INVITATION TO BID
BID NO. 9872
POOL UPGRADE AND REMODELING PROJECT
TROY HIGH SCHOOL
FOR TROY SCHOOL DISTRICT

The Troy School District will receive firm, sealed bids for all labor, material, equipment and all other services to complete Bid No. 9872 Pool Upgrade and Remodeling at Troy High School, for Troy Schools.

Specifications and proposal forms can be obtained online at http://www.troy.k12.mi.us. From the main page click the "Business Services" tab listed under "Departments", then click "Purchasing" and scroll down to locate and access the bid document.

Your proposal and two copies marked **"Bid No. 9872 Pool Upgrade and Remodeling Project"** must be delivered no later than 2:30 p.m., Tuesday, December 18, 2018, Troy School District Maintenance/Operations and Purchasing Offices, 1140 Rankin, Troy, MI 48083, at which time all bids will be publicly opened and read aloud immediately thereafter. Bid proposals received after this time will not be considered or accepted.

A pre-bid walk through has been scheduled for 10:30 a.m., Friday, December 7, 2018, at Troy High School, 4777 Northfield Pkwy, Troy, MI 48098. All questions regarding the services specified, the bid specified, or the bid terms and conditions will be accepted in writing ONLY and subsequently answered through an addendum to all interested parties. Questions must be received no later than noon, Thursday December 13, 2018; at no other time prior to the bid opening will questions/concerns be addressed or accepted and may be faxed to: 248.823.4077, or emailed as a Word document to: PurchasingOffice@troy.k12.mi.us.

All bidders must provide familial disclosure in compliance with MCL 380.1267 and attach this information to the bid proposal. The bid proposal will be accompanied by a sworn and notarized statement disclosing any familial relationship that exists between the owner or any employee of the bidder and any member of the Troy School Board or the Troy School Districts Superintendent. Also, a sworn and notarized Affidavit of compliance for the Iran Economic Sanctions Act certifying the vendor does and will comply with Public Act 517 of 2012 shall accompany all proposals. Both forms will be enclosed in the specification's booklet that shall be used for this purpose. The District will not accept a bid proposal that does not include these sworn and notarized disclosure statement.

In accordance with Michigan Compiled Laws Section 129.201, successful bidders whose proposals are $50,000 or more, for any bid category, will be required to furnish a U.S. Treasury Listed Company Performance and Payment Bond in the amount of 100% of their bid. The cost of the Bond shall be identified within each proposal.

The Troy Board of Education reserves the right to accept or reject any or all bids, either in whole or in part; to award contract to other than the low bidder; to waive any irregularities and/or informalities; and in general to make awards in any manner deemed to be in the best interest of the owner.

Purchasing Department
Troy School District
1140 Rankin
Troy, MI 48083

INSTRUCTIONS TO BIDDERS

PROPOSAL/INTENT

1. The Troy School District will receive firm, sealed bids for all labor, material, equipment and all other services to complete Bid No. 9872 Pool Upgrade and Remodeling at Troy High School.

2. Proposals will be submitted only on the forms provided, will be enclosed in a sealed envelope marked with the name of the bidder, the title of the work and must be delivered to Troy School District Maintenance/Operations and Purchasing Offices, 1140 Rankin, Troy, MI 48083, no later than 2:30 pm, Tuesday, December 18, 2018, at which time all bids will be publicly opened and read aloud immediately thereafter. Bid proposals received after this time will not be considered or accepted. Oral, telephone, fax or electronic mail bids are invalid and will not receive consideration. Submit one original and two copies.

3. Proposals will be made in conformity with all the conditions set forth in the specifications. All products must conform to the specifications.

4. A pre-bid walk through has been scheduled at 10:30 a.m., December 7, 2018, at Troy High School, 4777 Northfield Pkwy, Troy, MI 48098. Questions must be received no later than noon, Thursday, December 13, 2018.

5. Bidder shall be reputable and a recognized organization, with at least five (5) years successful experience on work of this type and scope, of equal or better quality than this project.

6. References in the specifications to any article, product, material, fixture, form or type of construction, etc., by proprietary name, manufacturer, make or catalog number will be interpreted as establishing a standard quality of design and will not be construed as limiting proposals.

7. Bid bond or certified check, for an amount not less than five (5%) percent of the amount of the bid, must accompany each bid. Failure to submit proper bid security shall constitute rejection of bid.

8. A performance bond shall be required for the project if the cost is in excess of $50,000 and must be listed separately on the proposal form as an individual line item.

9. A completed Familial Disclosure and an Iran Economic Sanctions form must be included with each proposal submitted or the proposal will not be accepted, please note these forms must be notarized.

10. The Troy Board of Education reserves the right to accept or reject any or all proposals either in whole or in part; to waive any irregularities and/or informalities; and in general to make awards or cancel this proposal, if deemed to be in the best interests of the owner.

SCOPE

This bid includes pool upgrades and refinishing at Troy High School per the attached documents. Proposals will be on a line item lump sum basis, according to the schedule listed below and where specified only the qualified products listed will be considered in this proposal.

WARRANTY

All material and equipment will be guaranteed to be free from defects in both workmanship and materials for no less than two years from date of receipt/installation. If manufacturer warranty exceeds this minimum requirement, the manufacturer warranty will prevail. Any item(s) found to be defective will be replaced or repaired within seven working days at Vendor(s) expense.

WITHDRAWAL OF BIDS

Any bidder may withdraw their bid at any time prior to the scheduled time for receipt of bids. No proposal may be withdrawn until after 45 days after bid opening.

FIRM PRICING

Unit pricing will prevail when computing total quantity on bids. No price allowance or extra consideration on behalf of the bidder will subsequently be allowed by reason of error or oversight on the part of the bidder. The successful bidder(s) will hold bid prices firm for all purchase orders placed for a period of approximately one full year.

PERMITS, FEES AND REGULATIONS

The Contractor shall obtain and pay for all permits, assessments, fees, bonds, and other charges as necessary to perform and complete the work of this contract, including disconnection charges, capping and unplugging utilities.

The Contractor shall be responsible for obtaining all permits and licenses necessary for the proper completion of project. Permits and licenses are available from the appropriate agencies having jurisdiction. The Contractor shall give all notices, pay all fees and comply with all laws, ordinances, rules and regulations bearing on the work. At the completion of the project, the Contractor will provide to the District all paperwork related to the full execution of the permits(s), including all payments and inspections.

If any of the work of the Contractor is done contrary to such laws, ordinance rules and regulations without such notice, he shall bear all costs arising therefrom. The Contractor shall include all cost and taxes in its bid, and make proper provisions for payment of all other State and Federal applicable taxes, fees or other costs.

TAXES

Troy School District is not automatically exempt from State of Michigan Sales and Use Taxes. The District must pay these taxes when materials are to be incorporated into reality. Materials that are permanently attached i.e lockers, built-in, incorporated or otherwise made part of the structure all applicable taxes shall be paid by the Vendor. Troy School District shall not be responsible for any taxes that are imposed on the Vendor. Furthermore, the Vendor understands that it cannot claim exemption from taxes by virtue of any exemption that is provided to Troy School District.

DELIVERY/INSTALLATION

Time of delivery is part of the consideration. It is understood that the bidder agrees to deliver prepaid to the schools, specified from the resulting contract, all items. All cost of delivery, drayage, freight, packing, unpacking, and setup are to be included in the prices bid.

The Contractor is responsible for removing from the project all waste materials and rubbish resulting from his operations and installation including all packing cartons and debris. Removal is to occur on a daily basis. Failure to do so will result in the Owner doing so and the cost thereof shall be charged to the Contractor as a deduction in his contract price.

The Contractor shall provide an adequate number of qualified, experienced installers, in harmony with other works at the site.

BID BOND

Bid Bond or certified check, for an amount not less than five (5%) percent of the amount of the bid, must accompany each bid. The check or bond of each unsuccessful bidder will be returned within ten (10) days after the bid is awarded. Failure of any accepted bidder to enter into a contract to complete the specified work may forfeiture of his bid security. Failure to submit proper bid security shall constitute rejection of bid.

PERFORMANCE BOND/PAYMENT BOND

Within fourteen (14) days after date of issuance of written notice of selection for the award of a contract, which shall be considered as the notice to proceed, the successful bidder shall enter into a contract with the Owner and shall execute and file with the Owner, the following in the amount 100% equal to full contract sum.

A performance bond shall be required for the project if the cost is in excess of $50,000 and must be listed separately on the proposal form as an individual line item. The Performance Bond must insure the faithful performance of all provisions of the contract and satisfactory completion of the specified work, within the time agreed upon.

The payment bond must insure the payment and protection of claimants supplying labor or materials to the principal contractor or his subcontractors in the prosecution of the work provided for in the contract. The successful contractor's bond company must be listed by the State of Michigan as a licensed carrier and have an excellent or superior rating from AM Best Company.

SAFETY

Under the "General Conditions of the Contract for Construction" of the contract to be awarded, the Contractor;

a) shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures;
b) shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the contract;
c) shall take reasonable precautions for safety of all persons who may be affected, including employees of the Contractor and Subcontractor; and
d) shall have an accident prevention representative at the site.

The general conditions of the contract for construction and the agreement also require that the Contractor indemnify the Owner in the event of certain claims arising out of the performance of the work.

INSURANCE REQUIREMENTS

The Contractor shall protect, defend and indemnify the Owner, its officers, agents, servants, volunteers, and employees from any and all liabilities, claims, liens, demands, and costs of whatsoever kind and nature which may result in injury or death to any persons, and for any result in injury or death to any person, and for loss or damage to any property, including property owned or in the care, custody, or control of the Owner in connection with or in any way incident to or arising out of the occupancy, use, with this Agreement resulting in whole or in part from negligent acts or omissions of the Contractor, any Subcontractor, or any employee, agent or representative of the Contractor or any Subcontractor.

The Contractor shall maintain, at its expense, during the term of this contract the following insurance:

a) Worker's Compensation Insurance with statutory limits and Employer's Liability Insurance with a minimum limit of $1,000,000 each occurrence.

b) Comprehensive General Liability Insurance with a minimum combined single limit of $1,000,000 per occurrence, $1,000,000 aggregate, in the same amount made for bodily injury and property damage. The policy is to include products and completed operations, cross liability, broad form property damage, independent contractors, and contractual liability coverage. The policy shall be endorsed to provide sixty (60) days written notice to the District of any material change of coverage, cancellation, or non-renewal of coverage.

c) If Subcontractors are likely to be used, the Comprehensive General Liability policy shall include coverage for independent Contractors.

d) Owner's Contractor's Protective Policy-comprehensive in the name of the Owner, with a minimum combined single limit of $1,000,000 per occurrence in the same amount for bodily injury or property damage.

e) Automobile Liability insurance covering all owned, hired, and non-owned vehicles with personal protection insurance and property insurance to comply with the provisions of the Michigan no-fault Insurance Law, including residual liability insurance with a minimum combined single limit of $1,000,000 each occurrence of bodily injury and property damage.

f) All insurance policies shall be issued by companies licensed to do business in the State of Michigan. The companies issuing the policies must be domestic (on-shore) companies and have an A rating by AM Best.

g) The Contractor shall be responsible for payment of all deductibles contained in any insurance policy required in this contract.

COMPLIANCE WITH SCHOOL SAFETY INITIATIVE LEGISLATION

Meeting the requirements of the School Safety Initiative Legislation, being MCL 380.1230, 80.1230a, 380.1230c, 380.1230d and 380.1230g.

The Bidder acknowledges and agrees that the Bidder will have any and all of its installation personnel (including sub-contractors) subjected to criminal history and background checks. **Personnel that fall into this group will be working on District premises for more than one continuous week.** Criminal history and background checks will be done within a year of the beginning of the project and should be completed before worked begins on this project.

The Bidder is required to provide written documentation listing all personnel who fall into the group indicated in the above paragraph. The documentation will also verify that none of the personnel have a "listed offense" as indicated below. This documentation is to be provided before the beginning of the project and updated as necessary for any additions or subtractions from the list as long as the project lasts.

The Bidder shall indemnify, defend and hold the District, its employees, Board of Education, and each member thereof, agents and consultants, harmless from and against any and all claims, counter-claims, suits, debts, demands, actions, judgments, liens, liabilities, costs, expenses, including actual attorney's fees and actual expert witness fees, arising out of or in connection with any violation of, or the Bidder's failure to comply with the above paragraphs.

The Bidder shall be responsible for all costs and expenses associated with the above-required criminal history and background checks.

LISTED OFFENSES

1. MCL 750.145a - Accosting, enticing or soliciting child (less than 16 years of age) for immoral purposes.
2. MCL 750.145b - Accosting, enticing or soliciting childe (less than 16 years of age) immoral purposes – second or subsequent offenses.
3. MCL 750.145c - Involvement in child sexually abusive activity or material, including possession of child sexually abusive material ("child" is a person less than 18 years of age who has not been legally emancipated.)
4. MCL 750.158 - Crime against nature (i.e., sodomy and beastiality) if the victim is an individual less than 18 years of age.
5. A third of subsequent violation of any combination of the following:
    a. MCL 750.167(1)(f) - indecent or obscene conduct in a public place;
    b. MCL 750.335a - indecent exposure;
    c. A local ordinance of a municipality substantially corresponding to a section described in (a) or (b), *supra.*
6. Except for juvenile disposition or adjudication, a violation of:
    a. MCL 750.338 - gross indecency between males; fellatio or masturbation;
    b. MCL 750.338a - gross indecency between females; oral sex;
    c. MCL 750.338b - gross indecency between male and female persons;
    if the victim is an individual less than 18 years of age.
7. MCL 750.349 - Kidnapping, if victim is an individual less than 18 years of age.
8. MCL 750.350 - Kidnapping; child under 14 years of age with intent to detain or conceal from child's parent or legal guardian.
9. MCL 750.448 - Soliciting or accosting by a person 16 years of age or older, if victim is an individual less than 18 years of age.
10. MCL 750.455 - Pandering
11. MCL 750.520b - First degree criminal sexual conduct.
12. MCL 750.520c - Second degree criminal sexual conduct.
13. MCL 750.520d - Third degree criminal sexual conduct.
14. MCL 750.520e - Fourth degree criminal sexual conduct.
15. MCL 750.520g - Assault with intent to commit criminal sexual conduct.

16. Any other violation of a law of the state or a local ordinance of municipality that by its nature constitutes a sexual offense against an individual who is less than 18 years of age.
17. MCL 750.10a - Offense by sexually delinquent person (i.e., "any person whose sexual behavior is characterized by repetitive or compulsive acts which indicate a disregard of consequences or the recognized rights of others, or by the use of force upon another person in attempting sexual relations of either a heterosexual or homosexual nature, or by the commission of sexual aggressions against children under the age of 16").
18. An attempt or conspiracy to commit an offense described in (1) through (17).
19. An offense substantially similar to an offense described in (1) through (17) under a law of the United States, any state, or any country or any tribal or military law.

TERMINATION BY THE DISTRICT FOR CONVENIENCE

The District may, at any time, terminate the Contract for the District's convenience and without cause.

Upon receipt of written notice from the District of such termination for the District's convenience, the Contractor shall:

a) Cease operations as directed by the District in the notice;
b) Take actions necessary, or that the District may direct, for the protection and preservation of the Work; and
c) Except for Work directed to performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further Subcontracts and purchase orders.

Owner Is An Equal Opportunity Employer

The Owner is an Equal Opportunity Employer. Pursuant to the Executive Order 11246 as amended, you are advised that under the provisions of this order, Contractors and Subcontractors are obligated to take affirmative action to provide equal opportunity without regard to race, creed, color, national origin, age or sex.

Michigan Right to Know Law

Troy School District will comply with the Michigan Right to Know Law by informing Contractors of hazardous chemicals to which they may be exposed. All Contractors will be required to provide Material Safety Data Sheets for any hazardous chemicals brought to the workplace. The Contractor shall comply with all applicable provisions of the Occupational Safety and Health Act for the duration of the specified work.

Asbestos Hazard Emergency Response Act

As required by the Environmental Protection Agency Asbestos Hazard Emergency Response Act, each school district is responsible for providing contractors with information regarding locations of known or assumed asbestos containing material prior to the Contractor entering a building under the school district's jurisdiction. The successful bidder will be required to complete the school district's Contractor Notification forms.

Notification of Assumed Lead-Containing Materials

The intent of this section is to formally notify all Contractors and Sub-Contractors applying for or bidding on work covered within this specification that, due to the age of the facilities within this District, there is the presumption that building components do contain lead-based paint pursuant to OSHA definition. The District has not conducted lead-based paint inspections. As a result, all Contractors and Sub-Contractors bidding must assume that building components do contain lead-based paint.

Furthermore, all awarded Contractors and Sub-Contractors shall be responsible to comply with all applicable Federal and Michigan State lead regulations including, but not limited to, 29 CFR Part 1926.62 of the OSHA Lead Construction Standard, (Part 603 of the Michigan State Standards). All costs associated with regulatory compliance shall be borne by the Contractor and/or Sub-Contractor.

General Conditions

The District reserves the right to accept or reject any or all proposals, to waive irregularities, and to accept a proposal which, in the District's opinion, is in the District's best interest.

The District reserves the right to declare as non-responsive, and reject, any bid which is incomplete or where material information requested in not furnished, or where indirect or incomplete answers or information is provided.

In the event, the Administration Building is closed due to unforeseen circumstances on the day Proposals are due, Proposals will be due at the same time on the next day that the District and/or the Administration Building is open.

Negligence in preparation, improper preparation, errors in, or omissions from, proposal shall not relieve a bidder from fulfillment of any and all obligations and requirements of the proposed Contract Documents.

The District expects that the awarded bidder will complete the work as outlined in the specifications for the amount bid by the bidder. Any additional costs above the amount bid and awarded, must be approved by the District in advance of any work.

Voluntary alternates for bids are acceptable but should NOT be put in the space for the Base Bid on the Bid Response Form but on an attached sheet, clearly labeled Voluntary Alternative. Such Alternates should be described in enough detail for the District to understand the Bidder's intent.

Owner may choose to conduct testing to verify correct products and installation. If the materials and installation are found not to be per spec, owner will require subsequent tests to be performed by Owners testing company at contractors' expense.

Any exceptions to the terms and conditions contained in this RFP or any special considerations or conditions requested or required by the Contractor MUST be specifically enumerated by the Contractor and be submitted as part of its Proposal, together with an explanation as to the reason such terms and conditions of this RFP cannot be met by, or in the Contractor's opinion should not be applicable to, the Contractor. The Contractor shall be required and expected to meet the specifications and the requirements as set forth in this RFP in their entirety, except to the extent exceptions or special considerations or conditions are expressly set forth in the Contractor's Proposal and those exceptions or special considerations or conditions are expressly accepted by the District.

No responsibility shall attach to the District, or the authorized representatives of either one, for the premature opening of any proposal, which is not properly addressed and identified.

The Contract Documents, as outlined in the executed Agreement, shall imply the inclusion of the entire agreement between the parties thereto, and the Contractor shall not claim any modification thereof resulting from any representation or promise made at any time by an officer, agent or employee of the District or by any other person.

Opening and Awarding of Bids

Bids will be publicly opened and read aloud at the Troy School District Maintenance/Operations and Purchasing Offices, 1140 Rankin, Troy, MI 48083, at 2:30 p.m. Tuesday, December 18, 2018.

The recommendation for award will be submitted to the Board of Education at the regular Board of Education Meeting to be held on Tuesday, January 15, 2019.

Scope of Work \ Specifications

Work Schedule

- 3/29/19 to 4/1/19. Drain Pool.
- Week of 4/1/19 to Week of 5/6/19. Ceiling Painting Over Pool including scaffolding erection and removal.
- Week of 5/13/19 to Week of 7/1/19. Pool Repairs
- Week of 6/3/19 to Week of 6/24/19 Electrical Work.
- Week of 7/1/19 to Week of 7/8/19 Ceiling Painting Over Deck and Wall Painting
- Week of 7/15/19 Punchlist, Building Inspections and Final Cleaning.
- 7/22/19 to 8/7/19. Fill Pool and Obtain Final Health Department Approval.
- Pool Opens 8/8/19.
- Final Closeout 45 days after Substantial Completion

Drawings and Specifications

Drawings

#	Description	Date
E0.1	Electrical Standards and Drawing Index	11/29/18
E0.2	Electrical Standard Schedules	11/29/18
E1.1	Electrical Plans	11/29/18
AC.2	Second Level Architectural Composite Plan	9/22/15
A1.2A	Second Level Floor Plan – Zone A	9/22/15
A3.2	Building Sections	9/22/15
A4.1	Wall Sections and Plan Details	9/22/15
A10.2A	Second Level Finish Plan – Zone A	9/22/15

Specifications

#	Description	Pages
099000	Interior, Exterior and Industrial Paints and Coatings	12
131500	Pool Refinishing	14
260010	Electrical General Requirements	8
260500	Basic Electrical Materials and Methods	4
260519	Conductors and Cables	5
260526	Grounding and Bonding	10
260529	Hangers and Supports for Electrical Systems	6
260533	Raceways and Boxes	9
260553	Electrical Identification	8
260923	Lighting Control Devices	8
262726	Wiring Devices	7
262813	Fuses	4
265119	LED Interior Lighting	11

BID CATEGORIES

PAINTING

INCLUDE:

BASE SPECIFICATION SECTION:
099000 – Interior, Exterior and Industrial Paints and Coatings

RELATED SPECIFICATION DIVISION:
26 – Electrical

OTHER ITEMS:

1. Protection of all items not scheduled to be painted.
2. Coordinate with the trades the temporary supporting of mechanical and electrical items.
3. Restoration of any landscaping due to moving items within the space.
4. A single person motorized manlift is permitted on the pool deck.
5. Architectural drawings included in this package are for reference only. These are intended to show the existing conditions.
6. Include in your base bid an allowance of $10,000. This is to be used at the Owner's discretion.

EXCLUDE:

1. Removal of existing signage.

ELECTRICAL

INCLUDE:

BASE SPECIFICATION SECTION:

260010 - Electrical General Requirements
260500 - Basic Electrical Materials and Methods
260519 - Conductors and Cables
260526 - Grounding and Bonding
260529 - Hangers and Supports for Electrical Systems
260533 - Raceways and Boxes
260553 - Electrical Identification
260923 - Lighting Control Devices
262726 - Wiring Devices
262813 - Fuses
265119 - LED Interior Lighting

RELATED SPECIFICATION DIVISION:

09900 – Interior, Exterior and Industrial Paints and Coating

OTHER ITEMS:

1. Electrical demolition
2. Cut and patching for items not shown but required for proper installation
3. All items required but listed for proper installation of this bid categories work.
4. Maintain proper lighting levels during the entire work schedule.
5. Restoration of any landscaping due to moving items within the space.
6. A single person motorized manlift is permitted on the pool deck.
7. Architectural drawings included in this package are for reference only. These are intended to show the existing conditions.
8. Include in your base bid an allowance of $10,000. This is to be used at the Owner's discretion.

EXCLUDE:

1. General building permit

POOL WORK

INCLUDE:

BASE SPECIFICATION DIVISION:
131500 – Pool Refinishing

OTHER ITEMS:

1. Protection of existing surfaces.
2. Cleaning of all surfaces created by the work of this bid category.
3. If required placing the fire alarm into test mode and provide proper fire watch for all areas effected.
4. Provide temporary filter media on all return air grilles and clean/replace as required.
5. Provide temporary barricades around the entire pool itself per MIOSHA standard during the entire course of construction to eliminate a fall. This is required for the entire length of the project.
6. Restoration of any landscaping due to moving items within the space.
7. A single person motorized manlift is permitted on the pool deck.
8. Architectural drawings included in this package are for reference only. These are intended to show the existing conditions.
9. Include in your base bid an allowance of $10,000. This is to be used at the Owner's discretion.

EXCLUDE:

1. General building permit

DUE: 2:30 pm., Tuesday, December 18, 2018
PROPOSAL: BID 9872 Pool Upgrade and Remodeling Project

PROPOSAL FORM

We propose to furnish all material, labor and equipment, as per the specifications, for the Troy School District. and all other services to complete BID 9872 Pool Upgrade and Remodeling Project.

Painting Costs - $ _____

Bond Costs – $ _____

Electrical Costs – $ _____

Bond Costs – $ _____

Pool-work Costs – $ _____

Bond Costs – $ _____

Grand Total $ _____

BIDDER'SFIRM NAME_____

ADDRESS_____

CITY/STATE _____ ZIP _____

CELL NUMBER_____FAX # _____

SIGNED BY_____TITLE _____

TYPED NAME_____DATE_____

E-MAIL ADDRESS_____

VENDOR: LIST FIVE RECENT REFERENCES, PREFERABLY SCHOOL DISTRICTS:

School District	Person to Contact	Phone Number
School District	Person to Contact	Phone Number
School District	Person to Contact	Phone Number
School District	Person to Contact	Phone Number
School District	Person to Contact	Phone Number

Interested vendors will note in this space only any additional information, criteria or contingencies affecting their proposal, understanding that this additional information, criteria or contingency may be utilized in the evaluation process and subsequent award.

SWORN AND NOTARIZED FAMILIAL DISCLOSURE STATEMENT
FAMILIAR DISCLOSURE AFFIDAVIT

The undersigned, the owner or authorized office of the below–named contractor (the 'Contractor"), pursuant to the familial disclosure requirement provided to Troy Schools, hereby represents and warrants that, excepts as provided below, no familial relationship exists between the owner or key employee of the Contractor, and any member of the Troy School Board or the Troy School Superintendent. A list of the School District's Board of Education Members and its Superintendent may be found at http://www.troy.k12.mi.us.

List any Familial Relationships:

Contractor:

_____
Print Name of Contractor

By: _____

Its: _____

Subscribed and sworn before me, this _____ Seal:

day of _____, 20 ____, a Notary Public

in and for _____ County, _____

_____
(Signature)
NOTARY PUBLIC

My Commission expires _____

CERTIFICATION OF COMPLIANCE – IRAN ECONOMIC SANCTIONS ACT

Michigan Public Act No. 517 of 2012

The undersigned, the owner, or authorized officer of the below-named Company, pursuant to the compliance certification requirement provided in Troy School District's Request For Proposal, the "RFP", hereby certifies, represents, and warrants that the Company and its officers, directors and employees, is not an "Iran Linked Business" within the meaning of the Iran Economic Sanctions Act, Michigan Public Act No. 517 of 2012 (the "Act"), and that in the event the Company is awarded a contract by Troy School District as a result of the aforementioned RFP, the Company is not and will not become an "Iran Linked Business" at any time during the course of performing any services under the contract.

The Company further acknowledges that any person who is found to have submitted a false certification is responsible for a civil penalty of not more than $250,000.00 or two (2) times the amount of the contract or proposed contract for which the false certification was made, whichever is greater, the cost of Troy School District's investigation, and reasonable attorney fees, in addition to the fine. Moreover, any person who submitted a false certification shall be ineligible to bid on a request for proposal for three (3) years from the date the it is determined that the person has submitted the false certification.

_____

NAME OF COMPANY

_____

NAME AND TITLE OF AUTHORIZED REPRESENTIVE

_____

SIGNATURE

_____

DATE

Acceptance of Proposal

The undersigned agrees to execute a Contract for work covered by this Proposal provided that he is notified of its acceptance within thirty days after the opening of the Proposal.

It is agreed that this bid will not be withdrawn until after forty-five (45) days after receipt of bids.

The undersigned affirms that the bid was developed without any collusion, undertaking, or agreement, either directly or indirectly, with any other bidder(s) to maintain the prices of indicated work or prevent any other bidder(s) from bidding the work.

BIDDER'S FIRM NAME _____

BUSINESS ADDRESS _____

_____

TELEPHONE NUMBER _____

CELL NUMBER _____

FAX NUMBER _____

BY (SIGNATURE) _____

PRINTED NAME _____

TITLE _____

SIGNED THIS _____ DAY OF _____, 20 _____

E-MAIL ADDRESS _____

ELECTRICAL SYMBOL LIST (NOTE: SOME SYMBOLS AND ABBREVIATIONS SHOWN MAY NOT APPLY TO THIS PROJECT)

SYMBOL	DESCRIPTION
FX	FIXTURE TYPE
	LIGHTING FIXTURE
	DIRECT/INDIRECT LIGHTING FIXTURE
	EMERGENCY FIXTURE
FX-NL	NIGHT LIGHTING FIXTURE
	LIGHTING FIXTURE
	EMERGENCY FIXTURE
	WALL MOUNTED LIGHTING FIXTURE
	LIGHTING FIXTURE
	DIRECTIONAL LIGHTING FIXTURE
	PENDANT LIGHTING FIXTURE
	DIRECTIONAL PENDANT LIGHTING FIXTURE
	WALL SCONCE
	LIGHTING TRACK
	TRACK LIGHTING FIXTURE
	POLE MOUNTED LIGHTING FIXTURE
	POLE MOUNTED LIGHTING FIXTURE - POST TOP
	BOLLARD LIGHTING FIXTURE
	EMERGENCY LIGHTING UNIT
	EXIT LIGHTING FIXTURE WITH DIRECTIONAL ARROWS (SHADED AREA INDICATES FACE)
	EXIT LIGHTING FIXTURE WITH DIRECTIONAL ARROWS (SHADED AREA INDICATES FACE)
	EXIT LIGHTING FIXTURE - WALL MOUNTED
ELTD	EMERGENCY LOAD TRANSFER DEVICE
ALCR	AUTOMATIC LOAD CONTROL RELAY
LC	LIGHTING CONTROL DEVICE - REFER TO LIGHTING CONTROL SCHEDULE
123	ROOM CONTROL DESIGNATION - REFER TO LIGHTING CONTROL SCHEDULE
S	SINGLE POLE TOGGLE SWITCH
S2	TWO POLE TOGGLE SWITCH
S3	3 WAY TOGGLE SWITCH
S4	4 WAY TOGGLE SWITCH
K	KEY OPERATED SWITCH
K3	3 WAY KEY OPERATED SWITCH
K4	4 WAY KEY OPERATED SWITCH
D	DIMMER SWITCH
D3	3 WAY DIMMER SWITCH
Do	DIMMER OCCUPANCY SENSOR SWITCH
DL	LOW VOLTAGE DIMMER SWITCH
SP	PILOT SWITCH

SYMBOL	DESCRIPTION
TWC	TWO-WAY COMMUNICATION SYSTEM CALL STATION
TWCD	TWO-WAY COMMUNICATION SYSTEM AUTO DIALER
TWCA	TWO-WAY COMMUNICATION SYSTEM ANNUNCIATOR & COMMUNICATION PANEL
TWCP	TWO-WAY COMMUNICATION SYSTEM POWER SUPPLY WITH BATTERY BACK-UP
TWCDP	TWO-WAY COMMUNICATION SYSTEM AUTO DIALER POWER SUPPLY WITH BATTERY BACK-UP
RGP	REMOTE GENERATOR ANNUNCIATOR PANEL
ATS	AUTOMATIC TRANSFER SWITCH
UPS	UN-INTERRUPTABLE POWER SUPPLY
CSX	LOW VOLTAGE CONTROL STATION "X" INDICATES TYPE
	SINGLE / DUPLEX RECEPTACLE
	SINGLE/DUPLEX RECEPTACLE CONTROLLED BY AUTOMATIC CONTROL DEVICE/SYSTEM
	QUAD RECEPTACLE
	ABOVE COUNTER DUPLEX RECEPTACLE (SIMILAR FOR TAMPER RESISTANT, QUADS, EMERGENCY AND GFI RECEPTACLES)
	DUPLEX RECEPTACLE-GROUND FAULT CIRCUIT INTERRUPTER
	DUPLEX EMERGENCY RECEPTACLE
	DUPLEX TAMPER RESISTANT RECEPTACLE
	QUAD TAMPER RESISTANT RECEPTACLE
	ABOVE COUNTER DUPLEX TAMPER RESISTANT RECEPTACLE
	DUPLEX UPS RECEPTACLE
	DUPLEX RECEPTACLE WITH 2 USB PORTS
	4 PORT USB CHARGING STATION
	CEILING MOUNTED DUPLEX RECEPTACLE
	POWER POLE
	SPECIAL RECEPTACLE - REFER TO ELECTRICAL STANDARD SCHEDULES
	MULTI-OUTLET RACEWAY
	MULTI-SERVICE DROP SEE ELECTRICAL DETAILS AND DIAGRAMS SHEET "X" INDICATES TYPE
PTX	POKE-THROUGH ASSEMBLY "X" INDICATES TYPE
FBX	FLOOR SERVICE FITTING "X" INDICATES TYPE
AFX	ACCESS FLOOR SERVICE FITTING "X" INDICATES TYPE
RX	CORD REEL "X" INDICATES TYPE
	DUAL SWITCHING FOR INNER/OUTER LAMPS OF FLUORESCENT LIGHT FIXTURES
S3S3	3-WAY DUAL SWITCHING FOR INNER/OUTER LAMPS OF FLUORESCENT LIGHT FIXTURES
S4S4	4-WAY DUAL SWITCHING FOR INNER/OUTER LAMPS OF FLUORESCENT LIGHT FIXTURES
ST	DIGITAL TIME SWITCH
SI	ILLUMINATED TOGGLE SWITCH FOR CONTROL OF LIGHTING ON CRITICAL POWER-ILLUMINATED WHEN SWITCH IS IN "OFF" POSITION
SL	LOW VOLTAGE SWITCH
SO	OCCUPANCY SENSOR — REFER TO ELECTRICAL STANDARD SCHEDULES
SO2	OCCUPANCY SENSOR
OSX	OCCUPANCY SENSOR "X" INDICATES TYPE

SYMBOL	DESCRIPTION
CP	CONTROL PANEL
	MOTOR
VFC	VARIABLE FREQUENCY CONTROLLER.
	MANUAL CONTROLLER
	MAGNETIC CONTROLLER
	COMBINATION MAGNETIC CONTROLLER
	NON-FUSIBLE DISCONNECT SWITCH
	FUSIBLE DISCONNECT SWITCH
CB	ENCLOSED CIRCUIT BREAKER
	PUSH BUTTON STATION
J	JUNCTION BOX
	HARD WIRE POWER CONNECTION
DP	AUTOMATIC DOOR CONTROLLER
PP	AUTOMATIC DOOR PUSH PAD OPERATOR
	GROUND ROD
	GROUND CONNECTION
X	CONDUIT SLEEVE WITH BUSHINGS LENGTH AS REQUIRED "X" INDICATES CONDUIT SIZE
	CONDUIT UP
	CONDUIT DOWN
	EMPTY BOX FOR FUTURE TELECOMMUNICATION OUTLET
	ABOVE COUNTER EMPTY BOX FOR FUTURE TELECOMMUNICATION OUTLET
	EMPTY BOX FOR FUTURE CEILING MOUNTED TELECOMMUNICATION OUTLET
X	TELECOMMUNICATION OUTLET "X" INDICATES TYPE
X	ABOVE COUNTER TELECOMMUNICATION OUTLET "X" INDICATES TYPE
X	TELECOMMUNICATION CEILING MOUNTED OUTLET "X" INDICATES TYPE
	(ABOVE SIX ITEMS:) REFER TO ELECTRICAL STANDARD SCHEDULES
	TELECOMMUNICATION BACKBOARD
TGB	TELECOMMUNICATION GROUNDING BUS BAR
TMGB	TELECOMMUNICATION MAIN GROUNDING BUS BAR
IC	INTERCOM OUTLET
S	SPEAKER
S	SPEAKER - WALL MOUNTED
MIC	MICROPHONE
VC	VOLUME CONTROL/STATION SELECTOR
	SIGNALING BELL
	SINGLE FACE CLOCK - CEILING MOUNTED
	SINGLE FACE CLOCK - WALL MOUNTED
	DOUBLE FACE CLOCK - CEILING MOUNTED
	DOUBLE FACE COMBINATION CLOCK/SPEAKER CEILING MOUNTED
	DOUBLE FACE CLOCK - WALL MOUNTED
	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
TC	TIME CLOCK
C	CONTACTOR
P	PHOTOCELL
TT	TWIST TIMER

SYMBOL	DESCRIPTION
	SECURITY CAMERA
MD	MOTION DETECTOR
K	SECURITY KEY SWITCH
DC	DOOR CONTACT
KP	KEY PAD
CR	ACCESS CONTROL STATION
DB	DURESS PUSH BUTTON STATION
DE	DELAYED EGRESS
REX	REQUEST TO EXIT STATION
	CIRCUIT BREAKER
	DRAWOUT CIRCUIT BREAKER MANUALLY/ OPERATED
	DRAWOUT CIRCUIT BREAKER ELECTRICALLY/ OPERATED
	SWITCH
	AUTOMATIC OR MANUAL TRANSFER SWITCH
	FUSE
	TRANSFORMER
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	LIGHTNING ARRESTOR
X	PANELBOARD "X" INDICATES PANELBOARD NAME
	GROUND
	STRESS CONE TERMINATION
K	SECURITY KEY INTERLOCK
G	ENGINE GENERATOR
M	UTILITY METER
EMU	ELECTRONIC METERING UNIT
A	AMMETER
V	VOLTMETER
AS	AMMETER SWITCH
VS	VOLTMETER SWITCH
SPD	SURGE PROTECTIVE DEVICE
CR	CONTROL RELAY
TDR	TIME DELAY RELAY
	THERMAL OVERLOAD RELAY
	NORMALLY OPEN CONTACTS
	NORMALLY CLOSED CONTACTS
	N.O. PUSH BUTTON SINGLE CIRCUIT
	N.C. PUSH BUTTON SINGLE CIRCUIT
X-X	CABLE VAULT "X-X" INDICATES TYPE
	BRANCH CIRCUIT PANELBOARD
	LOAD CENTER
	MOTOR CONTROL CENTER
T	TRANSFORMER
	DISTRIBUTION PANEL
GB	GROUND BUS
PB	PLUG IN BUSWAY
FB	FEEDER BUSWAY

