ADDENDUM NO. 1

December 5, 2014

To: All Bidding contractors

Re: Middlesex County College – South Hall

This Addendum forms a part of the Contract Documents and modifies the original Bidding Documents dated October 28, 2014.

Bid Opening Date. The bid period has been extended. The new opening date of December 18, 2014 at 2:00pm

I. CHANGES TO SPECIFICATIONS:
   a. Section D – Contractors Proposal
   b. 226219 – Vacuum Equipment for Lab Facilities
   c. 231123 – Facility Natural Gas Piping
   d. 271300 – COMMUNICATIONS BACKBONE CABLELING
   e. 283111 – Digital Addressable Fire Alarm System

II. REVISED DRAWINGS: Revision 1 dated 12/05/14

   C001 – Demolition Plan
   C007 – Construction Details

   S111 – Foundation & First Floor Framing Plans
   S601 – Typical Details

   G101 – Code Summary
   A111 – Ground and First Floor Plans
   A112 – Second and Atrium Floor Plans
   A121 – Ground and First Floor Ceilings Plans
   A122 – Second Floor Ceiling Plan
   A131 – Roof Plan
   A201 – Exterior Elevations
   A401 – Enlarged Toilet Room Plans
   A501 – Plan Details
   A502 – Plan Details and Interior Details
   A601 – Door Schedule and Details
   A611 – Curtain Wall Frame Types
   A612 – Curtain Wall Frame Types
   A701 – Room Finish Schedule
   A710 – Casework Elevations and Plan Details

   FP001 – Fire Protection General Information
   FP002 – Fire Protection Details
   FP101 – Fire Protection 1ST Flr and Bsmt
III. ANSWERS TO RFI QUESTIONS SUBMITTED:
a. Refer to attached RFI response documents dated 12/05/14

IV. ATTACHMENTS:
a. Revised Specifications
b. Revised Drawings
c. RFI answers

END OF ADDENDUM NO.1
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| G-1  | Instruction to Bidders page A5 section 0.05B1.B, states maintenance bond valid for minimum of one year. Page 41 of AIA General Conditions Article 9.10.6, states one year maintenance bond while page 48 Article 11.4.3 states two (2) year maintenance bond. Please clarify whether a one or two year maintenance bond is required.  
A   11.4.3 is to be change to state one (1) year  |
A   Yes.  |
| G-3  | Please clearly provide a list of paperwork that the named subcontractors have to provide with the bid.  
A   The listed subcontractors are to supply their Public Works Contractor Registration Certificate  |
| G-4  | Please confirm that the named subcontractors must be DPMC qualified.  
A   Listed subcontractors are not required to be DPMC classified.  |
| G-5  | Please confirm that the alternates will be selected in the order it was written.  
A   The alternates may not be selected in order written on the Contractor's Proposal.  |
| G-6  | Please confirm that the LEED Administration will be performed by the Owner or the Architect.  
A   The Construction Manager will administer LEED although the contractor shall have a LEED coordinator as stated in Section 018113-4 Paragraph 1.5.A  |
| G-7  | Please confirm that the Owner will be responsible and paying for the traffic control while performing the underground utilities outside the project fenced area and while receiving deliveries.  
A   The contractor personnel are responsible for providing signage for work outside the fenced area and during deliveries. The college police will not provide traffic control.  |
| G-8  | All the drawings on the CD were 30" x 42" with the exception of ET-101 thru ET-501 and EAV001 thru EAV600. Please clarify the size difference.  
A   All drawing sizes are to be 30"x42". ET & EAV drawings will be resized and replotted with the addendum issue.  |
| G-9  | Please confirm that no cost to be considered in the bid for using Newforma Information Management Software including training cost, if any required.  
A   No cost will be considered for using the Newforma Information Management Software, including training.  |
| G-10 | Please clarify whether our project super can act as Waste Management/LEED Coordinator OR does GC have to include in their bid for hiring outside agency as 017419-5 (3.1-B) call for full time for duration of project.  
A   See 018113-4 Paragraph 1.5.A  |
| G-11 | Please confirm CAD file provided to GC at no cost.  
A   CAD Backgrounds of base floor and ceiling plans will be provided to GC at no additional cost. MEP backgrounds will not be provided for shop drawing purposes.  |
| G-12 | Spec 011000-3 (1.8-C) calls for contingency amount, none found in the contract documents as an allowance. Please confirm it is not part of bid amount.  
A   There is no "owner's contingency" in this contract.  |
| G-13 | Please confirm there are no removal of asbestos/asbestos hazardous material involved.  
A   There are no known hazardous materials  |
| G-14 | Alternates 1, 2 & 3: Specs section 01 23 00-2 provided with options in each of THREE alternates with (a) and (b), where as in Bid form, each of Three Alternate have option (C). Please clarify if (C) is required and please provide Specs for the same in Alternates section.  
A   If the bidders want to substitute an equal that is not listed in alternate A or B the option is available as C. If the bidders does not want to submit an equal enter "No bid" in the C section  |
Q Please confirm the date of Award and NTP.
A It is anticipated that the college Board of Trustees will award at its regularly scheduled meeting of December 17, 2014 or a special meeting called for the purpose of awarding this contract. Issuing of the Notice to Proceed is dependent on the bidder’s submission of all post bid award documents.

Q Please confirm the status of issue of Building permit and status of City’s Full Review status on drawings.
A Contractor is to submit the building permit applications. See 011000-4 (3.1.B)

Q Please confirm all the points discussed during pre-bid meeting in form of minutes of Meeting but not limited to RFI deadline date (Please extend date as suitables due to Thanks giving holidays), possible Bid opening Extension etc...
A There are no meeting minutes

Q Please confirm that owner will pay the Down / advance payment to GC as demanded by Subs, who are Pre approved as basis of design.
A Payments will be made per the General Conditions section of the specifications

Q AISC Certification: Can this requirement be waived, enable GC to obtain very competitive bid offer from the subs that do not have this certification.
A This requirement will not be waived.

Q Please confirm that only the General Contractor is to provide the DPMC, uncompleted contracts, public work registration and New Jersey Business Registration Certificate. Subcontractors are not required to provide above listed paperwork at the time of the bid.
A The General Contractor is to supply all documents listed in section D Required Contract Documents. The listed subcontractors are to supply their Public Works Contractor Registration Certificate. Copies of the general contractor and the listed subcontractors NJ Public Works Contractor Registration certificate are to be included with the bid submission

Q Please confirm that the previously demolished South 1 and South 2 buildings footings and foundations have been removed under a separate contract.
A Confirmed

Q Please clearly provide a list of paperwork that the named subcontractors have to provide with the bid.
A The listed subcontractors are to supply their Public Works Contractor Registration Certificate

Q Please confirm that the Project Labor Agreement signature page to be signed and submitted by the Bidder ONLY with the bid package submission.
A Project Labor Agreement signature page is to be signed and submitted by the general contractor only

Q Please confirm that the Structural Steel fabricator must be AISC certified.
A Yes, the fabricator and erector must be AISC certified.

Q Please provide a list of the materials and equipment that we must use the named manufacturer and there is no approved equal for it.
A This is an open project and all products and manufacturers are acceptable that meet the requirements of the specifications or an equal to any basis of design designated in specifications.

Q Please advise what the extent of work the owner will be providing under a separate contract.
A Owner is contracting separately for furniture

Q Please advise if maintenance bonds are required and if yes, for how long?
A Maintenance bonds are required, see AIA Document A232-209 section 11.4.3

Q As per our communication with Johnson Controls, Inc., they stated that they are not going to bid this job, so please delete their related alternate in the bid proposal.
A If a manufacturer elects not to provide pricing for an alternate the contractor shall indicate “no bid” on the Form of Proposal.

Q Will the Owner pay for 2nd and 3rd shift work through bid contingency?
A There is no “owner’s contingency” in this contract.

WORK HOURS
All work is to be performed during normal work hours 8:00 am to 4:30 pm, Monday through Friday. If additional work hours are required, they shall be included in the contractor’s bid price and approval of the College shall be requested by the contractor in writing 48 hours prior to the desired work date.

The work hours in this section take precedence over, and will supersede any conflicting references to hours of work elsewhere in these plans and specifications.
Middlesex County Community College  
South Hall  
Addendum 1 Questions/Answers

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<tr>
<td>C-1</td>
<td>Drawing C001 indicates the &quot;Demolition of South 1 and South 2 Building and Associated Utilities by others&quot;. Please advise what grade elevation the demolition area will be at, so contractors can determine the cuts and fills that will be required.</td>
</tr>
<tr>
<td></td>
<td>The existing buildings were backfilled to surrounding elevations.</td>
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<tr>
<td>C-2</td>
<td>Drawing C003 indicates &quot;Proposed 2&quot; gas service for Main Hall by contractor. The gas company typically does not permit the contractor to install the gas line, only provide the excavation, backfill, compaction and bedding. Please confirm this work is by the General Contractor.</td>
</tr>
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<td></td>
<td>The GC will have to coordinate and pay for the gas company to relocate the exiting Main Hall gas service up to, and including the meter. The GC then has to connect the relocated meter to the existing Main Hall generator and lab gas connections.</td>
</tr>
<tr>
<td>C-3</td>
<td>Will the demolition of South 1 and South 2 Buildings &quot;by others&quot; include the demolition removal &amp; disposal of the footings and foundations for the structures. Please confirm whether or not the &quot;footprints&quot; of these existing structures will be backfilled with controlled compactable, structural fill.</td>
</tr>
<tr>
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<td>The footprints have NOT been controlled compactable structural fill.</td>
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<tr>
<td>C-4</td>
<td>The soils report indicates depths of uncontrolled fill that is not suitable for footing/foundation bearing or suitable for the support of the floor slab. These fill materials must be excavated as per the soils report. There is an allowance in the Bid Form for 1500 CY of unsuitable material removal and replacement. It is assumed that this allowance will be used for all unsuitable material removal and replacement for this project. Please confirm.</td>
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<td></td>
<td>The allowance is meant for all unsuitable soil as determined by the Owner's Testing Agency. If more than 1,500 CY of unsuitable material is found, the difference will be paid at the unit Price bid by the Contractor. Similarly, if there is less than 1,500 CY, the balance will be credited to the Owner at the Unit Price.</td>
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<tr>
<td>C-5</td>
<td>Please confirm if the telecommunication lines shall be concrete encased or not, if yes, please provide details.</td>
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<tr>
<td></td>
<td>Telecommunication lines do not need to be encased in concrete. Lines are in conduit.</td>
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<td>C-6</td>
<td>Electrical line and telecommunication line in the civil drawings doesn’t match with what shown in the electrical drawings. Please clarify.</td>
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<td></td>
<td>A separate set of drawings are being included in the specifications to address the telecommunication line work.</td>
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<tr>
<td>C-7</td>
<td>Allowance # 1: provided in Spec section 01 21 00-3 but it’s not mentioned in Bid form. Please provide the space where this amount is to be mentioned as part of Base bid. Also can you provide Unit rate for removal of Unsuitable soil of 1,500 CY to have uniform Allowance amount in Base bid.</td>
</tr>
<tr>
<td></td>
<td>Bid Form has been revised and provided.</td>
</tr>
<tr>
<td>C-8</td>
<td>No details for Stone bedding for water line. So request to provide details stone bedding for water line. Also need details for Concrete Pad &amp; Curb.</td>
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|      | Depressed Curb Detail is on C007. Use Concrete Sidewalk for Concrete Pads at Exit Door. A water line bedding detail has been added to C007.
C-9  Q  Drawing C002 calls for concrete walkways with brick bands. Please specify the extent of this stencil pattern on the project.
A  The stencil pattern limits are shown on sheet C002.

C-10  Q  Please confirm that the 1,250 Cy of unsuitable soil removal allowance is in addition to the soil generated for export after site cut to fill.
A  The allowance is meant for all unsuitable soil as determined by the Owner's Testing Agency. If more than 1,500 CY of unsuitable material is found, the difference will be paid at the unit Price bid by the Contractor. Similarly, if there is less than 1,500 CY, the balance will be credited to the Owner at the Unit Price.

C-11  Q  Please provide details and elevations for the existing gas line in the existing building (Main Hall Building) that need to be relocated. Also please clarify if this work will be performed under this contract or will be performed under a separate contract.
A  As indicated on C003, the existing meter will be relocated by Elizabethtown Gas and the new gas extension to MH is by the GC. The meter relocation and connection to the new gas extension is to be completed in a single day and coordinated with the college. Drawing C003 requires the contractor to dig test pits to verify the utility locations.

C-12  Q  There are foundation drains shown in the architectural and structural drawings but they are not reflected in the civil drawings where to be tied in. Please clarify.
A  The foundation drains are tied into the interior sump pump. The discharge line from the sump pump to the storm sewer interconnection is shown on sheet C003.

C-13  Q  Specification section 012100 lists allowance #1 for unsuitable soil. This item is not included on bid form. Please advise and
A  Bid form is revised.

C-14  Q  Site works: Diameter of fire Department water line is not given. Also need Details for the Fire Department Connection.
A  The fire department water line is shown as 6" on Sheet C003. Refer to FP101 for FDC Connection requirements.

C-15  Q  Please Confirm that Existing demolition contractor of South 1 & South 2 Building & Associated utilities area / Location will provide to GC, the Building Pad with required grade including Removal of Existing Foundation and Utilities. Or Please provide scope of Demo Contractor or Provide elevation of Grade level will be provided by Demo contractor to GC.
A  The existing buildings were backfilled to surrounding elevations. No as-built plans exist.

C-16  Q  Please also confirm that same demo contractor will remove existing stock pile of soil as seen in Site Visit / photos.
A  Soil will be removed.

C-17  Q  Is there a post buildings demolition as-bid grading plan with latest and greatest grades? If yes, please provide. If no, please advise where the post demolition grade elevations are.
A  No, the existing buildings were backfilled to surrounding elevations.

C-18  Q  Please provide details and sections for the segment retaining wall at the basement access.
A  Details are provided on Sheet C007. Manufacturer Shop Drawings are to be provided for each retaining wall.

C-19  Q  Utility drawing C003 does not clearly show where the existing utility lines are and where are the proposed lines, so please clarify.
A  All known existing and proposed utility lines are shown on Sheet C003.
Architecture

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| A-1  | Q: WT-1 is listed on the finish legend on drawing A701. This does not appear on the finish schedule. Please advise.  
   A: See interior elevations. |
| A-2  | Q: WB-3 is listed on the finish schedule on A701. This does not appear on the finish legend. Please advise.  
   A: See Supplemental drawing SD-A101 |
| A-3  | Q: QT1-3 is listed on the finish schedule on A701. This does not appear on the finish legend. Please advise.  
   A: See Supplemental drawing SD-A101 |
| A-4  | Q: Please provide more information on the ballasted low roof shown on drawing A131.  
   A: Disregard notation for ballasted roof, no roof ballast on project. |
| A-5  | Q: Drawing 9/A401 shows resilient stair treads and nosing’s. This does not appear on the finish schedule. Please advise  
   A: Correct. Resilient stair treads and nosing. Typical. Refer to specifications |
| A-6  | Q: Hardware: Hardware is Schlage, no substitution on the locks. Is it any other substitute allowed?  
   A: All hardware listed except locks are basis of design with approved equals allowed. Locks are Schlage #1031 campus proprietary locks. |
| A-7  | Q: Toilet Plan Detail #1 and 13 on Drawing A410 note to provide FRP Panels around the Janitor’s sinks from the sink to the ceiling.  
   Elevation 11/A401 however shows the FRP Panels as only being 4’-0” above the floor. Please review and provide the required height for the FRP Panels.  
   A: Revised to 4’-0” above finished floor |
| A-8  | Q: In specification section 101418 Metal Letters the text “SOUTH HALL” is called out to be 22 inches. However, there are two sets shown on the drawings A201 and A202, and they are both shown to be 16 inches. Please advise how many sets are required and what size they should be.  
   A: Provide “South Hall” building signs in two (2) locations per elevation drawings. Letters are 16” high. |
| A-9  | Q: The corridors are being listed as QT for the flooring. No QT is being shown on the finish schedule. Please advise.  
   A: See revised finish schedule. |
| A-10 | Q: Please advise as to what the letters “AA” is indicating next to Wall Types at column P/1, 14, 16 and 18. (See Drawing A111)  
   A: AA = All Around for the wall type surrounding column. |
| A-11 | Q: Please confirm that the drywall wall types that are shown at Stair A and B are to be Type “J”.  
| A-12 | Q: Please provide the wall types for walls on Detail 12/A401 and 13/A401.  
   A: See supplemental drawing SD-A101 |
| A-13 | Q: Some of the walls on the Contract Drawings are shown shaded. Please advise what this represents if anything.  
   A: Shade exterior wall represent batt insulation. Shaded interior walls represent sound wall types. See wall types. |
| A-14 | Q: Adjustable wall shelving does not indicate what the shelf material is supposed to be. Are the shelves wood to match the Wood Lab Casework or epoxy resin to match the Lab Countertops? Reference elevation 5/A403 for example.  
   A: Phenolic resin |
A-15  Q Specification 115213 asks for tab-tensioned, glass beaded projection screens without borders, this is not possible. All tab-tensioned screens have borders. No tensioned screen comes with glass beaded fabric. Please confirm if you want OPTION 1: tab-tensioned screen with borders: this comes with matte white or a higher gain pearl white screen or OPTION 2: non-tensioned screen-- this uses glass beaded fabric.
   A Provide non-tensioned screen with glass beaded fabric

A-16  Q Drawing A402, Room 139, shows a double dotted line at both the east and west wall indicating (2) projection screens being supplied in this room. Is this correct?
   A Only one projection screen is required in Lab 139, on the north wall

A-17  Q Teaching wall Elevation 2/A406 matches plan view at Room 105 however, it does not match plan view for Rooms 101, 103, 135, 137, 139, 237 or 239. Should we bid per the elevation or the plan view for each of these rooms?
   A Provide cabinet quantities to match plan. Cabinet types are shown in elevation

A-18  Q Specification 101100 includes tackboards, where are these indicated on the drawings? Also, please confirm if all markerboards are to be 54” tall. If so, due to this height, any board over 10’ long will require a joint.
   A No tackboards shown. Floor plans show markerboard locations.

