Union County Public Schools

RE-BID

Request For Proposal #5-97648020

Date Issued: March 7, 2025

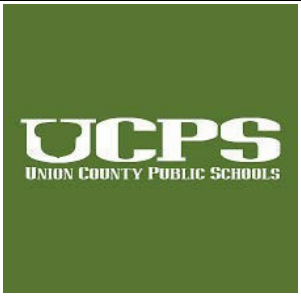
Hemby Bridge Elementary School Lighting Replacement, Electrical Panel Replacement and Ceil Grid Replacement.

Direct all inquiries concerning RFP #5-97648020 to:

Jennifer West

Purchasing/Construction Contracts Specialist

Email: facilitiesbids@ucps.k12.nc.us

	Union County Public Schools (UCPS) Facilities Department 201 Venus Street Monroe NC, 28112 Request for Proposal #: 5-97648020
Request for Proposal Description: Hemby Bridge Elementary School Lighting Replacement, Electrical Panel Replacement and Ceil Grid Replacement.	Date of Issue: March 7, 2025
Bid Opening Date: April 1, 2025	BID Opening Time: 2:00 PM
Refer ALL Inquiries regarding this RFP to: Jennifer West (Construction Contracts Spec) Email to: facilitiesbids@ucps.k12.nc.us	

EXECUTION

In compliance with this Request for Proposal (RFP), and subject to all the conditions herein, the undersigned Vendor offers and agrees to furnish and deliver any or all items upon which prices are bid, at the prices set opposite each item within the time specified herein.

By executing this bid, the undersigned Vendor understands that false certification is a Class I felony and certifies that:

- this bid is submitted competitively and without collusion (G.S. 143-54),
- none of its officers, directors, or owners of an unincorporated business entity has been convicted of any violations of Chapter 78A of the General Statutes, the Securities Act of 1933, or the Securities Exchange Act of 1934 (G.S. 143-59.2), and▪ it is not an ineligible Vendor as set forth in G.S. 143-59.1.

Furthermore, by executing this bid, the undersigned certifies to the best of Vendor's knowledge and belief, that:

- it and its principals are not presently debarred, suspended, proposed for debarment, declared ineligible or voluntarily excluded from covered transactions by any Federal or State department or agency.

As required by G.S. 143-48.5, the undersigned Vendor certifies that it, and each of its sub-Contractors for any Contract awarded as a result of this RFP, complies with the requirements of Article 2 of Chapter 64 of the NC General Statutes, including the requirement for each employer with more than 25 employees in North Carolina to verify the work authorization of its employees through the federal E-Verify system.

As required by Executive Order 24 (2017), the undersigned vendor certifies they will comply with all Federal and State requirements concerning fair employment and that it does not and will not discriminate, harass, or retaliate against any employee in connection with performance of any Contract arising from this solicitation. G.S. 133-32 and Executive Order 24 (2009) prohibit the offer to, or acceptance by, any State Employee associated with the preparing plans, specifications, estimates for public contracts;

or awarding or administering public contracts; or inspecting or supervising delivery of the public contract of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of this response to the RFP, the undersigned certifies, for Vendor's entire organization and its employees or agents, that Vendor is not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

By executing this bid, Vendor certifies that it has read and agreed to the **INSTRUCTION TO VENDORS and the NORTH CAROLINA GENERAL TERMS AND CONDITIONS incorporated herein.** These documents can be accessed from the ATTACHMENTS page within this document.

Failure to execute/sign bid prior to submittal may render bid invalid and it MAY BE REJECTED. Late bids shall not be accepted.

ACCEPTANCE OF BIDS

If your bid is accepted, all provisions of the RFP, along with the written results of any negotiations, shall become part of the written agreement between the parties ("Contract"). If applicable, the North Carolina General Terms and Conditions are incorporated herein and shall apply. Depending upon the Goods or Services being offered, other terms and conditions may apply, as mutually agreed.

<table>
<tr><td colspan="4">COMPLETE/FORMAL NAME OF VENDOR:</td></tr>
<tr><td colspan="2">STREET ADDRESS:</td><td>P.O. BOX:</td><td>ZIP:</td></tr>
<tr><td colspan="2">CITY & STATE & ZIP:</td><td>TELEPHONE NUMBER:</td><td>TOLL FREE TEL. NO:</td></tr>
<tr><td colspan="4">PRINCIPAL PLACE OF BUSINESS ADDRESS IF DIFFERENT FROM ABOVE (SEE INSTRUCTIONS TO VENDORS ITEM #21):</td></tr>
<tr><td colspan="2">PRINT NAME & TITLE OF PERSON SIGNING ON BEHALF OF VENDOR:</td><td colspan="2">FAX NUMBER:</td></tr>
<tr><td>VENDOR'S AUTHORIZED SIGNATURE*:</td><td>DATE:</td><td colspan="2">EMAIL:</td></tr>
</table>

VALIDITY PERIOD

Offer shall be valid for at least 60 days from date of bid opening, unless otherwise stated. After this time, any withdrawal of this offer shall be made in writing, effective upon receipt by the agency issuing this RFP.

1.0 PURPOSE AND BACKGROUND

The intent of this solicitation is for Union County Public Schools to award a contract for the Hemby Bridge Elementary School Lighting Replacement, Electrical Panel Replacement and Ceil Grid Replacement. (UCPS's intentions are to award this contract to the lowest responsive bidder.)

Work shall consist of furnishing all labor, taxes, materials, equipment, services, permits, incidental and implied for the Hemby Bridge Elementary School Lighting Replacement, Electrical Panel Replacement and Ceil Grid Replacement. per the attached drawings and specifications listed as Exhibit #1.

Bid shall be submitted in accordance with the terms and conditions of the RFP and any addenda issued hereto.

2.0 GENERAL INFORMATION

2.1 Request for Proposal Document

This RFP is comprised of the base RFP document, any attachments, and any addenda released before Contract award, which are incorporated herein by reference.

2.2 Taxes

UCPS is **NOT** tax-exempt. Unless otherwise indicated, tax must be computed and added to your proposal. Any itemized shipping charges are also subject to tax. When invoiced, tax should be invoiced as a separate line item.

2.3 Notice to Vendors Regarding RFP Terms and Conditions

It shall be the Vendor's responsibility to read the Instructions to Vendors, and the North Carolina General Terms and Conditions, all relevant exhibits and attachments, and any other components made a part of this RFP and comply with all requirements and specification herein. Vendors are also responsible for obtaining and complying with all Addenda and other changes that may be issued in connection with this RFP.

If Vendors have questions or issues regarding any component of this RFP, those must be submitted as questions in accordance with the instructions in the Bid Questions Section. If UCPS determines that any changes will be made as a result of the questions asked, then such decisions will be communicated in the form of an RFP addendum. UCPS may also elect to leave open the possibility for later negotiation of specific provisions of the Contract that have been addressed during the question-and-answer period, prior to contract award.

Other than through the process of negotiation under 01 NCAC 05B.0503, UCPS rejects and will not be required to evaluate or consider any additional or modified terms and conditions submitted with Vendor's bid or otherwise. This applies to any language appearing in or attached to the document as part of the Vendor's bid that purports to vary any terms and conditions or Vendor's instructions herein or to render the bid non-binding or subject to further negotiation. Vendor's bid shall constitute a firm offer that shall be held open for the period required herein ("Validity Period" above). UCPS may exercise

its discretion to consider Vendor proposed modifications. By execution and delivery of this RFP Response, the Vendor agrees that any additional or modified terms and conditions, whether submitted purposely or inadvertently, shall have no force or effect, and will be disregarded unless expressly agreed upon during negotiations and incorporated by way of a Best and Final Offer (BAFO). Noncompliance with, or any attempt to alter or delete, this paragraph shall constitute sufficient grounds to reject Vendor's bid as nonresponsive.

2.4 RFP Schedule

The table below shows the intended schedule for this RFP. UCPS will make every effort to adhere to this schedule.

Event	Responsibility	Date and Time
Issue RFP	UCPS	March 7, 2025
Pre-Bid Meeting - MANDATORY	UCPS	March 17, 2025 at 10:00 AM
Submit Written Questions	Vendor	March 24, 2025 by 2:00 PM
Provide Response to Questions	UCPS	March 26, 2025 by 2:00 PM
Bid Proposal Due Date	Vendor	April 1, 2025 by 2:00 PM
Contract Award	UCPS	Following Legal Counsel review and approval

2.4 Site Visit or Pre-Bid Conference

A site visit or pre-bid conference has been scheduled as follows and it is mandatory. If you were present at the first mandatory pre-bid meeting, it is not required that you attend this pre-bid meeting.

Date	Time	Location	Where to Meet
March 17, 2025	10:00 AM	6701 Indian Trail Fairview Rd, Indian Trail, NC 28079	Front of school

2.5 Bid Questions

Upon review of the RFP documents, Vendors may have questions to clarify or interpret the RFP in order to submit the best bid possible. To accommodate the Bid Questions process, Vendors shall submit any such questions by the "Submit Written Questions" date and time provided in the above RFP Schedule Section above, unless modified by an Addendum.

Written questions must be emailed to the contact listed below by the date and time specified above in Section 2.3 RFP Schedule. Vendors should format the subject of the email as follows: "RFP # 5-97648020 HBES Lighting". Question submittals should include a reference to the applicable RFP section and be submitted in the following format: RFP Section, Page Number – Vendor Question.

Contact Name	Contact Title	Contact Email Address
Jennifer West	Construction Contracts Specialist	facilitiesbids@ucps.k12.nc.us

No information, instruction or advice provided orally or informally by any UCPS personnel, whether made in response to a question or otherwise in connection with this RFP, shall be considered authoritative or binding. Vendors shall rely on written material contained in the RFP and an addendum to this RFP.

2.6 Bid Submittal

IMPORTANT NOTE: This is an absolute requirement. Late bids, regardless of cause, will not be opened or considered, and will be automatically disqualified from further consideration. Vendor shall bear the sole risk of late submission due to unintended or unanticipated delay. It is the Vendor's sole responsibility to ensure its bid has been received as described in this RFP by the specified time and date of opening. Any bid or portion thereof received after the bid deadline will be rejected.

CAUTION: Vendors are cautioned that bids sent by U.S. Mail, including Express Mail, may not be delivered to the UCPS Facilities/Purchasing Office in time to meet the required bid closing date and time. All Vendors are urged to take the possibility of delay into account when submitted bids by the U.S. Postal Service, courier, or other delivery service.

If confidential and proprietary information is included in the proposal, also submit one (1) signed, REDACTED copy of the proposal. Such information may include trade secrets defined by N.C. General Statutes 66-152 and other information exempted from the Public Records Act pursuant to N.C. General Statues 132-1.2 Vendor may designate information, Products, Services, or appropriate portions of its response as confidential, consistent with and to the extent permitted under the statutes and rules set forth above. By so redacting any page, or portion of a page, the Vendor warrants that it has formed a good faith opinion, having received such necessary or proper review by counsel and other knowledgeable advisors, that the portions determined to be confidential and proprietary and redacted as such, meet the requirements of the Rules and Statues set forth above. However, under no circumstances shall price information be designated as confidential.

If the vendor does not provide a redacted version of the proposal with its proposal submission, the Department may release an unredacted version if a record request is received.

Bids for this project will be received by the UCPS Facilities/Purchasing Department until the date and time listed below. At that time, the bids will be opened and evaluated. A bid tab will also be prepared.

Bid Closing Date	**Bid Closing Time (Eastern Standard Time)**
April 1, 2025	2:00 PM

Mailed bids must be sent to
Union County Public Schools
Attn: Facilities/Jennifer West
201 Venus Street
Monroe NC, 28112

Please note on the envelope: Bid: #5-97648020 REBID
Closing Date: April 1, 2025
Hemby Bridge Elementary School Lighting Replacement,
Electrical Panel Replacement and Ceil Grid Replacement

Delivered bids must be delivered to:
Union County Public Schools
Attn: Facilities/Jennifer West
201 Venus Street
Monroe NC, 28112

Delivered bids will be accepted at the UCPS Facilities Department at Visitor Entrance only. Bids may be delivered Monday – Friday from 7:30 a.m. through 4:00 p.m. Bid proposals will not be accepted after the bid closing time on the bid closing date.

Bid documents are also available on the Union County Public Schools website.

2.7 Bid Contents

Vendors shall complete the bid proposal form, and all indicated attachments and include all authorized signatures where requested. Failure to provide all required items, or Vendor's submission of incomplete items, may result in UCPS rejecting the Vendor's bid, in UCPS' sole discretion.

Mailed, delivered, and emailed bid submission must contain:

Item Description	**Required (Yes or No)**
RFP Page 2 – Acceptance of Bids	Yes
Cover Letter that includes (i) statement that confirms the Vendor has read the RFP in its entirety, including all links, and all Addenda released in conjunction with the RFP (ii) a statement that the Vendor agrees to perform in accordance with the scope of work, requirements, and specifications contained herein, and (iii) Vendor's agreement to comply with all instructions, terms, and conditions, and attachments	Yes
Title Page that includes the company name, address, phone number, and authorized representative along with the Bid Number	Yes
Completed and Signed Attachment: Bid Proposal Form	Yes
UCPS has the right to request references once the BID is awarded	Yes

Item Description	Required (Yes or No)
Completed and Signed Attachment: HUB Supplemental Vendor Information	Yes
Bid Bond Form (***Required for all bids of $300,000.00 or more***)	Yes

Additional items attached to this bid:

Item	Required (Yes or No)
UCPS General Terms and Conditions	Yes
NC Sales and Use Tax Form	Yes
NC DOR – Affidavit E-589CI (Capital Improvement Project)	8ÌÚ

Mailed or delivered bid submissions must contain the following copy requirements:

Item	Required (Yes or No)
Original Signed Hard Copy	Yes
One (1) Additional Hard Copy	No

3.0 Method of Award and Bid Evaluation Process

3.1 Method of Award

North Carolina G.S. 143-52 provides a general list of criteria Union County Public Schools shall use to award contacts, as supplemented by the additional criteria herein. The Goods and Services being procured shall dictate the application and order of criteria; however, all award decisions shall be in Union County Public Schools' best interest.

All responsive bids will be reviewed, and an award or awards will be based on the responsive bid(s) offering the lowest price that meets the specifications provided herein, to include any required verifications set out here in such as but not limited to past performance, references, and financial documents.

While the intent of this RFP is to award a Contract(s) to a single vendor UCPS reserves the right to make separate awards to different Vendors for one or more-line items, to not award one or more-line items, or

to cancel this RFP in its entirety without awarding a Contract, if it is considered to be most advantageous to UCPS to do so.

UCPS reserves the right to waive any minor informality or technicality in bids received.

UCPS reserves the right to reject any or all bids for any or no reasons.

3.2 Confidentiality and Prohibited Communications During Evaluation

While this RFP is under evaluation, the responding Vendor, including any subcontractors and suppliers, is prohibited from engaging in conversations intended to influence the outcome of the evaluation.

Each Vendor submitting a bid to this RFP, including its employees, agents, subcontractors, suppliers, subsidiaries and affiliates, is prohibited from having any communications with any person inside or outside the using agency; issuing agency, other government agency office or body (including the purchaser named above, any department secretary, agency head, members of the Board of Education) or private entity, if the communication refers to the content for Vendor's qualifications or ability to perform a resulting contract, and/or the transmittal of any other communication of information that could be reasonably considered to have the effect of directly or indirectly influencing the evaluation of proposals, the award of a contract, or both.

Any Vendor not in compliance with the provision shall be disqualified from evaluation and award. A Vendor's proposal may by disqualified if its subcontractor and/or supplier engage in any of the foregoing communications during the time that the procurement is active (i.e., the issuance date of the procurement until the date of contract award or cancellation of the procurement). Only those discussions, communications or transmittals of information authorized or initiated by the issuing agency for this RFP or inquiries directed to the purchaser named in this RFP regarding requirements of the RFP (prior to proposal submission) or the status of the award (after submission) are exempt from this provision.

3.3 Proposal Evaluation Process

UCPS will conduct an evaluation of responsive Proposals, as follows:

a) UCPS shall review the responses to this RFP to confirm that they meet the specifications and requirements. UCPS reserves the right to waive any minor informality or technicality.
b) Proposals are requested for the items as specified. UCPS reserves the right to reject any proposal on the basis of fit, form and/or function, as well as cost.
c) For all responses that pass the initial review process, UCPS will review and assess the Vendors' pricing. UCPS may request additional formal responses or submissions from any or all Vendors for the purpose of clarification or to amplify the materials presented in any part of the quote.

   Vendors are cautioned, however, UCPS is not required to request clarification, and often does not. Therefore, all proposals should be complete and reflect the most favorable terms available from the Vendor. Prices quoted cannot be altered or modified as part of a clarification.

d) Proposals will be evaluated, based on the award criteria identified by UCPS.

Award of a Contract to one Vendor does not mean that the other proposals lacked merit, but that, all factors considered, the selected proposal was deemed most advantageous and represented the best value to UCPS.

Vendors are cautioned that this is a request for proposal, not a request or an offer to contract, and UCPS reserves the unqualified right to reject any and all offers at any time if such rejection is deemed to be in the best interest of UCPS.

3.4 Interpretation of Terms and Phrases

This RFP serves two (2) functions: (1) to advise potential Vendors of the parameters of the solution being sought by UCPS; and (2) to provide (together with other specified documents) the terms of the Contract resulting from this procurement. The use of phrases such as "shall", "must", and "requirements" are intended to create enforceable contract conditions. In determining whether bids should be evaluated or rejected, UCPS will take into consideration the degree to which Vendors have proposed or failed to propose solutions that will satisfy UCPS needs as described in the RFP. Except as specifically stated in the RFP, no one requirement shall automatically disqualify a Vendor from consideration. However, failure to comply with any single requirement may result in UCPS exercising its discretion to reject a bid in its entirety.

4.0 Requirements

This Section lists the requirements related to this RFP. By submitting a bid, the Vendor agrees to meet all stated requirements in this Section as well as any other specifications, requirements, and terms and conditions stated in this RFP. If a Vendor is unclear about a requirement or specification or believes a change to a requirement would allow for UCPS to receive a better bid, the Vendor is urged to submit these items in the form of a question during the question-and-answer period in accordance with Section 2.5 Bid Questions.

4.1 Pricing

Bid price shall constitute the total cost to UCPS for the complete performance in accordance with the requirements and specifications herein, including all applicable charges for handling, transportation, administrative and other similar fees. Complete Attachment: Proposal Bid Form and include in Vendor's response.

4.2 Pay Applications with Schedule of Values

All pay applications shall be reviewed by the engineer and certified by the engineer. Once approved, the engineer will forward the pay application to the UCPS Project Manager.

Vendor's Billing Address, Customer Account Number, RFP #, Order Date, Buyer's Order Number, Item or Service Descriptions, Price, Quantity, and Unit of Measure.

4.3 Financial Stability

As a condition of contract award, the Vendor must certify that is has the financial capacity to perform and to continue to perform its obligations under the Contract; that the Vendor has no constructive or actual knowledge of an actual or potential legal proceeding being brought against Vendor that could materially adversely affect performance of this Contract; and that entering into this Contract is not prohibited by any contract, or order by any court of competent jurisdiction.

Each Vendor shall certify it is financially stable by completing Attachment: Certification of Financial Condition. UCPS is requiring this certification to minimize potential issues from contracting with a Vendor that is financially unstable. From the date of the Certification to the expiration of the Contract, the Vendor shall notify UCPS within thirty (30) days of any occurrence or condition that materially alters the truth of any statement made in this Certification. The Contract Manager may require annual recertification of the Vendor's financial stability.

In lieu of Attachment: Certification of Financial Condition, UCPS may require a bidder to submit their most recent financial statement (balance sheet and income statements).

4.4 HUB Participation

Pursuant to North Carolina General Statue G.S. 143-48, it is UCPS policy to encourage and promote the use of small, minority, physically handicapped, and women contractors in purchasing Goods and Services. As such, this RFP will serve to identify those Vendors that are minority owned or have a strategic plan to support UCPS Historically Underutilized Business program by meeting or exceeding the goal of 10% utilization of diverse firms as 1st or 2nd tier subcontractors. Vendor shall complete Attachment: HUB Supplemental Vendor Information.

4.5 Personnel

Vendor warrants those qualified personnel shall provide Services under this Contract in a professional manner. "Professional Manner" means that the personnel performing the Services will possess the skill and competence consistent with the prevailing business standards in the industry. Vendor will serve as the prime contractor under this Contract and shall be responsible for the performance and payment of all subcontractor(s) that may be approved by UCPS. Names of any third-party Vendors or subcontractors of Vendor may appear for purposes of convenience in Contract documents; and shall not limit Vendor's obligations hereunder. Vendor will retain executive representation for functional and technical expertise as needed in order to incorporate any work by third party subcontractor(s). Should the Vendor's bid result in an award, the Vendor shall be required to agree that it will not substitute key personnel assigned to the performance of the Contract without prior written approval by the Contract Lead. Vendor shall further agree that it will notify the Contract Lead of any desired substitution, including the name(s) and references of Vendor's recommended substitute personnel. UCPS will approve or disapprove the requested substitution in a timely manner. UCPS may, in its sole discretion, terminate the Services of any person providing Services under this Contract. Upon such termination, UCPS may request acceptable substitute personnel or terminate the contract Services provided by such personnel.