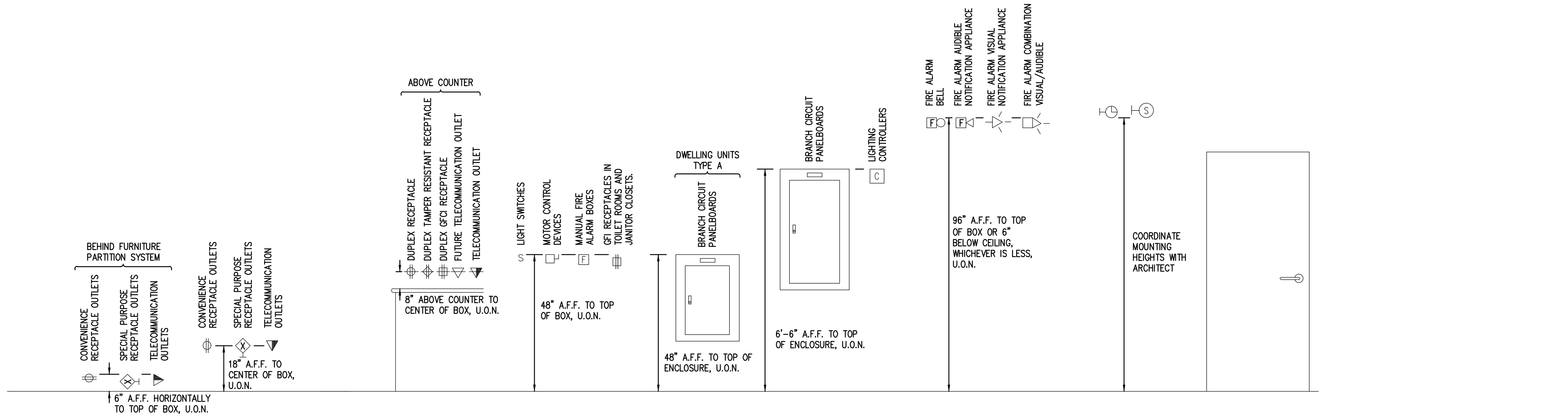
SYMBOL	DESCRIPTION
F	MANUAL FIRE ALARM BOX
SD	SMOKE DETECTOR
DD	DUCT SMOKE DETECTOR
CO	CARBON MONOXIDE DETECTOR
RT	REMOTE TEST STATION (FOR DUCT DETECTOR)
TD	THERMAL DETECTOR
BD	PROJECTED BEAM DETECTOR
F	FIRE ALARM BELL
F	FIRE ALARM AUDIBLE NOTIFICATION APPLIANCE
XX	FIRE ALARM VISUAL NOTIFICATION APPLIANCE "XX" INDICATES CANDELA RATING IF NO RATING SHOWN, APPLIANCE IS 15cd
XX	FIRE ALARM COMBINATION VISUAL/ AUDIBLE "XX" INDICATES CANDELA RATING IF NO RATING SHOWN, APPLIANCE IS 15cd
XX	FIRE ALARM COMBINATION VISUAL/ AUDIBLE NOTIFICATION APPLIANCE- CEILING MOUNTED "XX" INDICATES CANDELA RATING IF NO RATING SHOWN, APPLIANCE IS 15cd
XX	FIRE ALARM VISUAL NOTIFICATION APPLIANCE CEILING MOUNTED "XX" INDICATES CANDELA RATING IF NO RATING SHOWN, APPLIANCE IS 15cd
F	FIRE ALARM AUDIBLE NOTIFICATION APPLIANCE - CEILING MOUNTED
F	FIREFIGHTERS PHONE JACK
FACP	FIRE ALARM CONTROL PANEL
FAA	FIRE ALARM ANNUNCIATOR PANEL
NAC	NOTIFICATION APPLIANCE CIRCUIT EXTENDER PANEL
IM	ADDRESSABLE MONITORING MODULE
CM	ADDRESSABLE CONTROL MODULE
TS	TAMPER SWITCH
FS	FLOW SWITCH
DR	MAGNETIC DOOR RELEASE

ELECTRICAL DRAWING INDEX

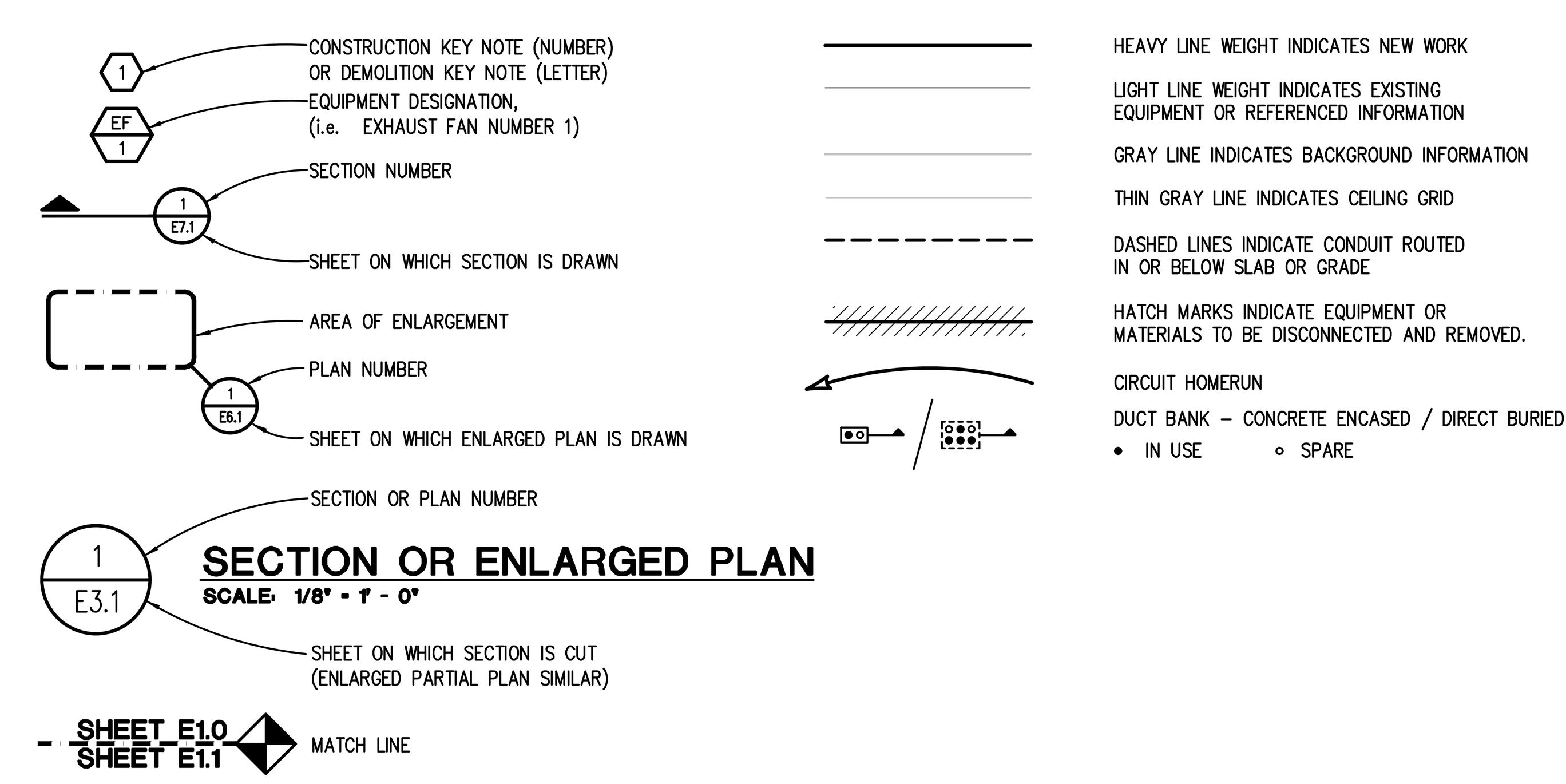
ELECTRICAL ABBREVIATION LIST

ABBREVIATION	DESCRIPTION
A	AMPERES
AF	AMPERES FRAME (BREAKER RATING)
AFCI	ARC FAULT CIRCUIT INTERRUPTER
A.F.F.	ABOVE FINISH FLOOR
AIC	AMPS INTERRUPTING CAPACITY
AL	AUDIENCE LEFT
AR	AUDIENCE RIGHT
AT	AMPERES TRIP (BREAKER SETTING)
ATS	AUTOMATIC TRANSFER SWITCH
AUX	AUXILIARY
BKR	BREAKER
BPS	BOLTED PRESSURE SWITCH
C	CONDUIT
CB	CIRCUIT BREAKER
CFCI	CONTRACTOR FURNISHED, CONTRACTOR INSTALLED
CKT	CIRCUIT
CT	CURRENT TRANSFORMER
DEMO	DEMOLITION
DIM	DIMENSION
DISC	DISCONNECT
DP	DISTRIBUTION PANEL
DS	DOWNSTAGE
DWG	DRAWING
EBU	EMERGENCY BATTERY UNIT
EC	ELECTRICAL CONTRACTOR
ELEC	ELECTRICAL
EM/ EMERG	EMERGENCY
EMT	ELECTRICAL METALLIC TUBING
EO	ELECTRICALLY OPERATED
EPO	EMERGENCY POWER OFF
EWC	ELECTRIC WATER COOLER
EXIST	EXISTING
FA	FIRE ALARM
FLA	FULL LOAD AMPS
FLR	FLOOR
FOH	FRONT OF HOUSE
FSEC	FOOD SERVICE EQUIPMENT CONTRACTOR
FU	FUSE
G/GRD/EG	GROUND
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GFP	GROUND FAULT PROTECTION
HOA	HAND-OFF-AUTO
HP	HORSEPOWER
HV	HIGH VOLTAGE
HZ	HERTZ
IG	ISOLATED GROUND
JB	JUNCTION BOX
KV	KILOVOLT
KVA	KILOVOLT - AMPERES
KW	KILOWATT
KWH	KILOWATT - HOURS
LA	LIGHTNING ARRESTOR
LP	LIGHTING PANEL
LDP	LIGHTING DISTRIBUTION PANEL
MAX	MAXIMUM
MCB	MAIN CIRCUIT BREAKER
MCC	MOTOR CONTROL CENTER
MDP	MAIN DISTRIBUTION PANEL
MECH	MECHANICAL
MIN	MINIMUM
MISC.	MISCELLANEOUS
MLO	MAIN LUGS ONLY
MTD	MOUNTED
MTG	MOUNTING
MTR	MOTOR
N	NEUTRAL
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRICAL CODE
NF	NON-FUSIBLE
NIC	NOT IN CONTRACT
NL	NIGHT LIGHT
NO	NORMALLY OPEN
NTS	NOT TO SCALE
OC	ON CENTER
OFCI	OWNER FURNISHED, CONTRACTOR INSTALLED
OFOI	OWNER FURNISHED, OWNER INSTALLED
P	POLE
PB	PUSHBUTTON STATION
PH	PHASE
PT	POTENTIAL TRANSFORMER
PDP	POWER DISTRIBUTION PANEL
RECEPT.	RECEPTACLE
RDP	RECEPTACLE DISTRIBUTION PANEL
RP	RECEPTACLE PANEL
RSC	RIGID STEEL CONDUIT
SCHED	SCHEDULE
SW	SWITCH
SWBD	SWITCHBOARD
SWGR	SWITCHGEAR
TB	TERMINAL BOX
TELECOM	TELECOMMUNICATIONS
TR	TAMPER RESISTANT
TTB	TELEPHONE TERMINAL BACKBOARD
TYP	TYPICAL
U.O.N.	UNLESS OTHERWISE NOTED
US	UPSTAGE
V	VOLTS
W	WIRE OR WATTS
WG	WIRE GUARD
WP	WEATHERPROOF
XFMR	TRANSFORMER
XP	EXPLOSION PROOF
(E)	EXISTING
(R)	RELOCATED

STANDARD MOUNTING HEIGHTS



STANDARD METHODS OF NOTATION



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REVISION

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PBA Project No. 2013.0408

PROJECT TITLE
TROY SCHOOL DISTRICT
TROY HIGH SCHOOL
POOL LIGHTING UPGRADE
TROY, MICHIGAN

SHEET TITLE
ELECTRICAL STANDARDS AND DRAWING INDEX

DATE
11-29-2018

ISSUE
BIDS

SHEET No.
E0.1

LIGHTING FIXTURE SCHEDULE

TYPE	DESCRIPTION	VOLTAGE	LIGHT SOURCE	MANUFACTURERS
L1 POOL	LED INDIRECT PENDANT FIXTURE. RATED FOR NATATORIUM ENVIRONMENT, WET LOCATION LISTED, IP66 RATED, SEALED LEDS. ALL FITTINGS, BOLTS, MECHANICAL PARTS AND PIECES SHALL BE STAINLESS STEEL. MOUNT LIGHTS AT 18'-0" A.F.F. TO BOTTOM OF FIXTURE. PROVIDE UNISTRUT AND MISC. PARTS AND PIECES FOR MOUNTING. PAINT UNISTRUT NATATORIUM FINISH TO MATCH DECK.	277V	30,000 LUMENS 4000K 80CRI	1. ORGATECH ZIRO SERIES 2. COOPER AMETRIX SERIES 3. WINONA 804 WINDIRECT SERIES
L1E POOL	SAME AS LIGHT FIXTURE TYPE "L1" EXCEPT PROVIDE EMERGENCY LOAD TRANSFER DEVICE.			

DTE LIGHTING INCENTIVES PROGRAM

THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND MEETING ALL REQUIREMENTS FOR THE OWNER TO PARTICIPATE IN THE CURRENT DTE ENERGY SAVINGS PROGRAM. THE FOLLOWING ITEMS WILL BE REQUIRED BUT NOT LIMITED TO, FOR PARTICIPATE IN THIS PROGRAM:

1. ON BEHALF OF THE OWNER, PROVIDE ALL REQUIRED INFORMATION FOR THE RESERVATION APPLICATION. REFER TO DTE ENERGY PROGRAM APPLICATION AT www.dtetradeally.com

2. CONTRACTOR BUSINESS INFORMATION.
3. LIGHTING INCENTIVES WORKSHEET.
4. TYPE OF FIXTURES REMOVED, WATTAGE AND LAMP SIZE.
5. EASY TO READ ITEMIZED INVOICES WITH PART NUMBERS OF ALL LED LIGHT FIXTURES, AND CONTROLS.
6. MANUFACTURERS CUT SHEETS WITH HIGHLIGHTED FIGURES, TYPES OF LED FIXTURES, DRIVERS, AND CONTROLS, ETC. AS REQUIRED BY DTE.
7. MEASURES ARE COMPLETELY INSTALLED WITH 90 DAYS OF PROJECT APPROVAL.

IT IS THE ELECTRICAL CONTRACTORS RESPONSIBILITY TO CONTACT DTE'S ENERGY SAVINGS TEAM OR ASSIGNED REPRESENTATIVE IF A PROJECT IS DELAYED, OR SUBSTANTIALLY CHANGED.

THE ELECTRICAL CONTRACTOR SHALL WORK WITH AND COORDINATE WITH THE OWNER FOR THE RESERVATION PROCESS PRIOR TO SITE WORK BEING CONDUCTED AND POST REVIEW INSPECTION FOR REMOVAL AND INSTALLATION OF ALL EQUIPMENT RELATED TO THE INCENTIVE PROGRAM.

FEEDER AND BRANCH CIRCUIT SIZING SCHEDULE - GENERAL PURPOSE

	COPPER CONDUCTORS					
OVERCURRENT DEVICE RATING (AMPERES)	WIRE SIZE (AWG OR KCMIL)		CONDUIT SIZE			
	PHASE & NEUTRAL	GROUND	SINGLE PHASE 2 WIRE+G (1PH, 1N, 1G)	SINGLE PHASE 3 WIRE+G (2PH, 1N, 1G)	THREE PHASE 3 WIRE+G (3PH, 1G)	THREE PHASE & NEUTRAL 4 WIRE+G (3PH, 1N, 1G)
15–20	12	12	3/4"	3/4"	3/4"	3/4"
25–30	10	10	3/4"	3/4"	3/4"	3/4"
35–40	8	10	3/4"	3/4"	3/4"	3/4"
* 45–50	8 (6)	10	3/4"	3/4"	3/4"	3/4"
* 60	6 (4)	10	3/4" (1")	3/4" (1")	3/4" (1")	1" (1 1/4")
70	4	8	1"	1 1/4"	1 1/4"	1 1/4"
* 80	4 (3)	8	1"	1 1/4"	1 1/4"	1 1/4"
* 90–100	3 (2)	8	1 1/4"	1 1/4"	1 1/4"	1 1/4"
* 110	2 (1)	6	–	1 1/4"	1 1/4"	1 1/4" (1 1/2")
* 125	1 (1/0)	6	–	1 1/4" (1 1/2")	1 1/4" (1 1/2")	1 1/2"
150	1/0	6	–	1 1/2"	1 1/2"	1 1/2"
175	2/0	6	–	2"	2"	2"
200	3/0	6	–	2"	2"	2 1/2"
225	4/0	4	–	2"	2"	2 1/2"
250	250	4	–	2 1/2"	2 1/2"	2 1/2"
300	350	4	–	2 1/2"	2 1/2"	3"
350	500	3	–	3"	3"	3"
400	500	3	–	3"	3"	3"
450	2–4/0	2–2	–	2–2"	2–2"	2–2 1/2"
500	2–250	2–2	–	2–2 1/2"	2–2 1/2"	2–2 1/2"
600	2–350	2–1	–	2–2 1/2"	2–2 1/2"	2–3"
700	2–500	2–1/0	–	2–3"	2–3"	2–3"
800	2–500	2–1/0	–	2–3"	2–3"	2–3 1/2"
1000	3–400	3–2/0	–	3–3"	3–3"	3–3"
1200	3–600	3–3/0	–	3–3 1/2"	3–3 1/2"	3–3 1/2"
1600	4–600	4–4/0	–	4–3 1/2"	4–3 1/2"	4–3 1/2"
2000	5–600	5–250	–	5–3 1/2"	5–3 1/2"	5–3 1/2"

* = SEE NOTE 4

NOTES:

1. CONTRACTOR TO SIZE FEEDERS AND BRANCH CIRCUITS BASED ON THIS SCHEDULE AND OVER CURRENT DEVICE SIZE, UNLESS NOTED OTHERWISE.
2. CONTRACTOR MAY COMBINE 20A CIRCUITS AS NOTED IN SPECIFICATION.
3. CONDUCTORS ARE BASED ON THHN/THWN UP TO AND INCLUDING #4/0. LARGER THAN #4/0 ARE BASED ON TYPE XHHW.
4. CONDUCTORS ARE BASED ON 90°C, 600V, INSULATED COPPER WIRE APPLIED AT 75°C FOR TERMINATION RATED 60/75°C OR 75°C. FOR TERMINATION RATED AT 60°C, USE CONDUCTORS AND CONDUIT SIZES INDICATED IN PARENTHESES.
5. CONDUIT SIZES ARE VALID FOR EMT OR RGS. CONDUIT SIZES SHALL BE ADJUSTED AS REQUIRED FOR OTHER TYPES OF CONDUIT.
6. ELECTRICAL CONTRACTOR TO COORDINATE WITH MECHANICAL CONTRACTOR AND PROVIDE REQUIRED WIRE SIZES TO ACCOMMODATE MECHANICAL EQUIPMENT LUG SIZES.
7. SIZE OF DISCONNECT SWITCH LOCATED AT EQUIPMENT SHALL BE SIZED BASED UPON OVERCURRENT PROTECTION OF THAT DEVICE.
8. OBTAIN APPROVAL FROM ENGINEER PRIOR TO INSTALLING DIFFERENT SIZE/QUANTITY OF CONDUCTORS TO OBTAIN AN EQUIVALENT AMPACITY.
9. SPLICE FROM ALUMINUM TO COPPER PRIOR TO ENTERING EQUIPMENT LISTED FOR USE WITH COPPER CONDUCTORS ONLY OR USE COPPER CONDUCTORS FOR THE ENTIRE LENGTH OF FEEDER.

BRANCH CIRCUIT VOLTAGE DROP WIRING SCHEDULE FOR SINGLE PHASE CIRCUITS

BRANCH CKT RATING (A)	WIRE SIZE (AWG)	MAXIMUM BRANCH CIRCUIT LENGTH (IN FEET)				
		120V	208V	240V	277V	480V
20A	12	83	143	165	191	331
	10	128	222	256	295	511
	8	201	348	402	464	804
	6	313	542	625	721	1250
30A	10	85	148	170	197	341
	8	134	232	268	309	536
	6	208	361	417	481	833
	4	313	542	625	721	1250

NOTES:

1. THE ABOVE TABLE VALUES ARE BASED ON COPPER CONDUCTORS, IN STEEL CONDUIT, WITH A LOAD POWER FACTOR OF 0.85 PER NEC CHAPTER 9, TABLE 9.
2. PROVIDE BRANCH CIRCUIT CONDUCTORS AS INDICATED IN THE TABLE ABOVE FOR ALL LIGHTING AND RECEPTACLE BRANCH CIRCUITS. WHERE BRANCH CIRCUITS SERVE DEDICATED EQUIPMENT, THE CONTRACTOR MAY PERFORM VOLTAGE DROP CALCULATIONS BASED ON ACTUAL EQUIPMENT CONNECTED LOAD AND PROVIDE CONDUCTORS APPROPRIATELY SIZED TO LIMIT VOLTAGE DROP TO A MAXIMUM OF 3%.
3. CONDUCTOR SIZES ARE BASED ON MAXIMUM OF 9 CURRENT CARRYING CONDUCTORS IN A SINGLE CONDUIT.
4. LIMITS FOR CONDUCTOR LENGTHS SHOWN ARE BASED ON A MAXIMUM BRANCH CIRCUIT LOADING OF 64% OF THE BRANCH BREAKER RATING AND A MAXIMUM OF 3 PERCENT VOLTAGE DROP TO COMPLY WITH ASHRAE 90.1 AND THE NEC. FOR CIRCUITS LOADED GREATER THAN 64% OF BRANCH BREAKER RATING, THE CONTRACTOR SHALL PROVIDE CONDUCTORS APPROPRIATELY SIZED TO LIMIT VOLTAGE DROP TO 3%

RACEWAY / CONDUCTOR / CABLE APPLICATION SCHEDULE

		WIRE			RACEWAYS												CABLE/ CORD
		COPPER, TYPE THHN/THWN-2	COPPER, TYPE XHHW-2	ALUMINUM, TYPE XHHW-2 (100A AND ABOVE ONLY)	ELECTRICAL METALLIC TUBING (EMT)	INTERMEDIATE METAL CONDUIT (IMC)	RIGID STEEL CONDUIT (RSC)	PVC COATED RIGID STEEL CONDUIT	RIGID NON-METALLIC CONDUIT (RNC) TYPE EPC-40	RIGID NON-METALLIC CONDUIT (RNC) TYPE EPC-80	RIGID NON-METALLIC CONDUIT (HDPE) SCHEDULE 40	HIGH DENSITY POLYETHYLENE (HDPE) SCHEDULE 80	HIGH DENSITY POLYETHYLENE (HDPE) SCHEDULE 40	FLEXIBLE METAL CONDUIT (FMC)	LIQUID TIGHT FLEXIBLE METAL CONDUIT (LFMC)	SURFACE RACEWAY	METAL CLAD TYPE CABLE WITH INSULATED GROUND WIRE (TYPE MC)
BRANCH CIRCUITS - INTERIOR	EXPOSED, BELOW 10' AFF AND SUBJECT TO DAMAGE	X				X	X										
	EXPOSED, ABOVE 10' AFF UNFINISHED SPACES	X			X												
	CONCEALED, ACCESSIBLE CEILINGS (NOTE 2)	X			X												X
	CONCEALED, INACCESSIBLE CEILINGS	X			X												
	CONCEALED IN GYPSUM BOARD PARTITION WALLS	X			X									X			X
	CONCEALED IN CMU WALLS	X			X												
	EXPOSED, FINISHED SPACES	X														X	
	EXPOSED, UNFINISHED SPACES	X			X												
	EXPOSED, EXISTING CONSTRUCTION	X														X	
	DAMP AND WET LOCATIONS	X				X	X	X	X						X		
SPECIAL APPLICATION	EMERGENCY FEEDERS		X	X		X	X	X	X	X	X	X	X				
	NATATORIUMS AND POOLS, PUBLIC SPACES	X	X					X	X	X					X		
	POOL AND FOUNTAIN EQUIPMENT ROOMS	X	X					X	X	X					X		

GENERAL NOTES:

1. PROVIDE RIGID STEEL SWEEPS WHERE CONDUITS PENETRATE WALLS, CONCRETE SLABS, AND CONCRETE BASES.
2. REFER TO SPECIFICATIONS FOR RESTRICTIONS ON MC CABLE INSTALLATION.
3. CONDUIT AND WIRE ALLOWED WHEN ENCASED IN MINIMUM 2" CONCRETE.

EXISTING SP-2E

#	LOAD TYPE	DESCRIPTION	CB TYPE	CB	VA	ØA	ØB	ØC	VA	CB	CB TYPE	DESCRIPTION	LOAD TYPE	#
1	NC	EXISTING LOAD	EXIST	20	500	1000			500	20	EXIST	EXISTING LOAD	NC	2
3	NC	EXISTING LOAD	EXIST	20	500		1000		500	20	EXIST	EXISTING LOAD	NC	4
5	NC	EXISTING LOAD	EXIST	20	500			1000	500	20	EXIST	EXISTING LOAD	NC	6
7	NC	EXISTING LOAD	EXIST	20	500	1000			500	20	EXIST	EXISTING LOAD	NC	8
9	NC	EXISTING LOAD	EXIST	20	500		1000		500	20	EXIST	EXISTING LOAD	NC	10
11	L	POOL LIGHTING	NEW	20	1600			1600				SPACE		12
13	L	POOL LIGHTING	NEW	20	3350	3350						SPACE		14
15	L	POOL LIGHTING	NEW	20	2800		2800					SPACE		16
17		SPACE										SPACE		18
						5350 ØA	4800 ØB	2600 ØC						

PANELBOARD INFORMATION
VOLTAGE: 480Y/277
BUS AMPACITY: 100A
MAIN TYPE: MLO
MINIMUM A.I.C.:
MOUNTING: SURFACE
☐ FEED-THROUGH LUGS
☐ DOUBLE LUGS
☐ INTEGRAL SPD

PANELBOARD LOCATION
ELECTRICAL
A224

BRANCH CIRCUIT CONNECTED LOAD		DEMAND FACTOR	CALCULATED DEMAND	FEEDER AND OVERCURRENT SIZING	
CONTINUOUS LOAD (C)		100%		125%	
ELECTRIC HEAT (E)		100%		125%	
NON-CONTINUOUS LOAD (NC)	5000	100%	5000	100%	5000
KITCHEN LOAD (K)		100%		100%	
RECEPTACLE BASE LOAD (R)		100%		100%	
RECEPTACLE DEMAND LOAD (R)		50%		100%	
LIGHTING LOAD (L)	7750	100%	7750	125%	9688
ADDITIONAL TRACK LIGHTING LOAD		(150VA/2FT)		100%	
MOTORS, HIGHEST LOAD (MH)		100%		125%	
MOTORS, REMAINING LOAD (M)		100%		100%	
		TOTAL(KVA):	12.75		
NOTE: DEMAND AND SIZING INFORMATION IS CALCULATED FROM CONNECTED LOAD		TOTAL (AMPS):	15	TOTAL (AMPS):	18

NOTES:

EXISTING LP-2G

#	LOAD TYPE	DESCRIPTION	CB TYPE	CB	VA	ØA	ØB	ØC	VA	CB	CB TYPE	DESCRIPTION	LOAD TYPE	#
1	NC	EXISTING LOAD	EXIST	20	500	1000			500	20	EXIST	EXISTING LOAD	NC	2
3	NC	EXISTING LOAD	EXIST	20	500		1000		500	20	EXIST	EXISTING LOAD	NC	4
5	NC	EXISTING LOAD	EXIST	20	500			1000	500	20	EXIST	EXISTING LOAD	NC	6
7	NC	EXISTING LOAD	EXIST	20	500	1000			500	20	EXIST	EXISTING LOAD	NC	8
9	NC	EXISTING LOAD	EXIST	20	500		1000		500	20	EXIST	EXISTING LOAD	NC	10
11	NC	EXISTING LOAD	EXIST	20	500			1000	500	20	EXIST	EXISTING LOAD	NC	12
13	L	POOL LIGHTING	NEW	20	1760	1760						SPACE		14
15		SPACE										SPACE		16
17		SPACE										SPACE		18
						3760 ØA	2000 ØB	2000 ØC						

PANELBOARD INFORMATION
VOLTAGE: 480Y/277
BUS AMPACITY: 100A
MAIN TYPE: MLO
MINIMUM A.I.C.:
MOUNTING: SURFACE
☐ FEED-THROUGH LUGS
☐ DOUBLE LUGS
☐ INTEGRAL SPD

PANELBOARD LOCATION
ELECTRICAL
A224

BRANCH CIRCUIT CONNECTED LOAD		DEMAND FACTOR	CALCULATED DEMAND	FEEDER AND OVERCURRENT SIZING	
CONTINUOUS LOAD (C)		100%		125%	
ELECTRIC HEAT (E)		100%		125%	
NON-CONTINUOUS LOAD (NC)	6000	100%	6000	100%	6000
KITCHEN LOAD (K)		100%		100%	
RECEPTACLE BASE LOAD (R)		100%		100%	
RECEPTACLE DEMAND LOAD (R)		50%		100%	
LIGHTING LOAD (L)	1760	100%	1760	125%	2200
ADDITIONAL TRACK LIGHTING LOAD		(150VA/2FT)		100%	
MOTORS, HIGHEST LOAD (MH)		100%		125%	
MOTORS, REMAINING LOAD (M)		100%		100%	
		TOTAL(KVA):	7.76		
NOTE: DEMAND AND SIZING INFORMATION IS CALCULATED FROM CONNECTED LOAD		TOTAL (AMPS):	9	TOTAL (AMPS):	10

NOTES:
EXISTING EMERGENCY PANEL SERVED FROM EXISTING GENERATOR

OCCUPANCY SENSOR LEGEND

TYPE	DESCRIPTION
OS A	360° CEILING MOUNTED DUAL TECHNOLOGY OCCUPANCY SENSOR 20' MOUNTING HEIGHT, SUITABLE FOR NATATORIUM ENVIRONMENT.
OS B	90° CEILING/WALL MOUNTED DUAL TECHNOLOGY OCCUPANCY SENSOR
OS C	360° CEILING MOUNTED PASSIVE INFRARED OCCUPANCY SENSOR
OS D	360° CEILING MOUNTED ULTRASONIC OCCUPANCY SENSOR
OS E	360° CEILING MOUNTED ULTRASONIC OCCUPANCY SENSOR – CORRIDOR OPTIMIZED
So	WALL SWITCH OCCUPANCY SENSOR
So2	WALL SWITCH OCCUPANCY SENSOR – DUAL LEVEL SWITCHING
Do	WALL DIMMER SWITCH OCCUPANCY SENSOR

NOTE: SOME SYMBOLS AND ABBREVIATIONS SHOWN MAY NOT APPLY TO THIS PROJECT.

REVISION

REVISION

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PBA Project No: 20133408

Peter Basso Associates Inc
CONSULTING ENGINEERS

PROJECT TITLE
TROY SCHOOL DISTRICT
TROY HIGH SCHOOL
POOL LIGHTING UPGRADE
TROY, MICHIGAN

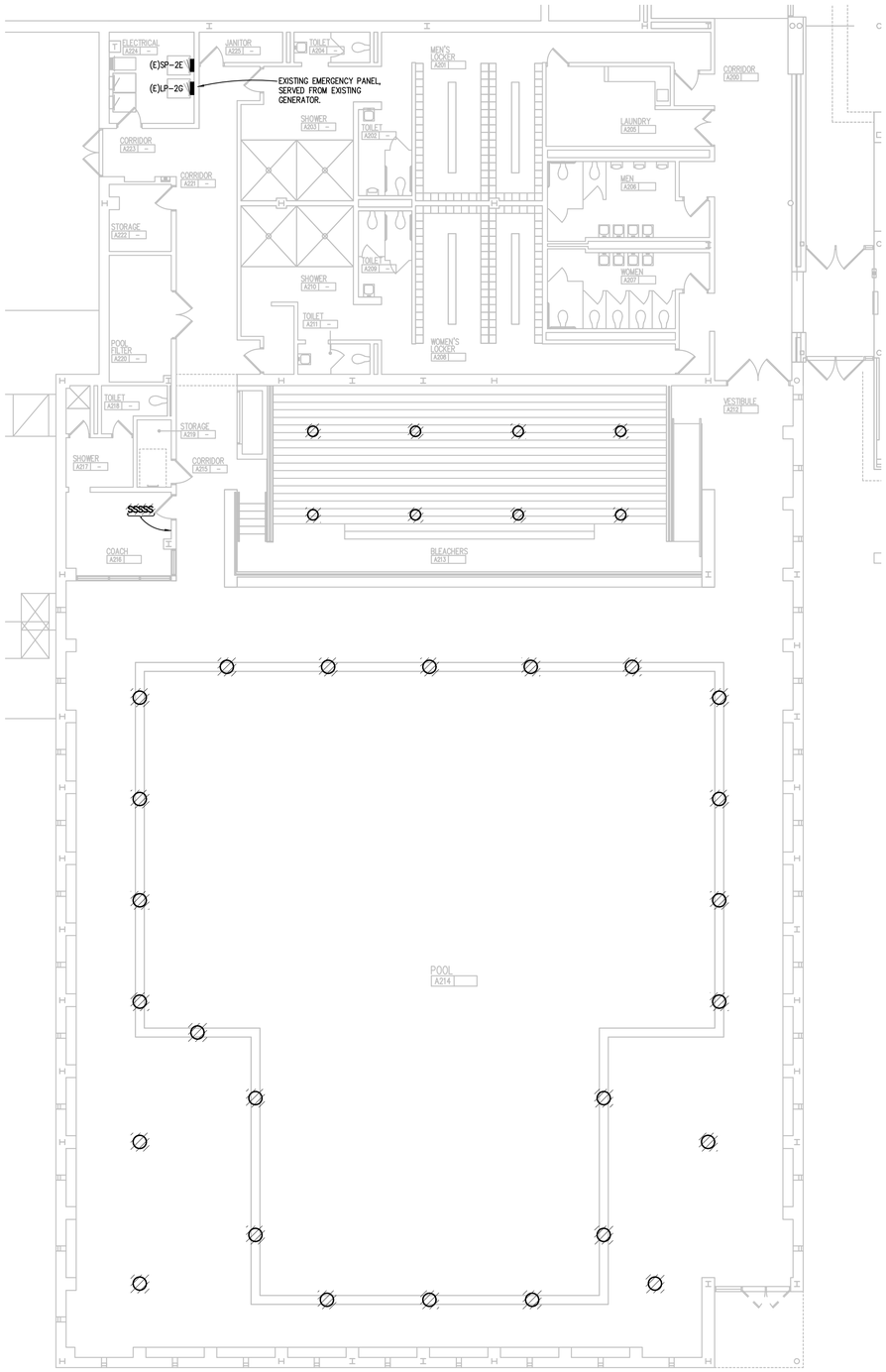
SHEET TITLE
ELECTRICAL STANDARD SCHEDULES

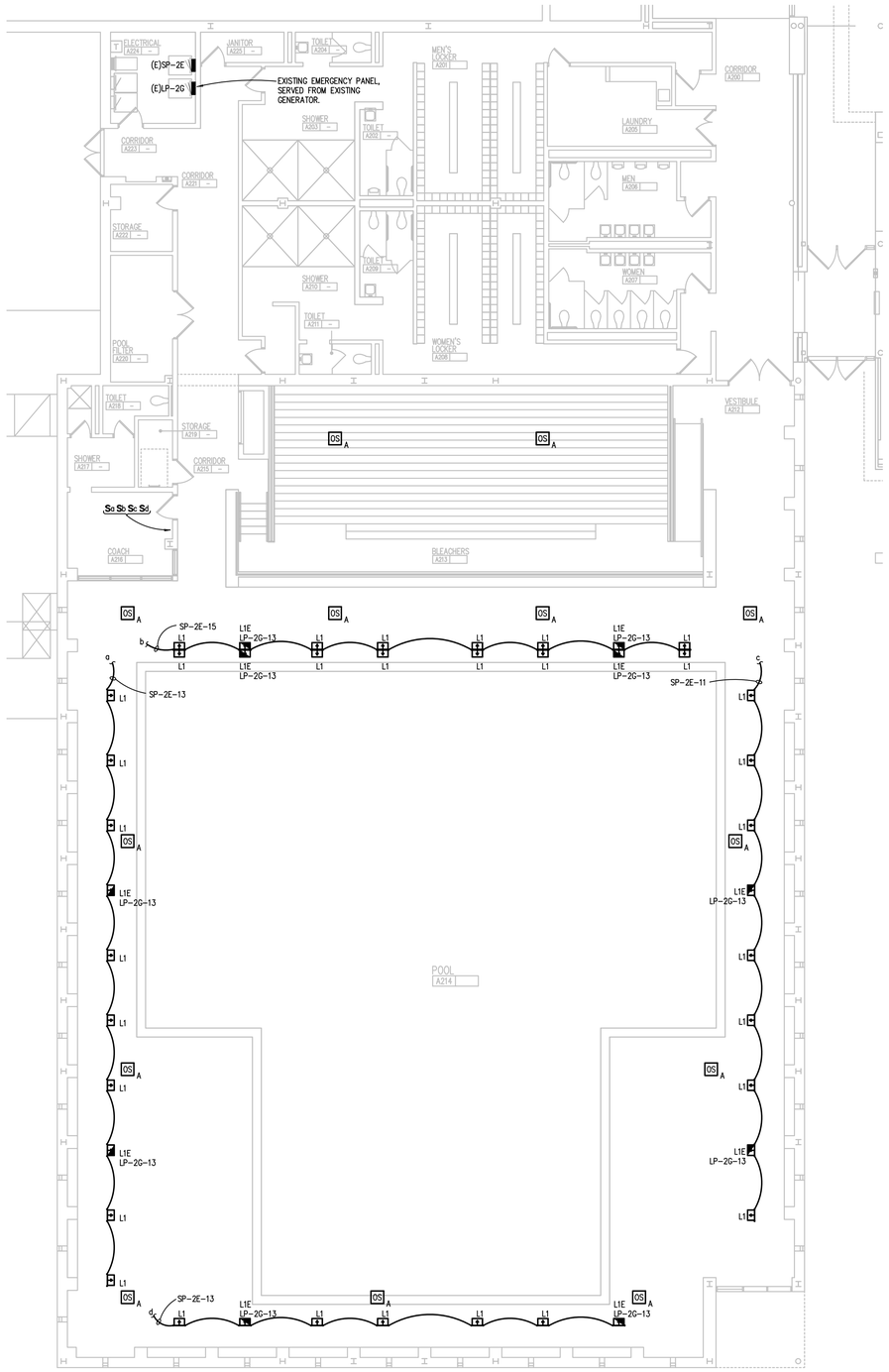
DATE
11-29-2018

ISSUE
BIDS

SHEET No.
E0.2

THE FOLLOWING DIMENSION EQUALS ONE INCH WHEN PRINTED TO SCALE. 1"





ELECTRICAL DEMOLITION GENERAL NOTES:

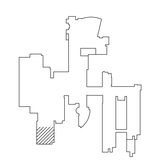
1. VISIT THE SITE PRIOR TO SUBMISSION OF BID TO EXAMINE THE EXISTING CONDITIONS AND THE EXTENT OF DEMOLITION WORK.
2. EXAMINE THE DRAWINGS OF OTHER TRADES AND BE FAMILIAR WITH THE DEMOLITION REQUIRED BY OTHER TRADES. PERFORM ALL INCIDENTAL ELECTRICAL DEMOLITION AND/OR RELOCATION REQUIRED TO FACILITATE THE DEMOLITION WORK OF OTHER TRADES, WHETHER OR NOT SPECIFICALLY INDICATED.
3. REMOVE EQUIPMENT OR MATERIALS AS INDICATED ON PLAN WITH CROSS HATCHING. DEMOLITION SHALL INCLUDE, BUT NOT BE LIMITED TO, THOSE COMPONENTS SHOWN.
4. COORDINATE WITH NEW WORK PLANS FOR EXTENT OF DEMOLITION WORK.
5. PROVIDE PROPER SUPPORT FOR EXISTING TO REMAIN CONDUITS AND BOXES WHERE EXISTING SUPPORT IS TO BE REMOVED. RE-ROUTE BRANCH CIRCUIT CONDUITS AND RELOCATE JUNCTION BOXES AS REQUIRED TO FACILITATE INSTALLATION OF NEW EQUIPMENT AND SYSTEMS IN CEILING SPACES.
6. REMOVE ALL CONDUIT AND WIRE BACK TO THE SOURCE OR NEAREST UPSTREAM DEVICE REMAINING IN SERVICE.
7. MAINTAIN ELECTRICAL SERVICE TO ALL LIGHTING FIXTURES, DEVICES AND EQUIPMENT THAT ARE TO REMAIN. EXTEND CONDUIT AND WIRE AS REQUIRED WHERE DEMOLITION WORK AFFECTS ELECTRICAL SERVICE TO DOWNSTREAM LOADS THAT ARE TO REMAIN.
8. DISPOSE OF ALL MATERIALS OFF SITE AND INCLUDE ALL COSTS FOR DISPOSAL IN BID. ALL MATERIALS SHALL BE DISPOSED OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS, INCLUDING TCLP TESTING, PROPER DISPOSAL AND/OR RECYCLING OF FLUORESCENT LAMPS.
9. PROVIDE BLANK COVER PLATES WHERE SWITCHES AND DEVICES ARE REMOVED BUT EXISTING WALLS REMAIN INTACT.
10. RING OUT AND TAG ALL CIRCUITS AFFECTED BY THIS ALTERATION AT BOTH ENDS. MARK ALL UNUSED CIRCUIT BREAKERS "SPARE".
11. PROVIDE UPDATED TYPED-IN DIRECTORIES FOR ALL PANELS AFFECTED BY THIS ALTERATION.
12. COORDINATE ANY SHUT DOWN OF EXISTING SERVICES AND EQUIPMENT THAT ARE REMAINING IN USE WITH THE OWNER'S REPRESENTATIVE. WHERE EXISTING BUILDING SERVICE IS REQUIRED TO BE SHUT DOWN, INCLUDE ALL ASSOCIATED OVERTIME COSTS TO PERFORM THIS WORK DURING WEEKENDS AND EVENINGS INCLUDE ALL COSTS FOR PROVIDING TEMPORARY POWER WHERE SHUT DOWNS MUST OCCUR FOR PERIODS LONGER THAN THESE HOURS. COORDINATE ELECTRICAL SHUT DOWNS WITH THE OWNER 72 HOURS PRIOR TO SHUT DOWN.