A-19  Q Please confirm that floor finish type RT1-4 do not apply to this project.
   A RT 1-4, Fritz tile finish is mistated on schedule as QT 1-4. Fritz tile in project.

A-20  Q The signage specifications list an allowance for 10 signs. This is not listed on the bid form. Please provide
   A GC to include 10 extra signs in base bid to be used at owner's direction

A-21  Q The specifications for the electric traction elevator item 1.2-A-1 lists Otis Gen 2 as elevator equipment provider. Item 2.1-A list Kone as basis of design. Please advise
   A Otis Gen 2 is basis of design or approved equal. Kone is an accepted manufacturer.

A-22  Q FRP panels are shown in the janitor's closet on drawing A401. This does not appear on the finish schedule or the specifications. Please advise
   A See detail 13/A401 note: FRP panel full height around janitor sink.

A-23  Q The hollow metal frame types shown on A601 list frames F6, F7 & F9-11. These frames do not appear on the door schedule. Please advise.
   A Hollow Metal frames F7, F8, F9, F10, F11, F13 are Hollow Metal window frames, see floor plans for locations. F6 is not used.

A-24  Q Please confirm all exterior window and interior offices will receive frosted glass film per glazing specifications.
   A Atrium windows C24, 25, 26 at atrium to receive complete frosted film. Interior window F11 & F12 to receive frosted band applied film from floor level up to 7'-0". Submit selection of film type for Architect's final approval.

A-25  Q Is it required to fully grout hollow metal door frames located in metal stud partitions per head details H5 & H6 shown on drawing A601?
   A Metal frame grouting is not required in metal stud partitions, only masonry and cast concrete wall.

A-26  Q Specification 061053 Paragraph 1.2.A.5 notes closet shelf, and rod. Where are these indicated on the drawings?
   A Disregard requirement for closet shelf and rod. Not applicable to this project.

A-27  Q Drawing A112, Conference Room 212, shows what looks to be furniture at the east wall. Please clarify what is this and advise if this is by the Owner or General Contractor.
   A A112 east wall is furniture and is shown on A902

A-28  Q Specification 123553, Section 1.5.B.1 on Page 2 calls for FSC material. Please indicate the percent of FSC material required.
   A Minimum 50%

A-29  Q Typical to Drawing A402, Room 133, symbols 'V' 'A' & 'G' are shown on the east wall and again in Elevation 11/A408 and appear to be wall mounted. Are these intended to be supplied under the Wood Laboratory Specification 123553 or under the plumbers spec? It is understood that the 'V' 'A' & 'G' fixtures shown in the Wood Laboratory Casework and epoxy tops are supplied under Specification 123553 and installed by the plumber contractor. Please advise Specifications.
   A The project is a single prime contract. Quality and quantity to meet specifications

A-30  Q Please provide details for the student lounge counter shown in drawings detail 11/A710.
   A Detail provided on revised drawings.
A-31 Q The building code for the project is type 2B which carries a zero hour fire rating. What is rating for the fireproofing? On the structural drawings, it labels some areas to receive spray on fireproofing. Are these the only areas? What about the columns and deck? Please advise.
A Fire rating for Structural steel to be 1 hour. Refer to diagram on sheet G101 for specific areas to receive applied fire proofing.

A-33 Q Locations of Corner Guards Required. Sections 10 26 00 do not seem to be defined. Refer Sections 12 48 13 and 10 26 00.
A Corner guards to be placed on all outside gypsum wallboard corners in public corridors on both floors

A-34 Q Section 12 35 53 Wood Lab Case Work & Section 11 53 13 – Lab Fume hoods - Adjustable Wall shelving does not indicate what the shelf material is supposed to be. Are the shelves wood to match the Wood Lab Casework or epoxy resin to match the Lab Countertops? Reference elevation 5/A403 for example
A Phenolic resin

A-35 Q Spec 12 35 53 – Wood Lab Casework, item 2.9 gives descriptions of the different types of fixtures. However, there does not appear to be a fixture schedule to indicate what type of fixture gets used where.
A Reagent Grade fixtures (polypropylene) - provide at all DI/RO locations
Provide serrated outlets at all mixing valve sink locations
Provide one aerator outlet per lab to owner
Provide Ball Valves throughout

A-36 Q FE and FEC: Specs. 10 44 00 & 10 44 13. Please provide drawings with Qty. and Location
A Floor plans locate FE and FEC.

A-37 Q Door # 143A Door schedule shows bipart, floor plan show single slider Door # 43B door schedule shows 6 panel telescopic, floor plan shows single slider Door # 144B door schedule shows 6 panel Telescopic, floor plan shows single slider.
A Door Schedule is correct, Biplarting door are to be used.

A-38 Q Specification details custom color matches, (GW4006 and Pine Green) drawing says “Manufacturers available colors”. Which is to be used for bid?
A Provide colors per specifications.

A-39 Q Drawing (A601) shows signs with square corners. Specification says “bullnose and radius”. Which is correct?
A Specification 101423 is correct with radius corners

A-40 Q For the “Wayfinding Signage” they say to match campus system, APCO SIGN. Will they accept an alternate? Can we get size and fabrication information? Photo or drawing?
A APCO is incorrect for interior wayfinding signage. Interior Signs are 8 1/2”X 11” in metal frames with plexiglass protection. The evacuation plan will be a drawing provided by sign company. CAD floor plan will be provided for this use by architect.

A-41 Q Please provide Specifications for the Cantilevered Sunscreen Assemblies shown on the drawings.
A Refer to spec 084413 section 2.6

A-42 Q Specification 101423-1 has allowance for interior signs to include 10 additional room signs. Confirm this is sign type S-2 on drawing A601.
A Provide 10 extra signs in base bid to be used at discretion of owner. Sign type to be type S-2

A-43 Q Specification 101423 details custom color matches, (GW4006 & Pine Green) drawing says “manufacturers available colors”. Which is to be bid?
A Follow color requirements outline in specifications

A-44 Q Drawing A601 shows signs with square corners. Specification 101423 says “bullnose and radius”. Which is correct?
A Specification 101423 is correct with radius corners

A-45 Q Please provide planting schedule for interior living wall
A Botanical Name  Common Name  Pot Size  % of Total Quantity Required
Chlorophytum comosum Variegatum’ Spider Plant 4 inch  20
Nephrolepis exaltata ‘Bostoniensis’ Boston Fern 4 inch  20
Peperomia caperata Emerald Ripple Peperomia 4 inch  20
Epipremnum aureum Golden Pothos 4 inch  20
Arrangement of plants on wall system to be determined in field and approved by Architect prior to proceeding with work.
Use a soil-less horticultural growth medium (COM) designed for your specific plants, combined with a biofungicide to prevent root disease.

A-46 Q Toilet Accessories - Specification Section 102810 does not list what models are to be used for various accessories. Please provide.

A Basis of Design Toilet Accessories, but not limited to the following:

A Wall Hung Mirror: Custom
B Utility Shelf with Hooks: ASI 1308-3
D Electric Hand Dryer: XLERATOR XL-SB
J 18" Grab Bar: ASI #3801
K 36" Grab Bar: ASI #3801
L 42" Grab Bar: ASI #3801
M 24"x4'-4" Wall Hung Mirror: ASI #0620
N Paper Towel Dispenser: ASI #20458
Q Coat Hook: ASI #7345
### Structure

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| S-1  | Q Drawing # S 901: Alternate Foundation Sections. Note provided therein states that Foundation sections indicated on this sheet are at the Contractor's option as part of the base bid. Please clarify as how to use this sheet, which is not provided in Bid form as any Alternate.  
A Alternate foundation sections are provided as an option to the contractor with no alternate bid to be provided. Bid shall be based on whichever foundation design is selected by the contractor. |
| S-2  | Q Structural drawing S 601 has a detail for "typical exterior stoop". Where is this detail to be applied? Site drawings have the sidewalks right up to entrances. If the Site shows sidewalks up to entrance. Why wouldn't the site drawings have a detail for typical stoop?  
A Stoop locations and dimensions will be added to structural foundation plan and typical detail. |
| S-3  | Q Drawing (S901 – Alternate Foundation section), please clarify where this drawing stands for as there is no alternate for it in the price proposal.  
A Alternate foundation sections are provided as an option to the contractor with no alternate bid to be provided. Bid shall be based on whichever foundation design is selected by the contractor. |
| S-4  | Q Please provide the detail for underpinning  
A Underpinning design and detailing is to be provided as required based on field conditions by a contractor specializing in the design and construction of underpinning. |
| S-5  | Q Please confirm that the Structural Steel fabricator must be AISC certified.  
A Yes, as indicated in the project specifications, the fabricator shall be AISC-Certified |
| S-6  | Q Please confirm that the Structural Steel erector must be AISC certified.  
A Yes, as indicated in the project specifications, the erector shall be AISC-Certified |
| S-7  | Q Sheet G101 references the operable building code as IBC 2009 NJ edition with no other reference. This code only requires impact performance when at or above 120 MPH wind speed design criteria or within one mile of the coast neither which apply to this building. But on sheet S-001 there is a clear reference to the building being in a hurricane prone area which would require wind borne debris resistant materials on the entire building skin.  
A Structure lies within Hurricane Prone Region - Not within a wind borne debris region |
| S-8  | Q A |
| S-9  | Q A |
| S-10 | Q A |
| S-11 | Q A |
### Mechanical

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<tr>
<td>M-1</td>
<td>Please confirm that hood controls by Venturi shown in M304 comply with Precision Air Control Valves shown in M502. &lt;br&gt;A Yes, <em>The control system provided by the equipment mfg allows for an airflow differential control.</em></td>
</tr>
<tr>
<td>M-2</td>
<td>If possible please provide cut sheet of fume hoods &lt;br&gt;A <em>Fume Hood basis of design and product requirements provided in Specifications. Cut Sheets are not provided by Architect for specified products.</em></td>
</tr>
<tr>
<td>M-3</td>
<td>Boiler Flue clarifications &lt;br&gt;A <em>In lieu of combined boiler flue shown on drawings the boiler flues shall be separately vented to the roof following the same routing as currently shown. Flue size shall be based on boiler mfg maximum allowable back pressure requirements (approx. 10&quot; dia).</em></td>
</tr>
<tr>
<td>Item</td>
<td>Question/Answer</td>
</tr>
<tr>
<td>------</td>
<td>-----------------</td>
</tr>
</tbody>
</table>
| E-1  | Q Drawing E 202: the Light Fixtures in room 248,225,227,215,246 and the area between room 241 and corridor 247 have no light fixture designations.  
A Light Fixture designations have been added to the drawings |
| E-2  | Q Drawing E 202: the Type D fixtures shown in room 241 do not match the type D fixtures shown in room 212.  
A Light Fixture designation has been update to type E |
| E-3  | Q Drawing E 201 & eE202: please confirm that all switches and occupancy sensors shown in "light" lines are new and part of this project.  
A Yes, all occupancy sensors are new and part of this job. The lineweight has been darkened for clarity. |
| E-4  | Q The above list is not and inclusive list of all lighting discrepancies. Please clarify the fixture types of all light fixtures required for this project.  
A Light Fixture designations have been added to the drawings |
| E-5  | Q The Lighting Fixtures schedule on drawing E 302 has the following light fixtures designations: Type: LA, LB, LBX, LC, LD, LF, LG4, LG12, LG20, LH, LJ, PK & LKF. These light fixtures designations do not match any of the light fixtures designations shown on drawings E 201 and E 202. An example would be Drawings E 201, Room 101  
A The prefix 'U' has been removed from the light fixture schedule |
| E-6  | Q Drawing E 201: The Light fixtures shown in rooms 001, 003, 106 and lights shown outside doors in stairwell 148,148, lobby 144, Vestibule 143 and towards column line 19 have no lighting fixtures designations.  
A Light Fixture designations have been added to the drawings |
| E-7  | Q Drawing E 201: The light fixture shown as type D in room 110 does not match the fixtures shown as type D in Vestibule 143  
A Light Fixture designation has been updated to type E |
| E-8  | Q Drawing E 201: Vestibule 113 A has the circuit "LP1-5" shown in the room but no fixtures or switches are shown.  
A There is a fixture type K shown in Vestible 113A. The tag has been added. |
| E-9  | Q Drawing E101: Throughout the drawing there are devices shown in "light" lines and smaller in scale. Please clarify if these devices are part of this project. Example: General Biology Room 135 -- the smaller receptacles shown around each lab table.  
A These have been updated to place darker symbols on all of the smaller receptacles shown. |
| E-10 | Q Drawing E101 Rooms #101, 103, 105, and 107: There appears to be a notation next to the fire alarm combination horn or speaker/strobe. Please clarify what this notation reads and the meaning of it. It appears blurry on the drawings.  
A General note #4 on drawing E101 and E102 has been updated to clarify the requirement for speaker strobes and tying into the exiting simplex system |
| E-11 | Q There are multiple light fixtures on Pages E201 and E202 with no fixture types next to them. Please advise what types they are  
A Light Fixture designations have been added to the drawings |
| E-12 | Q Drawing E101: Throughout the drawing there are devices shown in "light" lines and smaller in scale. Please clarify if these devices are part of this project. Example: General Biology Room 135 -- the smaller receptacles shown around each lab table.  
A These have been updated to place darker symbols on all of the smaller receptacles shown. |
| E-13 | Q Electrical outlets are shown throughout the Wood Laboratory Casework, are these outlets and pedestals to be supplied under Specification 123563?  
A These are by the electrical contractor. |
E-14  Q  MCC normally uses a Simplex 4100ES Voice (speakers in lieu of horns) Systems on campus and connects them to the existing fiber optic network on campus. Will this be requirement for this project? The drawings states a new Simplex Fire Alarm panel or approved equal, the challenge would be that if MCC went with a non-Simplex system they would not be able to connect to the existing network. Please advise.

A  The fire alarm system needs to connect to the existing system. General note #4 on drawing E101 and E102 has been updated to clarify the requirement for speaker strobes and tying into the exiting simplex system.