4.6 Vendor's Responsibility

If Vendor's bid results in an award, Vendor agrees that it will not enter any agreement with a third party that may abridge any rights of UCPS under the Contract. If any Services, deliverables, functions, or responsibilities not specifically described in this solicitation are required for Vendor's proper performance, provision and delivery of the Service and deliverables under a resulting Contract, or are an inherent part of or necessary sub-task included within such Service, they will be deemed to be implied by and included within the scope of the Contract to the same extent and in the same manner as is specifically described in the Contract. Unless otherwise expressly provided herein, Vendor will furnish all of its own necessary management, supervision, labor, facilities, furniture, computer and telecommunications equipment, software, supplies and materials necessary for the Vendor to provide and deliver the Service and/or other Deliverables.

4.7 Agency Insurance Requirements Modification

During the term of the contract, the contractor at its sole cost and expense shall provide commercial insurance of such type and with such terms and limits as may be reasonably associated with the contract. As a minimum, the contractor shall provide and maintain the following coverage and limits:

1) Workers' Compensation shall be maintained with at least the minimum statutory limits, including Employer's Liability with limits of at least $1,000,000.
2) Commercial General Liability shall be maintained with at least the following minimum limits with the policy and the Certificate of Insurance indicating that the coverage is written on a "project" basis:
    a) $1,000,000 Bodily Injury and Property Damage for each occurrence
    b) $100,000 Fire Damage
    c) $1,000,000 Medical Expenses Any One Person
    d) $1,000,000 Personal and Advertising Injury
    e) $1,000,000 Products/Completed Operations Aggregate
    f) $2,000,000 General Aggregate

List the Owner (including its officers, agents, and employees) as an additional insured on the policy as evidenced by a policy endorsement. Coverage shall include, but not be limited to, the following supplementary coverages: Contractual Liability to cover liability assumed under this Agreement, Product and Completed Operations Liability Insurance, Broad Form Property Damage Liability Insurance, and Independent Contractors.

Such policy shall include all of the coverages, which may be included in coverages A, B, and C contained in the Commercial General Liability Policy, without deletion. Such policy must be issued on an "occurrence" basis, as distinguished from a "claims made" basis.

Completed Operations shall extend three (3) years after final payment.

The Contractor shall furnish a Certificate of Insurance as proof of the above coverages. Certificate will contain provision that the insurance coverages cannot be canceled, reduced in amount or coverage eliminated without thirty (30) days written notice to the Union County Board of Education. Owner's Protective insurance must list Union County Board of Education as the Certificate Holder and as "additional insured" as it's interest may appear. Owner's approval of Certificate of Insurance does not decrease or relieve the contractor's responsibility for maintaining insurance coverage as required in this Request for Proposal.

5.0 Specifications and Scope of Work

5.1 Project

Hemby Bridge Elementary School Lighting Replacement, Electrical Panel Replacement and Ceil Grid Replacement

RFP #5-97648020

5.2 Scope of Work

Work shall consist of furnishing all labor, taxes, materials, equipment, services, permits; incidental and implied; to install a complete and warranted system as designed per the attached drawings and Specifications. Please refer to the attachment named Exhibit 1.

5.3 Safety Regulations

The Vendor shall adhere to the rules, regulations, and interpretations of the North Carolina Department of Labor.

5.4 License and Permits

The Vendor shall hold the appropriate license of work to be performed and shall secure all permits required for the job completion, obtain, and deliver to Union County Public Schools, all certification of inspection issued by the Authorities Having Jurisdiction.

5.5 Scheduling

The Contractor must submit a precise time schedule as to when specific work will occur in specific areas within the building. This will be used to coordinate the work with the occupants of the building. The Maintenance Project Manager or building Administrator may alter the schedule at any time to maintain the work process within the facility. Work must be scheduled during hours that are acceptable to the school Administrator and Maintenance Project Manager. The Union County Board of Education shall not incur any additional cost due to scheduling.

All work must be scheduled to avoid safety concerns and disruption of classroom instruction time and/or operation times. If required, all permits and inspections will be the responsibility of the contractor, and copies of permits and final inspection will be submitted to UCPS prior to final payment.

5.6 Project Timeline

Consecutive calendar days shall be determined and listed on the BID Form by the contractor.

5.7 Liquidated Damages

Time is of the essence. The contractor shall complete work on site within the allotted time. Liquidated damages shall be assessed for each calendar day beyond the substantial completed date in the amount of $250.00 per day. Liquidated damages shall be assessed for final completion beyond the final completion date in the amount of $500.00 per day.

5.8 Workers on the Job

All employees of the Vendor shall, while on Union County Board of Education property, act in a professional and courteous manner. All workers shall be expected to dress appropriately for a school site while on Board property. Also, all employees of the Vendor must sign-in in the main office upon entering the facility and sign-out in the main office upon leaving the property. Any employee of the Vendor may be told to leave the property by either the school administration or responsible department director if they do not follow the above procedure. The employee shall be replaced with another Vendor employee at no additional cost to the Union County Board of Education.

Smoking, vaping, or the use of tobacco products is prohibited on UPCS' property.

5.9 Sex Offender and Public Protection Program

In accordance with G.S. 14-208.18 all persons who (1) are required to register under the Sex Offender and Public Protection Program and (2) have been convicted of certain sexually violent offenses or any offense where the victim was under the age of sixteen (16) years at the time of the offense are expressly forbidden to knowingly be present on any property owned or operated by the school system, including school buildings, athletic fields, playgrounds, parking lots, school buses, activity buses or other property of any kind for any reason, including attendance at sporting events or other school related functions, whether before, during or after school hours. It is the responsibility of the Vendor that their employees and sub-contractors are in accordance with G.S. 14-208.18.

5.10 Equipment and Tools

The Vendor shall not use equipment or tools owned by the UCPS. Also, employees of UCPS shall not be utilized by the Vendor except for opening locked doors or giving directions.

5.11 Clean Up

The work area shall be cleaned after each service visit so that the Union County Board of Education shall not incur any additional cost to clean the treated area. Also, the Vendor shall make minimal use of UCPS' trash receptacles. All large trash items and Vendor used materials shall be properly disposed of off the property. Onsite dumpsters shall not be used.

5.12 Changes During Service Contract Period

Changes during the service contract period shall only be made by written direction signed by UCPS. No additional cost to the contract shall be allowed unless accepted in writing by UCPS before work has begun.

5.13 Contract Terms

Price must be applicable for the term agreed upon by both parties.

5.14 Performance of Work

All work shall be performed at the highest level of quality. UCPS shall be responsible for determining the quality of work and may notify the Vendor of the same. **ANY WORK COMPLETED THAT IS NOT SUITABLE TO THE OWNER SHALL BE REPEATED BY THE VENDOR AT NO COST TO UNION COUNTY PUBLIC SCHOOLS.** Any damage to existing area or utilities will be the responsibility of the Vendor. No Exceptions.

The Union County Board of Education reserves the right to reject any or all bids or any or no reason.

End of RFP # *5-97648020*

By submitting this proposal, the potential contractor certifies the following: 1) this proposal is signed by an authorized representative of the firm, 2) It can obtain and will submit to Union County Public Schools insurance certificates as required, within five (5) calendar days after the notice to award. 3) all taxes have been determined and are included in the proposed cost 4) the potential contractor has read and understands the conditions set forth in this RFP and agrees to them with no exceptions.

Contractor's Name

Federal ID Number

Address

City State Zip Code

Email

Telephone Number Fax Number

Principal Place of Business if Different from Above

Printed Name Title

Signature Date

Attest: (Corporate Seal)

By License #

Title

End of Proposal Form for RFP #5-97648020

Company Name: _____

_____**Bid Submittal Form**
_____**Affidavit A or B**
_____**Identification of Minority Business Form**
_____**5% Bid Bond**

Project Title: Hemby Bridge Elementary School Lighting Replacement, Electrical Panel Replacement and Ceil Grid Replacement.

Location: 6701 Indian Trail Fairview Rd, Indian Trail, NC 28079

BID No: 5-97648020

COST PROPOSAL/EXECUTION OF PROPOSAL

By submitting this proposal, the potential contractor certifies the proposal is signed by an authorized representative of the firm. The cost and availability of all equipment, materials, supplies, taxes, etc. associated with performing the services described herein have been determined and included in the proposed cost. All labor costs, direct and indirect (including sales tax), have been determined and included in the proposed cost. The offeror is aware of prevailing conditions associated with performing these services. The potential contractor has read and understands the conditions set forth in this bid and agrees to them with no exceptions.

Therefore, in compliance with this Request for Proposals, and subject to all conditions herein, the undersigned offers and agrees, if this proposal is accepted within **60** days from the date of the opening, to furnish the subject services for a cost not to exceed:

BASE BID:	**$_____**	**Painting the existing ceiling grids**
ALTERNATE 1:	**$_____**	**Covering the existing ceiling grids with grid clips**
ALTERNATE 2:	**$_____**	**Canopy lighting**
ALLOWANCE FUNDS:	**$_____**	**10% of the BID**
ALL INCLUSIVE TOTAL	**$_____**	

Consecutive calendar days required to achieve Final Completion from issuance of Notice to Proceed: _____ calendar days

***************PLEASE COMPLETE THE UNIT COST SHEET THAT IS DIRECTLY BEHIND THIS PAGE*****************

ADDENDA ACKNOWLEDGEMENT

ADDENDUM 1: _____ ADDENDUM 2: _____ ADDENDUM 3: _____ ADDENDUM 4: _____

EXECUTION

OFFEROR: _____ FEDERAL ID NO._____

LICENSE DESCRIPTION: _____LICENSE NO._____

ADDRESS: _____CITY, STATE, ZIP _____

TELEPHONE NUMBER: _____MOBILE: _____EMAIL: _____

BY: _____ DATE: _____TITLE: _____
(Signature)

_____
(Typed or printed name)

1. Painting the existing ceiling grids is Base Bid. Covering the existing ceiling grids with grid clips is an alternate
2. Canopy lighting is an alternate(refer to the electrical plans)
3. The bid form needs the following unit prices filled out (refer to the electrical plans)

**** UNIT COST SHEET ****

A2/2 X 2 Flat Panel	unit price $_____
A4/2X4 Flat Panel	unit price $_____
F4/Vanity Light	unit price $_____
G4/Downlight	unit price $_____
G4E/Downlight	unit price $_____
G4S/Wall Washer	unit price $_____
J4/4' Industrial	unit price $_____
K2/2' Surface Mount	unit price $_____
L2/2' Wall MTD	unit price $_____
L4/4' Wall MTD	unit price $_____
M2/Gym Light	unit price $_____
N1/Canopy Light	unit price $_____
V1/Vapor Tight	unit price $_____
V2/Vapor Tight-EM	unit price $_____
W1/Emergency Battery Pak	unit price $_____
X3/Single Face Exit W/ Heads	unit price $_____
Y1/Exterior Wall Pack	unit price $_____

Identification of HUB Certified/ Minority Business Participation

I,_____,
(Name of Bidder)

do hereby certify that on this project, we will use the following HUB Certified/ minority business as construction subcontractors, vendors, suppliers or providers of professional services.

Firm Name, Address and Phone #	Work Type	*Minority Category	**HUB Certified (Y/N)

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

**** HUB Certification with the state HUB Office required to be counted toward state participation goals.**

The total value of minority business contracting will be ($)_____.

DOCUMENT 00 43 13
BID SECURITY FORM

Date of Execution of this bond _____

Name and Address of Principle (Bidder) _____

_____

Name and Address of Surety _____

_____

Name and Address of Contracting Body THE UNION COUNTY BOARD OF EDUCATION a body corporate of the State of North Carolina,
201 Venus Street Monroe, NC 28112

Amount of Bond
Bid Amount
and Proposal Dated: _____

_____for _____

_____

KNOW ALL MEN BY THESE PRESENTS, that we the PRINCIPLE above named and SURETY above named who is duly licensed to act as SURETY in the State of North Carolina, are held and firmly bound unto THE UNION COUNTY BOARD OF EDUCATION, a body corporate of the State of North Carolina, as Obligee, in the penal sum of five percent (5%) of the amount bid in the bid and proposal described in lawful money of the United States of America, for the payment of which well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such, that if the PRINCIPLE shall be awarded the contract for which the bid and proposal above described is submitted and shall execute the contract, give bond for the faithful performance of the contract, and give bond for the payment of all persons supplying labor and materials in the prosecution of the work provided for in said contract, within ten (10) days after the award of the same to the PRINCIPLE above named, then this obligation shall be null and void; but if the PRINCIPLE above named fails to so execute such contract and give performance bond and payment bond as required by Section 129 of Chapter 143 of the General Statutes of North Carolina, as amended, the Article 3 of Chapter 44-A of the General Statutes of North Carolina, as amended, the Surety shall upon demand, forthwith pay the Obligee the amount of this bond set forth above.

IN WITNESS WHEREOF, the Principle above named and the Surety above named have executed this instrument under their several seals on the date set forth above.

WITNESS:

_____
Principle (Name of individual, and trade Name, partnership, corporation, or joint venture)

_____
(Proprietorship or Partnership)

BY _____(Seal)

TITLE_____
(Owner, Partner, Office held in corporation, joint venture)

(Corporate Seal)

ATTEST
BY _____
(Corporation)

TITLE_____
(Corporation Secretary or Assistant Secretary Only)

_____
Surety (Name of Surety Company)

WITNESS:

BY _____

_____

TITLE Attorney in Fact

(Corporate Seal of Surety)

_____
(Address of Attorney in Fact)

COUNTERSIGNED:

_____

_____
N.C. Licensed Resident Agent

PERFORMANCE AND PAYMENT BOND FORMS

FORM OF PERFORMANCE BOND

Date of Contract: _____

Date of Execution: _____

Name of Principal (Contractor) _____

Name of Surety: _____

Name of Contracting Body: _____

Amount of Bond: _____

Project _____

KNOW ALL MEN BY THESE PRESENTS, that we, the principal and surety above named, are held and firmly bound unto the above named contracting body, hereinafter called the contracting body, in the penal sum of the amount stated above for the payment of which sum well and truly to be made, we bind, ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal entered into a certain contract with the contracting body, identified as shown above and hereto attached:

NOW, THEREFORE, if the principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreements of said contract during the original term of said contract and any extensions thereof that may be granted by the contracting body, with or without notice to the surety, and during the life of any guaranty required under the contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreements of any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the surety being hereby waived, then, this obligation to be void; otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Executed in _____ counterparts.

Witness:

_____
Contractor: (Trade or Corporate Name)

_____
(Proprietorship or Partnership)

By: _____

Attest: (Corporation)

Title: _____
(Owner, Partner, or Corp.
Pres. or Vice Pres. only)

By: _____

Title: _____
(Corp. Sec. or Asst. Sec.. only)

(Corporate Seal)

_____
(Surety Company)

Witness:

By: _____

_____

Title: _____
(Attorney in Fact)

Countersigned:

_____

(Surety Corporate Seal)

_____
(N.C. Licensed Resident Agent)

_____

_____
Name and Address-Surety Agency

_____

_____
Surety Company Name and N.C.
Regional or Branch Office Address

FORM OF PAYMENT BOND

Date of Contract: _____

Date of Execution: _____

Name of Principal (Contractor) _____

Name of Surety: _____

Name of Contracting Body: _____

Amount of Bond: _____

Project _____

KNOW ALL MEN BY THESE PRESENTS, that we, the principal and surety above named, are held and firmly bound unto the above-named contracting body, hereinafter called the contracting body, in the penal sum of the amount stated above for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal entered into a certain contract with the contracting body identified as shown above and hereto attached:

NOW, THEREFORE, if the principal shall promptly make payment to all persons supplying labor/material in the prosecution of the work provided for in said contract, and any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the surety being hereby waived, then this obligation to be void; otherwise, to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Executed in _____ counterparts.

Witness:

Contractor: (Trade or Corporate Name)

By:

(Proprietorship or Partnership)

Attest: (Corporation)

Title:
(Owner, Partner, or Corp.
Pres. or Vice Pres. only)

By:

Title:
(Corp. Sec. or Asst. Sec... only)

(Corporate Seal)

(Surety Company)

Witness:

By:

Title:
(Attorney in Fact)

Countersigned:

(Surety Corporate Seal)

(N.C. Licensed Resident Agent)

Name and Address-Surety Agency

Surety Company Name and N.C.
Regional or Branch Office Address

UNION COUNTY PUBLIC SCHOOLS TAX FORM INSTRUCTIONS

To the tax statement preparer for pay applications for Union County Public Schools:

Please find the attached form for providing sales taxes paid on materials for Union County Public Schools. It is important that you note the following:

Tax paid by contractors on rental equipment, tools or supplies that they use in the process of completing their contract is not refundable. Tax statements from contractors should indicate the **amount of tax paid on materials that become part of the structure only.** Statements should indicate the vendor's name, date of invoice, invoice number, taxable amount, and sales tax amount. The statement must be "certified" by the contractor. Additionally, be sure the county tax is allocated to the correct county. As of January 1, 2002, the county is determined by the "ship to" address; therefore, if the material was shipped to your place of business instead of the job site the county name would reflect the county where your business is located.

Subcontractors performing work should also provide sales tax statements to the general contractor. It is the general contractor's responsibility to secure from the subcontractor the tax statement. (Reference Sales and Use Tax Bulletin Section 31)

If you submit a pay application upon which no sales tax was paid, **please send a blank form indicating "none this period"**. *Payment may be delayed if proper sales tax accounting is not attached.*

If you have any questions regarding the attached form please contact Anna Austin w/UCPS at 704-290-1541 or Chase Simpson at 704-290-1549.

AS OF JULY 1, 2011, THE SALES TAX DISTRIBUTION FOR UNION COUNTY IS 4.75% STATE AND 2.00% COUNTY.

Mecklenburg County has an additional ½% local transit tax. They and Wake County are the only counties with 7 ¼% rate of tax. Other counties local to Union may have 2.25% for the County Rate. For other county rates refer to Form Gen562 on the NC Department of Revenue website www.dor.state.nc.us.

PLEASE USE THE CORRECT DISTRIBUTION (NOTED ABOVE) ON ALL CONTRACTOR STATEMENTS.

STATE COUNTY SALES/USE TAX STATEMENT
CERTIFICATION

Contractor:_____

Project Name:_____

Sheet #:_____

For Sales Taxes Paid from _____ to _____

Payment Application #: _____

	Invoice Number	Invoice Date	Vendor	Type of Materials	Taxable Amount of Invoice	County Name	NC Tax 4.75%	County Tax (2%/2.25%)	Transit Tax (1/2%)	Total Taxes
1)										
2)										
3)										
4)										
5)										
6)										
7)										
8)										
9)										
10)										
11)										
12)										
13)										
14)										
15)										
16)										
17)										
18)										
19)										
20)										
21)										
22)										
23)										
24)										
25)										
Total:										

We certify that the above listing includes all materials purchased by us and incorporated into the above referenced project for the period stated, became a permanent part of the project, and that the sales tax shown has been paid. The above represents a complete listing of these sales taxes paid for the pay application number.

Sworn and subscribed before me this _____ day of _____, _____.

By: _____

Notary Public: _____

Title: _____

My Commission Expires: _____

NCDOR
Web-Fill
7-18

E-589CI
Affidavit of Capital Improvement

Form E-589CI, Affidavit of Capital Improvement, may be used to substantiate that a contract, or a portion of work to be performed to fulfill a contract, is to be taxed for sales and use tax purposes, as a real property contract for a capital improvement to real property.

The receipt of an affidavit of capital improvement for services to real property, absent fraud or other egregious activities, establishes that the subcontractor or other person receiving the affidavit should treat the transaction as a real property contract for sales and use tax purposes.

A real property contract is a contract between a real property contractor and another person to perform a capital improvement to real property.

Section I. Single Use *(Complete this section to issue the affidavit for a single capital improvement.)*

(A) **Owner, Lessee/Tenant, or Real Property Contractor**

Address

City **State** **Zip Code**

(B) **Real Property Contractor** *(General Contractor or Subcontractor)* *Hired to perform capital improvement*

Address

City **State** **Zip Code**

Describe capital improvement to be performed:

Project Name

Project Address (where the work is to be performed) **City** **State** **Zip Code**

I certify that, to the best of my knowledge, this affidavit is accurate and complete and that the transaction described to be performed by the Real Property Contractor (General Contractor or Subcontractor identified in box "B") shall be treated as a real property contract for a capital improvement to real property for sales and use tax purposes. I understand that if it is determined that I issued this affidavit in error and the transaction is subject to sales tax as a retail sale of repair, maintenance, and installation services to real property, I will be liable for payment of any additional taxes determined to be due.

Signature of Authorized Person: _____ Title: _____ Date: _____

Section II. Blanket Use *(Complete this section to execute a blanket affidavit for capital improvements.)*

(C) **Real Property Contractor**

Address

City **State** **Zip Code**

(D) **Real Property Contractor or Subcontractor** *Hired to perform capital improvement*

Address

City **State** **Zip Code**

To be completed by the Real Property Contractor identified in Box C.

I certify that I am a Real Property Contractor who performs capital improvements to real property and all transactions with the real property contractor (subcontractor) identified in box "D" shall be treated as real property contracts for capital improvements to real property for sales and use tax purposes. I understand that if it is determined that I issued this affidavit in error and the transaction is subject to sales tax as a retail sale of repair, maintenance, and installation services to real property, I will be liable for payment of any additional taxes determined to be due.