ELECTRICAL GENERAL NOTES:

1. THESE DRAWINGS REPRESENT THE GENERAL EXTENT AND ARRANGEMENT OF SYSTEMS, BUT ARE NOT TO BE CONSIDERED FABRICATION DRAWINGS. COORDINATE WITH OTHER TRADES, AND PROVIDE EACH SYSTEM COMPLETE, INCLUDING ALL NECESSARY COMPONENTS, FITTINGS, AND OFFSETS.
2. INSTALL SYSTEMS SUCH THAT REQUIRED CLEARANCE AND SERVICE ACCESS SPACE IS PROVIDED AROUND ALL MECHANICAL AND ELECTRICAL EQUIPMENT, AND AROUND ANY COMPONENTS WHICH REQUIRE SERVICE ACCESS.
3. COORDINATE AND PROVIDE ACCESS DOORS WITHIN INACCESSIBLE CEILING, SHAFT, AND CHASE AREAS FOR ALL COMPONENTS WHICH REQUIRE SERVICE ACCESS. REFER TO ARCHITECTURAL DRAWINGS FOR CEILING TYPES.
4. PROVIDE SUPPLEMENTARY STEEL AS REQUIRED FOR THE PROPER SUPPORT OF ALL SYSTEMS.
5. COORDINATE THE MOUNTING HEIGHTS OF DEVICES WITH ARCHITECTURAL ELEVATIONS AND THE TRADES INSTALLING THE WORK.

ELECTRICAL DEMOLITION PLAN
SCALE: 1/8" = 1' - 0"

ELECTRICAL NEW WORK PLAN
SCALE: 1/8" = 1' - 0"



KEY PLAN
NO SCALE

REVISION

REVISION

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Peter Basso Associates Inc
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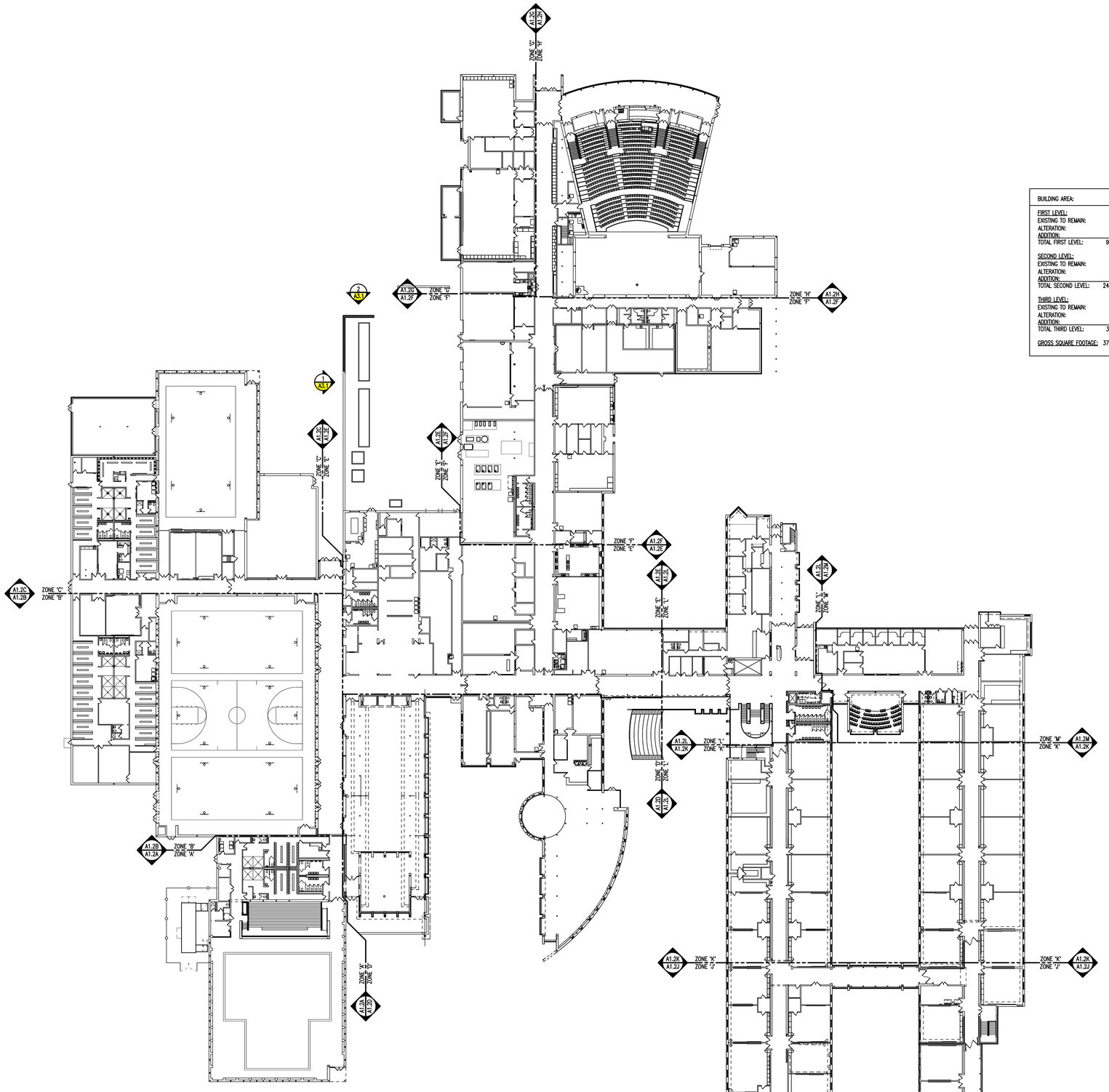
PROJECT TITLE
TROY SCHOOL DISTRICT
TROY HIGH SCHOOL
POOL LIGHTING UPGRADE
TROY, MICHIGAN

SHEET TITLE
ELECTRICAL PLANS

DATE
11-29-2018

ISSUE
BIDS

SHEET No.
E1.1



BUILDING AREA:	
FIRST LEVEL:	
EXISTING TO REMAIN:	##
ALTERATION:	##
ADDITION:	N/A
TOTAL FIRST LEVEL:	97,397
SECOND LEVEL:	
EXISTING TO REMAIN:	##
ALTERATION:	##
ADDITION:	N/A
TOTAL SECOND LEVEL:	248,747
THIRD LEVEL:	
EXISTING TO REMAIN:	##
ALTERATION:	##
ADDITION:	N/A
TOTAL THIRD LEVEL:	33,319
GROSS SQUARE FOOTAGE:	379,463

N

SECOND LEVEL COMPOSITE FLOOR PLAN

SCALE: 1/32" = 1'-0"

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REGISTRATION SEAL

CONSULTANT

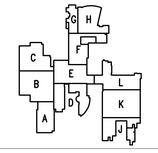
PROJECT TITLE

Troy High School MEP Upgrades Bid Package No. 8

Troy School District
Troy, Michigan

DRAWING TITLE

Second Level Architectural Composite Plan



ISSUE DATES

DATE:	ISSUED FOR:
09-22-15	BIDS

DRAWN	BJP/JMM
CHECKED	KRJ
APPROVED	JJC

PROJECT NO.

13174C

DRAWING NO.

AC.2

Drawing File: Q:\acad\2013revs\13174s\13174c_c01\13174c_ac2.dwg
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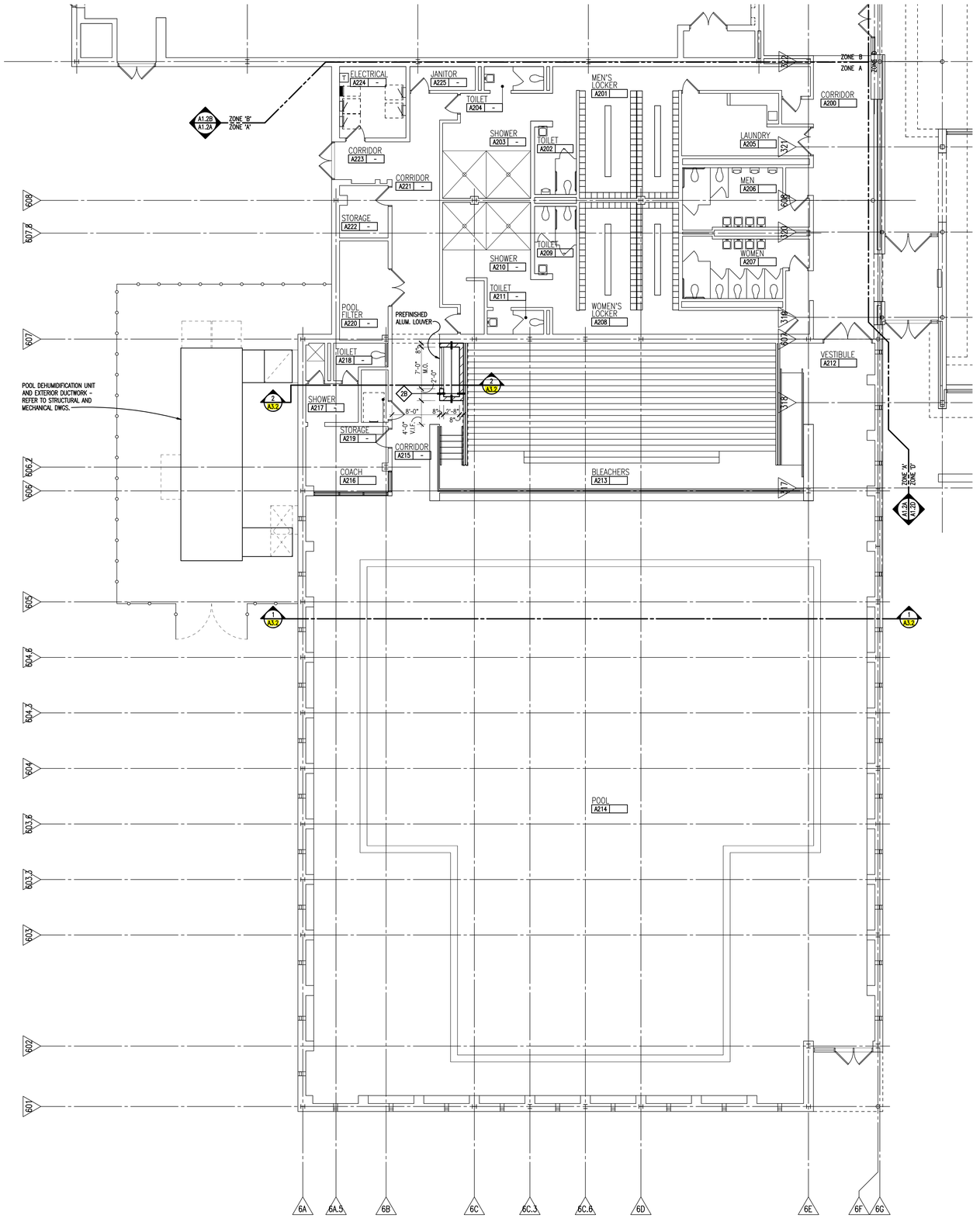

WALL / PARTITION KEY

- EXISTING WALL CONSTRUCTION
- METAL STUD PARTITION
- CONCRETE MASONRY UNIT WALL w/ HORIZONTAL JOINT REINFORCEMENT AT 16" O.C..
- CAST-IN-PLACE CONCRETE WALL (REFER TO STRUCTURAL FOR REINFORCING REQUIREMENTS)

WALL / PARTITION LEGEND

2A 4" CONCRETE MASONRY UNITS W/ HORIZONTAL JOINT REINFORCING.
HEIGHT: FROM TOP OF EXISTING CMU WALL CONSTRUCTION TO 1" BELOW EXISTING ROOF DECK. PROVIDE BLACK ACOUSTIC INSULATION FILLER BETWEEN TOP OF WALL & EXISTING ROOF DECK. COPE PARTITION AROUND EXISTING STRUCTURE, SEAL ALL GAPS AND PENETRATIONS. PROVIDE 1-HOUR FIRE RATED JOINT SYSTEM.
NOMINAL WIDTH: 4" (ACTUAL WIDTH: 3 5/8").

2B 8" CONCRETE MASONRY UNITS W/ HORIZONTAL JOINT REINFORCING.
HEIGHT: FROM FLOOR TO 1" BELOW EXISTING ROOF DECK. PROVIDE BLACK ACOUSTIC INSULATION FILLER BETWEEN TOP OF WALL & EXISTING ROOF DECK. COPE PARTITION AROUND EXISTING STRUCTURE, SEAL ALL GAPS AND PENETRATIONS.
NOMINAL WIDTH: 8" (ACTUAL WIDTH: 7 5/8").

NOTE: COORDINATE WITH THE REFLECTED CEILING PLANS FOR RATED WALLS, WALLS THAT EXTEND UP TO THE STRUCTURE ABOVE AND WALLS THAT EXTEND ONLY A MINIMUM OF 4" ABOVE THE ADJACENT HIGHEST CEILING. DIMENSIONS OF WALLS ARE SHOWN NOMINAL IN PLAN FOR DETERMINING THE CMU THICKNESS. REFER TO BUILDING SECTIONS, WALL SECTIONS AND INTERIOR ELEVATIONS FOR BANDING OF SPECIAL CMU TYPES OR ANY OTHER SPECIAL CONDITIONS. PARTIAL HEIGHT CMU WALLS WILL BE NOTED AS SUCH ON THE FLOOR PLANS.

NOTE: REFER TO MASONRY SPECIFICATION FOR VERTICAL REINFORCEMENT AND WALL BRACING NOT INDICATED ON DRAWINGS.

NOTE: AT FIRE-RATED AND SMOKE-RESISTING WALLS (MASONRY OR GYPSUM BOARD), PROVIDE U.L. APPROVED, FIRE-RATED, HEAD-OF-WALL TERMINATIONS AS INDICATED. IF NOT INDICATED, PROVIDE "BASIS OF DESIGN", HEAD-OF-WALL FIRESTOP JOINT SYSTEM AS INDICATED IN SPECIFICATION SECTION 078446 (1 OR 2 HOUR AS APPROPRIATE). PROVIDE MINIMUM 1 HOUR TERMINATION AT SMOKE-RESISTING WALLS.

GENERAL NOTES

1. COORDINATE SIZE AND LOCATION OF ALL CONCRETE HOUSEKEEPING PADS AND/OR EQUIPMENT SUPPORTS WITH APPROPRIATE EQUIPMENT MANUFACTURER.
2. COORDINATE SIZE AND LOCATION OF ALL ACCESS PANELS WITH TRADE REQUIRING THE SAME. ACCESS PANELS ARE SPECIFIED ARCHITECTURALLY BUT ARE REQUIRED TO BE PROVIDED BY EACH TRADE. ALL LOCATIONS MUST BE COORDINATED AND APPROVED BY THE ARCHITECTS FIELD REPRESENTATIVE.
3. CONTRACTORS SHALL VERIFY ALL EXISTING BUILDING DIMENSIONS, PARTITION AND WALL LOCATIONS, AND FLOOR ELEVATIONS IN THE FIELD AND NOTIFY THE ARCHITECTS REPRESENTATIVE OF ANY DISCREPANCIES BEFORE START OF WORK.
4. FLOOR PLANS ARE DIMENSIONED TO NOMINAL WALL THICKNESS - TYPICAL.
5. DIMENSIONS FOLLOWED BY ± SHOULD BE REVIEWED AND ALL NECESSARY ADJUSTMENTS MADE PRIOR TO FABRICATION AND/OR INSTALLATION OF AFFECTED WORK. NOTIFY ARCHITECTS REPRESENTATIVE IF DISCREPANCIES ARISE BEFORE PROCEEDING WITH THE WORK.
6. PROVIDE INTERIOR CMU AND GYPSUM BOARD CONTROL JOINTS AT BOTH JAMBS OF DOORS, WINDOWS, AND OPENINGS. PROVIDE AT HEAD AND SILL OF WINDOWS AND PASS THRU OPENINGS.
7. PROVIDE CONTROL JOINTS WHERE INTERIOR CMU (ON SLAB) ABUTS EXTERIOR/INTERIOR MASONRY (ON FOUNDATIONS OR FOOTINGS)
8. VERIFY QUANTITY, SIZE, AND LOCATION OF ALL FLOOR, ROOF, AND WALL OPENINGS FOR MECHANICAL AND ELECTRICAL WORK WITH THE APPROPRIATE TRADE. PROVIDE ALL OPENINGS SHOWN OR REQUIRED FOR THE COMPLETION OF THE WORK. PROVIDE ALL LINTELS REQUIRED FOR THESE OPENINGS PER SPECIFICATIONS.
9. REFER TO LIFE SAFETY PLANS FOR LOCATIONS OF REQUIRED FIRE RESISTANCE RATINGS. BECAUSE OF THE DRAWING SCALE OF THE LIFE SAFETY PLANS, COORDINATE THE REQUIRED FIRE RESISTANCE RATINGS WITH THOSE SHOWN ON THE REFLECTED CEILING PLANS.
10. REFER TO REFLECTED CEILING PLANS FOR EXTENSION OF PARTITION WALLS TO FLOOR OR ROOF CONSTRUCTION ABOVE AND WALL FIRE RESISTANCE RATING REQUIREMENTS.
11. REFER TO STRUCTURAL DRAWINGS FOR ALL WIND FRAME LOCATIONS AT INTERIOR AND EXTERIOR WALLS.
12. REFER TO A10... SERIES DRAWINGS FOR FLOOR FINISH PATTERNS AND ROOM FINISHES.
13. REFER TO STRUCTURAL DRAWINGS FOR EXACT ORIENTATION AND SIZES OF ALL STRUCTURAL COLUMNS.
14. REFER TO DRAWING A4.1 FOR TYPICAL DETAILS PERTAINING TO WALL TERMINATIONS AT STRUCTURE ABOVE AND MASONRY CONTROL JOINT DETAILS.
15. VERIFY ALL DIMENSIONS IN FIELD.
16. PROVIDE WOOD BLOCKING WITHIN STUD WALLS FOR WALL MOUNTED ITEMS i.e. GRAB BARS, TOWEL DISPENSERS, PENCIL SHARPENERS, WALL STOPS, ACCORDIAN PARTITION JAMBS, ETC. REFER ALSO TO A9... SERIES AND A6... SERIES DRAWINGS.
17. REFER TO EXTERIOR ELEVATIONS AND PLAN DETAILS FOR LOCATIONS OF CONTROL JOINTS IN EXTERIOR WALLS.

PATCHING NOTES

1. REFER TO DEMOLITION PLANS FOR ADDITIONAL PATCHING NOTES.
2. FOR ALL FLOOR SURFACES RECEIVING NEW FLOOR FINISHES, PREPARE SUBSTRATE BY PROVIDING LEVELING AND PATCHING COMPOUNDS RECOMMENDED BY FINISH FLOORING MANUFACTURERS. CONTRACTOR'S BASE BID PROPOSAL SHALL ASSUME THAT ALL AREAS, INDICATED TO RECEIVE NEW FINISHES, WILL REQUIRE FLOOR PREPARATION.
3. PATCH AND REPAIR ALL FLOOR AND WALL SURFACES LEFT DAMAGED OR INCOMPLETE FROM REMOVAL OF EXISTING PARTITIONS, MILLWORK, CASEWORK, CHALKBOARDS, TACKBOARDS, DISPLAY CASES OR OTHER FIXED EQUIPMENT WITH MATERIALS TO MATCH EXISTING, AS ACCEPTABLE TO THE ARCHITECT.
4. MATCH EXISTING MASONRY COURSING ADJACENT IN EACH AREA AND TOOTH NEW WORK INTO EXISTING, UNLESS OTHERWISE INDICATED.
5. AT EXISTING FLOOR FINISHES TO REMAIN, THAT BECOME SUBSTRATES FOR NEW FLOOR FINISHES, PATCH AND FILL EXISTING AS REQUIRED TO PREPARE FOR NEW FLOOR FINISH UNTIL ACCEPTABLE TO NEW FLOOR FINISH CONTRACTOR.
6. TOOTH-IN MASONRY INTO EXISTING, U.O.N., INCLUDING JAMBS OF DOOR AND OTHER OPENINGS.

N

SECOND LEVEL FLOOR PLAN - ZONE A

SCALE: 1/8" = 1'-0"

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REGISTRATION SEAL

CONSULTANT

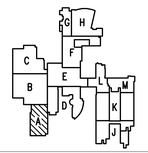
PROJECT TITLE

Troy High School MEP Upgrades Bid Package No. 8

Troy School District Troy, Michigan

DRAWING TITLE

Second Level Floor Plan - Zone A



ISSUE DATES

DATE:	ISSUED FOR:
09-22-15	BIDS

DRAWN	KBS/JMM
CHECKED	KRJ
APPROVED	JJC

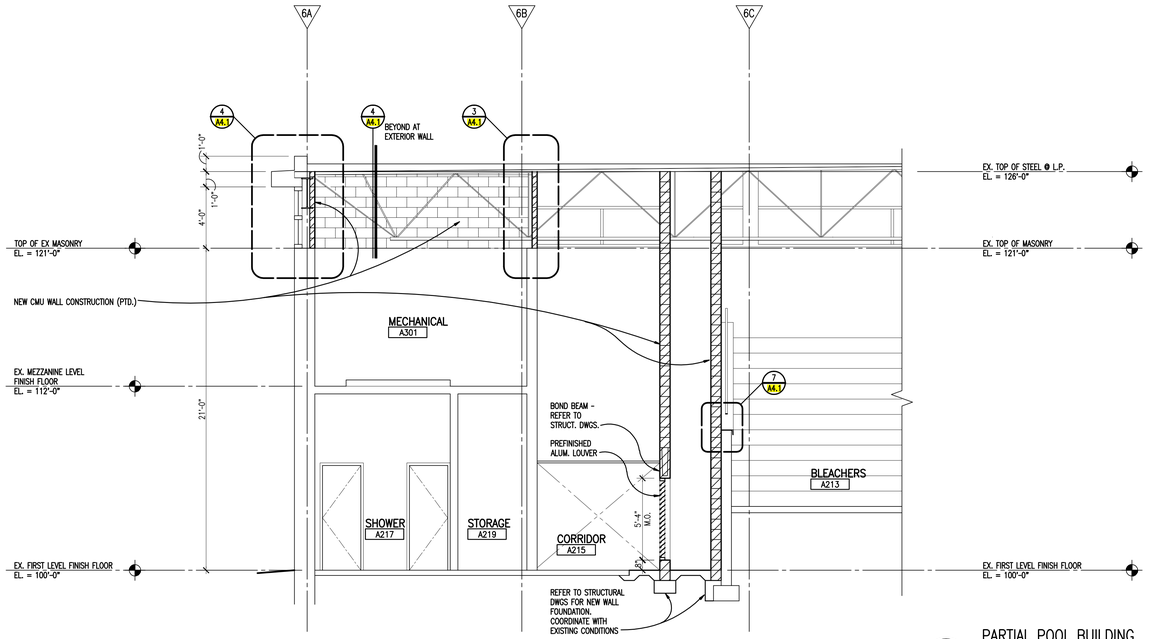
PROJECT NO.

13174C

DRAWING NO.

A1.2A

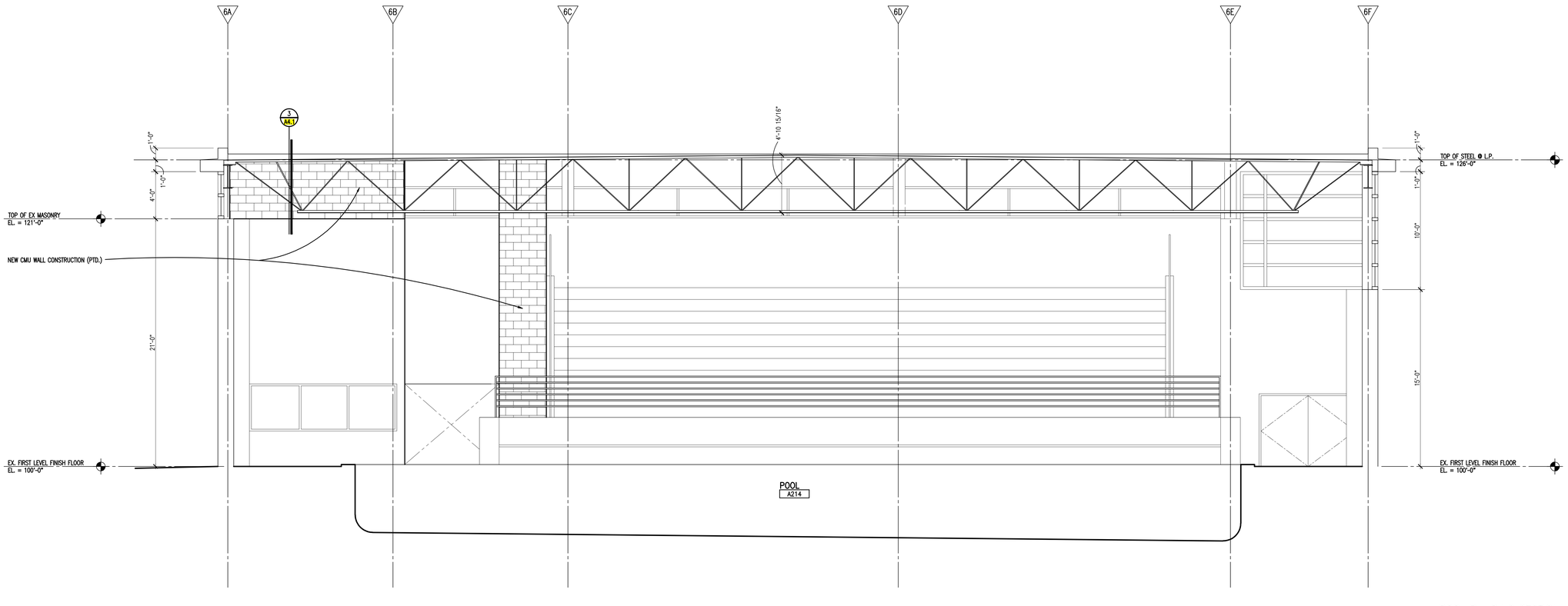
Drawing File: Q:\Local\2013\mep\13174\13174c_ucd\13174c_a12a.dwg
Sep 21, 2015 - 8:30am



2 A1.2A A1.3A

PARTIAL POOL BUILDING SECTION LOOKING NORTH

SCALE: 1/4" = 1'-0"



1 A1.2A A1.3A

POOL BUILDING SECTION LOOKING NORTH

SCALE: 1/4" = 1'-0"

TMP ARCHITECTURE

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REGISTRATION SEAL

CONSULTANT

PROJECT TITLE

Troy High School MEP Upgrades Bid Package No. 8

Troy School District
Troy, Michigan

DRAWING TITLE

Building Sections

ISSUE DATES

09-22-15	BIDS
DATE:	ISSUED FOR:

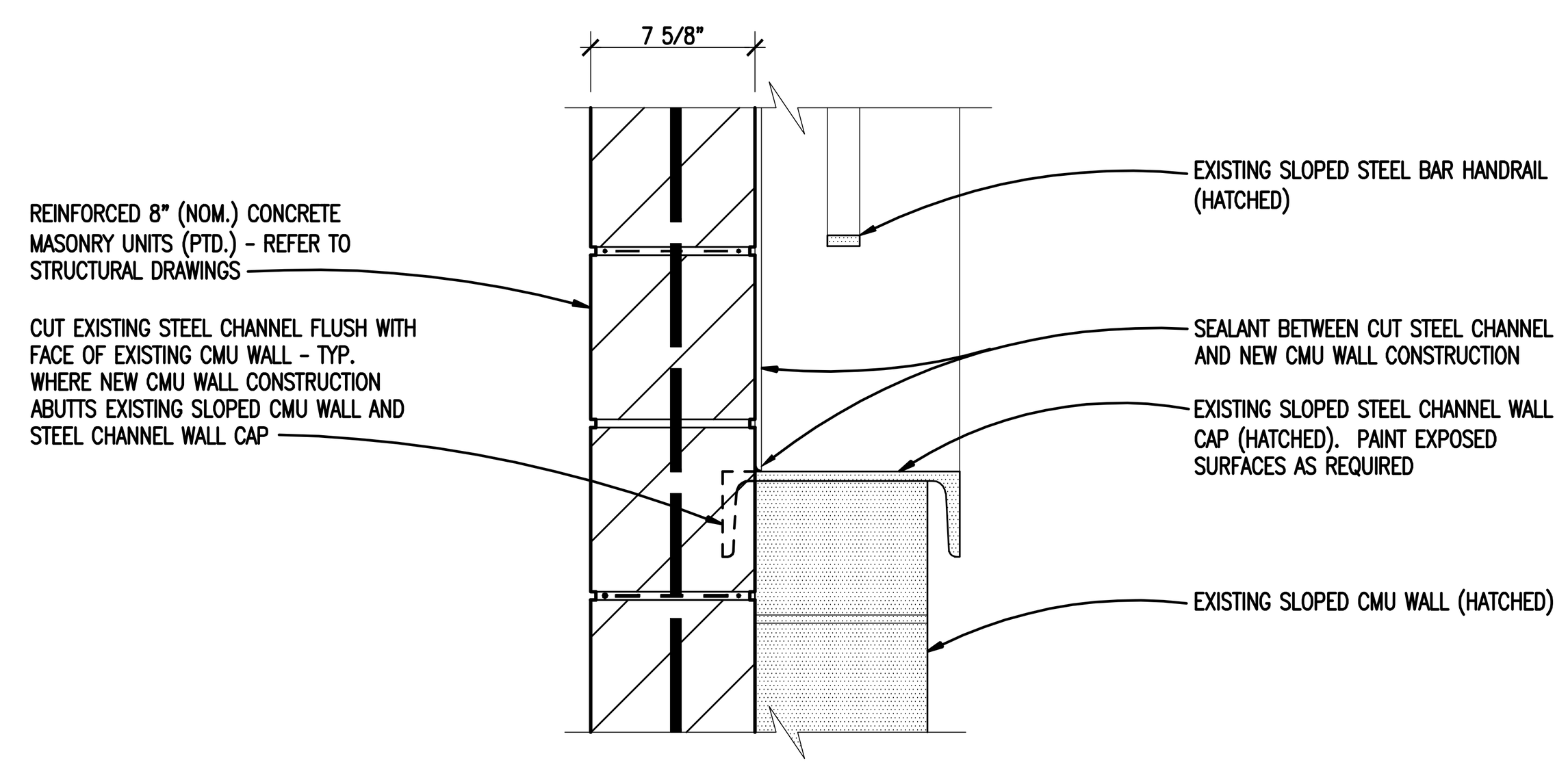
DRAWN	AKW/JMM
CHECKED	KRJ
APPROVED	JJC

PROJECT NO.

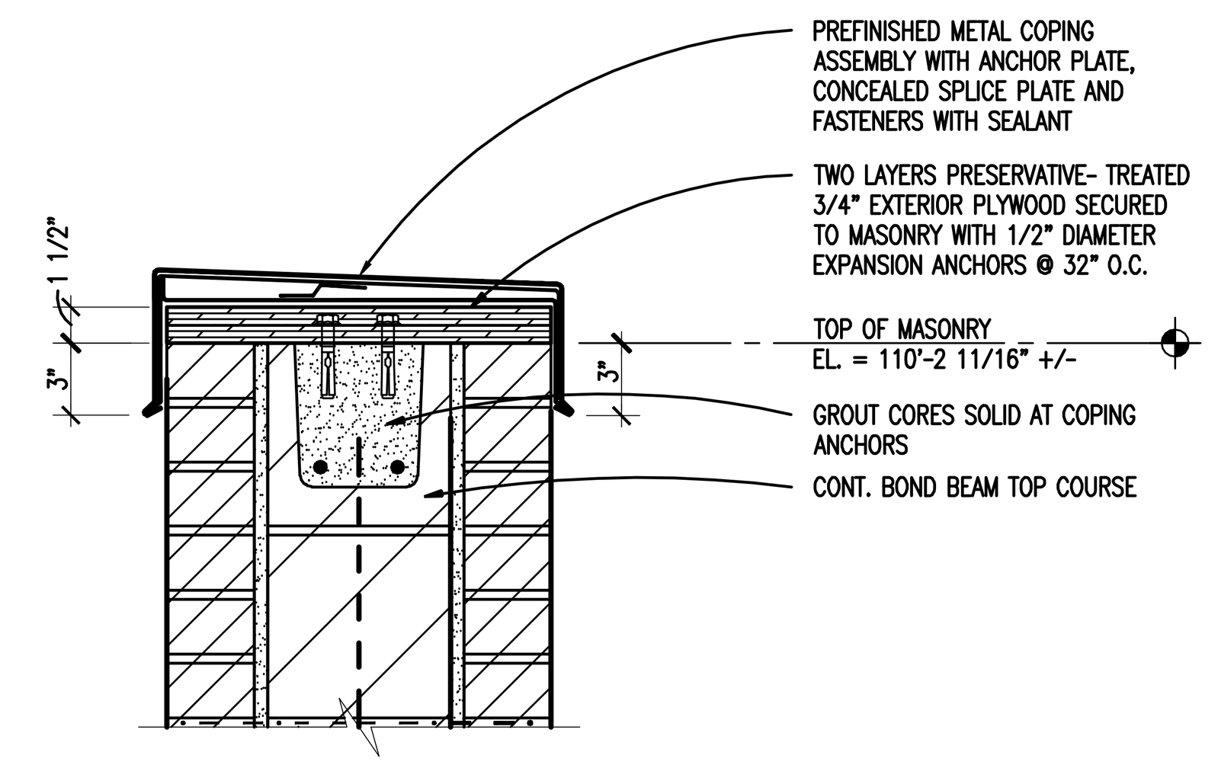
13174C

DRAWING NO.

