-6, "Conical Tees."

   a. Conical fitting.
   b. Conical saddle taps.
   c. No 90 degree taps or 90 degree saddle taps permitted.

K. Divided Flow Branches:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards – Metal and Flexible, Third Edition 2005, "Figure 4-5 Divided Flow Branches."

3.14 ACOUSTICAL DUCT WRAP

A. Apply acoustical duct wrap to all ductwork in the Auditorium per manufacturer installation instructions. Size duct hanger and supports to allow for acoustical wrap.

END OF SECTION 233113

SECTION 233600 - AIR TERMINAL UNITS **(*AD 02)**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and ASCE/SEI 7.

1. Seismic Hazard Level A: Force to weight ratio = 0.48.
2. Seismic Hazard Level B: Force to weight ratio = 0.30.
3. Seismic Hazard Level C: Force to weight ratio = 0.15.

1.3 ABBREVIATIONS

A. ° Degree, Degrees.

B. BAS Building Automation System.

C. CFM Cubic Feet per Minute.

D. ECM Electronically Commutated Motor.

E. F Fahrenheit.

F. PSIG Pounds per Square Inch Gauge.

G. PSC Permanent Split Capacitor

H. SCR Silicon Controlled Rectifier.

I. VA Volt Amps. (A measure of transformer power)

1.4 SUBMITTALS

A. Product Data: For each type of the following products, including rated capacities, furnished specialties, sound-power ratings, and accessories.

1. Air terminal units.

2. Liners and adhesives.
3. Sealants and gaskets.
4. Seismic restraint devices.

B. Shop Drawings: For air terminal units. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.
3. Hangers and supports, including methods for duct and building attachment, bracing, and vibration isolation.

C. Operation and Maintenance Data: For air terminal units to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Instructions for resetting minimum and maximum air volumes.
2. Instructions for adjusting software set points.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

PART 2 - PRODUCTS

2.1 FAN POWERED AIR TERMINAL UNITS

A. Manufacturers:

1. Anemostat; a Mestek Company.
2. Environmental Technologies, Inc.; Enviro-Air Div.
3. Price Industries.
4. Titus.
5. Trane Co. (The); Worldwide Applied Systems Group.
6. Tuttle & Bailey.
7. **JCI (*AD 02)**

B. Configuration: Volume-damper assembly and fan in series or parallel arrangement inside unit casing with control components inside a protective metal shroud.

C. Casing: Single wall.

1. Outer Casing: Galvanized sheet steel. Manufacturer's standard thickness.
2. Lining: Adhesive attached, 1" thick fiberglass insulation complying with UL 181 erosion requirements, and having a maximum flame spread index of 25 and a maximum smoke developed index of 50, for both insulation and adhesive, when tested according to ASTM E 84.
3. Air Inlets: Round stub connections or S-slip and drive connections for duct attachment.
4. Air Outlet: S-slip and drive connections.
5. Access: Removable panels for access to parts requiring service, adjustment, or maintenance; with airtight gasket and quarter-turn latches.
6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. Motorized Volume Damper: Galvanized steel with flow sensing element, peripheral gasket, and bearings. Operating range shall be 90 degrees.

1. Maximum Damper Leakage: ARI 880 rated, 3 percent of nominal airflow at 3-inch wg inlet static pressure.
2. Damper Position: Normally open.

E. Velocity Sensors: Multipoint array with velocity sensors in inlet duct connection.

F. Motor: Refer to Division 23 Section "Common Motor Requirements for HVAC Equipment."

1. Type: ECM.
2. Design: Designed for speed control. Use with a SCR or other technology for fan speed adjustment. Provide means of speed control on the terminal unit by the terminal unit manufacturer.

G. FAN

1. Type: Forward curved centrifugal.
2. Isolation: Rubber in shear.
3. Speed Control: Infinitely adjustable.

H. Filters: Where return is ducted to unit, no filter at unit is required. Filter shall be provided at return filter grille. Where return is not ducted to unit, provide 1" thick, pleated filter, MERV 8, in filter rack at terminal unit inlet.

I. Electric-Resistance Heating Coil: Nickel-chromium 80/20 heating wire, mounted in ceramic inserts in a galvanized steel housing; with primary automatic, and secondary manual, reset thermal cutouts. Terminate elements in stainless-steel, machine-staked terminals secured with stainless steel hardware.

1. Control Stage(s)/Step(s): As indicated.
2. Access door interlocked disconnect switch: Yes.

3. High temperature limit: Downstream air temperature sensor with local connection to override discharge air temperature set point. Set point shall not exceed maximum discharge temperature set point. Discharge air temperature set point may not be used. If not used limit discharge air temperature to 180° F.
4. Airflow switch for proof of airflow: Yes.
5. Fan interlock contacts: Yes.
6. Fuses in terminal box for overcurrent protection: Yes for coils more than 48 A.
7. Switches and relays: Yes
8. Contactor for each step of control: Yes

J. Factory mounted and wired components:

1. Electrical components and BAS unit controller mounted in control box with removable cover. Incorporate single point electrical connection to power source.
2. Control Transformer: 50 VA minimum factory mounted transformer for control voltage. Input voltage shall match the circuit provided. Coordinate output voltage with contractor performing work under Section "Building Automation System". Provide terminal strip in control box and field wiring of BAS unit controller to terminal strip. Wiring shall be as indicated.
3. Wiring Terminations: Fan, heat, and controls to terminal strip. Terminal lugs to match quantities, sizes, and materials of branch-circuit conductors and BAS requirements. Enclose terminal lugs in terminal box sized according to NFPA 70.

K. Control Panel Enclosure: NEMA 250, Type 1, with access panel sealed from airflow and mounted on side of unit to enclose controller furnished under Section "Building Automation System".

L. Electronic Controls: Provide bidirectional damper, integral airflow measurement device, and transducer. Control devices shall be compatible with temperature controls specified in Section "Building Automation System" and shall comply with the following:

1. Install microprocessor based controller furnished under Section "Building Automation System"
2. Install damper actuator provided under this section.
3. Provide airflow transducer. Output shall be compatible with controller.

M. Control Sequence:

1. As indicated in Section "Sequences of Control"

2.2 SHUTOFF AIR TERMINAL UNITS

A. Manufacturers:

1. Anemostat; a Mestek Company.

2. Environmental Technologies, Inc.; Enviro-Air Div.
3. Price Industries.
4. Titus.
5. Trane Co. (The); Worldwide Applied Systems Group.
6. Tuttle & Bailey.

B. Configuration: Volume-damper assembly inside unit casing with control components inside a protective metal shroud.

C. Casing: Single wall.

1. Outer Casing: Galvanized sheet steel. Manufacturer's standard thickness.
2. Lining: Adhesive attached, 1" thick fiberglass insulation complying with UL 181 erosion requirements, and having a maximum flame spread index of 25 and a maximum smoke developed index of 50, for both insulation and adhesive, when tested according to ASTM E 84.
3. Air Inlet: Round stub connection or S-slip and drive connections for duct attachment. Provide flexible connector.
4. Air Outlet: S-slip and drive connections. Provide flexible connector.
5. Access: Removable panels with airtight gaskets for access to parts requiring service, adjustment, or maintenance.
6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. Volume Damper: Galvanized steel with peripheral gasket and self-lubricating bearings.

1. Damper Position: Normally open.
2. Maximum Damper Leakage: ARI 880 rated, 2 percent of nominal airflow at 3-inch w. g. inlet static pressure.
3. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

E. Velocity Sensors: Multipoint array with velocity sensors in inlet duct connection.

F. Electric-Resistance Heating Coil: Nickel-chromium 80/20 heating wire, mounted in ceramic inserts in a galvanized steel housing; with primary automatic, and secondary manual, reset thermal cutouts. Terminate elements in stainless-steel, machine-staked terminals secured with stainless steel hardware.

1. Control Stage(s)/Step(s): As indicated.
2. Access door interlocked disconnect switch: Yes.
3. High temperature limit: Downstream air temperature sensor with local connection to override discharge air temperature set point. Set point shall not exceed maximum discharge temperature set point. Discharge air temperature set point may not be used. If not used limit discharge air temperature to 180° F.

4. Airflow switch for proof of airflow: Yes.
5. Fan interlock contacts: Yes.
6. Fuses in terminal box for overcurrent protection: Yes for coils more than 48 A.
7. Switches and relays: Yes
8. Contactor for each step of control: Yes

G. Factory mounted and wired components:

1. Electrical components mounted in control box with removable cover. Incorporate single point electrical connection to power source.
2. Control Transformer: 50 VA minimum factory mounted transformer for control voltage. Input voltage shall match the circuit provided. Coordinate output voltage with contractor performing work under Section "Building Automation System". Provide terminal strip in control box and field wiring of BAS unit controller to terminal strip. Wiring shall be as indicated.
3. Wiring Terminations: Fan and controls to terminal strip. Terminal lugs to match quantities, sizes, and materials of branch-circuit conductors and BAS requirements. Enclose terminal lugs in terminal box sized according to NFPA 70.

H. Control Sequence:

1. As indicated in Section "Sequences of Control"

2.3 HANGERS AND SUPPORTS

A. Hanger Rods: Cadmium-plated steel rods and nuts.

B. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

C. Air Terminal Unit Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

D. Trapeze and Riser Supports: Steel shapes and plates for units with steel casings; aluminum for units with aluminum casings.

2.4 SOURCE QUALITY CONTROL

A. Label each air terminal unit with tag, nominal airflow, maximum and minimum factory-set airflows, coil type if coil is included, and ARI certification seal.

B. For hydronic coils include hose kit and control valve shrink wrapped and labeled with terminal unit tag.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install air terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."

B. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.

3.2 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder actuated concrete fasteners for standard-weight aggregate concretes and for slabs equal to or more than 4" thick.
4. Do not use powder actuated concrete fasteners for lightweight aggregate concretes and for slabs less than 4" thick.

C. Hangers Exposed to View: Threaded rod and angle or channel supports.

D. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.3 CONNECTIONS

A. Install piping adjacent to air terminal unit to allow service and maintenance.

B. Connect ducts to air terminal units according to division 23 duct specification sections for metal and flexible ducts.

C. Make connections to air terminal units with flexible connectors complying with requirements in Division 23 Section "Air Duct Accessories."

3.4 IDENTIFICATION

A. Label each air terminal unit with tag, nominal airflow, and maximum and minimum factory set airflows. Comply with requirements in Division 23 Section "Identification for HVAC Piping and Equipment" for equipment labels and warning signs/labels.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Tests and Inspections:

1. After installing air terminal units and after electrical circuitry has been energized, test for compliance with requirements.
2. Leak Test: After installation, fill water coils and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Air terminal unit will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.6 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Verify that inlet duct connections are as recommended by air terminal unit manufacturer to achieve proper performance.
3. Verify that controls and control enclosure are accessible.
4. Verify that control connections are complete.
5. Verify that nameplate and identification tag are visible.
6. Verify that controls respond to inputs as specified.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air terminal units.

END OF SECTION 233600

SECTION 236423 – AIR COOLED SCROLL WATER CHILLERS **(*AD 02)**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

A. This Section includes packaged, air-cooled, electric-motor-driven, rotary-screw water chillers with the following features:

1. Motor controller.
2. Microprocessor-based controls complying with ASHRAE 135.
3. Sound Reduction Provisions

1.3 DEFINITIONS

A. BAS: Building automation system.

B. COP: Coefficient of performance. The ratio of the rate of heat removal to the rate of energy input using consistent units for any given set of rating conditions.

C. EER: Energy-efficiency ratio. The ratio of the cooling capacity given in terms of Btu/h to the total power input given in terms of watts at any given set of rating conditions.

D. IPLV: Integrated part-load value. A single-number part-load efficiency figure of merit calculated per the method defined by ARI 550/590 and referenced to ARI standard rating conditions.

E. kW/Ton: The ratio of total power input of the chiller in kilowatts to the net refrigerating capacity in tons at any given set of rating conditions.

F. NPLV: Nonstandard part-load value. A single-number part-load efficiency figure of merit calculated per the method defined by ARI 550/590 and intended for operating conditions other than ARI standard rating conditions.

1.4 SUBMITTALS

A. Product Data: Include refrigerant, rated capacities, operating characteristics, furnished specialties, and accessories.

1. Performance at ARI standard conditions and at conditions indicated.

2. Performance at ARI standard unloading conditions.
3. Minimum evaporator flow rate.
4. Refrigerant capacity of water chiller.
5. Oil capacity of water chiller.
6. Fluid capacity of evaporator.
7. Minimum entering condenser-air temperature
8. Performance at varying capacity with constant design entering condenser-air temperature. Repeat performance at varying capacity for different entering condenser-air temperatures from design to minimum in 10°F increments

B. Shop Drawings: Complete set of manufacturer's prints of water chiller assemblies, control panels, sections and elevations, and unit isolation. Include the following:

1. Assembled unit dimensions.
2. Weight and load distribution.
3. Required clearances for maintenance and operation.
4. Size and location of piping and wiring connections.
5. Wiring Diagrams: For power, signal, and control wiring.
6. Sound Reduction Provisions.

C. Coordination Drawings: Floor plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Structural supports.
2. Piping roughing-in requirements.
3. Wiring roughing-in requirements, including spaces reserved for electrical equipment.
4. Access requirements, including working clearances for mechanical controls and electrical equipment, and tube pull and service clearances.

D. Source quality-control reports.

E. Startup service reports.

F. Operation and Maintenance Data: For each chiller to include in emergency, operation, and maintenance manuals.

G. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

A. ARI Certification: Certify chiller according to ARI 590 certification program.

B. ARI Rating: Rate water chiller performance according to requirements in ARI 550/590, "Water Chilling Packages Using the Vapor Compression Cycle."

C. ASHRAE Compliance: ASHRAE 15 for safety code for mechanical refrigeration.

D. ASHRAE/IESNA 90.1-2010 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2010, Section 6 - "Heating, Ventilating, and Air-Conditioning."

E. ASME Compliance: Fabricate and stamp water chiller heat exchangers to comply with ASME Boiler and Pressure Vessel Code.

F. Comply with NFPA 70.

G. Comply with requirements of UL and include label by a qualified testing agency showing compliance.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Ship each chiller with a full charge of refrigerant. Charge each chiller with nitrogen if refrigerant is shipped in containers separate from chiller.

1.7 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases.

B. The chiller manufacturer and installing contractor shall coordinate and collaborate with the BAS contractor for the following: Programming and protocols of the mechanical equipment by the equipment manufacturer to support the specified BAS interface. Start-up coordination with the BAS contractor to verify everything is working correctly. Clearly defined termination points in the OEM control panel to allow BAS interface as specified.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of water chillers that fail in materials or workmanship within specified period.

1. Compressor Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PACKAGED, AIR-COOLED SCROLL CHILLERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Daikin
2. Johnson Controls / York
3. Trane

4. Quantech **(*AD 02)**

B. Description: Factory-assembled and run-tested water chiller complete with compressor(s), compressor motors and motor controllers, evaporator, condenser with fans, electrical power, controls, and indicated accessories.

C. Cabinet:

1. Base: Formed steel base extending the perimeter of chiller. Secure frame, compressors, and evaporator to base to provide a single-piece unit.
2. Frame: Rigid galvanized-steel frame secured to base and designed to support cabinet, condenser, control panel, and other chiller components not directly supported by base.
3. Casing: Galvanized steel.
4. Finish: Coat base, frame, and casing with a corrosion-resistant coating capable of withstanding a 500-hour salt-spray test according to ASTM B 117.
5. Security Package: Provide removable louvered panels with fasteners for additional protection of compressors, evaporator, and condenser coils without inhibiting service access. Finish to match cabinet.

D. Compressors:

1. Description: Positive-displacement direct drive with hermetically sealed casing.
2. Each compressor provided with suction and discharge service valves, crankcase oil heater, and suction strainer.

   a. For multiple compressor assemblies, it is acceptable to isolate each compressor assembly in lieu of each compressor.

3. Operating Speed: Nominal 3600 rpm for 60-Hz applications.
4. Capacity Control: On-off compressor cycling.

   a. Digital compressor unloading is an acceptable alternative to achieve capacity control.

5. Oil Lubrication System: Automatic pump with strainer, sight glass, filling connection, filter with magnetic plug or removable magnet in sump, and initial oil charge.

   a. Manufacturer's other standard methods of providing positive lubrication are acceptable in lieu of an automatic pump.

6. Vibration Isolation: Mount individual compressors on vibration isolators.

   a. For multiple compressor assemblies, it is acceptable to isolate each compressor assembly in lieu of each compressor.

E. Compressor Motors:

1. Hermetically sealed and cooled by refrigerant suction gas.

2. High-torque, two-pole induction type with inherent thermal-overload protection on each phase.

~~F. Compressor Motor Controllers:~~

~~1. The water chiller shall be furnished with a variable speed drive (VSD) to minimize maintenance and maximize cooling efficiency. The VSD shall be factory mounted on the chiller and shipped completely factory assembled, wired and tested.~~

~~2. The VSD will be specifically designed to interface with the water chiller controls and allow for the operating ranges and specific characteristics of the chiller. The VSD control logic shall optimize chiller efficiency by coordinating compressor motor speed to maintain the chilled water setpoint.~~

~~3. The VSD efficiency shall be 95% or better at full speed and full load. Fundamental displacement power factor shall be a minimum of 0.95.~~

~~4. The VSD shall be solid state, microprocessor based pulse width modulated (PWM) design. The VSD shall be voltage and current regulated. Output power devices shall be IGBT transistors.~~

~~5. The VSD shall use a surface permanent magnet motor.~~

~~6. Power semi-conductor and capacitor cooling shall be from a liquid cooled heatsink.~~

~~7. The VSD shall have thin film capacitors.~~

~~8. If thin film capacitors are not factory provided, then manufacturer should include a 5-year warranty on the drive.~~

~~9. The VSDs shall each be furnished in a UL 1995 rated metal enclosure having as minimum a short circuit withstand rating of 65,000 amps. It will include three phase input lugs plus a grounding lug for electrical connections, output motor connection via factory installed bus bars and all components properly segregated and completely enclosed in a single metal enclosure.~~

~~10. Enclosure shall include a padlockable, door mounted circuit breaker with shunt trip and AIC rating of 65,000 amps.~~

~~11. The entire chiller package shall be UL/CUL listed.~~

~~12. The VSD shall include the following features:~~

~~a. All control circuit voltages are physically and electrically isolated from power circuit voltage.~~

~~b. Soft start, adjustable linear acceleration, coast-to-stop.~~

~~c. Adjustable current limiting and UL approved electronic motor overload protection.~~

~~d. Insensitivity to incoming power phase sequence.~~

~~13. VSD and motor protection from the following faults:~~

~~a. Output line-to-line short circuit protection~~

~~b. Line-to-ground short circuit protection~~

~~c. Phase loss at AFD input~~

~~d. Phase reversal / Imbalance~~

~~e. Over-voltage / Under-voltage~~

(*AD 02)

G. Refrigeration:

1. Refrigerant: R-410A. Classified as Safety Group A1 according to ASHRAE 34.

2. Refrigerant Compatibility: Parts exposed to refrigerants shall be fully compatible with refrigerants, and pressure components shall be rated for refrigerant pressures.
3. Refrigerant Circuit: Each circuit shall include a thermal-expansion valve, refrigerant charging connections, a hot-gas muffler, compressor suction and discharge shutoff valves, a liquid-line shutoff valve, a replaceable-core filter-dryer, a sight glass with moisture indicator, a liquid-line solenoid valve, and an insulated suction line.
4. Refrigerant Isolation: Factory install positive shutoff isolation valves in the compressor discharge line and the refrigerant liquid-line to allow the isolation and storage of the refrigerant charge in the chiller condenser.

5. For multiple compressor assemblies, it is acceptable to isolate each compressor assembly in each circuit in lieu of each compressor.

H. Pressure Relief Device:

1. Comply with requirements in ASHRAE 15, ASHRAE 147, and applicable portions of ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
2. Select and configure pressure relief devices to protect against corrosion and inadvertent release of refrigerant.
3. ASME-rated, spring-loaded, pressure relief valve; single- or multiple-reseating type. Pressure relief valve(s) shall be provided for each heat exchanger.

I. Evaporator:
1. Brazed-plate or shell-and-tube design, as indicated.
2. Shell and Tube:

3. Description: Direct-expansion, shell-and-tube design with fluid flowing through the shell and refrigerant flowing through the tubes within the shell.
4. Code Compliance: Tested and stamped according to ASME Boiler and Pressure Vessel Code.
5. Shell Material: Carbon steel.
6. Shell Heads: Removable carbon-steel heads with multipass baffles designed to ensure positive oil return and located at each end of the tube bundle.
7. Shell Nozzles: Fluid nozzles located along the side of the shell and terminated with mechanical-coupling end connections for connection to field piping.[**Furnish flange adapters to mate to flanged piping.**]
8. Tube Construction: Individually replaceable copper tubes with enhanced fin design, expanded into tube sheets.

J. Flow Switch: Factory-furnished flow switch wired to chiller operating controls.

K. Heater: Factory-installed and -wired electric heater with integral controls designed to protect the evaporator to minus 20 deg F.

L. Air-Cooled Condenser:

1. Plate-fin coil with integral subcooling on each circuit, rated at 450 psig.

a. Construct coils of copper tubes mechanically bonded to aluminum fins. **All aluminum Micro-Channel is acceptable in lieu of copper tubes. (*AD-02)**
b. Hail Protection: Provide condenser coils with louvers, baffles, or hoods to protect against hail damage.

2. Fans: Very Low Sound Fans shall by dynamically and statically balanced, direct drive, corrosion resistant glass fiber reinforced composite blades molded into a very low noise fan blade.

3. Low Sound Fans with Variable Speed Drives. All fans shall be powered by VSDs. Fan shall provide vertical air discharge from extended orifices.
4. Fan Motors: Totally enclosed nonventilating (TENV) or totally enclosed air over (TEAO) enclosure, with permanently lubricated bearings, and having built-in overcurrent- and thermal-overload protection.
5. Fan Guards: Steel safety guards with corrosion-resistant coating.

M. Electrical Power:

1. Factory-installed and -wired switches, motor controllers, transformers, and other electrical devices necessary shall provide a single-point field power connection to water chiller.
2. House in a unit-mounted, NEMA 250, Type 3R enclosure with hinged access door with lock and key or padlock and key.
3. Wiring shall be numbered and color-coded to match wiring diagram.
4. Install factory wiring outside of an enclosure in a raceway.
5. Field power interface shall be to NEMA KS 1, heavy-duty, circuit breaker disconnect.
6. Provide branch power circuit to each motor and to controls with one of the following disconnecting means:

   a. NEMA KS 1, heavy-duty, fusible switch with rejection-type fuse clips rated for fuses. Select and size fuses to provide Type 2 protection according to IEC 60947-4-1.
   b. NEMA KS 1, heavy-duty, nonfusible switch.
   c. NEMA AB 1, motor-circuit protector (circuit breaker) with field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.

7. Provide each motor with overcurrent protection.
8. Overload relay sized according to UL 1995, or an integral component of water chiller control microprocessor.
9. Phase-Failure and Undervoltage: Solid-state sensing with adjustable settings.
10. Transformer: Unit-mounted transformer with primary and secondary fuses and sized with enough capacity to operate electrical load plus spare capacity.

    a. Power unit-mounted controls where indicated.

11. Control Relays: Auxiliary and adjustable time-delay relays.
12. Indicate the following for water chiller electrical power supply:

    a. Current, phase to phase, for all three phases.
    b. Voltage, phase to phase and phase to neutral for all three phases.

c. Three-phase real power (kilowatts).
d. Three-phase reactive power (kilovolt amperes reactive).
e. Power factor.
f. Running log of total power versus time (kilowatt hours).
g. Fault log, with time and date of each.

N. Controls:

1. Standalone and microprocessor based.
2. Enclosure: Share enclosure with electrical power devices or provide a separate enclosure.
3. Operator Interface: Multiple-character digital or graphic display with dynamic update of information and with keypad or touch-sensitive display located on front of control enclosure. In either imperial or metric units, display the following information:

   a. Date and time.
   b. Operating or alarm status.
   c. Operating hours.
   d. Outdoor-air temperature if required for chilled-water reset.
   e. Temperature and pressure of operating set points.
   f. Entering and leaving temperatures of chilled water.
   g. Refrigerant pressures in evaporator and condenser.
   h. Saturation temperature in evaporator and condenser.
   i. No cooling load condition.
   j. Elapsed time meter (compressor run status).
   k. Anti-recycling timer status.
   l. Percent of maximum motor amperage.
   m. Current-limit set point.
   n. Number of compressor starts.

4. Control Functions:

   a. Manual or automatic startup and shutdown time schedule.
   b. Entering and leaving chilled-water temperatures, control set points, and motor load limits.
   c. Current limit and demand limit.
   d. External chiller emergency stop.
   e. Anti-recycling timer.
   f. Automatic lead-lag switching.
   g. Variable evaporator flow.

5. Manually Reset Safety Controls: The following conditions shall shut down chiller and require manual reset:

   a. Low evaporator pressure or high condenser pressure.
   b. Low chilled-water temperature.
   c. Refrigerant high pressure.
   d. High or low oil pressure.
   e. High oil temperature.

f. Loss of chilled-water flow.
g. Control device failure.

6. Trending: Capability to trend analog data of up to five parameters simultaneously over an adjustable period and frequency of polling.
7. Security Access: Provide electronic security access to controls through identification and password with at least three levels of access: view only; view and operate; and view, operate, and service.
8. Control Authority: At least four conditions: Off, local manual control at chiller, local automatic control at chiller, and automatic control through a remote source.
9. BAS Interface: Factory-installed hardware and software to enable the BAS to monitor, control, and display chiller status and alarms.

   a. ASHRAE 135 (BACnet) communication interface with the BAS shall enable the BAS operator to remotely control and monitor the chiller from an operator workstation. Control features and monitoring points displayed locally at chiller control panel shall be available through the BAS.

O. Insulation:

1. Material: Closed-cell, flexible elastomeric, thermal insulation complying with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
2. Thickness: 3/4 inch.
3. Factory-applied insulation over cold surfaces of chiller components.

   a. Adhesive: As recommended by insulation manufacturer and applied to 100 percent of insulation contact surface. Seal seams and joints.

4. Apply protective coating to exposed surfaces of insulation to protect insulation from weather.

P. Sound Performance:
1. At full load chiller sound pressure shall not exceed 66 (dBA) A-weighted at 30 feet from the side of the unit. At 75% part load chiller sound pressure shall not exceed 64 (dBA) A-weighted at 30 feet from the side of the unit. Submitted sound data shall be in accordance with AHRI 370.

   a. If manufacturer cannot meet this sound specification then sound attenuation devices and/or barrier walls must be field installed at the contractors expense to meet the specified level.

2. Chiller shall ship with a muffler on each rotary screw compressor and very low noise condenser fans. Acoustic treatment consisting of insulating sound material applied to the suction and discharge line. An acoustically treated compressor enclosure and a variable speed drive for each condenser fan to reduce the fan speed shall be included to further attenuate the chiller. If chiller does not meet the scheduled sound levels, chiller manufacturer shall pay for field installed treatment to meet scheduled sound performance.

Q. Accessories:

1. Factory-furnished, chilled-water flow switch or other proof-of-flow device for field installation suited for variable flow.
2. Individual compressor suction and discharge pressure gages with shutoff valves for each refrigerant circuit.
3. Factory-furnished neoprene isolators for field installation.
4. Factory installed compressor sound attenuation option.
5. Provide low noise condenser fans and enclosure package.

2.2 SOURCE QUALITY CONTROL

A. Perform functional tests of chillers before shipping.

B. Factory run test each air-cooled chiller.

C. Factory test and inspect evaporator and condenser according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

D. For chillers located outdoors, rate sound power level according to ARI 370.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine chillers before installation. Reject chillers that are damaged.

B. Examine roughing-in for equipment support, anchor-bolt sizes and locations, piping, and electrical connections to verify actual locations, sizes, and other conditions affecting chiller performance, maintenance, and operations before equipment installation.

1. Final chiller locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CHILLER INSTALLATION

A. Equipment Mounting: Install chiller on concrete bases using elastomeric pads. Comply with requirements for concrete bases specified in Division 03 Section "Cast-in-Place Concrete." Comply with requirements for vibration isolation devices specified in Division 23 Section "Vibration Control for HVAC Piping and Equipment."

1. Minimum Deflection: 1/4 inch.
2. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
3. Install anchor bolts to elevations required for proper attachment to supported equipment.

B. Maintain manufacturer's recommended clearances for service and maintenance.

C. Charge chiller with refrigerant and fill with oil if not factory installed.

D. Install separate devices furnished by manufacturer and not factory installed.

3.3 CONNECTIONS

A. Comply with requirements for piping specified in Division 23 Section "Hydronic Piping". Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to chiller to allow service and maintenance.

C. Evaporator Fluid Connections: Connect to evaporator inlet with shutoff valve, strainer, flexible connector, thermometer, and plugged tee with pressure gage. Connect to evaporator outlet with shutoff valve, balancing valve, flexible connector, flow switch, thermometer, plugged tee with shutoff valve and pressure gage, and drain connection with valve. Make connections to chiller with a flange or mechanical coupling.

D. Refrigerant Pressure Relief Device Connections: Connect vent to chiller pressure relief device with flexible connector and dirt leg with drain valve.

E. Connect each chiller drain connection with a union and drain pipe, and extend pipe, full size of connection, to floor drain. Provide a shutoff valve at each connection.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Verify that refrigerant charge is sufficient and chiller has been leak tested.
3. Verify that pumps are installed and functional.
4. Verify that thermometers and gages are installed.
5. Operate chiller for run-in period.
6. Check bearing lubrication and oil levels.
7. For chillers installed indoors, verify that refrigerant pressure relief device is vented outdoors.
8. Verify proper motor rotation.
9. Verify static deflection of vibration isolators, including deflection during chiller startup and shutdown.
10. Verify and record performance of chiller protection devices.
11. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.

B. Inspect field-assembled components, equipment installation, and piping and electrical connections for proper assembly, installation, and connection.

C. Prepare test and inspection startup reports.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain chillers. Video record the training sessions.

END OF SECTION 236423

SECTION 237313 – MODULAR CENTRAL STATION AIR HANDLING UNITS **(*AD-02)**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Variable air volume air-handling units.

1.3 SUBMITTALS

A. Product Data: For each air-handling unit indicated.

   1. Unit dimensions and weight.
   2. Cabinet material, metal thickness, finishes, insulation, and accessories.
   3. Fans:
      a. Certified fan-performance curves with system operating conditions indicated.
      b. Certified fan-sound power ratings.
      c. Fan construction and accessories.
      d. Motor ratings, electrical characteristics, and motor accessories.
   4. Certified coil-performance ratings with system operating conditions indicated.
   5. Dampers, including housings, linkages, and operators.
   6. Filters with performance characteristics.

B. Source quality-control reports.

C. Field quality-control reports.

D. Operation and Maintenance Data: For air-handling units to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NFPA Compliance: Comply with NFPA 90A for design, fabrication, and installation of air-handling units and components.

C. ARI Certification: Air-handling units and their components shall be factory tested according to ARI 430, "Central-Station Air-Handling Units," and shall be listed and labeled by ARI.

D. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2013, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

E. ASHRAE/IESNA 90.1-2013 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2013, Section 6 - "Heating, Ventilating, and Air-Conditioning."

F. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

B. Coordinate sizes and locations of structural-steel support members, if any, with actual equipment provided.

C. Overall unit dimensions shall not exceed the unit dimensions as indicated on the Drawings. The AHUs are located in small mechanical spaces where height, length, width, and unit clearances must be carefully coordinated.

1.6 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

~~1. Fan Belts: One set for each belt-driven fan.~~

(*AD-02)

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carrier Corporation
2. Johnson Controls, Inc. / York International Corporation (Basis of Design)
3. McQuay International
4. Trane

2.2 AIR HANDLING UNITS

A. General Descriptions:

1. Units With Energy Recovery: Factory-assembled and –tested; designed for exterior installation; consisting of supply fan with VFD, relief fan with VFD, constant speed enthalpy wheel, pre-filters, hydronic heating and cooling coils, dampers, discharge plenums and roof curbs.
2. Units Without Energy Recovery: Factory-assembled and –tested; designed for exterior installation; consisting of supply fan with VFD, relief fan with VFD, pre-filters, hydronic heating and cooling coils, dampers, discharge plenums and roof curbs.

2.3 UNIT CASINGS

A. General Fabrication Requirements for Casings:

1. Forming: Form walls, roofs, and floors with at least two breaks at each joint.
2. Casing Joints: Sheet metal screws or pop rivets.
3. Sealing: Seal all joints with water-resistant sealant.
4. Factory Finish for Galvanized-Steel Casings: Apply manufacturer's standard primer immediately after cleaning and pretreating.
5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2013.
6. Rooftop units shall be suitable for use in outdoor environment.

B. Casing Insulation and Adhesive:

1. Materials: ASTM C 1071, Type I.
2. Location and Application: Encased between outside and inside casing.

C. Inspection and Access Panels and Access Doors:

1. Provide minimum 24" deep access section between heating and cooling coils.
2. Panel and Door Fabrication: Formed and reinforced, single- or double-wall and insulated panels of same materials and thicknesses as casing.
3. Inspection and Access Panels:
   a. Fasteners: Two or more camlock type for panel lift-out operation. Arrangement shall allow panels to be opened against air-pressure differential.
   b. Gasket: Neoprene, applied around entire perimeters of panel frames.
   c. Size: Large enough to allow inspection and maintenance of air-handling unit's internal components.
4. Access Doors:
   a. Access doors shall not require any tools to open.
   b. Hinges: A minimum of two ball-bearing hinges or stainless-steel piano hinge and two wedge-lever-type latches, operable from inside and outside. Arrange doors to be opened against air-pressure differential.
   c. Gasket: Neoprene, applied around entire perimeters of panel frames.
   d. Size: At least 18 inches wide by full height of unit casing up to a maximum height of 60 inches.
5. Locations and Applications:
   a. Fan Section: Doors.

b. Access Section: Doors.
c. Coil Section: Inspection and access panel.
d. Damper Section: Doors.
e. Filter Section: Doors large enough to allow periodic removal and installation of filters.
f. Mixing Section: Doors.

6. Service Light: 100-W vaporproof fixture with switched junction box located inside adjacent to door.

a. Locations: Each section accessed with door.

D. Condensate Drain Pans:

1. Fabricated with two percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and from humidifiers and to direct water toward drain connection.

a. Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1-2013.
b. Depth: A minimum of 2 inches deep.

2. Formed sections.
3. Single-wall, stainless-steel sheet.
4. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.
5. Units with stacked coils shall have an intermediate drain pan to collect condensate from top coil.

E. Air-Handling-Unit Mounting Frame: Formed galvanized-steel channel or structural channel supports, designed for low deflection, welded with integral lifting lugs.

2.4 FAN, DRIVE, AND MOTOR SECTION

A. Fan and Drive Assemblies: Statically and dynamically balanced and designed for continuous operation at maximum-rated fan speed and motor horsepower.

1. Shafts: Designed for continuous operation at maximum-rated fan speed and motor horsepower, and with field-adjustable alignment.

a. Turned, ground, and polished hot-rolled steel with keyway. Ship with a protective coating of lubricating oil.
b. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.

B. Plenum Fan Housings: Steel frame and panel; fabricated without fan scroll and volute housing.

C. Fan Shaft Bearings:

1. Grease-Lubricated Bearings: Self-aligning, pillow-block-type, ball or roller bearings with adapter mount and two-piece, cast-iron housing with grease lines extended to outside unit.

D. Belt Drives: Factory mounted, with adjustable alignment and belt tensioning, and with 1.5 service factor based on fan motor.

1. Pulleys: Cast iron or cast steel with split, tapered bushing; dynamically balanced at factory.
2. Motor Pulleys: Adjustable pitch for use with 5-hp motors and smaller; fixed pitch for use with motors larger than 5 hp. Select pulley size so pitch adjustment is at the middle of adjustment range at fan design conditions.
3. ~~Belts: Oil resistant, non-sparking, and non-static; in matched sets for multiple-belt drives.~~

(*AD-02)

E. Internal Vibration Isolation: Fans shall be factory mounted with manufacturer's standard vibration isolation mounting devices having a minimum static deflection of 1 inch.

F. Motor: Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."

1. Enclosure Type: Totally enclosed, fan cooled.
2. NEMA Premium (TM) efficient motors as defined in NEMA MG 1.
3. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
4. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.
5. Mount unit-mounted disconnect switches on exterior of unit.

G. Variable Speed Drives:

1. Factory provided where indicated on drawings or in sequence of control. Refer to Section 230514 for variable speed drive requirements.

2.5 COIL SECTION

A. General Requirements for Coil Section:

1. Comply with ARI 410.
2. Fabricate coil section to allow removal and replacement of coil for maintenance and to allow in-place access for service and maintenance of coil(s).
3. Coils shall not act as structural component of unit.
4. Maximum cooling coil face velocity shall not exceed 550 feet per minute.
5. Coil fin spacing shall be limited to a maximum of 144 fins per foot.

2.6 AIR FILTRATION SECTION

A. General Requirements for Air Filtration Section:

1. Comply with NFPA 90A.

2. Provide minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.
3. Provide filter holding frames arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lifted out from access plenum.

B. Extended-Surface, Disposable Panel Filters:

1. Factory-fabricated, dry, extended-surface type.
2. Thickness: 2 inches.
3. Arrestance (ASHRAE 52.1): 90.
4. MERV (ASHRAE 52.2): 8.
5. Media: Fibrous material formed into deep-V-shaped pleats and held by self-supporting wire grid.
6. Media-Grid Frame: Galvanized steel.
7. Mounting Frames: Welded, galvanized steel, with gaskets and fasteners, suitable for bolting together into built-up filter banks.

C. Filter Gage:

1. 3-1/2-inch- diameter, diaphragm-actuated dial in metal case.
2. Vent valves.
3. Black figures on white background.
4. Front recalibration adjustment.
5. 2 percent of full-scale accuracy.
6. Range: 0- to 1.0-inch wg.
7. Accessories: Static-pressure tips with integral compression fittings, 1/4-inch aluminum tubing, and 2- or 3-way vent valves.

2.7 DAMPERS

A. General Requirements for Dampers: Leakage rate, according to AMCA 500, "Laboratory Methods for Testing Dampers for Rating," shall not exceed 2 percent of air quantity at 2000-fpm face velocity through damper and 4-inch wg pressure differential.

B. Damper Operators: Comply with requirements in Division 23 Section "Instrumentation and Control for HVAC."

C. Electronic Damper Operators:

1. Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.
2. Electronic damper position indicator shall have visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.
3. Operator Motors:
   a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC."
   b. Size to operate with sufficient reserve power to provide smooth modulating action or two-position action.

c. Permanent Split-Capacitor or Shaded-Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.

4. Coupling: V-bolt and V-shaped, toothed cradle.
5. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
6. Fail-Safe Operation: Mechanical, spring-return mechanism with external, manual gear release on nonspring-return actuators.
7. Power Requirements (Two-Position Spring Return): 24-V ac.
8. Power Requirements (Modulating): Maximum 10 VA at 24-V ac or 8 W at 24-V dc.
9. Proportional Signal: 2- to 10-V dc or 4 to 20 mA, and 2- to 10-V dc position feedback signal.
10. Temperature Rating: Minus 22 to plus 122 deg F.
11. Run Time: 12 seconds open, 5 seconds closed.

D. Outdoor- and Return-Air Dampers: Low-leakage, double-skin, airfoil-blade, aluminum dampers with compressible jamb seals and extruded-vinyl blade edge seals in parallel-blade arrangement with cadmium-plated steel operating rods rotating in stainless-steel sleeve bearings mounted in a single aluminum frame, and with operating rods connected with a common linkage. Leakage rate shall not exceed 5 cfm/sq. ft. at 1-inch wg and 9 cfm/sq. ft. at 4-inch wg.

E. Enthalpy Wheel Exhaust and Supply Air Bypass Dampers: Parallel-blade, galvanized-steel dampers mechanically fastened to cadmium-plated steel operating rod in reinforced cabinet. Connect operating rods with common linkage and interconnect linkages so dampers operate simultaneously.

F. Mixing Section: Multiple-blade, air-mixer assembly located immediately downstream of mixing section.

G. Combination Filter and Mixing Section:

1. Cabinet support members shall hold 2-inch- thick, pleated, flat, permanent or throwaway filters.
2. Multiple-blade, air-mixer assembly shall mix air to prevent stratification, located immediately downstream of mixing box.

H. All rooftop units shall include a 12" long hood extension between unit and outside and exhaust hoods for mounting of airflow measuring station.

2.8 ENTHALPY WHEELS (where indicated):

A. Units with energy recovery shall include a vertical, rotary enthalpy wheel with the performance and pressure drop as scheduled.

1. The rotor shall be constructed of corrugated synthetic media providing individual flutes to channel air flow and minimize cross contamination. Rated performance shall be maintained under all differential pressure conditions. The desiccant shall be intimately bound and uniformly and permanently dispersed throughout the matrix structure of the media. Media shall be non-metallic to provide corrosion resistance against attack from

office, laboratory chemicals, etc. ---OR--- The rotor shall be made of aluminum coated to prohibit corrosion; etched or oxidized surfaces are not acceptable. All surfaces must be coated with a non-migrating adsorbent layer prior to being formed into the honeycomb media structure to insure that all surfaces are coated and that adequate latent capacity is provided. The desiccant must be specifically designed for the adsorption of water vapor. Verification in writing must be presented from the desiccant manufacturer confirming that the internal pore diameter distribution inherent in the desiccant being provided limits adsorption to materials not larger than the critical diameter of a water molecule (2.8 angstroms).

2. The rotor shall provide equal sensible and latent recovery efficiencies. This must be clearly documented through a certification program conducted in accordance with ASHRAE 87-78P and ARI 1060 standards. The certification must have been conducted by a qualified independent organization. Independent wheel testing to document that the desiccant material utilized does not transfer pollutants typically encountered in the indoor air environment shall be provided from a credible test laboratory.
3. The wheel manufacturer must have been producing the wheel product for a minimum of five years and must provide references with a successful operating history of at least four years.
4. Ribbon-type, heat exchangers that cannot control cross contamination at all differential pressures are not acceptable.
5. Unless otherwise specified rotors with desiccants applied as a coating, bonded, or synthesized onto the media are not acceptable due to the potential for de-lamination and erosion of the desiccant material.
6. The desiccant material shall be a molecular sieve with pore diameters ranging from 3A to 4A or silica gel.
7. Wheels shall be able to withstand air stream temperatures in excess of 200°F with no deterioration of the matrix.
8. Wheels shall be cleanable by vacuuming, blowing with compressed air (20 PSIG max.), low temperature steam, hot water, or light detergent, without degradation of latent recovery capacity.
9. The wheel frames shall consist of evenly spaced galvanized steel spokes, aluminum outer band, and rigid center hub.
10. The wheel construction shall allow for post fabrication wheel alignment.
11. The wheel seals shall be neoprene non-contact bulb seals and shall be easily adjustable.
12. Cassettes shall be fabricated of heavy-duty reinforced 16 gauge galvanized steel.
13. Bearings shall be inboard, zero maintenance, permanently sealed roller bearings.
14. ~~Drive systems shall be an AC drive motor with urethane drive belts.~~
    (*AD-02)
15. Heat exchangers shall be tested in accordance with ARI Standard 1060 and ASHRAE Standard 84-1991.

2.9 SOURCE QUALITY CONTROL

A. Fan Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Fans shall bear AMCA-certified sound ratings seal.

B. Fan Performance Rating: Factory test fan performance for airflow, pressure, power, air density, rotation speed, and efficiency. Rate performance according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating."

C. Water Coils: Factory tested to 300 psig according to ARI 410 and ASHRAE 33.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine casing insulation materials and filter media before air-handling unit installation. Reject insulation materials and filter media that are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for steam, hydronic, and condensate drainage piping systems and electrical services to verify actual locations of connections before installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Equipment Mounting: Install indoor air-handling unit on concrete base using elastomeric pads. Secure units to anchor bolts installed in concrete bases. Comply with requirements for concrete bases specified in Division 03 Section "Cast-in-Place Concrete." Comply with requirements for vibration isolation devices specified in Division 23 Section "Vibration Control for HVAC."

1. Install galvanized-steel plate to equally distribute weight over elastomeric pad.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
3. Install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.

B. Arrange installation of units to provide access space around air-handling units for service and maintenance.

C. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing, with new, clean filters.

D. Install filter-gage, static-pressure taps upstream and downstream of filters. Mount filter gages on outside of filter housing or filter plenum in accessible position. Provide filter gages on filter banks, installed with separate static-pressure taps upstream and downstream of filters.

3.3 CONNECTIONS

A. Comply with requirements for piping specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to air-handling unit to allow service and maintenance.

C. Connect piping to air-handling units mounted on vibration isolators with flexible connectors.

D. Connect condensate drain pans using ASTM B 88, Type M copper tubing. Extend to nearest equipment or floor drain. Construct deep trap at connection to drain pan and install cleanouts at changes in direction.

E. Hot- and Chilled-Water Piping: Comply with applicable requirements in Division 23 Section "Hydronic Piping." Install shutoff valve and union or flange at each coil supply connection. Install balancing valve and union or flange at each coil return connection.

F. Connect duct to air-handling units with flexible connections. Comply with requirements in Division 23 Section "Air Duct Accessories."

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Tests and Inspections:

1. Leak Test: After installation, fill water and steam coils with water, and test coils and connections for leaks.
2. Charge refrigerant coils with refrigerant and test for leaks.
3. Fan Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Air-handling unit or components will be considered defective if unit or components do not pass tests and inspections.