E-15  Q  Drawing E302: Please provide the conduit and wire sizes for the following feeders:
• Generator to each ATS shown on the one line diagram
• From ATS to Panel EM
• From ATS to Transformer EMNE
  From Transformer EMNE to Non Essential Generator Distribution Panel

A  Completed in Addendum #1.

E-16  Q  Drawing E303 Panel Schedule RP2: The following items are shown on the panel schedule that are not shown on the drawings:
• Circuit 68, 70, 72: Panel RPDS-1
• Circuit 74, 76, 80: Panel RPDS-2
• Circuit 82, 84, 86: Panel RPCL

A  These panels are shown on the drawings and everything has been relabeled for clarity (Panel G-1 in General Science Room and Panel CL-1 is in the Computer Lab). This also correspond to the one line diagram.
## Middlesex County Community College
### South Hall
#### Addendum 1 Questions/Answers

<table>
<thead>
<tr>
<th>Item</th>
<th>Question/Answer</th>
</tr>
</thead>
</table>
| P-1  | Q Please provide Complete Fire Alarm specifications if fire alarm is part of this project.  
A Fire Alarm specifications to be included in Addendum 1 - Campus standard is Simplex as basis of design. |
| P-2  | Q Specification section 220700 3.8 calls for the installation of cellular glass type insulation on all domestic water and storm piping. Please confirm that fiberglass and not cellular glass type insulation is to be applied to the domestic water and storm piping systems.  
A Fiberglass insulation is acceptable for all domestic water and storm piping. |
| P-3  | Q Specification section 220700 3.8 calls for 1" thick insulation to be applied to the storm pipe and roof/overflow drain bodies. Drawing P401 detail #4 calls for 1-1/2" thick insulation. Please advise if the insulation on the storm pipe system is to be 1" thick of 1-1/2" thick.  
A Drain body insulation shall be 1" thick. |
| P-4  | Q Please indicate if the vertical storm pipe is to be insulated or only the horizontal and roof/overflow drain bodies.  
A Only drain bodies and horizontal storm piping is to be insulation. Vertical storm piping does not require insulating. |
| P-5  | Q Please confirm the use of "Standard" type no-hub couplings on the storm pipe system.  
A Standard weight no-hub couplings are acceptable. |
| P-6  | Q Please confirm the use of pressure sealed (Pro-press) and mechanically formed tees (Tdrill) on the domestic water pipe system.  
A Pro-Press and Mechanically formed tees are acceptable. |
| P-7  | Q Compressed air specification section 226113 2.1 calls for the piping to be oxy-grade copper with cleaned and bagged fittings. Is oxy-grade copper really required? Noted in the compressed air specification is the use of pressure sealed (Pro-press) type joints. Pro-press fittings do not come cleaned and bagged. Please advise if the compressed air piping can be NCN oxy-grade and installed utilizing Pro-press type fittings.  
A Pre-cleaned, Oxy-Grade copper is to be used for Compressed Air system. Pro-press fittings shall not be used on the system. Certified Brazers are required by the Plumbing Inspector. |
| P-8  | Q Please confirm that Pro-press is acceptable on the vacuum piping system.  
A Pro-Press and Mechanically formed tees are not acceptable for vacuum systems. |
| P-9  | Q Please confirm that a 3rd party testing agency is not required for the compressed air or vacuum piping systems.  
A Third party testing of the compressed air & Vacuum systems are not required. |
| P-10 | Q Please indicate if trap primers are required to serve the floor drains or will trap sealing devices suffice? Trap primers are specified on drawing P001 Miscellaneous Plumbing Schedule but are not shown on the drawings.  
A Trap Primers are not required on floor drains. "Pro- Seal", "Sure-Seal" or equal, trap seal savers shall be installed on all floor drains. |
| P-11 | Q Drawing P001 Miscellaneous Plumbing Schedule includes specifications for wall hydrants (AFWH) but wall hydrants are not shown on plumbing floor plans. Please advise.  
A AFWH have been added to drawings, 1-outside Basement Mech. Rm. Door, 1-outside Office Area 104 and 1-outside Chemical Disposal 121. |
| P-12 | Q Please confirm that all below and above slab acid waste piping is to be electro-fusion joints but that the lab sink traps can be mechanical joint.  
A All lab waste to be electro-fusion except lab sink traps. Lab sink traps to be mechanical joints. |
Q If possible please provide cut sheet of fume hoods or please indicate if the domestic water piping is pre-piped to the top of fume hood.

A Furne Hood basis of design and product requirements provided in Specifications. Cut Sheets are not provided by Architect for specified products. As the project is an open spec, all manufacturer's and products meeting the specifications are provided. GC is responsible for providing a complete system.

Q In reference to question above is the domestic water pipe required to be piped to the top of the fume with a vacuum breaker and then dropped down to service connection as implied by drawing P304 water riser diagram. If so please provide specifications for required vacuum breaker.

A Water shall be piped to the top of the Fume Hoods with anti-spill vacuum breaker.

Q Drawing P001 Miscellaneous Plumbing Schedule calls for “Watts” series LFUGS mixing valves to serve the lavatory sinks. Please confirm that these mixing valves are NOT required at the laboratory sinks.

A Lab Sinks do not require mixing valves.

Q Drawing P103 shows a P6 sink in Staff Lounge 202 – Drawing P001 Plumbing Fixture Schedule does not include specifications for a P6 sink. Please advise.

A P6 sink has been added to fixture schedule. Elkay #URAD3321 with Moen Chateau #7425.

Q Please confirm that seismic bracing is not required for any of the plumbing piping systems.

A Seismic bracing is not required for plumbing piping.

Q No specification is indicated for Deck Mounted Eyewash Units. What is required?

A Deck mounted eyewash unit is item P8 on the Plumbing Fixture Schedule. Guardian #G1775 & G1775LH

Q Specification section 123353 – Wood Lab Casework, item 2.9 gives descriptions of the different types of fixtures. However, there does not appear to be a fixture schedule to indicate what type of fixture gets used where. Specification indicates:

- Reagent Grade fixtures (polypropylene) to be used where.
- Mixing Faucets – Which ones getorrated outlets, which get aerators, which are self-closing?
- Ball Valves, Ground Key Cock & Needle valves. What gets used where?

A Reagent Grade fixtures (polypropylene) - provide at all DI/RO locations
Provideorrated outlets at all mixing valve sink locations
Provide one aerator outlet per lab to owner
Provide Ball Valves throughout

Q Specs 22 07 00: Insulation specification calls for Cellular Glass Insulation for the plumbing. Will Fiberglass Insulation be allowed in lieu of Cellular Glass?

A Fiberglass insulation is acceptable.

Q Please confirm that countertop fixtures “EW” and wall mount/ceiling mount fixtures “ES/EW” are to be supplied by plumbing contractor as they are scheduled on Plumbing drawing P001.

A All eyewash & shower/eyewash units are supplied and installed by the Plumbing contractor.

Q Specs Section: 22 62 19. As per TOC is for Gas Piping for Laboratory and Health Care Facility but in the contents, the Specs provided for the Vacuum Equipment for Lab Facility. As Specs for Gas Piping not found, please provide

A Specification section 231123 "Facility Natural Gas Piping" has been modified to in clude Lab Gas Piping.

Q Drawing P303 gas riser diagram shows natural gas being installed under slab to serve the lab benches. Please indicate if a PVC sleeve would suffice for this gas pipe or does the sleeve need to be welded steel? Welded steel would add substantial additional costs.

A Underground containment conduit may be PVC as permitted and installed in accordance with IFGC of NJ section 404.6.

Q Please advise if type ‘L’ soft tubing (non-xy-grade) is permissible for all below slab domestic water, vacuum and compressed air piping serving the lab benches.

A All below floor domestic water copper tubing shall meet the requirements of table 3.4 of the NSPC. Vacuum piping shall be in accordance with specification 226213, section 2.1. Compressed air tubing shall be in accordance with specification 226213, section 2.1.

Q 3. Please indicate at what locations is the Leonard #TM-800 mixing valve that is specified on drawing P001 Miscellaneous Drain Schedule to be installed – it appears that the TMV-1 noted in Equipment Schedule is to be installed at the water heater. The ETV mixing valve noted in the Misc. Plumbing Schedule is at the emergency shower units, The Powers ES150 mixing valve is at the countertop eyewashes and the Watts LSFUG tempering valve at the lavatory sinks – is this correct?

A Leonard #TM-800 mixing valve is not required on the project.
**Tele-Data**

**Question/Answer**

**TD-1**  
Q Spec 015000-5 (2.4-A) refer to construction web based camera system. Please confirm only 1 camera unit required on 40' High pole.  
A Correct. Only one camera is required.

**TD-2**  
Q Spec 015000-4 (2.2-D-2) refer to security alarm system for CM trailer. Can be it connect to college system or contractor have to connect with their security system + local police? Please provide detailed info.  
A Security alarm system for CM trailer is not a requirement by Owner for this project.

**TD-3**  
Q Please confirm if the telecommunication lines shall be concrete encased or not, if yes, please provide details.  
A Concrete encasement not required

**TD-4**  
Q Please clarify the telecommunication scope of work that should be under this contract and performed by the General Contractor and what should be under a separate contract.  
A Telecommunication system/data wiring to be part of project.

**TD-5**  
Q Please clarify the Audio/Visual scope of work that should be under this contract and performed by the General Contractor and what should be under a separate contract.  
A The A/V scope of work included in the general contractors contract per the audio/visual drawings.

**TD-6**  
Q Drawing ET001: Who is responsible for voice/data wiring? The telecommunication system legend on ET001 states to provide conduit and pull string for data and phone outlets. Underneath the telecommunication system legend is an "Equipment Specifications" table that lists specific cabling requirements. Additionally, on Drawing E001 Electrical General Note # 3 states "All telephone/data wiring is contractor see other". Please clarify/define what this note means. These notes and drawings appear to be contradictory. Please definitively clarify if the aforementioned voice/data wiring and fiber optic equipment and cabling are part of this project.  
A Please read carefully. The note says, "FLUSH DATA OUTLET WITH 2 DATA DROPS. CABLE SHALL BE CATEGORY 6A, PROVIDE 1" CONDUIT, WITH BUSHINGS AND PULL-STRING TO A POINT ABOVE FINISHED CEILING." This means that the contractor shall furnish and install all cable, conduit AND pull string. The pull string is for future growth. Quantities of cables shall be in accordance with the schedules on the contract drawings.

**TD-7**  
Q ET300 – Detail 1, - lists room as 2nd floor MDF – is this Rm. # 225?  
A Yes. The MDF (Located on the 2nd Floor) is Room #225.

**TD-8**  
Q ET300 – Detail 3, - lists room as 2nd floor IDF – Is this Rm. # 225?  
A Yes. The room name is mislabeled and should be "MDF": The MDF (Located on the 2nd Floor) is Room #225.

**TD-9**  
Q ET300 – Detail 1, - cable tray runs along rear wall – how are cables going to be routed to the (4) racks?  
A Cable tray shall be run in the center of the room (above the racks).

**TD-10**  
Q ET602 – Detail 4, – 2- cables enter the South Hall, 2nd floor MDF from outside the Bldg.; Is there a site plan drawing showing the route these cables will take between Bldgs.?  
A refer to sketches included in addendum 1

**TD-11**  
Q Sec 271500, 2.3, B, 1, 2, 3, - Lists (Green) as Data, (Yellow) as Telephone, & (Blue) as Security?  
A The cable colors shall be as follows: (Green) as Data, (Yellow) as Voice, & (Blue) as Security Per detail 2 on ET602.

**TD-12**  
Q ET001, Telecom General Notes, # 11, - lists (Blue) as Data, (White) as Voice, & (Yellow) as Security?  
A The cable colors shall be as follows: (Green) as Data, (Yellow) as Voice, & (Blue) as Security Per detail 2 on ET602.

**TD-13**  
Q Please furnish correct color scheme for Cat 6A cabling and outlets
A The 6A outlet colors shall be as follows: (Green) as Data, (Yellow) as Voice, & (Blue) as Security Per details 1 and 2 on ET802.

TD-14 Q Sec 271500, 2.5.3, a. - Lists flush mounting jacks, positioning the cord at a 45-degree angle?
A Disregard the 45-degree angle.

TD-15 Q ET802 – Detail 2, shows a flush, 2-port faceplate?
A Yes, this is correct

TD-16 Q Are all flush faceplates to be 4-port, angled faceplates?
A There are no 4-port faceplates.

TD-17 Q ET001 – Equip. Specs – list Cat 6A, 48-Port, angled patch panels and ET601 shows 2RU cable managers – typically when angled patch panels are installed, no horizontal cable managers are installed because all patch cords are dressed directly from the patch panel to the vertical cable managers. This not only saves rack space, but also provides a cost saving to the client.
A Cable managers shall remain to keep rack organized. The owner shall install all network switches and require horizontal wire management.

TD-18 Q 70. ET601 – Detail 1-4 – Shows (4) Eaton 5PX3000RTN UPS units installed at the bottom of the racks – manufactures specifications list a 4-post rail kit included. All racks are 2-post, Should racks be 2-post or 4-post?
A Racks shall be 2-Post Racks as specified per College’s request. Contractor shall provide an (2) Eaton 2-Post Rail Kit (one for the UPS and one for the extended battery)

TD-19 Q Sec 271300, Item 2.3, D – No Field termination, Factory pigtailed fusion spliced
A This was a typo. Please disregard.

TD-20 Q ET001 Equip. Specifications – List factory pre-polished, field installable MM & SM connectors
A Drawing ET001 is correct.

TD-21 Q Which of the above methods 13 or 14 should be used for this project?
A #14 - Factory pre-polished, field installable MM & SM connectors.
TO: Board of Trustees
Middlesex County College
Edison, New Jersey

The Undersigned hereby declare that he/she carefully examined the site of the work, the Contract and Specifications, and the Drawings therein referred to, and will provide all necessary machinery, tools, apparatus, and other means for construction on all bid items and do all the work and furnish all the materials called for by said Contract and Specifications, and the requirements under them, in accordance with the Advertisement, Instructions to Bidders, Plans, Specifications, all of which are annexed hereto and form a part of this Contract, and any instructions which may be given during the work, in the time allowed for this contract.

The Undersigned understands that no subsequent claim for additional cost based on lack of full knowledge of the conditions of this project will be considered.

ALLOWANCE

Allowance No. 1 - Unsuitable Soil Replacement: 1,500 CY x $____________/CY = $____________

BASE BID including ALLOWANCE No. 1

Lump Sum total to complete as specified $______________________________
(In words) ____________________________________________________________________

ALTERNATES

1A - ATC Controls, Johnson Controls, Inc.

$ Add______________________________

$ Deduct______________________________

1B - ATC Controls, Automated Logic Corp.

$ Add______________________________

$ Deduct______________________________

1C - ATC Controls, Other manufacturer as substituted by the bidder

Manufacturer name______________________________

Vendor Representative Initials: _____

D-1.1
2A - Medium-voltage cables, Okonite Company

2B - Medium-voltage cables, Southwire Company

2C - Medium-voltage cables, Other manufacturer as substituted by the bidder

3A - Medium-voltage cable splicing and terminating accessories, Engineered Products Company

3B - Medium-voltage cable splicing and terminating accessories, 3M; Electrical Products Division

3C - Medium-voltage cable splicing and terminating accessories, Other manufacturer as substituted by the bidder

Vendor Representative Initials: _____

D-1.2
**SUBCONTRACTOR DISCLOSURE** - List subcontractors to be used on this project.

<table>
<thead>
<tr>
<th>Subcontractor's Name</th>
<th>NJ License #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plumbing</td>
<td></td>
</tr>
<tr>
<td>HVAC</td>
<td></td>
</tr>
<tr>
<td>Electrical</td>
<td></td>
</tr>
<tr>
<td>Structural Steel</td>
<td></td>
</tr>
</tbody>
</table>

It shall be understood that the award will be made to the lowest responsible Bidder by the Owner upon evaluation of the bids.

The total amount of the bid shall be printed in ink in both words and figures. Any bid which fails to name the total amount of the bid in both words and figures may be rejected. In case of discrepancy, the total amount of the bid written words shall be considered as the bid price. On case of any error in extension, the unit price shall be considered as the bid.