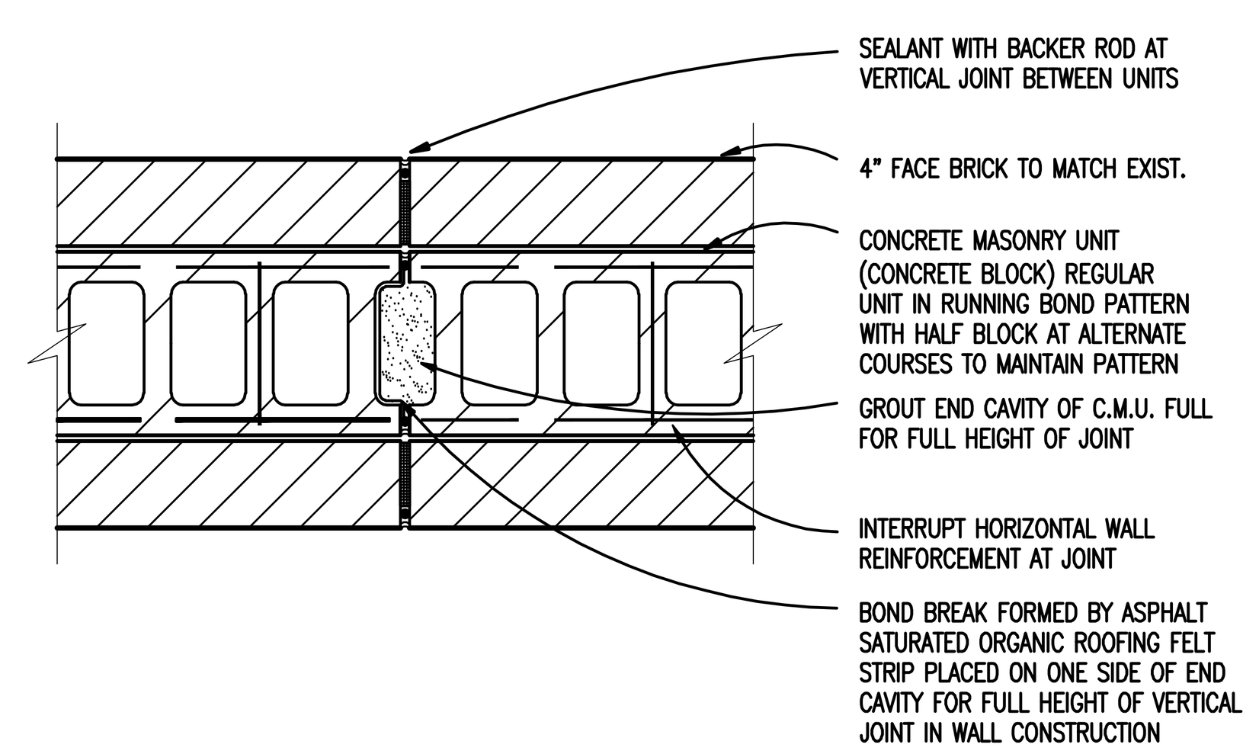
A3.2



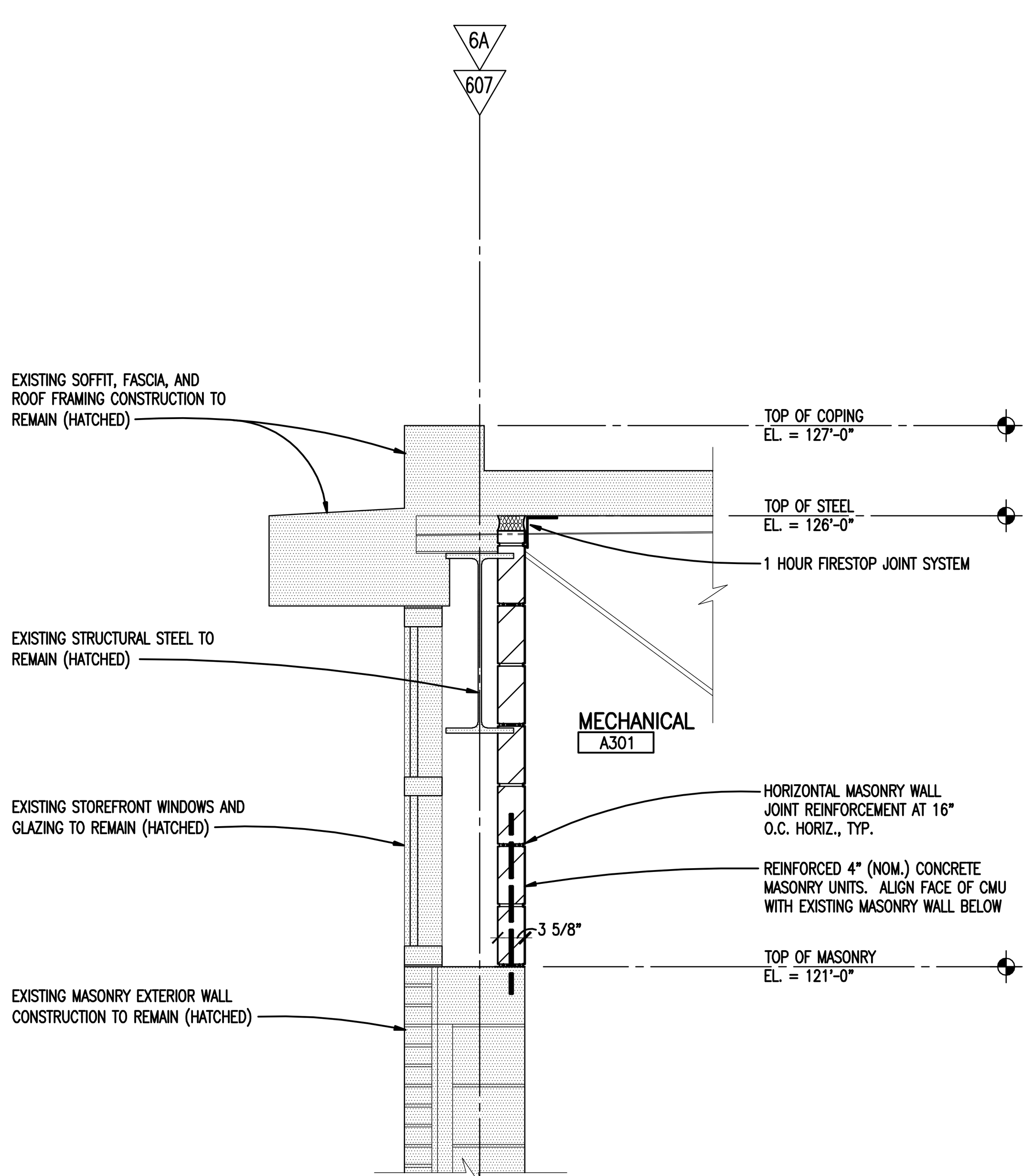
7 / A4.1 — SECTION DETAIL
SCALE: 1 1/2" = 1'-0"



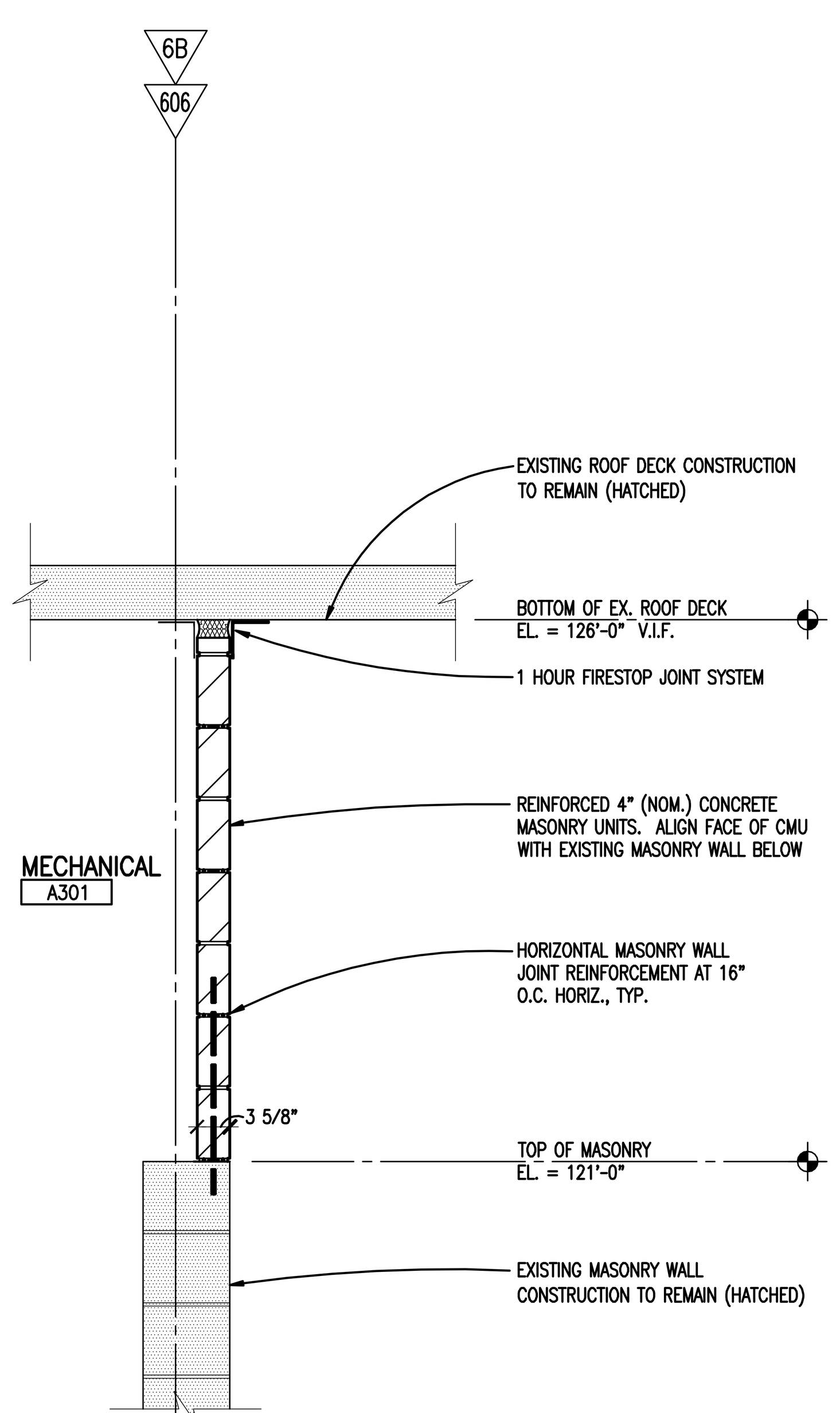
6 / A4.1 — SCREEN WALL COPING SECTION
SCALE: 1 1/2" = 1'-0"



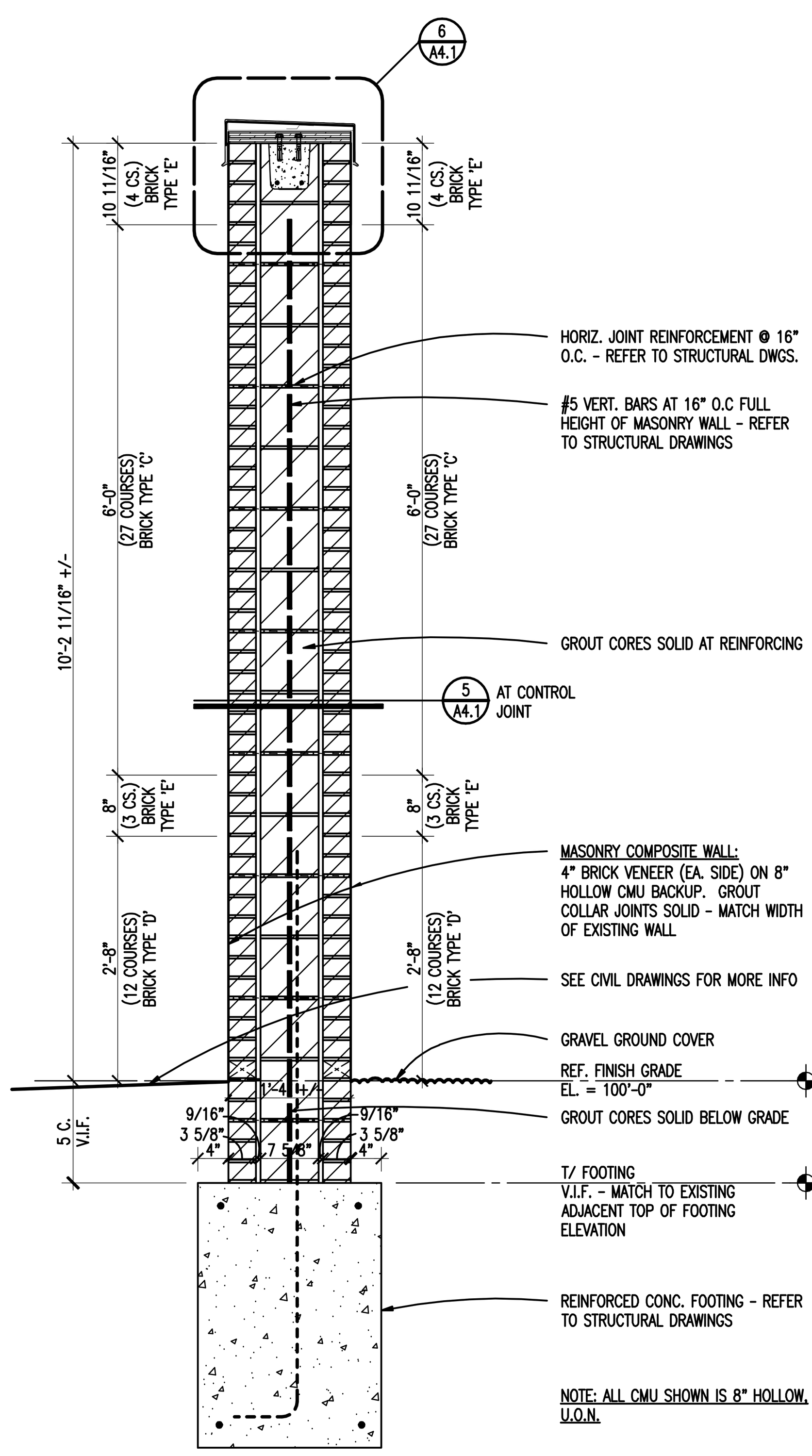
5 / A4.1 — TYPICAL MASONRY WALL CONTROL JOINT
SCALE: 1 1/2" = 1'-0"



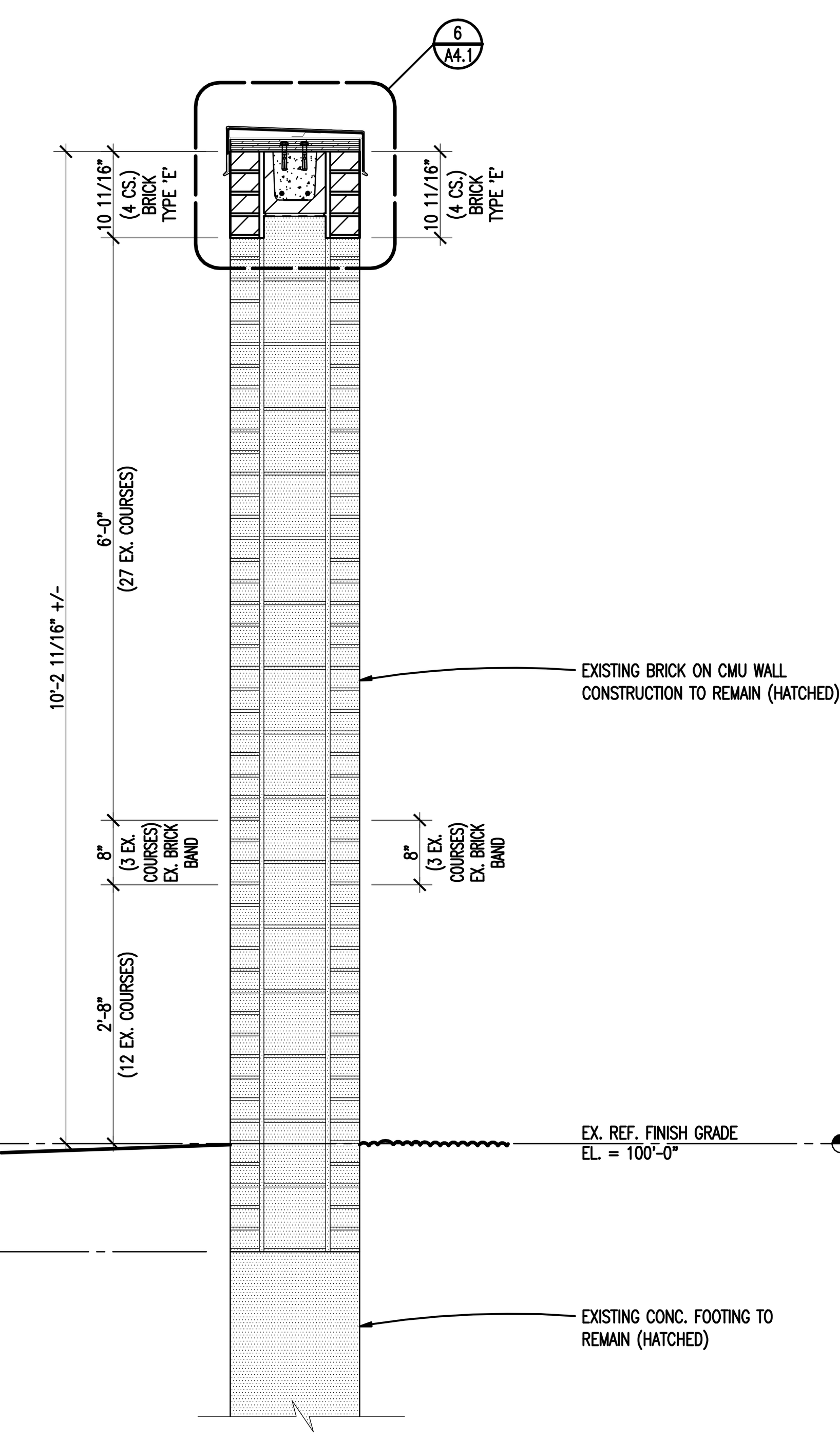
4 / A3.2 — WALL SECTION
SCALE: 3/4" = 1'-0"



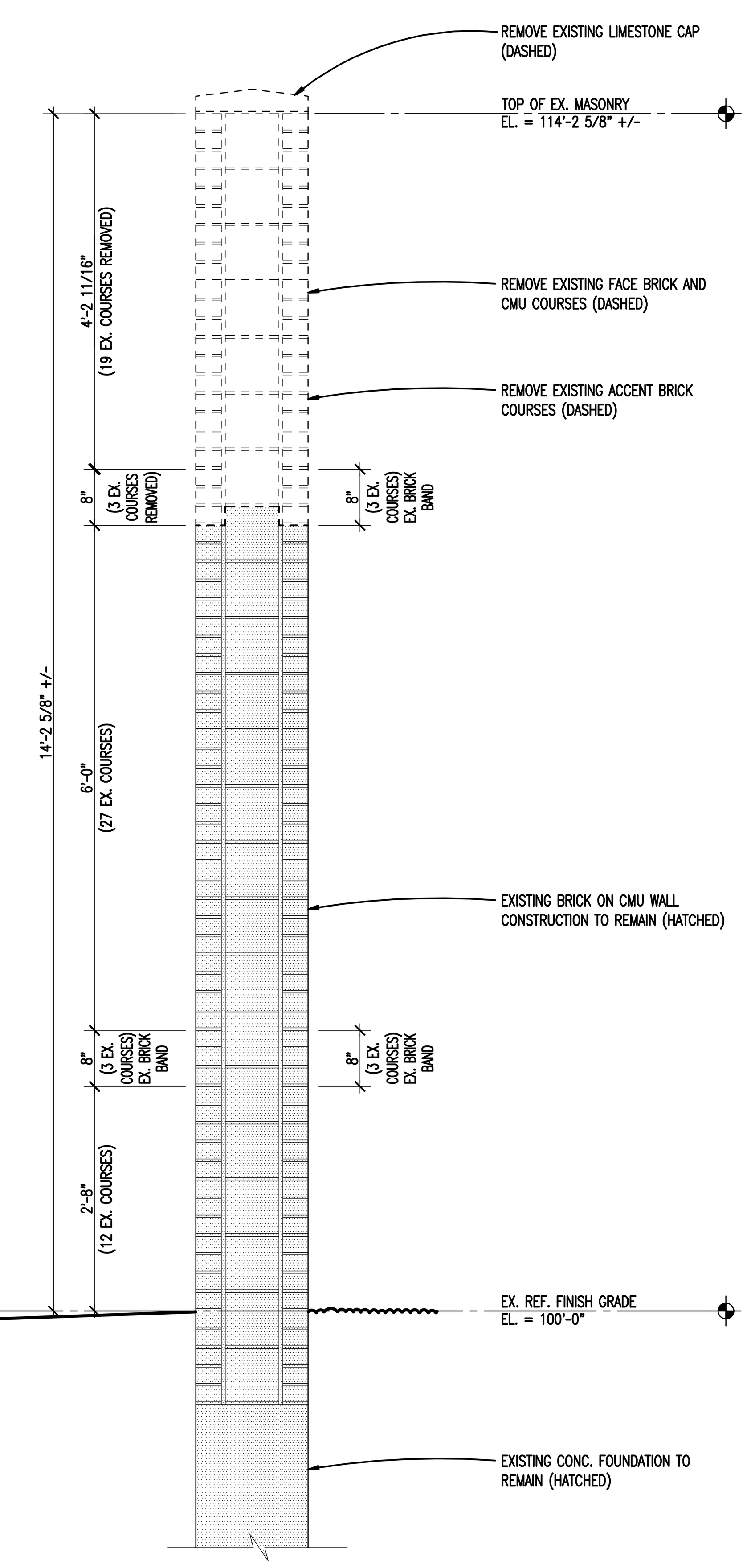
3 / A3.2 — WALL SECTION
SCALE: 3/4" = 1'-0"



2 / A3.1 — SECTION AT NEW SCREEN WALL
SCALE: 3/4" = 1'-0"



1A / A3.1 — SECTION AT EXISTING SCREEN WALL - NEW WORK
SCALE: 3/4" = 1'-0"



1 / A3.1 — SECTION AT EXISTING SCREEN WALL - DEMOLITION
SCALE: 3/4" = 1'-0"

TMP ARCHITECTURE

TMP ARCHITECTURE INC
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REGISTRATION SEAL

CONSULTANT

PROJECT TITLE
Troy High School MEP Upgrades Bid Package No. 8

Troy School District
Troy, Michigan

DRAWING TITLE
Wall Sections and Plan Details

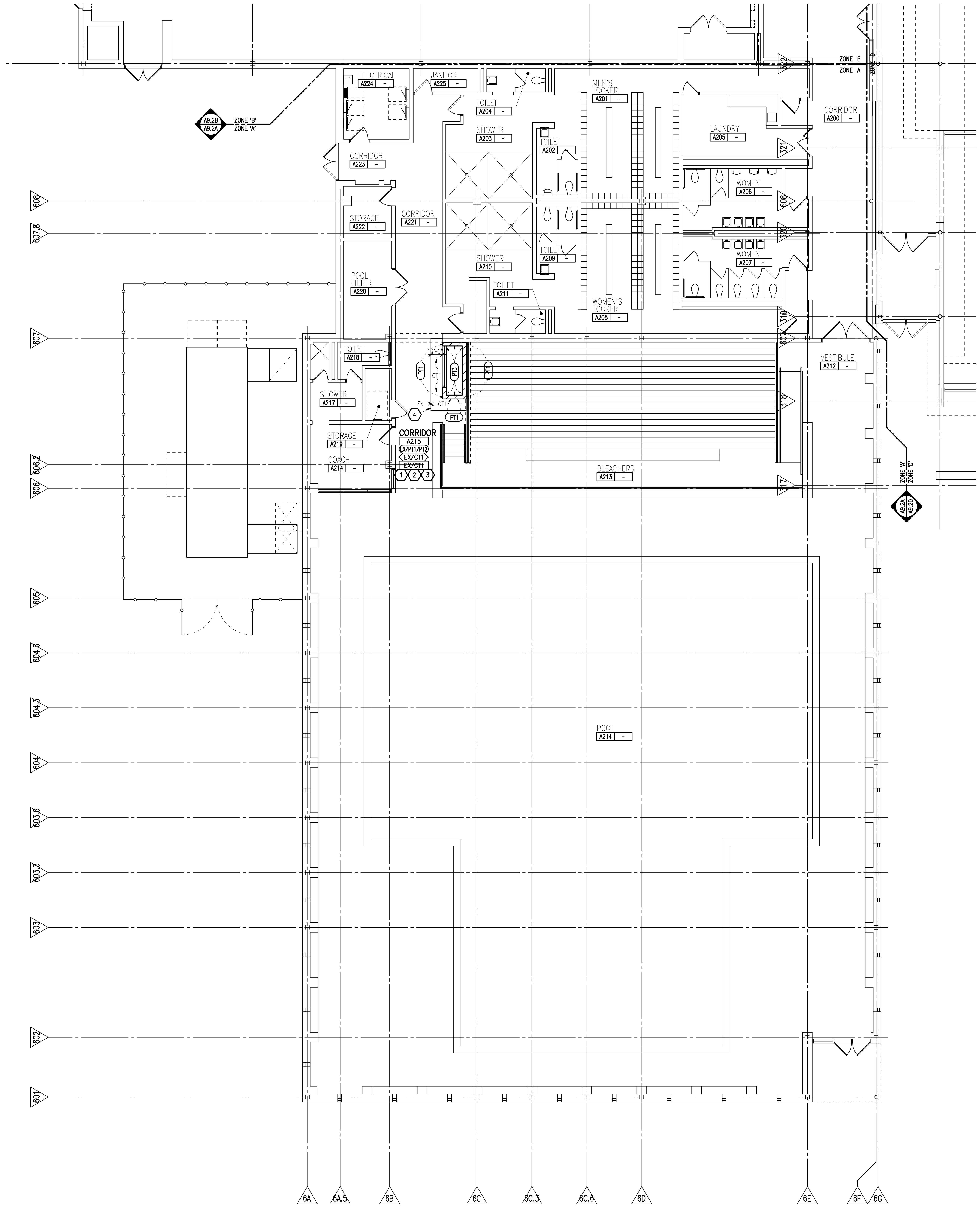
ISSUE DATES

DATE:	ISSUED FOR:
09-22-15	BIDS

DRAWN	BJP
CHECKED	KRJ
APPROVED	JJC

PROJECT NO.
13174C

DRAWING NO.
A4.1



FINISH LEGEND

ROOM FINISH TAGS
ROOM NAME AND NUMBER PLUS GENERAL ROOM FINISH INFORMATION.
FINISH TAGS SHALL APPLY TO ALL LIKE MATERIALS WITHIN A ROOM (U.O.N.).

FINISH LEGEND
FINISH LEGEND IS GENERAL. REFER TO SPECIFICATIONS FOR SPECIFIC FINISH INFORMATION. MULTIPLE FINISH TYPES ARE DENOTED BY NUMBER FOLLOWING ABBREVIATION.

CLASSROOM — ROOM NAME
101 — ROOM NUMBER
PT — WALL FINISH (SEE BELOW) — PT-P_ #
RB — BASE (SEE BELOW) — RB
CPT — FLOOR FINISH (SEE BELOW) — CPT-P_ #

DENOTES PATTERN DETAIL

REFER TO "SPECIFIC NOTES" BELOW

PL_ — PLASTIC LAMINATE TYPE/COLOR (TAG APPLIES TO ALL CABINETS AND/OR COUNTERTOPS WITHIN THAT SPACE, U.O.N.)

WALLS

EP	EPOXY PAINT
EX	EXISTING (NO NEW FINISH)
PT	PAINT

BASE

CT	CERAMIC TILE
EX	EXISTING (NO NEW FINISH)

FLOORS

CT	CERAMIC TILE
EX	EXISTING (NO NEW FINISH)

GENERAL NOTES

1. REFER TO REFLECTED CEILING PLANS FOR CEILING TYPES, HEIGHTS AND FINISH INFORMATION.
2. AT CERAMIC TILE LOCATIONS, INSTALLER TO USE APPROPRIATE TROWEL TO ACCOMMODATE DIFFERENT TILE THICKNESSES.
3. REFER TO STRUCTURAL DRAWINGS FOR DEPRESSED SLAB LOCATIONS, INDICATIVE OF MUDSET BEDS AT CERAMIC TILE. SLOPE MUDSET TO DRAINS. REFER TO ARCHITECTURAL DRAWINGS FOR DRAIN ELEVATIONS AND LOCATIONS.
4. PROVIDE ANTI-FRACTURE MEMBRANE AT ALL THINSET CERAMIC FLOOR TILE LOCATIONS, UNLESS OTHERWISE NOTED.
5. PROVIDE RESILIENT BASE AT TOE KICK OF ALL CASEWORK AND BEHIND ALL MOVABLE EQUIPMENT/APPLIANCES, WHEN SCHEDULED WITHIN A ROOM.
6. ALL WALL MOUNTED MECHANICAL EQUIPMENT (DIFFUSERS, GRILLES, ETC.) AND ELECTRICAL EQUIPMENT (PANELS, ETC.) SHALL BE PAINTED TO MATCH THE ADJACENT WALL COLOR. REFER TO MECHANICAL AND ELECTRICAL DRAWINGS FOR QUANTITIES AND LOCATIONS.
7. REFER TO SPEC. SECTION 01230 FOR COMPLETE LIST AND DESCRIPTION OF ALTERNATIVES.
8. WHERE REMOVAL OR MODIFICATION TO A FINISH MATERIAL IS SHOWN, BUT NEW FINISHES ARE NOT SCHEDULED, PATCH AND REPAIR TO MATCH EXISTING FINISH CONDITION AS REQUIRED.
9. PROVIDE APPROPRIATE TRANSITION STRIPS BETWEEN DISSIMILIAR FLOORING MATERIALS AT VERTICAL AND/OR HORIZONTAL APPLICATIONS.

SPECIFIC NOTES

(1) PT2 BEGINS AT APPROXIMATELY 10'-5" A.F.F. - CONTRACTOR TO FIELD VERIFY. DESIGN INTENT TO MATCH HEIGHT OF EXISTING COLOR CHANGE A.F.F.

(2) REFER TO DEMOLITION PLANS A0.2A FOR PATCHING AREA OF EXISTING TILE.

(3) CT1 WALL BASE PATCHING SHALL BE COORDINATED WITH AREAS OF DEMOLITION AND NEW WORK AT THIS LOCATION. REFER TO SHEETS A0.2A AND A1.2A. ALIGN CT1 NEW GROUT JOINTS WITH EXISTING GROUT JOINTS.

(4) WHERE NEW FLOOR FINISH ABUTS EXISTING FLOOR FINISH, INCLUDE APPROPRIATE PREPARATION AND FINISHING AS TO RESULT IN A SMOOTH AND LEVEL TRANSITION BETWEEN MATERIALS.

SECOND LEVEL FINISH PLAN - ZONE A
SCALE: 1/8" = 1'-0"

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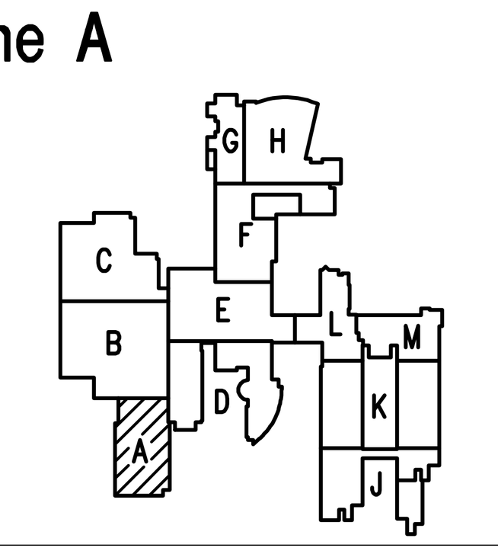
REGISTRATION SEAL

CONSULTANT

PROJECT TITLE
Troy High School
MEP Upgrades
Bid Package No. 8

Troy School District
Troy, Michigan

DRAWING TITLE
Second Level
Finish Plan -
Zone A



ISSUE DATES

DATE:	ISSUED FOR:
09-22-15	BIDS

DRAWN	KLK
CHECKED	KRJ
APPROVED	JJC

PROJECT NO.
13174C

DRAWING NO.
A10.2A

SECTION 099000
INTERIOR, EXTERIOR AND INDUSTRIAL PAINTS AND COATINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior high-performance paint and coatings systems including surface preparation.

1.2 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to complete the surface preparation and repainting of the Troy High School Natatorium including the exposed ceiling, wall surfaces, wood benches and metal railing systems in its entirety as specified herein. The Troy High School Natatorium includes rooms: A212 – Vestibule, A213 – Bleachers, A214 – Pool, and A215 – Corridor.

B. The Work includes but is not necessarily limited to, the following:
   1. Protecting all surfaces such as but not limited to fabric ducting, fire suppression sprinkler heads/cages, lights, aluminum frames, tile, flooring, bleacher system, glazing, pool deck, pool equipment, signage, and all other surfaces and equipment not scheduled to receive a new paint finish.
   2. Cleaning, preparation and repainting of the exposed to view ceiling surfaces including structural steel trusses, beams, lintels, plates, roof decking, conduit, and ductwork.
   3. Cleaning, preparation and repainting of the existing wall surfaces including the concrete masonry units (CMU), TECTUM sound panels, steel lintels, bench supports, railing system and hollow-metal frames and door slabs.
   4. Cleaning, preparation and recoating all sides of the existing wood benches.

C. The Work of this Contract is not necessarily limited to the above descriptions. Accordingly, and prior to bidding, the Contractor shall thoroughly familiarize themselves with the entire project site and all of the Contract Documents in order to fully understand the extent of their Work. The Contractor shall fully understand, and shall fulfill, their duties and responsibilities regarding coordination and cooperation with the Owner and other contractors working at the Site.

D. Project and Contractor Qualifications: Contractor shall be a firm having successfully completed a minimum of five (5) natatorium repainting projects and a minimum of three (3) years of experience in applying industrial paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

E. Testing – As part of the Owner's Quality Assurance plan, the Owner shall employ a third-party inspection service to perform surface preparation and coating inspections. Such inspections shall be performed at the minimum specific hold points listed below. Should the material or Work fail to comply with the requirements of the Contract Documents, the Contractor shall bear any, and all costs of any Owner required re-testing and inspections as well as the cost of replacement of any unsatisfactory material or Work.
   1. The Contractor shall provide sufficient, safe and proper facilities and access to all surfaces at all reasonable times for the observation and/or inspection of the Work by and duly authorized representative of the Owner.
   2. Inspection Hold Points shall include but not be limited to:
      a. After surface cleaning and before coating application.
      b. After each coat application and before the next sequential coat application.
      c. After the final coat application.

3. If any materials furnished under this Contract fails to meet the requirements of the Contract documents or perform in the manner such material is expected to perform in accordance with the intended usage, the Contractor shall proceed to repair or replace the material in accordance with the Owners independent inspection firm and the manufacture's written requirements. All repairs shall be performed at the Contractors sole expense.

F. Cleaning – The Contractor shall at all times, keep the Project premises safe and free from accumulation of waste materials or rubbish caused by the Work under this Contract. Upon completion of the Work, and prior to the Owner's final inspection, the Contractor shall present the premises in a neat and clean condition, prepared for acceptance by the Owner.

1.3 REFERENCES

A. Steel Structures Painting Council (SSPC):
   1. SSPC-SP 1 - Solvent Cleaning.
   2. SSPC-SP 2 - Hand Tool Cleaning.
   3. SSPC-SP 3 - Power Tool Cleaning.
   4. SSPC-SP12/NACE No. 5, Surface Preparation and Cleaning of Metals by Waterjetting Prior to Recoating.

B. Material Safety Data Sheets / Environmental Data Sheets: Per manufacturer's MSDS/EDS for specific VOCs (calculated per 40 CFR 59.406). VOCs may vary by base and sheen.

1.4 REGULATORY REQUIREMENTS

A. Compliance with Environmental Regulations: Compliance with local, state and federal regulations concerning emissions or disposal of solid, particulate, liquid, or gaseous matter as a result of the cleaning, surface preparation, painting, or other operations under this Agreement shall be the sole responsibility of the Contractor. This compliance shall be accomplished without supervision from the Owner, Engineer, Field Inspector, or other direct or indirect agents of the Owner. No additional compensations for changes in the laws, regulations, or the interpretation thereof shall be granted by the Owner.

B. Disposal: Dispose of all waste including paints, solvents, reducers, thinners, solvent-based materials, solvent soaked rags, solvent wipes and all other materials in accordance with all local, state and federal requirements including any and all requirements of the Environmental Protection Agency (EPA). It is the sole responsibility of the Contractor to dispose of any and all hazardous material waste in accordance with all local, state and federal requirements.

C. Compliance with Requirements: The Contractor shall comply with all applicable requirements of the Occupational Safety and Health Act of 1970 (Public Law 91-596), The Michigan Occupational Safety and Health Administration and shall hold harmless the Owner, Owner's Representatives, Field Observers and Consultants from any civil or criminal penalties imposed as a result of noncompliance with such requirements. No additional compensations for changes in the laws, regulations, or the interpretation thereof shall be granted by the Owner. The Contractor shall be responsible for complying with all state, local, and federal laws and regulations, even if not specifically listed in these Specifications.

D. Responsibility of Contractor's Competent Person(s): The Contractor's Competent Person(s) shall be responsible for overseeing all project operations and site administration without supervision of the Owner or the Owners Field Observers, Inspectors or Consultants. Responsibilities shall include:

1. Monitoring effectiveness and ensuring the continued integrity of environmental controls.
2. All duties as required under the MIOSHA/OSHA Scaffolding Standards.
3. Ensuring that a hazard communication program has been conducted for the personnel on site.
4. Determining adequacy of worker exposure monitoring data and exposure assessment.
5. Controlling access to the work site and ensuring that boundaries are marked off.
6. Ensuring that the engineering controls in use are in operating condition and functioning properly.
7. Ensuring that employees are wearing personnel protective equipment and are trained in the use of such equipment and in the use of exposure control methods, personal hygiene facilities, respiratory protection, hazardous communication, fall protection practices.
8. Ensuring that fugitive emissions to air, water, or soil are minimized and that handling of waste streams are in compliance with applicable state, local, and federal regulations and contract specifications.
9. Maintaining project documentation, record of safety violations and updated safety training requirements and other protocols are adhered to.

E. Contractor, its subcontractors, vendors, materials suppliers and consultants shall hold harmless the Owner, Owner's Representatives, Field Observers and Consultants from any civil or criminal penalties imposed as a result of noncompliance with any and all regulatory requirements, whether known or unknown.

1.5 SUBMITTALS

A. Within fourteen (14) calendar days from the receipt of the notice to proceed, the Contractor shall submit the following items to the Owner.

B. Product Data: For each paint system indicated, including.
1. Product characteristics.
2. Surface preparation instructions and recommendations.
3. Primer requirements and finish specification.
4. Storage and handling requirements and recommendations.
5. Application methods.
6. Cautions for storage, handling and installation.

C. Verification Samples: For each finish product specified, submit samples that represent actual product, color, and sheen.

D. Quality Control Plan: Contractor shall submit to Owner a project specific Quality Control plan which at a minimum shall include the following:
1. Key project personnel and their experience.
2. Ventilation and curing plan.
3. Project equipment list.
4. Manufacture's written letter listing their required surface preparation for each substrate to receive a new coating application.
5. Contractors written procedures for all major operations including but not limited to surface cleaning and preparation, mixing of coatings, coating application and performing and documenting all inspections.
6. Inspection plan including all hold point inspections.

E. Safety Plan and Project Specific Competent Person – The Contractor shall submit a Site Safety Plan to the Owner for review. On site work shall not proceed until the Site Safety Plan is received.
1. The site-specific Safety Plan shall conform to all applicable State, Local and Federal safety regulations and requirements. The plan must at a minimum meet the following:

a. Contain the Contractors name, address, submission date and reference to the specific job to which the site Safety Plan apples.
b. Contain a list of Contractors (Subs) and job contact personnel, including phone numbers in case of emergencies.
c. Include the name, qualifications, background of duties and phone numbers of the Contractors Safety Supervisor.
d. Definitions of the safety responsibilities of the Supervisor, Foreman and work crew.
e. Comply with safety requirements contained herein and elsewhere in the contract.
f. Comply with the requirement set forth by OSHA and MIOSHA, which at minimum shall include the following:
    1) Part 1 General Rules
    2) Part 6 Personal Protective Equipment
    3) Part 8 Handling and Storage of Materials
    4) Part 11 Fixed and Portable Ladders
    5) Part 12 Scaffolds and Scaffold Platforms
    6) Part 17 Electrical Installations
    7) Part 18 Fire Protection and Prevention
    8) Part 19 Tools
    9) Part 42 Hazard Communication
    10) Part 45 Fall Protection
    11) Part 451 Respiratory Protection
    12) Part 601 Air Contaminants for Construction
    13) Part 620 Ventilation Control for Construction
    14) Part 680 Noise Exposure for Construction
g. Provide content of the Safety Orientation and/or Hazardous Awareness training that the Contractor is giving to all workers at the project site. Define records to be kept to track and ensure all persons have completed the training.
h. Provide a list of Hazardous Materials to be used on site and the corresponding (MSDS) Material Safety Data Sheets or (SDS) Safety Data Sheets.
i. Provide a description of the Personal Protective Equipment that is mandatory for use on the site.
j. Describe the Respiratory Protection Program. The description should include the selection of respirators, fit testing procedures, training the equipment's use and function and familiarization with the signs and symptoms of exposure (symptomatic warnings).
k. Define the essential fall protection program protocols instituted on the project site.
l. Describe procedures for barricades, fences, warning signs, etc to restrict unauthorized personnel from entering the site.
m. Include a plan to ensure adequate ventilation, sanitation and dust control are achieved.
n. Describe procedures for hot work/fire protection including fire watches, shielding and placement of fire extinguishers.
o. Provide Lockout/Tagout or LOTO details and precautions to deal with potential live power.