D. Prepare test and inspection reports.

3.5 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Verify that shipping, blocking, and bracing are removed.
3. Verify that unit is secure on mountings and supporting devices and that connections to piping, ducts, and electrical systems are complete. Verify that proper thermal-overload protection is installed in motors, controllers, and switches.

4. ~~Verify proper motor rotation direction, free fan wheel rotation, and smooth bearing operations. Reconnect fan drive system, align belts, and install belt guards.~~
5. ~~Verify that bearings, pulleys, belts, and other moving parts are lubricated with factory-recommended lubricants.~~
   (*AD-02)
6. Verify that zone dampers fully open and close for each zone.
7. Verify that face-and-bypass dampers provide full face flow.
8. Verify that outdoor- and return-air mixing dampers open and close, and maintain minimum outdoor-air setting.
9. Comb coil fins for parallel orientation.
10. Verify that proper thermal-overload protection is installed for electric coils.
11. Install new, clean filters.
12. Verify that manual and automatic volume control and fire and smoke dampers in connected duct systems are in fully open position.

B. Starting procedures for air-handling units include the following:

1. Energize motor; verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated rpm.
2. Measure and record motor electrical values for voltage and amperage.
3. Manually operate dampers from fully closed to fully open position and record fan performance.

3.6 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for air-handling system testing, adjusting, and balancing.

3.7 CLEANING

A. After completing system installation and testing, adjusting, and balancing air-handling unit and air-distribution systems and after completing startup service, clean air-handling units internally to remove foreign material and construction dirt and dust. Clean fan wheels, cabinets, dampers, coils, and filter housings, and install new, clean filters.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air-handling units.

END OF SECTION 237313

SECTION 237433 – PACKAGED ROOFTOP UNITS **(*AD-02)**

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes packaged, outdoor, central-station air-handling units (rooftop units) with the following components and accessories:

1. Direct-expansion cooling.
2. Electric heating coil.
3. Supply and exhaust fans.
4. Filters.
5. Roof curb.

1.2 SUBMITTALS

A. Product Data: Include manufacturer's technical data for each RTU, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

C. Field quality-control test reports.

D. Warranty.

E. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Compliance:

1. Packaged air-cooled condenser units shall be certified in accordance with ANSI/AHRI Standard 340/360 *Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment*.
2. Comply with ARI 270 for testing and rating sound performance for RTUs.
3. Comply with ASHRAE 15 for refrigerant system safety.
4. Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
5. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

6. NFPA Compliance: Comply with NFPA 90A and NFPA 90B.
7. Units shall be safety certified by ETL and ETL US listed.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.4 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace components of RTUs that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Compressors: Five years.
2. Warranty Period for Remainder of Unit: Manufacturer's standard, but not less than one year.

PART 2 - PRODUCTS

2.1 PACKAGED OUTDOOR AIR UNITS (RTU-1)

A. Manufacturers:

1. Daikin Applied, Inc.
2. Greenheck.
3. Johnson Controls, Inc.
4. Trane.
5. Valent.

B. Description:

1. Packaged rooftop unit shall include compressors, evaporator coil, filters, supply fan, dampers, air-cooled condenser, condenser fans, reheat coil, electric heating coil, exhaust fan, energy recovery wheel, and unit controls.
2. Unit shall be factory assembled and tested including leak testing of the DX coils, pressure testing of the refrigeration circuit, and run testing of the completed unit. Run test report shall be supplied with the unit in the service compartment's literature pocket.
3. Unit shall have decals and tags to indicate lifting and rigging, service areas and caution areas for safety and to assist service personnel.
4. Unit components shall be labeled, including refrigeration system components and electrical and controls components.
5. Estimated sound power levels (dB) shall be shown on the unit ratings sheet.
6. Installation, Operation, and Maintenance manual shall be supplied within the unit.

7. Laminated color-coded wiring diagram shall match factory installed wiring and shall be affixed to the interior of the control compartment's hinged access door.
8. Unit nameplate shall be provided in two locations on the unit, affixed to the exterior of the unit and affixed to the interior of the control compartment's hinged access door.

C. Construction:

1. All cabinet walls, access doors, and roof shall be fabricated of **single wall**, impact resistant, rigid polyurethane foam panels. **(*AD-02)**
2. Unit insulation shall have a minimum thermal resistance R-value of 12. Foam insulation shall have a minimum density of 2 pounds/cubic foot and shall be tested in accordance with ASTM D1929-11 for a minimum flash ignition temperature of 610°F. No insulation shall be exposed to the airstream.
3. **Unit construction shall be single wall with foil faced R-7 insulation. (*AD-02)**
4. Roof of the air tunnel shall be sloped to provide complete drainage. Cabinet shall have rain break overhangs above access doors.
5. Access to filters, dampers, cooling coils, reheat coil, heaters, exhaust fans, energy recovery wheels, compressors, and electrical and controls components shall be through hinged access doors with quarter turn, lockable handles.
6. Exterior paint finish shall be capable of withstanding at least 500 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.
7. Unit shall include double-sloped 304 stainless steel drain pans.
8. Unit shall be provided with base discharge and return air openings. All openings through the base pan of the unit shall have upturned flanges of at least 1/2 inch in height around the opening.
9. Unit shall include lifting lugs on the top of the unit.

D. Electrical:

1. Unit shall be provided with factory installed and factory wired, non-fused disconnect switch.
2. Unit shall be provided with phase and brown out protection that shuts down all motors in the unit if the electrical phases are more than 10% out of balance on voltage, the voltage is more than 10% under design voltage or on phase reversal.

E. Supply and Exhaust Fans:

1. Unit shall include direct drive, un-housed, backward curved, plenum supply fan with variable frequency drive.
2. Blowers and motors shall be dynamically balanced and mounted on vibration isolators.
3. Motor shall be premium efficiency ODP with ball bearings rated for 200,000 hours service with external lubrication points and rated for use with variable frequency drives.
4. Variable frequency drives shall be factory wired and mounted in the unit. Fan motors shall be premium efficiency.

F. Dampers:

1. Motorized dampers
   a. Frame shall be constructed of 16 gage galvanized steel hat channel. Blades shall be constructed of 16 gage galvanized steel with 1" deep Vee grooves and symmetrical about axle pivot point.
   b. Axle bearings shall be synthetic, sleeve-type.
   c. Blade seals shall be extruded vinyl permanently bonded to the blade edges.
   d. Frame shall include flexible stainless steel compression type jamb seals.

2. Barometric relief dampers
   a. Shall be constructed with 0.125" extruded aluminum channel frame. Blades shall be extruded aluminum and include adjustable counter-balance weights for system balancing.
   b. Axle bearings shall be synthetic, sleeve-type.
   c. Blade seals shall be extruded vinyl permanently bonded to the blade edges.

G. Filters:

1. Outdoor air filter rack shall accommodate 2" MERV 13 filters. Filter section shall be accessible through a 2" foam-injected, double wall, hinged access door with quarter-turn latches.
2. Return air filter rack shall accommodate 2" MERV 8 filters. Filter section shall be accessible through a 2" foam-injected, double wall, hinged access door with quarter-turn latches.
3. Refer to Section "Particulate Air Filtration."

H. Packaged Air-Cooled DX Refrigeration System:

1. Unit shall be provided with a complete, factory-piped, -wired, -tested, and -charged air-cooled DX cooling system. Unit shall be factory charged with R-410A refrigerant.
2. Refrigeration systems larger than 10 tons shall be equipped with two stages of capacity control, each on an independent refrigerant circuit. Provide thermal expansion valve with adjustable superheat.
3. Evaporator Coils
   a. Coils shall be designed for use with R-410A refrigerant and constructed of copper tubes with aluminum fins mechanically bonded to the tubes and galvanized steel end casings.
   b. Coils shall have interlaced circuitry.
4. Coils shall be rated in accordance with ARI standards and pressure-tested for 250 psi working pressure.
5. Provide stainless steel drain pan, double-sloped to remove condensate from unit. Pan shall extend a minimum of 8" past the evaporator coil.
6. Modulating hot gas reheat:
   a. Reheat coil shall be a minimum of 6" from the evaporator coil to prevent re-evaporation of condensate, provide for coil cleaning, and allow monitoring of coil discharge temperature.
   b. Coil shall be rated in accordance with ARI standards and pressure-tested for 250 psi working pressure.
   c. Coil shall be constructed of copper tubes with aluminum fins mechanically bonded to the tubes and galvanized steel end casings.

d. Hot gas reheat shall be controlled through a factory-supply modulating control valve.

7. Compressors

a. Compressors shall be hermetic scroll type with thermal overload protection independently circuited. Provide digital or inverter scroll compressor on lead refrigeration circuit.
b. Provide suction and discharge service valves.
c. Reverse rotation protection.
d. Oil level adjustment.
e. Rotary dirt trap.
f. Short cycling control.
g. High and low-pressure limits.
h. Crankcase heaters.
i. Compressor isolation valves.
j. Sight glasses.

8. Compressors shall be mounted in an isolated service compartment that can be accessed without affecting unit operation. Lockable hinged compressor access doors shall be fabricated of double wall, rigid polyurethane foam injected panels to prevent the transmission of noise outside the cabinet.
9. Compressors shall be isolated from the base pan with the compressor manufacturer's recommended rubber vibration isolators, to reduce any transmission of noise from the compressors into the building area.
10. ~~Unit shall include a variable capacity scroll compressor on the lead refrigeration circuit which shall be capable of modulation from 10-100% of its capacity.~~ **(*AD-02)**
11. Lead refrigeration circuit shall be provided with hot gas reheat coil, modulating valves, electronic controller, supply air temperature sensor and a control signal terminal which allow the unit to have a dehumidification mode of operation, which includes supply air temperature control to prevent supply air temperature swings and overcooling of the space.
12. Provide condenser coils with galvanized casing, seamless copper tubes and aluminum fins.
13. Condenser fans shall be direct-drive, statically and dynamically balanced in accordance with AMCA Standard 205. Fan assembly shall include aluminum bladed propeller fan, formed channel base, formed inlet venturi, and coated steel basket guard on the discharge.

I. Electric Heating Coil:

1. Heaters shall meet the requirements of the National Electrical Code and shall be listed by Underwriters Laboratories for zero clearance to combustible surfaces and for use with heat pumps and air conditioning equipment. Heating elements shall be open coil, 80 percent nickel, 20 percent chromium, Grade A resistance wire. Type C alloys containing iron or other alloys are not acceptable. Coils shall be machine-crimped into stainless steel terminals extending at least 1 inch into the air stream and all terminal hardware shall be stainless steel. Coils shall be supported by ceramic bushings staked into supporting brackets. Heater frames and terminal boxes shall be corrosion resistant steel. Unless otherwise indicated, the terminal box shall be NEMA 1 construction and shall be

provided with a hinged, latching cover. Heaters shall be furnished with a disc type, automatic reset thermal cutout for primary over temperature protection. All heaters shall also be furnished with disc type, load-carrying manual reset thermal cutouts, factory wired in series with heater stages for secondary protection. Control will be SCR type. Unit shall be suitable for use with electric resistance heat.

J. Electrical:

1. Unit shall be factory-wired with a single point power connection.
2. Provide the following in the control center:
   a. Non-fused disconnect.
   b. Sub-circuit fusing.
   c. Low voltage transformers.
   d. Terminal block.
   e. Fan variable frequency drives.
3. Unit shall include a factory supplied, mounted, and wired phase and voltage monitor.

K. Controls:

1. Units shall include factory supplied, mounted, wired, and tested stand-alone microprocessor controls.
2. Microprocessor controller shall be factory-programmed for discharge air control and use an internal 7-day time clock.
3. Microprocessor controller shall be mounted in a weather-proof enclosure and accessible without exposing the operator to high voltage wiring or having to turn off or circumvent the main disconnect.
4. Microprocessor controller shall include local liquid crystal display (LCD) for user interface.
5. The following sensors shall be factory supplied, mounted, and wired inside the unit:
   a. Outdoor air humidity sensor.
   b. Outdoor air temperature sensor.
   c. Evaporator coil leaving air temperature sensor.
   d. Supply air filter pressure monitoring.
   e. Energy wheel rotation sensor.

6. The following devices shall be factory supplied but ship loose and require field installation and wiring:
   a. Wall-mounted room air temperature sensor with manual adjuster. Provide aluminum sensor guard.
   b. Wall-mounted room air humidity sensor. Provide aluminum sensor guard.
   c. Supply air temp temperature sensor.
   d. Space static pressure sensor.
   e. Duct static pressure sensor.
   f. Smoke detector.
7. Microprocessor controller shall include BACnet IP communications for BAS interface. Refer to Section 255500, Paragraph 2.03 for additional requirements for BAS interface.
8. Microprocessor controller shall include a Web UI interface for remote web-based access.

9. The controller shall send the following to the BAS:
   a. Unit status.
   b. Occupancy status.
   c. Space temperature.
   d. Space humidity.
   e. Unit leaving air temperature.
   f. Unit alarm.
10. The controller shall receive the following from the BAS:
   a. Unit enable/disable command.
   b. Space heating and cooling temperature set point.
   c. Occupied/unoccupied mode.

2.2 ROOF CURBS

A. Materials: Galvanized steel with corrosion-protection coating, watertight gaskets, and factory-installed wood nailer; complying with NRCA standards.

1. Curb Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.

   a. Materials: ASTM C 1071, Type I or II.
   b. Thickness: 1 inch.

2. Application: Factory applied with adhesive and mechanical fasteners to the internal surface of curb.

   a. Liner Adhesive: Comply with ASTM C 916, Type I.
   b. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in cabinet.
   c. Liner materials applied in this location shall have air-stream surface coated with a temperature-resistant coating or faced with a plain or coated fibrous mat or fabric depending on service air velocity.

B. Curb Height: 18 inches minimum.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Roof Curb: Install on roof structure, level and secure, according to NRCA's "Low-Slope Membrane Roofing Construction Details Manual," Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts." Install RTUs on curbs and coordinate roof penetrations and flashing with roof construction specified in Section 077200 "Roof Accessories." Secure RTUs to upper curb rail, and secure curb base to roof framing or concrete base with anchor bolts.

B. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.

C. Install piping adjacent to RTUs to allow service and maintenance.

D. Duct installation requirements are specified in other HVAC Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:

1. Install ducts to termination at top of roof curb.
2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
3. Connect supply ducts to RTUs with flexible duct connectors specified in Section 233300 "Air Duct Accessories."
4. Install return-air duct continuously through roof structure.

3.2 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

B. Tests and Inspections:

1. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.
2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

3.3 CLEANING AND ADJUSTING

A. After completing system installation and testing, adjusting, and balancing RTU and air-distribution systems, clean filter housings and install new filters.

END OF SECTION 237413

SECTION 271300 – TELECOMMUNICATIONS CABLING (*AD 02)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. All eight (8) position, modular jack products shall be installed and terminated in compliance with the TIA 568B standard for modular jack pin/pair assignments.

C. All cable installation and terminations shall be performed in strict accordance with the telecommunications cabling standards, drafted by the Telecommunications Industry Association (TIA) and BICSI, as set forth below. The Contractor for the cabling plant installation shall be thoroughly familiar with the requirements of these standards and shall have successfully installed as the primary contractor, within the past two (2) years, at least two (2) telecommunications cabling plants of a scope equal to or greater than the scope of work described herein. The Contractor shall have performed this work with their own regularly employed staff. Projects which have used subcontractors installing the cabling shall not be considered to meet the experience requirements. The Contractor shall have at least five (5) years of experience performing this type of work as the primary contractor and shall hold a Class A Contractor's License. Contractors who routinely subcontract cabling work shall not be considered qualified. The Contractor shall provide references that include the name of the firms for which this work was completed, the name(s) of appropriate contact people and corresponding telephone numbers.

D. TIA Standards with all applicable addendums:

1. TIA-526: Standard Test Procedures for Fiber Optic Systems
2. TIA-526-14.B : Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant
3. TIA-568.0-D: Generic Telecommunications Cabling for Customer Premises
4. TIA-568.1-D: Commercial Building Telecommunications Cabling Standard
5. TIA-568.3-D Optical Fiber Cabling and Components Standard
6. TIA-569-C, Telecommunications Pathways and Spaces
7. TIA-568-C.0: Generic Telecommunications Cabling for Customer Premises
8. TIA-568-C.2: Balanced Twisted- Pair Telecommunications Cabling and Components Standards
9. TIA-568-C.3-D: Optical Fiber Cabling Components Standard
10. TIA-568-C.4: Broadband Coaxial Cabling and Components Standard
11. TIA-598-D: Optical Fiber Cable Color Coding
12. TIA-606-B: Administration Standard for Telecommunications Infrastructure
13. TIA- 607-B: Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises

14. TIA-758-B: Customer-Owned Outside Plant Telecommunications Infrastructure Standard
15. TIA-862-B: Structured Cabling Infrastructure Standard for Intelligent Buildings
16. TIA-1005-A: Telecommunications Infrastructure Standard for Industrial Premises
17. TIA Document 4966 (Educational Buildings)
18. TIA-TSB-140 Additional Guidelines for Field Testing Length, Loss and Polarity of Optical Fiber Cabling Systems

E. Install cabling in accordance with the most recent edition of BICSI® standards and publications:

1. BICSI -- Telecommunications Distribution Methods Manual (TDMM)
2. BICSI – Electronic Safety and Security Design Reference Manual
3. BICSI – Outside Plant Design Reference Manual

F. Federal, state, and local codes, rules, regulations, and ordinances governing the work, are as fully part of the specifications as if herein repeated or hereto attached. If the contractor shall note items in the drawings or the specifications, construction of which would be code violations, promptly call them to the attention of the owner's representative in writing. Where the requirements of other sections of the specifications are more stringent than applicable codes, rules, regulations, and ordinances, the specifications shall apply.

1.2 SUMMARY

A. The Contractor shall establish a single point of contact responsible for reporting the periodic progress of the work performed to the owner. The designated individual shall remain a continuous point of contact through the duration of the project, unless written permission by the owner is granted.

B. The Contractor shall be responsible for the daily cleaning and disposal of all trash and debris resulting from the work. In an occupied facility, all areas shall be returned to the same clean and orderly condition that existed prior to the work. Any hazardous debris shall be safely and legally disposed of off-site immediately. The Contractor’s personnel shall follow all laws and regulations regarding safe work practices and safety equipment.

C. All installation work must be accomplished in accordance with the construction schedule. Time is of the essence and the completion date for the cabling plant may be used as a factor in determining this award.

D. A 25 year warranty for the cabling plant is required in this installation. It is recognized that many manufacturers will provide an extended warranty if only their product(s) or an approved product(s) is (are) used in the cabling plant installation throughout the project. Therefore, unless otherwise specified, this solicitation allows flexibility in the provision of approved equivalents, but is not intended to permit a mixing and matching of materials from a multitude of manufacturers. This installation requires that all materials within one series of materials be obtained from a single manufacturer.

E. The Contractor’s employees shall be required to wear identification badges, prepared by the Contractor, denoting company name, employee name, and project name, at all times on site through the duration of the project. In lieu of identification badges, uniforms plainly identifying the Contractor’s firm may be worn.

F. The Contractor shall obtain permission from the owner prior to beginning any work that may necessitate cutting into or through any part of a building structure, such as girders, beams, steel, concrete, masonry, floors or ceilings. It is the responsibility of the Contractor to coordinate scheduling and installation with the General Contractor of the building construction. The Contractor shall be financially responsible for any damage to any part of the owner facility resulting from his work.

G. The Contractor will use an industry accepted wire pulling lubricant, when needed, while pulling cables through conduit.

H. The Contractor shall use caution when pulling cables so that the maximum pulling force is not exceeded for the type of cable pulled. A basket weave cable grip/strap must be used to pull all cables to ensure that the maximum pulling tension is not exceeded.

I. For each type of cable pulled, the Contractor shall ensure that the proper amount of cable slack is retained at patch panels and workstation outlets. Thirty (30) and ten (10) feet of slack shall be retained at the telecommunications rooms for both fiber and copper cables, respectively. One meter of slack shall be retained at the copper telecommunications outlet (looped in the ceiling area). Inadequate cable lengths for proper termination will require the contractor to re-pull the affected cables.

J. The Contractor shall seal all riser conduit sleeves, voids and openings through fire and smoke rated walls and partitions with Code approved fire stopping materials installed in accordance with the manufacturer's recommended installation methods and all Code requirements.

K. The Contractor shall provide a detailed project work plan with the projected time lines and milestones for all major phases of the installation of the cabling plant prior to the start of the installation.

L. Throughout the installation of the cabling plant the Contractor must demonstrate a diligent and continuous effort to complete the work in a satisfactory manner. The owner will perform periodic observations and on-site reviews of work in progress. Should the quality of the work be deficient in the judgment of the owner, the owner shall notify the Contractor in writing of the unacceptable work. The Contractor shall have two (2) days to correct the unacceptable work from the date of the written notification.

M. It shall not be permissible for the contractor performing the cabling work to subcontract any portion of the project work, with one exception. It shall be permissible for the Division 28 portion of this work to be subcontracted by the Contractor.

N. The contractor shall procure, provide, install, test, and document all components necessary for a comprehensive telecommunications cabling plant that shall be completed in a "turnkey" manner. The cabling plant shall consist of all supporting hardware including, but not limited to "J" hooks, tie wraps and wire management modules.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Cable identification and labeling schedules
2. Cabling schedule design, drawings and printouts.
3. Wiring diagrams to show typical wiring schematics including the following:
    a. Cross-connects.

b. Patch panels.
c. Patch cords.

4. Cross-connects and patch panels. Detail mounting assemblies and show elevations and physical relationship between the installed components.

C. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.

D. Source quality-control reports.

E. Field quality-control reports.

F. Maintenance Data: For splices and connectors to include in maintenance manuals.

1.4 SOURCE QUALITY CONTROL:

A. Materials and equipment shall be new, unused, conform to present revisions of TIA specifications and UL listed.

B. The telecommunications cabling and components shall be installed by one (1) single telecommunications cabling trade of established reputation and experience in telecommunications cabling installation. All cable installation and terminations shall be performed in strict accordance with the industry standards referenced above. The telecommunications cabling trade shall be thoroughly familiar with the requirements of these standards and shall have successfully installed as the primary contractor, within the past two (2) years, at least two (2) telecommunications cabling plants of a scope equal to or greater than the scope of work described herein. The telecommunications cabling trade shall have at least five (5) years of experience performing this type of work as the primary contractor.

C. The telecommunications cabling trade shall provide references that include the name of the firms for which this work was completed, the name(s) of appropriate contacts and corresponding telephone number, as well as a description of each project.

D. The telecommunications cabling trade shall be qualified as stated hereinafter in the installation and testing of the systems being provided and shall be completely versed in TIA and BICSI standards and practices. The telecomm/ESS trade shall be capable of providing test reports containing the test data of all cables installed whether terminated or spared. The telecomm/ESS trade shall install and test all components of the telecommunications cabling plant not provided by the Owner, and provide wiring tables and certification to the Owner's representative and Engineer. The telecomm/ESS installation shall include cabling, connections, components, marking, testing, and certification. The electrical trade shall provide conduits, junction boxes and pull boxes, as well as sleeves, firestop approved assemblies and surface mounted raceway and boxes, as indicated or needed, and as required by the telecomm/ESS trade's instructions. The telecomm/ESS trade shall furnish all cabling, all racks, all patch panels, all connecting blocks, all couplers, all connectors, all terminating devices, all special boxes, and all accessories and parts associated with the above.

E. The telecomm/ESS trade shall have employed on their staff for at least two years prior to the issuance of this solicitation a Registered Communications Distribution Designer (RCDD) currently registered and certified by Building Industries Consulting Service International (BICSI). Telecomm/ESS Contractor shall submit the name, registration number and seal of the RCDD on the contractors' staff. It shall not be permissible for the contractor to retain or subcontract with a person holding the RCDD credential.

F. The RCDD shall certify by the phase of installation in writing and provide written verification that they have inspected the completed installation and that the installation meets the terms and

conditions of this document, design requirements of the BICSI TDMM (Latest Edition), and all TIA, NFPA, NEC and all local codes and specifications related to this work. This letter shall be provided with the closeout paperwork for each installation phase. An installation phase (which differs from an overall project phase) is defined as follows:

1. When all cable is pulled from a particular IDF (or MDF) to the workstation outlets.
2. When all cable originating from a particular IDF (or MDF) is terminated and tested.
3. When all backbone cabling is pulled between the MDF and IDFs.
4. When all cabling between the MDF and IDFs is terminated.

G. All design documents, submittals, project record drawings, test results, third party testing and other documentation provided by the telecomm/ESS trade shall bear the name, registration number and seal of the RCDD responsible for this project.

H. Telecommunication cabling systems installation shall be provided by the telecomm/ESS trade's own work forces. No subcontractor agreements for any portion of the work specified will be permitted, with the exception noted. It is the intent of the contract to have one telecomm/ESS trade provide sole responsibility for material, labor and service for the systems.

I. Telecomm/ESS trade shall have a staffed office (secretary, project manager, technicians, etc.) within 100 miles of the project and provide a service response time of a maximum of (2) hours from time of notification of major system failure.

J. Note this document distinguishes between first level IDFs and IDFs (that are not first level) in some sections of the document where this distinction is applicable.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work areas are dry and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.6 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and WAN and LAN equipment installers.

PART 2 - PRODUCTS

2.1 EQUIPMENT RACKS AND CABINETS

A. EQUIPMENT RACKS

1. MDF – 84-inch four-post open racks will be used to mount all networking and telecommunications equipment. Chatsworth Products (CPI) part number 50120-703 or equal Panduit products. Open racks must have vertical wire management on both sides that extend the entire height of the rack. Chatsworth Products (CPI) part number 30096-703 or equal Panduit products. Cage nuts (either M6, 10-32 or 12-24) shall also be provided with racks. Coordinate with owner for type of cage nuts required for mounting specific equipment.

2. IDF's – 84-inch two-post relay rack will be used to mount all networking and telecommunications equipment. Chatsworth Products (CPI) part number 55053-703 or equal

Panduit products. Open racks must have vertical wire management on both sides that extend the entire height of the rack. Chatsworth Products (CPI) part number 30096-703 or equal Panduit products. Cage nuts (either M6, 10-32 or 12-24) shall also be provided with racks. Coordinate with owner for type of cage nuts required for mounting specific equipment.

3. Each rack shall be equipped with a 19" rack mountable 8-outlet surge protector power strip. CPI part number 12816-705 or equal Panduit products

2.2 CABLE SUPPPORT AND MANAGEMENT

A. LADDER RACKS: All ladder rack must be at a minimum 18" wide. All ladder racking must be highly scratch resistant, double coated in black powder coat. All ladder racking must be securely fastened to the wall, open racks and to other pieces of ladder rack using appropriate mounting hardware. CPI part number 10250-718, no exceptions.

1. Cable Runway Radius– CPI 12100-718, or equal Panduit products
2. Rack Wall Angle Support Kit – CPI 11421-718, or equal Panduit products
3. Rack T-Junction Splice Kit – CPI 11302-701, or equal Panduit products
4. Triangle Wall Support Kit –CPI 11312-718, or equal Panduit products
5. Butt Splice Kit – CPI 11301-701, or equal Panduit products
6. Runway Wall to Rack Kit, CPI 11911-712, or equal Panduit products
7. Cable Runway Elevation Kit, CPI 10506-706, or equal Panduit products
8. Rack to Runway Mounting Plate, less intruding into mounting space,

   CPI 12730-718, or equal Panduit products
9. Rack to Runway Mounting Plate, CPI 10595-718, or equal Panduit products

Open racks must have vertical wire management on both sides that extend the entire height of the rack. Chatsworth Products (CPI) part number 30096-703, or equal Panduit products

B. INNERDUCT CONNECTORS

Innerduct connectors shall be used to terminate innerduct into a fiber patch panel and shall be of the following type: Jackmoon, part #1OIC142U (1 inch) or Jackmoon, part #201C252U (2 inch) or equal Panduit products.

PART 3 - INSTALLATION

3.1 GENERAL

A. Miscellaneous components, (i.e. mounting screws, cross-connect wire, "D" rings, etc.) are the installing telecommunications contractors' responsibility.

B. The cabling system shall be installed in a professional manner by persons skilled in the trades represented by the work, and in accordance with local building codes and applicable provisions of the National Electrical Code (NEC), except where specifications in the system design and specification exceed NEC requirements.

C. All electrical materials and equipment installed shall be of new manufacture, and approved by Underwriters Laboratories, Inc. (UL) and shall bear the UL label.

D. The location of outlet boxes and equipment on all drawings is approximate, unless dimensions are shown. Drawings shall not be scaled to determine position and routing of pathways, drops, and outlet boxes. The location of outlet boxes and equipment shall conform to architectural features of the building and other work already in place, and must be ascertained and verified by the contractor in the field prior to the start of work.

E. 110 patch panels are an integral part of this project. The multi-type of punch down tool that results in all four pairs being simultaneously punched down shall not be used on any part of this project.

3.2 MDF – MAIN DISTRIBUTION FRAME

A. 4-post 84" open racks shall be installed in the MDF. Fiber optic cabling and camera trunk cabling entering the racks shall be adequately supported. Cable ladders shall be used to support the cabling entering the racks.

B. Fiber optic patch panels shall be installed in the top portion of the rack.

C. (20) Fiber patch cords must be provided by the contractor for use in the MDF. Refer to sections above 2.4 for length and connector type.

D. Provide short patch cables to cross-connect between the patch panels and the network switches. The number to provide shall be equal to the number of ports at the MDF. See Design and Schedule of Required Materials attachment for quantity of ports. Patch cords are installed in the following typical orientation starting at the top of the rack. Owner will install patch cords.

1. Switch
2. 1 RU space
3. Patch panel (patch to switch above)
4. 1 RU space
5. Switch
6. 1 RU space
7. Patch panel (patch to switch above)

E. Patch panels and cable management modules shall be installed as depicted in the typical rack diagram on the drawings.

F. Provide CAT6 and CAT6 copper patch panels in quantity as required to serve number of ports in the associated data zone, plus number of spares as indicated above.

G. 1foot, 6 patch cords will be provided to support the wireless access points.

3.3 IDF – INTERMEDIATE DISTRIBUTION FRAMES

A. IDF locations are listed in the Design and Schedule of Required Materials attachment.

B. 2 post 84" open rack(s) or cabinet shall be installed in each IDF location unless otherwise indicated. Category 6 cabling originating from the workstation outlets as well as the fiber cabling, backbone voice cabling and camera trunk cabling entering the cabinet shall be adequately supported. Cable ladders shall be used to support the cables entering the cabinet. See Design and Schedule of Required Materials attachment to determine if a rack(s) or cabinet (and size) is to be provided for each IDF.

C. The IDF locations shall have a fiber patch panel installed with ports equal to the number of strands specified for that particular IDF plus growth as noted above. All fiber patch panels shall be installed in the top portion of the enclosed rack or cabinet.

D. A series of 48 and 24 port patch panels will be installed to support the total number of Category 6 cable runs out to the workstation locations. Appropriate cable management panels shall be installed to support each port patch panel.

E. Patch panels and cable management modules shall be installed as depicted in the attached diagram.

F. Four (4) fiber patch cords shall be provided by the contractor at each of the IDF's. Refer to above sections for length and connector type.

G. Provide patch cables to cross-connect the patch panels. The number provided shall be equal to the number of ports at each IDF.Again provide short patch cords according to the patch cord configuration outlined above.

H. 1 foot, 6 patch cords will be provided to support the wireless access points.

3.4 HORIZONTAL DISTRIBUTION (CAT 6) CABLE - DATA

A. The number of pairs of 6 cables that shall be installed between the MDF and the various IDF's, is indicated on the Design and Schedule of Required Materials attachment.

B. Cable routing plans should consider the proximity to electrical distribution facilities and EMI producing devices such as motors, transformers and copiers. To avoid EMI, cable runs must be kept at least four (4) feet away from large motors, transformers or copiers, one (1) foot from conduit and cables used for electrical power distribution and at least five (5) inches of clearance must be maintained between the horizontal distribution cable and all fluorescent lighting.

C. Category 6 cabling providing connectivity to the workstation outlets shall be installed and routed in a home run fashion from each of the workstation outlets to the 110 patch panel located in the nearest IDF.

D. All four pairs of cable providing connectivity to the workstation outlets shall be terminated on a single RJ 45 jack at each end of the cable.

E. Cables shall be neatly bundled and dressed to their respective panels. Each panel shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the enclosed cabinet or rack. Velcro shall be loosely secured so that they spin easily when fastened.

F. Each horizontal run of twisted pair cable shall be clearly labeled behind the patch panel. Labels located within the bundle will not be acceptable.

G. Sufficient cable slack of ten (10) feet in length must be retained at the patch panel.

3.5 HORIZONTAL DISTRIBUTION (CAT 6) CABLE – DATA

A. Two horizontal distribution cables to support voice shall be installed from the IDFs to each classroom.

3.6 HORIZONTAL DISTRIBUTION (Category 6) CABLE -WIRELESS

A. The number of 6 cables that shall be installed between the IDF's and the wireless access point locations is indicated on the Design and Schedule of Required Materials attachment.

B. Category 6 data drops to be installed to support additional high bandwidth and high power wireless access points to provide optimal wireless coverage and density for staff and student wireless laptop connectivity.

C. Two Category 6 pigtails shall be installed for each wireless access point location. 6 Patch panels shall be installed to support the installation of the wireless data drops

D. Installation procedures cited above for Category 6 cable shall also apply to 6 cable installation.

3.7 WORKSTATION OUTLETS

A. The number of workstation outlet locations to be installed is indicated on the Design and Schedule of Required Materials attachment.

B. Cables shall be dressed and terminated in accordance with the EIA/TIA 568A installation procedures standard and the T568B wiring scheme for pin/pair assignments.

C. Untwisting of the pairs at the point of termination must not exceed one-half inch.

D. The bend radius of the cable in the termination area of the workstation outlet shall not exceed four (4) times the outside diameter of the twisted pair cable.

E. The jacket of the cable shall be maintained as close as possible to the point of termination.

F. If surface mount boxes are to be used to supplement boxes installed by the general contractor they should be used in conjunction with either metallic or plastic surface mount raceways. No installed UTP cables should be left exposed on a wall surface. Metallic raceways such as those made by Wiremold should be used where the raceway may be subject to damage.

G. Unless otherwise noted, all workstation outlets shall be installed at the level of the existing AC outlets.

H. Data networking outlets shall be installed a minimum of 12 inches away from any AC Outlet.

3.8 VOICE JACKS

A. One blue RJ 45 jack, shall be installed As indicated on drawings.

B. All voice drop cables shall be installed in a home run fashion from each voice jack location to the nearest IDF.

C. The installation procedures cited above for workstation outlets shall apply to voice outlets except the color of the jacks shall be blue.

3.9 SURVEILLANCE CAMERA & ACCESS CONTROL CABLING

A. Camera drop cables shall be installed between each camera location and the nearest IDF and the installed cables shall be identical in specifications (and shall be Category 6) to the voice and data horizontal distribution cables, except for the color of the cable. Installation procedures shall be identical to that for the data cables except that the camera cables shall be clearly labeled as such

and shall be terminated on a separate Category 6 patch panel. Under no circumstances should data, voice and camera cables be co-mingled on the same patch panel. it shall be permissible to comingle camera and access control cables provided that the cables are terminated on opposite ends of the shared patch panel.

3.10 CEILINGS

A. All cables installed in the open ceiling area should be properly supported. Open top cable supports (J-hooks, etc.) are to be located on 48 to 60 inch centers.

B. All cable runs exiting the telecommunications closet should follow main building corridors to the drop or workstation area.

C. UNDER NO CIRCUMSTANCES are cables to be tied to ceiling support wire or laid directly on ceiling tiles or grids.

3.11 CONDUITS

A. Conduit shall be of a type permitted under the appropriate electrical codes, including EMT, IMC, RMC, and rigid PVC. Conduits shall be provided by Div 26 for Div 27 use.

B. ALL CONDUITS AND SLEEVES SHALL BE REAMED TO ELIMINATE SHARP EDGES AND SHALL HAVE AN INSULATED BUSHING INSTALLED PRIOR TO CABLES BEING PULLED THROUGH THEM.

C. A separate conduit should be dedicated for fiber cable use only. If a fiber cable must be installed in an occupied existing conduit, an innerduct shall be placed first and the fiber pulled into it. The innerduct would provide a measure of mechanical protection. This is not required if the fiber optic cable to be installed is armored.

D. If future cable pulls in the same conduit are a possibility, the use of innerduct to sectionalize the available conduit space is required. A mule tape shall be installed within the innerduct to facilitate cable pulling at a later date. Without this division, additional cables pulls can entangle an operating cable and possibly cause an interruption in service. Care must be taken to ensure the innerduct is installed as straight as possible without twists.

E. When installing a fiber optic cable by itself or in a conduit with other cables, particular care must be taken to pulling tension during installation and avoid bending the cable beyond the limits.

F. When two or more cables are installed at the same time, the total maximum pulling tension for the task is reduced by 20 percent from the maximum pulling tension of the lowest rated cable being installed.

G. The installer must adhere to the following general guidelines:

1. Innerducts and conduits must be clean and unobstructed before pulling the cable.
2. Where possible, pull multiple cables through the conduit together.
3. When installing a new cable in an occupied conduit and the measured tension begins to approach the maximum pulling tension, pull back the pulling line and the new cable. Reinsert the pulling line in the conduit and try again. Before removing existing cable or installing new cable in occupied conduits, the owner of the existing cable shall provide authorization for the installation.
4. Feed the cable into the conduit entry to reduce the amount of pulling tension.
5. Use a Tensiometer on any pull that may exceed 100 pounds.

6. Use Kevlar pulling tape when a power winch is used to absorb the shock of startup.
7. To reduce the amount of friction encountered in difficult pulls, lubricate the cables as well as the innerduct or conduit with a cable lubricant that is recommended by the cable manufacturer.
8. Never use petroleum grease or any product that is not recommended as a lubricant by the cable manufacturer.
9. Pull the cable at a steady rate.
10. Never allow the peak pulling tension to exceed the recommended pulling tension.
11. Never install cable in a 3/4" I.D. conduit that has a bend radius of less than 4-1/2"; never install cable in 1" I.D. conduit that has a bend radius of less than 5.75".
12. Never install more than the maximum recommended percentage full of cables in a conduit.
13. Be sure the cable enters the end of the duct or conduit nearest the curved sections.
14. Never string cable or innerduct through ring supports or allow it to sag between horizontal supports.
15. Limit the number of 90^0 bends. Do not pull the cables through more than two 90^0 bends.
16. Avoid tight pulls or tugs against sharp corners so you can minimize pulling tension during installation and reduce the possibility of broken fibers.
17. Never make bends less than six times the diameter of the conduit.

3.12 DETERMINING CONDUIT CAPACITY

A. Compare the cross-sectional area of the cables in a conduit to the area of the conduit. The National Electric Code (NEC) specifies a mathematical, rather than geometrical, method of determining conduit capacity.

B. The allowable capacity is specified as a percentage fill of the area of the conduit:

1. 53 percent - one cable
2. 31 percent - two cables
3. 40 percent - three or more cables

3.13 FIRESTOPPING

A. All floor penetrations (core bores, conduits, sleeves, slots) and firewall penetrations shall be sealed with UL-approved firestop material that carries the same firestop and duration ratings as the wall or floor that they penetrate.

B. All empty conduit stubs and sleeves shall be firestopped.

3.14 UNDERGROUND INSTALLATIONS

A. Buried conduit systems are buried 24" or deeper below finished grade.

B. Direct-buried cable should be buried at a depth of 30 to 36" marked with a dig-up warning tape buried at a depth of 18 to 24" directly above the buried cable.

C. Fiber cable installed in an underground conduit system shall be placed in innerduct to provide physical protection against other work activities in the manholes or conduit, unless armored cables is used.

D. The following safety precautions must be observed when pulling cable from manhole to manhole or manhole to building:

1. Set up safety cones or other barriers around the work areas.
2. When working in a manhole, remember there is a possibility of natural gas being present. No smoking is permitted in or near the manhole. Test for the presence of gas before beginning work and periodically during the work operation. Ventilate the manhole when working inside.
3. Take precautions to limit possible exposure to lead. Lead dust is released into the air anytime the sheath of older lead-sheath cable is disturbed. Do not transfer lead dust from hands or gloves to nose or mouth. Do not breathe in lead dust. Inhaling or ingesting lead dust can have a hazardous effect on your health.
4. If a manhole contains pulling irons (eyes built into the manhole for attaching pulling rigging), inspect them for rust or corrosion that might result in their giving way during cable installation.
5. Workers shall not remain in manholes during cable-pulling operations.
6. If progress checking is required, the pull shall be stopped while the inspection is made.
7. If the cable is to be pulled through multiple manholes, provide enough slack so that the cable in each manhole can be secured with cable ties or other devices.
8. The final destination of the cable is normally a building. In some cases, because of the topography of the land, it may be inconvenient to pull from the manhole to the building. If this is the case, it may be possible to set up the reel inside the building, pulling the cable from inside the building out to the manhole.
9. When installing fiber optic cable, only pull enough cable to reach the destination. Do not allow large amounts of slack to develop at intermediate manholes. Slack left at the feed manhole shall be coiled around the fiber optic cable reel.

3.15 TESTING, DOCUMENTATION, ACCEPTANCE AND WARRANTY

A. FIBER OPTIC TESTING AND VERIFICATION

1. The following method shall be used to test 100% of all fiber cabling. The fiber shall be tested using an OTDR or an optical power meter and a signal injector before it is taken off the reel. The power levels of the test fiber shall be compared with the power levels of a known reference fiber of the same length and type. Subsequent to termination a test shall be conducted to ensure that the termination did not cause excessive loss (DB) or fiber damage. The power losses observed shall be within the allowable losses specified by the EIA/TIA 568A and 455 standards. Any measured losses greater than a maximum attenuation of .50 dB per mated pair shall be corrected and retested at no additional cost to the owner. All testing results (and retesting results, if applicable) shall be fully documented and provided to the owner.

B. Category 6 CABLE TESTING

1. The Contractor shall test all Category 6 cable using the appropriate tester to certify that the cable meets or exceeds Category 6 standards set forth by TIA 568-B.2-1 and ISO/IEC 11801: NEXT and ELFEXT (pair-to-pair and Power Sum), Insertion Loss, Return Loss, and Delay Skew.
2. The Contractor shall test all category 6 cable using the appropriate tester to certify that the cable meets or exceeds category 6 standards set forth by TIA-568-C.2: NEXT and ELFEXT (pair-to-pair and Power Sum), Insertion Loss, Return Loss, and Delay Skew.
3. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions.
4. All copper pairs of each installed cable shall be tested and verified prior to system acceptance.
5. All cables shall be tested in accordance with this document, the TIA and BICSI Standards and best industry practice.
6. All testers used must have been factory calibrated by the manufacturer within one year of use or according to factory calibration recommendations, whichever is the more stringent.
7. Contractor shall set references according to manufacturer's recommendation prior to each day's testing and reset references anytime tester is left unused for more than two hours.
8. Permanent Link profile shall be used for testing.

C. INSTALLATION OF LABELS

1. One label at each end of each cable prior to pulling. These labels do not survive the stripping back of the cable sheath. These may be hand written with permanent ink.
2. One label on each cable inside the outlet box, plus one label on the outside of each faceplate, in the space provided.
3. Each horizontal run of twisted pair cable shall be clearly labeled behind the patch panel. Labels located within the bundle will not be acceptable
4. One label on each set of associated telephone pairs on the UTP termination block.
5. All markings shall be carefully done to present a neat, professional appearance. Machine produced labels are always required. All label printing shall be machine generated using indelible ink ribbons or cartridges. ANSI/TIA-606-A self- laminating labels will be used on cable jackets, appropriately sized to the outside diameter of the cable and placed within view at the termination point on each end. Outlet labels shall be the manufacturer's label provided with the workstation outlet.
6. Each backbone cable shall be labeled with an alphanumeric identifier which denotes origin, destination, cable type, number of conductors and unique character identifying the cable within the cabling plant.

D. CABLING PLANT DOCUMENTATION

1. The Contractor shall supply a diagram(s) upon completion of all work, depicting all cable runs and terminations that shall encompass the following requirements. Documentation shall be provided in electronic format within three weeks after the completion of the project. The testing results shall be in a raw data format consistent with the test equipment manufacturer.

2. The media shall be clearly marked on the outside front cover with the words “Project Test Documentation”, the project name, and the date of completion (month and year). The results shall include a record of test frequencies, cable type, conductor pair and cable (or outlet) I.D., measurement direction, reference setup, and crew member name(s).

3. The test equipment name, manufacturer, model number, serial number, software version and last calibration date will also be provided at the end of the document. Unless the manufacturer specifies a more frequent calibration cycle, an annual calibration cycle is anticipated on all test equipment used for this installation. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.

4. Printouts generated for each cable by the wire test instrument shall be submitted as part of the documentation package. Alternately, the contractor may furnish this information in electronic form.

5. The media shall contain the electronic equivalent of the test results as defined by the specification along with the software necessary to view and evaluate the test reports.

6. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be documented.

7. The cabling system shall be installed to provide labeling and documentation consistent with the provisions of TIA Standard 606. The cabling runs as well as the connecting hardware to which the installed cable is terminated shall be identified at both ends. The contractor shall use the labeling scheme authored and provided by the owner.

8. The contractor shall mark all distribution panels, cables, and outlet plates with appropriate labels. These labels shall be MACHINE PRINTED on proper label material and they shall have “permanent” adhesive. Label material for patch panels shall be white with black lettering.