Signature of Authorized Person: _____ Title: _____ Date: _____

Affidavit of Capital Improvement Instructions

Form E-589CI, Affidavit of Capital Improvement, may be issued to substantiate that a contract, or a portion of work performed to fulfill a contract, is a capital improvement to real property and subject to sales and use tax as a real property contract. Generally, services to real property are retail sales of or the gross receipts derived from repair, maintenance, and installation services, unless a person substantiates that a transaction is subject to tax as a real property contract, subject to tax as a mixed transaction contract, or the transaction is not subject to sales and use tax. A "real property contract" is a contract between a real property contractor and another person to perform a capital improvement to real property.

A mixed transaction contract is a contract that includes both a real property contract for a capital improvement and repair, maintenance, and installation services for real property that are not related to the capital improvement. For a mixed transaction contract, if the allocated sales price of the taxable repair, maintenance, and installation services included in the contract is less than or equal to twenty-five percent (25%) of the contract price, then the repair, maintenance, and installation services portion of the contract, and the tangible personal property, digital property, or service used to perform those services, are taxable as a real property contract for sales and use tax purposes.

- A person that issues Form E-589CI is liable for any additional tax due on the transaction in excess of tax paid on purchases pursuant to N.C. Gen. Stat. § 105-164.4H(a), if it is determined that the transaction is not a capital improvement, but rather the transaction is subject to tax as a retail sale.
- A person who receives Form E-589CI from another person, absent fraud or other egregious activities, is not liable for any additional tax on the gross receipts from the transaction if it is determined that the transaction is not a capital improvement.
- Form E-589CI **is not an affidavit of tax paid** on tangible personal property, or digital property purchased or used to fulfill a real property contract.
- Form E-589CI may not to be used to purchase tangible personal property, or digital property exempt from sales and use tax.

Exceptions from the Issuance of Form E-589CI to Establish a Transaction is to be Taxed as a Real Property Contract
In lieu of issuing an affidavit of capital improvement, a person may substantiate by other records that a transaction is a real property contract or a mixed transaction contract subject to tax as a real property contract, as discussed above, for a capital improvement to real property. However, where subcontractors are involved, it may be in the best interest of all parties to use Form E-589CI to ensure proper application of the sales and use tax laws.

Section I. Single Use Instructions
A person may complete "Section I - Single Use" for a one time use to substantiate that a transaction is a real property contract for a single capital improvement to real property and subject to sales and use tax as a real property contract. When a real property contractor hires a subcontractor to perform a portion of the overall real property contract and there is not a recurring business relationship between the two parties (when a period of no more than twelve months elapse between transactions between two parties), "Section I – Single Use" may be completed and the form issued to the subcontractor as notice that the transaction is subject to sales and use tax as a real property contract.

The following scenarios are for reference to assist a person to complete and issue Form E-589CI. The scenarios presented are not intended to cover all possible uses of the form.

A property owner oversees the entire activity to real property that is a real property contract for a capital improvement to real property. The property owner hires various subcontractors to complete the real property contract or portions thereof:

- **Box A - Owner, Lessee/Tenant or Real Property Contractor:** Enter property owner's name and address.
- **Box B - Real Property Contractor** *(General Contractor or Subcontractor)*: Enter a single subcontractor's name and address.
- Owner listed in Box A must describe the real property contract activity to be performed.
- Owner listed in Box A must enter the project address (if different than the address entered in Box A).
- Authorized Person (owner) signs, enters title (owner), enters the date, and issues to the person listed in Box B.

A property owner hires a general contractor to oversee the entire activity to real property that is a real property contract for a capital improvement to real property. The general contractor hires a subcontractor to perform the real property contract, or portion thereof:

- **Box A - Owner, Lessee/Tenant or Real Property Contractor:** Enter general contractor's name and address.
- **Box B - Real Property Contractor** *(General Contractor or Subcontractor)*: Enter subcontractor's name and address.
- General contractor listed in Box A must describe the real property contract activity to be performed.
- General contractor listed in Box A must enter the project address.
- Authorized Person (general contractor) signs, enters title (general contractor), enters the date, and issues to the person listed in Box B.

A lessee/tenant hires a general contractor for the installation of equipment that is to be attached to real property and will be depreciated under the Internal Revenue Code:

- **Box A - Owner, Lessee/Tenant or Real Property Contractor:** Enter lessee/tenant's name and address.
- **Box B - Real Property Contractor** *(General Contractor or Subcontractor)*: Enter general contractor's name and address.
- Lessee or tenant listed in Box A must describe the capital improvement to be performed and indicate the equipment will be depreciated under the Internal Revenue Code.
- Authorized Person (typically lessee or tenant) signs, enters title (lessee or tenant), enters the date, and issues to the person listed in Box B.

Section II. Blanket Use Instructions
A real property contractor may complete "Section II – Blanket Use" and issue the form to another real property contractor (subcontractor) who is used **exclusively** to perform part, or all, of real property contracts with respect to capital improvements to real properties, where the parties have a recurring business relationship (when a period of no more than twelve months elapse between transactions between two parties). A blanket use affidavit continues in force so long as the real property contractor named in "Box C" and the real property contractor (subcontractor) named in "Box D" maintain a recurring business relationship or until the affidavit is withdrawn or otherwise notified by the issuer of the form.

The blanket use will generally apply for the following: (1) a builder who hires the same contractor(s) only for new construction; (2) a real property contractor who hires the same subcontractor(s) only for reconstruction; (3) a real property contractor who hires the same subcontractor(s) for remodeling or renovation and the activities performed by the subcontractor(s) for the other party are never repair, maintenance, and installation services for real property based on the contract or agreement between the parties; and (4) a real property contractor who exclusively hires the same subcontractor(s) to perform part, or all, of its real property contracts for capital improvements to real properties.

A general contractor or subcontractor hires a subcontractor that will replace the complete electrical wiring in all renovated homes:

- **Box C - Real Property Contractor:** Enter the hiring real property contractor's name and address.
- **Box D - Real Property Contractor** *(General Contractor or Subcontractor)*: Enter the hired subcontractor's name and address.
- Authorized person listed in Box C signs, enters title, enters the date, and issues to the person listed in Box D.

I. Standard Terms and Conditions for All Contracts

1. Defined Terms, "Contract" means the agreement between UCBOE and Vendor which consists of the applicable Contract Documents. "Contract Documents" means: (i) any applicable purchase order between Vendor and UCBOE specifically including all terms and conditions set forth or referenced herein and on the face of a Purchase Order, (ii) any attachments hereto, (iii) any applicable solicitation documentation related to hereto (including without limitation any request for proposals or invitation for bids and Vendor's response thereto), and (iv) any other terms and conditions of a written agreement signed by Vendor and UCBOE that deals with the same subject matter. "Goods" means any supplies, materials, products or other tangible personal property provided by Vendor to UCBOE. "Purchase Order" mean any applicable purchase order issued by UCBOE. "Services" means services, specifically including without limitation construction services, design services, professional or consulting services and software as a service, "UCBOE" means the Union County Board of Education. "Vendor" means the party contracting with UCBOE and includes individual and entities that may be referred to in Contract Documents as "vendor", "seller", "service provider", or "contractor".

2. Written Agreement Signed by Both Parties; Acceptance of Purchase Order Terms and Conditions when there is not a Separate Written Agreement Signed by Both Parties. When a Contract is signed by both UCBOE and Vendor then the Purchase Order issued by UCBOE is for administrative convenience and is not part of the Contract Documents. When there is not a separate Contract signed by both UCBOE and Vendor, then Vendor's acknowledgment of the terms of any Purchase Order, without timely objection, or Vendor's shipment or performance of any part of a Purchase Order, constitutes an agreement to all terms and conditions set forth or referenced herein and on the face of the Purchase Order, together with the terms and conditions of any other applicable Contract Documents. The terms and provisions set forth in the Contract Documents shall constitute the entire agreement between Vendor and UCBOE with respect to the purchase by UCBOE of the Services and/or Goods work performed as described in the Contract Documents. In the event of any conflict between any terms and conditions of the Contract Documents, the terms and conditions most favorable to UCBOE shall control. A Purchase Order constitutes an offer by UCBOE and expressly limits acceptance to the terms and conditions stated therein. No additional or supplemental provision or provisions in variance herewith that may appear in Vendor's quotation, acknowledgment, invoice, or in any other communication from Vendor to UCBOE shall be deemed accepted by or binding on UCBOE. UCBOE hereby expressly rejects all such provisions which supplement, modify or otherwise vary from the terms of the Contract Documents, and such provisions are superseded by the terms and conditions stated in the Contract Documents, unless and until UCBOE's authorized representatives expressly assent, in writing, to such provisions. Stenographic and clerical errors and omissions by UCBOE are subject to correction.

3. Cancellation of Purchase Order. UCPS may cancel any Purchase Order or portion thereof without liability, if: (a) Vendor fails upon request to give reasonable assurance of timely performance or UCPS otherwise determines that it has reasonable grounds for insecurity regarding Vendor's performance; (b) conforming Goods or Services (including the quantities specified for delivery) are not delivered within the time specified or, if no time is specified, within a commercially reasonable time; (c) Vendor otherwise breaches the Contract and such breach is not corrected within thirty (30) days following written notice of breach; or (d) cancellation is otherwise required or allowed by law.

4. Quantities. Shipments must equal exact amounts ordered unless otherwise agreed in writing by UCBOE. The award of a term contract neither implies nor guarantees any minimum or maximum purchases. Materials received in excess of quantity specified on the purchase order, at UCBOE option's, may be returned at the Vendor's expense.

5. Prices. If Vendor's price or the regular market price of any of the Goods covered hereunder is lower than the price stated in the Contract Documents on the date of shipment of such Goods, Vendor agrees to give UCBOE the benefit of such lower price on any such Goods. In no event shall Vendor's price be higher than the price last

quoted or last charged to UCBOE unless otherwise agreed in writing. No charges for transportation, boxing, crating, etc. are allowable unless such charges are included in the Contract Documents.

6. Invoices. It is understood and agreed that orders will be shipped at the established Contract prices in effect on dates orders are placed. Invoicing at variance with this provision may subject the Contract to cancellation. Applicable North Carolina sales tax shall be invoiced as a separate item. Invoices shall be sent to UCBOE's accounts payable department with a copy to UCBOE Project Coordinator.

7. Freight on Board. All shipments of Goods are FOB destination unless otherwise stated in the Contract Documents. Any freight charges prepaid by Vendor are to be itemized on the invoice unless stated otherwise in writing by form of quote, bid, contract. In instances where Goods are shipped against this order by parties other than those specified on the Purchase Order, the third=party shipper must be instructed to list the UCBOE purchase order number on all packages, bills of lading, etc. to insure prompt identification of order.

8. Taxes. Taxes are included in the Contract Price. Applicable taxes shall be invoiced as a separate item for UCBOE's records.

9. Payment Terms. Payment terms are Net 30 days after receipt of correct invoice or acceptance of Goods, whichever is later.

10. Condition and Packaging. Unless otherwise provided by special terms and conditions or specifications, it is understood and agreed that any item offered or shipped has not been sold or used for any purpose and shall be in first class condition. All containers/packaging shall be suitable for handling, storage or shipment.

11. Safety Data Sheets. Safety Data Sheets must be provided with shipment of all chemicals."

12. Delays in Shipment. Time and date of delivery are of the essence, except when delay is due to causes beyond Vendor's reasonable control and without Vendor's fault or negligence.

13. Risk of Loss. Vendor shall have the risk of loss of and damage to the Goods subject to the Contract Documents until such Goods are delivered to the destination and accepted by UCBOE or its nominee.

14. Rejection. All Goods shall be received subject to UCBOE's inspection. Goods that are defective in workmanship or material or otherwise not in conformity with the requirements of the Contract Documents may be rejected and returned at Vendor's expense or may be accepted at a reduced price. UCBOE may require Vendor to promptly replace or correct any rejected Goods Services and, if Vendor fails to do so, UCBOE may contract with a third party to replace such Goods Services and charge Vendor the additional cost.

15. Warranties. Vendor warrants that all Goods delivered hereunder will be free from defects in materials and workmanship and will conform strictly to the specifications, drawings, or samples specified or furnished. This warranty shall survive any inspection, delivery, acceptance or payment by UCBOE of the Goods and shall run to UCBOE and any user of the Goods. This express warranty is in addition to Vendor's implied warranties of merchantability and fitness for a particular purpose which shall not be disclaimed. In addition to any other rights available at law or equity, UCBOE shall be entitled to all rights and remedies provided by the Uniform Commercial Code, Chapter 25 of the North Carolina General Statutes, for breach of express warranties and implied warranties of merchantability or fitness for a particular purpose, including but not limited to consequential and incidental damages.

16. Compliance with All Laws. Vendor warrants that all performance hereunder shall be in accordance with all applicable federal, state and local laws, regulations and orders. The right of Vendor to proceed may be terminated immediately by written notice if UCBOE determines that Vendor, its agent or another representative, has violated any provision of law.

17. Use of Federal Funds. If the source of funds for this Contract is federal funds, the following federal provisions apply pursuant to 2 C.F.R. § 200.326 and 2 C.F.R. Part 200, Appendix II (as applicable) Equal Employment Opportunity (41 C.F.R. Part 60); Davis-Bacon Act (40 U.S.C. 3141-3148); Copeland "Anti-Kickback" Act (40 U.S.C. 3145); Contract Work Hours and Safety Standards Act (40 U.S.C. 3701-3708); Clean Air Act (42 U.S.C. 74017671q.) and the Federal Water Pollution Control Act (33 U.S.C. 1251-1387); Debarment and Suspension (Executive Orders 12549 and 12689); Byrd Anti-Lobbying Amendment (31 U.S.C. 1352); Procurement of Recovered Materials (2 C.F.R. § 200.322); and Record Retention Requirements (2 CFR § 200.324).

18. Registered Sex Offenders; Jessica Lunsford Act. Under North Carolina law, certain sex offenders are prohibited from coming onto school campuses. Vendor agrees to conduct an annual check of the N.C. Sex Offender and Public Protection Registration Program, the N.C. Sexually Violent Predator Registration Program and the National Sex Offender Registry for all of its employees whose job involves direct interaction with students as part of the job. UCBOE prohibits any personnel listed on such registries from being on any property owned or operated by UCBOE and from having any direct interaction with students. As a term of the Agreement, said checks must be performed by the Vendor and reported to UCBOE's Superintendent or designee, if Vendor's employees will be working directly with students. Under provisions set forth in the Jessica Lunsford Act under North Carolina law, the signature below certifies that neither Vendor nor any employee or agent of Vendor is listed as a sex offender on the N.C. Sex Offender and Public Protection Registration Program, the N.C. Sexually Violent Predator Registration Program, and/or the National Sex Offender Registry.

19. Nondiscrimination. During the performance of the Contract, Vendor shall not discriminate against or deny the Contract's benefits to any person on the basis of sexual orientation, national origin, race, ethnic background, color, religion, gender, age or disability.

20. FERPA Electronically Stored Data Compliance: Vendor is expressly prohibited from selling or trading any education records or personally identifiable information acquired under the Agreement. Furthermore, Vendor agrees not to attempt to re-identify students from aggregated data. Further, Vendor will not use any personally identifiable information or education records to advertise or market to students of UCBOE or their parents. Any personally identifiable information and education records held by Vendor pursuant to the Agreement will be made available to UCBOE upon request. Vendor will store and process all data using appropriate administrative, physical, and technical safeguards to secure personally identifiable information and education records from unauthorized access, disclosure, and use. Vendor will conduct periodic risk assessments and remediate any identified security vulnerabilities in a timely manner. Vendor will also have a written incident response plan, to include prompt notification to UCBOE in the event of a security or privacy incident, as well as procedures for responding to a breach of data. Vendor agrees to share its incident response plan upon request. Vendor shall, for all personally identifiable data and education records in its possession and in the possession of any subcontractors, or agents to which it has transferred data as permitted herein, destroy or de-identify such data when such data is no longer needed to perform the Agreement. Vendor hereby agrees to abide by all Board of Education policies and procedures governing the confidentiality of student records and the responsible use of technology and internet safety. If Vendor experiences a security breach concerning any information covered by the Agreement, and such breach is covered by N.C.G.S. §75.61(14), then Vendor will (a) fully comply with Vendor's obligations under the N.C. Identity Theft Protection Act, (b) immediately notify UCBOE with the information listed in N.C.G.S. §75-65(d)(1-4), and (c) fully cooperate with UCBOE in carrying out its obligations under said Identity Theft Protection Act. Vendor will indemnify UCBOE for any breach of confidentiality or failure of its responsibilities to protect confidential information, and for cost of notification of affected persons as a result of its accidental or negligent release of personally identifiable information or education records provided to Vendor pursuant to the Agreement.

21. North Carolina Public Records Law: Vendor acknowledges that UCBOE is subject to the requirements of North Carolina's Public Records Law ("NCPRL"), N.C.G.S. § 132-1, et. seq. The Agreement and any related documents, papers, letters, maps, books, photographs, films, sound recordings, magnetic or other tapes, electronic data

processing records, artifacts, or other documentary material, regardless of physical form or characteristics, made or received by UCBOE in connection with the transaction of the Agreement may be considered a "public record," subject to disclosure under the NCPRL. UCBOE is under no obligation to notify Vendor prior to its compliance of its duties under NCPRL.

22. Conflict of Interest. Vendor represents and warrants that no member of UCBOE or any of its employees or officers who may obtain a direct benefit, personal gain or advantage for themselves or a relative or associate as a result of the Contract, subcontract or other agreement related to the Contract is in a position to influence or has attempted to influence the making of the Contract, has been involved in making the Contract, or will be involved in administering the Contract. Vendor also represents and warrants that, if the Contract is funded by any amount of federal funds, no violation of 2 C.F.R. § 200.318(c) or any other applicable federal conflict of interest law has occurred or will occur. Vendor shall cause this paragraph to be included in all Contracts, subcontracts and other agreements related to the Contract.

23. Gratuities. Vendor represents and warrants that no member of UCBOE or any of its employees has been or will be offered or given a gratuity to an official or employee of UCBOE in violation of applicable law or policy.

24. Kickbacks to Vendor. Vendor shall not permit any kickbacks or gratuities to be provided, directly or indirectly, to itself, its employees, subcontractors or subcontractor employees for the purpose of improperly obtaining or rewarding favorable treatment in connection with a UCBOE Contract or in connection with a subcontract relating to a UCBOE Contract. When Vendor has grounds to believe that a violation of this clause may have occurred, Vendor shall promptly report to UCBOE in writing the possible violation.

25. Iran Divestment Act. Vendor certifies that, as of the date listed below, it is not on the Final Divestment List, as created by the State Treasurer pursuant to N.C.G.S. § 143-6A-4, in violation of the Iran Divestment Act. In compliance with the requirements of the Iran Divestment Act and N.C.G.S. § 143C-6A-5(b), Vendor shall not utilize in the performance of the contract any subcontractor that is identified on the Final Divestment List. The Final Divestment List can be found on the State Treasurer's website at the address www.nctreasurer.com/Iran and should be updated every 180 days.

26. Divestment from Companies that Boycott Israel. The Vendor certifies that it has not been designated by the North Carolina State Treasurer as a company engaged in the boycott of Israel pursuant to N.C.G.S. 147-86.81. It is the responsibility of each vendor or contractor to monitor compliance with this restriction. Contracts valued at less than $1,000.00 are exempt from this restriction.

27. E-Verification. Vendor shall comply with the requirements of Article 2 of Chapter 64 of the North Carolina General Statutes

28. Indemnification. To the fullest extent permitted by law, Vendor shall indemnify and hold harmless UCBOE, its officers, agents, employees and assigns from and against all claims, losses, costs, damages, expenses, attorneys' fees and liability that any of them may sustain (a) arising out of Vendor's failure to comply with any applicable law, ordinance, regulation, or industry standard or (b) arising directly or indirectly out of Vendor's performance or lack of performance of the terms and conditions of the Contract. In the event that any Services and/or Goods sold and delivered or sold and performed under the Contract Documents shall be defective in any respect whatsoever, Vendor shall indemnify and save harmless UCBOE, its officers, agents, employees and assigns from all loss or the payment of all sums of money by reason of all accidents, injuries or damages to persons or property that shall happen or occur in connection with the use or sale of such Services and/or Goods and are contributed to by said condition. In the event Vendor, its employees, agents, subcontractors and or lower-tier subcontractors enter premises occupied by or under the control of UCBOE in the performance of the Contract Documents, Vendor agrees that it will indemnify and hold harmless UCBOE, its officers, agents, employees and assigns, from any loss, costs, damage, expense or liability by reason of property damage or personal injury of whatsoever nature or kind arising out of, as a result of, or in connection with such entry.

29. Insurance. Unless such insurance requirements are waived or modified by UCBOE or risk management ("DIRM"), Vendor certifies that it currently has and agrees to purchase and maintain during its performance under the Contract the following insurance from one or more insurance companies acceptable to UCBOE and authorized to do business in the State of North Carolina: Automobile - Vendor shall maintain bodily injury and property damage liability insurance covering all owned, non-owned and hired automobiles. The policy limits of such insurance shall not be less than $1,000,000 combined single limit each person/each occurrence. Commercial General Liability - Vendor shall maintain commercial general liability insurance that shall protect Vendor from claims of bodily injury or property damage which arise from performance under the Contract. This insurance shall include coverage for contractual liability. The policy limits of such insurance shall not be less than $1,000,000 combined single limit each occurrence/annual aggregate. Worker's Compensation and Employers' Liability Insurance - If applicable to Vendor, Vendor shall meet the statutory requirements of the State of North Carolina for worker's compensation coverage and employers' liability insurance. Vendor shall also provide any other insurance or bonding specifically recommended in writing by the DIRM or required by applicable law. Certificates of such insurance shall be furnished by Vendor to UCBOE and shall contain the provision that UCBOE be given 30 days' written notice of any intent to amend or terminate by either Vendor or the insuring company. Failure to furnish insurance certificates or to maintain such insurance shall be a default under the Contract and shall be grounds for immediate termination of the Contract.