F. Project Schedule: Contractor shall provide construction schedule and updates as specified herein for the Work under this contract.
    1. A preliminary construction schedule shall be submitted to Owner no later than seven (7) calendar days after the Notice to Proceed has been issued.
        a. The preliminary construction schedule shall reflect sequence of construction operations and activities, notice to proceed date, milestones, commencing and completion dates and durations of each item of Work. Schedule shall be developed using the critical path method.
    2. Within ten (10) calendar days of submission of the schedule by Contractor, Contractor shall meet with the Owner to participate in reviewing and revising the schedule as necessary. If revision of either form or content is necessary, Contractor shall revise and resubmit the schedule within five (5) calendar days.

3. From the start of the Work and to the Owner final acceptance of the Work, the Contractor shall provide one (1) week look ahead schedules to the Owner on each Friday prior to the next week. Each look ahead schedule shall at a minimum include all work tasks and deliveries schedule for the upcoming week, the quantity of Contractors workers that will be onsite each day, a list of the previous weeks work tasks that were completed, the actual number of Contractors workers that were onsite each day and a list of any work tasks that were not completed with a narrative explanation of the reason, cause or delay that those work tasks were not completed.

G. Construction Photographs: Contractor shall provide Owner digital photographs showing both the pre-construction and post construction project area. Preconstruction photographs shall be submitted to the Owner within ten (10) days of the effective date of the agreement.
   1. Pre-construction photographs shall be color photographs of commercial/professional quality with a minimum digital photo resolution setting of 10.0 MP. Photographs shall be submitted on a memory disk in jpg format and identified with a description of the area of view and date picture was taken. Each photo shall be marked with the name of the contract, name of Contractor, description and location of view and identity of photographer.
   2. Pre-construction photographs shall show any and all existing damage to project area. Contractor assumes sole responsibility for all damage not documented prior mobilization and the start of construction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver manufacturer's unopened containers to the work site. Packaging shall bear the manufacturer's name, label, and the following list of information.
   1. Product name, and type (description).
   2. Application and use instructions.
   3. Surface preparation.
   4. VOC content.
   5. Environmental handling.
   6. Batch date.
   7. Color number.

B. Storage: Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with all requirements of local, state and federal authorities having jurisdiction. Follow manufacture’s safety recommendations when using any solvents.

C. Store materials in an area that is within the acceptable temperature range, per manufacturer's instructions. Protect from freezing.

D. Handling: Maintain a clean, dry storage area, to prevent contamination or damage to the coatings.

1.7 PROJECT CONDITIONS

A. Contractor shall maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

B. Contractor shall not apply any coating when the environmental conditions are currently outside or may change to become outside of the manufacture’s application conditions. It is the Contractors sole responsibility to ensure all coatings are applied within the manufacture’s application conditions.

C. Cleaning Up – Contractor shall keep the premises free at all times from accumulations of waste materials and rubbish.

1. Contractor shall provide adequate trash receptacles and shall promptly empty the containers when filled.
2. Construction equipment, materials and supplies shall be neatly organized and or stacked by Contractor when not in use.
3. Contractor shall promptly remove spattered oil, fuel, paint, corrosive liquids, cleaning solutions and other liquids from surfaces to prevent marring or other damage.
4. Volatile wastes shall be properly stored in covered metal containers and removed daily.
5. Wastes shall not be disposed of into storm drains, sanitary sewers, streams or waterways. All wastes shall be removed from the site and disposed of in a manner complying with local ordinances and antipollution laws.
6. Adequate cleanup will be a condition for recommendation of progress and/or final payment applications.

D. Site Administration – Contractor shall be responsible for all areas of the site used by it and by all Subcontractors in the performance of the Work. Contractor will exert full control over the actions of all employees and other persons with respect to the use and preservation of property and existing facilities, except such controls as may be specifically reserved to Owner or others. Contractor has the right to exclude from the site all persons who have no purpose related to the Work or its inspection and may require all persons on the site (except Owner's employees) to observe the same regulations as Contractor requires of its employees.

1.8 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied and, in the quantities, described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.

B. Furnish Owner with an additional one (1) kit of each material and color, but not less than 1 gal (3.8 l) or 1 case, as appropriate.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Sherwin-Williams, located at: 101 Prospect Ave.; Cleveland, OH 44115; Tel: 800-524-5979; Tel: 216-566-2000; Fax: 440-826-1989; Joe Ghattas Phone: (734) 395-2448 Email: swrep6851@sherwin.com

2.2 APPLICATIONS/SCOPE

A. Interior High-Performance Paints and Coatings:
1. Masonry: CMU - concrete, split face, scored, smooth.
2. Drywall: Drywall board, Gypsum board
3. Wall Sound Panels: Tectum wood fiber sound panels.
4. Non-Ferrous Metal: Unpainted and previously painted galvanized steel.
5. Metal Ferrous: Ceilings, structural steel, joists, trusses, beams, and similar items including wood bench supports and railing system.
6. Wood: Wood benches and similar items.

2.3 PAINT MATERIALS - GENERAL

A. Paints and Coatings:
1. Unless otherwise indicated, provide factory-mixed coatings. When required, mix coatings to correct consistency in accordance with manufacturer's instructions before application. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions and Contractors Quality Control written procedures.

2. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color. Or follow manufactures product instructions for optimal color conformance.

B. Primers: Unless otherwise indicated, all surfaces require a full prime coat application of the specified product.

C. Coating Application Accessories: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required, per manufacturer's specifications.

D. Color: Multiple coats may be required to achieve maximum film thickness, uniformity of appearance and full color coverage. It is the Contractor's responsibility to ensure the finish coat fully covers and hides all previous coating materials.

2.4 HIGH PERFORMANCE INTERIOR PAINT SYSTEMS

A. MASONRY - (CMU - Concrete, Split Face, Scored, Smooth, High Density, Low Density, Fluted, Stucco).
   1. Epoxy System (Water Based):
      a. Gloss Finish:
         1) 1st Coat: S-W Heavy Duty Block Filler, B42W46 (18.0-34.0 mils wet, 10.0-18.0 mils wet) – New masonry only. Omit 1st coat on previously painted masonry.
         2) 2nd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Gloss, B73-300 Series.
         3) 3rd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Gloss, B73-300 Series (5.0-10.0 mils wet, 2.0-4.0 mils dry per coat).
            a) Finish Color Scheme: Up to three (3) finish colors to be determined by Owner.

B. DRYWALL - (Walls, Gypsum Board).
   1. Epoxy Systems (Water Based):
      a. Gloss Finish:
         1) 1st Coat (spot prime new drywall/patches): S-W ProMar 200 Zero VOC Interior Latex Primer, B28W02600.
         2) 1st Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Gloss, B73-300 Series. (5.0-10.0 mils wet, 2.0-4.0 mils dry per coat).
         3) 2nd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Gloss, B73-300 Series. (5.0-10.0 mils wet, 2.0-4.0 mils dry per coat).
            a) Finish Color Scheme: Up to three (3) finish colors to be determined by Owner.

C. SOUND PANELS - (Wall TECTUM Wood-Fiber Panels).
   1. Epoxy Systems (Water Based):
      a. Gloss Finish:
         1) 1st Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Gloss, B73-300 Series (5.0-10.0 mils wet, 2.0-4.0 mils dry per coat).
         2) 2nd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Gloss, B73-300 Series (5.0-10.0 mils wet, 2.0-4.0 mils dry per coat). Multiple coats may be required to achieve maximum film thickness, uniformity of appearance and full color coverage. It is the Contractor's responsibility to ensure the finish coat fully covers and hides all previous coating materials.
            a) Finish color shall be Snowbound SW-7004.

D. Non-Ferrous- (Unpainted Galvanized):
   1. Epoxy Systems (Solvent Base):
      a. Gloss Finish:
         1) 1st Coat: S-W DTM Wash Primer, B71Y1 (3.4-6.4 mils wet, 0.7-1.3 mils dry).
         2) 2nd Coat: S-W Macropoxy 646 Flake Filled FF Epoxy Gray, B58A604 Series (2.0-4.0 mils dry per coat).
         3) 3rd Coat: S-W Acrolon 218 HS Acrylic Polyurethane Gloss, B65-600 Series (4.5-9.0 mils wet, 3.0-6.0 mils dry to cover). Multiple coats may be required to achieve maximum film thickness, uniformity of appearance and full color coverage. It is the Contractor's responsibility to ensure the finish coat fully covers and hides all previous coating materials.
            a) Finish color shall be Snowbound SW-7004.

E. Non-Ferrous- (Previously Painted Galvanized):
   1. Epoxy Systems (Solvent Base):
      a. Gloss Finish:
         1) 1st Coat: S-W Corothane 1 Preprime, B65C10. (2.5-3.0 mils wet, 1.5-2.0 mils dry).
         2) 2nd Coat: S-W Macropoxy 646 Flake Filled FF Epoxy Gray, B58A604 Series (2.0-4.0 mils dry per coat).
         3) 3rd Coat: S-W Acrolon 218 HS Acrylic Polyurethane Gloss, B65-600 Series (4.5-9.0 mils wet, 3.0-6.0 mils dry to cover). Multiple coats may be required to achieve maximum film thickness, uniformity of appearance and full color coverage. It is the Contractor's responsibility to ensure the finish coat fully covers and hides all previous coating materials.
            a) Finish color shall be Snowbound SW-7004.

F. METAL - (Structural Steel Columns, Joists, Trusses, Beams, Miscellaneous and Ornamental Iron, Structural Iron, Railing System, Exposed Ceiling Structure, All Ferrous Metal).
   1. Epoxy System (Solvent Base):
      a. Gloss Finish:
         1) 1st Coat: S-W Corothane 1 Preprime, B65C10. (2.5-3.0 mils wet, 1.5-2.0 mils dry).
         2) 2nd Coat: S-W Macropoxy 646 Flake Filled FF Epoxy Gray, B58A604 Series (4.0-6.0 mils dry per coat).
         3) 3rd Coat: S-W Acrolon 218 HS Acrylic Polyurethane Gloss, B65-600 Series (4.5-9.0 mils wet, 3.0-6.0 mils dry to cover). Multiple coats may be required to achieve maximum film thickness, uniformity of appearance and full color coverage. It is the Contractor's responsibility to ensure the finish coat fully covers and hides all previous coating materials.
            a) Finish color scheme: All exposed ceiling structure shall be Snowbound SW-7004 with the bottom (underside) of the steel trusses will be a second color

G. WOOD BENCHES - (Wood Bench Surfaces).
   1. Urethane Systems (Solvent Based):
      a. Gloss Finish:
         1) Apply a test area, on the underside of the wood bench surface, allowing the coating to dry seventy-two (72) hours before testing adhesion. If the adhesion is poor, or if this product attacks the previous finish, removal of the previous coating may be necessary; notify Owner of test results.
         2) 1st Coat: S-W Armorseal Rexthane 1 Floor Coating B65-60 Series. (3.0-4.5 mils wet, 2.0-3.0 mils dry per coat).
         3) 2nd Coat: S-W Armorseal Rexthane 1 Floor Coating B65-60 Series. (3.0-4.5 mils wet, 2.0-3.0 mils dry per coat).
            a) Finish Color: Clear Gloss.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared; notify Owner of unsatisfactory conditions before proceeding. If substrate preparation is the responsibility of another installer, notify Owner of unsatisfactory preparation before proceeding.

B. Proceed with work only after conditions have been corrected and approved by all parties, otherwise application of coatings will be considered as an acceptance of surface conditions.

C. Previously Painted Surfaces: Verify that existing painted surfaces do not contain lead-based paints, notify Owner immediately if lead based paints are encountered.

D. Paint exposed surfaces. If a color of finish, or a surface is not specifically mentioned, Owner will select from standard products, colors and sheens available.

E. Do not paint prefinished items, concealed surfaces, finished aluminum metal surfaces, aluminum frames, operating parts, and labels unless indicated.

3.2 SURFACE PREPARATION

A. Access: It shall be the Contractor's sole responsibility to provide access to all areas scheduled to receive a new paint finish. Contractor shall provide and install, at their sole expense, full scaffolding over the entire existing pool structure. Scaffolding shall have a solid deck of planking and plywood (dance floor), have the proper scaffolding frames and trusses to properly support any and all activities above and be flush with the sides of the pool deck. Scaffolding shall be designed by a qualified person and supplied, erected and dismantled by a firm specializing in such scaffolding erection. All work access shall be done utilizing scaffolding towers, designed to be utilized on the dance floor scaffolding deck and shall equipped with all required guard rails and safety equipment. It is the sole responsibility of the Contractor to follow all Michigan Occupational Safety and Health Administration safety requirements including all "best practice" safety requirements. Contractor shall provide safe access to all work areas.
   1. Under no circumstances shall the Contractor or any of their vendors, subcontractors or others utilize any type of aerial lift, manlift, scissor lift, hydraulic lift in the Project area.
   2. Contractor shall provide the Owner with a written statement of the scaffolding load capacity and any specific requirements of use.

B. General: Contractor shall, at a minimum, perform these "General" surface preparation requirements for all surfaces scheduled to receive a new paint coating application.
   1. Contractor shall insure all surfaces shall be dry and in sound condition. Remove oil, dust, dirt, loose rust, peeling paint or other contamination to ensure good adhesion.
   2. All surfaces scheduled to receive a new paint finish shall be cleaned using CHLOR-RID Liquid Soluble Salt Remover and be free of all contaminates including but not limited to chlorides, sulfates, nitrates and other soluble salt contaminants.
      a. Sample Test Area: Contractor shall clean four (4) 20' x 10' test areas, two (2) CMU wall and two (2) exposed structural steel ceiling surface areas, and perform chloride field testing using CHLOR-TEST, both before cleaning and after cleaning, for chlorides surface contamination.
   3. Wash all surfaces scheduled to receive a new paint finish utilizing pressure washing equipment with a minimum rating of 2,700 psi water pressure fitted with a rotating nozzle with a minimum of a 3,000-psi rating.
   4. Contractor shall remove all loose, peeling and non-adherent paint, rust scale and corrosion utilizing SSPC-SP2 or SSPC-SP3. It's not intended that adherent mill scale, rust and paint be removed by this process. Loose coating is defined as a coating that has delaminated and disbanded from the substrate or other coats but has not fallen off.

5. Remove or protect all items not scheduled to receive a new paint finish including but not limited to thermostats, electrical outlets, switch covers, aluminum frames, window glazing, light fixtures, fire suppression sprinkler heads and cages, score boards, clocks, diving boards, starting blocks, signs, and similar items prior to painting. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
6. Protect all existing pool and surrounding surfaces including but not limited to floor surfaces, wall tiles and pool surfaces. Contractor shall cover all floor surfaces with a minimum of ½" plywood sheathing. It is the sole responsibility of the Contractor to properly protect all surfaces from damage.

C. Block (Cinder and Concrete): Remove all loose mortar, loose/peeling paint, and other foreign material. Surface must be free of laitance, concrete dust, dirt, form release agents, moisture curing membranes, loose cement, and hardeners. Fill all cracks, holes, air pockets, and other voids with a cement patching compound or elastomeric sealant approved by the paint coating manufacture. Sand all glossy surfaces in accordance with the paint manufacture's written instructions.

D. Drywall - Interior: Must be clean and dry. All nail heads must be set and spackled. Sand all glossy surfaces in accordance with the manufacture's written requirements.

E. Galvanized (Non-Ferous) Metal: Clean per SSPC-SP1 using detergent and water or a degreasing cleaner to remove greases and oils. Prior to painting unpainted galvanized metal, apply a prime coat to DTM Wash Primer in accordance with the paint manufacture's requirements. Omit the DTM Wash Primer on all previously painted galvanized metal and utilize the S-W Corothane 1 Preprime, B65C10.

F. Metal Steel: Structural, Plate, And Similar Items: In addition to the "General" surface preparations, these surfaces shall be cleaned and prepared utilizing a SSPC-SP1 and either a SSPC-SP2 Hand Tool Cleaning or a SSPC-SP3 Power Tool Cleaning as described below. These methods are used throughout the world for describing methods for cleaning structural steel. A brief description of these surface preparation standards together with numbers by which they can be specified follow.
1. Solvent Cleaning, SSPC-SP1: Solvent cleaning is a method for removing all visible oil, grease, soil, drawing and cutting compounds, and other soluble contaminants. Solvent cleaning does not remove rust or mill scale. Change rags and cleaning solution frequently so that deposits of oil and grease are not spread over additional areas in the cleaning process. Be sure to allow adequate ventilation.
2. Hand Tool Cleaning, SSPC-SP2: Hand Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Before hand tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.
3. Power Tool Cleaning, SSPC-SP3: Power Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Before power tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.
4. Water Blasting, SSPC-SP12/NACE No. 5: Removal of oil grease dirt, loose rust, loose mill scale, and loose paint by water at pressures of 2,000 to 2,500 psi at a flow of 4 to 14 gallons per minute.

G. Wood: Must be clean, dull and dry. Dull all glossy surfaces in accordance with the paint manufacture's written instructions. Patch all nail holes and imperfections with a wood filler or putty and sand smooth.

3.3 INSTALLATION

A. Apply all coatings and materials in accordance with the manufacturer's written requirements and

the Contract specifications. Mix and thin coatings according to manufacturer's recommendations. If there is a conflict between the Contract documents and the Manufacture's written specifications, the more stringent requirement shall be utilized. It is the sole responsibility of the Contractor to notify the Owner of any conflict in specification requirements prior to the commencement of any Work. No additional compensation shall be granted by Owner for additional work required to meet the Manufacture's or Owners requirements.

B. Contractor shall engage the paint manufacture in the review of the Work being performed including the cleaning/surface preparation and all paint coat applications. As one of the conditions of the Owners acceptance of substantial completion, Contractor shall supply the Owner a written statement from the Manufacture stating that the Manufacture has reviewed the project, state the stages they have reviewed the Work and that the proper specified materials have been applied. Manufacture's letter shall include the dates of all site visits, the specific materials utilized on each surface substrate and any issues and concerns they have regarding their product application.

C. Do not apply to wet or damp surfaces.

D. Apply coatings in accordance with manufacturers written application procedures and requirements. Follow all manufactures required minimum and maximum recoat timeframes.

E. Uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen.

F. Apply coatings at spreading rate required to achieve the contract required and the manufacturers recommended dry film thickness.

G. Regardless of number of coats specified, apply as many coats as necessary for complete hide, and uniform appearance.

H. Inspection: The coated surfaces shall be inspected by the Contractor prior to the application of each coat as part of the Contractors Quality Control plan. Upon completion of the Contractors Hold Point Inspections and after the Contractor has corrected any deficiencies in the coating application, the Contractor shall notify the Owner that the Work is ready to be inspected by the Owner's independent inspector in accordance with the Owners Quality Assurance "Testing Scope of Work". Contractor shall not proceed with sequential coating applications until the Owners Quality Assurance testing has been performed, approved by the Owner and any and all deficiencies have been repaired.

3.4 PROTECTION

A. Protect finished coatings from damage until completion of project.

B. Touch-up damaged coatings after substantial completion, following manufacturer's recommendation for touch up or repair of damaged coatings. Repair any defects that will hinder the performance of the coatings. All completed touch-up coatings shall be of uniform appearance and blend in to the new surrounding coatings.

3.5 WARRANTY

A. Warranty Period – Contractor shall warranty all Work including but not limited to all labor workmanship, materials and equipment for a period of twenty-four (24) months from the date of the Owner accepted substantial completion.

B. Maintenance Bond – As one of the conditions of final payment, the Contractor shall provide the Owner a maintenance bond for a period of two (2) years from the date of the substantial completion.

C. Correction Period - During a period of twenty-four (24) months from and after the date of the Conditional Letter of Acceptance (Substantial Completion), the Contractor shall make all needed repairs arising out of defective workmanship or materials, or both, which in the judgment of the Owner shall become necessary during such period. The Owner shall notify and submit a "Performance Claim Form", which will be completed by the Owner and details the location and nature of needed repairs, to the Contractor. The Contractor shall submit a schedule for inspection and completion of said repairs within five (5) days after the notification of the warranty repairs to be approved by the Owner. If within five (5) days after the receipt of a notice in writing from the Owner, the Contractor shall neglect to make or to undertake with due diligence the aforesaid repairs, the Owner is hereby authorized to make demand of performance from the company issuing the Performance/Maintenance Bond. If the Contractor fails to complete the repairs within the approved schedule, the Owner is hereby authorized to make demand of performance from the company issuing the Performance/Maintenance Bond.

D. Contractor and its Bonding company shall be solely responsible for any and all costs associated with the repairs and corrections of defective workmanship or materials. No additional compensation shall be granted by the Owner to the Contractor or its subcontractors, suppliers, vendors or others for the inspection and/or repairs of Work performed under this Contract.

END OF SECTION

SECTION 131500 - POOL REFINISHING
PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. Original Drawings and general provisions of contract, including General and Supplementary Conditions and specific requirements as directed by the owner or their representatives shall apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. This section of the specifications is intended to furnish all labor and material but not limited to the following:

1. Remove and replace the existing finish
2. Crack inject pool wall/floor in the deep end of the pool.
   a. State footage assumed in base bid and per foot price for additional crack injection if required.
3. Pressure test existing gutter to verify no leaks exist
4. Remove marcite, 3” in depth of grout and caulking from below existing gutter
5. Seal around all stainless steps with waterproof cement sealer
6. Furnish and install 4” wide tile stripe across the floor and up the side walls at the 5’ depth
7. Unit price to furnish and install fiberglass steps in place of the existing stainless steel in wall steps

B. This section of the specifications is intended to furnish and install complete Swimming Pool service and Construction as it relates to the work to be performed including installation and service as specified herein.

C. Only contractors capable of meeting the qualifications and furnishing all work called for in this section shall be and remain through the warranty periods, the sole responsibility of this contractor.

D. Contractor shall verify the power, access and staging requirements needed to perform a complete project and coordinate scheduling requirements with the owner’s representatives.

E. The term pool as used in this Division shall refer to: Competition Pool with all related functions. The term Contractor is used to represent or refer to the Pool bidder.

F. All instruction, service and warranty claims will be handled by one organization specializing in this work.

G. The owner is Troy Schools and/or their representatives or invitees such as engineer, consultants, representatives, maintenance, operators or the like.

H. Contract documents are the basis for receiving bid and are therefore the final determination for achieving Substantial Completion.

I. See any specific requirements by the owner for defined areas of responsibility.

J. Any reference to Contractor as stated herein shall be defined or intended to mean pool contractor bidding work to be performed as indicated herein.

1.03 SUBSTITUTIONS:

A. Detailed investigation has been made before selecting the specified products. If any contractor wishes to submit a substitute, he shall submit a formal request in writing 10 days prior to bidding with any information related to or layouts required which may be different that what is shown on the bid documents.

B. After bidding if a voluntary alternate is offered said contractor shall submit product information plans and specifications to the owner with any specific related areas affected by the change. This results as an owner's option. Said information, plans and specifications shall be for this specific project and show the installation of the proposed substitute. All changes required in the pool structure or in the building construction or any other areas related to the change shall be the sole responsibility of said contractor offering the substitute. In the event the option is chosen said contractor will be responsible for any additional costs due to the omission of affected work. This is to assure true costs of the alternate has been properly represented and evaluated. Any product offered as an owner's option must be proven design with at least ten (10) installations of this size in service for more than two (2) years.

1.04 SUMMARY OF WORK INCLUDED IN THIS SECTION:

A. The work of this section by Contractor/Pool Contractor includes the renovations of the pool as follows:

1. All pool related documents, permits, plans and fees as required. Contractor shall field verify all sizes, quantities, materials, equipment and parts needed to meet the intent of the information as stated herein.
2. Site access including repairs and clean up. Contractor shall leave the site and Natatorium the way he found it when he arrived.
3. Drain existing pool and verify no ground water is present and hydrostatic valves are in proper working order.
4. Remove existing finish to the original base and dispose of legally off site
5. Pressure test existing gutter. Remove 3” in depth of existing grout and caulking from below existing gutter. Perform any needed tile repairs or replacement
6. Crack inject existing cracks in pool wall. Apply base coat and interior finish on pool to the limits as indicated
7. Furnish and install 4” black tile stripe across the floor and up the side walls at the 5’ depth
8. Remove and replace existing in wall steps with fiberglass
9. Fill pool with owners’ water
10. Start system and balance chemicals to Langlier index

1.05 QUALITY OF MATERIALS:

A. Special attention is directed to the materials, products, methods and equipment described in these specifications. They establish a standard of required function, dimension, appearance and quality. Where only one manufacturer's name is mentioned for an item of equipment or material, the Contractor's base bid shall be on that item. Whenever the words "or equal", "or approved equal", or "equal as approved" appear in the specifications, they shall be interpreted to mean material, or an item of equipment equal in quality to that named. The burden of proof of equality or service shall be on the supplying contractor.

B. Proof of inequality is not implied by the specifications and is not a burden of the Owner or his representative. If the Contractor submits a substitution of an "equal" basis, he shall assume all risks involved should the Architect find it not acceptable. The Pool Contractor shall assume all costs for changes in drawings and specifications affected by the substitution, and the cost of the increase, if any including adjoining work.

C. Where references are made to Federal Specifications, American Society for Testing and Material, American Standards Association, American Institute of Steel Construction, Steel Institute, and similar associations, organizations and standards, it shall be construed to mean their current specifications and designations as amended as of the date of the opening.

1.06 PATENTED MATERIALS:

A. This contractor shall pay all royalties and license fees. He shall defend all suits of claims for infringement of any patent rights and shall save the Owner or his invitees harmless from the loss on account thereof, except that this contractor shall not be responsible for all such loss when a particular manufacturer or manufacturers are specified, but if this contractor has reason to believe that the design, process or product specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information to the Owner or their representatives.

1.07 CODES:

A. All work in this division shall be according to applicable Local, State and National Codes and Regulations.

1. Michigan Department of Environmental Quality
2. National Swimming Pool Institute for Public Pools
3. National Federation for High School Association
4. State Plumbing and Electrical Codes
5. National Electrical Code
6. National Sanitation Foundation
7. American Society for Testing and Materials
8. All State and National Codes associated with intended use of the facility
9. American Concrete Institute
10. National Plaster Council
11. Michigan Occupational Safety and Health Administration

1.08 JOB COORDINATION:

A. Prior to work start this contractor shall hold a meeting at the job site with owners' representatives to establish work limits, job schedule and liaison among contractors to ensure a coordinated construction process.

1.09 QUALIFICATION SUBMITTAL:

A. The bidding contractor must have performed the same services as described herein or show and prove he has the ability to provide such services to meet the full intent of the information as stated herein. Each pool must have had a water surface area equal to or larger than the pool described herein. Upon investigation these pools would be found to be completed in a satisfactory manner and having been in operation for at least three (3) years. The contractor shall furnish complete evidence that he has the facilities to complete all phases of this trade division.

B. The Owner reserves the right to reject any Contractor's request to bid if the evidence submitted by, or investigation of, such Contractor fails to satisfy the Owner that such Contractor is properly qualified to carry out the obligation of the contract and to complete the work described or if the Contractor does not meet the qualifications stated herein.

C. It is the desire of the Owner and by the intent of these documents that this bidding contractor furnish and install a complete package so that all warranties and/or guarantees become the sole responsibility of one single contractor and further to be able to furnish a necessary service staff who are capable of properly servicing emergency situations.

D. Before commencing any work, this contractor shall submit and obtain approval for all work called for in this division.

E. Unless specified otherwise the bidder shall submit with his bid a designation of the work to be performed by the bidder with his own forces and/or:.

1. The proprietary names of the suppliers and/or subcontractors of principle items or systems of materials and equipment proposed for the work; Including phone numbers, contact person, date of equipment order and expected delivery dates.
2. A list of names of the subcontractors and other entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principle portions of the work. In the event of long lead items or those items that could jeopardize the project schedule the pool contractor shall so state at this time. If no statements are contained in this notice the owner assumes all equipment will be available as needed.
3. The bidder will be required to establish to the satisfaction of the Owner the reliability and responsibility of the suppliers, persons, or entities proposed to furnish and perform work described in the bidding documents. Prior to the award of the contract, the Owner will notify the bidder in writing if after due investigation, has reasonable objection to any such proposed supplier, persons, or entity.
4. If the Owner has reasonable objection to any such proposed suppliers, person or entity, the bidder may, at his option:

    a. Withdraw his bid
    b. Submit an acceptable substitute supplier, person or entity, with an adjustment in his bid price to cover the difference in cost occasioned by such substitution. The Owner may, at his discretion, accept the adjusted bid price or he may disqualify the bidder.
    c. In the event of either withdrawal or disqualification under the subparagraph, bid security may not be forfeited, no compensation will be given for any efforts made; not withstanding the general provisions or qualifications on his bid security.
    d. Suppliers, persons and entities proposed by the bidder and to whom the Owner and the Architect have made no reasonable objection must be used on the work for which they were proposed and shall not be changed except with the written consent of the Owner.

5. The owner may at his option interview contractor(s) with the aide of a video camera or recording device which will become part of the bidding documents.

1.10 PERFORMANCE SUBMITTAL:

A. All submittals will be made in accordance with the requirements at stated herein with General Requirements and in strict compliance of the following:

B. Within 48 hours of Notification of award the Pool Contractor shall submit the design mix with schedule of calendar dates for the duration of scope of services with anticipated dates and or deadlines thru chemical balancing.

1. Contractors submittal and or approval is a representation that Contractor accepts full responsibility for draining the existing pool as well as determining and verifying all quantities, dimensions, field construction criteria, materials, catalog numbers and similar data and that he has review or coordinated each submittal with the requirements of the Work and the Contract Documents.
2. Note certification of or equal or approved equal status. Any and all deviations from the Contract Documents shall be so listed as a deviation with a description as it related to the deviation. Note substitution section herein. Any deviation not accepted requiring additional work by another trade division shall be paid by the Contractor.

C. No portion of his work shall commence without the performance submittal. Contractor is cautioned that if during this period he is expecting to start his portion of the work and he assumes all responsibility for such in the event proper approvals have not been obtained. Review will only be for the information submitted and not as a check list for items not submitted or not properly marked on the submittal. Contractor has bid the project with the equipment as specified he is expected to furnish and install what is specified.

D. Contractor shall accept full responsibility for all information as contained herein. Any additional coatings or performance related information not noted is expected to be installed even though it was not noted in the documents. Omission does not exonerate the contractor from installing the item or any item as it is described herein. The review is for general conformance with layouts elevations and quantities being the responsibility of the contractor. Not submitting this information as described or within the time frame as required does not allow the contractor additional time. This contractor is totally responsible for any errors or omissions in locations especially as they relate to location or elevation that directly affects it connection to another component or adjacent surface.

E. Review of drawings and data submitted by Contractor will cover only general conformity to the Drawings and Specifications, external connections and dimensions that affect the layout. Review does not indicate a thorough review of all dimensions, quantities and details of the material, equipment, device or item shown. Review of submittals shall not relieve Contractor from responsibility for errors, omissions or deviations or responsibility for compliance with Contract Documents. When the information is returned Rejected, Revise and Resubmit or no exceptions submit specified item, the corrections shall be made as noted thereon and as instructed and 6 corrected copies (or 1 copy and 1 corrected reproducible copy) needs to be resubmitted. Approved as Noted or Accepted as Noted indicates conditions of acceptance, the item does not need to be resubmitted. The contractor is responsible for installing the item as corrected or so noted.

F. Engineering data covering all systems, equipment, structures and fabricated materials, which will become a permanent part of the Work under this Contract shall be submitted for review. This data shall include drawings and descriptive information in sufficient detail and scale to show the kind, size, arrangement and operation of component materials and devices, external connections, anchorage's, supports required, performance characteristics, fabrication and dimensions needed for installation and correlation with other materials and equipment. A certification with the shop drawing shall state in writing indicating that all equipment will connect into, fit into and be connected into the space allotted and as shown in the drawings.

G. Submit shop drawings with any specific notes for all components as contained in each section of this Division in the order and format as indicated in another section indicating all equipment as stated herein and related to but not limited to the following equipment or details such as must be submitted with the shop drawings to scale as required. If some of the information related to that item is not on the cut sheet, then write that information on the submittal sheet. If the information is needed for other trades, then a separate submittal shall be made.

1. Design mix
2. Pool details
3. Typicals with penetration details
4. Special fabrications
5. Sections
6. Locations
7. Settings
8. Interconnecting parts
9. Manufacturers names and Model numbers
10. Internal and external components
11. Layout details for all equipment

1.11 CONTRACTORS RESPONSIBILITY:

A. The owner hereby assumes that the systems as installed are compatible with the water as used and maintained.

B. During Construction the Contractor shall take all steps necessary to prevent the pool from moving, floating, safety railing or any other outside condition that would create safety, timing or difficulties in completion.

C. Contractor is responsible for the pool shells, tanks, building, existing finishes, new finishes, bulkheads and components and everything as stated herein for the duration of construction. He shall make no assumptions as to outside conditions or events, which may occur during construction, such as power failures, spilled paint, water, dust dirt or the like, which could cause damage to the pool tank such as not being cleaned and prevent tile adhesion, existing tile or marcite damage or if the pool tanks were to float during construction.

1. Contractor shall take all necessary precautions to make sure such things or event do not occur. Should the conditions dictate, and such an event should occur this contractor shall provide whatever monetary and labor means deemed necessary to fix repair or replace and complete all work as described herein and with the same standards.

2. If some portion of the work as specified in this section or that is related to this section and a clarification has not been raised to the Owner prior to bid time or at the time of interview it is assuming to be included in this contractors' scope of work.
3. If applicable, the Contractor is responsible for supporting both bulkheads prior to and during the draining of the pool.
4. Contractor is responsible for maintaining any existing or new finishes during construction and thru the filling of the pool. Pool shall be filled and supervised by the contractor until it is completely filled and balanced using the owners' water.

D. Contractor is expected to Punch out the Swimming Pool as the project progresses.

E. Contractor is expected to leave the entire Natatorium, including, truss, panels, scoreboard, spectator seating, ceiling, deck and adjacent areas including those areas outdoors used as egress which include, doors, entrances, parking lots, landscape areas, etc. All egress areas shall be left in the same condition Contractor found when he arrived.

1. Protect all areas in and outside of the Natatorium from dust and debris particularly so dust, dirt or any pool demolition work does not contaminate, penetrate or end up leaving dust or other debris in the Natatorium or any adjacent area.
2. If Natatorium ventilation system needs to be turned off at any time during the renovation it shall be the responsibility of this contractor to advise the owners staff accordingly.
3. If contractor does not set up or bring their own ventilation equipment, tarps, covers or the like and it requires additional cleaning in the Natatorium or adjacent areas the owner shall so advise the Contractor and reserves the option to hire a cleaning company to be paid for at the discretion of the owner and deducted from the Contractors retention or payables.

1.12 START UP AND ENGINEERING SERVICES:

A. A qualified representative of this contractor or the manufacturer shall visit the site after the installation and shall put the filter into operation and balance the pool.

B. The contractor shall supply the services of a competent and experienced field engineer for a period of at least three (3) days during and after installation to inspect the completed installation, and before the owner is instructed place the system in operation and give operating instructions relative to care and use of the facility.

C. Contractor shall place the pool systems into operation, balance the pool to Langlier Saturation Index using liquid chlorine and furnish all chemicals. During the instruction the Contractor shall check all items related to the installation of the work performed and verify that installation of these items will not affect the warranty of any pool-related item. If this condition exists, the Contractor shall send the owner a registered letter describing these items. He shall also have all forms of instructions and warnings in place prior to instruction.

1.13 WARRANTY:

A. Standard one-year contractual warranty for the project shall apply to all work of this section unless stated otherwise. All warranties shall remain as joint responsibility of the Contractor and the Manufacturer. Contractor warrants that the installation and completion of the project is in compliance with the intent of this installation and in accordance with the manufacturer's recommendations and owner's requirements.

Contractor hereby agrees to repair or replace any work or component at no cost to the owner during the warranty period.

1. Pool Marcite and/or Tile - Five (5) years against defects in bonding, material or workmanship. Warranty shall remain as joint responsibility of the Contractor and the Manufacturer. Contractor warrants that the installation of the tile and systems are at the time of bid and completion of the project in compliance with the intent of this installation and in accordance with the manufacturers recommendations. Contractor hereby agrees to repair or replace any work or component at no cost to the owner during the warranty period.
2. No warranty as stated above, herein or implied shall be Pro-Rated with all warranties being held by the Contractor and the Manufacturer.

PART 2 PRODUCTS

2.01 QUALITY ASSURANCE:

A. Products purchased on the open market must be delivered and received by the Contractor to the project in their original containers.

B. Due to the specialized nature of the specified work and products, all bidders shall be required to have a minimum of five (5) years of operating history. The products or equipment described herein shall be products by a regularly used for swimming pools and have at least five (5) years operation.

2.02 ENGINEERING SERVICES AND STARTUP:

A. The contractor shall supply the services of a competent and experienced field engineer for a period of at least three (3) days during and after installation to inspect the completed installation, adjust the automatic controls to the proper set points, place the system in operation and give operating instructions relative to its care and use.

2.03 BASE BID:

A. It is not the intention of the specifications to limit competition. The base proposal must be on furnishing products or equipment as specified, however, any bidder may, at his option, offer a substitute for consideration. In proposing a substitute, the project bidder is cautioned to refer to the qualifications. Any proposed substitution shall include a layout or background information incorporating all required changes to the project. The cost of such changes shall be included in the price of the substitute. Any such proposed system must comply with the State and Local Health Departments.

2.04 GUARANTEE:

A. The equipment supplier/contractor shall guarantee that the installation of said products are installed per the manufacturer’s requirements and conditions of installation.

2.05 INSTALLATION:

A. The installation contractor shall mix, assemble and install all products accordance with the intent of these specifications and as indicated on the technical information of the Manufacturer.