9. The As-Built drawings are to include cable routes and outlet locations. Their sequential number as defined elsewhere in this document shall identify outlet locations. Numbering, icons, and drawing conventions used shall be consistent throughout all documentation provided.

10. The owner will provide floor plans in paper and electronic formats on which as-built construction information can be added. These documents will be modified accordingly by the contractor to denote as-built information as defined above and returned to the owner.

11. The Contractor shall annotate the base drawings and return a hard copy and electronic form.

12. The contractor shall provide the test results documentation to the appropriate manufacturers to facilitate obtaining the 25 year warranty

E. CABLING PLANT ACCEPTANCE

1. Periodic on-site observations will be made by the owner personnel during the installation of the cabling plant. Upon completion of all work, the contractor shall provide the owner all cabling plant documentation, including results of the fiber, Category 6 and Category 6 cable testing. Within two (2) weeks of this documentation being provided to the owner, the owner personnel will inspect all work to ensure compliance with the requirements of this document (as well as any amendments that may have been issued as accompanying materials) and will randomly test fiber and copper cable connections to verify the test results provided to the owner by the contractor. Portions of the cabling plant may also be activated. Any discrepancies between that observed by the owner personnel and the requirements stipulated herein and/ or the contractor's test results will be resolved by the contractor within a time frame agreed upon by both parties. Once discrepancies have been resolved, the owner will forward a letter of acceptance to the contractor within ten (10) business days. In the event that no discrepancies are revealed, a letter of acceptance by the owner will be provided within ten (10) days subsequent to the week allowed for the inspection.

2. The contractor's work shall be considered complete after the following has been accomplished:

   a. All system testing has been completed, the contractor certifies that the entire system is in working order, and Cable Test Forms have been submitted to the customer.

   b. All ceiling panels previously removed have been put back in place.

   c. All system labels have been put in place.

   d. All construction debris and scrap materials have been removed from the customer's premises.

   e. All marked-up, as-built, drawings have been returned to the customer.

   f. All unused customer material has been returned to the customer.

   g. The owner representative has inspected and accepted the installation.

   h. Any and all damage caused by the contractor has been resolved to customer's satisfaction. (e.g. ceiling tiles, carpet damage, etc.).

F. CABLING PLANT WARRANTY

1. The contractor shall warrant the cabling plant for a period of 25 years from the date of the letter of acceptance referenced above. This warranty shall cover all materials and labor necessary to correct a deficiency discovered subsequent to acceptance. Materials shall include all cable, fiber and copper, as well as all connectors and other associated materials. This warranty shall warrant that all cabling and associated materials installed are free of mechanical and electrical defect and guarantee the ability of the cabling plant to be fully operational now and in the future and have the ability to transmit 10, 100 and 1000 Megabit

Ethernet. At any time during the 25 year warranty period the manufacturer (or contractor) shall be responsible for all adjustments to the cabling plant installed by the contractor to ensure a properly functioning cabling plant. Any and all work performed by the manufacturer (or contractor) shall be performed at no additional cost to the owner. A four (4) hour response time shall be required for major failures and a 24 hour response time shall be sufficient for minor cabling plant failures. It is understood that such a warranty is provided by a number of single manufacturers as well as independent contractors and that this warranty would either convey directly from the manufacturer to the owner or from the contractor to the owner at the point of final acceptance. It is the responsibility of the contractor to facilitate the provision of this type of warranty.

END OF SECTION 271300

SECTION 271500 – STRUCTURED CABLING **(*AD 02)**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. DESCRIPTION

1. Construction and Maintenance Technical Operations has developed the following Structured Cabling System (SCS) Standard for the owner facilities. The Structured Cabling Systems (SCS) wiring is defined as all required equipment, cabling, hardware, termination blocks, termination patch panels, jacks and data cable installed and configured to provide computer data and voice connectivity from each data or voice outlet to the network file server or voice network/switch designated as the service point or demarcation point. The Structured Cabling System herein shall be referred to as SCS.

B. PURPOSE

1. The purpose of this document is to define the materials, methods and standards to be used for the SCS installation at the owner facilities. The intent is to provide a flexible and reliable infrastructure for the transmission of voice, data and video with maximum investment protection. The materials selected shall adhere to the ANSI/TIA-58-C series Standard (or current revision) Specifications. The methods called for in this document are to insure the owner of the highest level of workmanship and adherence to accepted industry practices. There shall be no deviation from this specification without prior written approval.

C. SCOPE

1. The tasks shall include the furnishing of all equipment, accessories, labor, and materials necessary for the installation of a complete and functional turn-key structured cabling distribution system. Any material or equipment necessary for the proper operation of the cabling system not specified or described herein shall be called to the attention of the owner prior to submitting the proposal. The cabling infrastructure design shall be based on the Panduit structured cabling system, its warranty, components and application guides.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
3. Cabling administration drawings and printouts.
4. Wiring diagrams to show typical wiring schematics, including the following:

    a. Cross-connects.
    b. Patch panels.
    c. Patch cords.

5. Cross-connects and patch panels. Detail mounting assemblies and show elevations and physical relationship between the installed components.
6. Cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements. Include the following:

    a. Vertical and horizontal offsets and transitions.
    b. Clearances for access above and to side of cable trays.
    c. Vertical elevation of cable trays above the floor or bottom of ceiling structure.
    d. Load calculations to show dead and live loads as not exceeding manufacturer's rating for tray and its support elements.

C. Samples: For workstation outlets, jacks, jack assemblies, in specified finish, one for each size and outlet configuration and faceplates for color selection and evaluation of technical features.

D. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.

E. Source quality-control reports.

F. Field quality-control reports.

G. Maintenance Data: For splices and connectors to include in maintenance manuals.

H. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test optical fiber cables to determine the continuity of the strand end to end. Use optical fiber flashlight.

2. Test optical fiber cables while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector; including the loss value of each. Retain test data and include the record in maintenance data.

3. Test each pair of UTP cable for open and short circuits.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.6 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

B. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area.

1.7 INSTALLATION & WORKMANSHIP

A. The installation and workmanship shall be in accordance with BICSI Methods Manual and Panduit structured cabling systems Guidelines. The SCS, and all supporting equipment and processes shall be in compliance with the requirements of state and local laws, codes, and ordinances. No claims shall be accepted for changes required to comply with codes, ordinances, and regulations in effect on date of proposal. It shall be the responsibility of each bidder to become familiar with all requirements before submitting their respective proposal.

1.8 REQUIRED MATERIAL

A. The quantities stated on any supplied drawings and specifications are estimated or approximations only, and any errors or variations therein shall not affect the obligations of the successful Supplier to complete the work herein contemplated, nor shall errors or variations be made the basis for any claim by the successful Supplier for adjustment to the unit prices. Any necessary changes to the lump sum price will be calculated using the unit prices supplied in the response to this RFP. Supplier shall be responsible for calculating all cable lengths and material quantities. All material necessary to perform the accompanying task shall be purchased through an authorized distributor, or the owner approved source.

1.9 BUILDING PERMITS

A. All permits and/or certificates, as required by Federal, State and Local Ordinances, shall be secured and paid for by the Supplier and made available for inspection by the owner.

1.10 MATERIAL GUARANTEE

A. The wiring Supplier shall guarantee at the time of the bid that all Category for new installations cabling and components meet or exceed specifications (including installation) of ANSI/TIA-58-

C series Standard (or current revision) and ANSI/TIA-59-C (or current revision). Vendor shall certify that all correct parts are ordered and installed. Supplier shall submit complete parts list with part numbers prior to installation of equipment.

1.11 BIDDER QUALIFICATION

A. Bidder must have current Panduit Certification. Bidder must submit a minimum of, three references of projects equal or greater in size. Bidder must be Panduit certified and may use subcontract personnel. Bidder shall submit a proposed maintenance agreement for moves, adds & changes after completion of project.

1.12 WARRANTY

A. Bidder shall-provide Panduit Extended Product Warranty and System Assurance Warranty for this wiring system. The Extended Product Warranty and the System Assurance shall cover the replacement or repair of defective product(s) and labor for the replacement or repair of such defective product(s).

1.13 SYSTEM ASSURANCE

A. Upon successful completion of the installation and subsequent inspection, the customer shall be provided with a numbered certificate, from the manufacturing company, registering the installation such as Panduit certification Plus System Assurance Warranty.

1.14 FACILITY UPGRADE

A. The requirements specified herein shall be followed for upgrading the owner owned buildings and rented facilities. The owner shall implement a “Structured Cabling System”, for the purpose of integrating all the voice, data, and video signals onto a common distribution platform. The purpose of this RFP is to invite prospective contractors to bid on the installation of the SCS.

1.15 BUILDING CONFIGURATION REQUIREMENTS

A. The requirements specified herein shall apply equally to the configuration of existing buildings and new construction. Existing buildings may be rented facilities or buildings currently owned by the owner scheduled for upgrade. The buildings referenced herein shall be referred to as the Facility.

1.1 REGULATORY AND STANDARD REFERENCES

A. All work and materials shall conform to the rules and requirements of the National Fire Protection Association (NFPA) National Electrical Code (NEC), local codes and ordinances, and the manufacturers’ standards.

B. The cabling system shall exceed the performance specified by the applicable published standards and, be installed and tested in accordance with the latest edition of the following applicable standards, including all addenda:

1. Common Standards:
    a. ANSI/TIA-58-C.0, Generic telecommunications cabling for customer premises.

b. ANSI/TIA-59-C, Telecommunications pathways and spaces.
c. ANSI/TIA-0-B, Administration standard for telecommunications infrastructure.
d. ANSI/TIA-07-B, Generic telecommunications bonding and grounding (earthing) for customer premises.
e. ANSI/TIA-758-B, Customer-owned outside plant telecommunications infrastructure standard.
f. ANSI/TIA-82-A, Building automation systems cabling standard.

2. Component standards:
   a. ANSI/TIA-58-C.2, Balanced twisted-pair telecommunications cabling and components standard.
   b. ANSI/TIA-58-C.3, Optical fiber cabling components standard.
   c. ANSI/TIA-58-C.4, Broadband coaxial cabling and components standard.
   d. Premises standards
   e. ANSI/TIA-58-C.1, Commercial building telecommunications cabling standard.
   f. ANSI/TIA-570-B, Residential telecommunications infrastructure standard.
   g. ANSI/TIA-942-A, Telecommunication infrastructure standard for data centers
   h. ANSI/TIA-1005-A, Telecommunications infrastructure standard for industrial premises.
   i. ANSI/TIA-1179, Healthcare facility telecommunications infrastructure standard.
3. Manufacturer:
   a. Manufacturers' installation manuals, guidelines, and bulletins.
4. Codes:
   a. State and local laws, codes, regulations, and ordinances.
   b. All documents listed are believed to be the most current releases of the documents. It is the responsibilities of the parties involved to determine and adhere to the most recent version and have all addenda when developing the proposal for installation.
   c. If this document and any of the documents listed above are in conflict, then the more stringent requirements apply. These documents do not replace any codes, either partially or wholly. Parties involved must be aware of and adhere to any applicable local codes.

PART 2 - SYSTEM REQUIREMENTS

A. The Purpose of this section is to define the system requirements and technical approach necessary to install a turn-key Structured Cable System (SCS).

2.1 SYSTEM DESCRIPTION

A. The Structured Cabling System (SCS) shall be used to provide our end user clients the highest level of resource availability to support mission critical applications. The need to quickly add new users to the network and provide enhanced performance for existing users, has led the Network Services Department to develop the set of standards presented herein. The SCS includes the following functional subsystem configurations:

1. Equipment Subsystem
2. Campus Backbone Subsystem

3. Backbone Subsystem
4. Administrative Subsystem
5. Work Area Subsystem
6. Horizontal Subsystem

B. The Structured Cabling System (SCS) shall be installed utilizing all hardware cabling and accessories necessary to ensure the completion of the turn-key facility. The SCS shall serve as a vehicle for transport of data, video and voice telephony signals throughout the network from designated demarcation points to outlets located at various desk, workstation and other locations as indicated on attached drawings and described herein

2.2 CAMPUS BACKBONE SUBSYSTEM

A. The subsystem shall include the backbone transmission media, associated connecting hardware and the proper termination devices. Electrical protection devices shall be employed to ensure the integrity of the transmission media. These primary and secondary devices shall protect against lightning and/or high voltage power surges that may pass through the building's transmission media.

2.3 WORK AREA SUBSYSTEM

A. The work area subsystem provides the media connection between the MDF/IDF, through the use of the Telecommunications Outlet (TO) located on the wall as appropriate. This includes cords, adapters and other specialized cabling required to connect the user community with the building backbone system. Each Workstation shall be assigned one voice and one data termination.

2.4 TELEPHONE COMPANY CONNECTIVITY

A. Wiring utilized for telephone company central office voice and data communications shall originate at owner provided demarcation points. The demarcation point may consist of wall mounted, vertical free standing, and/or enclosed vertical equipment racks located in the Telecommunications Room. The Main Cross-connect (MC) shall provide data, voice, video, and imaging to each IDF through the Backbone Subsystem. The wall mounted boxes, racks and cabinets must be sufficient to support the current requirements, while providing adequate capacity for new equipment and a minimum future expansion of 30%. All equipment racks shall be bolted securely, to the floor or wall or respective Telecommunications Room by the Supplier.

2.5 VOICE BACKBONE CABLE REQUIREMENTS

A. Copper cable shall be balanced twisted pair cable rated for plenum, non-plenum and/or outside plant, (as required). All cables shall be run, through conduit, under the raised floor, from the Main Cross Connect (MC) located in the Equipment Room, to each respective IDF. Separate cables shall be pulled from the MC to the IDF on each floor. Pull cabling to the upper floors and ceiling sleeves located in each Telecommunications closet. User voice distribution shall be done from the appropriate TR in accordance with the Administrative Subsystem for voice. Cabling shall be in accordance with the SCS Backbone Subsystem, for voice, video and imaging. The Supplier shall be responsibility for calculating all hardware and cabling requirements. The Supplier is responsible for terminating and testing voice connections on 110 terminal blocks.

2. TELECOMMUNICATION ROOMS – VOICE

A. Each Telecommunications Room shall provide sufficient voice, video and imaging connections to serve users assigned to that respective Telecommunications Room. Switching and connections shall be provided to serve the maximum users assigned to each Telecommunication Room and allow for 30% minimum, new equipment and user expansion.

B. All new Blue voice Category cables shall be terminated on a patch panel in the Telecommunications Room (TR).

C. Voice, video and imaging cabling to the Telecommunication Outlets (TO) shall be in compliance with the SCS Horizontal Subsystem. User connection and monitoring shall be in compliance with the SCS administrative subsystem.

D. The Supplier is responsible for securely fastening the terminal blocks and associated cabinets to the wall or floor as appropriate. Equipment used for voice communication shall be installed in vertical free standing racks or enclosed cabinets. Wiring from these cabinets shall be terminated on the appropriate voice-wiring block located on the wall of the Telecommunications Room. Equipment racks or cabinets shall be securely bolted to the raised floor in the Telecommunications Rooms by the Supplier. The Supplier is responsible for calculating all material requirements. The Supplier is responsible for making all connections between the user and the Telecommunication Room terminations and all necessary cross connections. Each individual connection shall be inspected and tested.

2.7 NETWORK AND SERVER CONNECTIVITY

A. Servers, Switches and the data demarcation point shall originate from the Equipment Room. Cabling utilized for data communications shall originate at owner provided switches mounted in vertical free standing racks, and/or enclosed vertical equipment racks located in the Equipment Room or the appropriate Telecommunications Room. File servers, routers, switches and other data equipment shall be connected to the network infrastructure utilizing the appropriate Category patch panel or fiber optic panels to the Fiber Optic or copper infrastructure as appropriate. Where needed and approved by the owner, media converters shall be used to interface between fiber optic and copper cables. Equipment racks and cabinets for Servers, and patch panels shall be securely fastened to the raised floor by the Supplier. The Supplier is responsible for terminating and testing fiber connections on the fiber patch panel (LC connector) and copper connection on the Category patch panels.

2.8 DATA BACKBONE / INFRASTRUCTURE REQUIREMENTS

A. Fiber Optic cable shall be used as the data backbone. Fiber optic cable shall be laser-optimized multimode 50/125 microns rated for plenum, non-plenum, inside and/or outside plant (as required). All fiber cables shall be run in drop ceilings, or in overhead pathways from the Main Cross Connect (MC) located in the Equipment Room to each appropriate Telecommunications Rooms through innerduct in 4” conduits. When conduit is needed, a maximum 3 cables and innerduct per 4” conduit. Separate cables shall be pulled from the MC to the appropriate TRs. All Fiber shall be installed in innerduct. Fiber connections to the MC shall be terminated in the appropriately sized patch panel. Fiber shall be terminated on appropriate shelf for connector type shelves in each Telecommunications room. User data distribution shall be done from the appropriate TR. Cabling shall be in accordance with the SCS Backbone Subsystem, for data.

2.9 TELECOMMUNICATION ROOMS – DATA

A. Each Telecommunications Room shall provide sufficient data connections to serve users assigned to that respective Telecommunications Room. Adequate patch panels shall be provided to serve the maximum users assigned to each Telecommunication Room and allow for new equipment and user expansion. Wiring utilized for Data communication shall originate at vendor provided vertical freestanding racks. In addition, provide capability for new equipment and expandability. Data cabling to work site outlets (jacks) shall be in compliance with the SCS Horizontal Subsystem for data distribution. User connection and monitoring shall be in compliance with the SCS administrative subsystem. Equipment racks and cabinets required for data equipment and patch panels shall be securely fastened to the raised floor by the cable vendor. All Yellow data Category , cables shall be terminated on rack mounted 48 port Category patch panels in the Telecommunications Room (TR) for new installs or complete re-wire.

B. The cable vendor is responsible for terminating and testing fiber connections on the fiber patch panel (LC connector).

2.10 HARDWARE REQUIREMENTS

A. All hardware and equipment shall meet the minimum requirements as specified herein. Hardware shall include, but not limited to, the furnishing of all equipment, accessories, labor, and materials necessary for the installation of a complete and functional turn-key structured cabling distribution system. Any material or equipment necessary for the proper operation of the cabling system not specified or described herein shall be called to the attention of the owner prior to submitting the proposal. The cabling infrastructure design shall be based on the Panduit structured cabling system, its warranty, components and application guides. The quantities stated on any supplied drawings and specifications are estimated or approximations only, and any errors or variations therein shall not affect the obligations of the bidder. Each bidder shall be responsible for calculating all cable lengths and material requirements. All material necessary to perform the accompanying task shall be purchased through an authorized distributor.

2.11 CABLE PATHWAYS

A. All data and voice cables shall be run within raceway, conduit, cable tray or other designated cable delivery system provided whether concealed in walls or exposed above ceilings in plenum spaces. Conduits and sleeves between manholes, buildings, Equipment Room and Telecommunications Rooms shall be supplied and installed by the owner.

2.12 COPPER CABLE

A. Copper cable shall be Category , unshielded twisted pair (UTP) rated for plenum, or non-plenum, inside and/or outside plant, (as required), installation that is extended from the network file server location and voice server to the data and voice outlets located at end user points (work area). All cables shall be specified in accordance with their application requirements. All copper cables shall meet clause 3.4 of this document. Cable colors: blue

B. In new Equipment Room installation, pre-terminated copper Category cabling solution may be used to connect equipment from one rack to the other.

1. Approved Manufacturer: Panduit, General Cable, Superior Essex

2.13 TELECOMMUNICATIONS OUTLETS

Duplex Modular Surface Mounted Boxes

Figure 1 Voice & Data Outlet Detail

One (1) for voice, color Blue

Two (2) for Data, color Blue

2.14 VOICE OUTLETS

A. One (1) Category , 4 pair cables for voice shall be installed, with appropriate box and connectors, to each location from their respective Telecommunications Room (TR). All Category voice cables shall have 2 feet of slack at the outlet to facilitate proper placement of the outlet. In the Telecommunications Room, all cables shall be terminated on a patch panel for new installation.

1. Approved Manufacturer: Panduit NetKey

2.15 DATA OUTLETS

A. Two (2) Category , 4 pair cables for Data shall be installed, with appropriate box and connectors, to each location from their respective Telecommunications Room (TR). All Category Data cables shall have 2 feet of slack at the outlet to facilitate proper placement of the outlet. In the Telecommunications Room, all cables shall be terminated on a patch panel for new installation.

1. Approved Manufacturer: Panduit NetKey

2.1 STAIRWAYS AND ELEVATORS

A. Voice outlets are required in each elevator, and on each floor of every stairwell. See Grounding and Bonding specification document.

2.17 FIBER CABLE

A. Fiber optic cable shall be a laser-optimized 50/125 microns Multimode and/or 8.3/125 microns Singlemode (as required) rated for plenum, non-plenum, inside and/or outside plant (as required).

2.18 FIBER USAGE

A. Multimode and/or single-mode fiber optic cabling shall be provided between facilities and furnished with the quantity of fibers as designated on the contract drawings and/or as specified below. All fiber optic cables installed in the campus, backbone and horizontal will be installed in innerduct to the fiber breakout point. All fiber optic jumpers and patch cords shall be protected as much as practical by fiber protection duct and spiral wrap. Plastic tie wraps shall not be used to tie in fiber optic jumpers and patch cords. All fiber optic cables shall be connectorized using LC connectors for new installation as specified herein.

B. All fiber optic cables in the Telecommunications Rooms (TR) shall be terminated in appropriate shelf for connector type shelves. The shelves shall be installed in 19" x 7' frames.

C. All fiber optic cables in the Main Cross-Connect (MC) and Intermediate Cross-Connect (IC) shall be terminated in appropriate housing hardware. It shall be the responsibility of the cable vendor to securely fasten all cabinet and racks to the raised flooring.

2.19 TELECOMMUNICATION BONDING AND GROUNDING

A. Telecommunication bonding and grounding shall be in accordance with the NEC and NFPA. In the case where Horizontal cables are shielded, they shall be grounded in compliance with ANSI/NFPA 70, ANSI/TIA-07-B and local requirements and practices. Horizontal equipment includes cross connect frames, patch panels and racks, active Telecommunication equipment and test apparatus and equipment. When required by local code, provide a Telecommunications Bonding Backbone utilizing a #-AWG or larger bonding conductor that provides direct bonding between equipment rooms and Telecommunications Rooms. This is part of the grounding and bonding infrastructure (part of the Telecommunications pathways and spaces in the building structure) and is independent of equipment or cable.

2.20 TESTING OF WIRING ACCURACY

A. During the installation process all cables must be tested for accuracy and performance, and results documented.

2.21 COPPER

A. CABLING TESTING REQUIREMENT

All copper cabling testing shall be performed between modular jacks at the outlets in the work area and the TR horizontal terminations or in the case of backbone, between the TR termination and the Equipment Room termination. Testing should be done according to ANSI/TIA-58-C.2 for Category using an appropriate Level testing instrument, to verify both the integrity of all conductors and correctness of the termination sequence.

B. DOCUMENTATION

Documentation of cable testing shall be required, and the engineer shall be present during all tests. The SCS contractor shall provide a table of test results in a 3-ring binder submitted with the as-built drawings. The table shall include:

1. All copper, voice, data, and backbone terminated cables tested.
2. MHz sweep tests, continuity, Near End Cross Talk, and attenuation and the installed length for all Data/Voice horizontal cables and backbone cables.
3. The table shall indicate all defective pairs and test results of all pairs listed above. Cables not complying with ANSI/TIA-58-C.2 (or current revision) for Category or Category 5e (for legacy cabling installation), shall be identified to the Project Manager for corrective action which may include replacement at no additional expense to the Owner.

2.22 FIBER OPTIC CABLE

A. CABLING TESTING REQUIREMENT

Each strand in fiber optic cables shall be tested for correctness of termination, polarity and overall transmission loss using an approved fiber optic Optical Loss Test Set (OLTS). The system loss measurements shall be provided at 850 and 1300 nanometers wavelengths for multimode fibers and, 1310 and 1550 nanometers wavelengths for single-mode fibers.

B. DOCUMENTATION

A certification report shall be provided listing both the calculated acceptable loss for each fiber link evaluated and the test results of the measured loss for each installed fiber link. The report shall be submitted with the test results as called for above within 2 week of completion of job.

2.23 INSPECTION

A. The owner shall perform on-going inspections during construction. All work shall be performed in a high-quality craftsman manner and the overall appearance shall be clean, neat and orderly. The inspection will be to insure compliance with Panduit guidelines as well as BICSI Methods Manuals and ANSI/TIA-58-C series Standard (or current revision).

PART 3 - DETAIL MATERIAL SPECIFICATIONS

A. The purpose of this section is to provide technical specifications for products that have been used within Prince George schools Facilities. Products listed within this section are for reference purposes, and do not constitute approval. Request for products not included in the preferred product list, shall be submitted in writing to prior to the bid, and, approved by the owner prior to contract award.

3.1 EQUIVALENT PRODUCTS

A. Equivalent product(s) may be considered for substitution for those products specified, however, the equivalent product(s) must be approved and show demonstrated and documented equivalence to the product(s) specified. Equivalent products shall meet all requirements of the SCS warranty as specified in this document and as per the manufacturer of choice mentioned in this document.

B. Substitute Products shall not be used on a new construction bid. No product shall be used that conflicts with or would impair, obtaining the System Warranty. Documentation shall include, but is not limited to: product samples, data sheets, and actual test data. The request for product substitution, and supporting documentation, must be submitted, in writing, prior to submitting the bid. Written approval for product substitution must be received from the owner prior to the bid submission.

3.2 OUTLETS

A. Each duplex surface mount box shall have two (2) information outlet; One (1) for voice and One (1) for data utilizing T58B wiring.

B. In the Telecommunications Room all Category cables shall be terminated on rack mounted Category patch panels.

1. Approved Manufacturer: Panduit NetKey

3.3 FACEPLATES

A. Faceplates shall be provided to cover all voice or data outlets required during installation of the SCS. All Faceplates shall be available in single, duplex, triplex, quadplex , or sixplex arrangement in a single gang configuration specified in the contractual requirements. Special consideration and configuration will be given for “Teacher Outlets” on a room by room basis.

1. Approved Manufacturer: Panduit NetKey

3.4 SURFACE RACEWAYS (TO INDIVIDUAL WORK LOCATIONS)

A. Telecommunication outlets that require surface mounting shall be mounted in non-metallic backboxes with surface raceways. Surface raceways may be omitted where access into existing walls is available. Backboxes shall be mounted at power receptacle height. Raceways shall be secured every 1 inches with screws and wall anchors. Best commercial practices shall be used. Molly bolts or plastic anchors shall not be used for mounting any retaining any hardware or cables.

3.5 SYSTEM CHANNEL

A. CATEGORY CHANNEL

1. All balanced twisted pair cable and apparatus shall conform to the Category component specifications and the installed channels shall comply with the Category Channel Performance Specification as per ANSI/TIA-58-C.2 (or current version).
2. The balanced twisted pair cable and apparatus channel performance shall be guaranteed up to the maximum 100 meters (328 feet) length including up to connection points.
3. The Category channel shall consist of all cable and components that comprise the full 100 meter (328 feet) length circuit from the Hub/Server/LAN Electronics port located in the Telecommunications Room or the main data administration location to the voice/data/video/imaging device port located at the User Work Station.
4. The Category cable and components shall be manufactured by a single manufacturer. The manufacturer shall warrant the Category channel and applications for a period of 20 years.
5. The 20 year warranty shall be a transferable warranty and include all labor to replace any defective components as well as the component replacement.
6. The Category cable shall be a 23 AWG unshielded balanced twisted-pair cable.
7. The Delay Skew on the 100 meter channel shall not exceed 30 ns.
8. The Category cable and components shall be electrically backward compatible with existing Category 3 and 5e.
9. The Category components shall be engineered and manufactured to compensate for any compliant Category 3 or 5e component crosstalk and shall provide at least Category 3or 5e performance in all of the customer's existing installed base of voice/data/video, based on the lowest category of component in the channel.
10. The Category cable and components shall be physically compatible with existing installed base of equipment.
11. The Category cable and components shall not require special cords, specialty tools or special installation requirements.
12. The guaranteed channel performance specifications of the Category Channel with cable, cords, outlets and four (4) connections as compared to standard Category shall apply to worst-case 100-meter channels using 4-pair Category horizontal cable and shall meet:

Electrical Parameter (1 – 250MHz)	Guaranteed Margins to Category 4-connection Channel Specifications
Insertion Loss	5.0 %
NEXT	.0 dB
PSNEXT	7.5 dB
ELFEXT	.0 dB
PSELFEXT	8.0 dB
Return Loss)	4.0 dB

Table 1: Category 4-connection Channel Performance

13. The guaranteed channel performance specifications of the Category Channel with cable, cords, outlets and six () connections as compared to standard Category shall apply to worst-case 100-meter channels using 4-pair Category horizontal cable and shall meet:

Electrical Parameter (1 – 250MHz)	Guaranteed Margins to Category -connection Channel Specifications
Insertion Loss	4.0 %
NEXT	4.0 dB
PSNEXT	5.5 dB
ELFEXT	4.0 dB
PSELFEXT	.0 dB
Return Loss)	2.0 dB

Table 2: Category -connection Channel Performance

14. Approved Manufacturer: Panduit, Superior Essex, General Cable, Corning

3.7 CATEGORY , 4 PAIR HORIZONTAL CABLE

A. The horizontal cable shall be Category . These cables are recommended for use between work area and Telecommunications Room/IDF's.

B. All 4 pair, Plenum and Non-plenum Category cables, when in a channel, shall meet the requirement of clause 3.3 of this document.

1. Approved Manufacturer: Panduit, Superior Essex, General Cable, Corning

3.9 FIBER OPTIC CABLING

A. Fiber optic cabling shall be provided between facilities or backbone and furnished with the quantity of fibers as designated on the contract drawings.

B. All fiber in a cable run shall be from the same manufacturer and shall be the same type. A mix of fibers from different manufacturers may not be used without written permission.

3.10 FIBER SPECIFICATION

A. MULTIMODE FIBER SPECIFICATION

1. The multimode fiber shall be a laser-optimized 50µm Cable and shall support 10 Gb/s over a distance of 550 m.
   a. The cable shall support current and next-generation LAN, SAN, and WAN applications via laser-optimized 50/125-µm optical fibers.
   b. The cable shall extend the distance of low-cost 850-nm VCSEL-based electronics, supporting 1100 m at 1 Gb/s and 550 m at 10 Gb/s.
   c. The application suite shall include Ethernet from 10 Mb/s to 10 Gb/s, Fiber Channel from 1 Gb/s to 10 Gb/s, and ATM/SONET/SDH from OC-1 to OC-192.
   d. The cable shall support migration to 40 Gb/s and 100 Gb/s over low-cost 850-nm VCSEL-based electronics
   e. All fibers shall be Differential Mode Delay (DMD) tested using a high-resolution test bench that exceeds the FOTP-220 standards and is independently certified by UL®.
   f. The cables shall be designed for point-to-point applications as well as mid-span access, and shall provide a high-level of protection for fiber installed in the building environment or outside plant environment.
   g. The fiber cable shall meet the following physical characteristics:

Core Diameter:	50.0 ± 2.5 µm
Cladding Diameter:	125.0 ± 1.0 µm
Core/Clad Offset:	≤ 1.5 µm
Coating Diameter (Uncolored):	245 ± 10 µm
Coating Diameter (Colored):	254 ± 7 µm
Coating/Cladding Concentricity Error, max:	µm
Clad Non-Circularity:	≤ 1%

   h. The fiber cable shall meet the following mechanical characteristics:

Proof Test:	100 kpsi (0.9 Gpa)
Coating Strip Force:	0.3 - 2.0 lbf (1.3 - 8.9 N)
Dynamic Fatigue Parameter (nd):	≥ 18
Macrobending, max.:	0.50 dB

   i. The fiber cable shall meet the following optical characteristics:

Numerical Aperature: 0	0.200 ± 0.015
Point Defects, Max.:	0.15 dB
Zero Dispersion Wavelength:	1297-131 nm
Zero Dispersion Slope:	0.105 ps/[km-nm-nm]

j. The fiber cable shall meet the following Environmental characteristics:

Temperature Dependence	≤ 0.10 dB -7°F to 185°F (-0°C to 85°C)
Temperature Humidity Cycling	≤ 0.10 dB 14°F to 185°F (-10°C to 85°C) up to 95% RH
Water Immersion, 73.4°F (23°C)	≤ 0.20 dB
Heat Aging, 185°F (85°C)	≤ 0.20 dB

k. Approved Manufacturer: Panduit, Superior Essex, General Cable, Corning

3.11 BACKBONE FIBER

A. The backbone fiber shall meet the requirement of clause 3..1 of this document. A 12- strand fiber optic cable shall be installed from the Main Cross-Connect (MC) located in the Equipment Room, to each Telecommunications Room (TR). There shall be TR's/IDF's on every floor as per ANSI/TIA-59-C.

1. The cables shall be installed in customer provided conduits and sleeves.
2. The contractor shall provide all required innerduct or armored cable.
3. All lengths to be determined by contractor.

3.14 FIBER SPLICING AND CLOSURES

A. The Fiber splice module shall meet the following specifications.

1. Fiber cables shall be fusion spliced using a fusion splicer.
2. Splices shall be stored in a spliced tray compatible with the enclosure.
3. Fusion shall meet the performance as per ANSI/TIA-58-C.3

B. Splice Closure for outside plant cable installation shall meet the following specifications.

C. The fiber splice closure shall seal, bond, anchor and protect fiber optic cable splices. The splice closure shall be a stand-alone closure that does not require an outer closure. The splice closure shall provide for a maximum of six () cable entries in a butt-end configuration. The splice closure shall be used in aerial, underground and direct buried applications.

1. Approved Manufacturer: Panduit

3.15 CAMPUS OUTSIDE PLANT COPPER

A. All voice grade cable placed in the outside environment shall be solid, Category 3, 24 gauge, twisted pair, and multi-conductor. The copper twisted pairs shall have a mutual capacitance at 1kHz of 15.7 nF/1,000 ft. The cable shall be resistant to mechanical damage, lightning or damage from wildlife.

B. The aerial air core cable shall be a self-supporting or lashed cable consisting of plastic insulated solid conductors covered by a plastic core wrap and surrounded by an inner polyethylene jacket, a corrugated aluminum shield, a corrugated steel wrap and a bonded polyethylene jacket (PASP).

C. The buried or underground cable shall have an aluminum steel polyethylene (ASP) sheath and a core of solid-copper conductors, dual insulated with foam skin and plastic, surrounded by FLEXGEL III filling compound.

D. The multi-pair copper cables shall meet the following specifications:
   1. Gauge: 24-AWG
   2. Pair Size: 25 to 1800 Pair
   3. Manufactured by a ISO 9001 Certified Manufacturer

3.1 COPPER CABLE PROTECTIVE PANELS AND MODULES

A. All outside plant copper circuits shall be provided with protection between each building with entrance cable protector panels. All building-to-building circuits shall be routed through this protector. The protector shall be connected with a # AWG copper bonding conductor between the protector ground lug and the building ground point. Each protector panel shall be provided with plug-in protector modules for each pair terminated on the chassis. Adequate protection modules shall be provided to terminate all cable pairs.

B. Supplier shall, based upon the Companies needs and installed equipment, determine the most appropriate types of protector panel and protector units from the approved product list.

PART 4 - COPPER INSIDE PLANT

4.1 COPPER 25 PAIR CATEGORY 5E, VERTICAL BACKBONE CABLES

A. A 25 pair, Category 5e, 24 AWG copper cable shall be installed from the Main Cross-Connect (MC) located in the Equipment Room to each Telecommunications Rooms (TR). The cables shall be installed in customer provided conduits and/or sleeves. All lengths to be determined by contractor.

B. All 25 pair, Category 5e, backbone cables shall be terminated on Category 5e, patch panel in both the Telecommunications Room (TR) and the Main Cross-Connect (MC). Each 25 pair cable shall utilize only 2 pairs per port. For instance, each 25 pair Category 5e, cable shall be used for 12 ports on the patch panels.

C. All 25 pair, Category 5e cables shall meet and exceed the specifications of ANSI/TIA-58-C.2 (or current version).
   1. Approved Manufacturer: Panduit, Superior Essex, General Cable, Corning

PART 5 - COPPER TERMINATION HARDWARE

5.1 CATEGORY MODULAR PATCH PANELS

A. The Category modular jack panels shall meet or exceed the Category standards requirements per ANSI/TIA-58-C.2 (or current version) and shall be UL Listed.

   1. The modular jack panel shall utilize universal A/B wiring.
   2. The jack panels shall be either wall or 19-inch rack mountable.
   3. Patch panels for Category shall be intelligent ready with up-grade without incurring loss of connectivity.
   4. Patch panels for Category may offer pre-terminated Category cables in bundles of four (4) jack-cassettes if the owner's needs require it.
      a. Approved Manufacturer: Panduit Netkey

5.3 CATEGORY MODULAR PATCH CORDS

A. All patch cords shall exceed the requirements per ANSI/TIA-58-C.2 (or current version).
B. All patch cords shall be backward compatible with all Category cabling systems.
C. The patch cords shall incorporate an anti-snag feature that provides maximum protection from snagging during moves and re-arrangements.
D. Patch cords shall be ETL/cETL listed.
E. Patch cords shall support network line speeds up to 10 Gb/s
F. Category patch cords shall be available in stranded or solid conductor in lengths to 100 feet.
    1. Approved Manufacturer: Panduit NetKey

PART - FIBER TERMINATION HARDWARE

.1 FIBER PATCH PANEL

A. The patch panel will be utilized to terminate the inside plant optical fiber in the Main Cross-Connect (MC), in the Telecommunications Rooms (TR/IDF) as appropriate and/or to terminate the outside plant optical fiber to the inside plant optical fiber in the Main Cross-Connect (MC).

    1. The patch panel shall support single-mode and/or multimode terminations, inside and outside plant cabling.
    2. The patch panel shall provide cross-connect, inter-connect, splicing capabilities and contain the proper troughs for supporting and routing the fiber cables/jumpers.
    3. The patch panel shall consist of a modular enclosure with retainer rings in the slack storage section to limit the bending radius of fibers.
    4. The patch panel shall provide terminating capacity for all fibers specified in the Backbone.
    5. The patch panel shall be mountable in a 19 inches rack
    6. The patch panel shall have a front face "window" door with a push/push-style latch for safe access.
    7. Patch panels shall offer feasibility to support the migration to higher data rate application.
    8. Patch panel shall offer diversity by supporting field-terminated fiber solution and pre-terminated fiber solutions
    9. Patch panel shall support high density number of termination.
    10. Patch panels shall offer the option to be intelligent ready with up-grade without incurring loss of connectivity.
    11. All quantities shall be calculated by contractor.
        a. Approved Manufacturer: Panduit Netkey or Corning

PART 7 - FIBER PATCH CORDS

7.1 LC-TO-LC PATCH CORDS

A. The fiber optic patch cord shall be constructed with the same fiber type as the fiber cable it is connected to.
B. The fiber-optic patch cord shall be configurable with standard LC, terminations, and shall be available in either 1. mm or 3.0 mm duplex zipcord.

C. The 1. mm cordage shall exceed the requirements for larger diameter cordage and allows at least twice as many fibers to be installed in a cabinet.

D. The duplex cordage shall be 1. mm by 3.5 mm and have two single fiber cords joined together with a web.

E. The connector shall have a pull-proof design that helps prevent accidental disconnects and helps to assure optimal performance of equipment.

F. Custom hybrid patch cords shall also be available, to simplify migration to industry-leading connectors.

G. All multimode fibers shall be Differential Mode Delay (DMD) tested by using a high-resolution test bench that exceeds the FOTP-220 standards and shall be independently certified by UL®.

H. All multimode patch cords shall be a distinctive aqua color with beige connectors for positive identification

I. All single-mode patch cords shall be a distinctive yellow color with blue connectors for positive identification.

1. Approved Manufacturer: Panduit NetKey

PART 8 - FIBER OPTIC CONNECTORS

8.1 LC FIBER OPTIC FIELD-TERMINATED CONNECTORS:

A. LC POLISHED LC FIELD-TERMINATED CONNECTORS

1. The fiber optic connector shall be one half the size (double density) of conventional LC connectors.
2. The connector shall have an insertion release mechanism similar to the RJ-45 intuitive push/pull-style housing.
3. The connector shall be pull-proof to prevent momentary disconnect from axial loads
4. The connector shall have a pre-radius end-face for faster installation.
5. The connector shall be field-mountable with minimal polish
6. The connector shall be available to terminate multimode or single-mode fiber cables.
7. The connector shall be ANSI/TIA-58-C.3 (or current version) compliant
   a. Approved Manufacturer: Pauduit NetKey or Corning

B. LC NO-POLISHED/NO EPOXY FIELD-TERMINATED CONNECTOR

1. The fiber optic connector shall be a factory pre-polished, field installable LC connector.
2. The fiber optic connector shall be one half the size (double density) of conventional LC connectors.
3. The connector shall have an insertion release mechanism similar to the RJ-45 intuitive push/pull-style housing.
4. The connector shall have an innovative translucent wedge enabling the use of a common VFI to provide a “pass/fail” signal once physical contact is achieved.
5. The connector shall be available to terminate multimode or single-mode fiber cables.
6. The connector shall be ANSI/TIA-58-C.3 (or current version) compliant
7. The connector shall have the ability to be re-terminated and still achieved appropriated performance.
   a. Approved Manufacturer: Panduit NetKey or Corning

8.3 PRE-TERMINATED CASSETTES

A. PRE-TERMIATED MODULAR CARTRIDGES LC TO PIGTAIL

1. The modular cartridges shall offered to support multimode fiber or single-mode fiber.
    a. The modular cartridges shall be small, compact module design offer improved density
    b. The modular cartridges shall be offered with pre-terminated LC connectors with pigtails.
    c. The modular cartridges shall be factory terminated and tested cable and apparatus for instant field connections with guaranteed quality and performance
    d. The modular cartridges shall offer supports easy reconfiguration for moves, adds and changes
    e. The modular cartridges shall be intelligent ready with up-grade without incurring loss of connectivity when used in the appropriated patch panels
        1) Approved Manufacturer: Panduit NetKey or Corning

8.4 PRE-TERMINATED OPTICAL FIBER SOLUTION

A. Factory terminated optical fiber channel may be used in new installation where the possibility of migration to higher data rate are possible.

B. The pre-terminated solution shall meet the following:
    1. Be offered for both single-mode and multimode optical fiber system
    2. Use factory terminated and tested trunk cables for instant field connection through the use of a MPO connector.
    3. 12-fiber MPO connector-based modular design with aligned-key MPO adapters as per the TIA FOCIS 5 Standard.
    4. Use “Method B” to maintain polarity and easy field installation.
    5. Can be easily upgraded to a parallel transmission path for the support of high data rate application while preserving the initial investment.
    6. Can support up to 2304 fibers in 4 rack units (RU) using 8 MPO pass-thru panels.
        a. Approved Manufacturer: Panduit NetKey or Corning

8.5 UNSPECIFIED EQUIPMENT & MATERIAL

A. Any item of equipment or material not specifically addressed on the drawings or in this document and required to provide a complete and functional PDS installation shall be provided in a level of quality consistent with other specified items.

8. GROUNDING SYSTEM AND CONNECTIONS

A. The SCS Supplier shall provide a # AWG stranded copper wire cable between ground bars located at each TR and the building main service ground point. This ground conductor shall be utilized for equipment termination, equipment rack and computer equipment grounding.

8.7 BONDING AND GROUNDING

A. Communication bonding and grounding shall be in accordance with the NEC and NFPA. Horizontal cables shall be grounded in compliance with ANSI/NFPA 70 and local

requirements and practices. Horizontal equipment includes cross connect frames, patch panels and racks, active telecommunication equipment and test apparatus and equipment.

END OF SECTION 271500

SECTION 275123 – INTERCOMMUNICATION SPECIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to this Section.

1.2 SUMMARY

A. The Contractor shall provide all equipment including, but not limited to, outlet boxes, wiring, speakers, and all other necessary equipment to provide a complete operating system as indicated with the contract documents. Provide all necessary wall plates, specialty boxes, etc.

B. IP6000™ Communication System shall be considered as meeting all specifications and as the basis of design. The owner shall pre-approve alternate systems. Provide all information, including catalog cuts, shop and working drawings, data sheets and a demonstration of the proposed system features. This information shall be presented to the relative parties as to allow sufficient time to review all material. This shall be accomplished at least 10 (ten) days prior to the bid date. Under this specification, the system shall provide a complete Communication System for the entire facility including the outdoor recreational areas. The Communication System shall provide distribution of intercom, overhead paging, emergency paging, class change time tones, emergency tones, program material and on-board emergency messaging. The IP6000™ Communication System shall distribute intercom, overhead paging, emergency paging, class change time tones, emergency tones and program material over the speakers. The Contractor shall meet with the owner, or their delegated agent, and obtain programming criteria prior to programming the system. The system shall be tested in the presence of the owner, or their delegated agent, to completion in order to ensure compliance with the owner's operational criteria. The Contractor shall make required modifications to the system as required to satisfy the owner's requirements.

1.3 SUBMITTALS

A. Submit layout drawings of the communication system and all components.

B. Submit drawings of control equipment showing all major components and positions in the rack.

C. Provide block diagrams showing components and relative connections.

D. Submit a certificate showing a completion of installation, programming, and service training from the system manufacturer.

E. Submit data sheets on the equipment provided.

F. Submit shop drawings: Signed and sealed by a qualified professional engineer or an RCDD.

G. Submit equipment details. Detail equipment assemblies and indicate dimensions, weights, required clearances, method of field assembly, components, and location of each field connection.