Firm Name: _____________________________________________________________

Signature: ______________________________________________________________

Address: _______________________________________________________________

_______________________________________________________________________

Phone #: ___________________________ Fax #: _____________________________

Vendor Representative Initials: _____

D-1.3
SECTION 226219

VACUUM EQUIPMENT FOR LABORATORY FACILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Packaged, rotary-claw vacuum pumps.

1.3 DEFINITIONS

A. Actual Air: Air delivered at vacuum producer inlet. Flow rate is air measured in expanded cfm (expanded L/s).

B. Laboratory Vacuum Equipment: Equipment and accessories for nonmedical laboratory facilities.

C. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

D. Standard Air: Free air at 68 deg F (20 deg C) and 1 atmosphere (29.92 in. Hg) before compression or expansion and measured in scfm (standard L/s).

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
   1. Wiring Diagrams: For power, signal, and control wiring.

B. Delegated-Design Submittal: For vacuum-producing equipment mounting 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. Detail fabrication and assembly of supports.
   2. Design Calculations: Calculate requirements for selecting vibration isolators and for designing vibration isolation bases.

C. Qualification Data: For qualified Installer.
D. Field quality-control reports.
E. Operation and Maintenance Data: For vacuum equipment to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE
A. Installer Qualifications:
   1. Laboratory Vacuum System Equipment for Nonmedical Laboratory Facilities: An employer of workers trained and approved by manufacturer.
   2. Medical Vacuum System Equipment for Healthcare Facilities: Qualify installers according to ASSE 6010.
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. ASME Compliance: Fabricate and label receivers and separators to comply with ASME Boiler and Pressure Vessel Code.

1.6 COORDINATION
A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.7 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. Belts: Two for each belt-driven vacuum producer.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PACKAGED VACUUM PUMPS
A. Furnish a central vacuum system consisting of industrial oil-free claw type vacuum pumps mounted on an ASME coded horizontal receiver tank and with automatic lead/lag electrical controls. The complete vacuum system including electrical controls shall be designed, assembled, and factory tested by the vacuum pump manufacturer. Vacuum systems that are designed and/or fabricated by sources other than the vacuum pump manufacturer shall not be accepted. Adequate documentation will be provided to allow installation, operation and future maintenance of the equipment.
B. The system shall consist of (2) vacuum pumps, each designed to pull 190 ACFM at 19” HgV and 177 ACFM at 24” HgV. Pump shall be capable of continuous operation. Pumps shall be capable of attaining 27” HgV.
C. Control Panels: Automatic control station with load control and protection functions. Comply with NEMA ICS 2 and UL 508. The control panel shall alternate the vacuum pumps on a demand basis when the lead vacuum pump has met vacuum demand and on an additional timed basis to provide approximate equal run time for each vacuum pump in use.

All vacuum pumps shall be controlled in a cascading lead-lag sequence when operating in the auto mode. The control system shall be programmed to minimize motor starts per hour per NEMA standards. Control circuits shall be arranged in such a manner that the shutdown of one pump does not interrupt the operation of another pump.

1. Enclosure: NEMA ICS 6, Type 12 control panel unless otherwise indicated.
3. Control Voltage: 120-V ac or less, using integral control power transformer.
5. Starting Devices: Hand-off-automatic selector switch in cover of control panel, plus pilot device for automatic control.
6. Automatic control switches to alternate lead-lag vacuum pumps for duplex vacuum pumps.
7. Instrumentation: Include vacuum pump inlet and receiver vacuum gages, hour meter, vacuum pump discharge-air and coolant temperature gages, and control transformer.
8. Alarm Signal Device: For connection to alarm system to indicate when backup vacuum pump is operating.

D. Receivers: Steel tank constructed according to ASME Boiler and Pressure Vessel Code.

1. Interior Finish: Corrosion-resistant coating.
2. Accessories: Include vacuum relief valve, vacuum gage, and drain.

E. Mounting Frame: Fabricate base and attachment to pressure vessel with reinforcement strong enough to resist packaged equipment movement during a seismic event when base is anchored to building structure.

2.2 ROTARY-CLAW VACUUM PUMPS

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

1. Gardner Denver Elmo Riestchle
2. Busch, Inc.
3. Quincy Compressor; an EnPro Industries company.
4. Kaeser Compressors, Inc.

B. Description: Packaged unit.

C. Vacuum Pump(s): Single-stage, dry claw vacuum pumps.

2. Cooling/Lubrication System: Unit-mounted, air-cooled exchanger package prepiped to unit; with air-pressure circulation system with coolant stop valve, full-flow coolant filter, and thermal-bypass valve.

4. Capacity Control: Capacity modulation between 0 and 100 percent vacuum delivery. Include necessary control to hold constant vacuum. When vacuum demand is zero, unload unit by using vacuum switch and blowdown valve.

5. Outlet silencers on discharge connections.

D. Capacities and Characteristics:

1. Vacuum Service: Science Laboratory vacuum.
2. Vacuum Pump(s): Two.
4. Actual-Air Capacity of Each Vacuum Pump: 177 ACFM (actual L/s) expanded air delivered.
5. Vacuum Required: 24-in. Hg (88-kPa) vacuum.
6. Pumps shall be capable of attaining 27” Hg.
7. Motor (Each Vacuum Pump):
   a. Horsepower: 7.5.

8. Unit Electrical Characteristics:
   a. Volts: 208
   b. Phase(s): Three.
   c. Hertz: 60 Hz.

   b. Capacity: 200 gal.
   c. Pressure Rating: 100 psig (690 kPa) minimum.
   d. Interior Finish: Epoxy
   e. Drain: Automatic valve.

2.3 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors.

1. 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.
2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.
PART 3 - EXECUTION

3.1 PREPARATION

A. Clean vacuum equipment, accessories, and components that have not been cleaned for oxygen service and sealed or that are furnished unsuitable for laboratory vacuum applications, according to CGA G4.1, "Cleaning Equipment for Oxygen Service."

3.2 VACUUM EQUIPMENT INSTALLATION

A. Equipment Mounting: Install vacuum producers on concrete bases using restrained spring isolators.
   1. Minimum Deflection: 1/4 inch (6 mm).
   2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
   3. For supported equipment, 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. Install vacuum equipment anchored to substrate.

C. Orient equipment so controls and devices are accessible for servicing.

D. Maintain manufacturer's recommended clearances for service and maintenance.

E. Install the following devices on vacuum equipment:
   1. Thermometer, Vacuum Gage, and Pressure Relief Valve: Install on each vacuum pump receiver.
   2. Drain Valves: Install on receivers. Discharge receiver condensate over nearest floor drain. Discharge separator oral evacuation fluids by direct connection into sanitary waste piping system.

3.3 CONNECTIONS

A. Comply with requirements for water-supply piping specified in Division 22 Section "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Comply with requirements for drain piping specified in Division 22 Section "Sanitary Waste and Vent Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

C. Comply with requirements for vacuum piping specified in Division 22 Section "Vacuum Piping for Laboratory." Drawings indicate general arrangement of piping, fittings, and specialties.

D. Install piping adjacent to equipment to allow service and maintenance.
3.4 IDENTIFICATION

A. Identify nonmedical laboratory vacuum equipment system components. Comply with requirements for identification specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

B. Identify medical vacuum equipment system components. Comply with requirements for identification specified in Division 22 Section "Identification for Plumbing Piping and Equipment." and with NFPA 99.

3.5 FIELD QUALITY CONTROL FOR HEALTHCARE-FACILITY MEDICAL VACUUM EQUIPMENT

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. Replace damaged and malfunctioning controls and equipment.

2. Testing Certification: Certify that specified tests, inspections, and procedures have been performed and certify report results. Include the following:

   a. Inspections performed.
   b. Procedures and materials used.
   c. Test methods used.
   d. Results of tests.

E. Components will be considered defective if they do not pass tests and inspections.

F. 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. Check for lubricating oil in lubricated-type equipment.

3. Check belt drives for proper tension.

4. Verify that vacuum producer outlet piping is clear.

5. Check for equipment vibration-control supports and flexible pipe connectors and verify that equipment is properly attached to substrate.
6. Check safety valves for correct settings.
7. Check for proper seismic restraints.
8. Drain receiver tank.
9. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
10. Test and adjust controls and safeties.

B. Verify that vacuum equipment is installed and connected according to the Contract Documents.

C. Verify that electrical wiring installation complies with manufacturer’s submittal and written installation requirements in Division 26 Sections.

D. Prepare written report documenting testing procedures and results.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner’s maintenance personnel to adjust, operate, and maintain vacuum producers.

END OF SECTION 226219
SECTION 231123
FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings

1.2 SUMMARY

A. Section Includes:
   1. Pipes, tubes, and fittings.
   2. Piping specialties.
   3. Piping and tubing joining materials.
   4. Valves.
   5. Pressure regulators.
   6. Mechanical sleeve seals.
   7. Grout.
   8. Lab gas piping

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

1.4 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:
   1. Piping and Valves: 100 psig minimum unless otherwise indicated.
   2. Service Regulators: 65 psig minimum unless otherwise indicated.
   3. Minimum Operating Pressure of Service Meter: 10 psig.

B. Natural-Gas System Pressure within Buildings: More than 0.5 psig but not more than 2 psig.

1.5 SUBMITTALS

A. Product Data: For each type of the following:
   1. Piping specialties.
   2. Corrugated, stainless-steel tubing with associated components.
3. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
4. Pressure regulators. Indicate pressure ratings and capacities.
5. Service meters.
6. Dielectric fittings.
7. Mechanical sleeve seals.
8. Escutcheons.

B. Shop Drawings: For natural-gas piping layout. Include plans, piping layout and elevations, sections, and details for fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

1. Shop Drawing Scale: 1/4 inch per foot.
2. Detail mounting, supports, and valve arrangements for meter assembly pressure regulator assembly.

C. Qualification Data: For qualified professional engineer.
D. Welding certificates.
E. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
C. 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.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of authorities having jurisdiction.
B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating, and protect from direct sunlight.
D. Protect stored PE pipes and valves from direct sunlight.

1.8 PROJECT CONDITIONS

A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.

1.9 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.
B. Coordinate requirements for access panels and doors for valves installed concealed behind
PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
   2. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
   3. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
      b. End Connections: Threaded or butt welding to match pipe.
      c. Lapped Face: Not permitted underground.
      e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel underground.
   4. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.
      a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

B. Annealed-Temper Copper Tube: Comply with ASTM B 88, Type L (ASTM B 88M, Type B)
      a. Copper fittings with long nuts.
      b. Metal-to-metal compression seal without gasket.
      c. Dryseal threads complying with ASME B1.20.3.
   3. Protective Coating for Underground Tubing: Factory-applied, extruded PE a minimum of 0.022 inch (0.56 mm) thick.

2.2 PIPING SPECIALTIES

A. Appliance Flexible Connectors:
   2 Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
   3 Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
   4 Corrugated stainless-steel tubing with polymer coating.
   5 Operating-Pressure Rating: 0.5 psig (3.45 kPa).
   6 End Fittings: Zinc-coated steel.
   7 Threaded Ends: Comply with ASME B1.20.1.
   8 Maximum Length: 72 inches (1830 mm).

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CDI Architects, Inc.
dba L.R. Kimball - Architecture
B. Weatherproof Vent Cap: Cast-or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.3 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

2.4 MANUAL GAS SHUTOFF VALVES

A. See "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles for where each valve type is applied in various services.
B. General Requirements for Metallic Valves, NPS 2 (DN 50) and Smaller: Comply with ASME B16.33.
   1. CWP Rating: 125 psig (862 kPa).
   3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
   5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch (25 mm) and smaller.
   6. Service Mark: Valves 1-1/4 inches (32 mm) to NPS 2 (DN 50) shall have initials "WOG" permanently marked on valve body.
C. General Requirements for Metallic Valves, NPS 2-1/2 (DN 65) and Larger: Comply with ASME B16.38.
   1. CWP Rating: 125 psig (862 kPa).
   2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
   4. Service Mark: Initials "WOG" shall be permanently marked on valve body.
D. Bronze Plug Valves: MSS SP-78.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, the following:
      a. Lee Brass Company.
   2. Plug: Bronze.

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4 Operator: Square head or lug type with tamperproof feature where indicated.
5 Pressure Class: 125 psig (862 kPa).
6 Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
7 Service: Suitable for natural-gas service with "WOG" indicated on valve body.

2.5 MOTORIZED GAS VALVES

Electrically Operated Solenoid Valves: Comply with UL 429.

Pilot operated.
Body: Brass or aluminum.
Seats and Disc: Nitrile rubber.
Springs and Valve Trim: Stainless steel.
120-V ac, 60 Hz, Class B, continuous-duty molded coil, and replaceable.
NEMA ICS 6, Type 4, coil enclosure.
Normally closed.
Visual position indicator.

2.6 PRESSURE REGULATORS

A. General Requirements:
   1 Single stage and suitable for natural gas.
   2 Steel jacket and corrosion-resistant components.
   3 Elevation compensator.
   4 End Connections: Threaded for regulators NPS 2 (DN 50) and smaller; flanged for regulators NPS 2-1/2 (DN 65) and larger.

B. Service Pressure Regulators: Comply with ANSI Z21.80.
   1. Subject to compliance with requirements, available manufacturers that may be incorporated into the Work include, but are not limited to, the following:
      a. Actaris.
      b. American Meter Company.
      c. Fisher Control Valves and Regulators; Division of Emerson Process Management.
      d. Richards Industries; Jordan Valve Div.
   2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
   5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
   6. Orifice: Aluminum; interchangeable.
   8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
   9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
   11. Atmospheric Vent: Factory-or field-installed, stainless-steel screen in opening if not
connected to vent piping.

12. Maximum Inlet Pressure: 100 psig (690 kPa).


1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. Maxitrol Company.

2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.


1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. Canadian Meter Company Inc.
   b. Eaton Corporation; Controls Div.
   c. Harper Wyman Co.
   d. Maxitrol Company.
   e. SCP, Inc.

5. Seat Disc: Nitrile rubber.
8. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.
9. Maximum Inlet Pressure: 5 psig (34.5 kPa).

2.7 LABELING AND IDENTIFYING

A. Detectable Warning Tape: Acid-and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored yellow.

PART 3 - EXECUTION
3.1 **EXAMINATION**

A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 **PREPARATION**

A. Close equipment shutoff valves before turning off natural gas to premises or piping section.
B. Inspect natural-gas piping according to the International Fuel Gas Code to determine that natural-gas utilization devices are turned off in piping section affected.
C. Comply with the International Fuel Gas Code requirements for prevention of accidental ignition.

3.3 **OUTDOOR PIPING INSTALLATION**

A. Comply with the International Fuel Gas Code for installation and purging of natural-gas piping.
B. Install underground, natural-gas piping buried at least 36 inches (900 mm) below finished grade. Comply with requirements in Section "Earthwork" for excavating, trenching, and backfilling.
   1. If natural-gas piping is installed less than 36 inches (900 mm) below finished grade, install it in containment conduit.
C. **Steel Piping with Protective Coating:**
   1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
   2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
   3. Replace pipe having damaged PE coating with new pipe.
D. **Copper Tubing with Protective Coating:**
   1. Apply joint cover kits over tubing to cover, seal, and protect joints.
   2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
E. Install fittings for changes in direction and branch connections.
F. **Aboveground, Exterior-Wall Pipe Penetrations:** Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
   1. Install steel pipe for sleeves smaller than 6 inches (150 mm) in diameter.
   2. Install cast-iron "wall pipes" for sleeves 6 inches (150 mm) and larger in diameter.
G. **Underground, Exterior-Wall Pipe Penetrations:** Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
H. **Mechanical Sleeve Seal Installation:** Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
I. Install pressure gage upstream and downstream from each service regulator. Pressure gages...
are specified in Section "Meters and Gages."

3.4 INDOOR PIPING INSTALLATION

A. Comply with the International Fuel Gas Code for installation and purging of natural-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Locate valves for easy access.

H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.

I. Install piping free of sags and bends.

J. Install fittings for changes in direction and branch connections.

K. Install escutcheons at penetrations of interior walls, ceilings, and floors.

1. New Piping:
   a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
   b. Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
   c. Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge and set screw.
   d. Piping in Unfinished Service Spaces: One-piece, stamped-steel type with set screw or spring clips.
   e. Piping in Equipment Rooms: One-piece, stamped-steel type with set screw or spring clips.
   f. Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

L. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Section "Through-Penetration Firestop Systems."