2.07 START UP AND ENGINEERING SERVICES:

A. An authorized representative of the bidding contractor shall provide the supervisory services of an installation engineer to fully instruct designated personnel in the operation, care and maintenance of the entire purifying, sterilizing and recirculating system.

2.08 IN WALL STEPS

A. Remove and replace in wall stainless steel steps with fiberglass steps. Steps shall be injection molded plastic OD 17 ½" X 7" X 5 ½" d. Recreonics Model No. 44-054. Verify size of existing steps with new steps prior to removing. Seal the existing opening and adjacent surface with waterproofing equal to Aquafin 1K waterproof cement.

PART 3 EXECUTION

3.01 CONDITIONS AND RELATED:

A. Coordinate and verify that all work stated in other sections has been performed.

B. All areas shall be protected in accordance with these documents and OSHA and MIOSHA guidelines.

3.02 POOL TILE AND RE-GROUT OF EXISTING TILE:

A. Tile used in this section is based on 1" X 1" Dal Tile. Approved Manufacturers are Dal Tile and American Olean.

1. The pool shall be completely cleaned, degreased, re-marcited with the existing tile being re-grout to match the new finish. All piping and drains shall be sealed to prevent the cleaning solution or demolition materials from entering the piping systems and prior to grouting the tile or installation of the new marcite. All existing pool tile shall be acid washed with a minimum of 20% hydrochloric acid and water to remove enough loose grout for proper installation of new grout. All loose grout shall be removing taking care to not allow the acid to become trapped below the tile not compromise the bond of the existing tile. It is for this reason the contractor shall do a tap test in the presence of the owner or his representative to assure none of the existing tile is loose or hollow. Upon completion of the acid wash and a thorough flooding of all surfaces the entire pool shall be cleaned with soda to neutralize any acid that may not have been neutralized during the flood washing of the tile.
2. Upon completion of the cleaning the entire pool shall be washed with a degreaser such as TSP or Tri Sodium Phosphate and rinsed thoroughly with water.
3. All grouting materials shall be as stated below.

B Leave finished tile area clean and free of cracked, chipped, broken or loose tile. Protect tile for at least three (3) days after installation. Interior surfaces of the pool shall be thoroughly cleaned of dust, oil, paint, and other loose material or foreign matter before application of setting bed or grout. Tile contractor shall walk the pool with the Owner or his representative prior to filling the pool. Any corrections shall be made prior to filling of the pool. Due to the method of fill for the pool the tile contractor is cautioned to make sure the owner or his representative has approved the work due to the Owners expense in filling the pool. Should the tile be rejected in areas the tile contractor shall immediately repair or replace those areas to the satisfaction of the owner prior to filling the pool.

1. Align all joints to be parallel and/or perpendicular with all other surfaces. All joints shall be straight and uniform. Tile shall have a maximum finish tolerance of 1/16".
2. All materials shall be furnished and installed in accordance with all manufacturer's recommendations.
3. If any non-manufactured edge is exposed it shall be protected by the adjacent tile and edge shall be ground to eliminate the sharp edge.
4. All surfaces to receive the final finish and or base coats shall have a rough to medium rough texture. Sandblast as required to achieve proper bonding to surfaces.
5. Furnish and install all tiles in accordance with the drawings and as listed in the Architects finish schedule and as stated herein.

B. Grouting and setting materials shall be by TEC and furnished and installed in accordance with the manufacturer's technical information. Grout is based on TEC Series 550 Power Grout System: Installers shall follow the strict requirements of the manufacturer.

C. Super Flex - Premium Latex Modified Thin Set Mortar. Install work in accordance with the manufacturers approved product installation procedures.

1. All surfaces shall be structurally sound, dry, and free from grease, oil, paint, sealers, or curing compounds.
2. Any fines, laitenance, projections, and honeycombing must be removed.
3. Surface protrusions and tile glazes must be removed.
4. Cutback all adhesive residue to appropriate substrate.

D. Grout Installation: Re-grout all existing lanes, targets or tile markings in pool.

1. Install Power Grout 550 in strict accordance with TEC brand products installation.
2. Fast Setting, Stain Resistant, Crack Resistant, High Performance Grout. "Provide a single component grout with less than 4% absorption, exceeds ANSI A118.7, passes CTI-T72 modified minute stain test for contaminates for grout with little or no effect, has minimum 6000 PSI compressive strength, a lifetime color consistency warranty, lifetime product defect warranty, and when included in a tile assembly qualifies for a system warranty for crack resistance when used in a system incorporating a crack isolation membrane. TEC Power Grout (one formula for joints from 1/16" – ½" in width) as manufactured by H.B. Fuller Construction Products Inc. Aurora, IL
3. Completely clean all grout haze and residue from the surface.
4. Grout joints must be clean and free of standing water, dust or foreign material.
5. Protect from foot traffic and fill pool in accordance with manufacturers technical standards.
6. Check condition of potable water to make sure water is not high in metals causing staining of the grout to occur. If water is high in metals use only trucked in water for all setting and grout materials.

3.03 POOL FINISH:

A. Marcite Pool Finish shall be applied to the Pool Floor and walls.

1. Prepare all surface in accordance with the information as contained herein so the tile is flush or, so the plaster finish can be tapered out to the face of the existing tile. Screed all new marcite to existing tile.

2. Apply minimum of 3/8” to 1/2” of new Marcite in accordance with the manufacturer’s recommendations which consists of a calcareous base of white cement and crushed marble (pool mix).
3. Maintain uniform thickness so visible shadowing from the surface behind or below does not occur.
4. Contractor shall install marcite with 3 coats of product to achieve a true consistent finish.
5. The shell must be free of any foreign material that may interfere with the bonding of the new finish. All loose material such as dripped thinset, grout, paint, dirt, patching or deck products must be removed by scraping, water blasting or sand blasting. Algae, mold and mildew must be eliminated by chlorine or acid washing. Failure to do so will result in discoloration and bond failure. Remove any oil, grease with trisodium phosphate and water. Oils and grease must be removed with proper etching and cleaned with a waterborne acid solution. Test the pool for oil by wetting the shell and examine structure for beading water droplets. Heavily saturated areas may require soaking with liquid detergents until the oil is removed.
6. Areas where the surface is smooth will require acid etching and or hydroblasting cleaned to a rough surface. Weepers or areas of hydrostatic water need to be stopped. Use SGM instant hydraulic cement to plug leaks and seal around fittings. Undercut all areas around fittings 2” away and 3/8” to ½” deep. Sound out all areas that may be hollow. Use SGM Bond Kote over all areas.
7. Mix finish products in accordance with the manufacturer’s technical specifications. Mix products for 5 minutes and no more than 10 minutes. Mix only the amount that can be properly applied making sure excess water is not used creating weak areas of the finish and air bubbles. Calcium chloride may be used in the plaster mix only, as an accelerator and in accordance with the National Plaster Council minimum standards. It must be fully dissolved in water allowing impurities to settle out and no more than 2% by weight of cement. Use SGM Accelerator 100 at a maximum rate of ¼ gallon per bag.
8. If pumping increase pump manifold from 3” to 4”. Set pump at lowest setting. Only pump at full stroke or when the wheel is at its highest position. Pump a complete batch. If jam do not water down and the entire assembly must be disassembled.
9. The substrate should be cool and damp and not wet. Unmixed material must be discarded. Do not trowel clumps or lumps. Apply scratch to coat bowl first. Begin in shady walls and work to the sunny walls and allow to set up slightly. Carefully trowel using slick toweling is recommended. This produces a slick surface and the aggregate can be seen thru a thin film of cement paste. Fill all spike holes with diamond Brite aggregate to avoid spike holes.
10. You must have one workman for every 300 square feet and exposure time is one hour, but conditions prevail. Use manufacturer’s recommended techniques for finish. Follow manufacturers recommendations for curing, chemical levels and brushing.
11. Unless stated specifically in writing, to the owner, the owner assumes that all conditions of installation are in accordance with the contractors means and methods of installation and in accordance with the manufacturer’s recommendations. Diamondbrite, Marcite and or tile shall not be subject to frost or freezing temperatures for 30 days upon installation. Contractor shall supervise the filling of the pool particularly during hot or wet weather to assure shrinkage or washout does not occur.

B. Pool finishes shall be marcite with tile markings. As with the tile as stated above leave finished tile area clean and free of cracked, chipped, broken or loose tile. Protect tile from all foot and wheel traffic for at least three (3) days after installation. Interior surfaces of the pool shall be thoroughly cleaned of dust, oil, paint, and other loose material or foreign matter before application of setting bed. Tile lanes, targets and other markings shall be as indicated on the drawings. Tile/Plaster contractor shall walk the pool with the Owner or his representative prior to installing any plaster or marcite and again prior to filling the pool. Any corrections shall be made prior to installing marcite or filling of the pool. Due to the method of fill for the pool the contractor is cautioned to make sure the owner or his representative has approved the work due to the Owners expense in filling the pool. Should the tile be rejected in areas the tile contractor shall immediately repair or replace those areas to the satisfaction of the owner prior to plastering or filling the pool. All areas receiving tile shall be flush with the final pool finish.

C. The tile lanes, targets and transition lines for the interior of the pool shall be 1” x 1” as manufactured by Dal Tile or American Olean with a matt finish. The pool shall be thoroughly cleaned with Tri-sodium Phosphate of dust, oil, paint, and other loose material or foreign matter before application of pool finish.

D. Furnish and Install Multicoat Scratch Kote System over all pool walls and floor surfaces to receive marcite prior to installation of marcite.

E. All areas within and outside of the enclosure shall be protected from damage as indicated in another section.

E. A hydrostatic relief valve exists in the drain boxes and shall be operable during the process. Verify the condition of the relief valve in the event it needs to be replaced, Apply minimum of 3/8” to 1/2” of new marcite in accordance with the manufacturer’s recommendations. The Marcite which consists of a calcareous base of white cement and crushed marble (pool mix). Those specific areas requiring preparation of coves, pitches or angled surfaces shall be installed according to the installer’s recommendations to accept the finish surface. Marcite is a high-density material consisting of white Portland cement and crushed marble. Finish shall be installed to minimum thickness of 3/8” to ½” minimum. Marcite is Pool Mix and white cement. The mix shall be in accordance with the manufacturer’s recommendations. Maintain uniform thickness so visible shadowing from the surface behind or below does not occur. Prepare all surfaces as described above. Properly prepare all surfaces to achieve a mechanical bond to the structural surfaces. Furnish and install a scratch coat of Bond Coat 2000 or equal prior to installing finished surface.

F. Use caution in cleaning to assure no oils have impregnated the surfaces to prevent adhesion of the finished surface. Contractor shall install marcite with 3 coats of product to achieve a true consistent finish. Prepare all areas to blend and receive marcite. Remove all oil to assure a true mechanical bond to the substrate. All chipped tiles at the water line, walls or on the pool floor shall be removed and replaced. Blend marcite into the tile and properly prepare all surfaces. Should shadowing occur, the finish will be deemed unacceptable and may need to be completely refinished. It is the contractor’s responsibility to eliminate shrinkage cracks in existing or new finish throughout the installation. Contractor shall protect the finish and properly cure to eliminate shrinkage cracks. Prior to starting this process walk the pool with the manufacturer’s representative and the owner. Prior to walking the pool fill, patch or coat and clean all surfaces so a uniform finish will result.

G. The stainless steel gutter system shall be grouted with a non-shrink grout equal to Sika Interplast N. Where the grout meets the stainless steel, **the joint shall be tooled** to allow for 3/8” X 3/8” waterproof caulking equal to Vulkem Sealants. Only Manufacturer recommended sealants shall be used between the stainless steel and the grout. The caulking is to be covered with finish surface of the pool.

3.04 CRACK INJECTION AND WATERPROOFING:

A. The deep end of the pool has cracks and bleeds thru the existing shell. Dewater below the pool using a diaphragm pump or if the shell becomes dry verify no water is present. If dewatering is still necessary, remove and replace the existing hydrostatic relief valves upon completion. Drill @3/8” holes in accordance with the manufacturer spaced to material may properly seal all cracks using foam-based crack injection material such as Hydra Stop 300 Injection foam as manufacturered by Applied Technologies Acta Leak Concrete Crack repair. Polyurethane Foam injection repairs leaks and hairline cracks. Grind surfaces and clean to assure a proper bond of the new plaster over the cracks. Do not change the plane of the adjacent surfaces so the crack does not reflect back thru the new finish.

B. Waterproof with (2) two coats of Aquafin 1K which is a cementitious ready mixed powder mixed with water to form a dense waterproofed surface barrier with a smooth finish. Product consists of Portland cement well graded quartz sand and polymer enhanced special chemical ingredients. Coat all areas with Super Aquafin (866 278 2346) a cementitious protective coating and waterproof barrier, resistant to moisture and abrasion. Clean all existing surfaces in accordance with the manufacturer’s technical specifications and all sides to bare concrete in accordance with the manufacturer’s technical information. All surfaces must be clean, sound and have an open capillary system.

3.05 SELECTIVE DEMOLITION AND INSTALLATION:

A. Protect all adjacent areas of the existing pool, deck, adjacent rooms and Natatorium and building as described in another section. Contractor shall provide for proper ventilation during the demolition process to keep dust from entering other parts of the building. Protect walls, floors and ceiling from smoke, dust and other construction materials. Pneumatic air hammers shall not be used. Remove all debris and spoils from the site and dispose of properly. Thicknesses shall be + 1/8". Contractor is responsible for bracing, lintels, shoring and protection of existing areas inside and outside the building. Should Contractor remove too much or too little or damage the wrong item the contractor shall at no cost to the owner repair, replace or remove whatever is necessary to complete his work to the conditions as stated herein and the intent of the information as stated herein.

END OF SECTION

TROY SCHOOL DISTRICT

Specifications Manual

Troy High School
Pool Lighting Project

Issued for Bids

Peter Basso Associates Inc
CONSULTING ENGINEERS

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Division	Section Title

SPECIFICATIONS GROUP

SECTION 260010 - ELECTRICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2 SUMMARY

A. This Section includes electrical general administrative and procedural requirements. The following requirements are included in this Section to supplement the requirements specified in Division 1 Specification Sections.

1.3 REFERENCES

A. All materials shall be new. The electrical and physical properties of all materials, and the design, performance characteristics, and methods of construction of all items of equipment, shall be in accordance with the latest issue of the various, applicable Standard Specifications of the following recognized authorities:

1. A.N.S.I. American National Standards Institute
2. A.S.T.M. American Society for Testing Materials
3. I.C.E.A. Insulated Cable Engineers Association
4. I.E.E.E. Institute of Electrical and Electronics Engineers
5. N.E.C. National Electrical Code
6. N.E.C.A National Electrical Contractors Association
7. N.E.M.A.National Electrical Manufacturer's Association
8. U.L.Underwriters Laboratories, Inc.
9. N.E.C.A. 1-2000, “Practices for Good Workmanship in Electrical Contracting (ANSI).”

1.4 QUALITY ASSURANCE

A. Scope of Work: Furnish all labor, material, equipment, technical supervision, and incidental services required to complete, test and leave ready for operation the electrical systems as specified in the Division 26 Sections and as indicated on Drawings.

B. Ordinances and Codes: Perform all Work in accordance with applicable Federal, State and local ordinances and regulations, the Rules and Regulations of NFPA, NECA, and UL, unless otherwise indicated.

1. Notify the Architect/Engineer before submitting a proposal should any changes in Drawings or Specifications be required to conform to the above codes, rules or regulations. After entering into Contract, make all changes required to conform to above ordinances, rules and regulations without additional expense to the Owner.

C. Source Limitations: All equipment of the same or similar systems shall be by the same manufacturer.

D. Tests and Inspections: Perform all tests required by state, city, county and/or other agencies having jurisdiction. Provide all materials, equipment, etc., and labor required for tests.

E. Performance Requirements: Perform all work in a first class and workmanlike manner, in accordance with the latest accepted standards and practices for the trades involved.

F. Sequence and Schedule: Work so as to avoid interference with the work of other trades. Be responsible for removing and relocating any work which in the opinion of the Owner’s Representatives causes interference.

1.5 CODES, PERMITS AND FEES

A. Unless otherwise indicated, all required permits, licenses, inspections, approvals and fees for electrical work shall be secured and paid for by the Contractor. All work shall conform to all applicable codes, rules and regulations.

B. Rules of local utility companies shall be complied with. Coordinate with the utility company supplying service to the installation and determine all devices including, but not limited to, all current and potential transformers, meter boxes, C.T. cabinets and meters which will be required and include the cost of all such items and all utilities costs in proposal.

C. All work shall be executed in accordance with the rules and regulations set forth in local and state codes. Prepare any detailed Drawings or diagrams which may be required by the governing authorities. Where the Drawings and/or Specifications indicate materials or construction in excess of code requirements, the Drawings and/or Specifications shall govern.

1.6 DRAWINGS

A. The Drawings show the location and general arrangement of equipment, electrical systems and related items. They shall be followed as closely as elements of the construction will permit.

B. Examine the Drawings of other trades and verify the conditions governing the work on the job site. Arrange work accordingly, providing such fittings, conduit, junction boxes and accessories as may be required to meet such conditions.

C. Deviations from the Drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of the Architect/Engineer.

D. The architectural and structural Drawings take precedence in all matters pertaining to the building structure, mechanical Drawings in all matters pertaining to mechanical trades and electrical Drawings in all matters pertaining to electrical trades. Where there are conflicts or differences between the Drawings for the various trades, report such conflicts or differences to the Architect/Engineer for resolution.

E. Drawings are not intended to be scaled for rough-in or to serve as shop drawings. Take all field measurements required to complete the Work.

1.7 MATERIAL AND EQUIPMENT MANUFACTURERS

A. All items of equipment shall be furnished complete with all accessories normally supplied with the catalog items listed and all other accessories necessary for a complete and satisfactory operating system. All equipment and materials shall be new and shall be standard products of manufacturers regularly engaged in the production of electrical equipment and shall be of the manufacturer's latest design.

B. If an approved manufacturer is other than the manufacturer used as the basis for design, the equipment or product provided shall be equal in size, quality, durability, appearance, capacity, and efficiency through all ranges of operation, shall conform with arrangements and space limitations of the equipment shown on the plans and/or specified, shall be compatible with the other components of the system and shall comply with the requirements for Items Requiring Prior Approval specified in this section of the Specifications. All costs to make these items of equipment comply with these requirements including, but not limited to, electrical work, and building alterations shall be included in the original Bid. Similar equipment shall be by one manufacturer.

1.8 INSPECTION OF SITE

A. Visit the site, examine and verify the conditions under which the Work must be conducted before submitting Proposal. The submitting of a Proposal implies that the Contractor has visited the site and understands the conditions under which the Work must be conducted. No additional charges will be allowed because of failure to make this examination or to include all materials and labor to complete the Work.

1.9 ITEMS REQUIRING PRIOR APPROVAL

A. Bids shall be based upon manufactured equipment specified. All items that the Contractor proposes to use in the Work that are not specifically named in the Contract Documents must be submitted for review prior to bids. Such items must be submitted in compliance with Division 1 specifications. Requests for prior approval must be accompanied by complete catalog information, including but not limited to, model, size, accessories, complete electrical information and performance data in the form given in the equipment schedule on the drawings at stated design conditions. Where items are referred to by symbolic designations on the drawings, all requests for prior approval shall bear the same designations.

1. Equipment to be considered for prior approval shall be equal in quality, durability, appearance, capacity and efficiency through all ranges of operation, shall fulfill the requirements of equipment arrangement and space limitations of the equipment shown on the plans and/or specified and shall be compatible with the other components of the system.
2. All costs incurred to make equipment comply with other requirements, including providing maintenance, clearance, electrical, replacement of other components, and building alterations shall be included in the original bid.

B. Voluntary alternates may be submitted for consideration, with listed addition or deduction to the bid.

1.10 SHOP DRAWINGS/SUBMITTALS

A. Submit project-specific submittals for review in compliance with Division 1.

B. All shop Drawings shall be submitted in groupings of similar and/or related items (lighting fixtures, switchgear, etc.). Incomplete submittal groupings will be returned unchecked.

C. Provide detailed layout shop Drawings (on transparent media) of all lighting and power distribution systems, routing of conduits, combining of circuits, circuiting, details and related information necessary of installation and maintenance. After review by the Architect/Engineer, a copy of Drawings will be stamped and returned to the Contractor.

D. If deviations (not substitutions) from Contract Documents are deemed necessary by the Contractor, details of such deviations, including changes in related portions of the project and the reasons therefore, shall be submitted with the submittal for approval.

E. Submit for approval shop drawings for all electrical systems or equipment but not limited to the items listed below. Where items are referred to by symbolic designation on the Drawings and Specifications, all submittals shall bear the same designation (light fixtures). Refer to other sections of the electrical Specifications for additional requirements.

1. Wiring Devices
2. Lighting Fixtures
3. Occupancy/Vacancy Sensors (material and lay-out drawings)

1.11 COORDINATION DRAWINGS

A. Submit project specified coordination drawings for review in compliance with Division 1 Specification Sections.

1.12 OPERATION AND MAINTENANCE INSTRUCTIONAL MANUALS

A. Submit project specific Operation and Maintenance Instructional Manuals for review in compliance with Division 1 Specification Sections.

B. Provide complete operation and maintenance instructional manuals covering all electrical equipment herein specified, together with parts lists. Maintenance and operating instructional manuals shall be job specific to this project. Generic manuals are not acceptable. Four (4) copies of all literature shall be furnished for Owner and shall be bound in ring binder form. Maintenance and operating instructional manuals shall be provided when construction is approximately 75% complete.

C. The operating and maintenance instructions shall include a brief, general description for all mechanical systems including, but not limited to:

1. Routine maintenance procedures.

2. Lubrication chart listing all types of lubricants to be used for each piece of equipment and the recommended frequency of lubrication.
3. Trouble-shooting procedures.
4. Contractor's telephone numbers for warranty repair service.
5. Submittals.
6. Recommended spare parts lists.
7. Names and telephone numbers of major material suppliers and subcontractors.
8. System schematic drawings on 8-1/2" x 11" sheets.

1.13 RECORD DRAWINGS

A. Submit record drawings in compliance with Division 1.

B. Contractor shall submit to the Architect/Engineer, record drawings on electronic media or mylar which have been neatly marked to represent as-built conditions for all new electrical work.

C. The Contractor shall keep accurate note of all deviations from the construction documents and discrepancies in the underground concealed conditions and other items of construction on field drawings as they occur. The marked up field documents shall be available for review by the Architect, Engineer and Owner at their request.

1.14 INSTRUCTION OF OWNER PERSONNEL

A. Before final inspection, instruct Owner's designated personnel in operation, adjustment, and maintenance of electrical equipment and systems at agreed upon times. A minimum of 8 hours of formal instruction to Owner's personnel shall be provided for each building. Additional hours are specified in individual specification sections.

B. Use operation and maintenance manuals as basis for instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

C. In addition to individual equipment training provide overview of each electrical system. Utilize the as-built documents for this overview.

D. Prepare and insert additional data in operation and maintenance manual when need for such data becomes apparent during instruction, or as requested by Owner.

1.15 WARRANTY

A. Warranty: Comply with the requirements in Division 1 Specification Sections. Contractor shall warranty that the electrical installation is free from defects and agrees to replace or repair, to the Owner’s satisfaction, any part of this electrical installation which becomes defective within a period of one year (unless specified otherwise in other Division 26 sections) from the date of substantial completion following final acceptance, provided that such failure is due to defects in the equipment, material, workmanship or failure to follow the contract documents.

B. File with the Owner any and all warranties from the equipment manufacturers including the operating conditions and performance capacities they are based on.

1.16 USE OF EQUIPMENT

A. The use of any equipment, or any part thereof for purposes other than testing even with the Owner's consent, shall not be construed to be an acceptance of the work on the part of the Owner, nor be construed to obligate the Owner in any way to accept improper work or defective materials.

B. Do not use Owner's lamps for temporary lighting except as allowed and directed by the Owner. Equip lighting fixtures with new lamps when the project is turned over to the Owner.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

3.1 INSTALLATION OF EQUIPMENT

A. Install all equipment in strict accordance with all directions and recommendations furnished by the manufacturer. Where such directions are in conflict with the Drawings and Specifications, report such conflicts to the Architect/Engineer for resolution.

B. Device Location:

1. Allow for relocation prior to installation of wiring devices and other control devices, for example, receptacles, switches, fire alarm devices, and access control devices, within a 10-foot radius of indicated location without additional cost.

3.2 DEMOLITION WORK

A. All demolition of existing electrical equipment and materials will be done by this Contractor unless otherwise indicated. Include all items such as, but not limited to, electrical equipment, devices, lighting fixtures, conduit, and wiring called out on the Drawings and as necessary whether such items are actually indicated on the Drawings or not in order to accomplish the installation of the specified new work.

B. In general, demolition work is indicated on the Drawings. However, the Contractor shall visit the job site to determine the full extent and character of this work.

C. Unless specifically noted to the contrary, removed materials shall not be reused in the work. Salvaged materials that are to be reused shall be stored safe against damage and turned over to the appropriate trade for reuse. Salvaged materials of value that are not to be reused shall remain the property of the Owner unless such ownership is waived. Items on which the Owner waives ownership shall become the property of the Contractor, who shall remove and legally dispose of same, away from the premises.

D. Where equipment or fixtures are removed, outlets shall be properly blanked off, and conduits capped. After alterations are done, the entire installation shall present a "finished" look, as approved by the Architect/Engineer. The original function of the present electrical work to be modified shall not be changed unless required by the specific revisions to the system as specified or as indicated.

E. Reroute signal wires, lighting and power wiring as required to maintain service. Where walls and ceilings are to be removed as shown on the Drawings, the conduit is to be cut off by the Electrical Trades so that the abandoned conduit in these walls and ceilings may be removed with the walls and ceilings by the Architectural Trades. All dead-end conduit runs shall be plugged at the remaining line outlet boxes or at the panels.

F. Where new walls and/or floors are installed which interfere with existing outlets, devices, etc., the Electrical Trades shall adjust, extend and reconnect such items as required to maintain continuity of same.

G. All electrical work in altered and unaltered areas shall be run concealed wherever possible. Use of surface raceway or exposed conduits will be permitted only where approved by the Architect/Engineer.

H. Existing lighting shall be reused where indicated on plans. Reused fixtures shall be detergent cleaned, relamped and reconditioned suitable for satisfactory operation and appearance.

3.3 TEMPORARY SERVICES

A. Provide and remove upon completion of the project, in accordance with the general conditions and as described in Division 1, a complete temporary electrical and telephone service during construction.

3.4 CHASES AND RECESSES

A. Provided by the architectural trades, but the Contractor shall be responsible for their accurate location and size.

3.5 CUTTING, PATCHING AND DAMAGE TO OTHER WORK

A. Refer to General Conditions for requirements.

B. All cutting, patching and repair work shall be performed by the Contractor through approved, qualified subcontractors. Contractor shall include full cost of same in bid.

3.6 EXCAVATION AND BACKFILLING

A. Provide all excavation, trenching, tunneling, dewatering and backfilling required for the electrical work. Coordinate the work with other excavating and backfilling in the same area.

B. Where conduit is installed less than 2'6" below the surface of pavement, provide concrete encasement, 4" minimum coverage, all around or as shown on the electrical Drawings.

C. Backfill all excavations with well-tamped granular material. Backfill all excavations under wall footings with lean mix concrete up to underside of footings and extend concrete within excavation a minimum of four (4) feet each side of footing. Granular backfill shall be placed in layers not more than 8 inches in thickness, 95 percent compaction throughout with approved compaction equipment. Tamp, roll as required. Excavated material shall not be used.

D. Backfill outside building with granular material to a height 12 inches over top of pipe compacted to 95 percent compaction as specified above. Backfill remainder of excavation with unfrozen, excavated material in such a way to prevent settling.

3.7 EQUIPMENT CONNECTIONS

A. Make connections to equipment, motors, lighting fixtures, and other items included in the work in accordance with the approved shop Drawings and rough-in measurements furnished by the manufacturers of the particular equipment furnished. All additional connections not shown on the Drawings, but called out by the equipment manufacturer's shop Drawings shall be provided.

3.8 CLEANING

A. All debris shall be removed daily as required to maintain the work area in a neat, orderly condition.

B. Final cleanup shall include, but not be limited to, washing of fixture lenses or louvers, switchboards, substations, motor control centers, panels, etc. Fixture reflectors and lenses or louvers shall be left with no water marks or cleaning streaks.

3.9 PROTECTION AND HANDLING OF EQUIPMENT AND MATERIALS

A. Equipment and materials shall be protected from theft, injury or damage.

B. Protect conduit openings with temporary plugs or caps.

C. Provide adequate storage for all equipment and materials delivered to the job site. Location of the space will be designated by the Owner's representative or Architect/Engineer. Equipment set in place in unprotected areas must be provided with temporary protection.

3.10 EXTRA WORK

A. For any extra electrical work which may be proposed, this Contractor shall furnish to the General Contractor, an itemized breakdown of the estimated cost of the materials and labor required to complete this work. The Contractor shall proceed only after receiving a written order from the General Contractor establishing the agreed price and describing the work to be done.

B. Prior to any extra work which may be proposed, the Electrical Contractor shall submit unit prices (same prices for increase/decrease of work) for the following items: 1/2", 3/4", 1", 1-1/2" conduit; #12, #10, #8, #6, #2 wire; receptacle, I.G. receptacle, data box, fire alarm horn/strobe, fire alarm strobe, P.A. speaker, clock, or other devices which may be required for any proposed extra work.

3.11 DRAWINGS AND MEASUREMENTS

A. These Specifications and accompanying Drawings are intended to describe and provide for finished work. They are intended to be cooperative, and what is called for by either shall be as binding as if call for by both. The Contractor understands that the work herein described shall be complete in every detail.

B. The Drawings are not intended to be scaled for rough-in measurements nor to serve as Shop Drawings. Field measurements necessary for ordering materials and fitting the installation to the building construction and arrangement are the Contractor’s responsibility. The Contractor shall check latest Architectural Drawings and locate light switches from same where door swings are different from Electrical Drawings.

END OF SECTION 260010

SECTION 260500 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Electrical equipment coordination and installation.
2. Sleeves for raceways and cables.
3. Sleeve seals.
4. Common electrical and communications installation requirements.
5. Grout.

1.3 DEFINITIONS

A. ATS: Acceptance Testing Specifications.

B. EPDM: Ethylene-propylene-diene terpolymer rubber.

C. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

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

1.5 QUALITY ASSURANCE

A. Test Equipment Suitability and Calibration: Comply with NETA ATS, "Suitability of Test Equipment" and "Test Instrument Calibration."

1.6 COORDINATION

A. Coordinate arrangement, mounting, and support of electrical equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location and provide access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 8 Section "Access Doors and Frames."

D. Coordinate electrical testing of electrical, mechanical, and architectural items, so equipment and systems that are functionally interdependent are tested to demonstrate successful interoperability.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch (1.3- or 3.5-mm) thickness as indicated and of length to suit application.

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

2.3 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Metraflex Co.
d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
3. Pressure Plates: Stainless steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.4 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL AND COMMUNICATIONS INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL AND COMMUNICATIONS PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

C. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

G. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require a different clearance.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with Division 7 Section "Through-Penetration Firestop Systems."

K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior-Wall 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.

M. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

A. Install to seal underground, exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve.

3.4 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Through-Penetration Firestop Systems."

3.5 FIELD QUALITY CONTROL

A. Inspect installed sleeve and sleeve-seal installations and associated firestopping for damage and faulty work.

*END OF SECTION 260500

SECTION 260519 - CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

B. Related Sections include the following:

1. Division 26 Section "Control/Signal Transmission Media" for transmission media used for control and signal circuits.
2. Division 26 Section “Electrical Identification” for conductor and cable color-coding.

1.3 SUBMITTALS

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

B. Qualification Data: For testing agency.

C. Field Quality-Control Test Reports: From a qualified testing and inspecting agency engaged by Contractor.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

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

C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 CONDUCTORS AND CABLES

A. Manufacturers, Copper:

1. Triangle.
2. Royal.
3. Rome.
4. General Cable Corporation.
5. Southwire Company.
6. Draka USA.

B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.

C. Conductor Insulation Types: Type THHN-THWN and XHHW complying with NEMA WC 70.

D. Multiconductor Cable: Metal-clad cable, Type MC with ground wire.

2.3 CONNECTORS AND SPLICES

A. Manufacturers:

1. AFC Cable Systems, Inc.
2. AMP Incorporated/Tyco International.
3. Hubbell/Anderson.
4. O-Z/Gedney; EGS Electrical Group LLC.
5. 3M Company; Electrical Products Division.
6. T & B.
7. Burndy.
8. ILSCO.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

A. Service Entrance: Type XHHW, single conductors in raceway.

B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

C. Exposed Feeders #4/0 and larger: Type XHHW, single conductor in raceway.

D. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

E. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspaces: Type THHN-THWN, single conductors in raceway.

F. Exposed Branch Circuits, including in Crawlspaces: Type THHN-THWN, single conductors in raceway.

G. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway and metal-clad cable, Type MC, for branch circuit drops to devices and within partition walls. MC cable shall not be run in ceiling space in lengths greater than 6’-0”.

H. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.

I. Underground Feeders and Branch Circuits: XHHW single conductors in conduit.

J. Cord Drops and Portable Appliance Connections: Type SO, hard service cord.

K. Fire Alarm Circuits: Type THHN-THWN, in raceway or Power-limited, fire-protective, signaling circuit cable.

L. Class 1 Control Circuits: Type THHN-THWN, in raceway.

M. Class 2 Control Circuits: Type THHN-THWN, in raceway.

N. Critical Fire Control Circuits: Type RHH, single conductor in raceway. UL classified with two hour fire rating when installed in EMT conduit per the NEC and UL electrical circuit protective system (FHIT) #25 of the UL fire resistance directory. Support every 5’ on center.

O. Variable Speed Drives to Motors: Use VFD power cable manufactured by Southwire or Draka. Support every 5’ on center.

3.2 INSTALLATION

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables according to Division 26 Section "Basic Electrical Materials and Methods."

F. Seal around cables penetrating fire-rated elements according to Division 7 Section "Through-Penetration Firestop Systems."

G. Each feeder shall be of the same conductor and insulation material (phase, neutral, and parallel).

H. Identify and color-code conductors and cables according to Division 26 Section "Electrical Identification."

I. All wiring shall be installed in conduit or approved raceway. All raceways shall be provided with a ground conductor unless noted otherwise on the Contract Documents.

J. Use conductor not smaller than 12 AWG for power and lighting circuits. Unless indicated otherwise, all circuits shall be 2#12, 1#12G, ¾"C. Do not share neutrals.

K. Use conductor not smaller than 14 AWG for control circuits, provided by Electrical Contractor.

L. Support communication cables above accessible ceiling, using spring metal clips or plastic cable ties to support cables from structure. Do not rest cable on ceiling panels.

M. Use suitable cable fittings and connectors.

N. Neatly train and lace wiring inside boxes, equipment, and panelboards.

O. Clean conductor surfaces before installing lugs and connectors.

P. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

Q. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and larger.

R. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

S. Branch circuits may be combined up to 6 circuits in a homerun conduit. Electrical Contractor shall be responsible for derating of conductors as required by N.E.C. Do not share neutrals.

T. Use piercing connector with insulating covers for conductor splices and taps, 8 AWG and larger.

U. Where the armor of type AC cable terminates, a fitting shall be provided to protect the wiring from abrasion. An approved bushing shall be provided between the conductors and the armor.

V. Type MC cable shall be supported and secured at intervals not exceeding 4'-0".

W. Fittings used for MC cable shall be identified for such use.

X. AC/MC cable shall not be used for home runs to receptacle or distribution panels.

Y. Between support, hangers and termination no more than 3" deflection from the bottom of the cable to a horizontal line between the support/hanger or termination.

3.3 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.4 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality control tests in accordance with Division 26 section “Electrical Testing”

1. Description: Test all feeders rated 100 A and above.
2. Visual and Mechanical Inspection

    a. Inspect cables for physical damage and proper connection in accordance with the one line diagram.
    b. Test cable mechanical connections with an infrared survey.
    c. Check cable color-coding against project Specifications and N.E.C. requirements.

3. Electrical Tests

    a. Perform insulation resistance test on each conductor with respect to ground and adjacent conductors. Applied potential to be 1000 volts dc for 1 minute.
    b. Perform continuity test to insure proper cable connection.

4. Test Values

    a. Minimum insulation resistance values shall be not less than fifty mega-ohms.

B. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

B. Related Sections include the following:

1. Division 26 Section “Electrical General Requirements”.
2. Division 26 Section “Conductors and Cables”.

1.3 REFERENCES

A. ASTM B 3: Specification for Soft or Annealed Copper Wire.

B. ASTM B 8: Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard or Soft.

C. ASTM B 33: Specification for Tinned Soft or Annealed Copper Wire for Electrical Purposes.

D. ASTM B 187: Specification for Copper, Bus Bar, Rod, and Shapes and General Purpose Rod, Bar, and Shapes.

E. IEEE 81: Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.

F. IEEE 142: Grounding of Industrial and Commercial Power Systems.

G. IEEE 1100 – 1992: Recommended Practice for Powering and Grounding Sensitive Electronic Equipment.

H. IEEE C2: National Electrical Safety Code.

I. NETA MTS – 2001: Maintenance Testing Specifications.

J. NFPA 70: National Electrical Code.

K. NFPA 70B: Recommended Practice for Electrical Equipment Maintenance.

L. NFPA 780: Lightning Protection Code.

M. TIA/EIA 607: Commercial Building Grounding and Bonding Requirements Standard.

N. UL 96: Lightning Protection Components.

O. UL 467: Grounding and Bonding Equipment.

P. UL 486 A: Wire Connectors and Soldering Lugs for Use with Copper Conductors.

Q. UL 486B: Wire Connectors for Use with Aluminum Conductors.

1.4 SUBMITTALS

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

B. Product Data: For the following:

1. Ground rods.

C. Qualification Data: For firms and persons specified in "Quality Assurance" Article.

D. Field Test Reports: Submit written test reports to include the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
4. Indicate overall system resistance to ground.
5. Indicate overall Telecommunications system resistance to ground.

1.5 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 26 “Electrical General Requirements”.

B. Accurately record actual locations of grounding electrodes and connections to building steel.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Refer to specification section “Electrical Testing.”

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

1. Comply with UL 467.

C. Comply with NFPA 70; for overhead-line construction and medium-voltage underground construction, comply with IEEE C2.

D. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.

E. Comply with ANSI/TIA/EIA-607 “Standard for Commercial Building Grounding and Bonding Requirements for Telecommunications”.

F. Comply with ANSI/IEEE 1100 -1992 “Powering and Grounding Sensitive Electronic Equipment”.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Grounding Conductors and Cables:

a. Refer to Division 26 Section “Conductors and Cables”.