30. Termination for Convenience. In addition to all of the other rights which UCBOE may have to cancel this Contract or an applicable Purchase Order, UCBOE shall have the further right, without assigning any reason therefore, to terminate the Contract (or applicable Purchase Order), in whole or in part, at any time at its complete discretion by providing 10 days' notice in writing from UCBOE to Vendor. If the Contract is terminated by UCBOE in accordance with this paragraph, Vendor will be paid in an amount which bears the same ratio to the total compensation as does the Services and/or Goods actually delivered or performed to the total originally contemplated in the Contract. UCBOE will not be liable to Vendor for any costs for completed Goods, goods in process or materials acquired or contracted for if such costs were incurred prior to the date of this Contract or an applicable Purchase Order.

31. Termination for Default. UCBOE may terminate the Contract, in whole or in part, immediately and without prior notice upon breach of the Contract by Vendor. In addition to any other remedies available to UCBOE law or equity, UCBOE may procure upon such terms as UCBOE shall deem appropriate, Services and/or Goods substantially similar to those so terminated, in which case Vendor shall be liable to UCBOE for any excess costs for such similar goods, supplies, or services and any expenses incurred in connection therewith.

32. Contract Funding. It is understood and agreed between Vendor and UCBOE that UCBOE's obligation under the Contract is contingent upon the availability of appropriated funds from which payment for Contract purposes can be made. No legal liability on the part of UCBOE for any payment may arise until funds are made available to UCBOE's Finance Officer and until Vendor receives notice of such availability. Should such funds not be appropriated or allocated, the Contract shall immediately be terminated. UCBOE shall not be liable to Vendor for damages of any kind (general, special, consequential or exemplary) as a result of such termination.

33. Accounting Procedures. Vendor shall comply with any accounting and fiscal management procedures prescribed by UCBOE to apply to the Contract and shall assure such fiscal control and accounting procedures as may be necessary for proper disbursement of and accounting for all project funds.

34. Improper Payments. Vendor shall assume all risks attendant to any improper expenditure of funds under the Contract. Vendor shall refund to UCBOE any payment made pursuant to the Contract if it is subsequently determined by audit that such payment was improper under any applicable law, regulation or procedure. Vendor shall make such refunds within thirty (30) days after UCBOE notifies Vendor in writing that a payment has been determined to be improper.

35. Contract Transfer. Vendor shall not assign, subcontract or otherwise transfer any interest in the Contract without the prior written approval of UCBOE.

36. Contract Personnel. Vendor agrees that it has, or will secure at its own expense, all personnel required to provide the Services and/or Goods set forth in the Contract.

37. Key Personnel. Vendor shall not substitute for key personnel (defined as those individuals identified by name or title in the Contract Documents or in written communication from Vendor) assigned to the performance of the Contract without prior written approval from UCBOE Project Coordinator (the individual at UCBOE responsible for administering the Contract).

38. Contract Modifications. The Contract may be amended only by written amendment duly executed by both UCBOE and Vendor.

39. Relationship of Parties. Vendor is an independent contractor and not an employee of UCBOE. The conduct and control of the work will lie solely with Vendor. The Contract shall not be construed as establishing a joint venture, partnership or any principal-agent relationship for any purpose between Vendor and UCBOE. Employees of Vendor shall remain subject to the exclusive control and supervision of Vendor, which is solely responsible for their compensation.

40. Advertisement. The Contract will not be used in connection with any advertising by Vendor without prior written approval by UCBOE.

41. Monitoring and Evaluation. Vendor shall cooperate with UCBOE, or with any other person or agency as directed by UCBOE, in monitoring, inspecting, auditing or investigating activities related to the Contract. Vendor shall permit UCBOE to evaluate all activities conducted under the Contract. UCBOE has the right at its sole discretion to require that Vendor remove any employee of Vendor from UCBOE Property and from providing Services and/or Goods under the Contract following provision of notice to Vendor of the reasons for UCBOE's dissatisfaction with the Services and/or Goods of Vendor's employee.

42. Financial Responsibility. Vendor is financially solvent and able to perform under the Contract. If requested by UCBOE, Vendor agrees to provide a copy of its latest audited annual financial statements or other financial statements as deemed acceptable by UCBOE's Finance Officer. In the event of any proceedings, voluntary or involuntary, in bankruptcy or insolvency by or against Vendor, the inability of Vendor to meet its debts as they become due or in the event of the appointment, with or without Vendor's consent, of an assignee for the benefit of creditors or of a receiver, then UCBOE shall be entitled, at its sole option, to cancel any unfilled part of the Contract without any liability whatsoever.

43. Governmental Restrictions. In the event any governmental restrictions are imposed which necessitate alteration of the material, quality, workmanship or performance of the items offered prior to their delivery, it shall be the responsibility of the Vendor to notify, in writing, the issuing purchasing office at once, indicating the specific regulation which required such alterations. UCBOE reserves the right to accept any such alterations, including any price adjustments occasioned thereby, or to cancel the Contract.

44. Inspection at Vendor's Site. UCBOE reserves the right to inspect, at a reasonable time, the equipment/item, plant or other facilities of a prospective contractor prior to Contract award, and during the Contract term as necessary for UCBOE determination that such equipment/item, plant or other facilities conform with the specifications/requirements and are adequate and suitable for the proper and effective performance of the Contract.

45. Confidential Information. All information about UCBOE provided to the Vendor or its officers, employees, agents, representatives and advisors (the "Vendor Representatives"), and all copies or other full or partial reproductions thereof and notes, memoranda or other writings related thereto created by Vendor or any Vendor

Representative, regardless of whether provided before or after the date of the Contract and regardless of the manner or medium in which it is furnished, is referred to as "Confidential Information". Confidential Information does not include any information that (a) is or becomes generally available to the public other than as a result of an impermissible disclosure by Vendor, (b) was known by or available on a nonconfidential basis to Vendor before it was disclosed by UCBOE or (c) becomes available to Vendor on a nonconfidential basis from a third party whom Vendor does not know to be bound by a confidentiality agreement with, or have an obligation of secrecy to, UCBOE. Except as and to the extent required by law or order or demand of any governmental or regulatory authority, Vendor and Vendor Representatives will (x) keep all Confidential Information confidential and (y) will only disclose or reveal any Confidential Information to Vendor Representatives who must have the information to fulfill Vendor's obligations under the Contract and who agree to observe the terms of this Section. Vendor and Vendor Representatives will not use the Confidential Information for any purpose other than fulfilling Vendor's obligations under the Contract. By way of example and not limitation, Vendor shall not sell, market, or commercialize Confidential Information, create derivative products or applications based on Confidential Information. If Vendor is requested or required, pursuant to applicable law or regulation or by legal process, to disclose any Confidential Information, Vendor will provide UCBOE with prompt and timely notice of the requests or requirements so that UCBOE can seek an appropriate protective order or other remedy and will not be prejudiced by delay. If UCBOE does not obtain a protective order or other remedy, Vendor will only disclose that portion of the Confidential Information which Vendor's legal counsel determines Vendor is required to disclose. Upon termination of the Contract or otherwise upon UCBOE's request, Vendor will promptly deliver to UCBOE all Confidential Information in the possession of Vendor or the Vendor Representatives. Student Information: If, during the course of Vendor's performance of the Contract, Vendor should obtain any information pertaining to students or students' official records, Vendor agrees to keep any such information confidential and to not disclose or permit it to be disclosed, directly or indirectly, to any person or entity. The Contract shall not be construed by either party to constitute a waiver of or to in any manner diminish the provisions for confidentiality of students' records. Additionally, pursuant to N.C.G.S. 115C-401.1, it is unlawful for a person who enters into a contract with a local board of education to sell personally identifiable information that is obtained from a student as a result of that person's performance under the Contract. Employee Personnel Information: If, during the course of Vendor's performance of the Contract, Vendor should obtain any information pertaining to employees of UCBOE's personnel records, Vendor agrees to keep any such information confidential and to not disclose or permit it to be disclosed, directly or indirectly, to any person or entity. This section will survive the termination of this Contract.

46. Intellectual Property. Vendor agrees, at its own expense, to indemnify, defend and save UCBOE harmless from all liability, loss or expense, including costs of settlement and attorney's fees, resulting from any claim that UCBOE's use, possession or sale of the Services and/or Goods infringes any copyright, patent or trademark or is a misappropriation of any trade secret.

47. No Pre-Judgment or Post-Judgment Interest. In the event of any action by Vendor for breach of contract in connection with the Contract, any amount awarded shall not bear interest either before or after any judgment, and Vendor specifically waives any claim for interest.

48. Background Checks. At the request of UCBOE's Project Coordinator, Vendor (if an individual) or any individual employees of Vendor shall submit to UCBOE criminal background check and drug testing procedures.

49. Mediation. If a dispute arises out of or relates to the Contract, or the breach of the Contract, and if the dispute cannot be settled through negotiation, the parties agree to try in good faith to settle the dispute by mediation administered by the American Arbitration Association under its Commercial Mediation Rules before resorting to litigation.

50. No Third-Party Benefits. The Contract shall not be considered by Vendor to create any benefits on behalf of any third party. Vendor shall include in all contracts, subcontracts or other agreements relating to the Contract an acknowledgment by the contracting parties that the Contract creates no third-party benefits.

51. Force Majeure. Neither party shall be responsible to the other for any losses resulting from the failure to perform any terms or provisions of the Agreement if the party's failure to perform is attributable to war, riot or other disorder, strike or other work stoppage; fire; flood; storm; illness; pandemic, communicable disease, or any other act not within the control of the party whose performance is interfered with, and which, by reasonable diligence, such party is unable to prevent. However, UCBOE will be entitled to a refund for fees paid on account of services not rendered by Vendor including any and all deposits.

52. Ownership of Documents; Work Product. All documents created pursuant to the Contract shall, unless expressly provided otherwise in writing, be owned by UCBOE. Upon the termination or expiration of the Contract, any and all finished or unfinished documents and other materials produced by Vendor pursuant to the Contract shall, at the request of UCBOE, be turned over to UCBOE. Any technical knowledge or information of Vendor which Vendor shall have disclosed or may hereafter disclose to UCBOE shall not, unless otherwise specifically agreed upon in writing by UCBOE, be deemed to be confidential or proprietary information and shall be acquired by UCBOE free from any restrictions as part of the consideration of the Contract.

53. Strict Compliance. UCBOE may at any time insist upon strict compliance with these terms and conditions notwithstanding any previous course of dealing or course of performance between the parties to the contrary.

54. General Provisions. UCBOE's remedies as set forth herein are not exclusive. Any delay or omission in exercising any right hereunder, or any waiver of any single breach or default hereunder, shall not be deemed to be a waiver of such right or of any other right, breach, or default. If action be instituted by Vendor hereunder, UCBOE shall be entitled to recover costs and reasonable attorney's fees. Vendor may not assign, pledge, or in any manner encumber Vendor's rights under this Contract or applicable Purchase Order or delegate the performance of any of its obligations hereunder, without UCBOE's prior, express written consent.

55. Contract Situs. All matters, whether sounding in contract or tort relating to the validity, construction, interpretation and enforcement of the Contract, will be determined in Union County, North Carolina. North Carolina law will govern the interpretation and construction of the Contract.

56. Severability. Any provision of this Contract that is determined by any court of competent jurisdiction to be invalid or unenforceable will not affect the validity or enforceability of any other provision. Any provision of the Contract held invalid or unenforceable only in part or degree will remain in full force and effect to the extent not held invalid or unenforceable.

II. Additional Standard Terms and Conditions for Construction Contracts

1. Supervision and Provision for Labor and Supplies. The Vendor will supervise and direct the construction work (the “Work”) and shall furnish, provide, and pay for all labor, materials, equipment, machinery, utilities, and services reasonably necessary for the execution and completion of the Work.

2. Coordination of Work and Notification of Progress. The Vendor agrees to coordinate its Work with the work of any other separate contractors or with the work of UCBOE’s own forces to avoid delaying or interfering with their work. Vendor shall enforce good order and discipline among his employees and subcontractors on the Project. The Vendor further agrees to inform UCBOE on a regular basis or at UCBOE’s request of the progress of the Work.

3. Provision for all Permits, Licenses, and Inspections. Unless otherwise provided, the Vendor shall secure and pay for all permits, licenses, and inspections necessary for the proper execution and completion of the Work.

4. Cleanliness. Vendor shall keep the Project reasonably free from waste materials or rubbish resulting from the Vendor’s operations.

5. Additional Warranties. The Vendor warrants that the Vendor has visited the location of the Project and is familiar with all field conditions bearing upon the Vendor’s performance of the Work; that the materials and

equipment furnished under the Contract are of good quality and new (unless otherwise permitted); that the Work is non-negligent and meets or exceeds the standards ordinarily observed in the industry; and that the Work conforms to the requirements of the Contract and to all applicable codes, ordinances, laws, or regulations. The Vendor further warrants and promises that the Work shall be free from defects and nonconformities in materials and workmanship for a period of one year from the later of the Date of Completion, which is the date UCBOE accepts the Work or such date as the Vendor actually completes all the Work (the "Date of Completion"). During such period, the Vendor will remedy at Vendor's expense nonconformities or defects in the Work within a reasonable time after receiving notice thereof from UCBOE.

6. Indemnity for Subcontractor Payment. In addition to the indemnification obligations contained in the attached terms and conditions to this Contract, the Vendor further agrees to defend and indemnify UCBOE from and against all claims, damages, losses, and expenses, including reasonable attorneys' fees, arising out of the Vendor's failure to pay subcontractors or materials suppliers.

7. Change Orders. The Vendor agrees that UCBOE may order changes in the general scope of the Work, including additions, deletions, and similar revisions. The parties agree to adjust the Contract Price and Date of Completion to reflect the effects of such changes, which adjustments shall be authorized only upon execution of a written change order (a "Change Order"). In case of emergency or extenuating circumstances or if a construction contingency is provided as stated below, approval of changes may be obtained verbally by telephone or field orders approved by UCBOE Project Coordinator and promptly thereafter substantiated in writing as outlined under normal procedures. The amount of any increase or decrease in the Contract Price shall be by mutual acceptance of a total amount supported by sufficient data and information to substantiate the change. Any decrease in Contract Price for a decrease in the Work will be the reasonable costs of the Work deleted, including a reasonable amount for the decrease in the Vendor's overhead.

8. Performance/Payment Bond. If required by law and/or the bidding documentation, the Vendor agrees to provide a Performance Bond and Labor and Material Payment Bond for its faithful performance in a form reasonably satisfying to UCBOE.

9. Payments Withheld. The UCBOE may withhold payment for the following reasons to the extent permitted under N.C. Gen. Stat. § 143-134.1(e): (1) defective Work not remedied; (2) third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to UCBOE is provided by the Vendor; (3) failure of the Vendor to make payments properly to subcontractors or for labor, materials or equipment; (4) reasonable evidence that the Work will not be completed with the time specified, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; (5) failure to carry out the Work in accordance with the Contract Documents; (6) failure to provide sales tax documentation in accordance with subparagraph 9.3.5; (7) failure or refusal of the Vendor to submit the required information on minority business enterprises; and (8) failure of the Vendor to comply with (a) the provisions of the Sedimentation and Pollution Control Act (N.C. Gen. Stat. § 113A-50 et seq.), and/or (b) any Notice of Violation issued by the North Carolina Department of Natural Resources.

10. Retainage. For public construction contracts costing an amount equal to or greater than $100,000, the UCBOE will retain five percent of the amount of each progress payment on the project for as long as is authorized by N.C. Gen. Stat. § 143-134.1. At all times during the Project, the UCBOE may retain the maximum funds allowed by N.C. Gen. Stat. § 143-134.1. The UCBOE specifically reserves the right to withhold additional funds as authorized by this Contract and N.C. Gen. Stat. § 143-134.1. The Vendor may pay each subcontractor no later than seven days after receipt of payment from the UCBOE and in accordance with N.C. Gen. Stat. § 143-134.1 the amount to which the subcontractor is entitled, reflecting percentages actually retained from payments to the Vendor on account of the subcontractor's portion of the Work. The Vendor shall, by appropriate agreement with each subcontractor, require each subcontractor to make payments to sub-subcontractors in a similar manner and in accordance with N.C. Gen. Stat. § 143-134.1.

11. The Vendor shall use and submit applications for payment using a form reasonably satisfactory to UCBOE ("Application for Payment"). The Contractor shall submit with each Application for Payment a completed "Statement of Sales Tax Paid" and "Minority Business Enterprise" documentation in a form acceptable to UCBOE.

III. Additional Standard Term and Condition for Designer Contracts (which include Architectural, Engineering, Surveying, and Technical Services)

Additional Insurance. In addition to the insurance required pursuant to Section 22 of the Standard Terms and Conditions for All Contracts, the Vendor certifies that it currently has and agrees to purchase and maintain during its performance under the Contract the following insurance from one or more insurance companies acceptable to UCBOE and authorized to do business in the State of North Carolina: Professional liability insurance in commercially reasonable amounts as reasonably determined by UCBOE.

IV. Additional Standard Terms and Conditions for Information Technology Contracts

1. Definitions.

"Hardware" means the hardware the Vendor utilizes in the Hosted Environment for delivery and maintenance of the Hosted Software Services.

"Hosted Environment" means the Hardware, system software, hosting support software, network connectivity, and facility used by Vendor to support the Hosted Software Services.

"Hosted Software Services" means the application, including the Hosted Software and any applicable Third-party Software, as run on the Hosted Environment.

"Hosted Software" means the software owned and controlled by Vendor or Vendor's third-party contractor that supports the Hosted Software Services.

"Support Services" means application and technical support required to maintain the performance, uptime and connectivity of the Hosted Software Services for UCBOE access and use, including without limitation, telephone support, error correction, maintenance, and installation of Updates and Upgrades to the Hosted Software.

"Updates" means (i) modifications to or releases of the Hosted Software that (a) add new features, functionality, and/or improved performance, (b) operate on new or other databases, operating systems, or server platforms or (c) extend the Hosted Software functionality to take advantage of advances in coding language, hardware, network or wireless infrastructures; and (ii) deviation corrections, bug or error fixes, patches, workarounds, and maintenance releases.

"Upgrades" means any new version or new release of the Hosted Software typically provided on an annual or bi-annual basis by the Vendor that includes new features, functions, support or service that were not in place with the immediately prior version.

2. Grant of License. Vendor grants to UCBOE for the term of this Contract a non-exclusive, non-transferable license to access and use over the internet the Hosted Software (the "License").

3. Updates and Upgrades. Vendor will make certain limited and applicable Hosted Software Updates and Upgrades available to UCBOE at no additional cost. All such Updates and Upgrades shall automatically become subject to the benefits and terms of this Contract and shall automatically be considered part of the License granted under this Contract.

4. Security. Vendor's Hosted Environment shall maintain security measures in place to help protect against the loss, misuse, and alteration of the Hosted Software Services, and specifically the Confidential Information provided to Vendor by UCBOE.

5. Warranties. Vendor warrants the following: (a) Vendor has the full authority to grant the License; (b) the Hosted Software is free from material defects or viruses; (c) the Hosted Software contains no disabling devices; and (d) the Hosted Software conforms to all material specifications set forth in the documentation and any other written material provided to UCBOE for any purpose. Without limiting any other remedies available to UCBOE under this Contract, at law or in equity, in the event that any Hosted Software does not conform to the warranties set forth for the Hosted Software herein, Vendor shall, at UCBOE's option, promptly correct or replace such Hosted Software and, in either case, Vendor shall perform any Support Services or other work required to restore the Hosted Software to the state that existed prior to any such breach, all at Vendor's expense. UCBOE reserves the right to reject the Hosted Software and to hold Vendor responsible for any loss, direct or indirect, caused by any such breach of warranty. In the event Vendor is or becomes aware of a problem with any item of Hosted Software, Vendor shall notify UCBOE upon such determination. Acceptance or use of the Hosted Software shall not constitute a waiver of any claim under any warranty.