H. Submit wiring diagrams

1. Signal, and control wiring

a. Single-line diagram showing interconnection of components.

b. Cabling diagram showing cable routing.

I. Submit coordination drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved.

1.4 INSTALLER QUALIFICATIONS

A. The equipment must be purchased and installed by a Valcom Factory Authorized Integrator with full warranty privileges.

B. The design shall be performed by a Valcom Factory Authorized Integrator.

C. The Valcom Factory Authorized Integrator must have installed a minimum of 3 (three) projects of this size and application or shall arrange for onsite factory assistance during system commissioning.

D. The Valcom Factory Authorized Integrator shall possess, or coordinate with entities that possess, technical knowledge of the network to which the IP6000 system will connect.

E. Full compliance with Valcom's latest published IP6000 network requirements and Best Practices is mandatory.

F. The contractor shall be from an established and local company providing solutions to similar facilities for a minimum of 3 (three) years.

G. The contractor shall maintain an adequate parts inventory to perform necessary service and upgrades.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: manufacturer's authorized representative must be trained and approved for installation of products required for this project.

1.6 COORDINATION

A. Coordinate layout and installation of ceiling-mounted speaker and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.7 MAINTENANCE

A. The contractor shall provide a 1 (one)-year guarantee of the installed system against defects in material and workmanship. All warranty material shall be provided at no expense to the Owner. Guarantee period shall begin on the date of acceptance by the owner or their delegated agent.

1.8 RESPONSIBILITIES

A. Contract documents are detailed only to the extent required to show design intent. It shall be understood and agreed upon by the Contractor that all work described herein shall be complete in every detail.

B. Furnish additional items not mentioned herein to meet requirements as specified without claim for additional payments. Items may include hardware, rack panels, 66 Blocks etc., and other devices that are required for installation.

C. Labor furnished shall be manufacturer trained and experienced in telecommunication and networked systems.

D. All equipment unless otherwise specified, shall be new, free from defects, and the best craftsmanship in its class.

E. Perform initial programming of system and audio level adjustments.

F. Perform final programming of system and audio level adjustments.

G. Provide system documentation including equipment manuals and drawings.

H. Guarantee all equipment and components for their specified period from date of acceptance.

I. Provide information on system requirements to any Contractor responsible for supplying related materials for this system.

1.9 COMMUNICATION SYSTEM

A. The Communication System shall provide at least the following functions and features

1. Designed, manufactured and supported in the United States of America.

2. Microprocessor based PoE system capable of handling unlimited end-points. An end-point is defined as a device with an IP address. The system IP speakers must be SIP compliant.

3. System shall be a VoIP system compatible with 45 ohm 2-way speakers, 25v 2-way speakers, self-amplified one-way speakers and VoIP speakers. The system should also have 1, 2 and 4 zone one-way gateways for common area announcements.

4. System shall interface with any SIP capable VoIP telephone system, analog telephone system, or single line telephone, thus allowing the facility(s) to upgrade or replace their telephone system without suffering a requirement to replace, or lose any feature of, their internal communications (intercom) system. Any system that limits system features based upon any selected telephone system, and/or is proprietary to one or only a few telephone systems shall not be acceptable.

5. System shall be capable of converting, recording and loading WAV files used for bells, announcements or music.

6. System shall be capable of initiating emergency notifications by internet browser from any designated location on the network.

7. System shall be capable of increasing volume by event. An event is defined as any WAV file or tone with a destination.

8. System shall be capable of downloading a graphic (site, building, etc.) and arranging icons on it to play emergency announcements, facility announcements and messages from any authorized person.

9. System shall automatically sound a tone over any loudspeaker connected for two-way communication to alert individuals at the speaker location a two-way call has been established. This is intended to prevent unauthorized monitoring. The privacy tone must repeat every 15 (fifteen) seconds.

10. System shall be capable of distribution of emergency or general announcement(s) from any authorized telephone to all areas furnished with a loudspeaker. Emergency announcements shall have the highest system priority.

11. Individual zones shall be software assignable to an unlimited number of audio groups.

12. Provide the ability to define and archive unlimited time tone schedules with unlimited events per schedule. Each scheduled event shall be capable of controlling any internal tone, user selected custom WAV files, audio from any auxiliary source or up to 40 relays for building control. Each scheduled audio event shall be distributable to any of the audio groups. The system shall feature the ability to automatically initiate unlimited schedules per day, based upon the day of the week or calendar dates up to one year in advance. The system shall feature the ability to operate 25 or more schedules simultaneously. Schedule administration, modification and creation functions must be available through an Internet browser. Systems that do not allow the facility to manage their own schedules with an Internet browser do not offer calendar based scheduling up to one year in advance or require separate page and time groups shall not be acceptable.

13. Provide 1 to 11 digits numbering plan.

14. Programmable features shall be stored in non-volatile memory and shall not be lost due to power failures.

15. System functionality must include the capability to manually activate an unlimited amount of chained events via browser based device, pushbuttons, contact closure, or dial code from any authorized telephone. These events shall be customizable with respect to volume levels, cadence, priority, type and duration. Browser access must password controlled.

16. The system must be capable of providing an unlimited number of connections to the telephone system via SIP or FXS Port integration from the intercom system. These ports shall provide built-in enhanced caller identification which will visually announce the name of the caller or location, the architectural number. Systems that require integration to a specific telephone system or systems in order to offer this feature, or any system feature, shall not be acceptable.

17. The system shall have the ability to control all system relays. Relays shall be controlled through the browser, DTMF controlled, automatically cycle at a programmed time of day, or follow time schedule events. All relays must be software programmable with the flexibility to change as required.

18. The system shall have the ability to store up to 25000 seconds of WAV files directly onto the Application Server and shall not be lost due to power outage.

    a. The WAV files shall be capable of being activated via any computer on the LAN/Wan, Telephone and/or Telephone system, and push buttons.

    b. The WAV files shall be programmable as to what level of priority they can be broadcast. They shall be programmable as to override any scheduled tones, normal all call, music, and intercom in the event of an emergency.

    c. The WAV files shall also have the ability to broadcast into any and all of the audio groups.

    d. The WAV files shall have the ability to be broadcast via a schedule for any day of the week or time of the day. They shall also have the ability to be broadcast for any duration of time and repeat number of plays with the ability to select how long the duration is between each repeated broadcast.

    e. The WAV files shall be able to be broadcast via a pushbutton. When this pushbutton is activated it shall be programmable to select which WAV file is broadcast, the priority level, where it is broadcast, and how many times it shall play.

    f. The WAV files shall also have the ability to be a part of the class change tones within the system. These files shall be able to replace any tone within the class change schedules as to offer the flexibility of customizable tones and or phrases in this class change mode.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. VALCOM, Inc. Roanoke VA USA

2.2 IP6000 COMMUNICATION SYSTEM

A. The Applications Server, Model VE6025:

1. When used in a IP6000 IP Facility Communications System shall provide scheduling, clock control, text to speech and on demand distribution of WAV formatted audio to simultaneous groups of speakers per event.

2. The server is Common Alert Protocol compliant (CAP). The server shall feature simple browser-based interface to facilitate easy manipulation of custom audio files for use as scheduled tones or emergency notification.

3. The server shall feature the ability to receive and act upon RSS, Atom, CAP feeds.

4. The server shall feature a high-quality text-to-speech engine for automatically announcing content from RSS, Atom, CAP feeds.

5. Schedules shall be capable of automated initiation based upon day of the week, calendar date up to one year in advance and shall feature manual control capability.

6. The 1U server shall utilize web browser access for setup of schedules, and real-time control. The server shall be capable of simultaneously operating multiple schedules, events per schedule and simultaneously occurring events.

7. The schedules shall feature one-second event resolution.

8. Events shall be capable of controlling paging, relays, and/or streaming audio.

9. The server shall allow cascading events from a single time trigger.

10. Schedules shall be presented to the user in a calendar view showing facility year and months with tabs for other options.

11. The server shall provide for default screen view after login and permissions per user.

12. The Application Server shall provide on demand access of pre-loaded audio files via web browser or contact closure.

13. The Applications Server shall provide for “Quick Page” on demand triggers for easy origination of unscheduled events and shall import and convert audio files from many .wav formats with both an option to enhance audio files during import and an option to record page audio to a file.

14. Events shall feature programmable pre/post page delays and volume control per event.

15. The server shall feature the ability to send text to groups of LED signs and computer screens.

16. The server shall communicate with VIP-102B setup tool for setup and dial code and group information.

17. Users shall have the ability to enter names for displaying dial codes, page groups, inputs, events, and schedules.

B. Shall seamlessly integrate to any VoIP/SIP or legacy phone system via SIP, FXO or Loop Start Trunk.

2.3 GATEWAYS AND ENDPOINTS

A. Contractor shall provide all required analog access talk paths in increments of 4 (four) ports.

1. FXS station port access shall be via Model # VE8014BR (four ports)

2. Enhanced Network Station Port Model VE8014BR will provide a single 10/100 Ethernet port and four FXS station ports. The Enhanced Network Station Port Model VE8014BR

will provide all circuitry and software to convert network data to audio output and analog telephone control signals. The Enhanced Network Station Port Model VE8014BR will provide all circuitry and software to convert input audio and analog telephone events to zone page audio and control information suitable for transmission to other IP6000 IP Solutions products. The Enhanced Network Station Model VE8014BR shall be powered from an 802.3af PoE Ethernet switch port.

B. Contractor shall provide all required Networked Page Zone Extenders at the MDF and each IDF. The purpose of this Networked Page Zone Extender is to provide streaming audio out to common area speakers (analog speakers). Connect the building's common area speakers to the Networked Page Zone Extender channels as required.

1. Lowe level audio connection shall be via Model #VE8004BR (four ports)

2. The Networked Page Zone Extenders shall provide a single 10/100 Ethernet port, audio input/output circuits and N.O. relay contact outputs. The unit shall be SIP compatible. The Networked Page Zone Extender shall provide all circuitry and software to convert network data to zone page audio output. The Networked Page Zone Extender shall also provide all circuitry and software to convert input audio to zone page audio and control information suitable for transmission to other IP6000 IP Solutions products over a data network. The Networked Page Zone Extender shall be powered via an 802.3af PoE Ethernet switch port.

C. Contractor shall provide all required Valcom Visual LED Message Display Signs with Speakers and Flashing Light in all classrooms. Valcom Visual LED Message Display Signs shall be:

1. Controlled and Set-UP via a software interface

2. Easy to install via RJ45

3. Powered Over Ethernet

4. Accurate via updates from a network time server

5. The Valcom Visual LED Message Display Signs shall be Valcom Model # VL520-BK

D. Contractor shall provide one-way, self-amplified speakers in common areas (Hallways, Cafeteria, Gym, Etc.) that are fed from VE8004BR Zone extenders and powered by VP4124D power supplies. Category 5/6 UTP shall be used for cabling. The following speakers shall be used:

1. Lay-In ceiling environments – V-9022A-2 2X2 Lay-Inn Speakers

2. Wall mounted environments - V-9880 Vandal-Resistant Flex Horns

E. Contractor shall provide IP **(*AD 02)** digital Clocks were required. The following clocks shall be used:

1. Areas requiring 2.5" digital clocks – D425A

2. Areas requiring 4" digital clocks – D440A

3. Areas requiring 4" double-sided digital clocks - D440ADS **(*AD 02)**

4. Wire guard were required – V-WGD4

2.4 CONDUCTORS AND CABLES

A. For simple systems, conductors and cables listed in this Article can be used. For large or complex systems, use Division 27 Section "Communications Horizontal Cabling" for specifying conductors and cables.

B. Plenum Cable: Listed and labeled for plenum use.

C. Category 6 UTP – Use when connecting an IP device.

PART 3 - EXECUTION

A. A factory representative shall be consulted to assist in system programming and commissioning.

3.1 INSTALLATION

A. Wiring Method: Install wiring in raceways except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum-board partitions where cable wiring method may be used. Use plenum cable in environmental air spaces, including plenum ceilings. Conceal cables and raceways except in unfinished spaces.

B. After installing facility intercom and program equipment and after electrical circuitry has been energized, test for compliance with requirements.

C. Operational Test: Test originating station-to-station, all-call, and page messages at each intercom station. Verify proper routing and volume levels and that system is free of noise and distortion. Test each available message path from each station on system.

D. Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.

E. Network equipment such as switches, routers, servers etc., shall be N.I.C.

F. The Contractor shall acquire and comply with the latest IP6000 network requirements as provided by Valcom.

G. Verify the server and devices are running the latest software revisions.

3.2 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service and initial system programming.

B. Verity that electrical wiring installation complies with manufacturer's submittal and installation requirements.

END OF SECTION 275123

SECTION 275124 –SOUND SYSTEM / FM ASSISTANCE HEARING SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes equipment for amplifying, distributing, and reproducing sound signals for the following areas.
   1. Gymnasium
   2. Music

1.3 DEFINITIONS

A. Installer(s): Shall refer to the person, persons, or company who or which actually contracts to perform the work specified herein.

B. Channels: Separate parallel signal paths, from sources to loudspeakers or loudspeaker zones, with separate amplification and switching that permit selection between paths for speaker alternative program signals.

C. Zone: A separate group of loudspeakers and associated supply wiring that may be arranged for selective switching between different channels.

1.4 SUBMITTALS

A. Product Data: For each type of equipment.

B. Shop Drawings: Prior to proceeding with the work:
   1. Complete schedule of ALL equipment and materials to be provided for the work.
   2. Detail equipment assemblies and indicate dimensions, weights, required clearances, and method of field assembly, components, and location of each field connection.
   3. Console layouts.
   4. Control panels.
   5. Rack arrangements.

6. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring. Identify terminals to facilitate installation, operation, and maintenance. Include a single-line diagram showing cabling interconnection of components.

7. Each drawing shall have a descriptive title and all sub-parts of each drawing shall be labeled. All drawings shall have the name and locations of the project, Systems Contractor's name in the title block.

8. Mounting hardware for wall mounted speakers.

C. Product Certificates: Signed by manufacturers of equipment certifying that products furnished comply with specified requirements.

D. Installer Certificates: Signed by manufacturer certifying that installers comply with requirements.

E. Manufacturer Certificates: Signed by manufacturers certifying that they comply with requirements.

F. Contractor shall video record the training session(S) and submit (3) copies of DVD's of the sessions for the O&M manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is an authorized representative of equipment manufacturer for both installation and maintenance of equipment required for this Section.

1. Provide documentation demonstrating a minimum of five (5) years previous experience and successfully completing a minimum of five (5) projects of similar size and scope of work.

2. Provide a list of installations that the Installer has specifically installed for verification by the Owner. Random installations from other vendors and/or Installers shall not be accepted. The Installer, not its employees, must meet these qualifications.

3. The Installer shall be bondable.

4. The Installer shall hold a valid Class "A" Contractors License within the Commonwealth of Virginia.

5. The Installer shall demonstrate to the satisfaction of the Architect/Engineer that he has:

   a. Adequate plant and equipment to pursue the wok properly and expeditiously.
   b. Adequate staff and technical experience to implement the work.
   c. Suitable financial status to meet the obligations of the work.
   d. Technically capable and factory trained service personnel at a local service facility to provide routine and emergency service for all products used in this project

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

C. Comply with NFPA 70.

D. Comply with UL 50.

1.6 OCCUPANCY ADJUSTMENTS

A. On-Site Assistance: Engage a factory-authorized service representative to provide on-site maintenance in adjusting sound levels, resetting transformer taps, and adjusting controls and cleaning of source devices to meet occupancy conditions. Provide two (2) on-site "preventive maintenance" service calls within one year spaced six (6) months apart after Substantial Completion.

B. The Installer shall be prepared to offer a service contract for the system after the warranty period.

PART 2 - PRODUCTS

Refer to GYMNASIUM AND MUSIC SOUND SYTEM DIAGRAMS ON Electrical Details drawings E-4 series for additional information.

2.1 EQUIPMENT

A. Coordinate features to form an integrated system. Match components and interconnections for optimum performance of specified functions.

B. Equipment: Modular type, using solid-state components, fully rated for continuous duty, unless otherwise indicated. Select equipment for normal operation on input power usually supplied at 110 to 130 V, 60 Hz.

2.2 SYSTEM PROCESSORS

A. Gymnasium and Music
1. Main System processor shall provide basic mixing functions for "Simple" system operation, and shall provide all system equalization, protection, anti-feedback and alignment of signals to be sent to the amplifiers.

a. Basis of Design: Biamp AudiaFlex, configured as required.

2.3 DIGITAL MIXING SYSTEM
A. Gymnasium:
1. Digital Mixing Console (Provide one):
a. Basis of Design: Allen & Heath Qu-16:
b. Allen & Heath Digital Snake System and,

c. Allen & Heath Digital Snake with rack mounting hardware.

2.4 WIRELESS MICROPHONE AND REMOTE ANTENNA DISTRIBUTION

1. Gymnasium:

a. Basis of Design: Shure UA-844+SWD with,

b. Shure UA-8 Series Antennas and,

c. Shure UA-834WB Remote Preamplifiers.

2. Wireless Microphone Systems (Provide a total of two):

a. Basis of Design: Shure ULX4 UHF receivers with,

b. One each Shure ULX2/58 Handheld Transmitter, and,

c. One each Shure ULX1 Belt pack Transmitter with;

d. One each Shure WL51B Miniature Lavaliere Microphone.

2.5 POWER AMPLIFIERS

A. Gymnasium and Music:

1. Type 1 Amplifiers:

a. Basis of Design: Bose Powershare 602.

b. Function: Stage Speaker Systems amplifiers.

B. Mounting:

1. Mount in equipment racks as indicated.

2.6 LOUDSPEAKERS

A. Gymnasium:

1. Stage Left and Right Speaker System:

a. Basis of Design: Bose 402 (provide two) with,

b. Bose MB-4 subwoofer.

c. Subwoofer to be mounted adjacent to left speaker.

d. Coordinate speaker locations for best coverage.

2.7 COMPONENTS

A. Microphone(s): Comply with EIA SE-105.
1. Type: Dynamic, with cardioid polar characteristic, vocal use w/ switch.

a. Basis of Design: Shure SM58S (provide four).

2. Type: Dynamic, with cardioid polar characteristic, instrument use.

a. Basis of Design: Shure SM57 (provide two).

B. Microphone Stands:
1. Type: Floor Stand, vocal use.

a. Basis of Design: Atlas MS-12CE (provide two).

2. Type: Floor Boom Stand, instrument use.

a. Basis of Design: Atlas SB-36W (provide two).

3. Type: Desk Stand, desk or low instrument use.

a. Basis of Design: Atlas DS-7E (provide two).

C. Interface Boxes:
1. Type: Direct Boxes, allowing high impedance input from any piece of stage equipment (keyboard, guitar amplifier, CD player, etc.) to the low impedance input of the sound system:

a. Basis of Design: Proco DB-1 (provide one).

2. Type: Direct Boxes, allowing high impedance input from laptop computers or other equipment with a 1/8” TRS Connector to the low impedance input of the sound system:

b. Basis of Design: Rapco LTI-100 (provide one).

D. Microphone Cables.
1. Rubber covered with braided shield construction using Belden 8412 cable.

a. Basis of Design: Rapco SP Series.

b. Provide 2 each 25 foot cables.

c. Provide 2 each 50 foot cables.

d. Provide 2 each 75 foot cables.

E. Cable and Conductors: Jacketed, twisted-pair and twisted-multi-pair, un-tinned, solid-copper conductors.

1. Insulation for Wire in Conduit: Thermoplastic, not less than 1/32 inch thick.

2. Microphone Cables: Neoprene jacketed, not less than 2/64 inch thick over shield with filled interstices. Shield No. 34 AWG tinned, soft-copper strands formed into a braid or approved equivalent foil. Shielding coverage on conductors is not less than 60 percent.

2.8 HEARING ASSISTANCE SYSTEM

A. The system shall transmit the program material used within the Individual Sound Systems for the "Commons".

1. Transmitter basis of design: Listen Technologies LT-800-072.

   a. The system shall operate within the 72-76 MHz band allocated for hearing assistance transmission. The transmitter shall broadcast up to 300 feet with a whip antenna.
   b. The unit shall accept both Low-Z and High-Z line inputs and frequency-synthesized with phase locked loop tuning
   c. Provide one, with rack mounting hardware.

2. Receiver basis of design: Listen Technologies LR-4200-072.

   a. The receivers shall be compact agile frequency FM receivers complete with volume/on-off control. The unit shall operate on a standard 9-volt battery.
   b. The receivers shall be able to "Lock" the received frequency to prevent tampering.
   c. Provide eight.

3. Provide the following Hearing Assistance components:

   a. Remote dipole antenna: Listen Technologies LA-401 (Provide one).

   b. Ear Speakers: Listen Technologies LA-164 (Provide four).
   c. 4 Space Charging and Storage Case: Listen Technologies LA 317 (Provide one).
   d. Provide NiMH Rechargeable batteries as required for all receivers.

2.9 SOUND SYSTEM RACK

A. Sound System Rack shall be wall mounted in the storage room. Panel space openings shall be sized to match equipment with 20% spare capacity. Enclosures shall be equipped with

convenient and useful provisions for custom cabinet mounting, wire management, equipment mounting, and structural support. Cabinet shall be finished in black epoxy.

1. Equipment Rack basis of design: Atlas WMA Series, size based on selected equipment.

    a. Rack shall have appropriate available space.

    b. Rack shall have 19 inches of useable depth.

    c. Provide a power control system to allow for proper turn-on and turn-off sequencing. Sequencer shall allow for different sequences based on the initiating turn-on location.

    d. Provide Surge suppression for the processing and other sensitive electronics, Basis of design: Surge-X.

    e. Provide lockable vented front door.

    f. Provide thermostatically controlled ventilation. Vent fan(s) shall be arranged such that the hot air exhausts from the top of the rack.

B. EXECUTION

2.10 INSTALLATION

A. Install equipment to comply with manufacturer's written instructions.

B. Wiring Method: Install wiring in raceway except within consoles, desks, and counters. Conceal cable and raceway except in unfinished spaces.

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess. Use lacing bars in cabinets.

D. Control-Circuit Wiring: Install number and size of conductors as recommended by system manufacturer for control functions indicated.

E. Separation of Wires: Separate speaker-microphone, line-level, speaker-level, and power wiring runs. Install in separate raceways or, where exposed or in same enclosure, separate conductors at least 12 inches (300 mm) for speaker microphones and adjacent parallel power and telephone wiring. Separate other intercommunication equipment conductors as recommended by equipment manufacturer.

F. Splices, Taps, and Terminations: Make splices, taps, and terminations on numbered terminal strips in junction, pull, and outlet boxes, terminal cabinets and equipment enclosures.

G. Match input and output impedances and signal levels at signal interfaces. Provide matching networks where required.

H. Identification of Conductors and Cables: Color-code conductors and apply wire and cable marking tape to designate wires and cables to identify media in coordination with system wiring diagrams.

I. Wall-Mounting Outlets: Flush mounted.

J. Conductor Sizing: Unless otherwise indicated, size speaker circuit conductors from racks to loudspeaker outlets not smaller than No. 14 AWG and conductors from microphone receptacles to amplifiers not smaller than No. 22 AWG.

K. Line Matching Transformer Connections: Make initial connections using tap settings recommend by manufacturer.

2.11 GROUNDING

A. Ground cable shields and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

B. Signal Ground Terminal: Locate at main equipment cabinet. Isolate from power system and equipment grounding.

2.12 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installations, including connections. Report results in writing.

B. Operational Test: Perform tests that include originating program and page material at microphone outlets, preamplifier program inputs, and other inputs. Verify proper routing and volume levels and freedom from noise and distortion.

C. Signal-to-Noise Ratio Test: Measure the ratio of signal to noise of complete system at normal gain settings, using the following procedure:

1. Disconnect a microphone at the connector or jack closest to it and replace it in the circuit with a signal generator using a 1000-Hz signal. Replace all other microphones at corresponding connectors with dummy loads, each equal in impedance to microphone it replaces. Measure the ratio of signal to noise.

2. Repeat test for each separately controlled zone of loudspeakers.

3. Minimum acceptance ratio is 50 dB.

D. Distortion Test: Measure distortion at normal gain settings and rated power. Feed signals at frequencies of 50, 200, 400, 1000, 3000, 8000, and 12,000 Hz into each preamplifier channel. For each frequency, measure the distortion in the amplifier outputs. Maximum acceptable distortion at any frequency is 3 percent total harmonics.

E. Power Output Test: Measure electrical power outputs of each amplifier at normal gain setting at 50, 1000, and 12,000 Hz. Maximum variation in power output at these frequencies must not exceed plus or minus 1 dB.

F. Signal Ground Test: Measure and report ground resistance at pubic address equipment signal ground. Comply with testing requirements specified in Division 26 Section "Grounding and Bonding for Electrical Systems."

G. Retesting: Correct deficiencies, revising tap settings of speaker-line matching transformers where necessary to optimize volume and uniformity of sound levels, and retest. Prepare written record tests.

H. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Prepare a list of final tap settings of paging speaker-line matching transformers.

I. Schedule tests with at least seven days' advance notice of test performance.

J. Field Test Reports: Indicate and interpret test results for compliance with performance requirements. Include record of final speaker-line matching transformer-tap settings, and signal ground-resistance measurement certified by Installer.

K. Maintenance Data: For equipment to include in maintenance manuals specified in Division 1.

L. Record Drawings: Prior to final acceptance, provide three (3) complete sets of drawings indicating all cable numbers and construction details in accordance with the actual system installation. Revise all shop drawings to represent actual installation conditions. These Record Drawings will be used during “Final Acceptance Testing”.

2.13 FINAL ACCEPTANCE TESTING

A. The Final Acceptance Testing shall be provided by the Owner or the Owners agent. Coordinate this period so that free access, work lighting and electrical power are available on the site.

B. Be prepared to verify the performance of any portion of the installation by demonstration, listening and viewing test, and instrumented measurements. Make additional adjustments within the scope of work and which are deemed necessary by the Owner because of the acceptance test.

2.14 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain equipment as specified below:
   1. Train Owners maintenance personnel on programming equipment for starting up and shutting down, troubleshooting, servicing, and maintaining equipment.

   2. Review data in maintenance manuals. Refer to Division 1 Section "Project Closeout."

   3. Schedule training with Owner, through Architect, with at least seven days' advance notice.

END OF SECTION 275119

SECTION 281300 – ELECTRONIC SAFETY AND SECURITY: ACCESS CONTROL, VIDEO SURVEILLANCE AND INTERCOM ENTRY **(*AD 02)**

PART 1 - ACCESS CONTROL

1.1 ACCESS CONTROL: GENERAL

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections and Division 27 shall all apply to this Section.

B. Four doors shall have the Paxton Net2 System. Three doors with Net2 Controllers and the front door with Net2 video entry system (Part 2). The card reader portion of the door station (and the accompanying door lock, request to exit device, Paxton door controller) shall be installed and connected as outlined in this access control section of Division 28.

C. At each of these card reader locations one Category 6 cable shall be installed to connect to the Paxton control panel supporting each of the card readers.

D. Card readers will be connected to local Paxton door controllers and will communicate to the centrally located access control management system.

E. The components of the access control system include the following: Paxton Door Station with the integrated card reader, locks, card readers, door position switches, request to exit (REX) devices and Paxton controllers.

F. Coordinate with the owner to register the access control devices to the Paxton server.

1.2 ACCESS CONTROL: PRODUCTS

A. Controller: Paxton Net2 Panel (No substitutions or alternates shall be accepted).

B. Reader: Paxton Reader.

C. Door Position Switch: Coordinate with door and intrusion vendor.

D. Request to Exit Sensor: Alarm Controls SREX-100 Focused PIR for Request-to-exit (REX) applications.

E. Electric Lock furnished and installed by door hardware vendor.

F. Contractor must be Paxton authorized and trained dealer.

1.3 ACCESS CONTROL: INSTALLATION

A. Paxton Net2 shall be installed at the (4) doors of the School.

B. Door controllers and power supplies will be installed in equipment cabinets adjacent to each of the four doors controlled by the card readers. A Category 6 horizontal distribution cable shall be installed from the Paxton door controller to the nearest IDF. IDF's include patch panels and cabling to support the video camera surveillance system.

C. The Paxton controllers and power supplies shall in most instances be installed above or near the door locations. Should these devices not be installed near door(s) a label shall be affixed to the top of the REX denoting the location of the equipment.

D. All IP access control devices will be connected to the nearest IDF via Category 6 cable. On the other hand, card readers and door locks, the latter especially, because of their on-off operation will be cabled in the traditional manner using cabling appropriate for the amperage load and distance.

E. Install the card reader and connect it to the Paxton door controller with 22-6 AWG, shielded cable.

F. Install the door lock and connect the door lock to the Paxton door controller and power supply with 18-2 AWG cable.

G. Install and connect the REX to the Paxton door controller with 22-4 AWG cable.

H. Install and connect the door position switch to the Paxton door controller with 22-2 AWG cable.

I. Drop cables at the equipment location may be terminated on a Category 6 RJ-45 plug for the control panels and door stations.

J. The general contractor will install dedicated 20 amp circuits to the IDFs and provide a duplex outlet for the UPS unit, provided by the Owner. These circuits will be connected to the emergency generator of the School.

K. Power bricks or adapters that plug into a common electrical outlet shall not be used on this project since they may be inadvertently easily removed resulting in a loss of power for the connected devices. Only PoE devices or power supplies housed in secure cabinets shall be permitted.

L. The access control system installed shall be configured in such a manner as to permit either locking or unlocking of a door remotely over the network. Coordinate this with the Owner.

M. Power will be provided to the IP devices via Power Over Ethernet (PoE). The Ethernet switches that these IP devices are connected to will be connected to a backup UPS provided by the owner. The intent and goal is that these devices shall retain power for a period of four (4) hours in the event of a power failure.

N. End of line resistors (EOLR) shall be installed on all door position switches (DPS) and request to exit devices (REX) as per specifications of the Paxton system.

PART 2 - VIDEO ENTRY SYSTEM

2.1 VIDEO ENTRY SYSTEM: GENERAL

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections and Division 27, apply to this Section.

B. Paxton Net2 entry touch panel (Standard panel, surface mount with rain hood) shall be installed at the front door. The receptionist desk shall have two desk mounted Paxton Net2 monitors (Premium with handset). The card reader portion of the entry station (and the accompanying door lock, request to exit device, Paxton door controller) shall be installed and connected as outlined in this access control section of Division 28.

C. At each location one Category 6 cable shall be installed to connect to the Paxton control panel, Category 6 shall run from the Entry panel to the control panel's POE switch as well as from each Paxton monitor to the control panel's POE switch.

D. Video Entry panel will be connected to local Paxton door controllers and will communicate to the centrally located access control management system.

E. The components of the access control system include the following: Paxton Video Entry System with integrated card reader, locks, card readers, door position switches, request to exit (REX) devices and Paxton controllers.

F. Coordinate with the owner to register the access control devices to the Paxton server.

2.2 VIDEO ENTRY SYSTEM: PRODUCTS

A. Video Entry System: Paxton Net2 Entry (No substitutions or alternates shall be accepted).
   1. Paxton Net2 entry touch panel (Standard panel, surface mount with rain hood) with integrated reader.
   2. Paxton Net2 panel with POE switch.
   3. Paxton Net2 monitors (Premium with handset). (Quantity 2)

B. Door Position Switch: Coordinate with door and intrusion vendor.

C. Request to Exit Sensor: Alarm Controls SREX-100 Focused PIR for Request-to-exit (REX) applications.

D. Electric Lock furnished and installed by door hardware vendor.

E. Contractor must be Paxton authorized and trained dealer.

2.3 VIDEO ENTRY SYSTEM: INSTALLATION

A. Cables may not be spliced.

B. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings and outlets.

C. Separate other telecommunication conductors as recommended by the Paxton equipment manufacturer.

D. The Paxton door and master stations shall be configured in such a manner as to permit either locking or unlocking of a door remotely over the network.

E. The Paxton video entry station shall be configured to communicate with the Paxton monitors and the associated Net2 panel to provide integrated control of the front entrance.

PART 3 - VIDEO SURVEILLANCE

3.1 VIDEO SURVEILLANCE: GENERAL

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections and Division 27 apply all apply to this Section.

B. It shall be the responsibility of the successful contractor to install any interconnecting cables and patch cords required to power the cameras and associated video surveillance camera system equipment.

C. UTP cable is used for the camera drop cables. Camera drop cables are installed between each camera location and the IDF and are identical in specifications (and shall be Category 6) to the voice and data horizontal distribution cables. Installation procedures for the camera cables are identical to that for the data and voice cables except that the camera cables are clearly labeled as such and are terminated on a separate Category 6 patch panel. Data, voice and camera cables are not to be co-mingled on the same patch panel.

D. All camera cables at the camera location are terminated on a Category 6 RJ-45 plug. All camera cables for outside cameras are to be installed on the interior of the building as close as possible to the location of the camera to allow for the connection of the camera. A service loop of cable of approximately 20 feet shall be installed to facilitate installation.

E. Cameras shall be installed by the contractor awarded this bid on the electrical boxes previously installed on the buildings and the canopies by the general contractor.

F. Pathways specifically constructed by the general contractor to support the video surveillance camera system are of three types: (1) electrical boxes to support the installation of individual cameras (2) conduits secured to the canopies and buildings to provide pathways to the electrical boxes (3) conduits to provide pathways for the trunk cables.

G. All UTP patch cords shall have a jacket. One foot patch cords shall be used at the IDF's.

H. Camera cables shall be terminated and properly labeled on a separate 12 or 24 port patch panel in each IDF.

I. The successful contractor will be responsible for training select the owner staff in the operation and use of the video surveillance camera system. Training shall consist of two types: 1) technical training for technical staff that will have the responsibility to maintain the video surveillance camera system and 2) general training provided to approximately six (6) key administrative staff which shall cover the operation of all system components. It is anticipated that a two (2) hour training session with key administrative staff will allow adequate time to review components of the system and the proper procedures to retrieve video footage.

3.2 VIDEO SURVEILLANCE: PRODUCTS

A. Cable: ETL Verified Category 6, UTP Cable, blue, plenum, 4 pair count

B. Patch Cable: Category 6 UTP Patch Cord, length as required, RJ45 to RJ45, 4-pair count

C. Interior Cameras: Hanwha XNV-6011.

D. Exterior Cameras: Hanwha XNV-8082R. Mounting hardware as required.

E. WAVE VMS License (Quantity based on number of cameras +4 for spare)

F. Video Management Server, Hanwha WRR-P-E200W1 Rack-Mount, Windows 10. (Storage size and quantity of servers determined by contractor to ensure 45-day storage at 15fps in high quality).

G. No substitutions or alternates shall be accepted for the above components. Contractor must be Hanwha certified dealer with minimum Silver status.

3.3 VIDEO SURVEILLANCE: INSTALLATION

A. All video camera drop cables shall be installed in a home run fashion from each camera location to the nearest IDF.

B. The installation procedures cited above for workstation outlets shall apply to video camera outlets except plugs rather than jacks will be used at the camera locations as noted above. Additionally, to support the NVR locations, if needed, the color of the jacks shall be green.

C. All patch cables and cords should be neatly dressed and properly secured with Velcro material at strategic intervals. Moreover, all patch cords and cables shall be clearly labeled.

D. At the IDF each camera shall be clearly labeled on the patch panels. Should a camera be mounted inside on a suspended ceiling the identifying label shall be placed on the "T" section of the ceiling tile grid adjacent the camera.

E. Focusing of the cameras shall be coordinated with a designated representative from the owner who shall dictate the specific camera views.

PART 4 – SUBMITTALS FOR ACCESS CONTROL, VIDEO ENTRY SYSTEM AND VIDEO SURVEILLANCE

A. Product Data: For each type of product.
1. Products: Include construction details, material descriptions, dimensions, profiles, and finishes.
2. Certifications: Include authorized dealer certificates and licenses.

B. Shop Drawings:
1. Complete schedule of all equipment and materials to be provided for the work.
2. Detail equipment assemblies and indicate dimensions, weights, required clearances, and method of field assembly, components, and location of each field connection.
3. Include floor plans to indicate device/equipment locations showing address of each addressable device.
4. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring. Identify terminals to facilitate installation, operation, and maintenance. Include a single-line diagram showing cabling interconnection of components.

END OF SECTION 281300

SECTION 32 1313 - SITE CONCRETE **(*AD-02)**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the Contract Documents apply to the work of this Section.

1.2 DESCRIPTION OF WORK:

A. Extent of Portland cement concrete paving is shown on drawings, including:
   1. Curbs and gutters
   2. Concrete Medians
   3. Walkways
   4. Service area pavement
   5. Paved Ditches

1.3 SUBMITTALS

A. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.

B. Material Certification: Certification signed by Contractor certifying that each material complies with requirements.

C. Concrete scoring plan.

1.4 JOB CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects.
   1. Use flexible spring steel forms or laminated boards to form radius bends as required.
   2. Coat forms with a nonstaining form release agent that will not discolor or deface surface of concrete.

B. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A 185.

C. Reinforcing Steel: ASTM A 615, Grade 60, deformed

D. Concrete Materials: Comply with requirements of applicable Division 3 sections for concrete materials, admixtures, bonding materials, curing materials, and others as required.

E. Expansion Joint Materials: Comply with requirements of applicable Division 7 sections for preformed expansion joint fillers and sealers.

F. Antispalling Compound: Combination of boiled linseed oil and mineral spirits, complying with AASHTO M-233.

G. Liquid-Membrane Forming and Sealing Curing Compound: Comply with VDOT Road and Bridge Specifications.

2.2 CONCRETE MIX, DESIGN, AND TESTING

A. Comply with requirements of applicable Division 3 sections for concrete mix design, sampling and testing, and quality control or VDOT Road and Bridge Specifications whichever is more stringent.

B. Design mix to produce normal-weight concrete consisting of Portland cement, aggregate, water-reducing or high-range water-reducing admixture (superplasticizer), air-entraining admixture, and water to produce the following properties:

1. Comply with the requirements of VDOT Std. Class A3 Concrete, unless otherwise indicated.

C. Testing to be performed by the Owner's third-party testing firm.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

B. Proof-roll prepared subbase surface to check for unstable areas and need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.

C. Subbase from the adjacent pavement shall extend under new curb and new curb and gutter. Subbase thickness under curb and curb and gutter should match the subbase thickness of the existing roadway or be 6" in thickness, whichever is greater.

3.2 FORM CONSTRUCTION

A. Set forms to required grades and lines, braced and secured. Install forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.

B. Check completed formwork for grade and alignment to following tolerances:

1. Top of forms not more than 1/8 inch in 10 feet.
2. Vertical face on longitudinal axis, not more than 1/4 inches in 10 feet.

C. Clean forms after each use and coat with form release agent as required to ensure separation from concrete without damage.

3.3 REINFORCEMENT

A. Locate, place and support reinforcement as specified in Division 3 sections, unless otherwise indicated.

3.4 CONCRETE PLACEMENT

A. General: Comply with requirements of applicable Division 3 sections for mixing and placing concrete or VDOT Road and Bridge Specifications whichever is more stringent.

B. Do not place concrete until subbase and forms have been checked for line and grade. Moisten subbase if required to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

C. Place concrete by methods that prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.

D. Deposit and spread concrete in a continuous operation between transverse joints as far as possible. If interrupted for more than 1/2 hour, place a construction joint.

E. Fabricated Bar Mats: Keep mats clean and free from excessive rust, and handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities or replace units as required before placement. Set mats for a minimum 2-inch overlap to adjacent mats.

F. Place concrete in 2 operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.

G. Remove and replace portions of bottom layer of concrete that have been placed more than 15 minutes without being covered by top layer or use bonding agent if acceptable to Architect.

H. Curbs and Gutters: Automatic machine may be used for curb and gutter placement. If machine placement is to be used, submit revised mix design and laboratory test results that meet or exceed minimums indicated. Machine placement must produce curbs and gutters to required cross-section, lines, grades, finish, and jointing as indicated for formed concrete. If results are not acceptable, remove and replace with formed concrete meeting requirements.

3.5 JOINTS

A. General: Construct expansion, weakened-plane (contraction), and construction joints true to line with face perpendicular to surface of concrete. Construct transverse joints at right angles to the centerline, unless otherwise indicated.

B. Weakened-Plane (Contraction) Joints: Provide weakened-plane (contraction) joints, sectioning concrete into approximately 10' areas or as shown on drawings. Construct weakened-plane joints for a depth equal to at least 1/4 concrete thickness, as follows:

1. Tooled Joints: Form weakened-plane joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer.
2. Sawed Joints: Form weakened-plane joints with powered saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut joints into hardened concrete as soon as surface will not be torn, abraded, or otherwise damaged by cutting action.

C. Construction Joints: Place construction joints at end of placements and at locations where placement operations are stopped for more than 1/2 hour, except where such placements terminate at expansion joints.
1. Construct joints as indicated or, if not indicated, use standard metal keyway-section forms.

D. Expansion Joints: Provide premolded joint filler for expansion joints abutting catch basins, manholes, inlets, structures, walks, and other fixed objects, unless otherwise indicated.

E. Locate expansion joints at 30' o.c. minimum in sidewalk, curb, and curb and gutter unless otherwise indicated. Locate expansion joints at 50 feet o.c. for each pavement lane unless otherwise indicated.

F. Extend joint fillers full width and depth of joint, not less than 1/2 inch or more than 1 inch below finished surface where joint sealer is indicated. If no joint sealer, place top of joint filler flush with finished concrete surface.

G. Provide joint fillers in one-piece lengths for full width being placed wherever possible. Where more than one length is required, lace or clip joint filler sections together.

H. Protect top edge of joint filler during concrete placement with a metal cap or other temporary material. Remove protection after concrete has been placed on both sides of joint.

I. Fillers and Sealants: Comply with requirements of applicable Division 7 sections for preparation of joints, materials, installation, and performance.

3.6 CONCRETE FINISHING

A. After striking-off and consolidating concrete, smooth surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.

B. After floating, test surface for trueness with a 10-ft. straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous smooth finish.

C. Work edges of slabs, gutters, back top edge of curb, and formed joints with an edging tool, and round to 1/2-inch radius, unless otherwise indicated. Eliminate tool marks on concrete surface.

D. After completion of floating and when excess moisture or surface sheen has disappeared, complete troweling and finish surface as follows:
1. Broom finish by drawing a fine-hair broom across concrete surface perpendicular to line of traffic. Repeat operation if required to provide a fine line texture acceptable to Architect.
2. Exposed-Aggregate Finish: At ~~handicap ramps and~~ **locations identified as finish type 2** where indicated on **architectural** drawings, by applying an approved retardant curing

compound to the surface. Allow minimum 12 hours of setting time before washing surface to expose a maximum of (1/3) one-third of stone surface. Aggregate shall be brown Riverstone having a uniform size and color for each subsequent concrete pour. Aggregate size shall range between 1/2" and 3/4".

E. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point-up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Architect.

3.7 CURING

A. Protect and cure finished concrete paving in compliance with applicable requirements of Division 3 sections. Use membrane-forming curing and sealing compound or approved moist-curing methods.

3.8 REPAIRS AND PROTECTIONS

A. Repair or replace cracked, broken or defective concrete curbs and curb and gutter, as directed by Architect.

B. Replace cracked, broken or defective concrete sidewalks.

C. Repair or replace cracked, broken or defective concrete pavement, as directed by Architect.

D. Drill test cores where directed by Architect when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to pavement with epoxy adhesive.

E. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

F. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just before final inspection.

END OF SECTION 32 1313

BID SET

NEW PRINCE GEORGE ELEMENTARY SCHOOL

PRINCE GEORGE COUNTY SCHOOLS
PRINCE GEORGE COUNTY, VIRGINIA

DOE PROJECT#: 074-38-00-100

MOSELEYARCHITECTS

3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555 FAX (804) 355-5690
MOSELEYARCHITECTS.COM

TIMMONS GROUP — CIVIL ENGINEERS
1001 BOULDERS PARKWAY, SUITE 300 — RICHMOND, VA 23225

FOODSERVICE CONSULTANTS STUDIO, INC — FOOD SERVICE CONSULTANTS
3420 PUMP RD, #158 — HENRICO, VA 23233

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LOCATION MAP

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NEW PRINCE GEORGE ELEMENTARY SCHOOL
DOE PROJECT#: 074-38-00-100
PRINCE GEORGE COUNTY SCHOOLS
4700 Romans Road, Prince George, VA 23875

PROJECT NO: 592926
DATE: January 24, 2021

REVISIONS

DATE	DESCRIPTION
02/03/21	*AD 01
02/12/21	*AD 02

COVER VOL. 2

SET NO.

2/15/2021 1:11:24 AM

BID SET

NEW PRINCE GEORGE ELEMENTARY SCHOOL

PRINCE GEORGE COUNTY SCHOOLS
PRINCE GEORGE COUNTY, VIRGINIA

DOE PROJECT#: 074-38-00-100

VICINITY MAP

MOSELEYARCHITECTS

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FOODSERVICE CONSULTANTS STUDIO, INC — FOOD SERVICE CONSULTANTS
3420 PUMP RD, #158 — HENRICO, VA 23233

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*AD 02

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NEW PRINCE GEORGE ELEMENTARY SCHOOL
DOE PROJECT#: 074-38-00-100
PRINCE GEORGE COUNTY SCHOOLS
4700 Romans Road, Prince George, VA 23875

PROJECT NO: 592926
DATE: January 24, 2021

REVISIONS

DATE	DESCRIPTION
02/12/21	*AD 02

COVER VOL. 3

SET NO.