2. Grounding Rods:

a. American Electric-Blackburn.
b. Apache Grounding/Erico Inc.
c. Chance/Hubbell.

3. Mechanical Connectors:

a. American Electric-Blackburn.
b. Burndy.
c. Chance/Hubbell.

4. Exothermic Connections:

a. Cadweld.

2.2 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Division 26 Section "Conductors and Cables."

B. Material: Aluminum, copper-clad aluminum, and copper.

C. Equipment Grounding Conductors: Insulated with green-colored insulation.

D. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.

E. Grounding Electrode Conductors: Stranded cable.

F. Underground Conductors: Bare, tinned, stranded, copper unless otherwise indicated.

G. Bare Copper Conductors: Comply with the following:

1. Solid Conductors: ASTM B 3.
2. Assembly of Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.

H. Copper Bonding Conductors: As follows:

1. Bonding Conductor: Stranded copper conductor; size per the NEC.
2. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; size per the NEC.
3. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; size per the NEC.

I. Aluminum Bonding Conductors: As follows:

1. Bonding Conductor: Stranded aluminum conductor; size per the NEC.
2. Bonding Jumper: Aluminum tape, braided bare aluminum conductors, terminated with aluminum ferrules; size per the NEC.

J. Ground Conductor and Conductor Protector for Wood Poles: As follows:

1. No. 4 AWG minimum, soft-drawn copper conductor.
2. Conductor Protector: Half-round PVC or wood molding. If wood, use pressure-treated fir, or cypress or cedar.

K. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

L. Telecommunications Main Grounding Busbar (TMGB)

1. 48” (min) x 4” x ¼” tin plated, copper busbar with three rows of ¼ x 20 tapped holes 3” on center.

M. Telecommunications Grounding Busbar (TGB)

1. 12” (min) x 2” x ¼” tin plated, copper busbar with two rows of ¼ x 20 tapped holes 3” on center.

N. Telecommunications Bonding Backbone (TBB)

1. Minimum No. 2 AWG insulated stranded copper.

O. Telecommunications Bonding Conductors

1. Minimum No. 6 AWG insulated stranded copper.

2.3 CONNECTOR PRODUCTS

A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.

C. Welded Connectors: Exothermic-welded type, in kit form, and selected for the specific application per manufacturer's written instructions.

D. Compression-Type Connectors: Pure, wrought copper, per ASTM B187.

2.4 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel.

1. Size: 5/8 (16 mm) in diameter.
2. Length: 120 inches (3000 mm).

B. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Provide handholes as specified in Division 2 Section "Underground Ducts and Utility Structures."

PART 3 - EXECUTION

3.1 EQUIPMENT GROUNDING

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.

C. Underground Grounding Conductors: No. 2/0 AWG minimum. Bury at least 24 inches (600 mm) below grade or bury 12 inches (300 mm) above duct bank when installed as part of the duct bank.

D. In raceways, use insulated equipment grounding conductors.

E. Install equipment grounding conductors in all feeders and circuits. Terminate each end on suitable lugs, bus or bushing.

F. Busway Supply Circuits: Install insulated equipment grounding conductor from the grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.

G. Computer Outlet Circuits: Install insulated equipment grounding conductor in branch-circuit runs from computer-area power panels or power-distribution units.

H. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at the isolated equipment ground bus of the source panelboard unless otherwise indicated.

I. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate equipment grounding conductor. Isolate equipment grounding conductor from raceway and from panelboard grounding terminals. Terminate at the isolated ground bus in the circuit’s overcurrent device enclosure unless otherwise indicated.

J. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.

K. Air-Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.

L. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate equipment grounding conductor to each electric water heater, heat-tracing, and antifrost heating cable. Bond conductor to heater units, piping, connected equipment, and components.

M. Metal Poles Supporting Outdoor Lighting Fixtures: Provide a grounding electrode in addition to installing a separate equipment grounding conductor with supply branch-circuit conductors.

N. Verify specific equipment grounding requirements with the manufacturer’s recommendations.

3.2 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells. Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Equipment Grounding Conductor Terminations.

D. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and larger.

E. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

F. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

G. Connections at Test Wells: Use compression-type connectors on conductors and make bolted- and clamped-type connections between conductors and ground rods.

H. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

I. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

J. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.3 INSTALLATION

A. Equipotential Ground: Interconnect grounding electrodes to form one, electrically continuous, equipotential grounding electrode system Grounding electrodes to be interconnected include:

1. Ground rods.
2. Counterpoise ground.
3. Ufer ground.
4. Lightning protection system.
5. Metal water service pipe.
6. Plate electrode.

B. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.

1. Verify that final backfill and compaction has been complete before driving ground rods.
2. Drive ground rods until tops are 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated.
3. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.

C. Counterpoise Ground:

1. Ground the steel framework of the building with a driven ground rod at the base of every corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.
2. Provide a grounding conductor (counterpoise), electrically connected to each ground rod and to each steel column, extending around the perimeter of the building. Use conductors not less than No. 2/0 AWG for counterpoise and for tap to building steel. Bury counterpoise not less than 18 inches (450 mm) below grade and 24 inches (600 mm) from building foundation.

D. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70, Paragraph 250-81(c):

1. Provide a minimum of 20 feet (6 m) of bare copper conductor not smaller than No. 4 AWG. If concrete foundation is less than 20 feet (6 m) long, coil excess conductor within the base of the foundation.
2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts.
3. Extend grounding conductor below grade and connect to building grounding grid or to a grounding electrode external to concrete.

E. Common Ground Bonding with Lightning Protection System: Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor. Install in conduit where routed above grade.

F. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage. Install in conduit where routed above grade.

G. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

H. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a

dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

I. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.

J. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.

K. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.

L. Separately Derived AC Power Systems: Ground separately-derived ac power system neutrals including distribution transformers to grounding electrodes per NFPA 70.

M. Packaged Engine Generator: Solidly ground the packaged engine generator neutral to the normal power source neutral. Do not ground the generator neutral to a separate grounding electrode.

N. Install one test well for each service at the ground rod electrically closest to the service entrance. Set top of well flush with finished grade or floor.

O. Grounding Bus:

1. Install grounding bus in the locations listed below and elsewhere as indicated:

   a. Electrical equipment rooms.
   b. Telephone equipment rooms.
   c. Rooms housing service equipment.

2. Use insulated spacer; space 1 inch (25.4 mm) from wall and support from wall 6 inches (150 mm) above finished floor, unless otherwise indicated.

P. Equipment Grounding: Provide a permanent and continuous bonding of conductor enclosures, equipment frames, power distribution equipment ground busses, cable trays, metallic raceways, and other non-current carrying metallic parts of the electrical system.

Q. Access Floor Pedestal Ground: Ground access floor pedestals where indicated.

1. Provide access floor pedestal ground plate where indicated.

   a. Provide ½ inch (12 mm) thick x 4 inches (102 mm) wide x 12 inches (305 mm) long, soft copper bar, bolted construction with minimum six 3/8 inch (10 mm) diameter drilled holes 1 ½ inches (38 mm) on center.
   b. Provide cadmium plated bolts, nuts and screws.
   c. Mount plate on ¾ inch (19 mm) plywood with 2 inch (50 mm) wood spacers.

2. Provide No. 2 AWG insulated ground conductor from pedestal to pedestal ground plate or building steel.
3. Provide No. 2 AWG insulated ground conductor from pedestal ground plate to building steel.
4. Tie wrap ground conductor as close to concrete floor as possible at every other pedestal.
5. Clean all pedestals prior to welding.

R. Access Floor Ground Grid: Install ground grid under access floors where indicated.

1. Construct grid of No. 2 AWG bare copper wire installed on 24 inch centers both ways.
2. Bond each access floor pedestal to grid.

S. Bond together each metallic raceway, pipe, duct and other metal object entering space under access floors. Bond to underfloor ground grid. Bond to pedestal ground plate or Bond to building steel. Use No. 2 AWG bare copper conductor.

T. Provide grounding and bonding in patient care areas to meet requirements of NFPA 99 and ANSI/NFPA 70.

U. Bond together metal siding not attached to grounded structure; bond to ground.

V. Pool Structures: Provide a common bonding grid with a solid copper conductor not smaller than No. 8 AWG. Bond together the following:

1. All metallic parts of the pool or fountain structure, including reinforcing steel of the pool or fountain shell, coping stones, and deck.
2. All forming shells and mounting brackets of no-niche luminaries.
3. All metal fittings within or attached to the pool or fountain structure that are greater than 4 inches (100 mm) in any dimension and penetrate the pool or fountain structure more than one inch (25 mm).
4. Metal parts of electrical equipment associated with the pool or fountain water circulating system, including pump motors and metal parts of equipment associated with pool covers, including electric motors.
5. Metal sheathed cables and raceways, metal piping, and all fixed metal parts including fences, awnings, door and window frames, except those separated from the pool or fountain by a permanent barrier shall be bonded that are within the following distances of the pool:

    a. Within 5 feet (1.5 m) horizontally of the inside walls of the pool.
    b. Within 12 feet (3.7 m) measured vertically above the maximum water level of the pool, or any observation stands, towers, or platforms, or any diving structure.

W. Provide a flexible braid bonding jumper at each set of columns at expansion joints.

3.4 UNDERGROUND DISTRIBUTION SYSTEM GROUNDING

A. Manholes and Handholes: Install a driven ground rod close to wall, inside manhole, and set rod depth so 4 inches (100 mm) will extend above finished floor. If necessary, install ground rod before manhole is placed and provide a No. 1/0 AWG conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive tape or heat-shrunk insulating sleeve from 2 inches (50 mm) above to 6 inches (150 mm) below concrete. Seal floor opening with waterproof, nonshrink grout.

B. Connections to Manhole Components: Connect all exposed-metal parts, such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.

C. Pad-Mounted Transformers and Switches: Install two ground rods and counterpoise circling pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with transformers/substations by connecting them to underground cable and grounding electrodes. Use not less than a No. 2 AWG conductor for counterpoise and for taps to equipment ground pad. Bury counterpoise not less than 18 inches (450 mm) below grade and 6 inches (150 mm) from the foundation.

3.5 TELECOMMUNICATIONS GROUNDING

A. Telecommunications Grounding System: The telecommunications grounding system shall consist of:

1. Telecommunications Main Grounding Busbar (TMGB) located in the main telecommunications room near the telecommunications service entrance. Bond to the main building electrical grounding electrode system via a No. 3/0 AWG copper ground conductor.
2. A Telecommunications Grounding Busbar (TGB) in each telecommunications room, cabinets, etc.
3. A Telecommunications Bonding Backbone (TBB) tying together the TMGB and each TGB.
4. Bonding of all equipment racks, raceways, non-current carrying metallic equipment and surge protection devices within the telecommunications room to the TGB's or TMGB using approved bonding conductors. Each piece of equipment shall be bonded individually directly to the ground bus.

B. All bonding connections shall be installed at an accessible location for inspection and maintenance.

C. All telecommunications bonding connections shall be of an approved mechanical type connection. Do not use exothermic welds unless specifically indicated on the Drawings.

D. The physical routing shall, in general, follow the same path as the backbone cable system.

E. Bond each TGB directly to the building steel with a No. 6 AWG conductor.

F. Do not use TGB's as a power system ground connection unless specifically noted on the Drawings.

G. All bonding connectors and conductors shall be UL listed for the purpose intended.

H. Mount TMGB and TGB bus to backboard or wall using 2" standoff insulators.

I. Individually bond each piece of non-current carrying metallic equipment in the Telecommunications Room to the TGB.

J. Install continuous cable from the TMGB to the furthest TGB. Bond all TGB's to TBB with bare No. 6 AWG copper ground conductor and T-tap grounding hardware.

3.6 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality control tests in accordance with Division 26 section "Electrical Testing"

1. Inspect grounding and bonding system conductors and connections for tightness and proper installation and for compliance with the Drawings and Specifications.
2. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.

    a. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal.
    b. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    c. Perform tests, by the fall-of-potential method according to IEEE 81. Instrumentation utilized shall be as defined in Section 12 of IEEE 81 and shall be specifically designed for ground impedance testing. Provide sufficient spacing so that curves flatten in the 62% area of the distance between the item under test and the current electrode.
    d. Perform ground-impedance measurements utilizing either the intersecting curves method of the slope method. (Ref. Nos. 40 and 41 in IEEE Std. 81).
    e. Equipment Grounds: Utilize two-point method of IEEE 81. Measure between equipment ground being testing and known low-impedance grounding electrode or system.

3. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

    a. Equipment Rated 500 kVA and Less: 10 ohms.
    b. Equipment Rated 500 to 1000 kVA: 5 ohms.
    c. Equipment Rated More Than 1000 kVA: 3 ohms.
    d. Substations and Pad-Mounted Switching Equipment: 5 ohms.
    e. Manhole Grounds: 10 ohms.
    f. The telecommunications grounding system shall have a maximum resistance of 1 ohm as measured from the TMGB ground to earth ground.

4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Steel slotted support systems.
2. Nonmetallic slotted support systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Steel slotted channel systems. Include Product Data for components.
3. Nonmetallic slotted channel systems. Include Product Data for components.
4. Equipment supports.

C. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

1.7 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7 Section "Roof Accessories."

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allied Tube & Conduit.
b. Cooper B-Line, Inc.; a division of Cooper Industries.
c. ERICO International Corporation.
d. GS Metals Corp.
e. Thomas & Betts Corporation.

f. Unistrut; Tyco International, Ltd.
g. Wesanco, Inc.

3. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
4. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
5. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
6. Channel Dimensions: Selected for applicable load criteria.

B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- (14-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c., in at least 1 surface.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allied Tube & Conduit.
b. Cooper B-Line, Inc.; a division of Cooper Industries.
c. Fabco Plastics Wholesale Limited.
d. Seasafe, Inc.

3. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
4. Fitting and Accessory Materials: Same as channels and angles.
5. Rated Strength: Selected to suit applicable load criteria.

C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

D. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Hilti Inc.
2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
3) MKT Fastening, LLC.
4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel or stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

    a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Cooper B-Line, Inc.; a division of Cooper Industries.
        2) Empire Tool and Manufacturing Co., Inc.
        3) Hilti Inc.
        4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
        5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Division 5 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

    1. Secure raceways and cables to these supports with single-bolt conduit clamps using spring friction action for retention in support channel.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

E. Support all electrical items independently of supports provided by the other trades.

F. Support conduits and boxes using steel conduit straps or 1/4-inch minimum diameter threaded rod hangers. Suspended ceiling hangers or hanger wire shall not be used (except to support flexible metallic conduit and manufactured wiring systems).

G. Support cable trays with support brackets or 3/8" diameter minimum threaded rod hangers at intervals not exceeding 8'-0" for straight runs. Additional supports shall be provided at tray fittings.

H. Hangers shall be of sufficient strength that their deflection at mid span does not exceed 1/240 of the hanger span length after the cables are installed.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

E. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.

F. Obtain permission from Architect/Engineer before using powder-actuated anchors.

G. Obtain permission from Architect/Engineer before drilling or cutting structural members.

H. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

I. Install surface-mounted cabinets and panelboards with minimum of four anchors.

J. In wet and damp locations use steel channel supports to stand cabinets and panelboards one inch (25 mm) off wall.

K. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

L. The Contractor shall replace all supports and channels that sag, twist, and/or show signs of not providing proper structural support, to the equipment, it is intended for, as determined by the Owner and Architect/Engineer. All costs associated with replacing supports and steel channels shall be incurred by the Contractor.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Division 5 Section "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Provide concrete bases for all floor mounted electrical equipment.

B. Provide concrete bases for all exterior, grade level electrical equipment, and where indicated.

C. Base/Pad Construction:

1. Construct per manufacturer’s recommendations for particular equipment, including suggested piers and dowel rods.
2. Construct concrete bases for primary and secondary power distribution equipment per requirements of the electrical utility, where submitted for its review.

D. Anchor equipment to base per both supports and equipment manufacturer’s instructions.

E. Coordinate conduit openings and sleeve locations in base with requirements of equipment to be supported.

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around full perimeter of the base.
2. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

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

END OF SECTION 260529

SECTION 260533 - RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Related Sections include the following:

1. Division 26 Section, “Basic Electrical Materials and Methods” for exterior ductbanks, manholes, and underground utility construction.
2. Division 7 Section, "Through-Penetration Firestop Systems"
3. Division 26 Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings, and for access floor boxes and service poles.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. ENT: Electrical nonmetallic tubing.

C. FMC: Flexible metal conduit.

D. IMC: Intermediate metal conduit.

E. LFMC: Liquidtight flexible metal conduit.

F. LFNC: Liquidtight flexible nonmetallic conduit.

G. RNC: Rigid nonmetallic conduit.

H. PVC: Polyvinyl Chloride.

I. HDPE: High Density Polyethylene.

1.4 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Manufacturer Seismic Qualification Certification: Submit certification that enclosures, cabinets, accessories, and components will withstand seismic forces defined in Division [16][26] Section "Electrical Supports and Seismic Restraints." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

    a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
    b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

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.

1.5 QUALITY ASSURANCE

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

B. Comply with NFPA 70.

C. All work in natatorium/pool area shall be in accordance with N.E.C. article 680, “Swimming Pools, Fountains, and Similar Installations.”

1.6 COORDINATION

A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 METAL CONDUIT AND TUBING

A. Manufacturers:

1. AFC Cable Systems, Inc.
2. Alflex Inc.
3. Allied Tube Triangle Century.
4. Anamet Electrical, Inc.; Anaconda Metal Hose.
5. International Metal Hose.
6. Electri-Flex Co
7. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
8. LTV Steel Tubular Products Company – Manhattan/CDT/Cole-Flex.
9. Maverick.
10. O-Z Gedney; unit of General Signal.
11. Wheatland.

B. Rigid Steel Conduit: ANSI C80.1.

C. IMC: ANSI C80.6.

D. EMT and Fittings: ANSI C80.3.

1. Fittings: Steel set-screw type.

E. LFMC: Flexible steel conduit with PVC jacket.

F. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

2.3 FIRE ALARM EMT

A. Manufacturers:

1. Allied Tube Triangle Century.

B. EMT conduit with bright red topcoat; Fire Alarm EMT.

C. EMT and Fittings: ANSI C80.3.

2.4 NONMETALLIC CONDUIT AND TUBING

A. Manufacturers:

1. American International.

2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corp.
4. Cantex Inc.
5. Certainteed Corp.; Pipe and Plastics Group.
6. Condux International.
7. ElecSys, Inc.
8. Electri-Flex Co.
9. Integral.
10. Kor-Kap.
11. Lamson and Sessions: Carlon Electrical Products.
12. Manhattan/CDT/Cole-Flex.
13. RACO; Division of Hubbell, Inc.
14. Scepter.
15. Spiralduct, Inc./AFC Cable Systems, Inc.
16. Thomas & Betts Corporation.

B. ENT: NEMA TC 13.

C. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.

D. ENT and RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.

E. LFNC: UL 1660.

F. HDPE: UL 651, ASTM D 3350, ASTM D 1248 Schedule 40.

2.5 METAL WIREWAYS

A. Manufacturers:

1. Hoffman.
2. Square D.

B. Material and Construction: Sheet metal sized and shaped as indicated, NEMA 1.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

E. Wireway Covers: Hinged type.

F. Finish: Manufacturer's standard enamel finish.

2.6 NONMETALLIC WIREWAYS

A. Manufacturers:

1. Hoffman.
2. Lamson & Sessions; Carlon Electrical Products.

B. Description: Fiberglass polyester, extruded and fabricated to size and shape indicated, with no holes or knockouts. Cover is gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections are flanged, with stainless-steel screws and oil-resistant gaskets.

C. Description: PVC plastic, extruded and fabricated to size and shape indicated, with snap-on cover and mechanically coupled connections with plastic fasteners.

D. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

E. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

2.7 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers. **Shall be white finish.**

1. Manufacturers:

a. Airey-Thompson Sentinel Lighting: Wiremold Company (The).
b. Panduit.
c. Walker Systems, Inc.; Wiremold Company (The).
d. Wiremold Company (The); Electrical Sales Division.

B. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

2.8 BOXES, ENCLOSURES, AND CABINETS

A. Sheet Metal Outlet and Device Boxes: NEMA OS 1. Shall be used within walls or ceiling.

B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover. Shall be used in all exposed, non-recessed, locations.

C. Nonmetallic Outlet and Device Boxes: NEMA OS 2. Shall be used in corrosive areas.

D. Floor Boxes: Cast metal, fully adjustable, rectangular.

E. Floor Boxes: Nonmetallic, nonadjustable, round.

F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

G. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover. Shall be used in areas exposed to water.

H. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

I. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

2.9 FACTORY FINISHES

A. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard prime-coat finish ready for field painting.

B. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard paint applied to factory-assembled surface raceways, enclosures, and cabinets before shipping.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors Applications:

1. Exposed: Rigid steel or IMC.
2. Concealed: Rigid steel or IMC.
3. Underground, Single Run: RNC.
4. Underground, Grouped: RNC.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. Boxes and Enclosures: NEMA 250, Type 3R.

B. Indoor Applications:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: Rigid steel conduit up to 10’-0” above finished floor. Includes raceways in the following locations:

    a. Loading dock.
    b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    c. Mechanical rooms.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: IMC.
7. Raceways Embedded in Concrete Above Grade: EMT or Rigid Steel.
8. Raceways for Optical Fiber or Communications Cable in Spaces Used for Environmental Air: EMT.
9. Raceways for Optical Fiber or Communications Cable Risers in Vertical Shafts: EMT.
10. Raceways for Concealed General Purpose Distribution of Optical Fiber or Communications Cable: EMT.
11. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.

C. Minimum Raceway Size: 1/2-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
2. Rigid Steel Conduits: Use only fittings approved for use with that material.

E. Do not install aluminum conduits embedded in or in contact with concrete.

3.2 INSTALLATION

A. Install conduit in accordance with NECA “National Electrical Installation Standards”.

B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."

E. Install temporary closures to prevent foreign matter from entering raceways.

F. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.

G. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.

H. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

1. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.

I. Raceways Embedded in Slabs:

1. Raceways embedded in slabs shall be limited to above grade concrete decks. Embedded conduit shall be limited to servicing floor boxes and equipment located in open spaces away from accessible walls.
2. Install in middle 1/3 of slab thickness where practical and leave at least 2 inches (50 mm) of concrete cover.
3. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
4. Space raceways laterally to prevent voids in concrete.
5. Run conduit larger than 1-inch trade size (DN 27) parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
6. Conduits shall run flat. Do not allow conduits to cross.

J. Raceways installed under slab on grade: Use Schedule 40 nonmetallic conduit with rigid steel conduit sweeps, route conduits a minimum of 6” below bottom of slab.

K. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.

1. Run parallel or banked raceways together on common supports.
2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

L. Join raceways with fittings designed and approved for that purpose and make joints tight.

1. Use insulating bushings to protect conductors.

M. Tighten set screws of threadless fittings with suitable tools.

N. Terminations:

1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.

O. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.

P. Provide pull string and 25% spare capacity in every branch circuit conduit.

Q. Telephone and Signal System Raceways, 2-Inch Trade Size (DN 53) and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet (45 m) and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

1. Electrical condulet (LB's) are not permitted.
2. Conduits shall have no more than two 90 degree bends between pull points or pull boxes.
3. Conduits shall contain no continuous sections longer than 100 ft. without a pull point/box.
4. The bend radius of conduit must be at least 6 times the internal diameter for a conduit 2 inches or less and a radius of 10 times the diameter for a conduit greater than two inches.
5. All conduit ends shall have an insulated bushing.

R. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where otherwise required by NFPA 70.

S. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches (150 mm) above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.

T. Flexible Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.

U. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.

V. Set floor boxes level and flush with finished floor surface.

W. Set floor boxes level. Trim after installation to fit flush with finished floor surface.

X. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

Y. Do not route feeders across roof.

Z. Provide a pull box (a handhole for outdoor applications) for each conduit run that exceeds 250 feet. Provide two pull boxes (handholes for outdoor applications) for runs that exceed 500 feet.

AA. Conduit run in natatorium/pool area shall be Rigid Steel or EMT with compression fittings, and painted by the electrical contractor (corrosion treatment paint).

BB. Provide bonding of the pool structure/equipment per N.E.C. article 680-22. Coordinate with the pool contractor.

CC. Route conduits in finished areas with exposed ceilings at underside of structural deck or as high as possible.

DD. Conduits that route through, to, or from a hazardous classified space (Class I or II) shall have proper seal offs when exiting or entering the hazardous classified space.

EE. Outlet boxes within hazardous locations shall be of the proper class and division as noted in the N.E.C.

FF. Offset outlet boxes on opposite sides of common walls to prevent sound transmission between adjoining rooms.

GG. Firestop raceways passing through rated walls and floors in accordance with Division 07 specifications. See architectural drawings for locations of rated assemblies.

3.3 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.4 CLEANING

A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

END OF SECTION 260533

SECTION 260553 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Identification for raceway and metal-clad cable.
2. Identification for conductors and communication and control cable.
3. Underground-line warning tape.
4. Warning labels and signs.
5. Instruction signs.
6. Equipment identification labels.
7. Miscellaneous identification products.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

C. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and ANSI C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.145.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 RACEWAY AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Color for Printed Legend:

1. Power Circuits: Black letters on an orange field.
2. Legend: Indicate system or service and voltage, if applicable.

C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

D. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

F. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches wide; compounded for outdoor use.

2.2 CONDUCTOR, COMMUNICATION AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

C. Aluminum Wraparound Marker Labels: Cut from 0.014-inch- thick aluminum sheet, with stamped, embossed, or scribed legend, and fitted with tabs and matching slots for permanently securing around wire or cable jacket or around groups of conductors.

D. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking nylon tie fastener.

E. Write-On Tags: Polyester tag, 0.010 inch thick, with corrosion-resistant grommet and polyester or nylon tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.3 UNDERGROUND-LINE WARNING TAPE

A. Description: Permanent, bright-colored, continuous-printed, polyethylene tape.

1. Not less than 6 inches wide by 4 mils thick.
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core.
4. Printed legend shall indicate type of underground line.

2.4 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.

C. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 7 by 10 inches.

D. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 10 by 14 inches.

E. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

2.5 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.6 EQUIPMENT IDENTIFICATION LABELS

A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. Black letters on a white background. Minimum letter height shall be 3/8 inch.

B. Outdoor Equipment Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.

1. Minimum Width: 3/16 inch.
2. Tensile Strength: 50 lb, minimum.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black, except where used for color-coding.

B. Paint: Paint materials and application requirements are specified in Division 9 painting Sections.

C. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

2.8 WIRING DEVICE IDENTIFICATION

A. Description: Self adhesive label with black upper case letters on clear polyester label, font size 7.

PART 3 - EXECUTION

3.1 APPLICATION

A. Raceways and Duct Banks More Than 600 V Concealed within Buildings: 4-inch- wide black stripes on 10-inch centers over orange background that extends full length of raceway or duct and is 12 inches wide. Stencil legend "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- high black letters on 20-inch centers. Stop stripes at legends. Apply to the following finished surfaces:

1. Floor surface directly above conduits running beneath and within 12 inches of a floor that is in contact with earth or is framed above unexcavated space.
2. Wall surfaces directly external to raceways concealed within wall.
3. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in the building, or concealed above suspended ceilings.

B. Accessible Raceways and Metal-Clad Cables More Than 600 V: Identify with "DANGER-HIGH VOLTAGE" in black letters at least 2 inches high, with self-adhesive vinyl labels. Repeat legend at 10-foot maximum intervals.

C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 400 A: Identify with orange self-adhesive vinyl label.

D. Accessible Raceways and Cables of Auxiliary Systems: Identify the following systems with color-coded, self-adhesive vinyl tape applied in bands:

1. Fire Alarm System: Red.
2. Fire-Suppression Supervisory and Control System: Red and yellow.

3. Combined Fire Alarm and Security System: Red and blue.
4. Security System: Blue and yellow.
5. Mechanical and Electrical Supervisory System: Green and blue.
6. Telecommunication System: Green and yellow.
7. Control Wiring: Green and red.

E. Power-Circuit Conductor Identification: For primary conductors No. 1/0 AWG and larger in vaults, pull and junction boxes, manholes, and handholes use metal tags. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.

F. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use color-coding conductor tape. Identify each ungrounded conductor according to source and circuit number as indicated on Drawings. Identify control circuits by control wire number as indicated on shop drawings.

G. Branch-Circuit Conductor Identification: Mark junction box covers in indelible ink with the panel and breaker numbers of other circuits contained within.

H. Conductor Identification: Locate at each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection or termination point.

I. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.

J. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable. Install underground-line warning tape for both direct-buried cables and cables in raceway.

K. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply baked-enamel warning signs. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.

1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:

   a. Power transfer switches.
   b. Controls with external control power connections.

2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.

L. Provide a 3" by 5" yellow "Warning Arc Flash Hazard" label on the outside of panels in 'occupant areas' - Brady Type 99454 or equivalent from another manufacturer. Center the label horizontally and vertically on outside of door.

M. Provide a 4" by 6"'red "Danger Arc Flash and Shock Hazard" label on the outside of panels in areas open only to 'qualified personnel', and on the inside panel door of panels in 'occupant areas' - Brady Type 99459. Center label on gutter areas of distribution panels, centered above or below the directory of panels, and otherwise centered in other applications. In all cases, label will be no lower than 48" or above 84" AFF

N. Instruction Signs:

1. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
2. Emergency Operating Instructions: Install instruction signs with white legend on a red background with minimum 3/8-inch- high letters for emergency instructions at equipment used for power transfer or load shedding.

O. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
1. Labeling Instructions:

a. Indoor Equipment: Mechanically secured, Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where 2 lines of text are required, use labels 2 inches (50 mm) high. Labels shall be 2 1/2” high x 4 1/2” wide. Provide 3 lines of text. Line one shall have 1/2’” letters spaced 1/2” down from top of label. Lines 2 and 3 shall have 1/4” letters. Each line shall be spaced 1/4” apart.
b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.

2. Equipment to Be Labeled:

a. Panelboards, electrical cabinets, and enclosures.
b. Access doors and panels for concealed electrical items.
c. Electrical switchgear and switchboards.
d. Transformers.
e. Emergency system boxes and enclosures.
f. Motor-control centers.
g. Disconnect switches.
h. Enclosed circuit breakers.
i. Motor starters.
j. Push-button stations.
k. Power transfer equipment.
l. Contactors.
m. Remote-controlled switches, dimmer modules, and control devices.
n. Intercommunication and call system master and staff stations.
o. Fire-alarm control panel and annunciators.
p. Breakers at distribution panels.

P. Wiring Device Identification Labels: On each faceplate install circuit designation label that is consistent with panelboard directories, and as-built plan drawings. Apply labels to receptacle faceplates centered below bottom outlet. Apply labels to toggle switch faceplates on backside.

3.2 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location:

1. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
2. Conduit Markers: Provide identification for each power conduit two inches or larger.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

E. System Identification Color Banding for Raceways and Cables: Each color band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

F. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service, feeder, and branch-circuit conductors.

1. Color shall be factory applied or, for sizes larger than No. 10 AWG if authorities having jurisdiction permit, field applied.
2. Colors for 208/120-V Circuits:

    a. Phase A: Black.
    b. Phase B: Red.
    c. Phase C: Blue.
    d. Neutral: White.
    e. Ground: Green.

3. Colors for 240/120-V Circuits:

    a. Phase A: Black.
    b. Phase B: Orange.
    c. Phase C: Blue.
    d. Neutral: White.
    e. Ground: Green.

4. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

G. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

H. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.

I. Label information arrangement for 3 lines of text.

1. Line one shall describe the panel or equipment. Line one example: “DP-XX,” RP-XX,” “T-XX,” “EF-XX,” etc.
2. Line two shall describe the first disconnecting means feeding this panel or equipment. Line two example: “Fed from DP-XX,” “Fed from RP-XX,” etc.
3. Line three indicates that location of the disconnecting means as identified in line two. Line three example: “First Floor Elect. Rm #XXX.”
4. Line four shall include “Via T-XX” when panel or equipment is fed from a transformer.

J. Examples:

RP-1A FED FROM DP-1A	EF-1 FED FROM MCC-1A	LP-1A FED from PP-1A

ELECTRICAL ROOM A100 VIA T-1A	MECHANICAL ROOM F101	ELECTRICAL ROOM A100

K. Painted Identification: Prepare surface and apply paint according to Division 9 painting Sections.

L. Degrease and clean surface to receive nameplates.

M. Install nameplate and labels parallel to equipment lines.

N. Secure nameplate to equipment front using screws.

O. Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.

P. Identify conduit using field painting where required.

Q. Paint red colored band on each fire alarm conduit and junction box.

R. Paint bands 10 feet on center, and 4 inches minimum in width.

S. Labels shall be neatly centered. Place labels in like positions on similar equipment.

END OF SECTION 260553

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following lighting control devices:

1. Occupancy sensors.
2. Lighting contactors.

B. Related Sections include the following:

1. Division 26 Section “Electrical General Requirements”.
2. Division 26 Section "Wiring Devices" for wall-box dimmers and manual light switches.

1.3 REFERENCES

A. IEEE C62.41: Guide for Surge Voltages in Low-Voltage AC Power Circuits.

B. IEEE C136.10: Standard for Roadway Lighting Equipment Locking-Type Photocontrol Devices and Mating Receptacle Physical and Electrical Interchangeability and Testing.

C. NEMA ICS 2: Industrial Control and Systems Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC Part 8: Disconnect Devices for Use in Industrial Control Equipment.

D. NFPA 70: National Electrical Code.

E. UL 486A: Wire Connectors and Soldering Lugs for Use with Copper Conductors.

F. UL 486B: Wire Connectors for Use with Aluminum Conductors.

G. UL 773: Plug-in, Locking Photocontrols for Use with Area Lighting.

H. UL 773A: Nonindustrial Photoelectric Switches for Lighting Control.

I. UL 917: Clock Operated Switches.

J. UL 1449: Transient Voltage Surge Suppressors.

K. UL 1598: Luminaires.

L. NECA 130-2010: Installing and Maintaining Wiring Devices.

M. ASHRAE 90.1 – 2013.

1.4 DEFINITIONS

A. LED: Light-emitting diode.

B. PIR: Passive infrared.

C. ULTRASONIC: Active emission of at least 35 kHz sound waves, using Doppler reflectance to detect motion.

D. MICROPHONIC: Passive reception to listen for continued occupancy, with circuitry to filter out white noise.

E. MULTI-Tech: Using PIR and ultrasonic or microphonic technologies in one sensor.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated including physical data and electrical performance.

B. Shop Drawings: Show installation details for occupancy and light-level sensors.

1. Lighting plan showing location, orientation, and coverage area of each sensor.
2. Interconnection diagrams showing field-installed wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. Include the following:

1. Description of operation and servicing procedures.
2. List of major components.
3. Recommended spare parts.
4. Programming instructions and system operation procedures.

1.6 QUALITY ASSURANCE

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

1.7 COORDINATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the site under provisions of Division 26 Section “Electrical General Requirements”.

B. Store and protect products under provisions of Division 26 Section “Electrical General Requirements”.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

2.2 GENERAL LIGHTING CONTROL DEVICE REQUIREMENTS

A. Line-Voltage Surge Protection: An integral part of the devices for 120- and 277-V solid-state equipment. For devices without integral line-voltage surge protection, field-mounting surge protection shall comply with IEEE C62.41 and with UL 1449.

2.3 OCCUPANCY SENSORS

A. **Note: model numbers listed below shall be adjusted to meet the requirements of ASHRAE 90.1 – 2013.**

B. General

1. Coordinate occupancy sensor locations, coverages and required quantities with manufacturer’s recommendations. Coverage areas indicated on the Drawings are for minor motion (6 to 8 inches of hand movement). Provide additional occupancy sensors and control units as required to achieve complete minor motion coverage of the space indicated.
2. Adjust occupancy sensors and test that complete minor motion coverage is obtained in accordance with Part 3. Provide written confirmation of testing to owner, architect and engineer.
3. Provide occupancy sensors with a bypass switch to override the “ON” function in the event of sensor failure.
4. Provide occupancy sensors with an LED indicator indicating when motion is being detected during testing and normal operation of the sensor.
5. Provide occupancy sensors and occupancy sensor control units from single manufacturer.

6. Provide occupancy sensors with automatic daylight responsive control where sensors are indicated in spaces with windows and skylights. Occupancy sensors shall meet the requirements of ASHRAE 90.1 – 2013.

C. Wall Switch Passive Infrared Occupancy Sensor

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

E. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Wattstopper PW-100.
2. Hubbell Building Automation SOM 101.
3. Greengate OSW-P-0451-W.
4. Sensorswitch WSD.
5. Leviton equal.
6. Description: Wall mounted, 180° coverage, passive infrared sensing occupancy sensor.

    a. Electrical Characteristics: Capable of switching up to 800W fluorescent or incandescent lighting loads at 120V and 1200 watts fluorescent loads at 277V.
    b. Functions: Automatic ON/Automatic OFF, or Manual ON/Automatic OFF operation, field selectable. Integral manual override pushbutton switch.
    c. Adjustments: User adjustable sensitivity and time delay. Time delay shall be adjustable from 30 seconds to 30 minutes.
    d. Device Body: White, plastic with momentary on/off override pushbutton designed to mount in a standard switch box with “decora” style switch plate.

7. Dual Level Switching: Provide occupancy sensor capable of controlling two switch legs independently where dual level switching is indicated.

    a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Wattstopper PW-200.
        2) Hubbell Building Automation SOM-102.
        3) Greengate OSW-P-0451-DMV.
        4) Sensorswitch WSD-2P.
        5) Leviton equal.

F. 360° Ceiling Mounted Dual Technology Occupancy Sensor

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Wattstopper DT 300
    b. Hubbell Building Automation “OMNI-DT” Series.
    c. Greengate OMC-DT-2000-R.
    d. Sensorswitch CM-PDT-R.
    e. Leviton equal.

3. Description: Ceiling mounted, 360° coverage, multi-tech sensing occupancy sensor.

    a. Housing: White, thermoplastic, tamper resistant ceiling mount.
    b. Functions: Automatic ON must sense motion from both ultrasonic and infrared sensing elements. Either technology shall maintain ON, with adjustable time delays.

c. Adjustments: User adjustable sensitivity adjustment shall be provided for each sensing technology. Time delay shall be adjustable from 15 seconds to 30 minutes.
d. Sensor shall operate on 24V DC power through control unit which supplies DC power to the sensor and provides relay contacts to control the lighting load and auxiliary contacts.
e. Manual override function.

G. 110° Wall Mounted Dual Technology Occupancy Sensor

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Wattstopper DT-200
b. Hubbell Building Automation “LO-DT” Series.
c. Sensorswitch WV-PDT-R/WV-BR.
d. Leviton equal.