M. Verify final equipment locations for roughing-in.

N. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

O. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped.
   Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches (75 mm)
long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

P. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.

Q. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

R. Concealed Location Installations: Except as specified below, install concealed natural-gas piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.

1. Above Accessible Ceilings: Natural-gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.

2. In Floors: Install natural-gas piping with welded or brazed joints and protective coating in cast-in-place concrete floors. Cover piping to be cast in concrete slabs with minimum of 1-1/2 inches (38 mm) of concrete. Piping may not be in physical contact with other metallic structures such as reinforcing rods or electrically neutral conductors. Do not embed piping in concrete slabs containing quick-set additives or cinder aggregate.

3. In Floor Channels: Install natural-gas piping in floor channels. Channels must have cover and be open to space above cover for ventilation.

4. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.
   a. Exception: Tubing passing through partitions or walls does not require striker barriers.

5. Prohibited Locations:
   a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
   b. Do not install natural-gas piping in solid walls or partitions.

S. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

T. Connect branch piping from top or side of horizontal piping.

U. Install unions in pipes NPS 2 (DN 50) and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.

V. Do not use natural-gas piping as grounding electrode.

W. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

X. Install pressure gage upstream and downstream from each line regulator. Pressure gages are specified in Section "Meters and Gages."

Y. Install copper lab gas piping. Run parallel with compressed air and vacuum piping.

3.5 SERVICE-METER ASSEMBLY INSTALLATION

A. Install service-meter assemblies aboveground, on concrete bases.

B. Install metal shutoff valves upstream from service regulators. Shutoff valves are not required at second regulators if two regulators are installed in series.

C. Install strainer on inlet of service-pressure regulator and meter set.

D. Install service regulators mounted outside with vent outlet horizontal or facing down.
screen in vent outlet if not integral with service regulator.

E. Install metal shutoff valves upstream from service meters. Install dielectric fittings downstream from service meters.

F. Install service meters downstream from pressure regulators.

G. Install metal bollards to protect meter assemblies. Comply with requirements in Section "Metal Fabrications" for pipe bollards.

3.6 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.

B. Install underground valves with valve boxes.

C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

D. Install earthquake valves aboveground outside buildings according to listing.

E. Install electric solenoid valves on each supply line to each room. Wire to key switch at doorway into room. Provide check valve directly after all solenoid valves for each room.

3.7 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
2. Cut threads full and clean using sharp dies.
3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:

2. Bevel plain ends of steel pipe.
3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

F. Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural-gas service. Install gasket concentrically positioned.

G. Flared Joints: Cut tubing with roll cutting tool. Flare tube end with tool to result in flare dimensions complying with SAE J513. Tighten finger tight, then use wrench. Do not overtighten.

3.8 HANGER AND SUPPORT INSTALLATION

A. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices
specified in Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

B. Comply with requirements for pipe hangers and supports specified in Section "Hangers and Supports."

C. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1 (DN 25) and Smaller: Maximum span, 96 inches (2438 mm); minimum rod size, 3/8 inch (10 mm).
2. NPS 1-1/4 (DN 32): Maximum span, 108 inches (2743 mm); minimum rod size, 3/8 inch (10 mm).
3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): Maximum span, 108 inches (2743 mm); minimum rod size, 3/8 inch (10 mm).
4. NPS 2-1/2 to NPS 3-1/2 (DN 65 to DN 90): Maximum span, 10 feet (3 m); minimum rod size, 1/2 inch (13 mm).
5. NPS 4 (DN 100) and Larger: Maximum span, 10 feet (3 m); minimum rod size, 5/8 inch (15.8 mm).

D. Install hangers for horizontal drawn-temper copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 3/8 (DN 10): Maximum span, 48 inches (1220 mm); minimum rod size, 3/8 inch (10 mm).
2. NPS 1/2 and NPS 5/8 (DN 15 and DN 18): Maximum span, 72 inches (1830 mm); minimum rod size, 3/8 inch (10 mm).
3. NPS 3/4 and NPS 7/8 (DN 20 and DN 22): Maximum span, 84 inches (2134 mm); minimum rod size, 3/8 inch (10 mm).
4. NPS 1 (DN 25): Maximum span, 96 inches (2440 mm); minimum rod size, 3/8 inch (10 mm).

E. Install hangers for horizontal, corrugated stainless-steel tubing with the following maximum spacing and minimum rod sizes:

1. NPS 3/8 (DN 10): Maximum span, 48 inches (1220 mm); minimum rod size, 3/8 inch (10 mm).
2. NPS 1/2 (DN 15): Maximum span, 72 inches (1830 mm); minimum rod size, 3/8 inch (10 mm).
3. NPS 3/4 (DN 20) and Larger: Maximum span, 96 inches (2440 mm); minimum rod size, 3/8 inch (10 mm).

3.9 CONNECTIONS

A. Connect to utility's gas main according to utility's procedures and requirements.

B. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

C. Install piping adjacent to appliances to allow service and maintenance of appliances.

D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches (1800 mm) of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.
3.10 LABELING AND IDENTIFYING

A. Comply with requirements in Section "Identification for HVAC Piping" for piping and valve identification.
B. Install detectable warning tape directly above gas piping, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.11 PAINTING

A. Comply with requirements in painting Sections for painting interior and exterior natural-gas piping.
B. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.12 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base.
   1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.
   2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of the base.
   3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
   4. Place and secure anchorage devices. Use supported equipment manufacturer's 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.
   6. Use 3000-psi (20.7-MPa), 28-day, compressive-strength concrete with reinforcement.

3.13 FIELD QUALITY CONTROL

A. Perform tests and inspections.
B. Tests and Inspections:
   1. Test, inspect, and purge natural gas according to the International Fuel Gas Code and authorities having jurisdiction.
C. Natural-gas piping will be considered defective if it does not pass tests and inspections.
D. Prepare test and inspection reports.

3.14 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain earthquake valves.

3.15 OUTDOOR PIPING SCHEDULE

A. Underground natural-gas piping shall be one of the following:
   1. Steel pipe with wrought-steel fittings and welded joints, or mechanical couplings. Coat
pipe and fittings with protective coating for steel piping.

B. Aboveground natural-gas piping shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

C. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

3.16 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES MORE THAN 0.5 PSIG (3.45 kPa) AND LESS THAN 5 PSIG (34.5 kPa)

A. Aboveground, branch piping NPS 2 (DN 25) and smaller shall be one of the following:

1. Corrugated stainless-steel tubing with mechanical fittings having socket or threaded ends to match adjacent piping.
2. Steel pipe with malleable-iron fittings and threaded joints.

B. Aboveground, distribution piping shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with steel welding fittings and welded joints.

C. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat underground pipe and fittings with protective coating for steel piping.

D. Containment Conduit Vent Piping: Steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

3.17 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Valves for pipe sizes NPS 2 (DN 50) and smaller at service meter shall be [one of] the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, full-port, bronze ball valves with bronze trim.

B. Valves for pipe sizes NPS 2-1/2 (DN 65) and larger at service meter shall be one of the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.
2. Bronze plug valve.
3. Cast-iron, lubricated plug valve.

C. Distribution piping valves for pipe sizes NPS 2 (DN 50) and smaller shall be [one of] the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, full-port, bronze ball valves with bronze trim.

D. Distribution piping valves for pipe sizes NPS 2-1/2 (DN 65) and larger shall be one of the following:
1. Two-piece, full-port, bronze ball valves with bronze trim.
2. Bronze plug valve.
3. Cast-iron, lubricated plug valve.

E. Valves in branch piping for single appliance shall be one of the following:
   1. One-piece, bronze ball valve with bronze trim.
   2. Two-piece, full-port, bronze ball valves with bronze trim.

END OF SECTION 231123
SECTION 271300 - COMMUNICATIONS BACKBONE CABLEING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Pathways.
   2. 62.5/125 -micrometer, optical fiber cabling.
   4. 25-Pair – Copper Telephone Cable
   5. Coaxial cable.
   6. Cable connecting hardware, patch panels, and cross-connects.
   7. Cabling identification products.

B. Related Sections:
   1. Division 28 Section "Conductors and Cables for Electronic Safety and Security" for voice and data cabling associated with system panels and devices.

1.3 DEFINITIONS


B. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

C. EMI: Electromagnetic interference.

D. IDC: Insulation displacement connector.

E. LAN: Local area network.

F. RCDD: Registered Communications Distribution Designer.

G. UTP: Unshielded twisted pair.
1.4 BACKBONE CABLING DESCRIPTION

A. Backbone cabling system shall provide interconnections between communications equipment rooms, main terminal space, and entrance facilities in the telecommunications cabling system structure. Cabling system consists of backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross-connection.

B. Backbone cabling cross-connects may be located in communications equipment rooms or at entrance facilities. Bridged taps and splitters shall not be used as part of backbone cabling.

C. Both fiber optic and copper telephone cable will be directly connecting or interconnecting the following campus buildings:
   1. Building Name
      a. Science Building to Johnson Learning Center (12 Multi Mode and 12 Single Mode Fiber)
      b. Science Building to Crabiel Hall (12 Multi Mode and 12 Single Mode Fiber)
      c. Science Building to Physical Education Center (25 pair copper)
   2. Refer to the Site/Civil Plans for additional details.
   3. All inter-building cable pulls will be underground. Refer to the Civil Plans. Refer to the special system plans for the reference only not to scale campus map sketch. The actual distances must be measured, estimated and determined in the field prior to bid by the bidder.

1.5 PERFORMANCE REQUIREMENTS

A. General Performance: Backbone cabling system shall comply with transmission standards in TIA/EIA-568-B.1, when tested according to test procedures of this standard.

1.6 ACTION SUBMITTALS

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

   1. For coaxial cable, include the following installation data for each type used:
      a. Nominal OD.
      b. Minimum bending radius.
      c. Maximum pulling tension.
      d. UL and industry listings

   2. For fiber optic cable, include the following installation data for each type used:
      a. Nominal OD.
      b. Minimum bending radius.
c. Maximum pulling tension.
d. UL and industry listings

3. For 25-Pair Telephone cable, include the following installation data for each type used:
   a. Nominal OD.
   b. Minimum bending radius.
   c. Maximum pulling tension.
   d. UL and industry listings

4. Purchase and installation that proceeds without strict equipment approval shall be corrected at the contractor’s expense.

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:
   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.
7. 200LB pull cord must be left in any utilized conduit. Submit shop drawing for review and approval by MCC and Architect.

C. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.

D. Source quality-control reports.

E. Field quality-control reports.
F. The specific mounting methods must be approved by MCC and the architect.

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.

I. Refer to the contract drawings for additional shop drawing and submittal requirements.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.

B. Source quality-control reports.

C. Field quality-control reports.

D. Maintenance Data: For splices and connectors to include in maintenance manuals.

1.8 CLOSEOUT SUBMITTALS

A. 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.

B. Ten printed copies, and an electronic copy of the final documentation must be submitted to Architect before final job acceptance. Acceptable electronic format will be in Microsoft Word.

C. The documentation must include but is not limited to:
   1. copies of all test results
   2. as built site and building plans
   3. detailed legend of symbols and abbreviations used

D. All documentation will be presented in a professional manner.

E. The contractor shall provide MCC and architect with total individual link test and results documentation on each fiber run, cable, and strand before MCC acceptance of the backbone.
F. Refer to the contract drawings for additional shop drawing and submittal requirements.

1.9 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Patch-Panel Units: One of each type.
   2. Connecting Blocks: One of each type.

1.10 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
   1. Layout Responsibility: Preparation of Shop Drawings, Cabling Administration Drawings, and field testing program development by an RCDD.
   2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician, who shall be present at all times when Work of this Section is performed at Project site.
   3. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

B. Testing Agency Qualifications: An NRTL.
   1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

C. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: 25 or less.
   2. Smoke-Developed Index: 50 or less.

D. 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.

E. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.
   1. Test optical fiber cable to determine the continuity of the strand end to end. Use optical fiber flashlight and optical loss test set.
   2. Test optical fiber cable 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.

1.12 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.

1.13 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

1.14 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning with Substantial Completion, provide software support for two years.

B. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.
   1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

1.15 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. Fiber Optic Patch-Panel Units: two of each type.
   2. Connecting Blocks: two of each type.
   3. 3’ Patch Single Mode Fiber Optic Patch Cords: 20 of each type
4. 3’ Patch Multimode Fiber Optic Patch Cords: 20 of each type

1.16 WARRANTY

A. All material and workmanship must be covered by a maintenance bond with a minimum duration of three years.

1.17 25 YEAR MISSION CRITICAL WARRANTY

A. Fiber Optic channel systems are warranted free of defects in material or workmanship.

B. Fiber Optic channel systems are warranted to perform the intended function within design limits.

C. Installed Fiber Optic channel systems shall be granted a full link or channel 25-Year warranty.
   1. Construction shall be performed by an installer that is certified by the manufacturer’s warranty training program.
   2. Contractors shall perform the certified installation and shall properly register with the manufacturer’s warranty program.
   3. The channel components are supplied entirely by the manufacturer (including patch cords for channel).

PART 2 - PRODUCTS

2.1 PATHWAYS

A. General Requirements: Comply with TIA/EIA-569-A.

B. Cable Support: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
   1. Support brackets with cable tie slots for fastening cable ties to brackets.
   2. Lacing bars, spools, J-hooks, and D-rings.
   3. Straps and other devices.

C. Cable Trays:
   1. Manufacturers: Subject to compliance with the requirements provide the named product or an approved equal:
      a. Cable Management Solutions, Inc.
      b. Cooper B-Line, Inc.
      c. Cope - Tyco/Allied Tube & Conduit.
      d. Or Approved Equal
2. Cable Tray Material: Metal, suitable for indoors, and protected against corrosion by electroplated zinc galvanizing, complying with ASTM B 633, Type 1, not less than 0.000472 inches thick.
   
a. Basket Cable Trays: 18 inches wide and 4 inches deep or as noted on the contract drawings. Wire mesh spacing shall not exceed 2 by 4 inches.

D. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems." Flexible metal conduit shall not be used.
   
1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-3/4 inches deep.

2.2 BACKBOARDS

A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches. Comply with requirements in Division 06 Section "Rough Carpentry" for plywood backing panels.

2.3 OPTICAL FIBER CABLE

A. Manufacturers: Subject to compliance with the requirements provide the named product or an approved equal:
   
1. Hubbell Premise Wiring
2. Or Approved Equal

B. Description: OM1 Multimode, Indoor/Outdoor Loose Tube Fiber Cable, 62.5/125-micrometer, 12-fiber, Loose Tube, 10G, optical fiber cable similar to HUBBELL #HFC2012Z6BK with 25-Year Mission Critical Warranty or approved equal.
   
1. Comply with ANSI/ICEA S-87-640
2. Comply with TIA/EIA-568-C.3 Optical fiber cabling standards
3. Comply with Telcordia GR-409 and GR-20
4. Comply with TIA-492 Series optical fiber specifications
5. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 910, and NFPA 70 for the following types:
   

6. Maximum Attenuation: 3.5 dB/km at 850 nm; 1.5 dB/km at 1300 nm.
7. Fiber coating shall be: 900 micron PVC tight buffer
8. Temperature range:
   
a. Storage: -40º F to +176º F (-40º C to +80º C)
b. Installation: 14º F to +176º F (-10º C to +80º C)
c. Operation: -40º F to +176º F (-20º C to +80º C)
C. Jacket:
   2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA/EIA-598-B.
   3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

D. No field terminations. Factory pig-tails fusion spliced.

E. Description: OS2 Singlemode, Indoor/Outdoor Loose Tube Fiber Cable, 9/125-micrometer, 12-fiber, loose tube, 10G, optical fiber cable similar to HUBBELL #HFC2012ZSBK with 25-Year Mission Critical Warranty or approved equal.
   1. Comply with ANSI/ICEA S-87-640
   2. Comply with TIA/EIA-568-C.3 Optical fiber cabling standards
   3. Comply with Telcordia GR-409 and GR-20
   4. Comply with TIA-492 Series optical fiber specifications
   5. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 910, and NFPA 70 for the following types:
   6. Maximum Attenuation: 0.5 dB/km at 1310 nm; 0.4 dB/km at 1550 nm.
   7. Fiber coating shall be: 900 micron PVC tight buffer
   8. Temperature range:
      a. Storage: -40º F to +176º F (-40º C to +80º C)
      b. Installation: 14º F to +176º F (-10º C to +80º C)
      c. Operation: -40º F to +176º F (-20º C to +80º C)

F. Jacket:
   2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA/EIA-598-B.
   3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

G. Factory pig-tails fusion spliced.

2.4 OPTICAL FIBER CABLE HARDWARE

A. Manufacturers: Subject to compliance with the requirements provide the named product or an approved equal:
   1. Hubbell Premise Wiring
   2. Or approved Equal
B. Fiber optic cable shall be terminated with LC connectors mounted in fiber optic enclosures with at least 50% spare capacity.