2/15/2021 1:11:24 AM

SITE LAYOUT KEYNOTES

1	VDOT STANDARD CG-6 CURB & GUTTER
2A	VDOT STANDARD CG-12 TYPE 'A' RAMP
2B	VDOT STANDARD CG-12 TYPE 'B' RAMP
3	VDOT STANDARD CG-2 CURB
4	REGULATORY SIGN OR MARKING, REFER TO DRAWING C4.10 FOR DETAILS
5	CONCRETE WHEEL STOP
6	LOADING / RECEIVING AREA
7	SCREENED MECHANICAL YARD, REFER TO ARCHITECTURAL DRAWINGS
8	HARD SURFACE PLAY AREA
9	PLAYGROUND ALLOWANCE AREA
10	MULTI PURPOSE GRASS PLAY AREA
11	FLUSH CURB
12	DUMPSTER PAD / SCREENING, REFER TO ARCHITECTURAL DRAWINGS FOR DETAILS
13	SOFTBALL FIELD, REFER TO DRAWING C4.20 FOR DETAILS
14	VDOT STANDARD CG-9D
15	DOUBLE SWING ROAD GATE, REFER TO C4.20 FOR DETAILS
16	12' CHAINLINK, DOUBLE SWING GATE, REFER TO 4.20 FOR DETAIL
17	VDOT STD. CG-3
18	6' CHAIN LINK FENCE (BLACK PVC CLAD)
19	6' CHAIN LINK FENCE (NON-COATED GALVANIZED)
20	KNOX BOX
21	SCHOOL MARQUEE SIGN, REFER TO ARCHITECTURAL DRAWINGS FOR DETAIL
22	PROVIDE EXPANSION JOINT IN SIDEWALK AT RIGHT OF WAY LINE
23	4FT VALLEY GUTTER
24	6" BOLLARD
25	GROUND MOUNTED FLAGPOLE REFER TO ARCHITECTUAL DRAWINGS
26	VDOT STD. CG-7 (MOUNTABLE CURB & GUTTER)

*AD-02

*AD-02

*AD-01

*AD-01

PAVEMENT LEGEND

	HEAVY DUTY ASPHALT
	MEDIUM DUTY ASPHALT
	LIGHT DUTY ASPHALT
	CONCRETE SIDEWALK
	HEAVY DUTY CONCRETE
	REINFORCED PAD, REFER TO STRUCTURAL DRAWINGS FOR DETAIL
	STONE SECTION MECHANICAL YARD
	PLAYGROUND SURFACING
	6" GRAVEL SECTION (VDOT TYPE 1, NO. 21B)
	RUBBERIZED SURFACE (REFER TO ARCHITECTURAL DRAWINGS)

CURVE TABLE

CURVE	RADIUS	LENGTH	TANGENT	DELTA	CHORD BEARING	CHORD
C11	735.71	145.19	72.83	11°18'25"	N31°32'15"E	144.95
C12	1154.00	187.28	93.84	9°17'53"	N32°40'46"E	187.07
C13	1166.00	143.96	72.07	7°04'26"	N41°55'34"E	143.86
C14	766.00	65.43	32.74	4°53'39"	N47°54'37"E	65.41
C15	825.49	111.58	55.87	7°44'40"	S60°46'22"W	111.49
C16	754.00	120.80	60.53	9°10'45"	N63°06'29"E	120.67

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NEW PRINCE GEORGE ELEMENTARY SCHOOL

DOE PROJECT# 074-38-00-100
PRINCE GEORGE COUNTY PUBLIC SCHOOLS
4700 ROMANS ROAD, PRINCE GEORGE, VA 23875

PROJECT NO: 45407
DATE: JANUARY 24, 2021

REVISIONS

DATE	DESCRIPTION
	*AD 01
	*AD 02

LAYOUT PLAN

C4.01

SITE LAYOUT KEYNOTES

1	VDOT STANDARD CG-6 CURB & GUTTER
2A	VDOT STANDARD CG-12 TYPE 'A' RAMP
2B	VDOT STANDARD CG-12 TYPE 'B' RAMP
3	VDOT STANDARD CG-2 CURB
4	REGULATORY SIGN OR MARKING, REFER TO DRAWING C4.10 FOR DETAILS
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6	LOADING / RECEIVING AREA
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11	FLUSH CURB
12	DUMPSTER PAD w/ SCREENING, REFER TO ARCHITECTURAL DRAWINGS FOR DETAILS
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15	DOUBLE SWING ROAD GATE, REFER TO C4.20 FOR DETAILS
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17	VDOT STD. CG-[illegible]
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20	KNOX BOX
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22	PROVIDE EXPANSION JOINT IN SIDEWALK AT RIGHT OF WAY LINE
23	4FT VALLEY GUTTER
24	6" BOLLARD
25	GROUND MOUNTED FLAGPOLE REFER TO ARCHITECTUAL DRAWINGS
26	VDOT STD. CG-7 (MOUNTABLE CURB & GUTTER)

*AD-02

*AD-02

PAVEMENT LEGEND

	HEAVY DUTY ASPHALT
	MEDIUM DUTY ASPHALT
	LIGHT DUTY ASPHALT
	CONCRETE SIDEWALK
	HEAVY DUTY CONCRETE
	REINFORCED PAD, REFER TO STRUCTURAL DRAWINGS FOR DETAIL
	STONE SECTION MECHANICAL YARD
	PLAYGROUND SURFACING
	6" GRAVEL SECTION (VDOT TYPE 1, NO. 21B)

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NEW PRINCE GEORGE ELEMENTARY SCHOOL

DOE PROJECT# 074-38-00-100
PRINCE GEORGE COUNTY PUBLIC SCHOOLS
4700 ROMANS ROAD, PRINCE GEORGE, VA 23875

PROJECT NO: 45407
DATE: JANUARY 24, 2021

REVISIONS

DATE	DESCRIPTION
02/03/21	*AD 01
02/12/21	*AD 02

LAYOUT PLAN

C4.02

PARKING SIGNS:

SIGN COLORS: RED LETTERS AND BORDER ON A REFLECTORIZED WHITE BACKGROUND.

LETTERS: TWO (2) INCH "C" SERIES.

NOTES: THIS DRAWING IS FOR GUIDANCE ONLY. FOR MORE ACCURATE DETAILS RELATED TO SIGN FABRICATION SPECIFICATIONS REFER TO THE VIRGINIA MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS.

PAVEMENT MARKING

FIRE LANE SIGNS

NO SCALE

NOTES:
1. ARROWS PER MUTCD SECTION 3B.20.
2. ALL TRAFFIC FLOW ARROWS TO BE REFLECTIVE YELLOW PER SPECS.

TRAFFIC FLOW ARROW

NO SCALE

PIPE BOLLARD DETAIL

NO SCALE

SIGNAGE NOTES

1. ALL SIGNING AND PAVEMENT MARKING SHALL BE IN ACCORDANCE WITH THE MOST CURRENT EDITION OF EACH OF THE FOLLOWING AND ANY REVISION THERETO:

A. MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
B. THE VIRGINIA SUPPLEMENT TO THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
C. THE VIRGINIA DEPARTMENT OF TRANSPORTATION ROAD AND BRIDGE SPECIFICATIONS.

2. SIGN LOCATIONS ARE APPROXIMATE AND ARE TO BE MODIFIED IN THE FIELD TO AVOID CONFLICT WITH UNDERGROUND UTILITIES OR OTHER OBSTRUCTIONS, AND TO COMPLY WITH STANDARDS REFERENCED IN NOTE 1 ABOVE.

3. ALL SIGNS AND PAVEMENT MARKINGS ARE TO BE FURNISHED AND INSTALLED BY THE CONTRACTOR. ALL SIGNS OUTSIDE OF VDOT ROW SHALL BE INSTALLED ON STEEL POST 1.5" DIA. GALVANIZED SET IN MIN. 2' OF CONCRETE DEPTH AND 1' DIA. OF CONCRETE.

CROSSWALK DETAIL

VDOT STD.
MUTCD: R1-1
STOP SIGN

STRIPING & SIGNAGE NOTES & DETAILS

IDENTIFY SPACES BY ABOVE GRADE SIGNS AS RESERVED FOR PHYSICALLY DISABLED PERSONS. PROVIDE ONE (1) R7-8 SIGN AT EACH PARKING SPACE INDICATED ON SITE PLAN. SIGN SHALL BE ALUMINUM (PAINTED WHITE) WITH GREEN LETTERS AND INTERNATIONAL WHEELCHAIR SYMBOL. SECURE SIGN ON STEEL POST 1-1/2" Ø PAINTED BLACK SET IN MIN. 2' x 12"Ø OF CONCRETE.

PARKING SIGNS FOR THE DISABLED

NO SCALE

TYPICAL PARKING SPACE DETAILS

NO SCALE

ACCESSIBLE PARKING SPACES
WITH CURB AND GUTTER

NOTES:
1. HEIGHT OF CURB IS 0' BETWEEN ACCESSIBLE RAMPS. RAMPS TRANSITION CURB FROM 0.5' TO STANDARD CURB HEIGHT.

2. ALL WHEELCHAIR RAMPS SHALL HAVE A DETECTABLE WARNING 24 INCHES DEEP (IN THE DIRECTION OF PEDESTRIAN TRAVEL) AND EXTENDING THE FULL WIDTH OF THE CURB RAMP OR LANDING. THE DETECTABLE WARNING SHALL CONSIST OF RAISED TRUNCATED DOMES, ALIGNED IN A GRID PATTERN WITH A DIAMETER OF NOMINAL 0.9 INCHES (23mm), A HEIGHT OF NOMINAL 0.2 INCHES (5mm), AND A CENTER-TO-CENTER SPACING OF NOMINAL 2.35 INCHES (60mm).

3. DETECTABLE WARNINGS SHALL CONTRAST VISUALLY WITH ADJOINING SURFACES, EITHER LIGHT-ON-DARK, OR DARK-ON-LIGHT. THE MATERIAL USED SHALL BE AN INTEGRAL PART OF THE WALKING SURFACE.

STANDARD PARKING SPACE
WITH VDOT CG-6

STANDARD PARKING SPACE
WITH VDOT CG-2

SIGNAGE LEGEND

	SIGN/PLAQUE	DESIGNATION	SIGN SIZE	QUANTITY
A	'STOP'	R1-1	30"x30"	6
B	'RESERVED PARKING ' (for persons with disabilities)	R7-8	12"x18"	7
C	'AUTHORIZED VEHICLES ONLY'	R5-11	36"x24"	5
D	'NO PARKING FIRE LANE TOWING ENFORCED'		12"x18"	32
E	'NO SERVICE BETWEEN 9P.M. - 6A.M.'	(PLACE ON DUMPSTER GATES)		2
F	'NO TRESPASSING OR SOLICITING'			4
H	'NO RIGHT TURN'	R3-1	24" 24"	1
I	'DO NOT ENTER'	R5-1	30"x30"	2

STRIPING LEGEND

SYMBOL	DESCRIPTION	QUANTITY
	FIRE LANE	3835 LF
	CROSSWALK	2
1	4" SOLID WHITE LINE	7400 LF
2	24" STOP BAR	70 LF

*AD-02

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ROAD STRIPING AND SIGNAGE PLAN

C4.10

MATCHLINE DRAWING C6.02

MATCHLINE DRAWING C6.01

20' SPILLWAY
TOP = 105.50'

CLASS I RIP-RAP
D_{50} = 0.5'
DEPTH = 18"

10YR=112.77

GRAVEL FLOW SPREADER
(REFER TO DETAIL, SHEET C6.41)

PRETREATMENT CELL

CLEANOUT INSTALL
6" POND BOTTOM
(TYP.)

15' SPILLWAY
TOP = 112.55'

6" UNDERDRAIN
(TYP.)

SHORTEST FLOW PATH (SFP) =78'
LENGTH (L) = 82'
SFP / L = 0.95

1' GRAVEL BERM
CLASS I RIP-RAP
TOP = 112.0'

*AD-02

CLEANOUT
(TYP.)

CLEANOUT

6" HDPE @
1.04% MIN

8" HDPE @
1.04% MIN

CONTRACTOR SHALL
COORDINATE THE RELOCATION
OF UFO WITH SERVICE PROVIDER

NEW PRINCE GEORGE
ELEMENTARY SCHOOL
F.F. = 121.00'

10" HDPE
@ 1.04% MIN

NOTES:
1. ALL ROOF DRAIN PIPING SHALL RUN AT 1.04% MIN UNLESS OTHERWISE INDICATED.
2. REFER TO PLUMBING DRAWINGS FOR ROOF DRAIN SIZES EXITING THE BUILDING.
3. ALL ROOF DRAINS 4" UNLESS OTHERWISE INDICATED.

4" HDPE @
1.04% MIN

REFER TO PLUMBING
DRAWINGS FOR CONTINUATION.

TEMP. CONSTRUCTION
EASEMENT

12" CMP CULVERT
40 FT. @ 0.50%
INV IN = 118.00'
INV OUT = 117.80'

END VDOT
MAINTENANCE

LIMITS OF SURVEY

PROPERTY LINE

EXIST. CL DITCH

EXIST. ROADSIDE
CL DITCH

U/G POWER

NAD 83

SCALE: 1"=40'
0 40' 80'

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02/12/2021
PROFESSIONAL ENGINEER

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NEW PRINCE GEORGE ELEMENTARY SCHOOL

DOE PROJECT# 074-38-00-100
PRINCE GEORGE COUNTY PUBLIC SCHOOLS
4700 ROMANS ROAD, PRINCE GEORGE, VA 23875

PROJECT NO: 45407
DATE: JANUARY 24, 2021

REVISIONS

DATE	DESCRIPTION
02/03/21	*AD 01
02/12/21	*AD 02

GRADING AND
DRAINAGE PLAN

C6.01

MOSELEYARCHITECTS

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TIMMONS GROUP
YOUR VISION ACHIEVED THROUGH PLANNING, DESIGN AND DELIVERY
COMMON WEALTH OF VIRGINIA
DEPARTMENT OF PROFESSIONAL AND OCCUPATIONAL REGULATION
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LICENSE
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GRADING AND DRAINAGE PLAN

C6.02

PRINCE GEORGE COUNTY MINIMUM LANDSCAPE REQUIREMENTS

Landscape Buffer Requirements (sec. 90-826.2.a)

Yard	Requirement		Length / Width	Calculation	Required	Provided
Yard-A (East)	Landscape Type:		669 - 32 Entry - If Esmt			**
	Lg Evgrn Tree:	1 / 15	- 85 If Drive Aisle	(552 ÷ 15) x 1 = 36.80	Lg Evgrn Tree: 37	Lg Decid Tree: 13
	Sm Evgrn Tree:	1 / 5	= 552 If	(552 ÷ 5) x 1 = 110.40	Sm Evgrn Tree: 111	Flowering Tree: 96
	Med. Shrub:	1 / 3	15 Feet Wide	(552 ÷ 3) x 1 = 184.00	Med. Shrub: 184	Med. Shrub: 96
Yard-B (West)	Landscape Type:		2307 - Entry - If Esmt			**
	Lg Evgrn Tree:	1 / 15	- 1510 If Exist Veg	(797 ÷ 15) x 1 = 53.13	Lg Evgrn Tree: 54	Lg Decid Tree: 23
	Sm Evgrn Tree:	1 / 5	= 797 If	(797 ÷ 5) x 1 = 159.40	Sm Evgrn Tree: 160	Evgrn Tree: 39
	Med. Shrub:	1 / 3	15 Feet Wide	(797 ÷ 3) x 1 = 265.67	Med. Shrub: 266	Flowering Tree: 35

Interior Tree Requirements (sec.90-826.5.1 & 2)

Requirement	Parking Spaces	Calculation	Required	Provided
1 Deciduous tree per 10 parking spaces	171	171 ÷ 10 = 17.1	18 Deciduous Trees	17 Large dciduous trees 4 Small dciduous trees

Perimeter Landscape Requirements (90-826.4.a & b)

Requirement	Length	Calculation	Required	Provided
Landscape planting strip Min. width: 10'	N/A	N/A	Plantings	92 Shrubs

* 2 EXISTING LARGE EVERGREEN TREES TO REMAIN AND APPLIED TOWARD REQUIREMENT.
** THOUGH REQUIRED PLANTINGS ARE NOT MET, THE PLANNING DEPARTMENT HAS AWARDED AN ALTERNATE LANDSCAPE DESIGN THAT ACCOMMODATES THE SITE APPROPRIATELY.

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OVERALL LANDSCAPE PLAN

L1.00

PLANT KEY

EVERGREEN TREE	QTY	BOTANICAL NAME
ILE AME	3	ILEX OPACA
ILE NEL	5	ILEX X `NELLIE R STEVENS`
JUN EST	4	JUNIPERUS VIRGINIANA
MAG GRA	3	MAGNOLIA GRANDIFLORA

FLOWERING TREES	QTY	BOTANICAL NAME
AME ARB	6	AMELANCHIER ARBOREA
CER CAN	10	CERCIS CANADENSIS `FOREST PANSY`
COR FLO	2	CORNUS FLORIDA `CHEROKEE PRINCESS`
LAG MUS	2	LAGERSTROEMIA INDICA `MUSKOGEE`

LARGE TREES	QTY	BOTANICAL NAME
ACE RUB	3	ACER RUBRUM `RED SUNSET`
BET NIG	4	BETULA NIGRA `DURAHEAT`
NYS WIL	4	NYSSA SYLVATICA `WILDFIRE`
PLA ACE	2	PLATANUS X ACERIFOLIA
QUE PHL	8	QUERCUS PHELLOS
ULM PRI	1	ULMUS AMERICANA `PRINCETON`

SHRUBS	QTY	BOTANICAL NAME
ITE LIT	169	ITEA VIRGINICA `LITTLE HENRY` TM

EVERGREEN SHRUBS	QTY	BOTANICAL NAME
ILE GLA	15	ILEX GLABRA
ILE RED	15	ILEX VERTICILLATA `RED SPRITE`

GRASSES	QTY	BOTANICAL NAME
PAN SHE	97	PANICUM VIRGATUM `SHENANDOAH`

SOD/SEED	QTY	BOTANICAL NAME
SOD	6,909 SF	SOD

AD-02

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LANDSCAPE PLAN

L1.03

PLANT KEY

EVERGREEN TREE	QTY	BOTANICAL NAME
MAG GRA	4	MAGNOLIA GRANDIFLORA
FLOWERING TREES	QTY	BOTANICAL NAME
AME ARB	4	AMELANCHIER ARBOREA
CER CAN	7	CERCIS CANADENSIS `FOREST PANSY`
COR FLO	2	CORNUS FLORIDA `CHEROKEE PRINCESS`
LAG MUS	4	LAGERSTROEMIA INDICA `MUSKOGEE`
MAG SWE	5	MAGNOLIA VIRGINIANA
VIT SHO	2	VITEX AGNUS-CASTUS `SHOAL CREEK`
LARGE TREES	QTY	BOTANICAL NAME
ACE RUB	1	ACER RUBRUM `RED SUNSET`
NYS WIL	1	NYSSA SYLVATICA `WILDFIRE`
PLA ACE	2	PLATANUS X ACERIFOLIA
QUE PHL	5	QUERCUS PHELLOS
ULM PRI	2	ULMUS AMERICANA `PRINCETON`
SHRUBS	QTY	BOTANICAL NAME
DEU NI5	154	DEUTZIA GRACILIS `NIKKO DWARF`
ILE HGD	18	ILEX CRENATA `HOOGENDORN`
VIB VIB	2	VIBURNUM X BURKWOODII `MOHAWK`
EVERGREEN SHRUBS	QTY	BOTANICAL NAME
ILE DWA	14	ILEX CORNUTA `DWARF BURFORD`
ILE GLA	62	ILEX GLABRA
ILE JIM	3	ILEX VERTICILLATA `JIM DANDY`
ILE RED	18	ILEX VERTICILLATA `RED SPRITE`
PRU OTT	15	PRUNUS LAUROCERASUS `OTTO LUYKEN`
THU EME	11	THUJA OCCIDENTALIS `EMERALD`
GRASSES	QTY	BOTANICAL NAME
PAN SHE	53	PANICUM VIRGATUM `SHENANDOAH`
GROUND COVERS	QTY	BOTANICAL NAME
RUD YIU	41	RUDBECKIA SPECIOSA `VIETTE'S LITTLE SUZY`

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LANDSCAPE PLAN

L1.04

Thank you for purchasing TREEDIAPER®
For best results, please follow these procedures to install and use your TreeDiaper® product!

TREEDIAPER®
Advanced Plant Hydration System
INSTRUCTIONS

For Trees and Shrubs

A) Placing treemat up to 2 months before the dry season of your region

1. Place the TreeDiaper® product on top of soil around plants. Make sure the pellets inside the TreeDiaper® product are evenly distributed.

2. (Recommended, but optional) Cover with 2" of mulch to disguise and protect the TreeDiaper® product. **Do not cover with soil**. Landscaping staples can be used in a high wind region.

3. Water trees if wilting or yellow leaves appear or once every three to four (3-4) weeks if less than 1" of rainfall during that period.

B) Placing treemat during or less than two months before drought

1. Place the TreeDiaper® product completely submerged in water in a sink or bucket for at least 5 hours or overnight.

2. Follow steps 1-3 from procedure A.

C) Using treemat with an irrigation system

1. Follow procedure A or B.

2. Let drip irrigation water the top of the mat.

NOTE:
- **Always place the mat with the darker black woven side facing up!**
- Covering with mulch, pine needles, or leaves is recommended.
- Do not place any soil, dirt, fine sand, compost, or iron-based sticks or tomato cage on top of TreeDiaper® products. This may result in the loss of functionalities of TreeDiaper® products.
- Direct contact of fertilizers with the material in use or in storage may temporarily or permanently affect the performance of the product.
- Do not poke TreeDiaper® products with sticks. Damage to the surface integrity of the TreeDiaper® products may decrease functionality of the product.

If you have any questions, please email info@treediaper.com.
Version 2.0.17. Updated on 9/25/2017

zynnovation LLC

NOTE:
TREE DIAPER TO BE USED FOR TREES WITHIN WESTERN BUFFER (YARD-B).

CARE OF SEEDLINGS UNTIL PLANTED
SEEDLINGS SHOULD BE PLANTED IMMEDIATELY. IF IT IS NECESSARY TO STORE MOSS-PACKED SEEDLINGS FOR MORE THAN 2 WEEKS, ONE PINT OF WATER PER PKG. SHOULD BE ADDED. IF CLAY-TREATED, DO NOT ADD WATER TO PKG. PACKAGES MUST BE SEPARATED TO PROVIDE VENTILATION TO PREVENT "HEATING". SEPARATE PACKAGES WITH WOOD STRIPS AND STORE OUT OF THE WIND IN A SHADED, COOL (NOT FREEZING) LOCATION.

CARE OF SEEDLINGS DURING PLANTING
WHEN PLANTING, ROOTS MUST BE KEPT MOIST UNTIL TREES ARE IN THE GROUND. DO NOT CARRY SEEDLINGS IN YOUR HAND EXPOSED TO THE AIR AND SUN. KEEP MOSS-PACKED SEEDLINGS IN A CONTAINER PACKED WITH WET MOSS OR FILLED WITH THICK MUDDY WATER. COVER CLAY-TREATED SEEDLINGS WITH WET BURLAP ONLY. ALL BARE ROOT SEEDLINGS SHALL BE TREATED WITH ROOT DIP ABSORBENT POLYMERS AND MYCORRHIZAL ROOT DIP INOCULATES IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS. SAID ROOT DIP SHALL BE MYCORTREE® ROOT DIP OR APPROVED EQUAL.

HAND PLANTING

EXCAVATE HOLE DEEP ENOUGH TO CONTAIN ROOT SYSTEM WITHOUT BENDING ROOTS. | PLACE SEEDLING AT CORRECT DEPTH WITH ROOT CROWN LEVEL WITH IN-SITU SOIL OR SLIGHTLY HIGHER. | USE NEARBY TOPSOIL TO PLACE AROUND SEEDLING TO COVER ROOT CROWN BY 1-2". | PLANTING SHALL RESULT IN A MOUND 2-3" ABOVE SURROUNDING ELEVATION.

FIRM SOIL AROUND SEEDLING WITH FEET. | TEST PLANTING BY PULLING LIGHTLY ON SEEDLING. | PLACE 1 1/2" - 2" DEEP AND INSTALL TREE MAT. | SATURATE PLANTING HOLE WITH WATER.

DON'T EXPOSE ROOTS TO AIR DURING FREEZE OR PLANT IN FROZEN GROUND. ROOT COLLAR SHALL BE 1"-2" BELOW SOIL. | PLANT SEEDLINGS UPRIGHT - NOT AT AN ANGLE.

DO NOT BEND ROOTS SO THAT THEY GROW UPWARDS OUT OF THE GROUND. | ALWAYS PLANT IN SOIL - NEVER LOOSE LEAVES OR DEBRIS. PACK SOIL TIGHTLY.

9 TUBELING AND BARE-ROOT INSTALLATION
NTS

5 GROUNDCOVER PLANTING DETAIL
NTS

SODDING PROCEDURE:
1. THE GENERAL CONTRACTOR WILL PROVIDE GRADES TO (+/- 20) OF A FOOT OF PROPOSED GRADES.
2. CULTIVATE ENTIRE AREA TO A MINIMUM DEPTH OF 6", HAND-RAKE SMOOTH.
3. ADD ADDITIVES (PER SOIL TEST ANALYSIS) & ROTOTILL.
4. WATER AREA TO BE SODDED PRIOR TO LAYING SOD.
5. LAY & ROLL SOD, WATER THOROUGHLY.

6 SOD INSTALLATION DETAIL
1" = 1'-0"

NOTE:
- INSTALL TREE SHELTERS OVER TREE SEEDLINGS.
- PLANTING SITE TO BE INSPECTED ANNUALLY TO ENSURE TREE SHELTERS AND STAKES REMAIN SOUND AND UPRIGHT.
- INSTALL TREE MATS AT TIME OF PLANTING TO PROVIDE 3 YEARS OF WEED CONTROL.
- DISPOSE OF TREE SHELTER FRAGMENTS AS THEY BREAKDOWN NATURALLY.
- REMOVE TREE SHELTER IF FILLED BY FAST GROWING TREE.

NOTE:
*SEEDLINGS SPACED AT NO LESS THAN 8' O.C. WITH TUBES RENDER 700 SEEDLINGS PER ACRE. *REFER TO "SITE STOCKING REQUIREMENTS BY PLANTING TYPE" CHART FOR PROJECT SPECIFIC SPACING.

7 REFORESTATION (BARE-ROOT)
3/4" = 1'-0"

1 DECIDUOUS TREE PLANTING DETAIL
NTS

2 MULTI-STEM TREE PLANTING DETAIL
NTS

3 EVERGREEN TREE PLANTING DETAIL
NTS

8 REFORESTATION SIGN
3/4" = 1'-0"

4 SHRUB PLANTING DETAIL
NTS

GENERAL NOTES

PRE-CONSTRUCTION

- CONTRACTOR IS RESPONSIBLE FOR CONTACTING "MISS UTILITY" AT 1.800.552.7001 FOR LOCATION OF ALL UTILITY LINES.TREES SHALL BE LOCATED A MINIMUM OF 5 FEET FROM SEWER/WATER CONNECTIONS. NOTIFY LANDSCAPE ARCHITECT OF CONFLICTS.
- VERIFY ALL PLANT MATERIAL QUANTITIES ON THE PLAN PRIOR TO BIDDING. PLANT LIST TOTALS ARE FOR CONVENIENCE ONLY AND SHALL BE VERIFIED PRIOR TO BIDDING.
- PROVIDE PLANT MATERIALS OF QUANTITY, SIZE, GENUS, SPECIES, AND VARIETY INDICATED ON PLANS. ALL PLANT MATERIALS AND INSTALLATION SHALL COMPLY WITH RECOMMENDATIONS AND REQUIREMENTS OF ANSI Z60.1 "AMERICAN STANDARD FOR NURSERY STOCK". IF SPECIFIED PLANT MATERIAL IS NOT OBTAINABLE, SUBMIT PROOF OF NON AVAILABILITY TO THE LANDSCAPE ARCHITECT, TOGETHER WITH PROPOSAL FOR USE OF EQUIVALENT MATERIAL.
- PROVIDE AND INSTALL ALL PLANTS AS IN ACCORDANCE WITH DETAILS AND CONTRACT SPECIFICATIONS.
- SOIL TESTS SHALL BE PERFORMED TO DETERMINE SOIL CHARACTER AND QUALITY. NECESSARY SOIL AMENDMENTS SHALL BE PERFORMED PER TEST RESULTS TO ENSURE PLANT HEALTH.

CONSTRUCTION/INSTALLATION

- LANDSCAPE ARCHITECT RESERVES THE RIGHT TO REJECT ANY PLANTS AND MATERIALS THAT ARE IN AN UNHEALTHY OR UNSIGHTLY CONDITION, AS WELL AS PLANTS AND MATERIALS THAT DO NOT CONFORM TO ANSI Z60.1 "AMERICAN STANDARD FOR NURSERY STOCK"
- LABEL AT LEAST ONE TREE AND ONE SHRUB OF EACH VARIETY AND CALIPER WITH A SECURELY ATTACHED, WATERPROOF TAG BEARING THE DESIGNATION OF BOTANICAL AND COMMON NAME.
- INSTALL LANDSCAPE PLANTINGS AT ENTRANCES/EXITS AND PARKING AREAS ACCORDING TO PLANS SO THAT MATERIALS WILL NOT INTERFERE WITH SIGHT DISTANCES.
- CONTRACTOR IS RESPONSIBLE FOR WATERING ALL PLANT MATERIAL DURING INSTALLATION AND UNTIL FINAL INSPECTION AND ACCEPTANCE BY OWNER. CONTRACTOR SHALL NOTIFY OWNER OF CONDITIONS WHICH AFFECTS THE GUARANTEE.

INSPECTIONS/GUARANTEE

- UPON COMPLETION OF LANDSCAPE INSTALLATION, THE LANDSCAPE CONTRACTOR SHALL NOTIFY THE GENERAL CONTRACTOR WHO WILL VERIFY COMPLETENESS, INCLUDING THE REPLACEMENT OF ALL DEAD PLANT MATERIAL. CONTRACTOR IS RESPONSIBLE FOR SCHEDULING A FINAL INSPECTION BY THE LANDSCAPE ARCHITECT.
- ALL EXTERIOR PLANT MATERIALS SHALL BE GUARANTEED FOR ONE FULL YEAR AFTER DATE OF FINAL INSPECTION AGAINST DEFECTS INCLUDING DEATH AND UNSATISFACTORY GROWTH. DEFECTS RESULTING FROM NEGLECT BY THE OWNER, ABUSE OR DAMAGE BY OTHERS, OR UNUSUAL PHENOMENA OR INCIDENTS WHICH ARE BEYOND THE CONTRACTORS CONTROL ARE NOT THE RESPONSIBILITY OF THE CONTRACTOR.
- PLANT MATERIAL QUANTITIES AND SIZES WILL BE INSPECTED FOR COMPLIANCE WITH APPROVED PLANS BY A SITE PLAN REVIEW AGENT OF THE PLANNING DEPARTMENT PRIOR TO THE RELEASE OF THE CERTIFICATE OF OCCUPANCY.
- REMOVE ALL GUY WIRES AND STAKES 12 MONTHS AFTER INSTALLATION.

PLANT SCHEDULE

EVERGREEN TREE	QTY	BOTANICAL NAME	COMMON NAME	MIN. INSTALLED SIZE	ROOT	
ILE AME	9	ILEX OPACA	AMERICAN HOLLY	6` HT.	B&B	
ILE NEL	14	ILEX X `NELLIE R STEVENS`	HOLLY	8` HT.	B&B	
JUN EST	10	JUNIPERUS VIRGINIANA	EASTERN RED CEDAR	6` HT.	CONTAINER	
MAG GRA	10	MAGNOLIA GRANDIFLORA	SOUTHERN MAGNOLIA	6` HT.	B&B	
FLOWERING TREES	QTY	BOTANICAL NAME	COMMON NAME	MIN. INSTALLED SIZE	ROOT	
AME ARB	19	AMELANCHIER ARBOREA	DOWNY SERVICEBERRY	2" CAL.	B&B	
CER CAN	33	CERCIS CANADENSIS `FOREST PANSY`	EASTERN REDBUD	2" CAL.	B&B	
COR FLO	13	CORNUS FLORIDA `CHEROKEE PRINCESS`	CHEROKEE PRINCESS DOGWOOD	6` HT.	B&B	
CRA VIR	4	CRATAEGUS VIRIDIS `WINTER KING`	WINTER KING HAWTHORN	8` HT.	B&B	
LAG MUS	10	LAGERSTROEMIA INDICA `MUSKOGEE`	MUSKOGEE CRAPE MYRTLE	8` HT.	B&B	
MAG SWE	5	MAGNOLIA VIRGINIANA	SWEET BAY	8` HT.	B&B	
VIT SHO	2	VITEX AGNUS-CASTUS `SHOAL CREEK`	CHASTE TREE	4` HT.	B&B OR CONTAINER	
LARGE TREES	QTY	BOTANICAL NAME	COMMON NAME	MIN. INSTALLED SIZE	ROOT	
ACE RUB	14	ACER RUBRUM `RED SUNSET`	RED MAPLE	2" CAL.	B&B	
BET NIG	4	BETULA NIGRA `DURAHEAT`	RIVER BIRCH	10` HT	B&B	
NYS WIL	11	NYSSA SYLVATICA `WILDFIRE`	BLACK GUM	2" CAL.	B&B	
PLA ACE	15	PLATANUS X ACERIFOLIA	LONDON PLANE TREE	2" CAL.	B&B	
QUE PHL	24	QUERCUS PHELLOS	WILLOW OAK	2" CAL.	B&B	
ULM PRI	15	ULMUS AMERICANA `PRINCETON`	AMERICAN ELM	2" CAL.	B&B	
SHRUBS	QTY	BOTANICAL NAME	COMMON NAME	MIN. INSTALLED SIZE	ROOT	SPACING
DEU NI5	154	DEUTZIA GRACILIS `NIKKO DWARF`	SLENDER DEUTZIA	1 GAL.	CONTAINER	18" o.c.
ILE HGD	18	ILEX CRENATA `HOOGENDORN`	HOOGENDORN JAPANESE HOLLY	15" SPRD	CONTAINER	30" o.c.
ITE LIT	307	ITEA VIRGINICA `LITTLE HENRY` TM	VIRGINIA SWEETSPIRE	18" HT.	CONTAINER	30" o.c.
VIB VIB	2	VIBURNUM X BURKWOODII `MOHAWK`	MOHAWK VIBURNUM	7 GAL.	CONTAINER	72" o.c.
EVERGREEN SHRUBS	QTY	BOTANICAL NAME	COMMON NAME	MIN. INSTALLED SIZE	ROOT	SPACING
ILE DWA	37	ILEX CORNUTA `DWARF BURFORD`	DWARF BURFORD HOLLY	24" HT/SPRD	CONTAINER	48" o.c.
ILE GLA	100	ILEX GLABRA	INKBERRY HOLLY	24" HT./SPRD.	CONTAINER	48" o.c.
ILE JIM	3	ILEX VERTICILLATA `JIM DANDY`	JIM DANDY WINTERBERRY	30" HT/SPRD	CONTAINER	48" o.c.
ILE RED	48	ILEX VERTICILLATA `RED SPRITE`	RED SPRITE WINTERBERRY	18" HT.	CONTAINER	48" o.c.
ILE SCH	92	ILEX VOMITORIA `SCHILLINGS`	SCHILLINGS YAUPON HOLLY	18" HT/SPRD	CONTAINER	48" o.c.
PRU OTT	32	PRUNUS LAUROCERASUS `OTTO LUYKEN`	LUYKENS LAUREL	24" HT/SPRD	CONTAINER	60" o.c.
THU EME	19	THUJA OCCIDENTALIS `EMERALD`	EMERALD ARBORVITAE	5` HT	CONTAINER	54" o.c.
GRASSES	QTY	BOTANICAL NAME	COMMON NAME	MIN. INSTALLED SIZE	ROOT	SPACING
PAN SHE	165	PANICUM VIRGATUM `SHENANDOAH`	SWITCH GRASS	18-24" HT/SPREAD	CONTAINER	36" o.c.
GROUND COVERS	QTY	BOTANICAL NAME	COMMON NAME	MIN. INSTALLED SIZE	ROOT	SPACING
RUD YIU	41	RUDBECKIA SPECIOSA `VIETTE`S LITTLE SUZY`	BLACK-EYED SUSAN	1 GAL.	CONTAINER	24" o.c.
SOD/SEED	QTY	BOTANICAL NAME	COMMON NAME	MIN. INSTALLED SIZE	ROOT	SPACING
SOD	16,523 SF	SOD	SOD	SOD		

AD-01
AD-02

* QUANTITIES ARE PROVIDED FOR CONVENIENCE ONLY AND SHALL BE VERIFIED PRIOR TO BIDDING.
* ALL DISTURBED AREAS TO BE SEEDED UNLESS OTHERWISE CALLED OUT AS HARDSCAPE, MULCH, OR SOD.

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LANDSCAPE NOTES AND DETAILS

L2.00

2/15/2021 1:11:31 AM

1 LOADING DOCK / MECHANICAL YARD PLAN
A1.2.1 A1.2.2 1/8" = 1'-0"

2 WALL SECTION
A1.2.2 A1.2.2 3/4" = 1'-0"

3 WALL SECTION
A1.2.2 A1.2.2 3/4" = 1'-0"

4 EQUIPMENT SCREEN DETAIL
A1.2.2 A1.2.2 3/4" = 1'-0"

5 EQUIPMENT SCREEN / RAMP DETAIL
A1.2.2 A1.2.2 3/4" = 1'-0"

6 RAMP SECTION
A1.2.2 A1.2.2 1/4" = 1'-0"

7 STAIR SECTION
A1.2.2 A1.2.2 1/2" = 1'-0"

8 BUILDING ELEVATION
A1.2.2 A1.2.2 1/8" = 1'-0"

9 BUILDING ELEVATION
A1.2.2 A1.2.2 1/8" = 1'-0"

10 BUILDING ELEVATION
A1.2.2 A1.2.2 1/8" = 1'-0"

11 BUILDING ELEVATION
A1.2.2 A1.2.2 1/8" = 1'-0"

STORAGE BUILDING ROOF PLAN
1/8" = 1'-0"

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NEW PRINCE GEORGE ELEMENTARY SCHOOL

DOE PROJECT#: 074-38-00-100
PRINCE GEORGE COUNTY SCHOOLS
4700 Romans Road, Prince George, VA 23875

PROJECT NO: 592926
DATE: January 24, 2021

REVISIONS

DATE	DESCRIPTION
02/12/21	*AD 02

SITE DETAILS

A1.2.2

2/15/2021 1:11:39 AM

1 A1.2.1 A1.2.3 **PUMP STATION PLAN** 1/4" = 1'-0"

2 A1.2.1 A1.2.3 **DUMPSTER ENCLOSURE PLAN** 1/4" = 1'-0"

3 A1.2.3 A1.2.3 **FRONT ELEVATION** 1/4" = 1'-0"

4 A1.2.3 A1.2.3 **REAR ELEVATION** 1/4" = 1'-0"

5 A1.2.3 A1.2.3 **SIDE ELEVATION** 1/4" = 1'-0"

14 A1.2.3 A1.2.3 **WALL SECTION** 3/4" = 1'-0"

13 A1.2.3 A1.2.3 **WALL SECTION** 3/4" = 1'-0"

12 A1.2.3 A1.2.3 **WALL SECTION** 3/4" = 1'-0"

*AD 02

8 A1.2.4 A1.2.3 **FLAG POLE DETAIL** 3/4" = 1'-0"

10 A1.2.3 A1.2.3 **ELEVATION** 1/2" = 1'-0"

11 A1.2.3 A1.2.3 **ELEVATION** 1/2" = 1'-0"

9 A1.2.1 A1.2.3 **SITE PLAN - SCHOOL SIGN** 3/4" = 1'-0"

7 TYP A1.2.3 **BOLLARD DETAIL** 3/4" = 1'-0"

6 A1.2.3 A1.2.3 **WALL SECTION** 3/4" = 1'-0"

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SITE DETAILS

A1.2.3

2/15/2021 1:11:47 AM

4 BUS LOOP CANOPY PLAN

A1.2.1 A1.2.4 — 1/8" = 1'-0"

5 CANOPY SECTION

A1.2.4 A1.2.4 — 3/4" = 1'-0"

3 CANOPY SECTION

A1.2.4 A1.2.4 — 3/4" = 1'-0"

*AD 01

2 CANOPY PLAN

A1.2.1 A1.2.4 — 1/8" = 1'-0"

N

1 PARTIAL FLOOR PLAN - PART A

A1.2.1 A1.2.4 — 1/8" = 1'-0"

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02/12/21	*AD 02

SITE DETAILS

A1.2.4

2/15/2021 1:11:53 AM

ARCHITECTURAL SITE PLAN KEYNOTES

REPRESENTED BY n

APPLIES TO DRAWINGS A1.2.1 - A1.2.5

1	ARCHITECTURAL PRECAST CONCRETE (APC)
2	DAMPPROOFING APPLIED TO EXTERIOR CMU FACE WITH COLLAR JOINT GROUTED SOLID
3	GROUT SOLID
4	METAL CAP FLASHING W/ WEEPS. SLOPE (1) BRICK COURSE TO PREVENT WATER PONDING UNDER APC
5	STRAP ANCHOR W/ DOWEL BETWEEN UNITS BY APC MFR - SEAL WATER TIGHT AT FLASHING
6	ALUMINUM RAILING
7	CONCRETE FINISH TYPE 1
8	CONCRETE FINISH TYPE 2
9	RUBBERIZED SURFACE (INCLUDED IN PLAY GROUND AND SPORTS EQUIPMENT ALLOWANCE)
10	MULCH

*AD 02

4 A1.2.2 A1.2.5 **SECTION DETAIL** 3/4" = 1'-0"

3 A1.2.1 A1.2.5 **DINING PATIO PLAN** 1/8" = 1'-0"

2 A1.2.1 A1.2.5 **COURTYARD NORTH PLAN** 1/8" = 1'-0"

1 A1.2.1 A1.2.5 **COURTYARD SOUTH PLAN** 1/8" = 1'-0"

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02/03/21	*AD 01
02/12/21	*AD 02

SITE DETAILS

*AD 01

A1.2.5

2/15/2021 1:11:55 AM

FLOOR PLAN KEYNOTES

REPRESENTED BY n

APPLIES TO DRAWINGS A2.1.1 - A2.1.6

1	PROVIDE MULLION MATE
2	TV MONITOR
3	KILN
4	PRIVACY CURTAIN ON OVERHEAD TRACK
5	WALL PADS
6	MARKERBOARD WITH MUSIC STAFF LINES
7	OPERABLE PARTITION - VERTICAL FOLDING
8	COAT ROD AND SHELF
9	ROLL UP CURTAIN DIVIDER; WIDTH OF COURT
10	36" X 18" X 75" MTL SHELVING UNIT
11	5 DRAWER LATERIAL FILE CABINET 36" X 20"
12	MOP & BROOM SHELF
13	12"X12"X72" DOUBLE TIER LOCKERS W/ MTL BASES
14	CHIN UP BAR

*AD 02

FLOOR PLAN GENERAL NOTES

A. UNLESS NOTED OTHERWISE, ALL EXTERIOR DIMENSIONS ARE TO THE FACE OF MASONRY OR CENTERLINE OF COLUMN. DIMENSIONS AT DOOR / WINDOW OPENINGS ARE TO FRAMES. CONTRACTOR SHALL COORDINATE ACTUAL REQUIRED MASONRY OPENING. NOTIFY ARCHITECT IF UNCERTAIN AS TO THE STARTING POINT OF A DIMENSION.

B. UNLESS NOTED OTHERWISE ALL INTERIOR DIMENSIONS ARE TO THE FACE OF MASONRY OR FACE OF GYPSUM BOARD. NOTIFY ARCHITECT IF UNCERTAIN AS TO THE STARTING POINT OF A DIMENSION.

C. ALL MARKERBOARDS AND TACKBOARDS SHALL BE MOUNTED AT 30" AFF TO TOP OF MARKER TRAY. CENTER VISUAL DISPLAY ITEMS ON WALL UNLESS NOTED OTHERWISE. WHERE MULTIPLE VISUAL DISPLAYS ARE PLACED IN SERIES, CENTER THE SERIES ON WALL UNLESS NOTED OTHERWISE.

D. ALL INTERIOR CMU CORNERS SHALL BE BULLNOSED. WHERE CEILING TERMINATES AT A BULLNOSE CORNER, PROVIDE A NON-BULLNOSE BLOCK ONLY FOR THE COURSE WHERE THE CEILING TERMINATES.