3. Description: Wall mounted, 110° coverage, multi-tech occupancy sensor.

a. Housing: White, thermoplastic, tamper resistant with swivel bracket for wall or ceiling mounting.
b. Functions: Automatic ON must sense motion from both sensing elements. Either technology shall maintain ON, with adjustable time delays.
c. Adjustments: User adjustable sensitivity adjustment shall be provided for each sensing technology. Time delay shall be adjustable from 15 seconds to 15 minutes.
d. Sensor Orientation: Orient sensor in room such that sensor will not detect motion through open door which could cause false activation.
e. Sensor shall operate on 24V DC power through control unit which supplies DC power to the sensor and provides relay contacts to control the lighting load and auxiliary contacts.
f. Manual override function.

H. 360° Ceiling Mounted Ultrasonic Occupancy Sensors

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Wattstopper “WT” Series.
b. Hubbell Building Automation “OMNI-US” Series.
c. Greengate OPC-U-2000.
d. Sensorswitch CM MPT-10.
e. Leviton equal.

3. Description: Ceiling mounted, 360° coverage, ultrasonic or microphonics sensing occupancy sensor.

a. Housing: White, thermoplastic, tamper resistant.
b. Adjustments: Adjustments: User adjustable sensitivity and time delay. Time delay shall be adjustable from 15 seconds to 15 minutes.
c. Sensor shall operate on 24V DC power through control unit which supplies DC power to the sensor and provides relay contacts to control the lighting load and auxiliary contacts.
d. Manual override function.

I. 360° Ceiling Mounted Passive Infrared Occupancy Sensor.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Wattstopper CI-200.
b. Hubbell Building Automation OMNI-IR.
c. Greengate OMC-P-04500-R.
d. Sensorswitch CM-9.
e. Leviton equal.

3. Description: Ceiling mounted, 360° coverage, infrared sensing occupancy sensor.

a. Housing: White, thermoplastic, tamper resistant ceiling mount.
b. Adjustments: User adjustable sensitivity adjustment shall be provided for each sensing technology. Time delay shall be adjustable from 30 seconds to 30 minutes.
c. Sensor shall operate on 24V DC power through control unit which supplies DC power to the sensor and provides relay contacts to control the lighting load and auxiliary contacts.
d. Manual override function.

J. Occupancy Sensor Control Units:

1. Description: Transformer and relay combined in single unit to provide 24DC power to sensors and provide 20A contact(s) for control of lighting loads at 120 or 277V. Control unit input power shall be from unswitched leg of lighting circuit it is controlling.

a. Control units shall be provided as required to power ceiling mounted occupancy sensors, control lighting loads and provide a minimum of one auxiliary contact.
b. Occupancy sensor control units shall mount external to 4” sq junction box in the ceiling space. Wiring between control unit and occupancy sensor shall be plenum rated.
c. Locate control unit in accessible location in gyp-board ceilings, adjacent to return air grilles, or provide access panel.
d. Additional auxiliary relay modules shall be provided as required to provide control of all lighting circuits and additional auxiliary contacts as required.
e. It is acceptable to provide controls and auxiliary contacts as required integral to the ceiling sensor, provided all required contacts are provided.
f. Maximum of 3 sensors per power pack. Verify exact quantities required with manufacturer.

2.4 LIGHTING CONTACTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cutler-Hammer; Eaton Corporation.
2. Square D Co.
3. General Electric.
4. Siemens.

B. Contactor

1. Electrically-operated electrically-held unless otherwise indicated 600 volt, 30 ampere three pole with number of poles indicated.
2. Provide contacts to be 100 percent, continuously rated for all types of ballast and tungsten lighting and resistance loads without the need for in-rush current derating.
3. Provide NEMA type 1 enclosure unless otherwise indicated.
4. Provide NEMA type 1 hinged cover cabinet enclosure sized as required for contactors as indicated on drawings. Mount switches and indicating lights required on front of enclosure. Install terminal strips for connection of all external control wiring connections.
5. Provide solderless pressure wire terminals.
6. Provide corrosion-resistant primer treatment with light gray baked acrylic enamel finish.
7. Provide the following control and indicating devices:

a. Auxiliary contacts: One field convertible.

b. Auxiliary relay to convert maintained-contact type control circuit to momentary-contact type control circuit necessary for contactor control.
c. Green pilot light to indicate “power on” condition. Mount on front cover with legend plate.

PART 3 - EXECUTION

3.1 LIGHTING CONTACTOR INSTALLATION

A. Install lighting contactors as indicated on plan. Install at accessible locations. Switch controls where provided shall be no higher than 54” or lower than 48”.

B. Demonstrate proper operation of all lighting control functions to the Owner and Engineer.

3.2 OUTDOOR PHOTOELECTRIC CONTROL INSTALLATION

A. Mount photocell on roof or parapet to ½” GRS conduit, supported to building structure below. Coordinate roof penetration with roofing contractor.

B. Install photoelectric control oriented in the northeast direction and not within any potential shadows.

C. Adjust photocell sensitivity and delay to meet owner’s requirements. Multiple adjustments may be required, as needed.

3.3 TIME CONTROLLER INSTALLATION

A. Install time controller, near contactor control equipment or as indicated on plan. Install at accessible location.

B. Program time controller as directed by the owner. Train owner in time clock programming.

3.4 OCCUPANCY SENSOR INSTALLATION

A. Install wall mounted occupancy sensors as noted on plan. Arrange occupancy sensors with adjacent switch devices so that device plates line-up and are equally spaced.

B. Install ceiling mounted sensors at approximate locations as indicated on plan. Sensor manufacturer shall provide quantity of sensors as required to provide complete coverage for rooms.

C. Locate sensors such that motion through open doors will not falsely activate sensors.

D. Do not locate ultrasonic sensors within six feet of supply air diffusers.

E. Locate infrared sensors to avoid obstructions.

F. Provide the services of a manufacturer’s representative for commissioning of occupancy sensor installation. This shall include consultation on layout and location prior to installing sensors, testing of each sensor for compliance with Contract Documents and field adjustment and fine tuning after installation is complete. Provide written confirmation of testing to the Owner, Architect and Engineer.

G. Field adjustments shall take place in the presence of the owner and the engineer. This shall include owner training on adjustment techniques for the occupancy sensors. The owner shall dictate the setting of the time delay in all sensors.

3.5 WIRING INSTALLATION

A. Wiring Method: Comply with Division 26 Section "Conductors and Cables".

B. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

E. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.6 IDENTIFICATION

A. Identify components and power and control wiring according to Division 26 Section "Electrical Identification."

B. Label time switches and contactors with a unique designation.

3.7 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
2. Operational Test: Verify actuation of each sensor and adjust time delays.

B. Remove and replace lighting control devices where test results indicate that they do not comply with specified requirements.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

D. **In addition to the testing listed above, provide Functional Testing per ASHRAE 90.1 – 2013. Functional Testing shall be performed by the Manufacturer or Manufacturer’s representative. Electrical contractor shall include all costs in bid.**

3.8 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to site outside normal occupancy hours for this purpose.

END OF SECTION 260923

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Single and duplex receptacles, ground-fault circuit interrupters, integral surge suppression units, and isolated-ground receptacles.
2. Single- and double-pole snap switches and dimmer switches.
3. Device wall plates.
4. Pin and sleeve connectors and receptacles.
5. Floor service fittings, poke-through assemblies, access floor boxes, and service poles.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. PVC: Polyvinyl chloride.

D. RFI: Radio-frequency interference.

E. TVSS: Transient voltage surge suppressor.

F. UTP: Unshielded twisted pair.

1.4 REFERENCES

A. DSCC W-C-596G: Federal Specification Connector, Electrical, Power, General Specification.

B. DSCC W-C-896F: Federal Specification Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification).

C. IEC 309-1, Part 1: General Requirements: Plugs, Socket-Outlets and Couplers for Industrial Purposes

D. NEMA FB 11: Plugs, Receptacles, and Connectors of the Pin and Sleeve Type for Hazardous Locations.

E. NEMA WD 1: General Requirements for Wiring Devices.

F. NEMA WD 6: Wiring Device – Dimensional Requirements.

G. UL 20: General-Use Snap Switches.

H. UL 486A: Wire Connectors and Soldering Lugs for Use with Copper Conductors.

I. UL 486B: Wire Connectors for Use with Aluminum Conductors.

J. UL 498: Electrical Attachment Plugs and Receptacles.

K. UL 943: Ground Fault Circuit Interrupters.

1.5 SUBMITTALS

A. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations for each type of product indicated.

B. Qualification Data: For testing agency.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association to supervise on-site testing specified in Part 3.

B. Source Limitations: Obtain each type of wiring device through one source from a single manufacturer.

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

D. Comply with NFPA 70.

1.7 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 RECEPTACLES

A. **All receptacles shall be tamper resistant (adjust model numbers listed below as required).**

B. Straight-Blade and Locking Receptacles: Heavy-Duty grade.

C. Straight-Blade-Type Receptacles: Comply with NEMA WD 1, NEMA WD 6, DSCC W-C-596G, and UL 498. Configuration 5-20R duplex receptacle.

1. Manufacturers:

a. Hubbell Incorporated; Wiring Device-Kellems HBL 5362.

D. Self-Test GFCI's: Duplex GFCI Convenience Receptacles, 125 V, 20 A. Comply with NEMA WD1, NEMA WD6 configuration 5-20R, UL 498, Federal Specification W-C-596 and UL 943, Class A, and include indicator light that is lighted when device is tripped. Must have self-test feature and SafeLock protection™: conducts an automatic test every second, ensuring its always ready to protect. If the device fails the self-test, the indicator light flashes to signal that the GFCI should be replaced. With SafeLock Protection™, if critical components are damaged and ground fault protection is lost, power to receptacle must be discontinued.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work, include, but are not limited to the following:
2. Products: Subject to compliance with requirements, provide one of the following:

a. Pass & Seymour/Legrand; Wiring Devices Division: 2096.
b. Hubbell equal.

E. Industrial Heavy-Duty Pin and Sleeve Devices: Comply with IEC 309-1.

F. Hazardous (Classified) Location Receptacles: Comply with NEMA FB 11.

2.3 WALL SWITCHES

A. Manufacturers:

1. Hubbell Incorporated; Wiring Device-Kellems 1220 Series.

B. Device body: Plastic toggle handle**.**

C. Single- and Double-Pole Switches: Comply with DSCC W-C-896F and UL 20.

D. Provide single-pole, two-pole, three-way and four-way switches as indicated.

E. Provide pilot light where indicated.

F. Provide key type where indicated. Furnish a minimum of six keys to Owner.

1. Switch shall be Hubbell 1220 series (or equal as specified above) with locking coverplate.
2. Coverplate shall be Hubbell HBL96062, straight keyed cylinder type lock, with stainless steel finish.

G. Combination Switch and Receptacle: Both devices in a single gang unit with plaster ears and removable tab connector that permit separate or common feed connection.

1. Switch: 20 A, 120/277-V ac.
2. Receptacle: NEMA WD 6, Configuration 5-20R.

2.4 DIGITAL TIME SWITCHES

A. General:

1. Watt Stopper TS-400 or equal. Operation on 100 to 300 volts.
2. Digital time switch turns lights off automatically after pre-set time. Pushbutton operation with time setting from 5 minutes to 12 hours.
3. Back-lit LCD shows timer countdown.

2.5 DIMMER SWITCHES

A. General:

1. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on/off switches and audible frequency and EMI/RFI filters.
2. Dimmer switches shall provide full-range, variable control of light intensity utilizing a continuous Square Law dimming curve.
3. Provide protected memory during temporary power failures that restores lights to same level of intensity set prior to power interruption.
4. Provide dimmer switches UL listed for the type of load being served (incandescent, fluorescent, magnetic low voltage transformer, electronic low voltage transformer). Universal load-type dimmer switches shall not be acceptable.
5. Provide dimmers that provide no adverse effects on other components of the electrical system being served (low voltage transformers, ballasts, lamps, etc.).

B. Incandescent Lamp Dimmers:

1. Manufacturers:

a. Lutron Model N-2000-W.
b. Leviton Model 82000-W.
c. Hubbell equal.

2. Modular, 120 V, 60 Hz with continuously adjustable control; single pole with soft tap or other quiet switch; and 5-inch wire connecting leads.

3. Dimmer switches serving magnetic low voltage transformers shall be designed to control and provide a symmetrical ac waveform to the input of the magnetic low voltage transformer and not cause the transformer to operate above its rated operating current or temperature.
4. Dimmer switches serving solid-state low-voltage transformers shall not affect the sound rating of the transformer and not cause lamp flicker at any point in the dimming range.
5. Control: Continuously adjustable slider with slide-to-off; with single-pole or three-way switching to suit connections.
6. Power Rating: 2000 W.

C. Fluorescent Lamp Dimmer Switches:

1. Manufacturers:

a. Hubbell Incorporated; Wiring Device-Kellems
b. Lutron.
c. Leviton.

2. Modular; single-pole, compatible with electronic dimming ballast provided with fluorescent light fixtures and rated for the specified load and voltage; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.
3. Control: Continuously adjustable slider with pre-set; single-pole or three-way switching to suit connections.
4. Power rating: 1200 W.

2.6 WALL PLATES

A. Manufacturers:

1. Provide wall plates and corresponding wiring devices from same manufacturer.

B. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: 0.035-inch- thick, satin-finished stainless steel.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Wet Locations: Gasketed Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

a. Manufacturers:

1) Red Dot Model CKSGV (cast aluminum), Thomas & Betts.

2.7 FLOOR SERVICE FITTINGS

A. Manufacturers:

1. Wiremold.

B. Type: Modular, fully adjustable recessed-type, with services indicated suitable for wiring method used.

C. Compartments: Provide barrier separating power from telecommunications cabling. Provide recessed-type floor service fittings with independent compartments and feed through wiring capability.

D. Service Plate: Provide service plate type as indicated. Provide protective ring for flush service plates.

E. Power Receptacle(s): NEMA WD 6, Configuration 5-20R Heavy-duty grade duplex receptacle, black finish, unless otherwise indicated.

F. Telecommunications Outlet: Blank cover with bushed cable opening.

2.8 FINISHES

A. Color:

1. Wiring Devices Connected to Normal Power System: White at each school, unless otherwise indicated or required by NFPA 70.
2. Wiring Devices Connected to Emergency Power System: Red.
3. Wall Switches: White, unless otherwise indicated.
4. Dimmer Switches: White, unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer’s instructions.

B. Prior to installation of devices, verify wall openings are neatly cut and will be completely covered by wall plates, clean debris from outlet boxes and provide extension rings to bring outlet boxes flush with finished surface.

C. Install devices and assemblies level, plumb, and square with building lines.

D. Install wall dimmers to achieve full rating specified and indicated after derating for ganging according to manufacturer's written instructions.

E. Arrangement of Devices:

1. Coordinate locations of outlet boxes provided under Division 26 Section “Raceways and Boxes” to obtain mounting heights indicated on Drawings.
2. Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on top.
3. Where multiple switches, dimmers, and/or occupancy sensors are adjacent to each other, provide a single cover plate. Custom fabricate, if required, for all combinations. Provide separate boxes or barriers as required for the application.
4. Install horizontally mounted receptacles with grounding pole on the left.
5. Install GFCI receptacles so that the “Push To Test” and “Reset” designations can be read correctly. If printed in both directions, install with ground pole on top.
6. Install switches with OFF position down.

F. Install cover plates on switch, receptacle, and blank outlets in finished areas.

G. Use oversized plates for outlets installed in masonry walls.

H. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

I. Remove wall plates and protect devices and assemblies during painting.

J. Coordinate installation of access floor boxes with access floor system provided by Architectural trades.

K. Install properly oriented access floor boxes into cutouts in access floor tiles and secure to tiles per Manufacturer's instructions.

L. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

M. Adjust devices and wall plates to be flush and level. Three corners of wall plates must be in contact with wall surfaces. Devices shall be solidly mounted against the box.

3.2 IDENTIFICATION

A. Comply with Division 26 Section "Electrical Identification."

1. Receptacles: Identify panelboard and circuit number from which served. Use adhesive label as specified in Division 26 Section "Electrical Identification" with black-filled lettering on back side of wall plate, and durable wire markers or tags inside outlet boxes.

3.3 CONNECTIONS

A. Ground equipment according to Division 26 Section "Grounding and Bonding." Connect wiring device grounding terminal to outlet box with bonding jumper. Use of quick ground strap or screw is not acceptable.

B. Connect wiring according to Division 26 Section "Conductors and Cables." Connect wiring devices by wrapping conductor around screw terminal or by using back wiring and tightening the screw securely.

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Inspect each wiring device for defects.
2. Operate each wall switch with circuit energized and verify proper operation.
3. After installing wiring devices and after electrical circuitry has been energized, test each receptacle for proper polarity, ground continuity, and compliance with requirements.
4. Test each GFCI receptacle for proper operation with both local and remote fault simulations according to manufacturer's written instructions.

B. Remove malfunctioning units, replace with new units, and retest as specified above.

END OF SECTION 262726

SECTION 262813 - FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Cartridge fuses rated 600 V and less for use in switches, switchboards, and controllers.

1.3 SUBMITTALS

A. Product Data: Include the following for each fuse type indicated:

1. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
2. Let-through current curves for fuses with current-limiting characteristics.
3. Time-current curves, coordination charts and tables, and related data.
4. Fuse size for elevator feeders and elevator disconnect switches.

B. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.

1. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
2. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.

C. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Division 1 Section " Operation and Maintenance Data," include the following:

a. Let-through current curves for fuses with current-limiting characteristics.
b. Time-current curves, coordination charts and tables, and related data.
c. Ambient temperature adjustment information.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses from a single manufacturer.

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

C. Comply with:

1. NEMA FU 1 – Low Voltage Cartridge Fuses.
2. NFPA 70 – National Electrical Code.
3. UL 198C – High-Interrupting-Capacity Fuses, Current-Limiting Types.
4. UL 198E – Class R Fuses.
5. UL 512 – Fuseholders.

1.5 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.6 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Quantity equal to 10% percent of each fuse type and size, but no fewer than 3 of each type and size.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Bussman, Inc.
2. Eagle Electric Mfg. Co., Inc.; Cooper Industries, Inc.

3. Ferraz Shawmut, Inc.
4. Tracor, Inc.; Littelfuse, Inc. Subsidiary.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class and current rating indicated; voltage rating consistent with circuit voltage.

1. Service Entrance: Class L, time delay.
2. Feeders: Class J, time delay.
3. Motor Branch Circuits: Class RK5, time delay.
4. Other Branch Circuits: Class J, time delay.

2.3 FLUORESCENT AND H.I.D. LIGHTING BALLAST FUSES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Bussman, Inc. – GLR fuses with HLR holder.
2. Tracor, Inc.; Littelfuse, Inc. Subsidiary – LGR fuses with LHR-000 holder.
3. Ferraz Shawmut, Inc. – SLR fuses.

B. Provide each fluorescent and HID lighting ballast with individual protection on the line side.

C. Provide fuse and holder mounted within or as part of the fixture.

D. Provide fuse size and type recommended by the fixture manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

B. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

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

3.2 INSTALLATION

A. Fuses shall be shipped separately. Any fuses shipped installed in equipment, shall be replaced by the Electrical Contractor with new fuses as specified above prior to energization at no additional expense to Owner. All fuses shall be stored in moisture free packaging at job site and shall be installed immediately prior to energization of the circuit in which it is applied.

B. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

C. Install spare-fuse cabinet(s).

3.3 IDENTIFICATION

A. Install labels indicating fuse replacement information on inside door of each fused switch.

END OF SECTION 262813

SECTION 265119 - LED INTERIOR LIGHTING

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. Interior solid-state luminaires that use LED technology.
2. Lighting fixture supports.

B. Related Requirements:

1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
2. Section 260926 "Lighting Control Panelboards" for panelboards used for lighting control.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. Lamp: LED and substrate as a replaceable assembly.

F. LED: Light-emitting diode.

G. Lumen: Measured output of lamp and luminaire, or both.

H. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 SUBMITTALS

A. Product Data: For each type of product.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaires.
4. Include emergency lighting units, including batteries and chargers.
5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
6. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing and Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps and accessories identical to those indicated for the lighting fixture as applied in this Project per IES LM-79 and IES LM-80.

    a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products or certified by a qualified independent testing agency.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Samples: For each luminaire and for each color and texture with standard factory-applied finish.

D. Samples for Initial Selection: For each type of luminaire with custom factory-applied finishes.

1. Include Samples of luminaires and accessories involving color and finish selection.

E. Samples for Verification: For each type of luminaire.

1. Include Samples of luminaires and accessories to verify finish selection.

F. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Lighting luminaires.
2. Suspended ceiling components.
3. Partitions and millwork that penetrate the ceiling or extend to within 12 inches of the plane of the luminaires.
4. Structural members to which luminaires will be attached.
5. Initial access modules for acoustical tile, including size and locations.
6. Items penetrating finished ceiling, including the following:

    a. Other luminaires.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Access panels.
    f. Ceiling-mounted projectors.

7. Moldings.

G. Qualification Data: For testing laboratory providing photometric data for luminaires.

H. Seismic Qualification Certificates: For luminaires, 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.

I. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

J. Product Test Reports: For each luminaire, for tests performed by manufacturer.

K. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.6 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. LED Drivers 5% attic stock of each type and rating installed. Furnish at least one of each type.
2. Diffusers and Lenses: 1% attic stock of each type and rating installed. Furnish at least one of each type.

1.7 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

C. Provide luminaires from a single manufacturer for each luminaire type.

D. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

E. Mockups: For interior lighting luminaires in room or module mockups, complete with power and control connections.

1. Obtain Architect's approval of luminaires in mockups before starting installations.
2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

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

G. Comply with:

1. NFPA 70 - National Electrical Code.
2. NECA/IESNA 500-1998 – Recommended Practice for Installing Indoor Commercial Lighting Systems.
3. NECA/IESNA 502-1999 – Recommended Practice for Installing Industrial Lighting Systems.
4. Code of Federal Regulations (47 CFR 37342).
5. Michigan Department of State Police, Fire Marshall Division Policy Number 11-06 “Plastic Materials as Interior Finishes” pertaining to the use of plastic lenses in lighting fixtures for health care facilities.
6. Michigan Department of Community Industry Services requirements that all lamps shall be protected from breakage. Exposed lamps are not acceptable.

H. FMG Compliance: Fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FMG.

I. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.9 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.10 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Plastic Diffusers and Lenses: 6 of each type and rating installed.
2. Emergency Battery Packs: 6 of each type and rating installed.
3. Drivers: 6 of each type and rating installed.

1.11 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: Five year(s) or manufacturer's standard warranty length (whichever is longer) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.

1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

2.2 LUMINAIRES (LIGHTING FIXTURES)

A. Provide Luminaires indicated on the drawings.

B. Acceptable alternate manufacturers are indicated on the product data sheets. Alternate manufacturer products shall be equal in all respects including materials, finishes, photometric performance and energy performance and shall include all options, features, and accessories identified.

C. The Luminaire schedule shown on the drawings is supplemental provided for convenience and reference only. The requirements of this section and 26 5100 shall govern.

2.3 LUMINAIRE REQUIREMENTS

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

B. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

D. Unless otherwise specified in Luminaire product data, provide products with a minimum CRI of 80.

E. Unless otherwise specified in Luminaire product data, provide products with a CCT of 4100 K.

F. Unless otherwise specified in Luminaire product data, provide products with an IES LM-80 rated lamp life of 50,000 hours.

G. Driver

1. Provided as a integrated component of the luminaire or as a external component of an assembly of luminaries.
2. Nominal Input Voltage: As specified.

2.4 EXIT SIGNS

A. General: Comply with UL 924; for sign colors and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:

1. Lamps: Light-emitting diodes, 70,000 hours minimum of rated lamp life.

C. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.

1. Battery: Sealed, maintenance-free, nickel-cadmium type with special warranty.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.

2.5 EMERGENCY LIGHTING UNITS

A. General: Self-contained units complying with UL 924.

1. Battery: Sealed, maintenance-free, lead-acid type with minimum 10-year nominal life and special warranty.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically turns lamp on when power supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
4. Wire Guard: Where indicated, heavy-chrome-plated wire guard protects lamp heads or fixtures.

2.6 EMERGENCY LOAD TRANSFER DEVICE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Nine-24, Inc.: BLTC Series.
2. Bodine GTD Series.
3. Dual Lite.
4. LVS.
5. Side-Lite.

B. Description: Localized load transfer switch to allow emergency fixture to be controlled on normal lighting circuits and to sense presence of normal power ahead of control circuit and switch luminaire (both line and

neutral) over to emergency source upon loss of normal source. Device shall be installed integral to luminaire or mounted remotely for each control circuit as application requires.

C. U.L. 924 Listed.

D. Integral test switch and indicating lamps to indicate status.

2.7 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

C. Diffusers and Globes:

1. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
2. Glass: Annealed crystal glass unless otherwise indicated.
3. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

D. Factory-Applied Labels: Comply with UL 1598 Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:

a. "USE ONLY" and include specific lamp type.
b. Lamp diameter, shape, size, wattage, and coating.
c. CCT and CRI for all luminaires.

2.8 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.9 LUMINAIRE FIXTURE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: Unless otherwise specified in Luminaire product data, provide products with a minimum 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: Unless otherwise specified in Luminaire product data, provide products with a minimum ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage.

D. Rod Hangers: Unless otherwise specified in Luminaire product data, provide products with a minimum 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. Do not use permanent luminaires for temporary lighting.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions and N.E.C.A./I.E.S.N.A. 500-2006 and 502-2006.

B. Locate ceiling luminaires as indicated on reflected ceiling plan.

C. Support for Fixtures in or on Grid-Type Suspended Ceilings: Use grid for support.

1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches from fixture corners.
2. Support Clips: Fasten to fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.

D. Support luminaires independent of ceiling framing. Support recessed grid luminaries from two opposite corners directly to structure. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.

E. Exposed Grid Ceilings: Support surface mounted luminaires on grid ceiling directly from building structure.

F. Install recessed luminaires to permit removal from below.

G. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.

H. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

I. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.

3. Provide support for luminaire without causing deflection of ceiling or wall.
4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.

J. Flush-Mounted Luminaire Support:

1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
3. Trim ring flush with finished surface.

K. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls or attached to a minimum 20 gauge backing plate attached to wall structural members.
2. Do not attach luminaires directly to gypsum board.

L. Ceiling-Mounted Luminaire Support:

1. Ceiling mount with two 5/32-inch- diameter aircraft cable supports adjustable to 120 inches in length.

M. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing or rod wire support for suspension for each unit length of luminaire chassis, including one at each end.
4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

N. Connect night light fixtures and emergency lighting fixtures to the hot (unswitched) side of lighting circuits.

O. Provide an individual feed with ground conductor from a junction box to each lighting fixture. Lighting fixtures shall not be daisy-chained.

P. Provide green grounding conductors back to the panel ground for lighting circuits. Raceways shall not be used as grounding conductors.

Q. Fixtures shall have their exterior labels removed and shall be thoroughly cleaned. Non-functioning LED Boards and drivers shall be replaced.

R. For emergency fixtures, locate the remote test/monitor modules identically so that they are visible and they form a straight line when viewed from the end of the corridor or room. Where a suspended ceiling exists, center the modules in adjacent ceiling tiles.

S. Mount LED emergency lighting units where shown and aim to light the egress path as uniformly as possible.

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

C. Bond products and metal accessories to branch circuit equipment grounding conductor.

D. Connect luminaires to branch circuit outlet boxes provided under Division 26 Section "Raceways and Boxes" using 1/2" flexible conduit.

3.5 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.6 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

D. A visual inspection shall be performed to verify cleanliness and alignment of the fixtures, misalignment and light leaks shall be corrected, and rattles due to ventilation system vibration shall be eliminated.

3.7 STARTUP SERVICE

A. Comply with requirements for startup specified in Section 260943.16 "Addressable-Fixture Lighting Controls."

B. Comply with requirements for startup specified in Section 260943.23 "Relay-Based Lighting Controls."

3.8 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps, drivers, or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Architect.

B. Adjust exit sign directional arrows as indicated on Drawings.

C. Adjust and calibrate all dimming system controls until the system works as designed. Contact the Architect/Engineer when dimming is complete and demonstrate operation to owner’s representative and Architect/Engineer.

3.9 CLEANING

A. Clean electrical parts to remove conductive and deleterious materials.

B. Remove dirt and debris from enclosures and lenses.

C. Clean photometric control surfaces as recommended by manufacturer.

D. Clean finishes and touch up damage.

END OF SECTION 265119

Addendum 1

Project: **BID NO. 9872 POOL UPGRADE AND REMODELING PROJECT TROY HIGH SCHOOL**

Bid Due date: 2:30PM Tuesday, December 18, 2018 (UNCHANGED)

This Addendum is issued as modifications to the RFP previously issued to provide clarifications to the scope of work. This Addendum supersedes the original RFP. This along with the RFP becomes the bid documents.

I. General Information

1. For questions contact Mark Paulus at lecoleplanners3@gmail.com or (248) 880-6791.
2. A review of the documents occurred at the pre-bid meeting.
3. There will be another pre-bid site visit scheduled for Thursday December 13, 2018 at 9:00 am.
4. If any bidders would like schedule another job site visit, contact Mark Paulus or Chuck at (248) 404-0965. Do not visit the building with a scheduled visit.
5. A schedule review occurred at the pre-bid meeting.
6. Attached is the sign in sheet for the pre-bid meeting held on November 2, 2018.

II. Questions and Answers

1Q. Where is the access to the space?
1A. The space can be accessed through the existing school near the northeast corner of the pool.

2Q. Will parking be provided?
2A. Parking will be provided on site at no cost to the contractors.

END

Addendum 2

Project: **BID NO. 9872 POOL UPGRADE AND REMODELING PROJECT TROY HIGH SCHOOL**

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2. If any bidders would like schedule another job site visit, contact Chuck at (248) 404-0965. Do not visit the building with an unscheduled visit.

II. Questions and Answers

1Q. On drawing E1.1 at the bleacher area it shows the removal of existing light fixtures and does not appear there are new light fixtures. Is this correct?

1A. The bleacher area is illuminated by the light fixtures at the north side of the pool. These light fixtures are back to back, half illuminate the north side of the pool, the other half illuminates the bleachers.

2Q. Can the existing light fixture support systems be used for the new light fixtures? If not, should they be removed.

2A. Existing light fixtures, supports, and circuiting shall be removed.

3Q. The existing lighting circuits are fed by a Unistrut wireway system. Is this system to be reused to feed the new lighting?

3A. Contractor may re-use/relocate existing Unistrut system or provide all new circuiting to feed the new light fixtures. If the existing Unistrut system is not re-used/relocated, it will need to be removed.

4Q. If the Unistrut wireway system is to be reused for power feeds, is it also intended to support the new light fixtures, which may require the system to be relocated?

4A. Provide new supports for new light fixtures. All new support steel shall be painted.

5Q. Is there any scope of work to replace any of the older GFCI receptacles and covers around the pool and/or bleachers?

5A. No work for the existing GFCI devices.

6Q New lighting specifications requires that each fixture “Light Source” be 30,000 lumens. Is the intent of this to be one light at 30,000 lumens or two or more lights at 30,000 lumens?
6A. Type “L1”/”L1E” light fixtures shall be 20,000 lumens in lieu of 30,000 lumens.

7Q. If it is the intent for a single light location is to be 30,000 lumens using more than one fixture, what is the intent of the North side of the pool that shows two fixtures? Is this intended to be a triple or quad fixture location?
7A. The row of light fixtures on the north side of the pool are to be mounted back to back, illuminating the north side of the pool and the bleacher area

8Q. Are there any specifications on the length of down rod desired for the pendent lights?
8A. Refer to “Lighting Fixture Schedule” on drawing E0.2 for mounting height.

9Q. Are there any specifications on how the fixtures are to be mounted to the ceiling?
9A. Coordinate with manufacturers recommendations.

10Q. Is there any scope of work that should be included to correct/move or properly support the low voltage cabling that is currently tie wrapped to the beams?
10A. Provide new supports as required.

11Q. Is there any scope of work to take down and reinstall the horn/strobe devices on the walls for painting?
11A. Horn/strobe devices will not be taken down for the wall painting. The painting contractor will have trim around these devices.

12Q. Please provide more information how or what the thirteen occupancy sensors are to control and/or work with the four lighting switches.
12A. Coordinate lighting controls with the manufacture/representative agency for sensor controls.

13Q. If Type “L1E” lights are fed from an emergency generator panel, what type of emergency load transfer device is needed as called out in the “Lighting Fixture Schedule”?
13A. Refer to specification section 265119, article 2.6.

14Q. Is the intent of the project to pull all new feeders from the new lighting back to the electrical panels, or are the existing circuits to be reused?
14A. New circuiting per plans.

15Q. Section 1.02 line #6 states “Seal around all stainless steps with waterproof cement sealer” while section 2.02 says to remove and replace the stainless steel steps with fiberglass steps. If they are to be replaced, the top step for all 8 sets is positioned and weld into the stainless steel gutter, this step can’t be replaced. Is the scope of work to clean and seal the existing steps or replace them?
15A. Leave the existing stainless steel step in the gutter and replace all others with fiberglass.

16Q. Work is limited to the 3 bid categories, Painting, Electrical and Pool Work. Plans also show new masonry work. Please clarify if the masonry work is also to be included and if so, is it to be included in the Pool work costs.
16A. There is no masonry on this project. All work shown on the Architectural (A-) drawings is for reference for dimensions.

17Q. Is the prime paint coat the entire area or spotting where necessary?
17A. The entire area.

18Q. Who will be performing the initial draining of the pool, the Owner or contractor?
18A. Per specification section 131500, the contractor.

19Q. Section 1.04 line #4 refers to removing the surface to the original base, this would require removal and replacement of all tiled swim lane lines and targets. Will this be a full strip and replacement of the interior surface including tile or a standard resurface leaving the existing tile and solid surfaces?
19A. The intent is to leave all existing tile. Even if it was not a full strip the edge of the tile would to be exposed.

20Q. Typically, with this type of renovation the main drain covers are replaced keeping in VGBA compliance, there is no reference to this within the bid. Are the main drain covers to be replaced as part of the bid?
20A. Remove and replace existing drain covers. Furnish and install four (4) Neptune Benson Model Number MLD 12 x 12 Grates with frames over existing drains. MLD 18 x 18 frames and grates are also acceptable provided the additional 3" on each side can be open at least 1" at the edge of the grate. All drains shall be VGBA compliant under APSP 16/ASME A 112.19.8. 18" x 18" compliant and NSF Approved. All covers shall be secured in at least 4 places with stainless steel screws.

21Q. Does the existing hollow metal doors and frames get painted?
21A. No.

22Q. Do existing benches around the pool deck get repainted/refinished. These benches aren't shown on the plans.
22A. Per specification section 099000 article 1.02A, yes, the existing benches around the pool deck get repainted/refinished. The architectural drawings were issued for reference and to give bidders the size of the space not the work scope.

23Q. Are the joints between the glass block and the CMU to be caulked?
23A. No.

24Q. Can the HVAC system be shut down and if so, will the fabric ductwork deflate?
24A. We are expecting to leave the HVAC system in operation during construction to provide ventilation. If the HVAC is shut down the fabric ductwork will deflate.

25Q. Please advise on protection to be used for the fabric ductwork that does not get painted?
25A. As stated in the bid documents protection for the fabric ductwork is required. The type of protection is a contractor's means and methods.

26Q. Does the pool deck require protection? Is so, is this by each trade or one of the 3 trades doing the work?
26A. Each bid category is responsible to protect the existing building for their work.

27Q. Is screw in type hangers that screw into the metal roof deck flute acceptable for hanging new conduits and light fixtures?
27A. Yes, if they are rated for the weight and the installation meets code. Refer to NEC section 300.4(E).

28Q. Does the existing painted signage on the walls get painted over or repainted?
28A. Yes, with the specified material listed in specification section 099000.

29Q. What color is the stain for the wood benches? There may be color consistency issue due to the condition of the benches?
29A. The stain will be a honey color. The exact color is to be determined.

30Q. Instead of scaffold the pool area in order to complete the painting would it be possible to use lifts.
30A. Contractor may provide a voluntary alternate to use lifts instead the specified scaffolding.

31Q. Would contractors be able to bring material and access the pool through a door located on the north side of the school and go through the corridor that separates the gymnasium and cafeteria?
31A. There will be no access from this location. Access will occur on the northwest corner of the pool per the attached map. As noted on the map the double set of doors have a removable mullion.

Google Maps Troy High School

Imagery ©2018 Google, Map data ©2018 Google 100 ft

Double Doors w/ removable Mullion

Addendum 3

Project: **BID NO. 9872 POOL UPGRADE AND REMODELING PROJECT TROY HIGH SCHOOL**

Bid Due date: 2:30PM Tuesday, December 18, 2018 (UNCHANGED)

This Addendum is issued as modifications to the RFP previously issued to provide clarifications to the scope of work. This Addendum supersedes the original RFP. This along with the RFP becomes the bid documents.

I. General Information

1. For questions contact Mark Paulus at lecoleplanners3@gmail.com or (248) 880-6791.
2. If any bidders would like schedule another job site visit, contact Chuck at (248) 404-0965. Do not visit the building with an unscheduled visit.

II. Questions and Answers

1Q. Specifications call for ½" plywood for floor protection. Would Masonite sheeting be adequate?

1A. Provide ½" plywood for floor protection per the specifications.

2Q. According to the specifications, lifts are not allowed to be used?

2A. Per the painting bid category item #4, electrical bid category #6, and pool work bid category item #7; A single person motorized manlift is permitted on the pool deck.

3Q. Wood benches that call for refinishing are severely dented and look as though they have been patched with a light colored material (almost white). In order to remedy, the wood needs to be sanded aggressively (between 1/16" and 1/8") to remove dents. This would require removal of the benches to complete. Is that the intent?

3A. Specification section 099000 article 3.2G states "Wood: Must be clean, dull, and dry. Dull all glossy surfaces in accordance with the paint manufacture's written instructions. Patch all nail holes and imperfections with a wood fiber or putty and sand smooth." Means and methods are the contractor's responsibility to meet this specification. We understand these are existing and intent is not to make them to brand new.

END

Bid Tabulation
BID 9872 Pool Upgrade and
Remodeling Project
Troy High School

Vendors	Painting Costs	Electrical Costs	Pool Ugrade Costs	Vendor Bond Costs	Grand Total
Allied Building Services		$158,500.00		$1,616.70	$160,116.70
B & B Pools Service and Supply Co.			$203,000.00	$6,090.00	$209,090.00
Envision Builders		$124,900.00		$1,700.00	$126,600.00
General Painting Co, LLC	$120,000.00			$3,600.00	$123,600.00
Heritage Contracting, LLC	*Cost Included - One Total Price*	*Cost Included - One Total Price*	*Cost Included - One Total Price*	*Cost Included - One Total Price*	$722,980.00
Hoffman Electric, Inc.		$127,900.00		$3,900.00	$131,800.00
Paint Plus	$145,310.00			$3,990.00	$149,300.00
Shoreview Electric		$122,000.00		$1,400.00	$123,400.00