C. Provide wire management necessary for a neat, complete, and first class installation. At a minimum include one two space horizontal wire management panel above and below each fiber and copper patch panel. Provide rear horizontal wire management bars behind each patch panel for strain relief.

D. FIBER ADAPTER WALL MOUNT ENCLOSURE REQUIREMENTS
1. Basic wall mount enclosure design shall be a dual zone, double door, wall mounted, cold rolled steel enclosure.
2. Enclosure material shall be 16-gage cold rolled steel (CRS).
3. Finish shall be durable black electrostatic powder coat on all surfaces.
4. Enclosures shall be available to contain 12-Port (6 Duplex) LC connector adapter plates for Multimode and Singlemode applications.
5. Enclosures shall be supplied complete with manufacturer’s instructions and hardware. Screws for wall mounting are not included.
6. Enclosure back side shall have pre-punched key-shaped holes to permit fastening to properly prepared wall surfaces.
7. Enclosure top and bottom shall have two vertically aligned left and right knockouts to permit conduit and cable entry, and vertical stacking of multiple units.
8. Basic dimensions of wall mount enclosure shall be 12” height by 14” wide by 3.25” deep and contain (4) LC fiber adapter plates.
9. Hinged covers shall open at least 180 degrees from the closed position.
10. Each cover shall be lockable with a keyed lock available separately.
11. Product delivered shall consist of: (1) enclosure assembly, (4) knock-out hole grommets, (2) knock-out plugs installed, (6) cable ties, (6) cable routing clips, (2) spare ¼ -turn fasteners, (1) grid label, (1) danger label, splice tray mounting hardware, and instructions.

E. FIBER ADAPTER PANELS REQUIREMENTS
1. Fiber adapter panels shall be a modular, quick-fastening steel plate, powder coated to match the enclosure finish.
2. Fiber adapter panels shall have pre-installed 6 duplex LC fiber connectors for multimode and Singlemode applications.
3. Each individually bagged unit delivered shall consist of: (1) fully assembled adapter panel, with push-pull fasteners pre-installed.
4. Adapter panels shall be constructed of 16 gage cold rolled steel.
5. Finish shall be black durable powder coat on all surfaces.
6. Basic dimensions of the FSP panels shall be 5.10” length by 1.10” wide.
7. Panels shall have two pre-installed, push-pull type quick-release fasteners for quick snap-in installation. Push-pull fasteners shall have an industry standard center distance of 4.65”.
8. Panels shall be suitable for mounting either vertically or horizontally.
9. Panels shall be available in with LC adapters with precision ceramic alignment sleeves.
10. All fiber adapters installed in FSP panels shall have dust caps installed.
11. Panels shall be available in low-density and high-density adapter patterns.

F. Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.
1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria. (50% spare)

G. Patch Cords: Factory-made, dual-fiber cables in 36-inch lengths.
1. LC duplex optical fiber patch cords shall be constructed with aramid-reinforced PVC loose-jacket duplex cable, with optical fibers having a 900-micron PVC buffer coating diameter. Optical fiber used in 10 GbE patch cords shall be laser optimized 62.5 micron multimode, per ANSI/TIA/EIA-492AAAC, with no substitutes.
2. Multimode 62.5 micron core optical fiber within the patch cord cable shall be graded index type in accordance with ANSI/TIA/EIA-492AAAC, with the following specifications:
   a. Core diameter: 62.5 +/-3.0 microns
   b. Cladding diameter: 125 +/- 2.0 microns
   c. Core/cladding concentricity: less than 3.0 microns
   d. Core non-circularity: 6% maximum
   e. Proof test: 100 kpsi
   f. Effective modal bandwidth: 2000 MHz•km
   g. Coating diameter: 245 +/-15 microns
   h. Buffer diameter: 900 microns nominal
3. Connector terminations on each end of the fiber patch cord shall be heat-cured epoxy type with a machine polish, inspected 100% for polish quality and mated-pair insertion loss.
4. Epoxy volume within each connector shall be sufficient to properly surround and strain relieve the fiber and buffer layer at the buffer/fiber transition inside the connector body.
5. Optical fiber patch cords shall be supplied in a sealed plastic bag with dust caps installed on each end, with insertion loss test results included.
6. Optical fiber patch cords shall be 36” in length.
7. Optical fiber patch cords shall be manufactured with industry standard LC connector terminations on each end.
8. Factory mounted connectors on each end of the patch cords shall comply with the applicable ANSI/TIA/EIA-604 Intermateability standard.
9. Buffered fiber strands within the cable jacket shall be surrounded by aramid (Kevlar) material serving as a strength member.
10. The aramid (Kevlar) strength member shall be mechanically secured at each connector to provide tensile strain relief of the optical fiber.
11. Additional strain relief of the buffered fiber shall result from crimping the rear of the connector during termination.
12. LC Duplex fiber patch cords shall be a zip-cord cable construction with jacket cross-section dimensions of 1.6 mm X 3.0 mm.
13. Duplex fiber patch cords shall have reverse-pair polarity according to ANSI/TIA/EIA-568-C.3 and TIA/EIA-TSB-125.
14. Cable jacket shall be marked with the cable manufacturer, UL Optical Fiber Non-Metallic Riser rating (Type OFNR) designation, lot number, and fiber core/cladding diameter designation.
15. Fiber A-B polarity shall be clearly marked on each end of duplex patch cords.
16. Optical fiber patch cord jacket color shall be aqua blue, specifically for 62.5 micron laser optimized multimode fiber cables.
17. Fiber patch cord connector materials shall be as follows:
   a. Ferrules: zirconium ceramic
b. Housings: injection molded thermoplastic

c. Dust Cap: nylon or PVC

d. Strain relief boot: UL94-V0 molded PVC

18. Multimode 62.5 micron laser optimized patch cords shall have a maximum mated-pair insertion loss of 0.60 dB per end, with a minimum return loss of –20 dB.

19. Fiber patch cords shall exceed 10 Gigabit Ethernet performance requirements of IEEE 802.3 standard.

20. Fiber patch cords shall exceed the mechanical reliability requirements for tensile, flex, twist and impact as specified in ANSI/TIA/EIA-568-C.3

21. Fiber patch cords shall exceed the environmental reliability requirements for high/low temperature and humidity as specified in ANSI/TIA/EIA-568-C.3

H. Fiber Connector Requirements:


2. Quick-connect, simplex and duplex, Type LC connectors. Insertion loss not more than 0.75 dB.

3. No field terminations. Factory pig-tails fusion spliced.

4. Connector basic design shall be a factory pre-polished LC optical fiber connector with a zirconium ceramic ferrule. Integral with the connector body is a wedge-activated fiber clamping mechanism to secure the inserted fiber into a mechanical splice with the factory installed cleaved fiber stub. Index-matching gel is supplied factory-injected into the cleaved fiber stub splice to optimize transmission performance. Connector attachment is achieved without tools, by inserting a field-cleaved optical fiber and then extracting the disposable clamp wedges from the connector body.

5. Each basic connector unit delivered shall consist of: (1) connector body with disposable clamp wedge, (1) strain relief boot, and (1) plastic dust cap.

6. LC multimode factory pre-polished connectors shall be 62.5 micron laser optimized pre-installed fiber.

7. Connector termination method shall utilize an industry standard multi-layer strip tool and bare fiber cleave tool as the only field tools required.

8. LC connectors shall have features to enable field verification using a Visual Fault Locator (VFL) during termination.

9. Connector materials shall be designed with thermal stability to comply with environmental requirements of ANSI/TIA/EIA-568-C.3 and Telcordia GR-1081-CORE.

10. Multimode and singlemode pre-polished fiber connector materials shall be as follows:

a. Ferrule: zirconium ceramic

b. LC inner body: thermally stable injection molded thermoplastic

c. Dust Cap: nylon or PVC

d. Strain relief boot: UL94-V0 molded PVC

11. Pre-polished LC connectors shall require no field polishing.
12. Pre-polished MM LC connector body shall be industry standard aqua for 62.5 micron multimode, laser optimized.
13. Pre-polished MM LC connectors shall require no adhesives for termination.
14. LC connector internal fiber clamping mechanism shall firmly secure both the inserted glass fiber and the 900 micron buffer layer of the inserted fiber for maximum strain relief.
15. All standard mating and interface dimensions for LC connectors shall comply with ANSI/TIA/EIA-604-10 (FOCIS 10).
16. Ferrule outside diameter for LC multimode connectors shall be 1.2467mm to 1.2497mm.
17. Ferrule outside diameter for LC singlemode connectors shall be 1.2483mm to 1.2497mm.
18. LC ferrule tip shall have a PC spherical radius of approximately 7.0 mm radius for multimode and singlemode versions.
19. Delivered connectors shall be individually bagged with the dust cap installed to protect from contamination.
20. Delivered connectors shall have the disposable clamp activation wedge element pre-installed onto the connector body.
21. Connector design and termination technique shall be independent of cable type or manufacturer, and shall be compatible for either 900 micron buffer or 262.5 micron buffer distribution cables.
22. LC connector strain relief boot shall be a Telcordia style slotted design for maximum flexural strain relief.
23. Strain relief boot shall be black for multimode, and yellow for singlemode.
24. LC connectors shall be available individually bagged in packs of 12.
25. Pre-polished LC fiber connectors, when properly installed onto qualified cable, shall meet the 10 Gb/s Ethernet performance requirements of IEEE802.3.
26. Pre-polished LC fiber connectors, properly installed onto qualified cable, shall exceed the mechanical and environmental performance requirements of ANSI/TIA/EIA-568-C.3, Annex ‘A’.
27. Pre-polished LC fiber connectors, properly installed onto qualified cable, shall exceed the mechanical and environmental performance requirements of Telcordia GR-1081-CORE.
28. Qualification test data shall be available from the manufacturer.

2.5 COPPER TELEPHONE CABLE

A. Manufacturers: Subject to compliance with the requirements provide the named product or an approved equal:
   1. General Cable
   2. Or Approved Equal

B. Description: Voice grade wire and cable placed in the outside environment shall be solid, 24 AWG, twisted pair, and multi-conductor. The copper twisted pairs shall meet the Bell Specifications or RUS P-89 electrical performance characteristics for exchange cable. Similar to the General Cable Spec. 2007 Model #7525785 or approved Equal.
C. All cable must be Telecommunication Grade Certified for duct and direct buried installation with protection against water and moisture entry.

D. Underground cable shall have an aluminum steel polyethylene (ASP) sheath and a core of 24 AWG solid-copper conductors, dual insulated with foam skin and plastic, surrounded by water-blocking filling compound suitable for use in underground wet locations.

E. Manufacturer shall be ISO 9001 Certified.

F. Cable shall be UL® Listed outdoor use and installed in accordance with the NEC, NESC, ANSI/TIA/EIA Standards, BICSI Methods, and local codes.

2.6 GROUNDING

A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems." for grounding conductors and connectors.

B. Comply with ANSI-J-STD-607-A.

2.7 IDENTIFICATION PRODUCTS

A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.8 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test cables on reels according to TIA/EIA-568-B.1.

C. Factory test UTP cables according to TIA/EIA-568-B.2.

D. Factory test multimode optical fiber cables according to TIA/EIA-526-14-A and TIA/EIA-568-B.3.

E. Cable will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 ENTRANCE FACILITIES

A. Coordinate backbone cabling with the protectors and demarcation point.
B. Entrance units are to be Siecor Fiber Building Terminals (FBT) Part Number FBT-048 or approved equal.

3.2 WIRING METHODS

A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, in attics, and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements for raceways and boxes specified in Division 26 Section "Raceway and Boxes for Electrical Systems."

B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

D. The college will require full termination of all fiber strands and conductors of all cables.

3.3 INSTALLATION OF PATHWAYS

A. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A.

B. Comply with requirements for demarcation point, pathways, cabinets, and racks specified in Division 27 Section "Communications Equipment Room Fittings." Drawings indicate general arrangement of pathways and fittings.

C. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.

D. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.

E. Install manufactured conduit sweeps and long-radius elbows whenever possible.

F. Pathway Installation in Communications Equipment Rooms:

1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
2. Install cable trays to route cables if conduits cannot be located in these positions.
3. Secure conduits to backboard when entering room from overhead.
4. Extend conduits 3 inches above finished floor.
5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

G. Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly, and form smooth gap-free corners and joints.

3.4 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
5. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
6. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
8. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
10. In the communications equipment room, install a 10-foot- long service loop on each end of cable.
11. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

C. Optical Fiber Cable Installation:

2. Cable may be terminated on connecting hardware that is rack or cabinet mounted.
3. All fiber optic terminations must meet the following requirements:
4. maximum attenuation through cross-connect from any terminated fiber to any other terminated fiber - 2.0 dB.
5. maximum optical attenuation through any splice (fusion or mechanical) - 3.0 dB.
D. Open-Cable Installation:
   1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
   2. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

E. Outdoor Coaxial Cable Installation:
   1. Install outdoor connections in enclosures complying with NEMA 250, Type 4X. Install corrosion-resistant connectors with properly designed O-rings to keep out moisture.
   2. Attach antenna lead-in cable to support structure at intervals not exceeding 36 inches.

F. Group connecting hardware for cables into separate logical fields.

G. Separation from EMI Sources:
   1. Comply with BICSI TDMM and TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
   2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
      b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
   3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
      b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
   4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
      b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.5 FIRESTOPPING
   A. Comply with requirements in Division 07 Section "Penetration Firestopping."
   B. Comply with TIA/EIA-569-A, Annex A, "Firestopping."
   C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.6 GROUNDING
   A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
   B. Comply with ANSI-J-STD-607-A.
   C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.
   D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.7 IDENTIFICATION
   A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
      1. Administration Class: 2.
      2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.
   B. Comply with requirements in Division 09 Section "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.
C. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 2 level of administration including optional identification requirements of this standard.

D. Comply with requirements in Division 27 Section "Communications Horizontal Cabling" for cable and asset management software.

E. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

F. All patch panels must have labels uniquely identifying each fiber including the specific location of the remote end.

G. All outside plant cables must be permanently labeled with a durable waterproof tag (such as plastic) at each end of a passage through a wall or floor, and in each hand or manhole. These marking tags must specify that it is a fiber optic cable and have enough information to uniquely identify each separate cable.

H. The covers of all patch panels and splice boxes must be permanently labeled indicating:
   1. The presence of fiber optic cable
   2. A phone number to call for questions (extension 2525)

I. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.

J. Cable and Wire Identification:
   1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
   2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
   3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
   4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
      a. Individually number wiring conductors connected to terminal strips and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device with name and number of particular device as shown.
      b. Label each unit and field within distribution racks and frames.
5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

K. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA 606-A, for the following:

1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:


2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

3. Test UTP copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.

   a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

4. Optical Fiber Cable Tests:

   a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

   b. Link End-to-End Attenuation Tests:

       1) Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in 1 direction according to TIA/EIA-526-14-A, Method B, One Reference Jumper.
2) Horizontal and singlemode backbone link measurements: Test at 1310 or 1550 nm in 1 direction according to ANSI/TIA/526-7.

3) Attenuation test results for backbone links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-B.1.

c. Additional Attenuation must be measured in accordance with a procedure detailed in EIA-455-59 and submitted under separate cover.