N

FIRST FLOOR - PART A

1/8" = 1'-0"

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N

KEY PLAN

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FIRST FLOOR PLAN - PART A

A2.1.1

2/15/2021 1:12:03 AM

2/15/2021 1:12:11 AM

NEW PRINCE GEORGE ELEMENTARY SCHOOL

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DATE	DESCRIPTION
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02/12/21	*AD 02

FIRST FLOOR PLAN - PART B

A2.1.2

N

SECOND FLOOR - PART B

1/8" = 1'-0"

2/15/2021 1:12:17 AM

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KEY PLAN

NEW PRINCE GEORGE ELEMENTARY SCHOOL

DOE PROJECT#: 074-38-00-100
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02/12/21	*AD 02

SECOND FLOOR & PENTHOUSE PLAN - PART B

A2.1.5

N

PENTHOUSE LEVEL - PART C

1/8" = 1'-0"

N

PENTHOUSE LEVEL - PART C

1/8" = 1'-0"

N

SECOND FLOOR - PART C

1/8" = 1'-0"

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02/12/21	*AD 02

SECOND FLOOR & PENTHOUSE PLAN - PART C

A2.1.6

2/15/2021 1:12:24 AM

6 WALL SECTION
A2.1.4 A5.1.8 3/4" = 1'-0"

WALL SECTION KEYNOTES

REPRESENTED BY n

APPLIES TO DRAWINGS A5.1.1 - A5.1.17

1	BRICK CORBEL, RUNNING BOND
2	ARCHITECTURAL PRECAST CONCRETE SILL
3	SOLDIER ORIENTED RUNNING BOND, BEYOND
4	ACOUSTICAL BATT INSULATION
5	THRU-WALL SCUPPER
6	REVEAL JOINT
7	WOOD CAP
8	SOLID SURFACE SILL
9	ALUMINUM SOFFIT PANEL
10	PREFAB ALUMINUM CANOPY SYSTEM
11	INTERIOR BUTT GLAZED GLASS PARTITION WALL
12	STEEL SHELVING SUPPORT TUBE. SLOTTED TO RECEIVE ADJUSTABLE HEIGHT SHELF ARM
13	GLASS SHELF
14	STEEL SHELF ARM
15	WOOD VENEER
16	1/2" PLYWOOD
17	WOOD BLOCKING
18	SEALANT, ALL SIDES - TOOL TO 90°.
19	RUBBER PAD, MIN. 2 PER SHELF SUPPORT
20	PREFABRICATED DISPLAY CASE WITH 2 SHELVES

5 WALL SECTION
A2.1.2 A5.1.8 3/4" = 1'-0"

4 WALL SECTION
A2.1.1 A5.1.8 3/4" = 1'-0"

3 WALL SECTION
A2.1.1 A5.1.8 3/4" = 1'-0"

2 WALL SECTION
A2.1.2 A5.1.8 3/4" = 1'-0"

1 WALL SECTION
A2.1.1 A5.1.8 3/4" = 1'-0"

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REVISIONS

DATE	DESCRIPTION
02/12/21	*AD 02

WALL SECTIONS

A5.1.8

2/15/2021 1:12:30 AM

10 WALL SECTION A5.1.12 A5.1.17 3/4" = 1'-0"

9 ELEVATION A2.0.2 A5.1.17 1/4" = 1'-0"

8 ELEVATION A2.0.2 A5.1.17 1/4" = 1'-0"

7 ELEVATION A2.0.1 A5.1.17 1/4" = 1'-0"

5 DETAIL A5.1.17 A5.1.17 3" = 1'-0"

6 DETAIL A5.1.17 A5.1.17 1 1/2" = 1'-0"

4 DETAIL A5.1.17 A5.1.17 3" = 1'-0"

3 WALL SECTION A2.1.1 A5.1.17 1 1/2" = 1'-0"

2 ENLARGED PLAN A2.1.2 A5.1.17 3/4" = 1'-0"

1 ENLARGED PLAN A2.1.1 A5.1.17 3/4" = 1'-0"

WALL SECTION KEYNOTES

REPRESENTED BY n

APPLIES TO DRAWINGS A5.1.1 - A5.1.17

1	BRICK CORBEL, RUNNING BOND
2	ARCHITECTURAL PRECAST CONCRETE SILL
3	SOLDIER ORIENTED RUNNING BOND, BEYOND
4	ACOUSTICAL BATT INSULATION
5	THRU-WALL SCUPPER
6	REVEAL JOINT
7	WOOD CAP
8	SOLID SURFACE SILL
9	ALUMINUM SOFFIT PANEL
10	PREFAB ALUMINUM CANOPY SYSTEM
11	INTERIOR BUTT GLAZED GLASS PARTITION WALL
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13	GLASS SHELF
14	STEEL SHELF ARM
15	WOOD VENEER
16	1/2" PLYWOOD
17	WOOD BLOCKING
18	SEALANT, ALL SIDES - TOOL TO 90°.
19	RUBBER PAD, MIN. 2 PER SHELF SUPPORT
20	PREFABRICATED DISPLAY CASE WITH 2 SHELVES

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WALL SECTIONS AND DISPLAY CASE DETAILS

*AD 02

A5.1.17

2/15/2021 1:12:39 AM

11 TREAD & RISER DETAIL
A6.1.2 | A6.1.2 — 1 1/2" = 1'-0"

9 STAIR SECTION
A2.1.6 | A6.1.2 — 1/2" = 1'-0"

7 STAIR C302 - PENTHOUSE PLAN
A2.1.6 | A6.1.2 — 1/4" = 1'-0"

4 STAIR PLAN
A2.1.4 | A6.1.2 — 1/4" = 1'-0"

10 ELEVATOR SECTION
A6.1.2 | A6.1.2 — 1/2" = 1'-0"

8 STAIR SECTION
A2.1.6 | A6.1.2 — 1/2" = 1'-0"

6 STAIR C201 - SECOND FLOOR PLAN
A2.1.6 | A6.1.2 — 1/4" = 1'-0"

3 STAIR B201 PLAN
A2.1.2 | A6.1.2 — 1/4" = 1'-0"

5 STAIR C101 - FIRST FLOOR PLAN
A2.1.3 | A6.1.2 — 1/4" = 1'-0"

2 ENLARGED ELEVATOR PLAN - SECOND FLOOR
A2.1.5 | A6.1.2 — 1/4" = 1'-0"

1 ENLARGED ELEVATOR PLAN - FIRST FLOOR
A2.1.2 | A6.1.2 — 1/4" = 1'-0"

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DATE	DESCRIPTION
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ENLARGED STAIR PLANS & SECTIONS

A6.1.2

2/15/2021 1:12:46 AM

STRUCTURAL ABBREVIATIONS

AB	ANCHOR BOLT	HORIZ	HORIZONTAL
AESS	ARCHITECTURALLY EXPOSED STRUCTURAL STEEL	HS	HIGH STRENGTH
		HSS	HOLLOW STRUCTURAL SECTION
AFF	ABOVE FINISHED FLOOR	HT	HEIGHT
ALUM	ALUMINUM	IN	INCH
APPROX	APPROXIMATE	INFO	INFORMATION
ARCH	ARCHITECTURAL, ARCHITECT	INT	INTERIOR
AVG	AVERAGE	JBE	JOIST BEARING ELEVATION
BLDG	BUILDING	JS	JOIST SUBSTITUTE
BM	BEAM	JST	JOIST
BOT	BOTTOM	JT	JOINT
BRG	BEARING	K	KIP
BTWN	BETWEEN	LBS	POUNDS
CANT	CANTILEVER	LF	LINEAR FEET (FOOT)
CFSF	COLD FORMED STEEL FRAMING	LLH	LONG LEG HORIZONTAL
CIP	CAST IN PLACE	LLV	LONG LEG VERTICAL
CJ	CONTROL JOINT	M	METER(S)
CLG	CEILING	MAS	MASONRY
CLR	CLEAR	MATL	MATERIAL
CMU	CONCRETE MASONRY UNIT	MAX	MAXIMUM
COL	COLUMN	MECH	MECHANICAL
CONC	CONCRETE	MFR	MANUFACTURER
CONN	CONNECTION	MIN	MINIMUM
CONSTR	CONSTRUCTION	MM	MILLIMETER(S)
CONT	CONTINUOUS	NOM	NOMINAL
CTR	CENTER	NS	NON SHRINK
DBA	DEFORMED BAR ANCHOR	OC	ON CENTER
DBL	DOUBLE	OD	OUTSIDE DIAMETER
DIA	DIAMETER	OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
DIAG	DIAGONAL	OPNG	OPENING
DIM	DIMENSION	OPP	OPPOSITE
DN	DOWN	PC CONC	PRECAST CONCRETE
DN	DRAWING	PEMB	PRE-ENGINEERED METAL BUILDING
EA	EACH	PFBC	PRE-FABRICATED BUILDING COLUMN
EF	EACH FACE	PLF	POUNDS PER LINEAR FOOT
EJ	EXPANSION JOINT	POLY	POLYETHYLENE
EL	ELEVATION	PPT	PRESSURE PRESERVATIVE TREATED
ELECT	ELECTRICAL	PSF	POUNDS PER SQUARE FOOT
ELEV	ELEVATOR	R	RADIUS
EOD	EDGE OF DECK	RD	ROOF DRAIN
EOS	EDGE OF SLAB	REF	REFERENCE
EQ	EQUAL	REINF	REINFORCING, REINFORCED
EW	EACH WAY	REQ'D	REQUIRED
EX	EXISTING	SIM	SIMILAR
EXP	EXPANSION	SL	SLOPE
EXT	EXTERIOR	SOG	SLAB ON GRADE
FB	FIXED BASE	SPA	SPACES
FD	FLOOR DRAIN	SS	STAINLESS STEEL
FDN	FOUNDATION	STD	STANDARD
FF	FINISHED FLOOR	STIFF	STIFFENER
FIN	FINISHED	STRUCT	STRUCTURAL
FLR	FLOOR	SUSP	SUSPENDED
FOB	FACE OF BRICK	SYM	SYMMETRY(RICAL)
FOC	FACE OF CONCRETE	T&B	TOP AND BOTTOM
FOM	FACE OF MASONRY	T&G	TONGUE AND GROOVE
FRMG	FRAMING	TF	TRANSFER FORCE
FRT	FIRE RETARDANT TREATED	TOC	TOP OF CONCRETE
FT	FOOT	TOS	TOP OF STEEL
FTG	FOOTING	TOSL	TOP OF SLAB
GA	GAGE	TOW	TOP OF WALL
GALV	GALVANIZED	TYP	TYPICAL
GB	GRADE BEAM	UNO	UNLESS NOTED OTHERWISE
GC	GENERAL CONTRACTOR	VB	VAPOR BARRIER
GRD	GRADE	VERT	VERTICAL
HD	HEADED	VR	VAPOR RETARDER
HK	HOOK	WPT	WORK POINT
		WWF	WELDED WIRE FABRIC

STRUCTURAL MATERIALS LEGEND

- EARTH
- CAST IN PLACE CONCRETE
- CLAY BRICK
- HOLLOW CONCRETE BLOCK
- SPLIT-FACE CONCRETE BLOCK
- GROUT FILLED CONCRETE BLOCK
- PRECAST CONCRETE
- POROUS FILL OR GRANULAR BASE COURSE
- CMU SHEAR WALLS

℄	CENTERLINE
JBE (+X'-X")	JOIST BEARING ELEVATION
BP1, BP2	BEAM BEARING PLATE
BP-A, BP-B ...	COLUMN BASE PLATE
P-1, P-2 ...	CONCRETE PIER
JS	JOIST SUBSTITUTE
SP	SPECIAL JOIST
	WALL FOOTING STEP
-X'-X"	TOP OF FOOTING ELEVATION
WPT	WORK POINT
(X'-X")	TOP OF SLAB ELEVATION
L1, L2 ...	LINTEL
X.X	COLUMN FOOTING
(+X'-X")	TOP OF STEEL BEAM ELEVATION
(J)	INDICATES TOP OF STRUCTURAL MEMBER SHALL BE IN SAME PLANE AS TOP OF JOIST
(SL)	INDICATES TOP OF STRUCTURAL MEMBER SHALL BE SLOPED
WFX.X	WALL FOOTING
	THICKENED SLAB
*	STEEL JOIST BOTTOM CHORD EXTENSION, WELDED
	STEEL BEAM MOMENT CONNECTION
TF	TRANSFER FORCE
#5@48"	CMU WALL REINFORCING SIZE AND SPACING
	CHANGE IN SLAB ELEVATION

DESIGN LOAD DATA

1. CLASSIFICATION OF BUILDING
   RISK CATEGORY (IBC TABLE 1604.5) — III

2. FLOOR LIVE LOADS

	UNIFORM	CONCENTRATED
OFFICES	50 PSF	2000 LB
PARTITION ALLOWANCE	15 PSF	
CLASSROOMS	50 PSF	1000 LB
CORRIDORS ABOVE FIRST FLOOR	80 PSF	1000 LB
LOBBIES AND FIRST FLOOR CORRIDORS	100 PSF	1000 LB
LIGHT STORAGE	125 PSF	
MECHANICAL ROOMS	150 PSF	
CATWALKS	40 PSF	300 LB
LIBRARIES		
STACK ROOM	150 PSF	1000 LB
READING ROOM	60 PSF	1000 LB
STAIRS	100 PSF	
ACCESS FLOOR SYSTEMS		
OFFICE USE	50 PSF	2000 LB
COMPUTER USE	100 PSF	2000 LB

CONCENTRATED LOAD APPLIED OVER 2'-6" x 2'-6" AREA.

REDUCTION OF FLOOR LIVE LOAD HAS NOT BEEN UTILIZED.

3. ROOF LIVE LOADS

MINIMUM ROOF LIVE LOAD	20 PSF	300 LB
ROOF GARDEN	100 PSF	
ASSEMBLY	100 PSF	

CONCENTRATED LOAD APPLIED OVER 2'-6" x 2'-6" AREA.

REDUCTION OF MINIMUM ROOF LIVE LOAD HAS NOT BEEN UTILIZED.

4. SUPERIMPOSED DEAD LOADS

ROOF	20 PSF
PENTHOUSE, MECHANICAL AREAS	20 PSF
STORAGE, STAIRS	-
ALL FRAMED FLOORS, UNO.	13 PSF

5. ROOF SNOW LOAD

GROUND SNOW LOAD (Pg)	20 PSF
IMPORTANCE FACTOR (Is)	1.1
EXPOSURE FACTOR (Ce)	1.0
THERMAL FACTOR (Ct)	1.0
MINIMUM Pf FOR Pg ≤ 20 PSF: Pf min = Pg x I	22 PSF
SLOPED ROOF SNOW LOAD (Ps = Cs x Pf)	22 PSF

6. WIND DESIGN DATA

ULTIMATE DESIGN WIND SPEED (3 SECOND GUST)	120 MPH
NOMINAL DESIGN WIND SPEED (3 SECOND GUST)	93 MPH
EXPOSURE	B
INTERNAL PRESSURE COEFFICIENT (GCpi)	±0.18 (ENCLOSED)
COMPONENTS AND CLADDING	REFER TO TABLE BELOW (PER IBC 2012 AND ASCE 7)

7. SEISMIC DESIGN DATA

SEISMIC DESIGN CATEGORY	B
SEISMIC IMPORTANCE FACTOR (Ie)	1.25
SITE CLASS	D
MAPPED SPECTRAL RESPONSE ACCELERATIONS	
(Ss)	0.156
(S1)	0.059
DESIGN SPECTRAL RESPONSE ACCELERATIONS	
(Sds)	0.167
(Sd1)	0.094
BASIC SEISMIC FORCE RESISTING SYSTEM:	B. BUILDING FRAME SYSTEM INTERMEDIATE REINFORCES MASONRY SHEAR WALLS
ALL STEEL SYSTEMS ARE:	H. SYSTEMS NOT SPECIFICALLY DETAILED FOR SEISMIC RESISTANCE.
RESPONSE MODIFICATION COEFFICIENT (R)	3.0
SYSTEM OVERSTRENGTH FACTOR	2.5
DEFLECTION AMPLIFICATION FACTOR	2.25
SEISMIC RESPONSE COEFFICIENT (Cs)	0.069
DESIGN BASE SHEAR (V = Cs x W)	0.069W
ANALYSIS PROCEDURE	EQUIVALENT LATERAL FORCE PROCEDURE
AREA SPECIFIC BASE SHEAR	
AREA A	286k
AREA B WING	84k
AREA C WING	185k
AREA B/C	144k
STORAGE BLDG	5k

*AD 02

8. LATERAL EARTH PRESSURE (EQUIVALENT FLUID PRESSURES)

AT REST (BRACED WALLS)	60 PCF
ACTIVE (CANTILEVERED WALLS)	40 PCF
PASSIVE	-
SLIDING FRICTION COEFFICIENT	0.35

STEEL DECK SCHEDULE

DECK TYPE 1	1 1/2" - 20 GAGE WIDE RIB ROOF DECK, GALVANIZED	FASTEN TO ALL SUPPORTS WITH HILTI X-HSN24 AT 36/7 PATTERN, AND AT 6" OC AT ALL EDGES AND END LAPS. FASTEN SIDELAPS WITH #12 TEK SCREWS AT 12" OC. (575 PLF SEISMIC)
DECK TYPE 2	3" - 20 GAGE ACOUSTIC ROOF DECK, GALVANIZED AND SHOP PRIMED	FASTEN TO ALL SUPPORTS WITH HILTI X-ENP19 AT 24/8 PATTERN, AND AT 6" OC AT ALL EDGES. FASTEN SIDELAPS BY WITH #12 TEK SCREWS AT 18" OC. (500 PLF SEISMIC)
DECK TYPE 3	1 1/2" - 18 GAGE COMPOSITE FLOOR DECK, GALVANIZED	FASTEN TO ALL SUPPORTS AND EDGES WITH 5/8" DIAMETER PUDDLE WELDS 36/4 PATTERN AT 12" OC. FASTEN SIDELAPS WITH #10 TEK SCREWS AT 24" OC.

*AD 02

STEEL DECK FASTENER LAYOUT

LEGEND FOR SECTION AND DETAIL MARKS

SECTION AND DETAIL (WHERE DRAWN)

SECTION WHERE CUT

DETAIL WHERE CUT

DESIGN WIND PRESSURE FOR COMPONENTS AND CLADDING (ULTIMATE DESIGN PSF)								
ROOF ZONE	COMPONENT EFFECTIVE WIND AREA (SF)							
	≤10		20		50		≥100	
1	+16	-27	+16	-26	+16	-25	+16	-25
2	+24	-45	+23	-41	+22	-34	+21	-29
3	+24	-45	+23	-41	+22	-34	+21	-29
WALL ZONE	COMPONENT EFFECTIVE WIND AREA (SF)							
	≤10		20		50		≥100	
4	+25	-27	+24	-26	+22	-24	+21	-23
5	+25	-33	+24	-31	+22	-28	+21	-26

NOTES:

1. POSITIVE AND NEGATIVE SIGNS SIGNIFY PRESSURES ACTING TOWARD AND AWAY FROM SURFACES, RESPECTIVELY.
2. BUILDING ZONES ARE DEFINED IN ASCE 7-10.
3. REDUCTION FACTORS FOR EFFECTIVE WIND AREAS ARE ALLOWED AS DEFINED BY TABLE 30.7.2 OF ASCE 7-10.

GENERAL

1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE VIRGINIA UNIFORM STATEWIDE BUILDING CODE (USBC), 2015 EDITION, EFFECTIVE SEPTEMBER 4, 2018.
2. THE STRUCTURAL DRAWINGS ARE INTENDED TO BE USED IN CONJUNCTION WITH THE ARCHITECTURAL DRAWINGS AND THE DRAWINGS OF THE OTHER ENGINEERING DISCIPLINES.
3. THE CONTRACT DOCUMENTS ARE COMPLEMENTARY AND WHAT IS REQUIRED BY ONE SHALL BE AS BINDING AS IF REQUIRED BY ALL. IN THE CASE OF A CONFLICT, DISAGREEMENT, OR AMBIGUITY, PROVIDE THE BETTER QUALITY. IN THE CASE OF A CONFLICT, DISAGREEMENT, OR AMBIGUITY, PROVIDE THE GREATER QUANTITY OF WORK.
4. VERIFY AND COORDINATE MECHANICAL UNIT SUPPORTS AND OPENINGS WITH EQUIPMENT PURCHASED FOR THE PROJECT. COORDINATE REQUIREMENTS FOR SLEEVES, HANGERS, INSERTS, ANCHORS AND ALL OTHER ITEMS TO BE SET IN STRUCTURAL WORK.
5. SPECIAL INSPECTIONS ARE REQUIRED BY THE VUSC8 (SECTION 1704). REFER TO THE STATEMENT OF SPECIAL INSPECTIONS PREPARED FOR THIS PROJECT AND THE PROJECT SPECIFICATIONS FOR SPECIFIC INSPECTION REQUIREMENTS. REFER TO SPECIFICATION SECTION 014000 FOR GENERAL INSPECTION REQUIREMENTS.

FOUNDATIONS

1. FOUNDATIONS ARE DESIGNED TO BEAR ON ORIGINAL UNDISTURBED SOIL OR CONTROLLED COMPACTED FILL WITH AN ALLOWABLE BEARING CAPACITY OF 2000 PSF. IN ACCORDANCE WITH THE GEOTECHNICAL ENGINEERING REPORT PREPARED BY ECS, LTD DATED JANUARY 22, 2021.
2. THE GEOTECHNICAL ENGINEER FOR THE OWNERS TESTING AGENCY SHALL VERIFY BEARING CAPACITY AND SUITABILITY OF SUBGRADE PRIOR TO PLACING FOUNDATIONS AND GRADE SLABS.
3. SELECT AND PLACE CONTROLLED COMPACTED FILL UNDER DIRECT SUPERVISION OF THE GEOTECHNICAL ENGINEER FOR THE OWNERS TESTING AGENCY.
4. FOOTING STEPS FOR UNDERSLAB UTILITIES INDICATED ON FOUNDATION PLANS SHALL BE CONSIDERED APPROXIMATE. COORDINATE FOOTINGS WITH ACTUAL LOCATION, SIZE AND INVERT OF ALL UNDERGROUND PIPE (AND CONDUIT). REFER TO "FOOTING STEP" DETAIL TO STEP WALL FOOTING DOWN TO ALLOW UNDERSLAB PIPING TO PASS ABOVE THE FOOTING. ALTERNATELY, REFER TO "FOOTING SLEEVE" AND "PIPE TRENCH BACKFILL AT FOOTING" DETAILS TO ALLOW UNDERSLAB PIPING TO PASS BELOW THE TOP OF THE WALL FOOTING.
5. AVOID INFLUENCE OF PIPE TRENCH PARALLEL TO WALL FOOTING AND / OR ADJACENT TO COLUMN FOOTING. REFER TO "TRENCH LOCATION DETAIL".
6. PROTECT FOOTINGS AND GRADE SLABS FROM FROST HEAVE UNTIL BUILDING IS PERMANENTLY ENCLOSED.
7. BRACE WALLS PLUMB WHICH ARE SUBJECTED TO UNBALANCED BACKFILL UNTIL PERMANENTLY STABILIZED BY STRUCTURE.

CONCRETE

1. ALL CONCRETE WORK SHALL CONFORM TO THE REQUIREMENTS OF ACI 318 "BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE" AND ACI 301 "STANDARD SPECIFICATIONS FOR STRUCTURAL CONCRETE".
2. CONCRETE SHALL BE NORMAL WEIGHT AND SHALL OBTAIN ULTIMATE 28 DAY COMPRESSIVE STRENGTHS (F'c), AS FOLLOWS:

FOOTINGS	3000	PSI
SLAB-ON-GRADE	3500	PSI
SLABS ON STEEL DECK	3500	PSI
ELEVATED SLABS	4000	PSI
COLUMNS, PIERS AND WALLS	4000	PSI

3. ALL EXTERIOR CONCRETE SHALL BE AIR-ENTRAINED.
4. REINFORCING STEEL SHALL BE AS FOLLOWS:
   - REINFORCING BARS: ASTM A615, GRADE 60, DEFORMED
   - WELDED WIRE FABRIC: ASTM A1064, SHEET TYPE ONLY
   - WELDABLE REINFORCING BARS: ASTM A706 LOW ALLOW STEEL REINFORCING BARS, DEFORMED
   - DEFORMED BAR ANCHORS (DBA) ASTM A1064, DEFORMED
   - WELDING PER AWS D1.4 STRUCTURAL WELDING CODE - REINFORCING STEEL
5. MINIMUM CONCRETE COVER OVER REINFORCING SHALL BE UNO:

A. UNFORMED SURFACE CAST AGAINST EARTH	3 IN
B. FORMED SURFACE EXPOSED TO EARTH/WEATHER	2 IN
C. FORMED SLABS AND WALLS NOT EXPOSED TO EARTH/WEATHER FOR #11 AND SMALLER BAR	3/4 IN
D. ALL OTHER FORMED ELEMENTS NOT EXPOSED TO EARTH/WEATHER	1 1/2 IN

6. REFER TO DRAWING S3.0.1 FOR REINFORCING BAR LAP LENGTHS.

FIBER REINFORCING

1. STEEL FIBER REINFORCING SHALL BE PROVIDED IN SLAB ON GRADE AND IN SLAB ON COMPOSITE STEEL FLOOR DECK.
2. DOSAGE RATE SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, BUT NOT LESS THAN 35 POUNDS / CUBIC YARD.
3. STEEL FIBERS SHALL BE ADDED AT THE CONCRETE BATCH PLANT.
4. STEEL FIBER SHALL BE INCLUDED IN THE CONCRETE MIX DESIGNS SUBMITTED FOR REVIEW.

FLOWABLE FILL

1. CONTROLLED LOW STRENGTH MATERIAL (CLSM), ALSO REFERRED TO AS FLOWABLE FILL, MAY BE SUBMITTED FOR APPROVAL AS A SUBSTITUTE FOR COMPACTED FILL AT FOUNDATION UNDERCUT LOCATIONS. THE CLSM MIXTURE SHALL BE PROPORTIONED TO PRODUCE AN UNCONFINED COMPRESSIVE STRENGTH OF 100 PSI MINIMUM TO 300 PSI MAXIMUM.

STEEL DECK

1. ALL STEEL DECK WORK SHALL CONFORM TO THE LATEST EDITION OF THE STEEL DECK INSTITUTE (SDI) "DESIGN MANUAL FOR COMPOSITE DECKS, FORM DECKS AND ROOF DECKS", AND AMERICAN IRON AND STEEL INSTITUTE (AISI) "SPECIFICATION FOR THE DESIGN OF COLD FORMED STEEL STRUCTURAL MEMBERS".
2. WELDING SHALL BE IN ACCORDANCE WITH AWS D1.3, "STRUCTURAL WELDING CODE - SHEET STEEL".
3. PERMANENT LOADS SHALL NOT BE SUSPENDED FROM STEEL ROOF DECK UNLESS APPROVED BY ENGINEER OF RECORD.
4. STEEL DECK UP TO 2" DEEP SHALL BE INSTALLED WITH A MINIMUM OF 3 CONTINUOUS SPANS, UNLESS NOTED OTHERWISE. STEEL DECK 3" DEEP OR GREATER SHALL BE INSTALLED WITH A MINIMUM OF 2 CONTINUOUS SPANS, UNLESS NOTED OTHERWISE. ANY LOCATIONS NOT MEETING THESE CONDITIONS SHALL BE SPECIFICALLY IDENTIFIED ON THE STEEL DECK SHOP DRAWINGS.
5. REFER TO "STEEL DECK SCHEDULE" FOR DECK TYPES AND FASTENING REQUIREMENTS

STRUCTURAL STEEL

1. ALL STRUCTURAL STEEL WORK SHALL CONFORM TO THE FOLLOWING AISC DOCUMENTS:
   AISC 360 "SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS"
   AISC 303 "CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES"
   RCSC S "SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH STRENGTH BOLTS"
2. STRUCTURAL STEEL SHALL COMPLY WITH THE FOLLOWING SPECIFICATIONS:

WIDE FLANGE SHAPES AND ANGLES	ASTM A992 (FY=50 KSI)
MISCELLANEOUS SHAPES, PLATES & BARS (TO 8" THICK)	ASTM A36 (FY=36 KSI)
HOLLOW STRUCTURAL SECTIONS (HSS)	
SQUARE & RECTANGLE	ASTM A500, GRADE C (FY=50 KSI)
ROUND	ASTM A500 GRADE C (FY=46 KSI)
HIGH STRENGTH BOLTS (CONVENTIONAL)	ASTM F3125 GRADE A325 OR A490 (TYPE 1)
WASHERS	ASTM F436 (FLAT AND BEVELED)
HEAVY HEX NUTS	ASTM A563
TWIST OFF TENSION CONTROL BOLTS	ASTM F3125 GRADE F1852 OR F2280 (TYPE 1)
COMPRESSIBLE-WASHER DIRECT-TENSION INDICATORS	ASTM F959 (TYPE 325 OR 490)
ANCHOR RODS	ASTM F1554, GR. 55 INCLUDE SUPPLEMENT S1
WELDING ELECTRODES	E70 (LOW HYDROGEN)
HEADED SHEAR STUDS	AWS D1.1 CLAUSE 7, TYPE B (FY=51 KSI)
THREADED ROD	ASTM A36

3. UNLESS NOTED OTHERWISE, CONNECTIONS SHALL BE DESIGNED IN ACCORDANCE WITH AISC MANUAL OF STEEL CONSTRUCTION, AS SIMPLE CONNECTIONS USING ALLOWABLE STRENGTH DESIGN (ASD). CONNECTIONS FOR NON-COMPOSITE BEAMS SHALL BE DESIGNED FOR THE UNIFORM LOAD CAPACITY INDICATED IN THE ALLOWABLE UNIFORM LOAD TABLES, PART 3, OF THE AISC MANUAL. CONNECTIONS FOR COMPOSITE STEEL BEAMS SHALL BE DESIGNED FOR THE REACTIONS INDICATED ON THE PLANS.
4. BOLTED JOINTS SHALL BE "SNUG TIGHTENED", UNLESS OTHERWISE INDICATED.
5. WHERE INDICATED, BOLTED JOINTS SHALL BE "PRETENSIONED" AND SHALL HAVE THREADS EXCLUDED FROM THE SHEAR PLANE. PRE-INSTALLATION VERIFICATION IS REQUIRED.
6. WHERE INDICATED, BOLTED JOINTS SHALL BE "SLIP CRITICAL". PRE-INSTALLATION VERIFICATION IS REQUIRED.
7. WELDING SHALL BE IN ACCORDANCE WITH AWS D1.1 "STRUCTURAL WELDING CODE - STEEL".
8. WHERE STRUCTURAL STEEL IS EXPOSED BELOW GRADE, PROVIDE MINIMUM 3" CONCRETE COVER OR COAT WITH BITUMINOUS MASTIC.
9. STRUCTURAL STEEL EXPOSED TO WEATHER IN THE FINISHED WORK SHALL BE HOT DIPPED GALVANIZED IN ACCORDANCE WITH ASTM A123, UNLESS NOTED OTHERWISE.
10. ARCHITECTURALLY EXPOSED STRUCTURAL STEEL INDICATED THUS (AESS), SHALL CONFORM TO THE REQUIREMENTS OF SECTION 10 OF THE AISC CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES. ALL FABRICATION AND CONNECTIONS OF COMPONENTS EXPOSED AND VISIBLE IN THE FINISHED WORK SHALL BE MADE WITH CONTINUOUS WELDS. INTERMITTENT WELDS ARE ACCEPTABLE FOR NON-EXPOSED OR NON-VISIBLE LOCATIONS. WELD SIZE SHALL BE AS REQUIRED FOR STRUCTURAL STRENGTH BUT NOT LESS THAN 1/8" FILLET. HOLES BURNED THROUGH STEEL DECK DURING WELDING SHALL NOT BE ALLOWED. REPLACEMENT OF DECK WILL BE REQUIRED.
11. DESIGN ALL BEAM CONNECTIONS FOR 2.5k AXIAL TRANSFER FORCE, UNO.

*AD 02

STEEL JOISTS

1. ALL STEEL JOIST WORK SHALL CONFORM TO THE LATEST EDITION OF THE STEEL JOIST INSTITUTE (SJI) STANDARD SPECIFICATIONS.
2. STEEL JOISTS SHALL BE DESIGNED USING ALLOWABLE STRENGTH DESIGN (ASD).
3. PROVIDE JOIST BRIDGING IN ACCORDANCE WITH SJI SPECIFICATIONS, OSHA REQUIREMENTS, AND AS REQUIRED BY JOIST DESIGN.
4. ROOF JOISTS AND BRIDGING SHALL BE DESIGNED FOR A NET UPLIFT OF 20 PSF (0.6D+0.6W). *AD 01
5. SPECIAL JOISTS, INDICATED "SP" ON FRAMING PLANS, SHALL BE DESIGNED FOR CRITERIA INDICATED.
6. DETAILING AND ERECTION OF OPEN WEB STEEL JOISTS SHALL COMPLY WITH OSHA REQUIREMENTS.
7. STEEL ROOF JOISTS SHALL BE PROVIDED WITH NO CAMBER.
8. DESIGN ALL JOISTS (K, KCS, LH) FOR 500 LB CONCENTRATED LOAD (SERVICE LOAD) AT ALL DIAGONAL STRUTS FRAMING TO JOIST CHORDS, UNLESS NOTED OTHERWISE.
9. TOP CHORD OF K-SERIES JOISTS SHALL BE DESIGNED FOR A POINT LOAD OF 200 POUNDS DEAD LOAD, LOCATED AT ANY POINT ALONG JOIST LENGTH, IN ADDITION TO ALL OTHER LOADS.
10. BOTTOM CHORD OF K-SERIES JOISTS SHALL BE DESIGNED FOR A POINT LOAD OF 200 POUNDS DEAD LOAD, LOCATED AT ANY POINT ALONG JOIST LENGTH, IN ADDITION TO ALL OTHER LOADS.
11. TOP CHORD OF KCS AND LH SERIES JOISTS SHALL BE DESIGNED FOR A POINT LOAD OF 500 POUNDS DEAD LOAD, LOCATED AT ANY POINT ALONG JOIST LENGTH, IN ADDITION TO ALL OTHER LOADS.
12. BOTTOM CHORD OF KCS AND LH SERIES JOISTS SHALL BE DESIGNED FOR A POINT LOAD OF 500 POUNDS DEAD LOAD, LOCATED AT ANY POINT ALONG JOIST LENGTH, IN ADDITION TO ALL OTHER LOADS.
13. REFER TO "TYPICAL CONCENTRATED LOAD ON STEEL JOIST" DETAIL FOR REQUIREMENTS REGARDING PIPE HANGERS AND OTHER EQUIPMENT LOADS.
14. STEEL JOISTS EXPOSED TO WEATHER IN THE FINISHED WORK SHALL BE PAINTED WITH A ZINC RICH TNEMEC PAINT THAT MEETS THE REQUIREMENTS OF ASTM D 520 TYPE III.
15. DESIGN ALL JOISTS FOR 1000 POUNDS ROLL-OVER, UNO. *AD 01

CONCRETE MASONRY (CMU)

1. ALL MASONRY WORK SHALL CONFORM TO THE REQUIREMENTS OF TMS 602 "BUILDING CODE REQUIREMENTS FOR MASONRY STRUCTURES WITH COMMENTARY" AND TMS 602 "SPECIFICATIONS FOR MASONRY STRUCTURES WITH COMMENTARY".
2. NET AREA COMPRESSIVE STRENGTH OF CONCRETE MASONRY(F'm), SHALL BE 2000 PSI, DETERMINED IN ACCORDANCE WITH THE UNIT STRENGTH METHOD PER TMS 602, UNLESS NOTED OTHERWISE.
3. CONCRETE MASONRY UNITS (CMU) SHALL CONFORM TO ASTM C90, AND SHALL BE MADE WITH LIGHTWEIGHT AGGREGATE.
4. MORTAR FOR CMU SHALL CONFORM TO ASTM C270, TYPE S, UNLESS NOTED OTHERWISE.
5. GROUT SHALL CONFORM TO ASTM C476 AND SHALL BE PROPORTIONED TO OBTAIN MINIMUM ULTIMATE 28 DAY COMPRESSIVE STRENGTH OF 2500 PSI.
6. PLACE GROUT IN ACCORDANCE WITH TMS 602. ALLOW A MINIMUM OF 24 HOURS FOR MASONRY TO SET PRIOR TO PLACING GROUT.
7. FILL COLLAR JOINTS OF COMPOSITE WALLS SOLID WITH MORTAR AS THE WALLS PROGRESS. BOND WYTHES OF COMPOSITE WALLS TOGETHER USING HORIZONTAL JOINT REINFORCING @ 16" ON CENTER, UNLESS NOTED OTHERWISE.
8. PROVIDE VERTICAL REINFORCING STEEL OF SIZE AND SPACING INDICATED. LAP SPLICE LENGTHS SHALL BE AS FOLLOWS:

#4 BAR AND SMALLER	26 INCHES
#5 BAR	34 INCHES
#6 BAR	38 INCHES
#7 BAR	45 INCHES

9. PROVIDE POSITIONERS TO HOLD VERTICAL WALL REINFORCING STEEL IN PROPER ALIGNMENT.
10. REINFORCING STEEL SHALL COMPLY WITH ASTM A615, GRADE 60.
11. MASONRY WALLS OF HOLLOW UNITS WHICH CHANGE THICKNESS SHALL HAVE A CONTINUOUS SOLID OR GROUT FILLED COURSE BELOW THE TRANSITION. IF WALL THICKNESS IS GREATER ABOVE THE TRANSITION, THE COURSE ABOVE THE TRANSITION SHALL ALSO BE GROUTED SOLID.
12. FILL CMU CELLS WITH GROUT FROM TOP OF FOOTING TO TOP OF SLAB-ON-GRADE ELEVATION.
13. MASONRY WALL CONTROL JOINTS ARE INDICATED ON THE STRUCTURAL DRAWINGS. REFER TO ARCHITECTURAL DRAWINGS FOR CMU JOINT LOCATIONS AND DETAILS. COORDINATE JOINT LOCATIONS TO AVOID BEAM BEARING LOCATIONS AND SHEAR WALLS. DO NOT BREAK BOND BEAM REINFORCEMENT AT CONTROL JOINTS.

COLD FORMED STEEL FRAMING

1. ALL STRUCTURAL COLD FORMED STEEL FRAMING (CFSF) SHALL COMPLY WITH AISI'S "NORTH AMERICAN SPECIFICATION FOR THE DESIGN OF COLD-FORMED STEEL STRUCTURAL MEMBERS".
2. CFSF-S (STRUCTURAL): INCLUDES ALL EXTERIOR WALLS, SOFFITS, BULKHEADS, TRUSSES, RAFTERS, JOISTS AND CEILING JOISTS (IF SELF-SUPPORTING). PROVIDE ENGINEERING DESIGN OF ALL CFSF-S, AND SUBMIT DESIGN CALCULATIONS, ERECTION DRAWINGS AND DETAIL DRAWINGS SIGNED AND SEALED BY A PROFESSIONAL ENGINEER LICENSED IN THE COMMONWEALTH OF VIRGINIA. REFER TO SECTION 054000 FOR ADDITIONAL INFORMATION.
3. CFSF-NS (NON-STRUCTURAL): INCLUDES INTERIOR NON-LOAD BEARING STUD WALLS AND SUSPENDED CEILING FRAMING SYSTEM. REFER TO SECTION 092216 FOR ADDITIONAL INFORMATION.
4. ALL FRAMING MEMBERS, BRIDGING AND ACCESSORIES SHALL BE FORMED FROM STEEL SHEET HAVING A GALVANIZED COATING IN ACCORDANCE WITH ASTM A653.
5. ALL C - SHAPED FRAMING MEMBERS SHALL HAVE A MINIMUM FLANGE WIDTH OF 1 5/8 INCHES.
6. MINIMUM YIELD STRENGTH SHALL BE AS FOLLOWS:

FY = 33,000 PSI	18 GAUGE AND 20 GAUGE
FY = 50,000 PSI	16 GAUGE, 14 GAUGE AND 12 GAUGE

POST INSTALLED ANCHORS & DOWELS

1. INSTALL ALL ANCHORS IN ACCORDANCE WITH MANUFACTURER'S PUBLISHED PROCEDURES AT NOT LESS THAN THE MINIMUM EDGE DISTANCES INDICATED IN THE MANUFACTURER'S LITERATURE. SUBMIT MANUFACTURER'S PRODUCT DATA FOR REVIEW BY THE ARCHITECT.
2. ALL ANCHORS (INCLUDING THREADED RODS, NUTS, WASHERS) SHALL BE ZINC PLATED IN ACCORDANCE WITH ASTM B633, FOR SERVICE CONDITION SC-1.
3. SCREW ANCHORS SHALL BE ONE OF THE FOLLOWING:

   SCREW-BOLT + BY DEWALT
   TITEN HD, BY SIMPSON STRONG-TIE ANCHORING S

FOUNDATION PLAN - PART A

1/8" = 1'-0"

FOUNDATION PLAN NOTES:

1. FINISHED FIRST FLOOR ELEVATION = 121.00' = REFERENCE DATUM EL (+0'-0"). ALL STRUCTURAL ELEVATIONS INDICATED ARE REFERENCED FROM THIS ELEVATION, UNO.
2. FLOOR CONSTRUCTION SHALL BE 4" NORMAL WEIGHT CONCRETE SLAB ON GRADE REINFORCED WITH STEEL FIBER REINFORCING OVER VAPOR BARRIER OVER 6" GRANULAR BASE COURSE, UNO.
3. BASE COURSE SHALL BE A CLEAN, DENSELY-GRADED "CRUSHER RUN" MATERIAL WITH A BALANCED FINE CONTENT, SUCH AS VDOT 21A OR 21B STONE. THE BASE COURSE SHALL BE COMPACTED AND SHALL BE FINISHED TO A FLAT, SMOOTH, LOW-FRICTION SURFACE. COMPACTION SHALL BE MONITORED BY THE ON-SITE TESTING AGENCY. OPEN GRADED STONE, SUCH AS #57 STONE, IS NOT ACCEPTABLE.
4. TOP OF ALL FOOTINGS SHALL BE (-2'-0"), UNO.
5. ALL INTERIOR WALL FOOTINGS SHALL BE WF2.0, UNO. ALL EXTERIOR WALL FOOTINGS SHALL BE WF2.5, UNO.
6. FB INDICATES FIXED BASE, REFER TO BASEPLATE DETAILS ON S3.0.1.
7. COORDINATE FOOTING STEPS WITH ALL UNDERSLAB UTILITIES. REFER TO FOUNDATION NOTE #4 ON DRAWING S0.0.1.
8. REINFORCE ALL FULL HEIGHT INTERIOR 8" NON-LOAD BEARING CMU WITH #4 @ 48" UNO, (UNBRACED AND GREATER THAN 16'-0" SHALL BE #4 @ 24" OC) REINFORCE ALL FULL HEIGHT INTERIOR 8" NON-LOAD BEARING CMU W/ #5 @ 56" OC, UNO

FOUNDATION PLAN NOTES (CONT):

9. WALLS INDICATED AS SHADED ON PLAN ARE SHEAR WALLS. 8" CMU SHEAR WALLS SHALL BE REINFORCED WITH #5 AT 32" OC, UNO. CONTROL JOINTS ARE NOT PERMITTED IN SHEAR WALLS (SHADED REGION, UNO). LOCATE CONTROL JOINTS OUTSIDE OF SHEAR WALLS. CONTROL JOINTS ARE INTENDED TO BE PLACED IN GAPS BETWEEN SHADED REGIONS OF WALLS INDICATED ON PLAN UNO. DO NOT PLACE CONTROL JOINTS UNDER BEAM OR JOIST BEARING PLATES OR WITHIN 16" OF THE JAMB OF A WALL OPENING.
10. REFER TO DRAWING S0.0.1 FOR GENERAL NOTES, PLAN LEGEND, AND STRUCTURAL ABBREVIATIONS.
11. REFER TO DRAWINGS S3.0.1 AND S3.0.2 FOR TYPICAL FOUNDATION DETAILS AND SCHEDULES.
12. REINFORCING STEEL IN WALLS SHALL NOT BE CUT. LOCATE ALL PIPING AND CONDUIT OUTSIDE OF REINFORCED CELLS; EXCEPT A SINGLE 1" CONDUIT IS ALLOWED AT JAMBS.
13. WALL REINFORCING CALLOUTS INDICATED ON PLAN SHALL APPLY FOR THE ENTIRE LENGTH OF WALL, UNO.
14. ALL BELOW GRADE WALLS AND PARAPETS SHALL BE REINFORCED WITH HORIZONTAL JOINT REINFORCING AT 8" OC, UNO.
15. CJ INDICATES CONTROL JOINT IN CMU WALL. CJ SHALL BE LOCATED 1'-4" MIN FROM OPENING.
16. AT TERRAZO FLOORING, COORDINATE LOCATION OF SLAB ON GRADE CONTROL JOINTS WITH FLOOR JOINTS INDICATED ON THE ARCHITECTURAL FLOOR PATTERN DRAWINGS. DEPRESS SLAB MAXIMUM OF 3/4" FOR INSTALLATION OF FLOORING.
17. DESPRESS SLAB 3/4" FOR WALK OFF MATS.
18. (2) HSS4x4x5/16 ON 10" SQx3/4" BASEPLATE W/ (4) 3/4" DIA ANCHOR RODS ON A THICKENED SLAB FOR STAIR SUPPORT. COORDINATE FINAL LOCATION W/ STAIR MANUFACTURER REQUIREMENTS.