6. Effect of Termination and Orderly Transition. Upon termination or expiration of this Contract for any reason, Vendor will cooperate in good faith with UCBOE to provide for an orderly transfer of the Goods and Services and Confidential Information to UCBOE or UCBOE's successor vendor ("Orderly Transition") and according to the terms of this section.

a. Scope of Work for Orderly Transition. Within thirty (30) days of notification by UCBOE that it will transfer Goods and Services to itself or a successor vendor, the parties will create and execute a scope of work document detailing tasks, the responsible parties for individual tasks, and timeframes for completion of tasks necessary to complete an Orderly Transition. The final, executed Orderly Transition scope of work shall be incorporated into this Contract and become subject to its terms. Vendor's failure to (a) cooperate in developing the Orderly Transition scope of work, (b) execute an Orderly Transition scope of work, or (c) abide by the executed Orderly Transition scope of work shall be deemed a material breach of this Contract.

b. Time Frame. Unless otherwise mutually agreed in an executed Orderly Transition scope of work, Vendor shall continue to provide Goods and Services while UCBOE migrates its Confidential Information from Vendor's Hosted Software Services in the Orderly Transition process. Vendor agrees that, as part of the Orderly Transition process and within the specified time frame, it will transfer to UCBOE all of the Confidential Information provided to Vendor by UCBOE pursuant to this Contract. Vendor will provide the Confidential Information in commercially reasonable electronic format as agreed in the Orderly Transition Scope of work at no additional cost.

c. Time and Material Costs Only. UCBOE will be obligated to pay for time and materials at a reasonable hourly rate of no more than $75/hour for the Orderly Transition. No other fees will be assessed for the Orderly Transition. Fees shall be agreed upon in advance as part of developing the scope of work referenced in subsection (a) above.

d. Destruction of Confidential Information after Orderly Transition. Unless otherwise mutually agreed in an executed Orderly Transition scope of work, Vendor agrees that after returning all Confidential Information to UCBOE pursuant to subsection (b) above it will destroy all remaining copies of Confidential Information and back-up Confidential Information in its possession, contained in or on any medium (such as a storage area network or "SAN") or as may be stored offsite, within thirty (30) days of completion of Orderly Transition. Vendor shall provide UCBOE with a detailed summary of the destruction process and standards to be utilized by Vendor with respect to the Confidential Information, and UCBOE shall approve such process and standards prior to Vendor commencing such destruction.

7. Intellectual Property Warranty. In addition to the warranties set forth elsewhere in this Contract with respect to the Goods and Services, Vendor expressly represents, warrants and covenants that neither the furnishing of

Hosted Services to UCBOE hereunder, nor does the Hosted Software, violate, in whole or in part, any provision of any law, common law or regulation concerning copyrights, trade secrets, trademarks, tradenames, service marks, patents or other provisions regulating or concerning intellectual property rights.

8. Additional Indemnification. To the fullest extent permitted by law, Vendor shall indemnify, defend and hold harmless UCBOE, its and directors, officers, managers, employees and agents, from all suits, claims, costs, damages and other liabilities, including reasonable attorneys' fees as incurred by counsel of UCBOE's choice, relating to or arising from (a) Vendor's failure to maintain the security and integrity of Confidential Information, the Hosted Software Services and the Hosted Environment; (b) any claim for infringement of any copyright, trade secret, trademark, tradename, service mark, patent, or other law or regulation concerning intellectual and/or proprietary property rights; and (c) any claims by third party interests in the Hosted Software.

9. Data Use. Notwithstanding the foregoing, Vendor acknowledges and agrees that all Confidential Information is proprietary to and owned exclusively by UCBOE, whether provided in tangible or electronic form and whether entered into any software or Hosted Software Services owned or licensed by Vendor (including without limitation the Hosted Software and Hosted Software Services) or otherwise provided in connection with any products provided and services performed by Vendor (including without limitation the Goods and Services) and whether to, by or through a Vendor-affiliated ASP or other Hosted Software Services. Furthermore, Vendor shall not sell, market, or commercialize Confidential Information, create derivative products or applications based on Confidential Information or otherwise use Confidential Information in any manner unrelated to the performance of Vendor's obligations under the Contract. Vendor shall not share Confidential Information with any parent or subsidiary company of Vendor or any other Vendor-affiliated entity without the express prior written consent of UCBOE detailing the scope of allowable disclosure. Vendor agrees that if it breaches this section, UCBOE may, at its option, pursue any or all of the following remedies: (a) immediately terminate this Contract without liability to Vendor; (b) seek an injunction without posting a bond; and (c) pursue whatever other remedies may be available to it at law, in equity or pursuant to this Contract.

EXHIBIT 1 Scope of Work

Hemby Brdige Lighting Replacement

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Provided under separate cover by Union County.

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Provided under separate cover by Union County.

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024100 Demolition

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SECTION 024100
DEMOLITION

PART 1 GENERAL

1.01 DEFINITIONS

A. "Remove": Carefully detach or dismantle items from existing construction and properly dispose of or recycle off site, unless items are indicated to be salvaged or reinstalled.

B. "Salvage" or "Remove and Salvage": Carefully detach or dismantle items from existing construction in a manner to prevent damage. Clean, package, label and deliver salvaged items to Owner in ready-for-reuse condition. If indicated to be reinstalled, store in a secure area until ready for reinstallation.

C. "Reinstall" or "Remove and Reinstall": Carefully detach or dismantle items from existing construction in a manner to prevent damage. Clean and prepare for reuse and reinstall where indicated.

D. "Existing", "Existing to Remain" or "ETR": Designation for existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1. Not all existing construction to remain shall be noted with one of these terms on the Drawings; the intent is to assist the Contractor in areas where it may be difficult to determine. Existing construction shall be assumed to remain unless specifically noted to be removed - either when noted with "remove", "salvage", or "reinstall" terminology per above, or when indicated graphically in accordance with the Demolition Legend on the Demolition Drawings.

1.02 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1. Hold the preinstallation meeting at the Project site; perform a walkthrough to review the existing conditions and highlight areas of particular concern.
2. Review structural concerns and deficiencies in the existing building(s).
3. Review demolition schedule, including phasing.
4. Review specific elements indicated to remain or to be salvaged, and review procedures for protection and / or storage of those elements.
5. Review Owner's occupancy and noise requirements.

B. Coordination: Coordinate phasing and staging requirements with Owner's occupancy of the existing building.

1. Coordinate with Division 01 sections for Owner's occupancy, phasing, and noise requirements.
2. Owner's personnel shall remove existing equipment and furnishings from spaces to be demolished prior to the beginning of the Work. Except for any built-in equipment specifically indicated on the Drawings to remain and be protected, the Contractor will not be required to work in furnished areas and will not be responsible for the condition of furniture or equipment left in place.

1.04 SUBMITTALS

A. Photographic Documentation: Submit photographic record of the existing conditions, either as still photographs or as a video-recorded walkthrough. Contractor shall perform walkthrough of existing conditions with Owner's representative prior to site mobilization.
   1. Photographic documentation shall clearly show existing damage and wear on existing surfaces that may be interpreted as being caused by subsequent demolition and construction operations.
   2. For still photographs, submit marked-up plan(s) indicating locations where photographs were taken and direction photograph is facing. Include a written narrative to describe existing damage and other conditions as deemed necessary.
   3. For video recordings, include a spoken narrative to describe locations and existing conditions, or provide a supplementary written narrative.
   4. Submit all photographic documentation as digital photo / video files, and supplementary narratives and plans as PDF files. Submit as part of the initial submittal package required prior to release of the first request for payment.

B. Shop Drawings: Submit demolition plans and survey as required by OSHA and local AHJs.
   1. Engineering Survey: Provide structural survey of existing building(s). Provide additional surveys if unforeseen conditions are revealed during the course of the Work.
   2. Indicate extent of demolition, removal sequencing, bracing and shoring, and location and construction of barricades and fences.
   3. Indicate elements to be salvaged and elements that are to remain in place and protected.

C. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

A. Perform an initial walkthrough and visual survey of the existing building(s). Take photographic documentation of the existing conditions per submittal requirements above.

B. Perform structural engineering survey of the existing conditions as required by OSHA and local AHJs.

3.02 PREPARATION

A. Remove and salvage items indicated to be reinstalled or turned over to Owner. Clean items and protect in secure packaging, and store in a secure location on-site.

3.03 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. All demolition work shall be considered unclassified. Barring discovery of hazardous materials or undocumented structural components, where elements are indicated to be demolished, the bid price shall be for complete demolition of the element, regardless of the individual component makeup of that element.

B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.

2. Fire Safety: Comply with applicable requirements of the International Fire Code; Chapter 33, and with NFPA 241.
    a. Use of explosives is not permitted.
    b. Hot Work: Remove all combustibles from areas where hot work is required, including use of cutting torches, welding, or heating equipment. Maintain fire watch for entire duration of hot work and for a minimum 30 minutes after completion of hot work.
        1) Keep portable fire extinguishers within 30 feet of locations where hot work is being performed for entire duration.
    c. Maintain egress routes and emergency access routes at all times; do not allow demolished materials to accumulate and block routes.
    d. Remove combustible demolished materials from the building by the end of each work day. Temporarily store combustible materials in noncombustible containers with self-closing lids until they can be removed from the building.
    e. Do not burn demolished material on site.
3. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
4. Provide, erect, and maintain temporary barriers and security devices.
5. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
6. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
7. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
8. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
9. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.

C. Do not begin removal until receipt of notification to proceed from Owner.

D. Do not begin removal until built elements to be salvaged, relocated, or reinstalled have been removed.

E. Protect existing structures and other elements to remain in place and not removed.
1. Provide bracing and shoring.
2. Prevent movement or settlement of adjacent structures.
3. Stop work immediately if adjacent structures appear to be in danger.

F. Minimize production of dust due to demolition operations. Do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

G. Perform demolition in a manner that maximizes salvage and recycling of materials.
1. Comply with requirements of Section 017419 - Construction Waste Management and Disposal.
2. Dismantle existing construction and separate materials.
3. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

H. If items of potential historic interest are discovered during the course of the Work, such as cornerstones or plaques, consult with the Owner prior to proceeding. If Owner wishes to

preserve these items, carefully remove and salvage, and store in on-site location designated by Owner.

3.04 EXISTING UTILITIES

A. Coordinate work with utility companies. Notify utilities before starting work, comply with their requirements, and obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

3.05 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
   1. Verify construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Separate areas in which demolition is being conducted from areas that remain occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction in accordance with Division 01 in locations indicated on drawings.

C. Maintain weatherproof exterior building enclosure, except for interruptions required for replacement or modifications; prevent water and humidity damage.

D. Protect existing work to remain.
   1. Prevent movement of structure. Provide shoring and bracing as required.
   2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.
   4. Patch to match new work.

E. Remove existing work as indicated and required to accomplish new work.
   1. Remove items indicated on drawings.

F. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
   1. Maintain existing active systems to remain in operation, and maintain access to equipment and operational components.
   2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.

3. Coordinate with Section 011000 - Summary for limitations on outages and required notifications to Owner, as applicable.
4. Verify that abandoned services serve only abandoned facilities before removal.
5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings. Remove back to source of supply where possible, otherwise cap stub and tag with identification.

G. Acoustical Ceiling Panels: Coordinate with Division 9 acoustical ceiling panel manufacturer and Division 1 Construction Waste Management section. Remove ceiling tiles and stack neatly on pallets; wrap or band pallet loads. Store in a protected, dry location in preparation for delivery to recycling facility.

H. Existing Surfaces to Receive Finishes: Remove miscellaneous hangers, exposed nails not serving as fasteners, and similar protrusions; remove adhesive residue and tape; fill anchorage holes; and otherwise patch and restore surface to be a uniform substrate suitable for applied finishes.

3.06 DEBRIS AND WASTE REMOVAL

A. Comply with requirements of 017419 - Construction Waste Management and Disposal.

B. Remove all debris, trash, and other materials not indicated to be salvaged or reinstalled from the site.

C. Leave site in clean condition, ready for subsequent work.

D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 024100

SECTION 095100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

B. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

D. ASTM E1264 - Standard Classification for Acoustical Ceiling Products.

1.02 SUBMITTALS

A. Shop Drawings: Indicate grid layout and related dimensioning.

B. Product Data: Provide data on suspension system components, acoustical units, and specialty ceiling products as indicated.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Refer to Section 016000 - Product Requirements, for additional provisions.
   2. Extra Acoustical Panels: Quantity equal to 2 percent of total installed, of each type.

D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.03 QUALITY ASSURANCE

A. Source Limitations: Provide each acoustical ceiling assembly (ceiling panel and suspension system) from a single manufacturer to obtain manufacturer's system warranty.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver until building is weather-tight and conditioned.

B. Store materials in dry and clean location until needed for installation. During installation, handle in a manner that will prevent damage and to prevent marring and soiling of finished surfaces.

1.05 FIELD CONDITIONS

A. Maintain uniform temperature and humidity at occupancy conditions during and after acoustical unit installation. Allow products to acclimatize prior to installation.

1.06 WARRANTY

A. System Warranty: Provide a single source system warranty covering both acoustical ceiling panels and suspension system.
   1. Warranty shall cover material failures including sag, warping, shrinkage, or delamination, biologic growth including mold or mildew, and rusting of suspension system.
   2. Warranty Period: Minimum 15 years, from date of Substantial Completion.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Surface Burning Characteristics: Each acoustical ceiling shall be Class A rated, with flame spread index of 25 or less, smoke developed index of 50 or less, when tested in accordance with ASTM E84.

2.02 ACOUSTICAL PANELS

A. Acoustical Panels - General: ASTM E1264, Class A.
   1. VOC Content: Third-party tested and certified, according to California Department of Public Health (CDPH) Standard Method (CA Section 01350).
   2. Antibacterial/Antimicrobial Treatment: Provide acoustical panels that have been factory-treated by manufacturer for resistance to bacteria, mold, mildew, and fungus.
   3. Humidity/Sag Treatment: Provide acoustical panels that have been factory-treated by manufacturer for humidity and sag-resistance.
   4. Formaldehyde-Free: Provide acoustical panels with formaldhyde-free compositon.

B. Acoustical Panels ACP: Painted mineral fiber, with the following characteristics:
   1. Classification: ASTM E1264 Type III.
      a. Form: 2, water felted.
   2. Size: 24 by 24 inches.
   3. Thickness: 3/4 inch.
   4. Light Reflectance: Not less than 0.82, determined in accordance with ASTM E1264.
   5. NRC Range: Not less than 0.70, determined in accordance with ASTM E1264.
   6. Panel Edge: Square.
   7. Color: White.
   8. Suspension System: Exposed grid.
   9. Products:
      a. Armstrong World Industries, Inc; School Zone Fine Fissured - Item #1713.
      b. CertainTeed Ceilings, Inc; Fine Fissured High NRC - Item #HHF-457 HNRCX.
      c. USG Corporation; Radar High-NRC Acoustical Panels - Item #22421.
      d. Substitutions: See Section 016000 - Product Requirements.

2.03 SUSPENSION SYSTEM(S)

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.
   1. Materials:
      a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.
   2. Cross Tee/Main Runner Connection: Override (stepped).
   3. Main Runner End Coupling: Bayonet ("stab") type; knuckle type is not acceptable.

B. Exposed Suspension System- for replacement of components of existing to remain exposed suspension system too damaged to reuse: Hot-dipped galvanized steel grid and cap.
   1. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
   2. Profile: Tee; 15/16 inch face width.

3. Finish: Baked enamel.
4. Products:
   a. Armstrong World Industries, Inc; Prelude XL 15/16".
   b. CertainTeed Ceilings, Inc; 15/16" EZ Stab Classic System.
   c. USG Corporation; Donn Brand DX/DXL 15/16 inch Acoustical Suspension System.
   d. Substitutions: See Section 016000 - Product Requirements.

2.04 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.

C. Perimeter Moldings: Same metal and finish as grid.
   1. Acoustical Sealant For Perimeter Moldings: Refer to Section 079200 - Joint Sealants for acoustical sealant for use in conjunction with suspended ceiling system.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 PREPARATION

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

3.03 INSTALLATION - SUSPENSION SYSTEM

A. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

B. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.

C. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.
   2. Apply acoustical sealant in a continuous bead at top edge of vertical legs of moldings after they are installed.

D. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
   1. Do not hang suspension system directly from steel floor or roof deck.

E. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

F. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

G. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

H. Do not eccentrically load system or induce rotation of runners.

3.04 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:
   1. Make field cut edges of same profile as factory edges.

F. Where round obstructions and bullnose concrete block corners occur, provide preformed closures to match perimeter molding.

3.05 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION 095100

SECTION 099100
PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior and interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated. Specific items include (but are not limited to) the following:

1. Fire- and Smoke-Rated Wall Identification: Permanently label fire- and smoke-rated walls, partitions, and barriers per requirements of applicable building code. Labeling shall include fire-resistance rating, type of assembly, and instruction to protect openings/penetrations. Example text: "ONE HOUR FIRE BARRIER - PROTECT ALL OPENINGS".
    a. Locate lettering in concealed accessible floor, floor-ceiling plenums, and attic spaces, located no more than 15 feet from end of wall and at horizontal intervals not exceeding 30 feet, with stenciled lettering not less than 3 inches high with minimum 3/8-inch strokes. Locate directly inside of access doors or panels that provide access to rated walls. Do not paint walls where exposed to view except in support spaces (mechanical / electrical rooms and similar spaces).
2. Refer to the life safety plans and partition schedule on the drawings for rated wall and partition locations.
3. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
4. Exposed faces of existing ceiling grid.
5. Mechanical and Electrical:
    a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
    b. Paint interior surfaces of air ducts and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
    c. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.
6. Shop-Primed Items: In finished areas, paint shop-primed items. Unless specifically indicated that additional field primer is not required, provide a tie coat primer over the shop primer before top coat(s) are applied.

D. Do Not Paint or Finish the Following Items:

1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
2. Items indicated to receive other finishes.
3. Items indicated to remain unfinished.
4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
5. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, and lead items.
6. Marble, granite, slate, and other natural stones.

7. Floors, unless specifically indicated.
8. Ceramic and other tiles.
9. Brick, architectural concrete, architectural precast, cast stone, and integrally colored plaster, fiberglass, or stucco.
10. Glass.
11. Acoustical materials, unless specifically indicated.
12. Concealed pipes, ducts, and conduits.

1.02 REFERENCE STANDARDS

A. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.2.

B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual.

C. SSPC-SP 1 - Solvent Cleaning.

D. SSPC-SP 6 - Commercial Blast Cleaning.

1.03 SUBMITTALS

A. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
   2. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.05 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F above the dew point, or to damp or wet surfaces.

D. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer.

B. Paints:
   1. Benjamin Moore.
   2. PPG Paints.
   3. Sherwin-Williams Company.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Supply each paint material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Low-Emitting Materials (Paints and Coatings): Paints and coatings field-applied inside the weatherproofing system shall be tested and determined compliant in accordance with CAL (CDPH SM) AND shall meet applicable VOC limits of CARB (SCM) or SCAQMD 1113.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: To be selected from manufacturer's full range of available colors.
   1. Selection to be made by Architect after award of contract.
   2. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.

2.03 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

D. Test shop-applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
   1. Gypsum Wallboard: 12 percent.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or repair existing paints or finishes that exhibit surface defects.

D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

E. Seal surfaces that might cause bleed through or staining of topcoat.

F. Concrete:
   1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

G. Masonry:
   1. Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.

H. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

I. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

J. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

E. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

F. Sand metal surfaces lightly between coats to achieve required finish.

G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

3.06 INTERIOR PAINT SCHEDULE

A. General: Provide the following paint systems for the various substrates, as indicated. Dry film thickness is noted as “DFT.” Provide compatibility test areas on existing painted substrates.

B. Concrete Masonry Units: Low-VOC Acrylic Satin Finish. 2 Coats over filler, with total DFT not less than 2.5 mils. (Provide for CMU except where “epoxy finish” is indicated.)

1. Filler Coat, 100% Acrylic. Apply filler coat at a rate to ensure complete coverage. Brush, spray or roller apply and back roll or squeegee for smooth, pinhole-free treatment.
    a. Moore: 571 Ultra Spec Hi-Build Masonry Block Filler.
    b. PPG: 16-90 Pitt Glaze WB Acrylic Interior Exterior Block Filler.
    c. S-W: B46W150 Pro Industrial Heavy Duty Block Filler. (PrepRite not acceptable)
2. Waterproofing Filler Coat – Showers & Wet Applications: Cementitious resin or epoxy block filler applied by brush, spray or roller and back rolled or squeegeed for smooth, pinhole-free treatment.
    a. Moore: P31 Waterborne Epoxy Block filler.
    b. PPG: 95-217 Epoxy Ester Cementitious Waterproofing Block Filler.
    c. S-W: B42W400/B42V401 Kem Cati-Coat HS Epoxy Filler/Sealer.
3. Bonding Primer (previously painted): Acrylic bonding primer for exceptional adhesion to hard, glossy surfaces. Test for adhesion. Brush, spray or roller apply and back roll.
    a. Moore: Stix Bonding Primer.
    b. PPG: 17-921 PPG Seal Grip Acrylic Universal Primer/Sealer.
    c. S-W: B51W150 Extreme Bond Interior/Exterior Primer.
4. First & Second Finish Coats: Commercial Interior Low-VOC Acrylic Satin Finish. Provide for wall finishes unless directed otherwise.
    a. Moore: N538 Ultra Spec 500 Interior Eggshell Finish.
    b. PPG: 6-411ZV Speedhide Interior Eggshell Latex.
    c. S-W: B20-12650 ProMar 200 Zero VOC Interior Latex Eg-Shel.

C. Concrete Masonry Units - Semi-Gloss Water-Borne Epoxy Finish: 2 Coats over filler:

1. Block Filler Coat: Acrylic-latex or as required by manufacturer for topcoat. Brush, spray or roller apply and back roll for smooth pinhole-free treatment.
    a. Moore: 571 Ultra Spec Hi-Build Masonry Block Filler.
    b. PPG: 6-15 Speedhide Int/Ext Acrylic Masonry Block Filler.
    c. PPG: 16-90 Pitt-Glaze WB Int/Ext Block Filler Latex.
    d. S-W: B46W150 Pro Industrial Heavy Duty Block Filler.
2. First and Second Coats: Two-component, semi-gloss water born polyamide epoxy enamel applied at a DFT of 1.5 to 4.0 mils per coat.
    a. Moore: Corotech V400 Polyamide Epoxy Coating.
    b. PPG: 98E-xx Base / 98E-100 Aquapon WB EP Water Based Epoxy – Semi-Gloss.
    c. S-W: B73W360 / B73V300 Pro Industrial Water Based Catalyzed Epoxy.