5. Contractor shall submit all Test results including OTDR with proof of calibration for each instrument utilized. All testing shall be performed, recorded, witnessed and submitted in accordance with all standards and codes listed above and ANSI/TIA/568-C.3, ANSI/TIA/-526-14-A and ISO IEC 14763-3. Testing that is not performed in accordance with industry standards and this specification shall be retested until proof of compliance is established.

D. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

E. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

F. End-to-end cabling will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

END OF SECTION 271300
SECTION 283111
DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fire-alarm control unit.
   3. System smoke detectors.
   7. Addressable interface device.
   8. Digital alarm communicator transmitter.

1.2 DEFINITIONS

A. LED: Light-emitting diode.

1.3 SYSTEM DESCRIPTION

A. Noncoded, UL-certified addressable system, with multiplexed signal transmission, dedicated to fire-alarm service only.

B. Noncoded addressable system, with automatic sensitivity control of certain smoke detectors and multiplexed signal transmission, dedicated to fire-alarm service only.

1.4 SUBMITTALS

A. General Submittal Requirements:
   1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
   2. Shop Drawings shall be prepared by persons with the following qualifications:
      a. Trained and certified by manufacturer in fire-alarm system design.
      b. NICET-certified fire-alarm technician, Level III minimum.
c. Licensed or certified by authorities having jurisdiction.

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

C. Shop Drawings: For fire-alarm system. Include plans, elevations, sections, details, and attachments to other work.

2. Include voltage drop calculations for notification appliance circuits.
3. Include battery-size calculations.
4. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
5. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale and coordinating installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.
6. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
7. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.

D. Delegated-Design Submittal: For smoke and heat detectors 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. Drawings showing the location of each smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of the detector.
2. Design Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72.

E. Qualification Data: For qualified Installer.

F. Seismic Qualification Certificates: For fire-alarm control unit, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

G. Field quality-control reports.
H. Operation and Maintenance Data: For fire-alarm systems and components 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. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
3. Record copy of site-specific software.
4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:
   a. Frequency of testing of installed components.
   b. Frequency of inspection of installed components.
   c. Requirements and recommendations related to results of maintenance.
   d. Manufacturer's user training manuals.
5. Manufacturer's required maintenance related to system warranty requirements.
6. Abbreviated operating instructions for mounting at fire-alarm control unit.
7. Copy of NFPA 25.

I. 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.

1.5 QUALITY ASSURANCE
A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.
B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level III technician.
C. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer. Components shall be compatible with, and operate as, an extension of existing system.
D. 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.
E. NFPA Certification: Obtain certification according to NFPA 72 by an NRTL.

Digital, Addressable Fire Alarm System
13-2200-0254  CDI Architects, Inc.
Middlesex County College - South Hall  28 3111 - 3  dba L.R. Kimball - Architecture
F. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.

G. NFPA Certification: Obtain certification according to NFPA 72 in the form of a placard by an FMG-approved alarm company.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner:

1.7 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Technical Support: Beginning with Substantial Completion, provide software support for two years.

C. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

1. Provide 30 days’ notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide network based Simplex system to match the existing campus standard, or a comparable product that can tie into the existing simplex system by, but not limited to one of the following:

1. Silent Knight; a Honeywell company
2. Edwards; EST3

2.2 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices:

2. Heat detectors.
3. Flame detectors.
4. Smoke detectors.
5. Duct smoke detectors.
6. Verified automatic alarm operation of smoke detectors.
7. Automatic sprinkler system water flow.
8. Heat detectors in elevator shaft and pit.
10. Fire standpipe system.

B. Fire-alarm signal shall initiate the following actions:

1. Continuously operate alarm notification appliances.
2. Identify alarm at fire-alarm control unit and remote annunciators.
3. Transmit an alarm signal to the remote alarm receiving station.
4. Unlock electric door locks in designated egress paths.
5. Release fire and smoke doors held open by magnetic door holders.
6. Activate voice/alarm communication system.
7. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
8. Activate smoke-control system (smoke management) at firefighter smoke-control system panel.
9. Activate stairwell and elevator-shaft pressurization systems.
10. Close smoke dampers in air ducts of designated air-conditioning duct systems.
11. Recall elevators to primary or alternate recall floors.
12. Activate emergency lighting control.
14. Record events in the system memory.
15. Record events by the system printer.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Valve supervisory switch.
2. Low-air-pressure switch of a dry-pipe sprinkler system.
3. Elevator shunt-trip supervision.

D. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of primary power at fire-alarm control unit.
4. Ground or a single break in fire-alarm control unit internal circuits.
5. Abnormal ac voltage at fire-alarm control unit.
7. Failure of battery charging.
8. Abnormal position of any switch at fire-alarm control unit or annunciator.
E. System Trouble and Supervisory Signal Actions: Initiate notification appliance and
annunciate at fire-alarm control unit and remote annunciators. Record the event on
system printer.

2.3 FIRE-ALARM CONTROL UNIT

A. General Requirements for Fire-Alarm Control Unit:

1. Field-programmable, microprocessor-based, modular, power-limited design with
electronic modules, complying with UL 864 and listed and labeled by an NRTL.

   a. System software and programs shall be held in flash electrically erasable
      programmable read-only memory (EEPROM), retaining the information
      through failure of primary and secondary power supplies.

   b. Include a real-time clock for time annotation of events on the event
      recorder and printer.

2. Network Addressable control circuits for operation of mechanical equipment.

B. Alphanumeric Display and System Controls: Arranged for interface between human
operator at fire-alarm control unit and addressable system components including
annunciation and supervision. Display alarm, supervisory, and component status
messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, 2 line(s) of 40 characters,
   minimum.

2. Keypad: Arranged to permit entry and execution of programming, display, and
   control commands.

C. Circuits:

1. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72,
   Class B.

   a. Initiating Device Circuits: Style A

   b. Notification Appliance Circuits: Style W

   c. Signaling Line Circuits: Style 4

   d. Install no more than 50 addressable devices on each signaling line circuit.


D. Stairwell Pressurization: Provide an output signal using an addressable relay to start
the stairwell pressurization system. Signal shall remain on until alarm conditions are
cleared and fire-alarm system is reset. Signal shall not stop in response to alarm
acknowledge or signal silence commands.

1. Pressurization starts when any alarm is received at fire-alarm control unit.
2. Alarm signals from smoke detectors at pressurization air supplies have a higher priority than other alarm signals that start the system.

E. Smoke-Alarm Verification:

1. Initiate audible and visible indication of an "alarm-verification" signal at fire-alarm control unit.
2. Activate an NRTL-listed and -approved "alarm-verification" sequence at fire-alarm control unit and detector.
3. Record events by the system printer.
4. Sound general alarm if the alarm is verified.
5. Cancel fire-alarm control unit indication and system reset if the alarm is not verified.

F. Notification Appliance Circuit: All strobe appliances or combination appliances with strobes shall be capable of providing the “Equivalent Facilitation” that is allowed under the Americans with Disabilities Act Accessibilities Guidelines (ADA(AG)), and shall be UL 1971 Listed.

G. Elevator Recall:

1. Smoke detectors at the following locations shall initiate automatic elevator recall.
   a. Elevator lobby detectors except the lobby detector on the designated floor.
   b. Smoke detector in elevator machine room.
   c. Smoke detectors in elevator hoistway.

2. Elevator lobby detectors located on the designated recall floors shall be programmed to move the cars to the alternate recall floor.
3. Water-flow alarm connected to sprinkler in an elevator shaft and elevator machine room shall shut down elevators associated with the location without time delay.
   a. Water-flow switch associated with the sprinkler in the elevator pit may have a delay to allow elevators to move to the designated floor.

H. Door Controls: Door hold-open devices that are controlled by smoke detectors at doors in smoke barrier walls shall be connected to fire-alarm system.

I. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and print out the final adjusted values on system printer.

J. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.
K. Printout of Events: On receipt of signal, print alarm, supervisory, and trouble events. Identify zone, device, and function. Include type of signal (alarm, supervisory, or trouble) and date and time of occurrence. Differentiate alarm signals from all other printed indications. Also print system reset event, including same information for device, location, date, and time. Commands initiate the printing of a list of existing alarm, supervisory, and trouble conditions in the system and a historical log of events.

L. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory and digital alarm communicator transmitters shall be powered by 24-V dc source.

1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

M. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

1. Batteries: Sealed, valve-regulated, recombinant lead acid

N. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.4 MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

1. Indoor Protective Shield: Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.

2.5 SYSTEM SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Detectors shall be four-wire type.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.

5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.

6. Integral Visual-Indicating Light: LED type indicating detector has operated.

7. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.
   a. Rate-of-rise temperature characteristic shall be selectable at fire-alarm control unit for 15 F (8 C) per minute.
   b. Fixed-temperature sensing shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 (57 C).
   c. Provide multiple levels of detection sensitivity for each sensor.

B. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
   a. Primary status.
   b. Device type.
   c. Present average value.
   d. Present sensitivity selected.
   e. Sensor range (normal, dirty, etc.).

C. Ionization Smoke Detector:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
   a. Primary status.
   b. Device type.
   c. Present average value.
   d. Present sensitivity selected.
   e. Sensor range (normal, dirty, etc.).

D. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

   a. Primary status.
   b. Device type.
   c. Present average value.
   d. Present sensitivity selected.
   e. Sensor range (normal, dirty, etc.).

3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector.

4. Each sensor shall have multiple levels of detection sensitivity.

5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.


2.6 HEAT DETECTORS

A. General Requirements for Heat Detectors: Comply with UL 521.

B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F (57 deg C) or a rate of rise that exceeds 15 deg F (8 deg C) per minute unless otherwise indicated.

   1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
   2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

C. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F (88 deg C).

   1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
   2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

D. Continuous Linear Heat-Detector System:

   1. Detector Cable: Rated detection temperature 155 deg F (68 deg C). NRTL listed for "regular" service and a standard environment. Cable includes two steel actuator wires twisted together with spring pressure, wrapped with protective tape, and finished with PVC outer sheath. Each actuator wire is insulated with heat-sensitive material that reacts with heat to allow the cable twist pressure to short-circuit wires at the location of elevated temperature.
   2. Control Unit: Two-zone or multizone unit as indicated. Provide same system power supply, supervision, and alarm features as specified for fire-alarm control unit.
   3. Signals to Fire-Alarm Control Unit: Any type of local system trouble shall be reported to fire-alarm control unit as a composite "trouble" signal. Alarms on
each detection zone shall be individually reported to central fire-alarm control unit as separately identified zones.

4. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.7 NOTIFICATION APPLIANCES

A. General Requirements for Notification Appliances: Individually addressed, connected to a signaling line circuit, equipped for mounting as indicated and with screw terminals for system connections.

B. General Requirements for Notification Appliances: Connected to notification appliance signal circuits, zoned as indicated, equipped for mounting as indicated and with screw terminals for system connections.

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated and with screw terminals for system connections.

C. Chimes, Low-Level Output: Vibrating type, 75-dBA minimum rated output.

D. Chimes, High-Level Output: Vibrating type, 81-dBA minimum rated output.

E. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet (3 m) from the horn, using the coded signal prescribed in UL 464 test protocol.

F. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.

1. Rated Light Output:

a. 15/30/75/110 cd, selectable in the field.

2. Mounting: Wall mounted unless otherwise indicated.

3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.

4. Flashing shall be in a temporal pattern, synchronized with other units.

5. Strobe Leads: Factory connected to screw terminals.

6. Mounting Faceplate: Factory finished, red

G. Voice/Tone Notification Appliances:

1. Appliances shall comply with UL 1480 and shall be listed and labeled by an NRTL.

2. High-Range Units: Rated 2 to 15 W.
3. Low-Range Units: Rated 1 to 2 W.
5. Matching Transformers: Tap range matched to acoustical environment of speaker location.

2.8 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.

1. Electromagnet: Requires no more than 3 W to develop 25-lbf (111-N) holding force.
2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
3. Rating: 24-V ac or dc.
4. Rating: 120-V ac.

B. Material and Finish: Match door hardware.

2.9 REMOTE ANNUNCIATOR

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.

1. Mounting: Surface cabinet, NEMA 250, Type 1.

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.10 ADDRESSABLE INTERFACE DEVICE

A. Description: Microelectronic monitor module, NRTL listed for use in providing a system address for alarm-initiating devices for wired applications with normally open contacts.

B. Integral Relay: Capable of providing a direct signal to circuit-breaker shunt trip for power shutdown

2.11 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632 and be listed and labeled by an NRTL.
B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture one telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

C. Local functions and display at the digital alarm communicator transmitter shall include the following:

1. Verification that both telephone lines are available.
2. Programming device.
3. LED display.
5. Communications failure with the central station or fire-alarm control unit.

D. Digital data transmission shall include the following:

1. Address of the alarm-initiating device.
2. Address of the supervisory signal.
3. Address of the trouble-initiating device.
4. Loss of ac supply or loss of power.
5. Low battery.
6. Abnormal test signal.
7. Communication bus failure.

E. Secondary Power: Integral rechargeable battery and automatic charger.

F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

2.12 RADIO ALARM TRANSMITTER

A. Transmitter shall comply with NFPA 1221 and shall be listed and labeled by an NRTL.

B. Comply with 47 CFR 90.

C. Description: Manufacturer's standard commercial product; factory assembled, wired, tested, and ready for installation and operation.

1. Packaging: A single, modular, NEMA 250, Type 1 metal enclosure with a tamper-resistant flush tumbler lock.
2. Signal Transmission Mode and Frequency: VHF or UHF 2-W power output, coordinated with operating characteristics of the established remote alarm receiving station designated by Owner.

Digital, Addressable Fire Alarm System
5. Antenna: Omnidirectional, coaxial half-wave, dipole type with driving point impedance matched to transmitter and antenna cable output impedance. Wind-load strength of antenna and mounting hardware and supports shall withstand 100 mph (160 km/h) with a gust factor of 1.3 without failure.
6. Antenna Cable: Coaxial cable with impedance matched to the transmitter output impedance.
8. Alarm Interface Devices: Circuit boards, modules, and other auxiliary devices, integral to the transmitter, matching fire-alarm and other system outputs to message-generating inputs of the transmitter that produce required message transmissions.

D. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit or from its own internal sensors or controls and shall automatically transmit signal along with a unique code that identifies the transmitting station to the remote alarm receiving station. Transmitted messages shall correspond to standard designations for fire-reporting system to which the signal is being transmitted and shall include separately designated messages in response to the following events or conditions:

1. Transmitter Low-Battery Condition: Sent when battery voltage is below 85 percent of rated value.
2. System Test Message: Initiated manually by a test switch within the transmitter cabinet, or automatically at an optionally preselected time, once every 24 hours, with transmission time controlled by a programmed timing device integral to transmitter controls.
3. Transmitter Trouble Message: Actuated by failure, in excess of one-minute duration, of the transmitter normal power source, derangement of the wiring of the transmitter, or any alarm input interface circuit or device connected to it.
4. Local Fire-Alarm-System Trouble Message: Initiated by events or conditions that cause a trouble signal to be indicated on the building system.
5. Local Fire-Alarm-System Alarm Message: Actuated when the building system goes into an alarm state. Identifies device that initiated the alarm.
6. Local Fire-Alarm-System Supervisory-Alarm Message: Actuated when the building alarm system indicates a supervisory alarm

2.13 SYSTEM PRINTER

A. Printer shall be listed and labeled by an NRTL as an integral part of fire-alarm system.
2.14 DEVICE GUARDS

A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.

1. Factory fabricated and furnished by manufacturer of device.
2. Finish: Paint of color to match the protected device.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Comply with NFPA 72 for installation of fire-alarm equipment.

B. Smoke- or Heat-Detector Spacing:

3. Smooth ceiling spacing shall not exceed 30 feet (9 m)
4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Appendix A in NFPA 72.
5. HVAC: Locate detectors not closer than 3 feet (1 m) from air-supply diffuser or return-air opening.
6. Lighting Fixtures: Locate detectors not closer than 12 inches (300 mm) from any part of a lighting fixture.

C. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct.

D. Heat Detectors in Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location.

E. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.

F. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

G. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.
H. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches (150 mm) below the ceiling.

I. Device Location-Indicating Lights: Locate in public space near the device they monitor.

J. Fire-Alarm Control Unit: Surface mounted, with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.

K. Annunciator: Install with top of panel not more than 72 inches (1830 mm) above the finished floor.

3.2 CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Division 08 Section "Door Hardware." Connect hardware and devices to fire-alarm system.

1. Verify that hardware and devices are NRTL listed for use with fire-alarm system in this Section before making connections.

B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet (1 m) from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

1. Alarm-initiating connection to smoke-control system (smoke management) at firefighter smoke-control system panel.
2. Alarm-initiating connection to stairwell and elevator-shaft pressurization systems.
3. Smoke dampers in air ducts of designated air-conditioning duct systems.
4. Alarm-initiating connection to elevator recall system and components.
5. Supervisory connections at valve supervisory switches.
6. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
7. Supervisory connections at elevator shunt trip breaker.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

B. Install framed instructions in a location visible from fire-alarm control unit.

3.4 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.
3.5 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by authorities having jurisdiction

B. Retain first paragraph below to require a factory-authorized service representative to perform inspections, tests, and adjustments.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

D. Perform tests and inspections.

   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

E. Tests and Inspections:

   1. Visual Inspection: Conduct visual inspection prior to testing.

      a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.

      b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.


   3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.

   4. Test visible appliances for the public operating mode according to manufacturer's written instructions.


F. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

G. Fire-alarm system will be considered defective if it does not pass tests and inspections.

H. Prepare test and inspection reports.
I. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

J. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION 283111
1. From top of slab) on 3" (20 GA) galvanized wide rib type composite steel deck (6" total thickness) typical unless noted otherwise (UNO). The deck shall be continuous over a minimum of three spans.

2. Elevations shown on plan thus (±xx'-x") are top of steel elevations and reference the top of all interior footings = -1'-0" typical, UNO on plan.

3. Welded wide flange beams shall be spaced between grid lines UNO on plan.

4. Provide angles as required for deck support around columns per typical detail.

5. All beams shall be equally spaced between grid lines UNO on plan.

6. Refer to typical details, structural notes, and project specifications for additional information.

7. Provide #5 @ 24" OC vertical reinforcing bars and CMU bond beams w/ (2)-#4 cont @ 48" OC vertically in slab.

8. Provide 10" @ 24" OC @ front face of masonry wall in all locations.

9. Provide steel sleeves for all pipes through foundation walls and for all pipes 12" or less below ground level.

10. Underpin and/or shore existing FTG as req'd to grade to drain, typical.

11. Refer to plan and typical details for size and locations.

12. To window openings, for recessed slab areas, and for additional information not shown.

13. Foundation and footings shall be continuous over a minimum of three spans.

14. Top of footing foundations shall be at least 6" top of footing, Foundation wall thickness shall be 10".

15. Project specifications shall govern with respect to construction of all structural work (masonry, concrete, steel, etc.).

16. Refer to typical details, structural notes, and project specifications for additional information.

17. Refer to architectural drawings for interior masonry walls where slab elevations differ.

18. Provide #5 @ re-entrant corner per typical detail.

19. Foundation and footings shall be continuous over a minimum of three spans.

20. Underpin and/or shore existing FTG as req'd to grade to drain, typical.

21. Refer to plan and typical details for size and locations.

22. Underpin and/or shore existing FTG as req'd to grade to drain, typical.

23. Refer to plan and typical details for size and locations.

24. Top of footing foundations shall be at least 6" top of footing, Foundation wall thickness shall be 10".

25. Project specifications shall govern with respect to construction of all structural work (masonry, concrete, steel, etc.).

26. Refer to typical details, structural notes, and project specifications for additional information.

27. Top of footing foundations shall be at least 6" top of footing, Foundation wall thickness shall be 10".

28. Project specifications shall govern with respect to construction of all structural work (masonry, concrete, steel, etc.).
REFLECTED CEILING PLAN LEGEND

- Ceiling mounted fire alarm, pull station, or smoke detector
- Ceiling mounted motion detector
- Ceiling mounted exit sign
- Ceiling mounted video projector/ manual screen
- Recessed round LED
- Reflective ceiling panel
- Ceiling mounted video projector/ manual screen

1. SEE LIGHTING PLANS FOR FIXTURE TYPES 4.
2. SEE FIRE PROTECTION DRAWING SHEETS FOR SPRINKLER HEAD LAYOUT
3. OVERHEAD VIDEO PROJECTORS ARE DIAGRAMMATICALLY SHOWN AT 14'-0" FROM PROJECTION SCREENS. SEE ELECTRICAL TECHNOLOGY DOCUMENTS AND VERIFY INSTALLED PROJECTOR RECOMMENDATIONS FOR DISTANCE PRIOR TO INSTALLATION.

GROUND AND FIRST FLOOR CEILING PLANS

NEW CONSTRUCTION FOR
MIDDLESEX COUNTY COLLEGE
SOUTH HALL

OWNER
Middlesex County College
2500 Woodbridge Avenue
Edison, NJ 08818-3050

PROJECT NORTH

KEYPLAN SHEET TITLE

MARK DATE DESCRIPTION

CDI Architects Group LLC dba L.R. Kimball - Architecture and Engineering
380 Foothill Road
Bridgewater, NJ 08807
(908) 720-0570
Fax: (908) 720-0579
www.lrkimball.com
architecture@lrkimball.com

PROJECT NORTH

GROUNDS AND FIRST FLOOR CEILING PLANS

100% CONSTRUCTION DOCUMENTS

A121
<table>
<thead>
<tr>
<th>Sheet Title</th>
<th>Review By</th>
<th>Author By</th>
<th>Project No</th>
<th>Issue</th>
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</table>

### Electrical General Notes

- **New Construction for Middlesex County College South Hall**
- **Owner:** Middlesex County College
  - 2600 Woodbridge Avenue
  - Edison, NJ 08818-3050
- **J.A. King, AIA, LEED BD+C**
  - New Jersey Architecture Lic. No. 08624
- **KEYPLAN**
  - Project North
  - 12/5/14
  - Addendum #1
  - E001
  - Electrical

### General Information

- **Typical Mounting Heights**
  - Electrical drawings Q'ty
  - Electrical General Information

- **100% Construction Documents**
  - E001
  - 10.28.14
  - 13-2200-0254
  - Jack A. King, AIA, LEED BD+C
  - New Jersey Architecture Lic. No. 08624
ROOF DRAIN ARCHITECTURE       ENGINEERING       COMMUNICATIONS  TECHNOLOGY

BUILT UP ROOF SYSTEM WITH WHITE SPAR FINISH

WATER CUT OFF MASTIC

6" RIGID BASE INSULATION

CLAMPING RING

PROVIDE THREADED CONNECTION AT ROOF DRAIN

PREMOLDED PIPE BOOT

IN-SEAM SEALANT

4" RIGID BASE INSULATION AT DRAINS

4" x 4" x 5/16" STEEL ANGLES ALL AROUND OPENING AS REQUIRED PER 'TYPICAL ROOF OPENING FRAMING DETAIL' ON STRUCTURAL DOCUMENTS

SOFFIT SYSTEM

3" GALVANIZED RAIN LEADER

LENGTH OF RAIN CHAIN TO BE MODIFIED TO FIT AS REQUIRED

3/8" ALUMINUM CHAIN, MODEL 0635311 BY CAMPBELL CHAIN

5/16" ALUMINUM CHAIN, MODEL 0635311 BY CAMPBELL CHAIN

STAINLESS NYLON LOCKNUT, TYPICAL AT ALL LOCATIONS

1 1/2" = 1'-0"

30°

18 GAUGE, TYPE 304 STAINLESS STEEL FUNNEL, FULLY WELDED CONSTRUCTION WITH NON-DIRECTIONAL BRUSHED FINISH

5/16" GLASS FACED GYPSUM SHEATHING

1-1/2" RIGID INSULATION

ISOLATION CURB PEDESTAL ASSEMBLY. SIZE TO ACCOMMODATE EACH INDIVIDUAL AIR HANDLING UNIT'S LOADING REQUIREMENTS

CONNECT TO STORM DRAIN. SEE CIVIL DOCUMENTS FOR SIZE AND TYPE

PROVIDE MANUFACTURER'S REQUIRED BOLT PATTERN AT EACH PEDESTAL, BUT NO LESS THAT THREE BOLTS PER PEDESTAL

FINISHED GRADE

1/2" STAINLESS STEEL BAR WITH ANCHOR, INSTALLED OVER AREA DRAIN AND EMBEDDED 4" INTO BASIN

ANCHOR RAIN CHAIN TO BAR IN BOTTOM OF BASIN AND SECURE WITH TURNBUCKLE AND WEATHER-PROOF PADLOCK. PROVIDE KEY TO OWNER

3" GALVANIZED RAIN LEADER

PRE-CAST CATCH BASIN

FINISHED FLOOR

1-1/2" X 1-1/2" CONTINUOUS WOOD NAILER

MEMBRANE FLASHING AND TERMINATION BAR

SEALANT

MEMBRANE FLASHING

75°

105°

90°

60°

33' - 3"

8 ' -  0 "

11' - 9 5/8"

6" BASE INSULATION

1-1/2" X 1-1/2" CONTINUOUS WOOD NAILER

METAL ROOF DECK

CONTINUOUS PRESERVATIVE TREATED BLOCKING IN FLUTES UNDER ALL CURB LOCATIONS

5/8" GLASS FACED GYPSUM SHEATHING

ROOF HATCH

ROOF ACCESS HATCH

ROOF ACCESS LADDER

1. ALL ARROWS INDICATE DOWN SLOPE DIRECTION (DIRECTION OF ACCESSION)

2. PROVIDE CURBS AND FLASHING FOR ALL. SEE PLUMBING, HVAC, AND ELECTRICAL DRAWINGS FOR LOCATIONS

3. PROVIDE ADDITIONAL CRICKETS, NOT INDICATED, AT ALL LOCATIONS NECESSARY TO ACHIEVE THE SPECIFIED ROOF WARRANTIES. MANUFACTURER'S DETAILS REQUIRED FOR WARRANTIES SUPERSEDE GENERAL DETAILS SHOWN ON THIS DRAWING SHEET.

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STEEL LINTEL SYSTEM - REFER TO STRUCTURAL DRAWINGS

APPROXIMATE FINISH GRADE B.

UTILITY BRICK VENEER ROWLOCK COURSE RECESSED 1" - COLOR 3

UTILITY BRICK VENEER - COLOR 2

FOUNDATION WALL AND FOOTING

ARCHITECTURE       ENGINEERING       COMMUNICATIONS  TECHNOLOGY

A  CDI  Company

A313
A311
A315

100% CONSTRUCTION DOCUMENTS

NEW CONSTRUCTION FOR
MIDDLESEX COUNTY COLLEGE
SOUTH HALL

OWNER
Middlesex County College
2500 Woodbridge Avenue
Edison, NJ  08818-3050

PROJECT NAME
SOUTHEAST ELEVATION

GROUND FLOOR

TOP OF MASONRY

TOP OF MASONRY

3'-0" x 3'-0" LOUVER. COORDINATE EXACT LOCATION WITHIN STRUCTURAL FRAMING

SCREEN WALL BEYOND

PENDING NATIONAL SYSTEM

OVER-SIZED MASONRY UNIT - VENEER

CANTILEVERED SUN SCREEN ASSEMBLY

ALUMINUM WALL COPING SYSTEM

ALUMINUM COMPOSITE PANEL SYSTEM

FLEE LAYER SYSTEM - REFER TO STRUCTURAL SPANNERS

MOVEMENT JOINT - REFER TO DETAIL 15 ON A502

STEPPED LANDSCAPE WALL - SEE CIVIL DRAWINGS

GRAY BRICK

C20
C7
C17

9' - 8" 14' - 0" 17' - 0"

1/8" = 1'-0"

10.28.14 Addendum 1

MJ MJ

PARTIAL SOUTH ELEVATION

EXTerior Elevation KEyNOTES

PARTIAL ELEVATION

PARTIAL ELEVATION

PARTIAL ELEVATION

EXTERIOR ELVATIONS

A201

UNMARKED SHEETS SUBJECT TO CHANGE
### Room Finish Schedule - Ground Floor and First Floor

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>ROOM NAME</th>
<th>WALL FINISH</th>
<th>CEILING FINISH</th>
<th>TURNOUT</th>
<th>HALLMARKS</th>
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### Room Finish Schedule - Second Floor

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<td>...</td>
<td>...</td>
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<td>...</td>
</tr>
</tbody>
</table>
NOTE:
DEVICES AND CABLES SHOWN ARE FOR REFERENCE ONLY. REFER TO
CONTRACT DOCUMENTS FOR EXACT DEVICES TO BE FURNISHED AND
INSTALLED.
3/4" FIRE RATED PLYWOOD BACKBOARD PAINTED BLACK

TELECOMMUNICATIONS MAIN GROUND BAR R1A C1A 19 RU WALL MOUNTED FIBER CABINET HUBBELL HSQ36 (TYP 2)

CABLE DEMARK TELEPHONE DEMARK EMERGENCY DUPLEX NEMA 5-20P RECEPTACLE.

COORDINATE WITH ELECTRICAL CONTRACTOR R1B R1C R1D

NEMA L5-30P 3000VA NEMA L5-30P 3000VA NEMA L5-30P 3000VA NEMA L5-30P 3000VA

STORAGE ROOM #125 TELECOMMUNICATIONS FLOOR PLAN SCALE: 1/2" = 1'-0" ET300

SECOND FLOOR MDF TELECOMMUNICATIONS CEILING PLAN SCALE: 1/2" = 1'-0" ET300

1. FOR ADDITIONAL NOTES, SYMBOLS AND ABBREVIATIONS SEE DRAWINGS ET001.
2. FOR BLOCK DIAGRAMS, SEE DRAWINGS ET400 AND ET401.
4. EQUIPMENT AND CONDUIT ARE SHOWN DIAGRAMMATICALLY. FINAL LOCATION OF CONDUIT AND EQUIPMENT SHALL BE DETERMINED IN THE FIELD AND SHALL BE SUBMITTED TO ENGINEER FOR APPROVAL BEFORE WORK IS COMMENCED.
5. ALL DATA CABLES SHALL BE TESTED IN ACCORDANCE WITH CATEGORY 6A EIA/TIA STANDARDS AND THE TEST RESULTS PROVIDED TO THE ENGINEER FOR APPROVAL.
6. FURNISH AND INSTALL GROUNDING IN ACCORDANCE WITH BISCI TDMM LATEST EDITION CHAPTER 9 AND NEC 250. ALL TELECOMMUNICATION CLOSETS SHALL BE INTERCONNECTED AND PROVIDED WITH COMMON 3/0 AWG REFERENCE GROUND. REFER TO DETAIL SHEET ETXXX.
7. FURNISH AND INSTALL TWO CATEGORY 6A CABLES FOR EACH WIRELESS ACCESS POINT PROVIDED BY OTHERS. CONTRACTOR SHALL ENGAGE THE SERVICES OF AN RF SPECIALIST TO PERFORM AN RF INTERFERENCE ANALYSIS TO IDENTIFY THE REQUIRED FINAL LOCATIONS OF ALL WAPS AND COORDINATE ALL FINAL LOCATIONS WITH THE ELECTRICAL CONTRACTOR. IN ADDITION TO THE WIRELESS ACCESS POINTS SHOWN ON PLAN, CONTRACTOR SHALL BUDGET ONE WIRELESS ACCESS POINT PER 1,500 SQ. FT. FOR COMMON AREAS.
THE DETAIL #6 ON THIS SHEET IS DIAGRAMMATIC, FOR REFERENCE ONLY AND NOT TO SCALE. ALL CONDITIONS AND LENGTHS TO BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO BID. FOR DETAILS, REFER TO THE CIVIL PLANS.
THE DETAILS ON THIS SHEET ARE DIAGRAMMIC, FOR REFERENCE ONLY AND NOT TO SCALE. ALL CONDITIONS AND LENGTHS TO BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO BID. FOR DETAILS, REFER TO THE CIVIL PLANS.