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COMMONWEALTH OF VIRGINIA
PAMELA J. BULLIVANT
Lic. No. 0402043907
01/24/2021
PROFESSIONAL ENGINEER

KEY PLAN

NEW PRINCE GEORGE ELEMETARY SCHOOL

DoE PROJECT # 074-38-00-100
PRINCE GEORGE COUNTY PUBLIC SCHOOLS
4700 Romans Road, Prince George, VA 23875

PROJECT NO: 592926
DATE: JAN 24, 2021

REVISIONS

DATE	DESCRIPTION
02/03/21	*AD 01
02/12/21	*AD 02

FOUNDATION PLAN - PART A

S1.1.1

2/12/2021 11:18:42 AM

FOUNDATION PLAN - PART B

1/8" = 1'-0"

FOUNDATION PLAN NOTES:

1. REFER TO S1.1.1 FOR FOUNDATION PLAN NOTES.

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KEY PLAN

NEW PRINCE GEORGE ELEMETARY SCHOOL

DoE PROJECT # 074-38-00-100
PRINCE GEORGE COUNTY PUBLIC SCHOOLS
4700 Romans Road, Prince George, VA 23875

PROJECT NO: 592926
DATE: JAN 24, 2021

REVISIONS

DATE	DESCRIPTION
02/03/21	*AD 01
02/12/21	*AD 02

FOUNDATION PLAN - PART B

S1.1.2

2/12/2021 11:25:00 AM

FOUNDATION PLAN - PART C

1/8" = 1'-0"

FOUNDATION PLAN NOTES:

1. REFER TO S1.1.1 FOR FOUNDATION PLAN NOTES.

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01/24/2021
PROFESSIONAL ENGINEER

KEY PLAN

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PRINCE GEORGE COUNTY PUBLIC SCHOOLS
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REVISIONS

DATE	DESCRIPTION
02/03/21	*AD 01
02/12/21	*AD 02

FOUNDATION PLAN - PART C

S1.1.3

2/12/2021 11:18:50 AM

SECOND FLOOR AND LOW ROOF FRAMING PLAN - PART A

1/8" = 1'-0"

FLOOR FRAMING PLAN NOTES:

1. TOP OF SECOND FLOOR SLAB (+15'-4") RELATIVE TO FINISHED FIRST FLOOR.
2. TOP OF STEEL BEAMS SHALL BE (-0'-6") RELATIVE TO FINISHED SECOND FLOOR, UNO.
3. TOP OF STEEL BEAMS INDICATED THUS (+X'-X") ON PLAN SHALL BE REFERENCED FROM FINISHED FIRST FLOOR ELEVATION.
4. FLOOR CONSTRUCTION SHALL BE 4 1/2" NORMAL WEIGHT CONCRETE SLAB ON 1 1/2" COMPOSITE FLOOR DECK (DECK TYPE 3), (6" TOTAL SLAB THICKNESS). REINFORCE SLAB WITH STEEL FIBER REINFORCING. REFER TO DRAWING S0.0.1 FOR STEEL DECK SCHEDULE.
5. PLACE CONCRETE MONOLITHICALLY ON STEEL FLOOR DECK. CONSTRUCTION JOINTS MAY BE PERMITTED ONLY AFTER APPROVAL OF THE ARCHITECT / STRUCTURAL ENGINEER.
6. CONCRETE THICKNESS INDICATED ON FLOOR DECK IS A MINIMUM THICKNESS AND MAY INCREASE TO MAINTAIN A LEVEL SURFACE AS FLOOR FRAMING DEFLECTS DURING CONCRETE PLACEMENT.
7. ALL FLOOR BEAMS SHALL RECEIVE 3/4" DIAMETER x 5" LONG HEADED SHEAR STUDS, UNO. ALL BEAMS NOTED [NC] SHALL BE NON-COMPOSITE (SHEAR STUDS NOT REQUIRED).
8. COMPOSITE BEAMS ARE DESIGNED UNSHORED.

*AD 02

9. DELETED
10. REBAR SHALL BE PROVIDED IN THE CONCRETE FLOOR SLAB UNDER ALL CMU PARTITION WALLS SUPPORTED ON THE CONCRETE FLOOR SLAB. REFER TO DETAILS ON DRAWING S4.0.2. BARS ARE NOT REQUIRED WHEN THE WALL IS DIRECTLY OVER A BEAM. REFER TO ARCHITECTURE DRAWINGS FOR ALL WALL LOCATIONS.
11. ALL BEAMS ARE EQUALLY SPACED BETWEEN COLUMN GRIDLINES, UNO.
12. REFER TO DRAWING S0.0.1 FOR GENERAL NOTES, PLAN LEGEND, AND STRUCTURAL ABBREVIATIONS.
13. REFER TO DRAWINGS S4.0.1 AND S4.0.2 FOR TYPICAL FRAMING DETAILS AND SCHEDULES.
14. REFER TO S4.0.3 FOR TYPICAL ROLL-UP SECURITY GATE SUPPORT AND BRACING DETAILS.

LOW ROOF FRAMING PLAN NOTES:

1. TOP OF STEEL BEAMS INDICATED THUS (+X'-X") ON PLAN SHALL BE REFERENCED FROM FINISHED FIRST FLOOR ELEVATION.
2. STEEL ROOF DECK SHALL BE 1 1/2" WIDE RIB ROOF DECK (DECK TYPE 1), UNO. REFER TO STEEL DECK SCHEDULE ON DRAWING S0.0.1 FOR DECK TYPES INDICATED ON PLAN. REFER TO FRAMING PLAN AND ARCHITECTURAL AND STRUCTURAL SECTIONS FOR EXTENT OF DECK TYPES.
3. ALL BEAMS AND JOISTS ARE EQUALLY SPACED BETWEEN COLUMN GRIDLINES, UNO.
4. REFER TO DRAWING S0.0.1 FOR GENERAL NOTES, PLAN LEGEND, AND STRUCTURAL ABBREVIATIONS.
5. REFER TO DRAWINGS S4.0.1 AND S4.0.2 FOR TYPICAL FRAMING DETAILS AND SCHEDULES.

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01/24/2021
PROFESSIONAL ENGINEER

KEY PLAN

NEW PRINCE GEORGE ELEMETARY SCHOOL

DoE PROJECT # 074-38-00-100
PRINCE GEORGE COUNTY PUBLIC SCHOOLS
4700 Romans Road, Prince George, VA 23875

PROJECT NO: 592926
DATE: JAN 24, 2021

REVISIONS	
DATE	DESCRIPTION
02/12/21	*AD 02

SECOND FLOOR AND LOW ROOF FRAMING PLAN - PART A

S2.1.1

2/12/2021 11:18:56 AM

SECOND FLOOR AND LOW ROOF FRAMING PLAN - PART B

1/8" = 1'-0"

FLOOR FRAMING PLAN NOTES:

1. REFER TO S2.1.1 FOR FLOOR FRAMING PLAN NOTES.
2. REFER TO S0.01 FOR GENERAL NOTES.
3. SIZE LINTEL TO ACCOMMODATE ELEVATOR DOOR AND CONTROL PANEL.

LOW ROOF FRAMING PLAN NOTES

1. REFER TO S2.1.1 FOR LOW ROOF FRAMING PLAN NOTES.
2. REFER TO S0.0.1 FOR GENERAL NOTES.

TYP POST SLEEVE - ALTERNATE 1

NO SCALE

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SECOND FLOOR AND LOW ROOF FRAMING PLAN - PART B

S2.1.2

2/12/2021 11:19:00 AM

ROOF FRAMING PLAN - MECHANICAL YARD - PART D

1/8" = 1'-0"

SECOND FLOOR FRAMING PLAN - PART C

1/8" = 1'-0"

FLOOR FRAMING PLAN NOTES:

1. REFER TO S2.1.1 FOR FLOOR FRAMING PLAN NOTES.
2. REFER TO S0.01 FOR GENERAL NOTES.
3. SIZE LINTEL TO ACCOMMODATE ELEVATOR DOOR AND CONTROL PANEL.

LOW ROOF FRAMING PLAN NOTES:

1. REFER TO S2.1.1 FOR LOW ROOF FRAMING PLAN NOTES.
2. REFER TO S0.0.1 FOR GENERAL NOTES.

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SECOND FLOOR AND LOW ROOF FRAMING PLAN - PART C

S2.1.3

2/12/2021 11:19:06 AM

ROOF FRAMING PLAN - PART A

1/8" = 1'-0"

ROOF FRAMING PLAN NOTES:

1. TOP OF STEEL BEAMS INDICATED THUS (+X'-X") ON PLAN SHALL BE REFERENCED FROM FINISHED FIRST FLOOR ELEVATION.
2. STEEL ROOF DECK SHALL BE 1 1/2" WIDE RIB ROOF DECK.(DECK TYPE 1), UNO. REFER TO STEEL DECK SCHEDULE ON DRAWING S0.0.1 FOR DECK TYPES INDICATED ON PLAN. REFER TO FRAMING PLAN AND ARCHITECTURAL AND STRUCTURAL SECTIONS FOR EXTENT OF DECK TYPES.
3. ALL BEAMS AND JOISTS ARE EQUALLY SPACED BETWEEN COLUMN GRIDLINES, UNO.
4. REFER TO DRAWING S0.0.1 FOR GENERAL NOTES, PLAN LEGEND, AND STRUCTURAL ABBREVIATIONS.
5. REFER TO DRAWINGS S4.0.1 AND S4.0.2 FOR TYPICAL FRAMING DETAILS AND SCHEDULES.

MECHANICAL ROOM FLOOR FRAMING PLAN NOTES:

1. TOP OF SECOND FLOOR SLAB (+30'-8") RELATIVE TO FINISHED FIRST FLOOR.
2. TOP OF STEEL BEAMS SHALL BE (-0'-6") RELATIVE TO FINISHED SECOND FLOOR, UNO.
3. TOP OF STEEL BEAMS INDICATED THUS (+X'-X") ON PLAN SHALL BE REFERENCED FROM FINISHED FIRST FLOOR ELEVATION.
4. FLOOR CONSTRUCTION SHALL BE 4 1/2" NORMAL WEIGHT CONCRETE SLAB ON 1 1/2" COMPOSITE FLOOR DECK (DECK TYPE 3), (6" TOTAL SLAB THICKNESS). REINFORCE SLAB WITH6x6-W2.9xW2.9 WWF AT MID-DEPTH. REFER TO DRAWING S0.0.1 FOR STEEL DECK SCHEDULE.
5. PLACE CONCRETE MONOLITHICALLY ON STEEL FLOOR DECK. CONSTRUCTION JOINTS MAY BE PERMITTED ONLY AFTER APPROVAL OF THE ARCHITECT / STRUCTURAL ENGINEER.
6. CONCRETE THICKNESS INDICATED ON FLOOR DECK IS A MINIMUM THICKNESS AND MAY INCREASE TO MAINTAIN A LEVEL SURFACE AS FLOOR FRAMING DEFLECTS DURING CONCRETE PLACEMENT.
7. ALL FLOOR BEAMS SHALL RECEIVE 3/4" DIAMETER x 5" LONG HEADED SHEAR STUDS, UNO. ALL BEAMS NOTED [NC] SHALL BE NON-COMPOSITE (SHEAR STUDS NOT REQUIRED).

MECHANICAL ROOM FLOOR FRAMING PLAN NOTES CONTINUED:

8. COMPOSITE BEAMS ARE DESIGNED UNSHORED.
9. ALL BEAMS ARE EQUALLY SPACED BETWEEN COLUMN GRIDLINES, UNO.
10. REFER TO DRAWING S0.0.1 FOR GENERAL NOTES, PLAN LEGEND, AND STRUCTURAL ABBREVIATIONS.
11. REFER TO DRAWINGS S4.0.1 AND S4.0.2 FOR TYPICAL FRAMING DETAILS AND SCHEDULES.

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PRINCE GEORGE COUNTY PUBLIC SCHOOLS
4700 Romans Road, Prince George, VA 23875

PROJECT NO: 592926
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REVISIONS

DATE	DESCRIPTION
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ROOF FRAMING PLAN - PART A

S2.2.1

2/12/2021 11:19:09 AM

ROOF FRAMING PLAN - PART B

1/8" = 1'-0"

ROOF FRAMING PLAN NOTES:

1. REFER TO S2.2.1 FOR ROOF FRAMING PLAN NOTES
2. SIZE LINTEL TO ACCOMMODATE ELEVATOR DOOR AND CONTROL PANEL
3. GYM AND COMMONS S2 DLH JOIST DL DOES NOT INCLUDE JOIST WEIGHT

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PRINCE GEORGE COUNTY PUBLIC SCHOOLS
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PROJECT NO: 592926
DATE: JAN 24, 2021

REVISIONS

DATE	DESCRIPTION
02/03/21	*AD 01

ROOF FRAMING PLAN - PART B

S2.2.2

2/12/2021 11:19:12 AM

ROOF FRAMING PLAN - PART C

1/8" = 1'-0"

ROOF FRAMING PLAN NOTES:

1. REFER TO S2.2.1 FOR ROOF FRAMING PLAN NOTES
2. GYM AND COMMONS S2 DLH JOIST DL DOES NOT INCLUDE JOIST WEIGHT

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02/03/21	*AD 01
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ROOF FRAMING PLAN - PART C

S2.2.3

2/12/2021 11:19:16 AM

HIGH ROOF - PART C

1/8" = 1'-0"

HIGH ROOF FRAMING PLAN NOTES:

1. REFER TO S2.3.2 FOR ROOF FRAMING PLAN NOTES

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KEY PLAN

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HIGH ROOF FRAMING PLAN - PART C

S2.3.2

2/12/2021 11:23:17 AM

FOOTING STEP

FOOTING SLEEVE

PIPE TRENCH BACKFILL AT FOOTING
(PIPE PLACED PRIOR TO FOOTING)

CONSTRUCTION JOINT

PLAN AT CORNER

PLAN AT INTERSECTION

WALL FOOTING DETAILS

NO SCALE

TRENCH LOCATION DETAIL

NO SCALE

5 S1.1.1 S3.0.1 **ENLARGED PLAN VIEW**
3/4" = 1'-0"

6 S1.1.1 S3.0.1 **ENLARGED PLAN VIEW**
3/4" = 1'-0"

7 S1.1.1 S3.0.1 **ENLARGED PLAN VIEW**
3/4" = 1'-0"

8 S1.1.1 S3.0.1 **ENLARGED PLAN VIEW**
3/4" = 1'-0"

WALL FOOTING SCHEDULE

MARK	WIDTH	THICKNESS	REINFORCING (BOT, UNO) LONGITUDINAL	REINFORCING (BOT, UNO) TRANSVERSE
SWF2.5	2' - 6"	1' - 4"	(3) #5 CONT T&B	#5 @ 48" OC
WF2.0	2' - 0"	1' - 4"	(3) #5 CONT	#5 @ 48" OC
WF2.5	2' - 6"	1' - 4"	(3) #5 CONT	#5 @ 48" OC
WF3.0	3' - 0"	1' - 4"	(4) #5 CONT	#5 @ 32" OC
WF3.5	3' - 6"	1' - 4"	(4) #5 CONT	#5 @ 32" OC
WF4.0	4' - 0"	1' - 4"	#5 @ 12" OC	#5 @ 12" OC
WF5.0	5' - 0"	1' - 4"	#5 @ 12" OC	#5 @ 12" OC

*AD 02

*AD 01

WITH BOT REINFORCING

WITH TOP & BOT REINFORCING

WALL FOOTING DETAILS

NO SCALE

(12) BARS

(8) BARS

CONCRETE PIER SCHEDULE

MARK	SIZE LENGTH	SIZE WIDTH	REINFORCING VERTICAL	REINFORCING TIES
P-1	2' - 0"	2' - 0"	(8) #6 DOWELS	#4 @ 12" OC
P-2	2' - 6"	2' - 6"	(12) #6 DOWELS	#4 @ 12" OC

*AD 01

SPREAD FOOTING SCHEDULE

MARK	SIZE LENGTH	SIZE WIDTH	SIZE THICKNESS	REINFORCING
3.0	3' - 0"	3' - 0"	1' - 4"	(4) #5 EA WAY BOT
3.5	3' - 6"	3' - 6"	3' - 6"	(4) #5 EA WAY BOT
4.0	4' - 0"	4' - 0"	1' - 4"	(4) #5 EA WAY BOT
4.0x6.0	6' - 0"	4' - 0"	2' - 6"	#5 @ 10" OC EW BOT
4.5	4' - 6"	4' - 6"	1' - 4"	(4) #5 EA WAY BOT
5.0	5' - 0"	5' - 0"	1' - 4"	(5) #5 EA WAY BOT
5.5	5' - 6"	5' - 6"	1' - 4"	(6) #5 EA WAY BOT
6.0	6' - 0"	6' - 0"	1' - 4"	(7) #5 EA WAY BOT
6.5	6' - 6"	6' - 6"	1' - 4"	(6) #6 EA WAY BOT
7.0	7' - 0"	7' - 0"	1' - 4"	(6) #6 EA WAY BOT
7.5	7' - 6"	7' - 6"	1' - 4"	(7) #6 EA WAY BOT
8.0	8' - 0"	8' - 0"	1' - 4"	(9) #6 EA WAY BOT
8.5	8' - 6"	8' - 6"	1' - 6"	(10) #6 EA WAY BOT
9.0	9' - 0"	9' - 0"	1' - 6"	(10) #6 EA WAY BOT
9.5	9' - 6"	9' - 6"	1' - 8"	(11) #6 EA WAY BOT
10.0	10' - 0"	10' - 0"	1' - 8"	(9) #7 EA WAY BOT
10.5	10' - 6"	10' - 6"	1' - 10"	(10) #7 EA WAY BOT
11.0	11' - 0"	11' - 0"	1' - 10"	(11) #7 EA WAY BOT

*** INDICATES FOUNDATIONS REQUIRING TOP MAT OF REINFORCING MATCHING THE BOT MAT

STEEL COLUMN FOOTING DETAILS

NO SCALE

1 S1.1.1 S3.0.1 **SPECIAL BASEPLATE 1**
3/4" = 1'-0"

2 S1.1.1 S3.0.1 **SPECIAL BASEPLATE 2**
3/4" = 1'-0"

3 S1.1.3 S3.0.1 **SPECIAL BASEPLATE 3**
3/4" = 1'-0"

4 S1.1.3 S3.0.1 **SPECIAL BASEPLATE 4**
3/4" = 1'-0"

LAP SPLICES SHALL BE IN ACCORDANCE WITH ACI 318 CHAPTER 25 AS INDICATED BELOW. TOP BAR LAPS (HORIZONTAL BARS WITH MORE THAN 12" OF CONCRETE CAST BELOW THE BAR) SHALL BE MODIFIED BY A MULTIPLICATION OF 1.3 TIMES THE LENGTHS LISTED IN THE TABLE BELOW. LENGTHS INDICATED IN INCHES.

NORMAL-WEIGHT (145 PCF)

f'c (psi)	LAP CLASS	#3	#4	#5	#6	#7	#8	#9
3000	A	16	22	27	33	48	55	62
	B	21	28	36	43	62	71	80
3500	A	15	20	25	30	44	51	57
	B	20	26	33	40	58	66	74
4000	A	14	19	24	28	42	47	53
	B	18	25	31	37	54	62	69
5000	A	13	17	21	25	37	42	48
	B	17	22	28	33	48	55	62

LIGHTWEIGHT (110 PCF)

f'c (psi)	LAP CLASS	#3	#4	#5	#6	#7	#8	#9
3000	A	22	29	37	44	64	73	82
	B	28	38	47	57	83	95	107
3500	A	20	27	34	41	59	68	76
	B	26	35	44	53	77	88	99
4000	A	19	25	32	38	55	63	71
	B	25	33	41	49	72	82	92
5000	A	17	23	28	34	49	57	64
	B	22	29	37	44	64	74	83

ACI318 LAP LENGTHS

COLUMN BASE PLATE SCHEDULE

MARK	BASE PLATE SIZE L	BASE PLATE SIZE W	BASE PLATE SIZE T	HEADED ANCHOR RODS SIZE	HEADED ANCHOR RODS EMBED	HEADED ANCHOR RODS GAGE
BP-A	1' - 2"	1' - 2"	3/4"	(4) 3/4" DIAM	9"	11"
BP-B	1' - 2"	1' - 2"	1"	(4) 3/4" DIAM	12"	11"
BP-C	1' - 4"	1' - 4"	1"	(8) 1" DIAM	12"	6.5"x13"

*AD 01

FB INDICATES FIXED BASE

FIXED BASE (HSS)

STANDARD BASE

BP-A, B

BP-C

COLUMN BASE PLATE DETAILS

NO SCALE

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REVISIONS

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02/03/21	*AD 01
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TYPICAL FOUNDATION DETAILS

S3.0.1

2/12/2021 11:22:08 AM

AIR HANDLING UNIT WITH ENERGY RECOVERY SCHEDULE

TAG	MFR	MODEL NUMBER	SERVING	SUPPLY FAN DATA: DESIGN AIRFLOW (CFM)	ESP (IN WC)	WHEEL: DIAMETER (IN)	WHEEL: TYPE	FAN SPEED (RPM)	MOTOR SIZE (HP)	OUTSIDE AIR DESIGN AIRFLOW (CFM)	UNIT PRESSURIZATION DIFFERENTIAL (CFM)	EXHAUST FAN DATA: DESIGN AIRFLOW (CFM)	ESP (IN WC)	WHEEL: DIAMETER (IN)	WHEEL: TYPE	FAN SPEED (RPM)	MOTOR SIZE (HP)	ENTHALPY WHEEL DATA: OUTDOOR AIR: DESIGN AIRFLOW (CFM)	SUMMER: EAT (°F DB)	SUMMER: EAT (°F WB)	SUMMER: LAT (°F DB)	SUMMER: LAT (°F WB)	WINTER: EAT (°F DB)	WINTER: EAT (°F WB)	WINTER: LAT (°F DB)	WINTER: LAT (°F WB)	EXHAUST AIR: DESIGN AIRFLOW (CFM)	SUMMER: EAT (°F DB)	SUMMER: EAT (°F WB)	SUMMER: LAT (°F DB)	SUMMER: LAT (°F WB)	WINTER: EAT (°F DB)	WINTER: EAT (°F WB)	WINTER: LAT (°F DB)	WINTER: LAT (°F WB)	COOLING COIL: TOTAL CAPACITY (BTUH)	SENSIBLE CAPACITY (BTUH)	EAT (°F DB)	EAT (°F WB)	LAT (°F DB)	LAT (°F WB)	EWT (°F DB)	LWT (°F DB)	WATER FLOW RATE (GPM)	WATER PRESSURE DROP (FT)	ELECTRIC HEATER: CAPACITY (KW)	EAT (°F)	LAT (°F)	ELECTRICAL DATA: SINGLE POINT CIRCUIT: FLA (A)	MCA (A)	MOCP (A)	SERVICE (V)	(PH)	(HZ)	WEIGHT (LBS)	NOTES
AHU-1	YORK	XTI-57x90	NORTH ACADEMIC WING	13500	2.00	27.0	DDPF	1721	20	8800	2400	12150	1.25	27.0	DDPF	1384	10	8800	95.0	77.0	82.6	69.3	15.0	13.0	54.1	44.4	7450	78.0	66.0	91.1	74.6	70.0	54.0	27.4	24.8	702000	436000	82.6	69.3	52.0	51.9	42	54	117	10.4	24	54.1	59.8	67.2	84.0	90	460	3	60	7,694	-
AHU-2	YORK	XTI-57x90	CENTRAL ACADEMIC WING	13500	2.00	27.0	DDPF	1635	20	7600	2300	10250	1.25	27.0	DDPF	1461	10	7600	95.0	77.0	82.4	69.2	15.0	13.0	54.8	44.9	4350	78.0	66.0	91.5	74.9	70.0	54.0	26.2	23.8	728000	445000	82.4	69.2	52.0	51.9	42	54	121	10.4	24	54.1	59.8	67.2	84.0	90	480	3	60	7,533	-
AHU-3	YORK	XTI-63x99	SOUTH ACADEMIC WING	16000	2.00	27.0	DDPF	1721	20	9600	2400	14125	1.25	27.0	DDPF	1384	15	9600	95.0	77.0	82.6	69.3	15.0	13.0	54.1	44.4	7725	78.0	66.0	91.1	74.6	70.0	54.0	27.4	24.8	780000	489000	81.2	68.2	51.4	50.9	42	54	130	10.4	24	54.1	58.9	73.3	91.7	100	460	3	60	9,299	1

GENERAL NOTES:
A. PROVIDE FACTORY-INSTALLED SINGLE POINT POWER CONNECTION AND NON-FUSED DISCONNECT.
B. SCHEDULED OUTSIDE AND EXHAUST AIRFLOWS DO NOT INCLUDE ANY ALOWANCE FOR PURGE AIRFLOW OR SEAL LEAKAGE IN ENTHALPY WHEEL. FINAL EXHAUST FAN SELECTION AND OUTSIDE AIRFLOW SET POINT IN BAS SHALL INCORPORATE ADJUSTED VALUES.
C. PROVIDE 2-WAY VALVES FOR COOLING COIL UNLESS A 3-WAY VALVE IS SPECIFIED IN NOTES.

NOTES:
1. PROVIDE 3-WAY VALVE FOR COOLING COIL.

AIR HANDLING UNIT SCHEDULE

TAG	MFR	MODEL NUMBER	SERVING	SUPPLY FAN DATA: DESIGN AIRFLOW (CFM)	ESP (IN WC)	WHEEL: DIAMETER (IN)	WHEEL: TYPE	FAN SPEED (RPM)	MOTOR SIZE (HP)	OUTSIDE AIR: MAXIMUM AIRFLOW (CFM)	MINIMUM AIRFLOW (CFM)	UNIT PRESSURIZATION DIFFERENTIAL (CFM)	EXHAUST FAN DATA: DESIGN AIRFLOW (CFM)	ESP (IN WC)	WHEEL: DIAMETER (IN)	WHEEL: TYPE	FAN SPEED (RPM)	MOTOR SIZE (HP)	COOLING COIL: TOTAL CAPACITY (BTUH)	SENSIBLE CAPACITY (BTUH)	EAT (°F DB)	EAT (°F WB)	LAT (°F DB)	LAT (°F WB)	EWT (°F DB)	LWT (°F DB)	WATER FLOW RATE (GPM)	WATER PRESSURE DROP (FT)	ELECTRIC HEATER: CAPACITY (KW)	EAT (°F)	LAT (°F)	ELECTRICAL DATA: SINGLE POINT CIRCUIT: FLA (A)	MCA (A)	MOCP (A)	SERVICE (V)	(PH)	(HZ)	WEIGHT (LBS)	NOTES
AHU-4	YORK	XTI-42x57	DINING	5000	1.25	20.0	DDPF	1787	5	4,250	1,030	500	4500	0.75	20.0	DDPF	1325	2	387000	207000	90.5	75.5	52.0	51.9	42	54	66	10.8	98	23.3	85.0	132.6	135.0	150	460	3	60	3,838	1
AHU-5	YORK	XTI-42x57	GYM	5700	1.25	18.3	DDPF	1930	5	5,550	1,120	600	4930	0.75	20.0	DDPF	1750	2	442000	249000	92.9	75.8	52.0	51.9	42	54	73	9.3	110	23.3	85.0	147.6	149.9	175	460	3	60	3,672	2

GENERAL NOTES:
A. PROVIDE FACTORY-INSTALLED SINGLE POINT POWER CONNECTION AND NON-FUSED DISCONNECT.
B. PROVIDE 2-WAY VALVES FOR COOLING COIL UNLESS A 3-WAY VALVE IS SPECIFIED IN NOTES.
C. PROVIDE PREHEAT COIL AND REHEAT COIL. REFER TO NOTES BELOW FOR INDIVIDUAL HEATING COIL CAPACITIES. SCHEDULED VALUE IS TOTAL.

*AD 02

NOTES:
1. PROVIDE 50 KW PREHEAT COIL AND 48 KW REHEAT COIL.
2. PROVIDE 56 KW PREHEAT COIL AND 54 KW REHEAT COIL.

*AD 02

*AD 02

ROOFTOP UNIT SCHEDULE

TAG	MANUFACTURER	MODEL NUMBER	SERVING	SUPPLY FAN: DESIGN AIRFLOW (CFM)	ESP (IN WC)	MOTOR SIZE (HP)	OUTSIDE AIRFLOW (CFM)	EXHAUST/RELIEF FAN: DESIGN AIRFLOW (CFM)	ESP (IN WC)	MOTOR SIZE (HP)	DX COOLING COIL: TOTAL CAPACITY (BTUH)	SENSIBLE CAPACITY (BTUH)	EAT: DB (°F)	EAT: WB (°F)	LAT: DB (°F)	LAT: WB (°F)	EER	IEER	ELECTRIC HEATER: SENSIBLE CAPACITY (BTUH)	EAT (°F)	LAT (°F)	CAPACITY (BTUH)	HOT GAS REHEAT: EAT (°F)	LAT (°F)	ELECTRICAL DATA: MCA (A)	MOCP (A)	SERVICE (V)	(PH)	(HZ)	WEIGHT (LBS)
RTU-1	JOHNSON CONTROLS	AD15E2CQ4T1CAH42H1	KITCHEN	4,500	1.25	4	1,250	1,800	0.75	1.0	171,400	118,000	82.7	69.3	58.4	57.6	11.1	13	156,500	60.0	92.2	98,000	58.0	78.0	83.5	90	480	3	60	2,120

GENERAL NOTES:
A. PROVIDE FACTORY-INSTALLED SINGLE POINT POWER CONNECTION AND NON-FUSED DISCONNECT.
B. PROVIDE WITH MODULATING HOT GAS REHEAT.

AIR COOLED CHILLER SCHEDULE

TAG	MANUFACTURER	MODEL NUMBER	COMPRESSOR TYPE	COMPRESSORS (QTY)	CIRCUITS (QTY)	REFRIGERANT	REFRIGERANT (LBS)	WATER FLOW RATE: MIN (GPM)	DESIGN (GPM)	PRESSURE DROP (FT WC)	CAPACITY (TONS)	EER	A WEIGHTED SOUND PRESSURE (dBA)	CHILLED WATER: EWT (°F)	LWT (°F)	AMBIENT AIR TEMPERATURE (°F)	ELECTRICAL DATA: TOTAL POWER (KW)	MCA (A)	MOCP (A)	SERVICE (V)	(PH)	(HZ)	WEIGHT (LBS)
CH-1	YORK	YLAA139HE	SCROLL	4	2	R-410A	141.5	138	245	13.80	123.5	9.95	68	54.0	42.0	95	148.9	278	300	480	3	60	7,467
CH-2	YORK	YLAA139HE	SCROLL	4	2	R-410A	141.5	138	245	13.80	123.5	9.95	68	54.0	42.0	95	148.9	278	300	480	3	60	7,467

GENERAL NOTES:
A. PROVIDE FACTORY-INSTALLED SINGLE POINT POWER CONNECTION AND NON-FUSED DISCONNECT.
B. PROVIDE 120 VOLT, 800 WATT EVAPORATOR HEATER FOR EACH CHILLER.
C. PROVIDE VFDS FOR CONDENSER FANS.
D. EVAPORATOR PRESSURE DROP IS THE TOTAL PRESSURE DROP INCLUDING THE STRAINER.

PUMP SCHEDULE

TAG	MANUFACTURER	MODEL NUMBER	SERVING	TYPE	OPERATING DATA: FLOW (GPM)	HEAD (FT WC)	PLEV EFFICIENCY (%)	SUCTION SIZE (IN)	DISCHARGE SIZE (IN)	IMPELLER SIZE (IN)	MOTOR RPM	ELECTRICAL DATA: MOTOR (HP)	SERVICE (V)	(PH)	(HZ)	NOTES
P-1	BELL & GOSSETT	e-1510 3EB	SECONDARY CHILLED WATER LOOP	BASE MOUNTED	488.0	90	77.5	4	3	11.000	1800	20	480	3	60	1, 2
P-2	BELL & GOSSETT	e-1510 3EB	SECONDARY CHILLED WATER LOOP	BASE MOUNTED	488.0	90	77.5	4	3	11.000	1800	20	480	3	60	1, 2
P-3	BELL & GOSSETT	e-80 3x3x9.5C	PRIMARY CHILLED WATER LOOP CH-1	INLINE	245.0	50	69.9	3	3	9.500	1800	7.5	480	3	60	1, 3
P-4	BELL & GOSSETT	e-80 3x3x9.5C	PRIMARY CHILLED WATER LOOP CH-1	INLINE	245.0	50	69.9	3	3	9.500	1800	7.5	460	3	60	1, 3
P-5	BELL & GOSSETT	e-80 3x3x9.5C	PRIMARY CHILLED WATER LOOP CH-2	INLINE	245.0	50	69.9	3	3	9.500	1800	7.5	460	3	60	1, 3
P-6	BELL & GOSSETT	e-80 3x3x9.5C	PRIMARY CHILLED WATER LOOP CH-2	INLINE	245.0	50	69.9	3	3	9.500	1800	7.5	460	3	60	1, 3

GENERAL NOTES:
A. TOTAL SECONDARY CHILLED WATER SYSTEM DESIGN FLOW RATE = 488 GPM.
B. TOTAL PRIMARY CHILLED WATER FLOW RATE = 490 GPM.
C. PROVIDE DISCONNECT BY DIV 23.

NOTES:
1. PROVIDE VARIABLE-SPEED DRIVE.
2. MINIMUM FLOW SHALL BE 94 GPM.
3. MINIMUM FLOW SHALL BE 44 GPM.

DUCTLESS SPLIT SYSTEM INDOOR UNIT SCHEDULE

TAG	LOCATION	SUPPLY AIR (CFM)	MANUFACTURER	MODEL NUMBER	TOTAL CAPACITY (BTUH)	INDOOR EAT (°F): DB	WB	ELECTRICAL DATA: MCA (A)	MOCP (A)	SERVICE (V)	(PH)	(HZ)	WEIGHT (LBS)	NOTES
DSS-1A	IDF C118	425	MITSUBISHI	PKA-A18HA7	18000	80	67	1.0	15	208	1	60	23	1, 2
DSS-2A	B113 IDF	425	MITSUBISHI	PKA-A18HA7	18000	80	67	1.0	15	208	1	60	23	1, 2
DSS-3A	IDF A126	425	MITSUBISHI	PKA-A18HA7	18000	80	67	1.0	15	208	1	60	23	1, 2
DSS-4A	MDF B206	810	MITSUBISHI	PKA-A36HA7	36000	80	67	1.0	15	208	1	60	23	1, 2

NOTES:
1. INDOOR UNIT RECEIVES POWER FROM OUTDOOR UNIT. REFER TO DUCTLESS SPLIT SYSTEM OUTDOOR UNIT SCHEDULE FOR ELECTRICAL REQUIREMENTS.
2. PROVIDE CONDENSATE PUMP.

AIR SEPARATOR SCHEDULE

TAG	MFR	MODEL NUMBER	SERVING	INLET SIZE (IN)	OUTLET SIZE (IN)	FLOW RATE (GPM)	WATER PRESSURE DROP (FT WC)	DRAIN SIZE (IN)	WEIGHT (LBS)
AS-1	BELL & GOSSETT	RL-6FB	CHILLED WATER LOOP	6	6	490	0.90	2	173

DUCTLESS SPLIT SYSTEM OUTDOOR UNIT SCHEDULE

TAG	MANUFACTURER	MODEL NUMBER	SERVING	AMBIENT AIR TEMPERATURE (°F)	ELECTRICAL DATA: MCA (A)	MOCP (A)	SERVICE (V)	(PH)	(HZ)	REFRIGERANT	WEIGHT (LBS)
DSS-1B	MITSUBISHI	PUY-A18NHA7	DSS-1A	95.0	11	30	208	1	60	R-410A	96
DSS-2B	MITSUBISHI	PUY-A18NHA7	DSS-2A	95.0	11	30	208	1	60	R-410A	96
DSS-3B	MITSUBISHI	PUY-A18NHA7	DSS-3A	95.0	11	30	208	1	60	R-410A	96
DSS-4B	MITSUBISHI	PUY-A36NHA7	DSS-4A	95.0	25	40	208	1	60	R-410A	211

GENERAL NOTES:
A. PROVIDE DISCONNECT BY DIV 23.

EXPANSION TANK SCHEDULE

TAG	MFR	MODEL NUMBER	SERVING	TYPE	TANK VOLUME (GAL)	ACCEPTANCE (GAL)	FILL PRESSURE (PSIG)	WEIGHT (LBS)
ET-1	WESSELS	NLA-130	CHILLED WATER LOOP	REPLACEABLE BLADDER	35	35	15	125

ELECTRIC UNIT HEATER SCHEDULE

TAG	MFR	MODEL NUMBER	LOCATION	TYPE	HEATING CAPACITY (KW)	AIRFLOW (CFM)	ELECTRICAL DATA: (V)	(PH)	(HZ)	WEIGHT (LBS)	NOTES
EUH-1	TRANE	UHEC-031CACA	ELEC C127	CEILING	3.3	400	277	1	60	27	1
EUH-2	TRANE	UHEC-031CACA	MECH C219	CEILING	3.3	400	277	1	60	27	1
EUH-3	TRANE	UHEC-031CACA	OUTDOOR STORAGE B109C	CEILING	3.3	400	277	1	60	27	1
EUH-4	TRANE	UHEC-031CACA	NORTH PENTHOUSE	CEILING	3.3	400	277	1	60	27	1
EUH-5	TRANE	UHEC-031CACA	NORTH PENTHOUSE	CEILING	3.3	400	277	1	60	27	1
EUH-6	TRANE	UHEC-031CACA	CENTRAL PENTHOUSE	CEILING	3.3	400	277	1	60	27	1
EUH-7	TRANE	UHEC-031CACA	CENTRAL PENTHOUSE	CEILING	3.3	400	277	1	60	27	1
EUH-8	TRANE	UHEC-031CACA	SOUTH PENTHOUSE	CEILING	3.3	400	277	1	60	27	1
EUH-9	TRANE	UHEC-031CACA	SOUTH PENTHOUSE	CEILING	3.3	400	277	1	60	27	1
EUH-10	TRANE	UHEC-031CACA	EAST PENTHOUSE	CEILING	3.3	400	277	1	60	27	1
EUH-11	TRANE	UHEC-031CACA	EAST PENTHOUSE	CEILING	3.3	400	277	1	60	27	1
EWH-1	TRANE	UHWA-051C2AT	STAIR A132	RECESSED WALL	5.0	250	277	1	60	41	1, 2
EWH-2	TRANE	UHWA-051C2AT	STAIR C108	RECESSED WALL	5.0	250	277	1	60	41	1, 2
EWH-3	TRANE	UHWA-051C2AT	VEST A100	RECESSED WALL	5.0	250	277	1	60	41	1, 2
EWH-4	TRANE	UHWA-051C2AT	VEST C100	RECESSED WALL	5.0	250	277	1	60	41	1, 2
EWH-5	TRANE	UHWA-051C2AT	RECIEVING C124	RECESSED WALL	5.0	250	277	1	60	41	1, 2

NOTES:
1. PROVIDE UNIT-MOUNTED THERMOSTAT AND DISCONNECTING MEANS BY DIV 23.
2. MOUNT BOTTOM OF UNIT AT 1'-0" AFF.

GRILLE, REGISTER, & DIFFUSER SCHEDULE

TAG	MANUFACTURER	MODEL NUMBER	MOUNTING STYLE	NECK SIZE	FACE SIZE	MAX NC LEVEL	NOTES
S1	PRICE	ASCDA	LAY-IN	6ø	24x24	30	-
S2	PRICE	ASCDA	LAY-IN	8ø	24x24	30	-
S3	PRICE	ASCDA	LAY-IN	10ø	24x24	30	-
S4	PRICE	VPD-HC	LAY-IN	6ø	24x24	30	1
S5	PRICE	SDGE	DUCT-MOUNTED	36x6	-	30	-
S6	PRICE	SDBI-100-2	SURFACE	8ø	48x3	30	-
S7	PRICE	SDBI-100-3	SURFACE	10ø	48x5	30	-
S8	PRICE	ASCDA	SURFACE	6ø	12x12	30	-
R1	PRICE	630-TB-L	LAY-IN	22x22	24x24	30	-
E1	PRICE	630-F-L	SURFACE	6x6	12x12	30	-
E2	PRICE	630-F-L	SURFACE	8x8	12x12	30	-
E3	PRICE	630-F-L	SURFACE	10x10	12x12	30	-
E4	PRICE	630-TB-L	LAY-IN	6x6	24x24	30	-
E5	PRICE	630-TB-L	LAY-IN	8x8	24x24	30	-
E6	PRICE	630-TB-L	LAY-IN	10x10	24x24	30	-
T1	PRICE	630-F-L	SURFACE	10x10	12x12	30	-
T2	PRICE	630-F-L	SURFACE	16x16	18x18	30	-

NOTES:
1. SELF-MODULATING THERMALLY-CONTROLED DIFFUSER.

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NEW PRINCE GEORGE ELEMENTARY SCHOOL

DOE PROJECT #: 074-38-00-100
PRINCE GEORGE COUNTY SCHOOLS
4700 ROMANS RD, PRINCE GEORGE, VA 23875

PROJECT NO: 592926
DATE: FEBRUARY 12, 2021

REVISIONS

DATE	DESCRIPTION
02/12/21	*AD 02

SCHEDULES

M0.2

2/11/2021 5:31:13 PM

1 ENLARGED PLAN - NORTH PENTHOUSE MECHANICAL ROOM

1/4" = 1'-0"

2 ENLARGED PLAN - CENTRAL PENTHOUSE MECHANICAL ROOM

1/4" = 1'-0"

3 ENLARGED PLAN - SOUTH PENTHOUSE MECHANICAL ROOM

1/4" = 1'-0"

4 ENLARGED PLAN - EAST PENTHOUSE MECHANICAL ROOM

1/4" = 1'-0"

KEYNOTES

APPLIES TO THIS DRAWING REPRESENTED BY X

1. 44/20 SUPPLY DUCT TRANSITION TO FULL SIZE SUPPLY CONNECTION AND CONNECT TO AHU
2. 80x54 RETURN DUCT AND 10x54 RECLAIMED EXHAUST DUCT COMBINE AND TRANSITION TO FULL SIZE RETURN CONNECTION OF AHU
3. 70x28 OUTSIDE AIR DUCT TRANSITION TO FULL SIZE OUTSIDE AIR CONNECTION OF AHU
4. 48x30 RELIEF DUCT TRANSITION TO FULL SIZE RELIEF AIR CONNECTION OF AHU
5. 72x48 OUTSIDE AIR DUCT CONNECT TO OUTSIDE AIR LOUVER
6. 72x48 RELIEF AIR DUCT CONNECT TO RELIEF AIR LOUVER
7. 44/20 SUPPLY AIR DUCT DN TO SECOND FLOOR
8. 50x30 RETURN AIR DUCT DN TO SECOND FLOOR
9. 18x18 RECLAIMED EXHAUST AIR DUCT DN TO SECOND FLOOR
10. 44/20 SUPPLY AIR DUCT DN TO FIRST FLOOR
11. 50x30 RETURN AIR DUCT DN TO FIRST FLOOR
12. 16x10 RECLAIMED EHXAUST AIR DUCT DN TO FIRST FLOOR
13. 22x14 RECLAIMED EXHAUST AIR DUCT DN TO SECOND FLOOR
14. 24x24 SUPPLY DUCT TRANSITION TO FULL SIZE SUPPLY CONNECTION AND CONNECT TO AHU
15. 32x18 RETURN DUCT TRANSITION TO FULL SIZE RETURN CONNECTION AND CONNECT TO AHU
16. 52x14 RELIEF AIR DUCT (ABOVE) AND 56x16 OUTSIDE AIR DUCT (BELOW) CONNECT TO AHU
17. 30x14 SUPPLY DUCT DN TO SECOND FLOOR, REFER TO M2.6.1 FOR CONTINUATION
18. DUCTWORK ROUTED THROUGH PENTHOUSE WALL TO SECOND FLOOR, REFER TO M2.6.1 FOR CONTINUATION
19. 60x48 OUTSIDE AIR DUCT CONNECT TO OUTSIDE AIR LOUVER
20. 60x48 RELIEF AIR DUCT CONNECT TO RELIEF AIR LOUVER
21. 2-1/2" CHWS & CHWR CONNECT TO AHU
22. 4" CHWS & CHWR DN TO SECOND FLOOR, REFER TO SHEET M2.6.2 FOR CONTINUATION
23. BLANK OFF AND PROVIDE INSULATION FOR REMAINING AREA OF LOUVER
24. PROVIDE 6" DEEP CONCRETE HOUSEKEEPING PAD
25. PROVIDE 1" LINER ON SUPPLY DUCTWORK FROM DISCHARGE OF AIR HANDLING UNIT TO 20' DOWNSTREAM

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02/12/21	*AD 02

ENLARGED PLANS

M3.2

2/11/2021 5:30:46 PM

ELEVATION VIEW

UNIT LAYOUT DETAIL - AHU-3

NO SCALE

ELEVATION VIEW

UNIT LAYOUT DETAIL - AHU-1 & 2

NO SCALE

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02/12/21	*AD 02

UNIT LAYOUT DETAILS

M5.3

2/11/2021 5:30:10 PM

UNIT LAYOUT DETAIL - AHU-5

NO SCALE

UNIT LAYOUT DETAIL - AHU-4

NO SCALE

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UNIT LAYOUT DETAILS

M5.4

2/12/2021 9:37:25 AM

VAV RTU SERVING A SINGLE ZONE - RTU-1

NO SCALE

VAV AHU W/ DCV SERVING A SINGLE ZONE - AHU-4 & 5

NO SCALE

VAV AHU W/ ENERGY RECOVERY SERVING TERMINAL UNITS - AHU-1, 2, & 3

NO SCALE

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REVISIONS

DATE	DESCRIPTION
2/12/21	*AD 02

CONTROL DIAGRAMS

M7.1

2/12/2021 9:38:54 AM

N

SITE PLAN - ELECTRICAL

1" = 40'-0"

GENERAL NOTES

A. COORDINATE WITH CIVIL DRAWINGS FOR ALL SITE WORK INCLUDING UTILITY TRANSFORMER AND GENERATOR LOCATIONS.

B. ELECTRICAL CONTRACTOR SHALL ROUTE ELECTRICAL CONDUITS TO AVOID CONFLICTS WITH SITE UTILITIES AND MAINTAIN REQUIRED EASEMENTS.