D. Gypsum Board Systems with Latex Finish: Satin (egg-shell) finish at walls and flat finish on ceilings except as indicated otherwise. Provide best commercial Zero-VOC formulation with 0

VOC per EPA test method 24.

1. Filler Coat: 0 VOC (per EPS test method 24) Latex Primer.
    a. Moore: N534 Ultra Spec 500 Interior Latex Primer.
    b. PPG: 9-900 Pure Performance Interior Latex Primer.
    c. S-W: B28-2600 ProMar 200 Zero VOC Interior Latex Primer.
2. First & Second Finish Coats: Interior Zero-VOC Acrylic Satin Finish. (Low lustre/Satin = 25-45% @60°) Provide for wall finishes unless indicated otherwise.
    a. Moore: N538 Ultra Spec 500 Interior Eggshell.
    b. PPG: 6-411ZV Speedhide Interior Eggshell Latex.
    c. S-W: B20-12650 ProMar 200 Zero VOC Interior Latex Eg-Shel.
3. First & Second Finish Coats: Interior Zero-VOC Acrylic Flat Finish. Provide for ceiling applications unless indicated otherwise.
    a. Moore: N536 Ultra Spec 500 Interior Flat.
    b. PPG: 6-70ZV Speedhide Interior Latex Flat.
    c. S-W: B30-2600 ProMar 200 Zero VOC Interior Latex Flat or B30-4650 ProMar 400 Zero VOC Interior Latex Flat.

E. Gypsum Board Systems with Water-Borne Polyamide Epoxy Finish (“EPX”):
1. Filler Coat: Manufacturer’s recommended primer.
    a. Moore: 217 Fresh Start Alkyd Enamel Underbody.
    b. PPG: 6-2 Speedhide Interior Latex Sealer.
    c. S-W: B28W2600 ProMar 200 Zero VOC Primer.
2. First and Second Coats: Two-component, water born polyamide epoxy enamel applied at a DFT of 1.5 to 4.0 mils per coat. Provide semi-gloss finish unless directed otherwise.
    a. Moore: Corotech V440 Waterborne Amine Epoxy.
    b. PPG: 98E-xx Base / 98E-100 Aquapon WB EP Water Based Epoxy – Semi-Gloss.
    c. S-W: B73W360 / B73V300 Water Based Catalyzed Epoxy.

F. Ferrous Metal with Latex Dry Fog Finish: One finish coat over primed exposed construction. Provide nominal 50 square foot sample area to test for paint compatibility with substrates.
1. Prime Coat: (Acrylic or recommended VOC-compliant metal primer for surfaces not pre-primed.) 2.0 mils DFT.
    a. Moore: N110 Superkote 5000 DryFall Latex Flat.
    b. PPG: 90-1908 Pitt-Tech Plus EP Acrylic Primer/Finish.
    c. S-W: B66-1300 Series Pro Industrial Pro-Cryl Universal Acrylic Primer.
2. Top Coat: All exposed structure as scheduled. Acrylic Dry Fog 3.0 mils DFT. Provide color finish as selected by Architect from manufacturer's full range.
    a. Moore: N110 Superkote 5000 DryFall Latex Flat.
    b. PPG: 6-725XI Speedhide Super Tech WB Int. Dry-Fog Flat Latex Flat.
    c. S-W: B42W1181 / B42B81 Waterborne Acrylic Dry Fall, Flat.

G. Ferrous Metal: Direct to Metal (“DTM”) Acrylic Enamel Finish: 2 Coats over primer, with total DFT not less than 2.5 mils. Provide satin finish at hollow metal steel doors and frames, and semi-gloss at other applications.
1. Prime Coat: Lead-free, acrylic base primer. Not required on shop primed items.
    a. Moore: HP29 Ultra Spec HP DTM Acrylic Semi-Gloss.
    b. PPG: 90-1908 Pitt-Tech Plus EP Acrylic Primer/Finish.
    c. S-W: B66W11 Pro Industrial DTM Acrylic Primer/Finish (or B66 W200).

2. Bonding Primer (previously painted): Acrylic bonding primer designed for previously painted ferrous metal to ensure secure bond. Brush, spray or roller apply and back roll.
    a. Moore: SXA-110 Insl-X Waterborne Bonding Primer.
    b. PPG: 90-1908 Pitt-Tech Plus EP Acrylic Primer/Finish.
    c. S-W: B66A50 DTM Bonding Primer.
3. First and Second Coat: DTM Acrylic Semi-Gloss Enamel. (30-40 units @ 60°)
    a. Moore: HP29 Ultra Spec HP DTM Acrylic Semi-Gloss.
    b. PPG: 90-1610 Pitt-Tech Plus EP DTM Acrylic Semi-Gloss.
    c. S-W: B66W1151 Pro Industrial DTM Acrylic Semi-Gloss Coating.
4. First and Second Coat: DTM Acrylic Satin Enamel. Provide for hollow metal steel doors and frames. (15-25 units @ 60°)
    a. Moore: HP25 Ultra Spec HP DTM Acrylic Low Lustre.
    b. PPG: 90-1710 Pitt-Tech Plus EP DTM Acrylic Satin.
    c. S-W: B66W1251 Pro Industrial DTM Acrylic Eg-Shel.

H. Zinc-Coated Metal: Semi-Gloss Direct to Metal (“DTM”) Acrylic Enamel Finish: 2 Coats over primer, with min. total DFT of 2.5 mils.
1. Prime Coat: Lead-free, acrylic base interior galvanized metal primer, premium grade.
    a. Moore: HP04 Ultra Spec HP Acrylic Metal Primer.
    b. PPG: 90-1908 Pitt-Tech Plus EP Acrylic Primer/Finish.
    c. S-W: B66W1151 Pro Industrial DTM Acrylic Semi-Gloss Coating.
2. First and Second Coats: DTM Acrylic Semi-Gloss Enamel. Same as for ferrous metal.

END OF SECTION 099100

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

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

1.3 SUBMITTALS

A. Provide drawings depicting the layout of each electrical room, electrical closet, security electronics room or any other similar space in which electrical equipment will be installed using a minimum scale of 1/2"=1'-0'. The drawings shall use the dimensions of the actual equipment being supplied for the project and shall include all NEC working clearances around the equipment. Drawings shall also include any the work of any other trade that will performing work in the space. Rough in may not begin until the submittal is approved by the engineer.

1.4 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 of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed.

1.5 QUALITY ASSURANCE

A. Third party agencies shall be amongst those accredited by the NCBCC (North Carolina Building Code Council) to Label Electrical & Mechanical Equipment".

PART 2 - PRODUCTS

2.1 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. Sleeves for Rectangular Openings: Galvanized sheet steel.

1. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE SEALS

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

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

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

2. Sealing Elements: NBR 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: Plastic. Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 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.

2.4 SECURITY FASTENERS:

A. Description: Accessories, anchorage inserts, and security fasteners providing a complete tamperproof installation.

B. Exposed Security Fasteners:
1. Fastener: Provide **torx-head** (star with center reject pin) security fasteners for anchoring work in exposed security areas.
2. Finish: Finish shall match that specified of the item anchored.
3. Tools: Provide tools for fastening devices.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1-2006. Mounting heights indicated in contract documents supersede 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 piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL 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. 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.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

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 indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry

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.

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.

K. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe 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.

3.3 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall and floor 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. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly.

3.5 SECURITY FASTENERS

A. All fasteners exposed in security areas shall be security fasteners. Where standard fasteners on manufactured devices and equipment are accessible, they shall be replaced with security fasteners.

END OF SECTION 260500

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.3 DEFINITIONS

A. RACEWAY: An enclosed channel of metal or nonmetallic materials designed expressly for holding wires or cables. Raceways include, but are not limited to, rigid metal conduit, rigid nonmetallic conduit, intermediate metal conduit, liquidtight flexible conduit, flexible metallic tubing, flexible metal conduit, electrical nonmetallic tubing, and electrical metallic tubing.
1. Cables such as MC, AC, or Greenfield are NOT raceways.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

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

1. Cerro Wire LLC.
2. General Cable; General Cable Corporation.
3. Southwire Company.
4. Encore Wiring Corporation.

B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-2-THWN-2.

D. Multiconductor Cable:
1. Shall only be allowed where specially indicated on the drawings.
2. Comply with NEMA WC 70/ICEA S-95-658 for metal-clad cable, Type MC with ground wire.

2.2 CONNECTORS AND SPLICES

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

1. 3M.
2. Hubbell Power Systems, Inc.
3. ILSCO.
4. Tyco Electronics Corp.

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

2.3 SYSTEM DESCRIPTION

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. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Cooper unless Aluminum specifically indicated on the drawings
1. When aluminum feeders are allowed, provide Copper for feeders smaller than No. 4 AWG; copper or aluminum for feeders No. 4 AWG and larger. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN-2-THWN-2, conductors in raceway or Type XHHW-2, single conductors in raceway. Type SE or Type USE multiconductor cable are not allowed.

B. Exposed Feeders: Type THHN-2-THWN-2, conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-2-THWN-2, conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2 conductors in raceway.

E. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-2-THWN-2, conductors in raceway

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-2-THWN-2, conductors in raceway.

G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, conductors in raceway, Type XHHW-2, conductors in raceway.

H. Feeders and Branch Circuits are not permitted to be installed in Cable Tray

3.3 INSTALLATION OF CONDUCTORS AND CABLES

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

B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. 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.

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

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

F. Branch Circuits Concealed in Casework: MC cable may be used to feed to outlet boxes fish concealed in built-in casework. Route cable supported tight in upper inside corners of casework, not in conflict with drawers or cabinet doors.

G. Branch Circuits Concealed Existing to Remain Drywall Partitions: MC cable may be used to feed to outlet boxes fish concealed in the drywall partition. Convert to conduit and conductor with 3' of exiting the partition.

H. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

I. Whips from Junction Box Concealed in Ceilings to Lighting Fixtures:
   1. Type MC Cable or FMC, with minimum #12AWG copper THHN/THWN and full size equipment grounding conductor. Maximum whip length 72".

2. MC Cable and FMC shall be supported within 24" of fixture connection so that whip is not in contact with ceiling or grid. Securing to fixture support wires with batwings is acceptable but not to ceiling support wires.
3. Do not connect fixture whips from fixture to fixture (daisy chain). No more than 4 whips shall be connected to any one junction box.

J. AC cable is not acceptable in any application.

K. All single-phase circuits shall include a dedicated neutral (grounded) and grounding conductor, unless specifically noted otherwise.
1. The intent of this is to eliminate multiwire branch circuits and allow disconnection of one circuit without requiring disconnection of other(s) as would be required to comply with NEC 210.4(B). Per NEC 310.15(B)(b) each of these neutral (grounded) conductor is not considered to be load-bearing so derating is not required.

L. Contract drawings are based upon a maximum of 3 current-carrying conductors in a conduit. Contractor may rework indicated circuitry to install a maximum of (6) L-N circuits (120 or 277V) in a single conduit. There shall be no more than 2 each A, B, C phase conductors per homerun. Each shall have dedicated neutral (grounded) conductor.
1. Do not group L-L circuits in a homerun, unless specifically indicated on the drawings.
2. Where there are more than 3 current-carrying conductors in a conduit, derate conductor ampacities in accordance with NEC Table 310.15(B)(2)(a).
3. When running more than 3 ungrounded conductors in a raceway, increase size of conduits beyond those indicated in contract documents, as required to not exceed NEC Chapter 9, Table 1 conduit-fill requirements. As-built drawings shall clearly indicate which circuits are grouped in homeruns.

M. Unless otherwise indicated, minimum conductor size shall be 12 AWG.

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-486B.

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

1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors where permitted.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.

    a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
    b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
    c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

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

1. Procedures used.
2. Results that comply with requirements.
3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

C. Cables will be considered defective if they do not pass tests and inspections. Remove and replace malfunctioning cables and retest as specified above.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes grounding and bonding systems and equipment

1.3 ACTION SUBMITTALS

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

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Burndy; Part of Hubbell Electrical Systems.
2. ERICO International Corporation.
3. Galvan Industries, Inc.; Electrical Products Division, LLC.
4. ILSCO.
5. O-Z/Gedney; an EGS Electrical Group brand; an Emerson Industrial Automation business.

2.2 SYSTEM DESCRIPTION

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

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Grounding Electrode Conductors: For the main service and transformers within the building shall be bare stranded copper and shall be sized no smaller than that indicated on the drawings or in the NEC table 250-66.

C. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.5 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet.

1. Termination: Factory-attached No. 4/0 AWG bare conductor at least 48 inches long.
2. Backfill Material: Electrode manufacturer's recommended material.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches below grade.

C. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, tele-data rooms and elsewhere as indicated.

D. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING SEPARATELY DERIVED SYSTEMS

A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

3.4 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

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

C. Metallic Fences:.

1. Grounding Conductor: Bare copper, not less than No. 8 AWG.
2. Gates: Shall be bonded to the grounding conductor with a flexible bonding jumper.
3. Barbed Wire: Strands shall be bonded to the grounding conductor.

3.5 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. When provided, Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting 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, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2. For grounding electrode system, 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, and connect to the service grounding electrode conductor.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install 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; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed 10 ohms.

F. 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 01 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. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

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

C. 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 QUALITY ASSURANCE

A. Comply with 2005 NFPA 70.

1.6 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Two Hole 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:

a. Cooper B-Line, Inc.; a division of Cooper Industries.
b. ERICO International Corporation.
c. Thomas & Betts Corporation.
d. Unistrut; an Atkore International company.

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101 and as required by NEC except in secure areas, the distance between supports shall be one half that specified by NEC. (twice as many supports as required by NEC).

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

D. 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.

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

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

1. 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:

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, 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:

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 05 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 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 two-bolt conduit clamps.

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. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
6. To Light Steel: Sheet metal screws.
7. 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.

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

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Division 05 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. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 033000 "Cast-in-Place Concrete."

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Comply with requirements in Division 09 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

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

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SECTION 260533 - RACEWAYS AND BOXES 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 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. RGS: Rigid Galvanized Steel conduit.

C. FMC: Flexible metal conduit.

D. IMC: Intermediate metal conduit.

E. LFMC: Liquidtight flexible metal conduit.

F. LFNC: Liquidtight flexible nonmetallic conduit.

G. NBR: Acrylonitrile-butadiene rubber.

H. RNC: Rigid nonmetallic conduit.

I. PVC: Schedule 40 PVC

J. ACCESSIBLE: Conduit less than 12' above the finished floor that is capable of being exposed without damaging the building structure or finish or not permanently closed in by the structure or finish of the building. Example: Conduit below 12' AFF that is above a removable ceiling tile is considered "Accessible"

K. RACEWAY: An enclosed channel of metal or nonmetallic materials designed expressly for holding wires or cables. Raceways include, but are not limited to, rigid metal conduit, rigid nonmetallic conduit, intermediate metal conduit, liquidtight flexible conduit, flexible metallic tubing, flexible metal conduit, electrical nonmetallic tubing, and electrical metallic tubing.
   1. Cables such as MC, AC, or Greenfield are NOT raceways.

1.3 ACTION SUBMITTALS

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

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

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

1. Allied Tube & Conduit.
2. O-Z/Gedney; an EGS Electrical Group brand; an Emerson Industrial Automation business.
3. Robroy Industries.
4. Thomas & Betts Corporation.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. IMC: Comply with ANSI C80.6 and UL 1242.

E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch, minimum.

F. EMT: Comply with ANSI C80.3 and UL 797.

G. FMC: Comply with UL 1; zinc-coated steel.

H. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

I. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
1. Fittings for EMT: Steel compression type.

2. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

J. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, AND FITTINGS

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

1. AFC Cable Systems, Inc.
2. Electri-Flex Company.

3. RACO; Hubbell.
4. Thomas & Betts Corporation.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. PVC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

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

1. Cooper B-Line, Inc.; a division of Cooper Industries.
2. Hoffman; a brand of Pentair Equipment Protection.
3. Square D.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled NEMA 3R, Flanged-and-gasketed type, and marked for intended location and application.

C. Fittings and Accessories: Include covers, 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. Wireway Covers: Screw-cover type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.4 SURFACE RACEWAYS

A. Listing and Labeling: Surface raceways shall be listed and labeled as defined in NFPA 70, and marked for intended location and application.

B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect].

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

a. MonoSystems, Inc.
b. Panduit Corp.
c. Wiremold / Legrand.

2.5 BOXES, ENCLOSURES, AND CABINETS

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

1. EGS/Appleton Electric.
2. Erickson Electrical Equipment Company.
3. Hoffman; a brand of Pentair Equipment Protection.
4. Hubbell Incorporated.
5. O-Z/Gedney; an EGS Electrical Group brand; an Emerson Industrial Automation business.
6. RACO; Hubbell.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy or aluminum, Type FD, with gasketed cover.

E. Metal Floor Boxes:

1. Material: Cast metal.
2. Shape: Rectangular.
3. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

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

H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum or galvanized, cast iron with gasketed cover.

I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

J. Gangable boxes are not prohibited.

2.6 FLOOR BOXES AND SERVICE FITTINGS

1. Floor boxes mounted in grade slabs shall be manufactured from cast-iron and be approved for use on grade and above grade floors.

2. Floor boxes not in grade slab shall be manufactured from stamped-steel and be approved for use on above-grade floors.

3. All floor boxes shall have four independent wiring compartments that allow capacity for up to four duplex receptacles and/or communication services. The box shall provide two 1" and two 1 1/4" conduit hubs. The box shall be fully adjustable...

4. Activation covers shall be available in flanged and flangeless versions of cast aluminum. Covers shall be available with options for tile or carpet inserts, flush covers, or furniture feed. Unless indicated otherwise, provide the following cover configurations:
    1) Power/Telecom Outlets: Brushed aluminum flanged with blank lid flush with floor and carpet/tile cutouts.
    2) Furniture Floor Feed: Brushed aluminum flanged with 1" trade size screw plug opening and one combination 1 1/4" and 2" trade size screw plug openings.
    3) Color and materiel shall be selected by the Architect
    4) The activation cover shall be listed by UL to meet the applicable U.S. and Canadian safety standards for scrub water exclusion when used on tile, terrazzo, wood, and carpet covered floors.

2.7 POKE-THRU ASSEMBLIES

1. 8" Poke-thru devices provide an interface between power, communication and audio/visual (A/V) cabling in an above grade concrete floor and the workstation or activation location where power, communication and/or A/V device outlets are required. These devices provide recessed device outlets that will not obstruct the floor area.

2. Insert: Insert body shall recess the devices a minimum of 2-3/4 inches (69mm) and have a polyester based backing enamel finished interior; ivory color. Furnish with necessary channels to provide complete separation of power and communication services. Provide compartments that allow for up to four duplex receptacles and/or communication ports

3. Body consists of an intumescent firestop material to maintain fire rating of the floor slab. Provide insert with a retaining feature to hold the poke-thru device in the floor slab without additional fasteners. Poke-thru insert shall also consist of a 3/4-inch trade size conduit stub that is connected to the insert body and a stamped steel junction box for wire splicing and connections. Stamped steel junction box shall also contain the means necessary to electrically ground the poke-thru device to the system ground

4. Activation Cover: Manufactured of die-cast aluminum alloy; finished in powder-coated color selected by the Architect. Provide with gaskets to maintain scrub water tightness. Provide cover with spring-loaded slides to allow cables to egress out of the unit and maintain as small an egress opening as possible.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: GRC.
3. Concealed in Masonry: GRC or PVC grouted solid after installation. Convert to metallic conduit per this specification prior to exiting the wall above ground
4. Concealed in Poured Concrete Walls: GRC or PVC. Convert to metallic conduit per this specification prior to exiting the wall above ground
5. Underground Conduit: Type PVC, direct buried.
6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
7. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed and Subject to Physical Damage: GRC. Raceway locations include the following:
   a. Loading dock.
   b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
   c. Mechanical rooms.
3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
4. Concealed in Masonry: GRC or PVC grouted solid after installation. Convert to metallic conduit per this specification prior to exiting the wall above ground
5. Concealed in Poured Concrete Walls: GRC or PVC. Convert to metallic conduit per this specification prior to exiting the wall above ground
6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
7. Damp or Wet Locations: GRC.
8. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

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

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Whips from Junction Box Concealed in Ceilings to Lighting Fixtures:
1. Above non-removeable or security type ceilings, junction boxes are not acceptable. Provide conduit between the fixtures.

F. AC is not acceptable in any application

G. Do not install aluminum conduits, boxes, or fittings.

H. Install surface raceways only where indicated on Drawings.

I. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. All conduit shall be tight to the structure and securely with two-hole steel conduit straps.

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

D. Complete raceway installation before starting conductor installation.

E. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

F. Arrange stub-ups so curved portions of bends are not visible above finished slab.

G. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

H. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

I. All conduit to be installed on exterior masonry shall not run continuously within the wall cavity.

J. Support conduit within 6 inches of enclosures to which attached.

K. Raceways Embedded in Slabs are not permitted, except as required for entry into recessed floor boxes. Conduits shall be routed below the slab within the porous fill and stub-up at the required location. Transition from PVC to RGS with RGS elbow before rising above the floor. After RGS elbow, stub-up conduit shall be type indicated in Part 3.1 above. PVC shall not be permitted exposed above the floor

L. 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.

M. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.

N. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

O. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

P. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

Q. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

R. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

S. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

T. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

U. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

V. Special Fittings and Installations:

1. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
    d. Attics: 135 deg F temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.

4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

W. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
1. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

X. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements and also refer to Architectural elevations. Install boxes with height measured to center of box unless otherwise indicated.

Y. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box. Retain the fire rating of any fire rated wall or assembly

Z. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

AA. Locate boxes so that cover or plate will not span different building finishes.

BB. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

CC. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

DD. Set metal floor boxes level and flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom for pipe less than 6 inches in nominal diameter.
2. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
3. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

4. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.

D. Install handholes with bottom below frost line, below grade.

3.5 CONDUIT COLOR CODING

A. All outlet boxes, junction boxes and pull boxes shall have their covers and exterior visible surfaces painted with colors to match the surface color scheme outlined below. This includes covers on boxes above lift-out and other type accessible ceilings, where identification shall also include branch circuit designation. Mark conduit a minimum of each 10'-0"

1. Blue for 120/208-volts normal circuits
2. Black for 277/480-volts normal circuits
3. Bright red for all conduit related to fire alarm system.
4. Dark red (burgundy) for all conduit related to security.
5. Green for all conduit related to NEC 701 and 702 emergency systems
6. Orange for all conduit related NEC 700 emergency systems
7. Brown for all conduit related to data systems.
8. White for all conduit related to paging systems.
9. Purple for all conduit related to TV systems or other LV systems.

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Maintain the fire rating of all fire rated walls and assemblies in which electrical raceway or boxes are installed.

END OF SECTION 260533

SECTION 260553 - IDENTIFICATION 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.3 ACTION SUBMITTALS

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

1.4 QUALITY ASSURANCE

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

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, 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 POWER AND CONTROL RACEWAY 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 size.

B. Colors for Raceways Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

C. Colors for Raceways Carrying Circuits at More Than 600 V:

1. Black letters on an orange field.
2. Legend: "DANGER CONCEALED HIGH VOLTAGE WIRING."

D. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

E. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

F. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

G. Tape and Stencil for Raceways Carrying Circuits More Than 600 V: 4-inch- wide black stripes on 10-inch centers diagonally over orange background that extends full length of raceway or duct and is 12 inches wide. Stop stripes at legends.

H. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

I. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.2 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 cable size.

B. Colors for Cables Carrying Circuits at 600 V and Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

C. Colors for Cables Carrying Circuits at More Than 600 V:

1. Black letters on an orange field.
2. Legend: "DANGER HIGH VOLTAGE WIRING."

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

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

F. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around cable it identifies. Full shrink recovery at a maximum of 200 deg F. Comply with UL 224.

2.3 POWER AND CONTROL 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 cable size.

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

C. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil- thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the cable diameter such that the clear shield overlaps the entire printed legend.

D. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around cable it identifies. Full shrink recovery at a maximum of 200 deg F. Comply with UL 224.

E. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

F. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

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

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

2.4 CONDUCTOR 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. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil- thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the conductor diameter such that the clear shield overlaps the entire printed legend.

C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.

D. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.

E. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around conductor it identifies. Full shrink recovery at a maximum of 200 deg F. Comply with UL 224.

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

G. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
2. Labels for Tags: Self-adhesive label, machine-printed with permanent, waterproof, black ink recommended by printer manufacturer, sized for attachment to tag.

2.5 FLOOR MARKING TAPE

A. 2-inch- wide, 5-mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

2.6 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE,.
3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE,.

C. Warning Tape:

1. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Overall Thickness: 5 mils.
3. Foil Core Thickness: 0.35 mil.
4. Weight: 28 lb/1000 sq. ft..
5. 3-Inch Tensile According to ASTM D 882: 70 lbf, and 4600 psi.

2.7 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.

1. Warning labels and signs shall include, but are not limited to, the following:
   a. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
   b. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES"
   c. Arc Flash Hazard Warning: Refer to Section 260574 for requirements.

2.8 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches 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.

B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.

2.9 EQUIPMENT IDENTIFICATION LABELS

A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

2.10 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black.

C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F.
5. Color: Black.

2.11 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding 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.

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. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

I. 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 or concrete envelope exceeds 16 inches overall.

J. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl label. Install labels at 10-foot maximum intervals.

B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:

1. Emergency Power.
2. Power.
3. UPS.

C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.

a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
b. Colors for 208/120-V Circuits:

1) Phase A: Black.
2) Phase B: Red.
3) Phase C: Blue.
4) Grounded (Neutral): White.
5) Ground: Green.

c. Colors for 480/277-V Circuits:

1) Phase A: Brown.
2) Phase B: Orange.
3) Phase C: Yellow.
4) Grounded (Neutral): Gray.
5) Ground: Green.

d. 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.

D. Power-Circuit Conductor Identification, More than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use nonmetallic plastic tag holder with adhesive-backed phase tags, and a separate tag with the circuit designation.

E. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

F. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive, self-laminating polyester labels with the conductor or cable designation, origin, and destination.

G. Control-Circuit Conductor Termination Identification: For identification at terminations provide heat-shrink preprinted tubes or self-adhesive, self-laminating polyester labels with the conductor designation.

H. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source.

I. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal 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 the 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.

1. Limit use of underground-line warning tape to direct-buried cables.
2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

K. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

L. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For 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.

M. Operating Instruction Signs: 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.

N. Emergency Operating Instruction Signs: 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 and load shedding.

O. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the 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: Adhesive film label with clear protective overlay. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.
    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.
    d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

    a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be, laminated acrylic or melamine label.
    b. Enclosures and electrical cabinets.
    c. Access doors and panels for concealed electrical items.
    d. Switchboards.
    e. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
    f. Emergency system boxes and enclosures.
    g. Enclosed switches.
    h. Enclosed circuit breakers.
    i. Enclosed controllers.
    j. Variable-speed controllers.
    k. Push-button stations.
    l. Power transfer equipment.
    m. Contactors.
    n. Remote-controlled switches, dimmer modules, and control devices.
    o. Battery-inverter units.
    p. Power-generating units.
    q. Monitoring and control equipment.
    r. UPS 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 01 Specification Sections, apply to this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show installation details for occupancy and light-level sensors.

1. Interconnection diagrams showing field-installed wiring.
2. Include diagrams for power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lighting control device to include in emergency, operation, and maintenance manuals.

1.4 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, smoke detectors, fire-suppression system, and partition assemblies.

1.5 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of lighting controls that fail in materials or workmanship or from transient voltage surges, and the Contractor agrees to provide associated electrical work to make good within the specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure equipment to operate, or to operate reliably.
b. Damage of electronic components due to transient voltage surges.

2. Warranty Period: One year from date of Final Acceptance for material and labor.
3. Extended Material Warranty Period Failure Due to Transient Voltage Surges: 10 years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 TIME SWITCHES

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

1. Cooper Industries, Inc.
2. Intermatic, Inc.
3. Leviton Manufacturing Co., Inc.
4. NSi Industries LLC.

B. Electronic Time Switches: Solid state, programmable, with alphanumeric display; complying with UL 917.

1. Listed and labeled as defined in NFPA 70, and marked for intended location and application.
2. Contact Configuration: DPDT
3. Contact Rating: 30-A inductive or resistive, 240-V ac.
4. Programs: Each channel is individually programmable with two on-off set points on a 24-hour schedule, allowing different set points for each day of the week.
5. Astronomic Time: All channels.
6. Automatic daylight savings time changeover.
7. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.

2.2 OUTDOOR PHOTOELECTRIC SWITCHES

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

1. Cooper Industries, Inc.
2. Intermatic, Inc.
3. NSi Industries LLC.
4. Tyco Electronics.

B. Description: Solid state, with SPST dry contacts rated for 1800-VA tungsten or 1000-VA inductive, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of the photocell to prevent fixed light sources from causing turn-off.
3. Time Delay: Fifteen second minimum, to prevent false operation.
4. Surge Protection: Metal-oxide varistor.

5. Mounting: Twist lock complies with NEMA C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.

2.3 DAYLIGHT-HARVESTING DIMMING CONTROLS

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

1. Cooper Industries, Inc.
2. Hubbell Building Automation, Inc.
3. Leviton Manufacturing Co., Inc.
4. Lithonia Lighting; Acuity Brands Lighting, Inc.
5. Watt Stopper.

B. System Description: Sensing daylight and electrical lighting levels, the system adjusts the indoor electrical lighting levels. As daylight increases, the lights are dimmed.

1. Lighting control set point is based on two lighting conditions:

   a. When no daylight is present (target level).
   b. When significant daylight is present.

2. System programming is done with two hand-held, remote-control tools.

   a. Initial setup tool.
   b. Tool for occupants to adjust the target levels by increasing the set point up to 25 percent, or by minimizing the electric lighting level.

C. Ceiling-Mounted Dimming Controls: Solid-state, light-level sensor unit, with separate controller unit, to detect changes in lighting levels that are perceived by the eye.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Sensor Output: 0- to 10-V dc to operate electronic dimming ballasts. Sensor is powered by controller unit.
3. Power Pack: Sensor has 24-V dc, Class 2 power source, as defined by NFPA 70.
4. Light-Level Sensor Set-Point Adjustment Range: 20 to 60 fc.

2.4 May be provided integral to the indoor occupancy sensors

2.5 INDOOR OCCUPANCY SENSORS

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

1. Hubbell Building Automation, Inc.
2. Leviton Manufacturing Co., Inc.
3. Lithonia Lighting; Acuity Brands Lighting, Inc.
4. Lutron Electronics Co., Inc.
5. Sensor Switch, Inc.
6. Watt Stopper.

B. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
4. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
5. Mounting:

    a. Sensor: Suitable for mounting in any position on a standard outlet box.
    b. Relay: Externally mounted through a knockout in a standard electrical enclosure.
    c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
7. When daylighting is indicated on the drawings, provide Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.

C. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
3. Detection Coverage:
    a. Standard Height Units: In areas that have ceiling heights of 12 feet or lower, provide Watt Stopper unit DT-300 (or approved equal): Detect occupancy anywhere within a circular area up to 2000 square feet. Detectors shall be networkable to allow coverage of larger or irregularly shaped areas.
    b. High Ceiling Units: In areas that have ceiling/mounting height over 12 feet up to 40 foot mounting including but not limited to Gymnasium, Auditorium, Cafeteria (commons) and forum spaces, provide Watt Stopper unit HB3x0 with L4 lens, or

approved equal. Detect occupancy anywhere within a circular area up to 3500 square feet. Detectors shall be networkable to allow coverage of larger or irregularly shaped areas.

2.6 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

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

1. Hubbell Building Automation, Inc.
2. Leviton Manufacturing Co., Inc.
3. Lutron Electronics Co., Inc.
4. Sensor Switch, Inc.
5. Watt Stopper.

B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
3. Switch Rating: Not less than 800-VA fluorescent at 120 V, 1200-VA fluorescent at 277 V, and 800-W incandescent.

C. Wall-Switch Sensor:

1. Standard Range: 210-degree field of view, field adjustable from 210 to 40 degrees; with a minimum coverage area of 2100 sq. ft.
2. Sensing Technology: Dual technology
3. Voltage: Dual voltage, 120 and 277 V.
4. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
5. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
6. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.
7. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

2.7 LIGHTING CONTACTORS

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

1. Allen-Bradley/Rockwell Automation.
2. ASCO Power Technologies, LP.
3. General Electric Company.
4. Square D.

B. Description: Electrically operated, combination-type lighting contactors with nonfused disconnect, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
3. Enclosure: Comply with NEMA 250.
4. Provide with control and pilot devices as indicated on Drawings, matching the NEMA type specified for the enclosure.

2.8 LIGHTING GENERATOR TRANFER DEVICE (GTR OR GTD)

A. A device to supply power to standard fluorescent or LED egress lighting fixture from a generator source upon failure of the normal lighting circuit. The device shall be capable of bypassing the wall switch when the auxiliary generator (or central inverter) powers lighting at full intensity. The device shall consist of relay switching circuitry and shall operate at 120 or 277 VAC, 60 Hz.

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

1. Bodine.
2. Wattstopper

C. The device shall be listed and tested by Underwriters Laboratories in accordance with the standards set forth in UL 924, "Emergency Lighting and Power Equipment," for factory or field installation inside, on top of or remote from the fixture and shall be warranted for a full five years from date of purchase.

D. The device may be designed to control a single fixture (3A rated) or control a 20A circuit within the space.

2.9 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

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, smoke detectors, fire-suppression systems, and partition assemblies.

B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 CONTACTOR INSTALLATION

A. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3 WIRING INSTALLATION

A. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 3/4 inch.

B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and non-power-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.

3.4 IDENTIFICATION

A. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."

1. Identify controlled circuits in lighting contactors.
2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

B. Label time switches and contactors with a unique designation.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Lighting control devices will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within months from date of Final Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION 260923

SECTION 262200 - LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUBMITTALS

A. Product Data: Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer indicated.

B. Percent Impedance for each transformer type.

C. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

D. Source quality-control test reports.

E. Field quality-control test reports.

F. Operation and Maintenance Data: For transformers to include in emergency, operation, and maintenance manuals.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain each transformer type through one source from a single manufacturer.

1.4 COORDINATION

A. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate installation of wall-mounting and structure-hanging supports with actual transformer provided.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include limited to the following:
   1. Eaton Electrical Inc.; Cutler-Hammer Products.
   2. General Electric Company.
   3. Siemens Energy & Automation, Inc.
   4. Square D; Schneider Electric. (Basis of Design)

2.2 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.

B. Cores: Grain-oriented, non-aging silicon steel.

C. Coils: Continuous windings without splices except for taps.

   1. Internal Coil Connections: Brazed or pressure type.
   2. Coil Material: Aluminum or Copper.

2.3 DISTRIBUTION TRANSFORMERS

A. Comply with NEMA ST 20, and list and label as complying with UL 1561.

B. Cores: One leg per phase.

C. Indoor Transformers
   1. Enclosure: Ventilated, NEMA 250, Type 2.
      a. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.

D. Outdoor Transformers

   1. Enclosure: Totally enclosed, nonventilated.

   2. NEMA 250, Type 3R: Core and coil shall be encapsulated within resin compound, sealing out moisture and air.

E. Transformer Enclosure Finish: Manufacturer's standard color. Comply with NEMA 250.

F. Taps for Transformers Smaller Than 3 kVA: None.

G. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.

H. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.

I. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 115 deg C rise above 40 deg C ambient temperature.

J. Energy Efficiency for Transformers Rated 15 kVA and Larger:
1. Minimum transformer efficiencies must satisfy efficiencies promulgated within United States Code of Federal Regulations CFR Title 10 Chapter II Part 431 (Appendix A of Subpart K 2016); these efficiency levels are commonly referred to as the "DOE 2016 Efficiency.

K. Wall Brackets: Manufacturer's standard brackets.

L. Low-Sound-Level Requirements: Minimum of 3 dBA less than NEMA ST 20 standard sound levels when factory tested according to IEEE C57.12.91.

2.4 IDENTIFICATION DEVICES

A. Nameplates: Engraved, laminated-plastic or metal nameplate for each transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Division 26 Section "Identification for Electrical Systems."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.

B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.

C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.

D. Verify that ground connections are in place and requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.

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

3.2 INSTALLATION

A. Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.

B. Construct concrete bases and anchor floor-mounting transformers according to manufacturer's written instructions.

3.3 CONNECTIONS

A. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

C. Remove and replace units that do not pass tests or inspections and retest as specified above.

D. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

3.5 ADJUSTING

A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.

B. Output Settings Report: Prepare a written report recording output voltages and tap settings.

3.6 CLEANING

A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

3.7 WARRANTY

A. Warranty Period: Provide a warranty to repair or replace for One year from date of **Final Acceptance**.

END OF SECTION 16461

SECTION 262416 - PANELBOARDS

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. Distribution panelboards.
   2. Lighting and appliance branch-circuit panelboards.

1.3 DEFINITIONS

A. SVR: Suppressed voltage rating.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

   1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
   2. Detail enclosure types and details for types other than NEMA 250, Type 1.
   3. Detail bus configuration, current, and voltage ratings.
   4. Short-circuit current rating of panelboards and overcurrent protective devices.
   5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
   6. Provide a coordination drawing of each electrical room or space contain electrical equipment using the actual dimensions of the equipment to be supplied indicating clearances and equipment dimensions.

C. Field Quality-Control Reports:

   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.

D. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

E. Coordination Study Report: The findings of the Section 260573 Coordination Study Report (CSR) may affect the overcurrent protective devices and fault-current withstand requirements for switchboards, panelboards, and transfer switches. Also, the preparation of the CSR is dependent on the manufacturer's data for this equipment. Therefore until Submittal final Approval is granted for the CSR, these materials shall be considered at best "Approved, pending Approval of the CSR" and not released for order.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

B. Comply with NFPA 70.

1.6 PROJECT CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

a. Ambient Temperature: Not exceeding minus 22 deg F (minus 30 deg C) to plus 104 deg F (plus 40 deg C).
b. Altitude: Not exceeding 6600 feet (2000 m).

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet (2000 m).

1.7 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.8 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period: One year from date of Final Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Enclosures:

1. Rated for environmental conditions at installed location.
   a. Indoor Locations: NEMA 250, Type 1.
   b. Exterior Locations: NEMA 250, Type 3R
   c. Kitchen and areas subject to water and corrosion: NEMA 250, Type 4X

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Finishes:

   a. Panels and Trim: galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
   b. Back Boxes: Same finish as panels and trim.

4. Directory Card: Inside panelboard door, mounted in transparent card holder, with metal frame.

B. Incoming Mains Location: Top or bottom.

C. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

D. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type.
3. Ground Lugs and Bus-Configured Terminators: Mechanical type.

E. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

F. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

G. All branch breakers over 60A in panelboards on the life safety, legally required and optional standby systems shall have LSI (long time, short time and instantaneous) settings. All main breakers in panelboards on the life safety, legally required and optional standby systems shall be LI mission critical breakers. Upsize the breaker frame size as required.

2.2 DISTRIBUTION PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work limited to the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric. (Basis of design)

B. Panelboards: NEMA PB 1, power and feeder distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.

D. Mains: Circuit breaker.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include limited to the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.

4. Square D; a brand of Schneider Electric. (Basis of Design)

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker.

D. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

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

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles.
    b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
    c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
    d. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.

C. Arc Energy Reduction. Where the highest continuous current trip setting of a circuit breaker is rated or can be adjusted to is 1200 A or higher.
1. Provide one of the following methods to reduce clearing time
    a. Zone-selective interlocking
    b. Differential relaying
    c. Energy-reducing maintenance switching with local status indicator
    d. Energy-reducing active arc flash mitigation system
2. Indicate the method of compliance in the submittals
3. Provide documentation how the breaker is authorized to be installed, operated, and/or inspected

4. Contractor shall adhere to the documentation and post the information at the location of the circuit breaker(s).

2.5 MINI UNIT SUBSTATIONS

A. UL Listed and tested assembly consisting of
   1. Primary and Secondary Main Circuit Breaker
      a. Circuit breaker ratings are selected to meet National Electrical Code (NEC) requirements and to coordinate with transformer magnetizing inrush current
   2. Sealed Step-Down Transformer
      a. 185°C (365°F) insulation with 115°C (239°F) temperature rise
      b. Sealed, epoxy-resin encapsulated transformer
   3. Distribution Panelboard
      a. Panel section has copper bus and uses standard circuit breakers. Tandem breakers are not allowed.
      b. Feeder circuit breakers are standard plug-on type

2.6 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Each panelboard section shall not exceed 42 single poles.

C. Panelboards 400A and less shall not exceed 20 in. (508 mm) wide by 5.75 in. (223 mm) deep

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

C. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated.

D. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

E. Install overcurrent protective devices and controllers not already factory installed.

F. Install filler plates in unused spaces.

G. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

H. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 26 Section "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. This includes thermo graphic survey. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

C. Panelboards will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports, including a report that identifies panelboards included and that describes scanning results. Include IR color photos of each panel scanned. For panels with defects found, include "before" and "after" defect is repaired. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION 262416

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Communications outlets.
3. Snap switches and wall-box dimmers.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

E. TVSS: Transient voltage surge suppressor.

F. UTP: Unshielded twisted pair.

1.4 ACTION SUBMITTALS

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

B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.

B. Comply with NFPA 70.

1.6 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

2.2 STRAIGHT BLADE RECEPTACLES

A. In buildings used for instruction of students in grade K-6, all outlets install in the building shall be tamper resistant.

B. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper Wiring Devices, Inc.
b. Hubbell.
c. Leviton Manufacturing Co., Inc.
d. Pass & Seymour/Legrand (Pass & Seymour).

2.3 GFCI RECEPTACLES

A. General Description: Straight blade, non-feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

    a. Cooper Wiring Devices, Inc.
    b. Hubbell.
    c. Leviton Manufacturing Co., Inc.
    d. Pass & Seymour/Legrand (Pass & Seymour).

2.4 TOGGLE SWITCHES

A. Comply with NEMA WD 1 and UL 20.

B. Manufacturers:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

    a. Cooper Wiring Devices, Inc.
    b. Hubbell.
    c. Leviton Manufacturing Co., Inc.
    d. Pass & Seymour/Legrand (Pass & Seymour).