C. REFER TO LIGHTING CONTACTOR DETAIL ON E0.4 FOR CONTROL OF CIRCUITS XH1B-1, H1B-1, H1B-2, H1B-48, H1B-50, EH1B-2, EH1B-4, H1C-1, H2A-1, AND H2C-1.

KEYNOTES

APPLIES TO DRAWING E0.3
REPRESENTED BY n

1. PROVIDE 1" CONDUIT WITH SMF SINGLE MODE FIBER OPTIC CABLE FROM IDF/C118 TO WASTEWATER STATION (BURY 24" BELOW GRADE), AND TERMINATE FIBER OPTIC CABLE IN A NEMA 3R ENCLOSURE MOUNTED ON THE PUMP STATION WALL. TRANSITION TO A CAT 6 CABLE TO INTERFACE WITH CONTROL STATION ALARMS.

2. PROVIDE1 1/4"C WITH 3#2,1#2G(BURY 24" BELOW GRADE) FROM PANEL EH TO S.E. RATED WIREWAY.

3. REFER TO WASTEWATER PUMP STATION WIRING DIAGRAM AND PANEL SCHEDULE GP ON E0.4 FOR ADDITIONAL INFORMATION.

4. REFER TO CIVIL DRAWINGS FOR EXACT ROUTE.

5. PROVIDE 1-1/4" CONDUIT FROM THE MONUMENT SIGN TO THE IDF/A126. PROVIDE PULLSTRING.

6. PROVIDE A JUNCTION BOX WITH 2#10,1#10G., 3/4"C. AT THE MONUMENT SIGN AND RUN TO A JUNCTION BOX IN THE ELEC/B117. THE CIRCUIT SHALL BE ASSIGNED AT A FUTURE TIME.

*AD 02

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NEW PRINCE GEORGE ELEMENTARY SCHOOL

DOE PROJECT #: 074-38-00-100
PRINCE GEORGE COUNTY SCHOOLS
4700 ROMANS RD, PRINCE GEORGE, VA 23875

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REVISIONS

DATE	DESCRIPTION
02/03/21	*AD 01
02/12/21	*AD 02

SITE PLAN - ELECTRICAL

E0.3

2/12/2021 4:00:59 PM

GENERAL NOTES

A. COORDINATE LOCATION OF ALL DISCONNECTS, CONTROL PANELS, & ELECTRICAL CONNECTIONS WITH MECHANICAL.

ROOF AND PENTHOUSE LEVEL - MECH POWER

1/16" = 1'-0"

DIV. 22 & 23 EQUIPMENT ELECTRICAL SCHEDULE - E2.7.4

NAME	VOLTAGE	PHASE	P/BD	CKT	DISCONNECTING MEANS	FEEDER SIZE
AHU-1 SINGLE POINT	480 V	3	H2CM	1,3,5	NOTE 1	4#2,#6G,1 1/4"C
AHU-2 SINGLE POINT	480 V	3	H1B	10,12,14	NOTE 1	4#2,#6G,1 1/4"C
AHU-3 SINGLE POINT	480 V	3	H2AM	2,4,6	NOTE 1	4#1,#6G,1 1/2"C
AHU-4 SINGLE POINT	480 V	3	H2CM	2,4,6	NOTE 1	4#1/0,#6G,2"C
AHU-5 SINGLE POINT	480 V	3	H2CM	9,11,13	NOTE 1	4#2/0,#6G, 2"C *AD 02
DSS-1B	208 V	1	EL2C	16,18	NOTE 1	3#10,#10G,3/4"C
DSS-2B	208 V	1	EL1B	11,13	NOTE 1	3#10,#10G,3/4"C
DSS-3B	208 V	1	EL2A	2,4	NOTE 1	3#10,#10G,3/4"C
DSS-4B	208 V	1	EL1B	22,24	NOTE 1	3#8,#10G,3/4"C
EUH-4	277 V	1	H2CM	7	NOTE 1	2#12,#12G,3/4"C
EUH-5	277 V	1	H2CM	10	NOTE 1	2#12,#12G,3/4"C
EUH-6	277 V	1	H1B	15	NOTE 1	2#12,#12G,3/4"C
EUH-7	277 V	1	H1B	16	NOTE 1	2#12,#12G,3/4"C
EUH-8	277 V	1	H2AM	1	NOTE 1	2#12,#12G,3/4"C
EUH-9	277 V	1	H2AM	8	NOTE 1	2#12,#12G,3/4"C
EUH-10	277 V	1	H2CM	15	NOTE 1	2#12,#12G,3/4"C
EUH-11	277 V	1	H2CM	8	NOTE 1	2#12,#12G,3/4"C
F-1	480 V	3	EH	19,21,23	NOTE 1	4#12,#12G,3/4"C
F-2	120 V	1	L1M	1	NOTE 1	2#12,#12G,3/4"C
F-3	120 V	1	L1M	2	NOTE 1	2#12,#12G,3/4"C
F-4	120 V	1	L1M	3	NOTE 1	2#12,#12G,3/4"C
F-5	120 V	1	L1M	4	NOTE 1	2#12,#12G,3/4"C
F-7	120 V	1	L2C	32	NOTE 1	2#10,#10G,3/4"C
F-8	120 V	1	L1B	1	NOTE 1	2#12,#12G,3/4"C
F-9	120 V	1	L2A	41	NOTE 1	2#10,#10G,3/4"C
F-10	120 V	1	L1B	2	NOTE 1	2#12,#12G,3/4"C
F-11	120 V	1	L1B	3	NOTE 1	2#12,#12G,3/4"C
F-12	120 V	1	L2C	33	NOTE 1	2#12,#12G,3/4"C
F-13	120 V	1	L2C	34	NOTE 1	2#12,#12G,3/4"C
F-14	120 V	1	L1B	4	NOTE 1	2#12,#12G,3/4"C
F-15	120 V	1	L2A	43	NOTE 1	2#12,#12G,3/4"C
F-16	120 V	1	L1B	5	NOTE 1	2#12,#12G,3/4"C
F-17	120 V	1	L2A	42	NOTE 1	2#12,#12G,3/4"C
F-18	120 V	1	L2A	44	NOTE 1	2#12,#12G,3/4"C
F-19	120 V	1	L2A	45	NOTE 1	2#12,#12G,3/4"C
MAU-1 HEATER	480 V	3	EH	13,15,17	NOTE 1	4#1/0,#6G, 2"C
MAU-1 MOTOR	480 V	3	EH	20,22,24	NOTE 1	4#12,#12G, 3/4"C
RTU-1	480 V	3	H1M	1,3,5	NOTE 1	4#2,#6G,1 1/4"C

NOTE:
1. PROVIDED BY DIVISION 23.

0' 4' 8' 16' 32'
1/16" = 1'-0"

MOSELEYARCHITECTS
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555 FAX (804) 355-5690
MOSELEYARCHITECTS.COM

COMMONWEALTH OF VIRGINIA
BRIAN C. WELLS
Lic. No. 046269
01/24/2021
PROFESSIONAL ENGINEER

NEW PRINCE GEORGE ELEMENTARY SCHOOL

DOE PROJECT #: 074-38-00-100
PRINCE GEORGE COUNTY SCHOOLS
4700 ROMANS RD, PRINCE GEORGE, VA 23875

PROJECT NO: 592926
DATE: FEBRUARY 12, 2021

REVISIONS

DATE	DESCRIPTION
2/12/21	*AD 02

ROOF AND PENTHOUSE LEVEL - MECH POWER

E2.7.4

2/11/2021 4:39:57 PM

PANELBOARD SCHEDULE H1A

LOCATION: ELEC A124 | FED FROM: MDS
225 AMP MLO | 480/277 Wye | 3 PH 4 W | MOUNT: SURFACE | PANEL ASSEMBLY RATED (KAIC): 25 KAIC

CKT	BRKR	POLE	LOAD	A		B		C		LOAD	POLE	BRKR	CKT
1	20 A	1	INTERIOR LIGHTING	2.9	2.1					INTERIOR LIGHTING CORRIDOR	1	20 A	2
3	20 A	1	SPARE			0.0	0.0			SPARE	1	20 A	4
5	20 A	1	SPARE					0.0	0.0	SPARE	1	20 A	6
7	25 A	1	EWH-1	5.0	5.0					EWH-3	1	25 A	8
9	25 A	1	TU3-01			4.5	4.5			TU3-02	1	25 A	10
11	25 A	1	TU3-03					4.5	1.8	TU3-04	3	15 A	12
13	15 A	3	TU3-05	1.7	1.8								14
15						1.7	1.8						16
17								1.7	4.5	TU3-06	1	25 A	18
19	25 A	1	TU3-07	4.5	1.5					TU3-08	1	15 A	20
21	15 A	3	TU3-05			2.3	1.0			TU3-10	1	15 A	22
23								2.3	2.3	TU3-11	3	15 A	24
25				2.3	2.3								26
27						1.7	2.3						28
29	15 A	3	TU2-17					1.7	2.0	TU2-19	1	15 A	30
31				1.7	1.0					TU2-20	1	15 A	32
33	15 A	1	TU2-21			1.0	3.2			TU2-22	1	15 A	34
35	25 A	1	TU2-23					4.7	3.2	TU2-24	1	15 A	36
37	15 A	3	TU2-25	2.3	1.0					TU2-26	1	15 A	38
39						2.3	0.0			SPACE ONLY	--	--	40
41								2.3	0.0	SPACE ONLY	--	--	42
43	--	--	SPACE ONLY	0.0	0.0					SPACE ONLY	--	--	44
45	--	--	SPACE ONLY			0.0	0.0			SPACE ONLY	--	--	46
47	--	--	SPACE ONLY					0.0	0.0	SPACE ONLY	--	--	48
49	--	--	SPACE ONLY	0.0	0.0					SPACE ONLY	--	--	50
51	--	--	SPACE ONLY			0.0	0.0			SPACE ONLY	--	--	52
53	--	--	SPACE ONLY					0.0	0.0	SPACE ONLY	--	--	54
				35 kVA		26 kVA		31 kVA					
				130 A		95 A		114 A					

(GE) = PROVIDE GFCI BREAKER FOR EQUIPMENT, 6-50mA PER NEC 427.22 DED. NEUTRAL.
(GP) = PROVIDE GFCI BREAKER FOR PERSONNEL, 4-6mA PER NEC 210.8. DED. NEUTRAL.
(L) = PROVIDE LOCKOUT BREAKER TO PREVENT UNAUTHORIZED SWITCHING.
(LC) = ROUTE TO LOAD VIA LIGHTING CONTACTOR, REF DETAIL ON DWG E4.X.
(ML) = PROVIDE BREAKER WITH MAINTENANCE LOCKOUT, LOCKABLE OFF.

Load Classification	Connected Load	Demand Factor	Estimated Demand
INTERIOR LIGHTING	5070 VA	125.00%	6338 VA
EXTERIOR LIGHTING	0 VA	0.00%	0 VA
RECEPTACLES	0 VA	0.00%	0 VA
AC / HEAT PUMP	45467 VA	100.00%	45467 VA
ELECTRIC HEAT	10000 VA	100.00%	10000 VA
KITCHEN	0 VA	0.00%	0 VA
MISCELLANEOUS	0 VA	0.00%	0 VA

Panel Totals
Total Conn. Load: 92.5 kVA
Total Est. Demand: 93.8 kVA
Total Conn. Current: 111 A
Total Est. Demand... 113 A

PANELBOARD SCHEDULE H1M

LOCATION: ELEC C127 | FED FROM: MDS
400 AMP MLO | 480/277 Wye | 3 PH 4 W | MOUNT: SURFACE | PANEL ASSEMBLY RATED (KAIC): 25 KAIC

CKT	BRKR	POLE	LOAD	A		B		C		LOAD	POLE	BRKR	CKT
1				15.5	3.3					EUH-1	1	20 A	2
3	90 A	3	RTU-1			15.5	3.3			EUH-2	1	20 A	4
5								15.5	3.3	EUH-3	1	20 A	6
7	25 A	1	EWH-5	5.0	1.1					F-6	1	20 A	8
9						8.0	8.0						10
11	40 A	3	PWH-1					8.0	8.0	WH-2	3	40 A	12
13				8.0	8.0								14
15						7.5	7.5						16
17	60 A	3	P-1 - MECH C129					7.5	7.5	P-2- MECH C129	3	60 A	18
19				7.5	7.5								20
21						3.1	3.1						22
23	25 A	3	P-3- MECH C129					3.1	3.1	P-4 - MECH C129	3	25 A	24
25				3.1	3.1								26
27						3.1	3.1						28
29	25 A	3	P-5- MECH C129					3.1	3.1	P-6- MECH C129	3	25 A	30
31				3.1	3.1								32
33	--	--	SPACE ONLY			0.0	0.0			SPACE ONLY	--	--	34
35	--	--	SPACE ONLY					0.0	0.0	SPACE ONLY	--	--	36
37	--	--	SPACE ONLY	0.0	0.0					SPACE ONLY	--	--	38
39	--	--	SPACE ONLY			0.0	0.0			SPACE ONLY	--	--	40
41	--	--	SPACE ONLY					0.0	0.0	SPACE ONLY	--	--	42
				66 kVA		60 kVA		60 kVA					
				237 A		215 A		215 A					

(GE) = PROVIDE GFCI BREAKER FOR EQUIPMENT, 6-50mA PER NEC 427.22 DED. NEUTRAL.
(GP) = PROVIDE GFCI BREAKER FOR PERSONNEL, 4-6mA PER NEC 210.8. DED. NEUTRAL.
(L) = PROVIDE LOCKOUT BREAKER TO PREVENT UNAUTHORIZED SWITCHING.
(LC) = ROUTE TO LOAD VIA LIGHTING CONTACTOR, REF DETAIL ON DWG E4.X.
(ML) = PROVIDE BREAKER WITH MAINTENANCE LOCKOUT, LOCKABLE OFF.

Load Classification	Connected Load	Demand Factor	Estimated Demand
INTERIOR LIGHTING	0 VA	0.00%	0 VA
EXTERIOR LIGHTING	0 VA	0.00%	0 VA
RECEPTACLES	0 VA	0.00%	0 VA
AC / HEAT PUMP	123740 VA	100.00%	123740 VA
ELECTRIC HEAT	61209 VA	100.00%	61209 VA
KITCHEN	0 VA	0.00%	0 VA
MISCELLANEOUS	0 VA	0.00%	0 VA

Panel Totals
Total Conn. Load: 184.8 kVA
Total Est. Demand: 184.8 kVA
Total Conn. Current: 222 A
Total Est. Demand... 222 A

PANELBOARD SCHEDULE H2AM

LOCATION: ELEC A214 | FED FROM: MDS
400 AMP MLO | 480/277 Wye | 3 PH 4 W | MOUNT: SURFACE | PANEL ASSEMBLY RATED (KAIC): 25 KAIC

CKT	BRKR	POLE	LOAD	A		B		C		LOAD	POLE	BRKR	CKT
1	20 A	1	EUH-8	3.3	19.5								2
3						2.3	19.5			AHU-3 SINGLE POINT	3	100 A	4
5	15 A	3	TU3-28					2.3	19.5				6
7				2.3	3.3					EUH-9	1	20 A	8
9	25 A	1	TU3-14			4.5	1.5			TU3-29	1	15 A	10
11								1.7	4.5	TU3-12	1	25 A	12
13	15 A	3	TU3-16	1.7	4.5					TU3-13	1	25 A	14
15						1.7	4.5			TU3-15	1	25 A	16
17	25 A	1	TU3-20					4.5	4.5	TU3-17	1	25 A	18
19				1.8	4.5					TU3-18	1	25 A	20
21	15 A	3	TU3-22			1.8	4.5			TU3-19	1	25 A	22
23								1.8	4.5	TU3-21	1	15 A	24
25	15 A	1	TU3-26	1.0	4.5					TU3-23	1	25 A	26
27	25 A	1	TU3-24			4.5	4.3			TU3-25	1	20 A	28
29	15 A	1	TU3-27					2.0	2.5	TU3-30	1	15 A	30
31	20 A	1	SPARE	0.0	0.0					SPARE	1	20 A	32
33	20 A	1	SPARE			0.0	0.0			SPARE	1	20 A	34
35	--	--	SPACE ONLY					0.0	0.0	SPACE ONLY	--	--	36
37	--	--	SPACE ONLY	0.0	0.0					SPACE ONLY	--	--	38
39	--	--	SPACE ONLY			0.0	0.0			SPACE ONLY	--	--	40
41	--	--	SPACE ONLY					0.0	0.0	SPACE ONLY	--	--	42
				45 kVA		49 kVA		48 kVA					
				163 A		179 A		174 A					

(GE) = PROVIDE GFCI BREAKER FOR EQUIPMENT, 6-50mA PER NEC 427.22 DED. NEUTRAL.
(GP) = PROVIDE GFCI BREAKER FOR PERSONNEL, 4-6mA PER NEC 210.8. DED. NEUTRAL.
(L) = PROVIDE LOCKOUT BREAKER TO PREVENT UNAUTHORIZED SWITCHING.
(LC) = ROUTE TO LOAD VIA LIGHTING CONTACTOR, REF DETAIL ON DWG E4.X.
(ML) = PROVIDE BREAKER WITH MAINTENANCE LOCKOUT, LOCKABLE OFF.

Load Classification	Connected Load	Demand Factor	Estimated Demand
INTERIOR LIGHTING	0 VA	0.00%	0 VA
EXTERIOR LIGHTING	0 VA	0.00%	0 VA
RECEPTACLES	0 VA	0.00%	0 VA
AC / HEAT PUMP	125396 VA	100.00%	125396 VA
ELECTRIC HEAT	6600 VA	100.00%	6600 VA
KITCHEN	0 VA	0.00%	0 VA
MISCELLANEOUS	0 VA	0.00%	0 VA

Panel Totals
Total Conn. Load: 142.0 kVA
Total Est. Demand: 142.0 kVA
Total Conn. Current: 171 A
Total Est. Demand... 171 A

PANELBOARD SCHEDULE H1B

LOCATION: ELEC-1 B117-1 | FED FROM: MDS
400 AMP MLO | 480/277 Wye | 3 PH 4 W | MOUNT: SURFACE | PANEL ASSEMBLY RATED (KAIC): 25 KAIC

CKT	BRKR	POLE	LOAD	A		B		C		LOAD	POLE	BRKR	CKT
1	20 A	1	INTERIOR LIGHTING CORRIDOR	1.3	0.3					INTERIOR LIGHTING CORRIDOR	1	20 A	2
3	20 A	1	INTERIOR LIGHTING			2.5	0.0			LCP	1	20 A	4
5	20 A	1	LCP-1B					0.0	0.0	SPARE	1	20 A	6
7	20 A	1	SPARE	0.0	0.0					SPARE	1	20 A	8
9	20 A	1	SPARE			0.0	17.8						10
11	20 A	1	SPARE					0.0	17.8	AHU-2 SINGLE POINT	3	90 A	12
13	20 A	1	SPARE	0.0	17.8								14
15	20 A	1	EUH-6			3.3	3.3			EUH-7	1	20 A	16
17	25 A	1	TU2-01					4.5	4.5	TU2-02	1	25 A	18
19	25 A	1	TU2-03	4.5	4.5					TU2-04	1	25 A	20
21	15 A	3	TU2-05			2.0	2.0			TU2-06	3	15 A	22
23								2.0	2.0				24
25				2.0	2.0								26
27						1.7	4.5			TU2-08	1	25 A	28
29	15 A	3	TU2-07					1.7	4.5	TU2-09	1	25 A	30
31				1.7	3.0					TU2-10	3	15 A	32
33	15 A	1	TU2-11			1.0	3.0						34
35								5.3	3.0				36
37	25 A	3	TU2-12	5.3	3.0					TU2-13	3	15 A	38
39						5.3	3.0						40
41								2.8	3.0				42
43	15 A	3	TU2-14	2.8	1.0					TU2-15	1	15 A	44
45						2.8	3.4			TU2-16	1	20 A	46
47								3.7	2.7	EXTERIOR LIGHTING	1	20 A	48
49	20 A	3	TU2-18	3.7	3.7					EXTERIOR LIGHTING	1	20 A	50
51						3.7	0.0			SPACE ONLY	--	--	52
53	--	--	SPACE ONLY					0.0	0.0	SPACE ONLY	--	--	54
55	--	--	SPACE ONLY	0.0	0.0					SPACE ONLY	--	--	56
57	--	--	SPACE ONLY			0.0	0.0			SPACE ONLY	--	--	58
59	--	--	SPACE ONLY					0.0	0.0	SPACE ONLY	--	--	60
61	--	--	SPACE ONLY	0.0	0.0					SPACE ONLY	--	--	62
63	--	--	SPACE ONLY			0.0	0.0			SPACE ONLY	--	--	64
65	--	--	SPACE ONLY					0.0	0.0	SPACE ONLY	--	--	66
				56 kVA		58 kVA		57 kVA					
				204 A		210 A		208 A					

(GE) = PROVIDE GFCI BREAKER FOR EQUIPMENT, 6-50mA PER NEC 427.22 DED. NEUTRAL.
(GP) = PROVIDE GFCI BREAKER FOR PERSONNEL, 4-6mA PER NEC 210.8. DED. NEUTRAL.
(L) = PROVIDE LOCKOUT BREAKER TO PREVENT UNAUTHORIZED SWITCHING.
(LC) = ROUTE TO LOAD VIA LIGHTING CONTACTOR, REF DETAIL ON DWG E4.X.
(ML) = PROVIDE BREAKER WITH MAINTENANCE LOCKOUT, LOCKABLE OFF.

Load Classification	Connected Load	Demand Factor	Estimated Demand
INTERIOR LIGHTING	4125 VA	125.00%	5156 VA
EXTERIOR LIGHTING	6265 VA	125.00%	7831 VA
RECEPTACLES	0 VA	0.00%	0 VA
AC / HEAT PUMP	119534 VA	100.00%	119534 VA
ELECTRIC HEAT	6600 VA	100.00%	6600 VA
KITCHEN	0 VA	0.00%	0 VA
MISCELLANEOUS	0 VA	0.00%	0 VA

Panel Totals
Total Conn. Load: 171.9 kVA
Total Est. Demand: 174.4 kVA
Total Conn. Current: 207 A
Total Est. Demand... 210 A

PANELBOARD SCHEDULE H2A

LOCATION: ELEC A214 | FED FROM: MDS
100 AMP MLO | 480/277 Wye | 3 PH 4 W | MOUNT: SURFACE | PANEL ASSEMBLY RATED (KAIC): 25 KAIC

CKT	BRKR	POLE	LOAD	A		B		C		LOAD	POLE	BRKR	CKT
1	20 A	1	INTERIOR LIGHTING CORRIDOR	1.5	3.4					INTERIOR LIGHTING	1	20 A	2
3	20 A	1	LCP-2A			0.0	0.0			SPARE	1	20 A	4
5	20 A	1	SPARE					0.0	0.0	SPARE	1	20 A	6
7	20 A	1	SPARE	0.0	0.0					SPARE	1	20 A	8
9	20 A	1	SPARE			0.0	0.0			SPARE	1	20 A	10
11	20 A	1	SPARE					0.0	0.0	SPARE	1	20 A	12
13	--	--	SPACE ONLY	0.0	0.0					SPACE ONLY	--	--	14
15	--	--	SPACE ONLY			0.0	0.0			SPACE ONLY	--	--	16
17	--	--	SPACE ONLY					0.0	0.0	SPACE ONLY	--	--	18
19	--	--	SPACE ONLY	0.0	0.0					SPACE ONLY	--	--	20
21	--	--	SPACE ONLY			0.0	0.0			SPACE ONLY	--	--	22
23	--	--	SPACE ONLY					0.0	0.0	SPACE ONLY	--	--	24
				5 kVA		0 kVA		0 kVA					
				17 A		0 A		0 A					

(GE) = PROVIDE GFCI BREAKER FOR EQUIPMENT, 6-50mA PER NEC 427.22 DED. NEUTRAL.
(GP) = PROVIDE GFCI BREAKER FOR PERSONNEL, 4-6mA PER NEC 210.8. DED. NEUTRAL.
(L) = PROVIDE LOCKOUT BREAKER TO PREVENT UNAUTHORIZED SWITCHING.
(LC) = ROUTE TO LOAD VIA LIGHTING CONTACTOR, REF DETAIL ON DWG E4.X.
(ML) = PROVIDE BREAKER WITH MAINTENANCE LOCKOUT, LOCKABLE OFF.

Load Classification	Connected Load	Demand Factor	Estimated Demand
INTERIOR LIGHTING	4832 VA	125.00%	6040 VA
EXTERIOR LIGHTING	0 VA	0.00%	0 VA
RECEPTACLES	0 VA	0.00%	0 VA
AC / HEAT PUMP	0 VA	0.00%	0 VA
ELECTRIC HEAT	0 VA	0.00%	0 VA
KITCHEN	0 VA	0.00%	0 VA
MISCELLANEOUS	0 VA	0.00%	0 VA

Panel Totals
Total Conn. Load: 4.8 kVA
Total Est. Demand: 6.0 kVA
Total Conn. Current: 6 A
Total Est. Demand... 7 A

PANELBOARD SCHEDULE H2CM

LOCATION: ELEC C216 | FED FROM: MDS
600 AMP MLO | 480/277 Wye | 3 PH 4 W | MOUNT: SURFACE | PANEL ASSEMBLY RATED (KAIC): 25 KAIC

CKT	BRKR	POLE	LOAD	A		B		C		LOAD	POLE	BRKR	CKT
1				17.8	36.2								2
3	90 A	3	AHU-1 SINGLE POINT			17.8	36.2			AHU-4 SINGLE POINT	3	150 A	4
5								17.8	36.2				6
7	20 A	1	EUH-4	3.3	3.3					EUH-11	1	20 A	8
9						3.9	3.3			EUH-5	1	20 A	10
11	175 A	3	AHU-5 SINGLE POINT					3.9	4.5	TU1-16	1	25 A	12
13				3.9	4.5					TU1-18	1	25 A	14
15	20 A	1	EUH-10			3.3	4.5			TU1-20	1	25 A	16
17	25 A	1	TU1-15					4.5	4.5	TU1-21	1	25 A	18
19	25 A	1	TU1-17	4.5	2.5					TU1-23	1	15 A	20
21	15 A	3	TU1-19			1.7	1.0			TU1-25	1	15 A	22
23								1.7	5.0	TU1-27	3	25 A	24
25				1.7	5.0								26
27	15 A	1	TU1-24			2.5	5.0						28
29	20 A	1	TU1-26					1.7	1.5	TU1-28	1	15 A	30
31	25 A	1	TU1-22	4.5	0.0					SPARE	1	20 A	32
33	20 A	1	SPARE			0.0	0.0			SPARE	1	20 A	34
35	--	--	SPACE ONLY					0.0	0.0	SPACE ONLY	--	--	36
37	--	--	SPACE ONLY	0.0	0.0					SPACE ONLY	--	--	38
39	--	--	SPACE ONLY			0.0	0.0			SPACE ONLY	--	--	40
41	--	--	SPACE ONLY					0.0	0.0	SPACE ONLY	--	--	42
				86 kVA		78 kVA		81 kVA					
				312 A		281 A		295 A					

*AD 02

(GE) = PROVIDE GFCI BREAKER FOR EQUIPMENT, 6-50mA PER NEC 427.22 DED. NEUTRAL.
(GP) = PROVIDE GFCI BREAKER FOR PERSONNEL, 4-6mA PER NEC 210.8. DED. NEUTRAL.
(L) = PROVIDE LOCKOUT BREAKER TO PREVENT UNAUTHORIZED SWITCHING.
(LC) = ROUTE TO LOAD VIA LIGHTING CONTACTOR, REF DETAIL ON DWG E4.X.
(ML) = PROVIDE BREAKER WITH MAINTENANCE LOCKOUT, LOCKABLE OFF.

Load Classification	Connected Load	Demand Factor	Estimated Demand
INTERIOR LIGHTING	0 VA	0.00%	0 VA
EXTERIOR LIGHTING	0 VA	0.00%	0 VA
RECEPTACLES	0 VA	0.00%	0 VA
AC / HEAT PUMP	232723 VA	100.00%	232723 VA
ELECTRIC HEAT	13200 VA	100.00%	13200 VA
KITCHEN	0 VA	0.00%	0 VA
MISCELLANEOUS	0 VA	0.00%	0 VA

Panel Totals
Total Conn. Load: 245.1 kVA
Total Est. Demand: 245.1 kVA
Total Conn. Current: 295 A
Total Est. Demand... 295 A

PANELBOARD SCHEDULE H2C

LOCATION: ELEC C216 | FED FROM: MDS
100 AMP MLO | 480/277 Wye | 3 PH 4 W | MOUNT: SURFACE | PANEL ASSEMBLY RATED (KAIC): 25 KAIC

CKT	BRKR	POLE	LOAD	A		B		C		LOAD	POLE	BRKR	CKT
1	20 A	1	INTERIOR LIGHTING CORRIDOR	1.0	2.6					INTERIOR LIGHTING	1	20 A	2
3	20 A	1	LCP-2C			0.0	0.0			SPARE	1	20 A	4
5	20 A	1	SPARE					0.0	0.0	SPARE	1	20 A	6
7	20 A	1	SPARE	0.0	0.0					SPARE	1	20 A	8
9	20 A	1	SPARE			0.0	0.0			SPARE	1	20 A	10
11	20 A	1	SPARE					0.0	0.0	SPARE	1	20 A	12
13	--	--	SPACE ONLY	0.0	0.0					SPACE ONLY	--	--	14
15	--	--	SPACE ONLY			0.0	0.0			SPACE ONLY	--	--	16
17	--	--	SPACE ONLY					0.0	0.0	SPACE ONLY	--	--	18
19	--	--	SPACE ONLY	0.0	0.0					SPACE ONLY	--	--	20
21	--	--	SPACE ONLY			0.0	0.0			SPACE ONLY	--	--	22
23	--	--	SPACE ONLY					0.0	0.0	SPACE ONLY	--	--	24
				4 kVA		0 kVA		0 kVA					
				13 A		0 A		0 A					

(GE) = PROVIDE GFCI BREAKER FOR EQUIPMENT, 6-50mA PER NEC 427.22 DED. NEUTRAL.
(GP) = PROVIDE GFCI BREAKER FOR PERSONNEL, 4-6mA PER NEC 210.8. DED. NEUTRAL.
(L) = PROVIDE LOCKOUT BREAKER TO PREVENT UNAUTHORIZED SWITCHING.
(LC) = ROUTE TO LOAD VIA LIGHTING CONTACTOR, REF DETAIL ON DWG E4.X.
(ML) = PROVIDE BREAKER WITH MAINTENANCE LOCKOUT, LOCKABLE OFF.

Load Classification	Connected Load	Demand Factor	Estimated Demand
INTERIOR LIGHTING	3609 VA	125.00%	4511 VA
EXTERIOR LIGHTING	0 VA	0.00%	0 VA
RECEPTACLES	0 VA	0.00%	0 VA
AC / HEAT PUMP	0 VA	0.00%	0 VA
ELECTRIC HEAT	0 VA	0.00%	0 VA
KITCHEN	0 VA	0.00%	0 VA
MISCELLANEOUS	0 VA	0.00%	0 VA

Panel Totals
Total Conn. Load: 3.6 kVA
Total Est. Demand: 4.5 kVA
Total Conn. Current: 4 A
Total Est. Demand... 5 A

PANELBOARD SCHEDULE H1C

LOCATION: ELEC C119 | FED FROM: MDS
225 AMP MLO | 480/277 Wye | 3 PH 4 W | MOUNT: SURFACE | PANEL ASSEMBLY RATED (KAIC): 25 KAIC

CKT	BRKR	POLE	LOAD	A		B		C		LOAD	POLE	BRKR	CKT
1	20 A	1	INTERIOR LIGHTING CORRIDOR	0.5	2.0					INTERIOR LIGHTING	1	20 A	2
3	20 A	1	INTERIOR LIGHTING OUTDOOR			0.2	0.0			SPARE	1	20 A	4
5	20 A	1	LCP-1C					0.0	0.0	SPARE	1	20 A	6
7	15 A	1	TU1-01	2.5	1.0					TU1-02	1	15 A	8
9	25 A	1	TU1-03			4.5	4.5			TU1-04	1	25 A	10
11	25 A	1	TU1-05					4.5	1.7	TU1-06	3	15 A	12
13	25 A	1	TU1-07	4.5	1.7								14
15	25 A	1	TU1-08			4.5	1.7						16
17	25 A	1	TU1-09					4.5	2.5	TU1-10	1	15 A	18
19	15 A	1	TU1-11	3.1	1.0					TU1-12	1	15 A	20
21	15 A	3	TU1-13			2.3	3.7			TU1-14	3	20 A	22
23								2.3	3.7				24
25				2.3	3.7								26
27	25 A	1	EWH-2			5.0	5.0			EWH-4	1	25 A	28
29	--	--	SPACE ONLY					0.0	0.0	SPACE ONLY	--	--	30
31	--	--	SPACE ONLY	0.0	0.0					SPACE ONLY	--	--	32
33	--	--	SPACE ONLY			0.0	0.0			SPACE ONLY	--	--	34
35	--	--	SPACE ONLY					0.0	0.0	SPACE ONLY	--	--	36
37	--	--	SPACE ONLY	0.0	0.0					SPACE ONLY	--	--	38
39	--	--	SPACE ONLY			0.0	0.0			SPACE ONLY	--	--	40
41	--	--	SPACE ONLY					0.0	0.0	SPACE ONLY	--	--	42
				22 kVA		31 kVA		19 kVA					
				82 A		115 A		69 A					

(GE) = PROVIDE GFCI BREAKER FOR EQUIPMENT, 6-50mA PER NEC 427.22 DED. NEUTRAL.
(GP) = PROVIDE GFCI BREAKER FOR PERSONNEL, 4-6mA PER NEC 210.8. DED. NEUTRAL.
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(ML) = PROVIDE BREAKER WITH MAINTENANCE LOCKOUT, LOCKABLE OFF.

Load Classification	Connected Load	Demand Factor	Estimated Demand
INTERIOR LIGHTING	2761 VA	125.00%	3451 VA
EXTERIOR LIGHTING	0 VA	0.00%	0 VA
RECEPTACLES	0 VA	0.00%	0 VA
AC / HEAT PUMP	53104 VA	100.00%	53104 VA
ELECTRIC HEAT	10000 VA	100.00%	10000 VA
KITCHEN	0 VA	0.00%	0 VA
MISCELLANEOUS	0 VA	0.00%	0 VA

Panel Totals
Total Conn. Load: 72.9 kVA
Total Est. Demand: 73.5 kVA
Total Conn. Current: 88 A
Total Est. Demand... 88 A

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01/24/2021
PROFESSIONAL ENGINEER

NEW PRINCE GEORGE ELEMENTARY SCHOOL

DOE PROJECT #: 074-38-00-100
PRINCE GEORGE COUNTY SCHOOLS
4700 ROMANS RD, PRINCE GEORGE, VA 23875

PROJECT NO: 592926
DATE: FEBRUARY

ADDENDUM NO. 2 / February 12, 2021

New Prince George Elementary School Addendum #2 Pre-Bid Questions

1. Specification 012100 Pg 2 Paragraph 3.3C: The Fire Lane Striping & Signage allowance per specification 012100-3.3C is noted to be $1,500, but on the bid form, this allowance is noted as $500. Please advise what the correct amount of this Allowance 3 is.
   Answer: See Addendum 2 (AD-02) for clarification.

2. Is the TABS contractor required to be a first tier subcontractor or can they be under the mechanical contractor?
   Answer: TAB contractor can be under the mechanical contractor.

3. Specification 085619 Paragraph 2.3C: The window type in the specifications is showing two different aluminum finishes. "Clear Satin Anodized" and "2-coat painted to match the storefront". In the model CRL "Daisy" "D1040A" the "A" is the abbreviation for anodized. Please advise which finish is required for this one window in the clinic on page "A2.1.1" and is marked "AS4" and is shown in window types on page "A3.1.2"."""
   Answer: See Addendum 2 (AD-02) for clarification.

4. Specification 010200 Pg 1 Paragraph 1.2C: The general sitework requirement specification 01 0200-1.2C notes that horizontal and vertical locations of underground utilities should be documented. Horizontal documentation/verification of utilities will require the surveyor be on site verifying heights of utilities prior to backfill and this documentation can be costly. Please confirm these record documents are indeed required.
   Answer: Confirmed record documents are required per referenced specification section.

5. Window type AS25. There are not details or explanation to what type of glass or framing is required here. The window is found in the window types and on page A2.1.1 between A121 "Maker Space" and "Corridor 122.
   Answer: See Addendum 2 (AD-02) for clarification.

6. In the drawings it refers to a baseball field and softball field. The plans reference Drawing C4.40 for the detail of each field. Could not locate C4.40 however there is a detail on C4.20 for the softball field. Question are the (2) fields identical in construction as the drawing on C4.20?
   Answer: See Addendum 2 (AD-02) for clarification.

7. Is playground or sports equipment to be included in the bid package?
   Answer: See Addendum 2 (AD-02) for clarification. Refer to Specification 012100 (Allowances) and Bid Form.

8. AIA Document A305, Contractor's Qualification Statement - The Invitation to Bid notes in the last paragraph to submit the AIA A305 with the bid, however AIA A701, Instructions to Bidders, Article 6.1 notes to submit the A305 upon request..."unless such a Statement has been previously required and submitted for this Bid". Please confirm it is the intent to have the AIA A305 submitted with the bid.

Answer: Submit with bid.

9. Specification Section Testing, Adjusting, and Balancing for HVAC 014520-3, 1.5, A, notes to engage a TAB firm. Will this be handled by the Owner? Please advise as to who is to engage and pay for the TAB firm.
   Answer: This shall be handled by Contractor. Contractor to engage and pay for TAB.

10. Telecommunications Cabling, Structured Cabling, These (2) Spec sections are conflicting and refer to the same type of installation: (Horizontal and backbone cabling). Which is correct?
    Answer: See Addendum 2 (AD-02) for clarification.

11. Drawing Number: 6.1 Trap Primer schedule shows two types of trap primers but none are shown on the plans. My question is can we use trap guards instead of trap primers? if not please provide location and piping for trap primers."
    Answer: Trap guards are acceptable. Specific trap primer assembly and primer pipe routing is not always indicated on plans to provide contractor field flexibility in selecting option best suited for field conditions, where alternative options may be acceptable. Contractor shall coordinate and provide any necessary items to facilitate proper installation and operation of the preferred and approved primer system; to include but not limited to, electrical conduit and circuitry to the panelboard for electronic systems.

12. There are allowances for interior signage and exterior signage. In specification 101400-2.2 Plaques are specified and in 2.3 Dimensional Characters are specified (and they are not noted as allowance like Panel Signs per 2.4. Please confirm we are to include pricing for any plaques and dimensional signage in our bid and these items are NOT included in the allowances.
    Answer: See Addendum 2 (AD-02) for clarification. Remove dimensional lettering from spec. Keep plaque in spec not part of allowance. Keep panel signage in spec as part of interior signage allowance. Add monumental sign to spec

13. On Sheet S1.1.2, the footing along columns line BC appears to be a WF3.0 footing, but it isn't called out. Please advise size of this wall footing. (it continues to Area A on Sheet S1.1.1.)"
    Answer: See Addendum 2 (AD-02) for clarification.

14. Sheet S3.02 shows a detail for a heavy equipment pad. Depth is indicated as at least 12" thick (but then notes varies based on MEP drawings). Sheet M3.1 shows teh two chiller pads as 6" thick concrete. Please clarify what thickness and (reinforcement) we should provide for the two chiller pads. The electrical site plans do not indicated requirements for the generator and transformer pads. What thickness and reinforcements should we provide for those pads?"
    Answer: See Addendum 2 (AD-02) for clarification.

15. Basis of Design unit does not have Variable Speed scroll compressors. RAWAL APR valve is being provided instead. Please remove this requirement. Please remove requirement for double wall construction. Basis of deign unit is single wall with Foil Faced R-7 insulation. Fans are

scheduled to be Direct Drive Plenum (DDPF) - Please remove requirement for Belts and spare belts.
Answer: See Addendum 2 (AD-02) for clarification.

16. Section 275124- 2.8 A2a states LR-4200-072 shall operate on a standard 9 Volt battery, it does not, it uses universal battery pack only. Please advise if universal battery pack is acceptable.
Answer: It is acceptable.

17. Section 275124-2.8 A3a calls for a remote dipole antenna, model LA-401. LA-401 is not an antenna, will LA-116 be acceptable as a replacement to LA-401?
Answer: See Addendum 2 (AD-02) for clarification.

18. Section 275154-2.8 A3c calls for a 4-space charging and storage case LA-317, which is not compatible with receivers called for. Will the LA-380 be an acceptable replacement for the LA-317?
Answer: See Addendum 2 (AD-02) for clarification.

19. Sheet E2.2.3 north east corner of the gymnasium calls for provisions for an outlet for a digital mixing board with jack and cable back to the stage sound system. Please clarify if the mixer called out in Section 275124-2.3 A1a is to be located in a portable rack (not clarified or specified) , or in the rack called out in Section 275124-2.9 A?
Answer: In the rack called out in Section 275124-2.9 A

20. Section 275124-2.9A, please clarify design intention by calling out which equipment should be located in each of the two rack locations shown on Sheet E2.2.3 Stor B107 and Stor B108. Section 275124 2.9A appears to call for a single rack, not two, contrary to Sheet E2.2.3
Answer: Each store needs a single rack. Refer to draw E4.7/Electrical Details for additional information

21. On Sheet C4.01, The fields are noted as Note 13 and refer to sheet C4.40. I do not have sheet C4.40 in my set of drawings. Please advise/provide this sheet."
Answer: Refer to drawing C4.20 for softball field detail referenced on drawing C4.01.

22. On Sheet A1.2.5 issued in Addendum 1, Notes 7 and 8 indicate "Concrete Finish Type 1" and "Concrete Finish Type 2", but I cannot find where the finish types are defined. What is finish type 1? What is finish type 2?"
Answer: See Addendum 2 (AD-02) for clarification.

23. Specification 122413 2.2.D.2. specifies "Future Low Voltage." Where is this required?
Answer: See Addendum 2 (AD-02) for clarification.

24. On Sheet C4.01, The fields are noted as Note 13 and refer to sheet C4.40. I do not have sheet C4.40 in my set of drawings. Please advise/provide this sheet."
Answer: Refer to drawing C4.20 for softball field detail referenced on drawing C4.01.

25. There are some differing quantities on the plans vs. the signage legend. Are we to go by what is indicated on the plans?
    Answer: See Addendum 2 (AD-02) for clarification.

26. On Sheet L2.00 updated in Addendum 1, the quantity of sod is noted as 16,523 SF. However, on the L1.01 to L1.06 sheets, only Sheet L1.06 notes sod and the quantity is 9,613SF. There appears to possibly be some more sod on L1.03, but it is not quantified. Please clarify the amount of sod we should include in our bid."
    Answer: Sod limits have been revised on drawing L1.03.

27. On the original Sheet L1.04, planting were shown in the courtyard areas, but in the updated L1.04 with Addendum 1, no plants are shown in the courtyards and it is noted to refer to the architectural drawings. However, sheet A1.2.5 only shows hardscape information and no planting/landscaping information. Please advise what landscaping it be provided in these courtyard areas."
    Answer: Refer to drawing L1.04 issued with addendum #2 for updated landscaping in the courtyards.

28. A118 shows no flooring pattern, but the finish schedule is showing RFT. What RFT does this room get? does it have patterns? The elevator is calling for RFT. Can you advise color? B109 shows no flooring pattern, but the finish schedule is showing RFT. What RFT does this room get? Does it have any patterns?
    Answer: A118 should receive RFT-1A, no pattern. The elevator should receive RFT-1A, no pattern. B109 should receive RFT-1A, no pattern.

29. A118 noted as RFT, but not showing a pattern on floor drawings; B105/B105A are noted as CONC-POL, but indicated on floor drawings as CONC-SEALED; B114 is noted as CONC-POL, but indicated as RFT; C202/C203 noted as CONC-POL, but indicated as RFT.
    Answer: A118 should receive RFT; B105/B105A Should receive CONC-SEALED; B114 should receive RFT; C202/ C203 Should receive RFT.

30. In reference to Exterior Building Enclosure Air Barrier Requirements, specification section 018317, please confirm the Owner is to engage and pay for the Testing/Inspection Agency.
    Answer: No testing is required of the air barrier other than air barrier manufacturer's technical rep, which does need to be provided/coordinated through the Contractor.

31. Metal Fabrications specification section 055000, notes the requirement Abrasive Metal Nosings, however we have not found where they are indicated on the drawings. Please advise if the metal nosings are required on this project and if so advise of the locations.
    Answer: See Addendum 2 (AD-02) for clarification.

ADDENDUM NO. 2 / February 12, 2021

32. having difficulty locating the appropriate documents (C4.40) associated with constructing the softball fields and multi-purpose grass play area. I am reaching out to see if you could help or steer me in the right direction.
    Answer: Addendum #2 will address that the softball details are on C4.20, we also have a specification (32 1823.13) specifically for softball infield mix that was included in the bid package.

33. Two flagpoles are indicated on A1.2.4 and C4.01. Neither drawings not the flagpole specifications note the height of the flagpoles. Please advise height(s)
    Answer: See Addendum 2 (AD-02) for clarification.

34. Is Yaskawa an acceptable manufacturer for Variable Speed Drives?"
    Answer: It is not acceptable.

35. Will the Geotechnical Engineering Study be provided to all bidders via an Addendum?
    Answer: Refer to Table of Contents for directions regarding Geotechnical Engineering Study.