C. Switches, 120/277 V, 20 A:

1. Description: Refer to drawings for pole configuation

D. Pilot Light Switches, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

    a. Cooper; 2221PL for 120 V and 277 V.
    b. Hubbell; HPL1221PL for 120 V and 277 V.
    c. Leviton; 1221-PLR for 120 V, 1221-7PLR for 277 V.
    d. Pass & Seymour; PS20AC1-PLR for 120 V.

2. Description: Single pole, with lighted handle, illuminated when switch is "ON."

2.5 WALL PLATES

A. 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: Steel with white baked enamel, suitable for field painting.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant , extra-duty rated, while-in-use, die-cast aluminum with lockable cover.

2.6 FINISHES

A. Color: Wiring device catalog numbers in Section Text do not designate device color.

1. Wiring Devices Connected to Normal Power System: White, unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

B. Coordination with Other Trades:

1. Take steps to ensure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:

a. Cut back and pigtail or replace all damaged conductors.
b. Straighten conductors that remain and remove corrosion and foreign matter.
c. Pigtailing existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.

2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."

1. Receptacles: Identify panelboard and circuit number from which served. Use durable wire markers or tags inside outlet boxes.

3.3 WARRANTY

A. Warranty: Replace devices that fail in materials or workmanship within One year from date of Final Completion.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.
1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

END OF SECTION 262726

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. Exit Signs
3. Lighting fixture supports.

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. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION 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.

7. Confirmation of compliance with Design Lighting Consortium (DLC) or ENERGY STAR product requirements.

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. Product Schedule: For luminaires. Use same designations indicated on Drawings.

D. For each fixture provide a color palette of the manufacturer's full color offering. Indicate which colors are standard (no additional cost) and which are custom (additional cost). Architect shall pick the color of all fixtures at the time of the submittal.

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 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.7 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within Five years from date of Final Completion.

1.8 EXTRA MATERIALS

A. Provide extra materials described below that match products installed including installation. Uninstalled devices shall be packaged with protective covering for storage, identified with labels describing contents and turned over to the owner at the completion of the project.
1. Ballasts/Drivers: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
2. Globes and Guards: 1 for every 20 of each type and rating installed. Furnish at least one of each type.
3. Exit signs: Provide 10% of total count but not less than 10 additional exit signs (single face or double face, as needed)

4. Including 100' of conduit, boxes, wire, associated accessories and installation for each unit listed above. Units shall be installed as directed by the Architect, Owner, or Authority Having Jurisdiction (AHJ).

1.9 SUBSTITUTIONS

A. The lighting fixture layout indicated in the Contract Documents is based upon photometric data, quality, construction and appearance of fixtures listed in the lighting fixture schedule. Substitutions of listed fixtures are allowed provided the following is provided:
   1. Substitution package shall be submitted to Architect no later than ten (10) days prior to bid for review and approval.
   2. Provide all data for the substitution package in a table similar in format to the lighting fixture schedule on the drawings.
   3. Provide cut sheets of substitute fixtures with the various features highlighted.
   4. Architect has final functional and aesthetic approval on all substituted fixtures.
   5. Pre-bid approved will still be subject to the usual post bid submittal process and review.

PART 2 - PRODUCTS

2.1 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. All interior LED lighting fixtures shall be compliant with current product requirements of Design Lighting Consortium (DLC) or ENERGY STAR program.

C. Recessed Fixtures: Comply with NEMA LE 4.

D. Bulb shape complying with ANSI C79.1.

E. CRI of minimum 80 CCT of 4100K.

F. Rated lamp life of 50,000.

G. Lamps dimmable from 100 percent to10 percent of maximum light output.

H. Internal driver:
   1. Minimum efficiency: 85% at full load.
   2. Minimum Operating Ambient Temperature: -20˚ C. (-4˚ F.).
   3. Input Voltage: 120 - 277V (±10%) at 60 Hz.
   4. Integral short circuit, open circuit, and overload protection.
   5. Power Factor: ≥ 0.95.
   6. Total Harmonic Distortion: ≤ 20%.
   7. Comply with FCC 47 CFR Part 15.

I. LED Modules:
   1. Comply with IES LM-79 and LM-80 requirements.
   2. Minimum CRI 80 and color temperature 4200˚ K unless otherwise specified in LIGHTING FIXTURE SCHEDULE.
   3. Minimum Rated Life: 50,000 hours per IES L70.
   4. Light output lumens as indicated in the LIGHTING FIXTURE SCHEDULE.

J. Nominal Operating Voltage: Provide Universal voltage (MVOLT) ballast where possible. Otherwise provide per the drawings.

K. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

L. Housings:

   1. Extruded-aluminum or steel housing and heat sink.
   2. Powder-coat painted finish.

2.2 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:
   1. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
   2. Battery Powered Exit Signs: Integral automatic charger in a self-contained power pack.

      a. Battery: Sealed, maintenance-free, nickel-cadmium type.
      b. Charger: Fully automatic, solid-state type with sealed transfer relay.
      c. 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.
      d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
      e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
      f. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.

2.3 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:
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. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

D. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. 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.

2.4 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.

2.5 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: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage.

D. Rod Hangers: 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. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.3 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. 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.

E. 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.

F. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls
2. Do not attach luminaires directly to gypsum board.

G. Ceiling-Mounted Luminaire Support:

1. Ceiling mount with two 5/32-inch diameter aircraft cable supports attached to structure. Do not attached to ceiling with no additional support.

H. 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 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.

I. Ceiling-Grid-Mounted Luminaires:
1. Lighting fixtures: Set level, plumb, and square with ceilings and walls.
2. Support for Lighting Fixtures in or on Grid-Type Suspended Ceilings.
   a. Do not use grid alone to at support element.
   b. Install a minimum of two support system rods or wires for each fixture located no more than 6 inches (150 mm) from lighting fixture corners diagonally across the fixture.
   c. Wire or rod shall have a minimum strength factor of the weight of fixture at a safety factor of 3.
   d. Secure luminaire to the luminaire opening using approved fasteners in a minimum of two locations, spaced near diagonal corners of luminaire.
3. Fixtures of Sizes Less Than Ceiling Grid:
   a. Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.
   b. Fixtures larger than 18"x18" shall also be supported by a minimum of two support system rods or wires for each fixture located no more than 6 inches (150 mm) from lighting fixture corners diagonally across the fixture.

J. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 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.

END OF SECTION 265119

SECTION 265619 – LED EXTERIOR 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. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
2. Luminaire supports.
3. Luminaire-mounted photoelectric relays.

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. Lumen: Measured output of lamp and luminaire, or both.

F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of luminaire.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaire.
4. Lamps, include life, output (lumens, CCT, and CRI), and energy-efficiency data.

.

5. Photometric data and adjustment factors based on laboratory tests,
6. Means of attaching luminaires to supports and indication that the attachment is suitable for components involved.

7. Confirmation of compliance with Design Lighting Consortium (DLC) or ENERGY STAR product requirements.

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. Product Schedule: For luminaires. Use same designations indicated on Drawings.

D. For each fixture provide a color palette of the manufacturer's full color offering. Indicate which colors are standard (no additional cost) and which are custom (additional cost). Architect shall pick the color of all fixtures at the time of the submittal.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires [and photoelectric relays] to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.
2. Provide a list of all photoelectric relay types used on Project; use manufacturers' codes.

1.6 QUALITY ASSURANCE

A. Provide luminaires from a single manufacturer for each luminaire type.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering prior to shipping.

1.8 FIELD CONDITIONS

A. Verify existing and proposed utility structures prior to the start of work associated with luminaire installation.

1.9 EXTRA MATERIALS

A. Provide extra materials described below that match products installed including installation. Uninstalled devices shall be packaged with protective covering for storage, identified with labels describing contents and turned over to the owner at the completion of the project.
1. Ballasts/Drivers: 1 for every 100 of each type and rating installed. Furnish at least one of each type.

2. Globes and Guards: 1 for every 20 of each type and rating installed. Furnish at least one of each type.
3. Including 100' of conduit, boxes, wire, associated accessories and installation for each unit listed above. Units shall be installed as directed by the Architect, Owner, or Authority Having Jurisdiction (AHJ).

1.10 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures, including luminaire support components.
b. Faulty operation of luminaires and accessories.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

B. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within Five years from date of Final Completion.

1.11 SUBSTITUTIONS

A. The lighting fixture layout indicated in the Contract Documents is based upon photometric data, quality, construction and appearance of fixtures listed in the lighting fixture schedule. Substitutions of listed fixtures are allowed provided the following is provided:
1. Substitution package shall be submitted to Architect no later than ten (10) days prior to bid for review and approval.
2. Provide all data for the substitution package in a table similar in format to the lighting fixture schedule on the drawings.
3. Provide cut sheets of substitute fixtures with the various features highlighted.
4. Architect has final functional and aesthetic approval on all substituted fixtures.
5. Pre-bid approved will still be subject to the usual post bid submittal process and review.

PART 2 - PRODUCTS

2.1 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 shall be listed and labeled for indicated class and division of hazard by an NRTL.

Coordinate "FM Global Compliance" Paragraph below with Drawings.

C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

D. UL Compliance: Comply with UL 1598 and listed for wet location.

E. CRI of minimum 70 CCT of 4100 K

F. L70 lamp life of 50,000 hours.

G. Lamps dimmable from 100 percent to 10 percent of maximum light output.

H. Internal driver.

I. Nominal Operating Voltage: Provide Universal voltage (MVOLT) ballast where possible. Otherwise provide per the drawings.

J. Source Limitations: For luminaires, obtain each color, grade, finish, type, and variety of luminaire from single source with resources to provide products of consistent quality in appearance and physical properties.

2.2 FINISHES

A. Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

B. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

C. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20 requirements; and seal aluminum surfaces with clear, hard-coat wax.
3. Class I, Clear-Anodic Finish: AA-M32C22A41 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

D. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a

smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1 or SSPC-SP 8.

2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.

PART 3 - EXECUTION

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 electrical conduit to verify actual locations of conduit connections before luminaire installation.

C. Examine walls, roofs, canopy ceilings and overhang ceilings for suitable conditions where luminaires will be installed.

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

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is substantially complete, clean luminaires used for temporary lighting and install new lamps.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Comply with NECA 1.

B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Install lamps in each luminaire.

D. Fasten luminaire to structural support.

E. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Support luminaires without causing deflection of finished surface.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

F. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls

G. Wiring Method: Install cables in raceways. Conceal raceways and cables.

H. Install luminaires level, plumb, and square with finished grade unless otherwise indicated. Install luminaires at height and aiming angle as indicated on Drawings.

I. Coordinate layout and installation of luminaires with other construction.

J. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

K. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and 260533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.4 BOLLARD LUMINAIRE INSTALLATION:

A. Align units for optimum directional alignment of light distribution.

B. Install on concrete base with top 4 inches above finished grade or surface at luminaire location. Cast conduit into base, and shape base to match shape of bollard base. Finish by troweling and rubbing smooth.

3.5 INSTALLATION OF INDIVIDUAL GROUND-MOUNTED LUMINAIRES

A. Aim as indicated on Drawings.

B. Install on concrete base with top [4 inches] <Insert dimension> above finished grade or surface at luminaire location. Cast conduit into base, and finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Section 033000 "Cast-in-Place Concrete."

3.6 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch-thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.7 FIELD QUALITY CONTROL

A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

B. 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. Verify operation of photoelectric controls.

3. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

C. Luminaire will be considered defective if it does not pass tests and inspections.

D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.8 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain luminaires and photocell relays.

END OF SECTION 265619

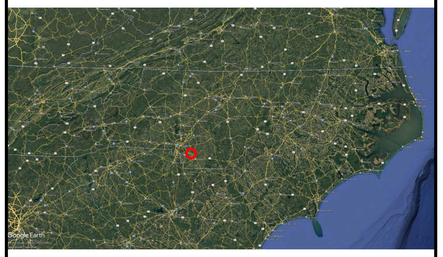
PROGRESS SET

HEMBY BRIDGE E.S. LIGHTING REPLACEMENT

UNION COUNTY PUBLIC SCHOOLS
INDIAN TRAIL, NC

641923

VICINITY MAP



LOCATION MAP



MOSELEYARCHITECTS

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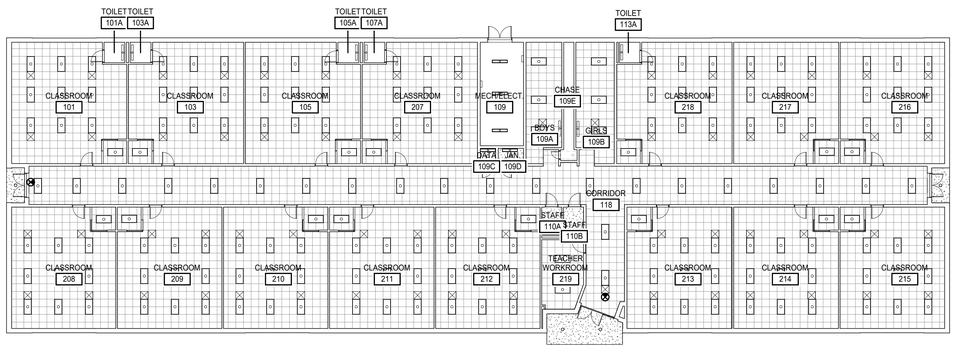
PROJECT NO: 641923
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DATE	DESCRIPTION

COVER

G0.1

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OVERALL FIRST FLOOR EXISTING REFLECTED CEILING PLAN

1/16" = 1'-0"

360° TOUR OF EXISTING CONDITIONS. FOR INFORMATION ONLY. NOT FOR CONSTRUCTION OR BIDDING PURPOSES

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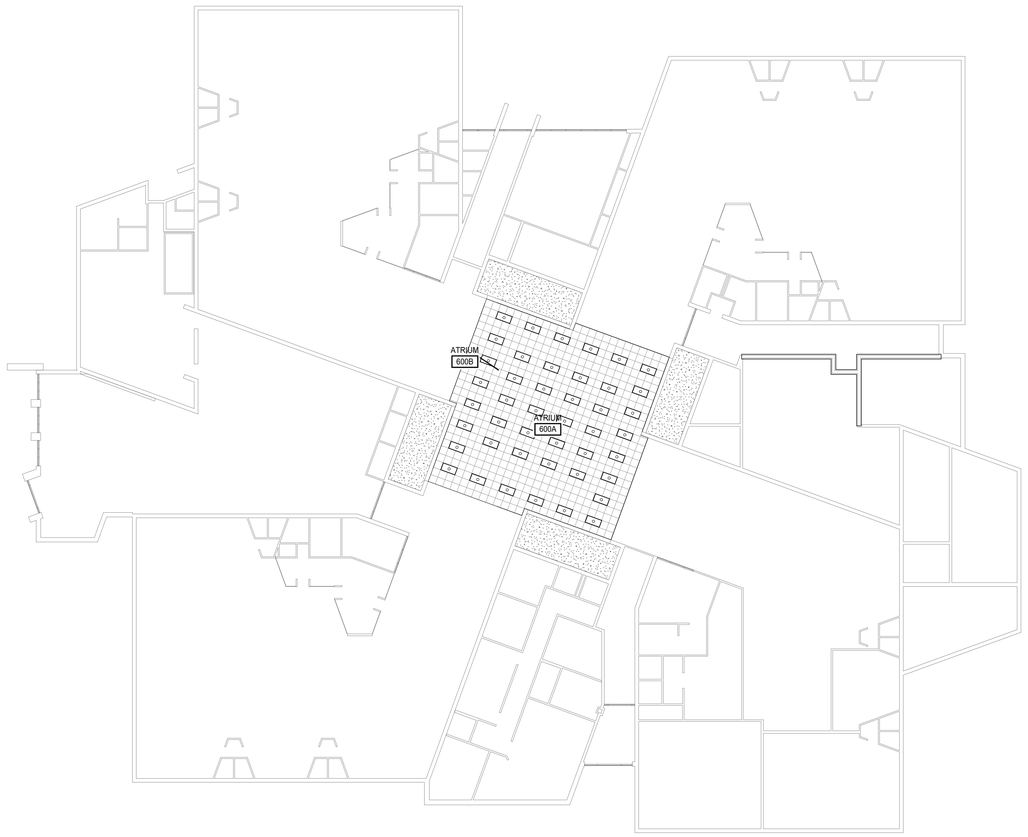
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EXISTING REFLECTED CEILING PLAN

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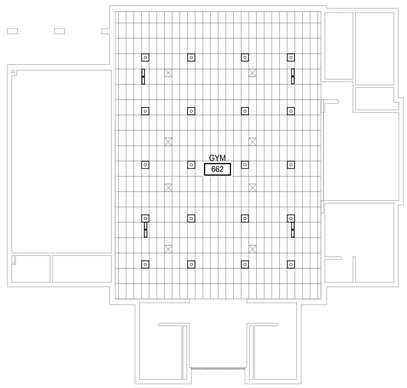
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360° TOUR OF EXISTING CONDITIONS. FOR INFORMATION ONLY. NOT FOR CONSTRUCTION OR BIDDING PURPOSES



OVERALL ATRIUM & GYMNASIUM EXISTING REFLECTED CEILING PLAN

1/16" = 1'-0"



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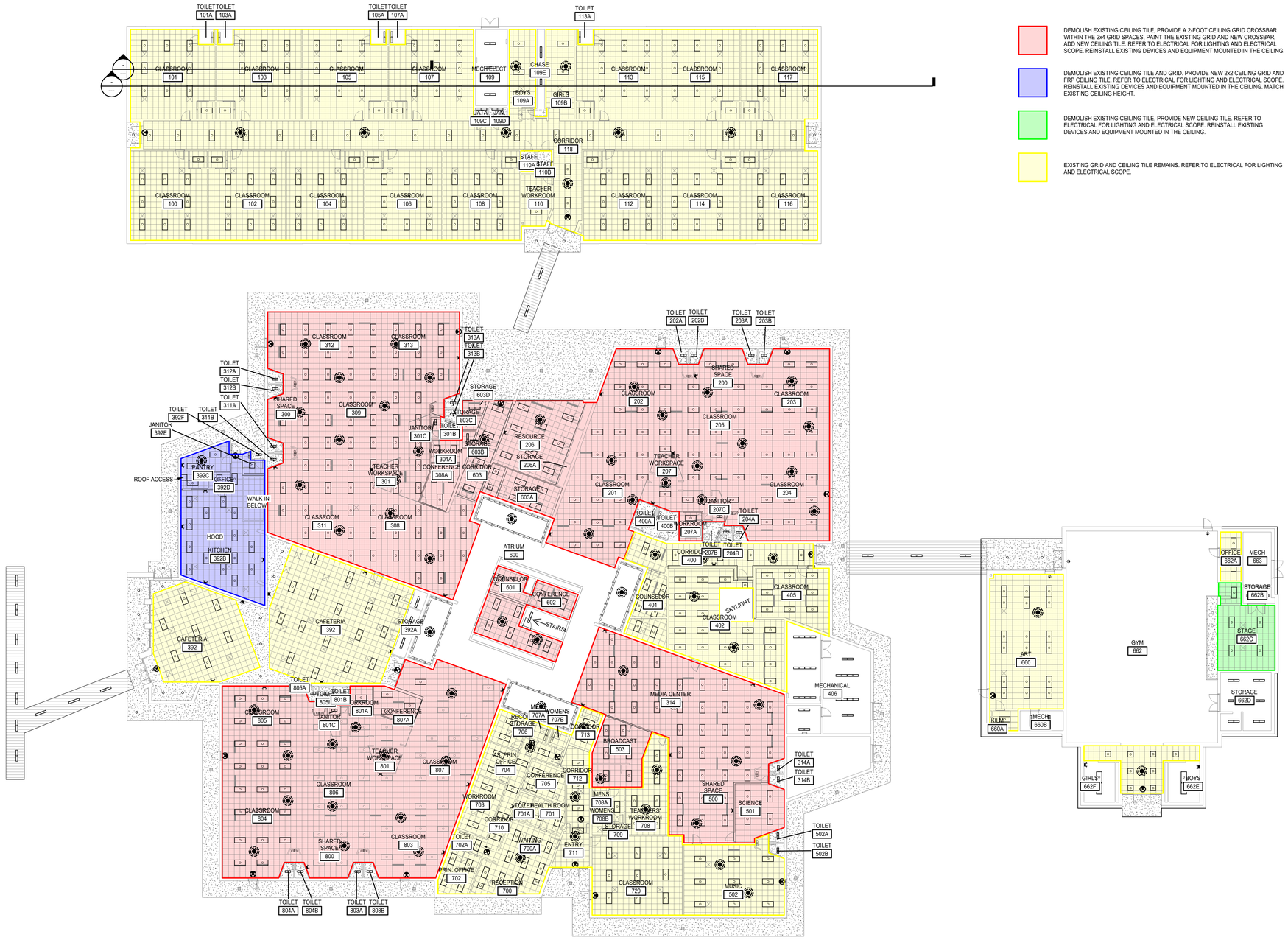
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DATE	DESCRIPTION

EXISTING REFLECTED CEILING PLAN

A9.2

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DEMOLISH EXISTING CEILING TILE, PROVIDE A 2-FOOT CEILING GRID CROSSBAR WITHIN THE 2x4 GRID SPACES, PAINT THE EXISTING GRID AND NEW CROSSBAR, ADD NEW CEILING TILE. REFER TO ELECTRICAL FOR LIGHTING AND ELECTRICAL SCOPE. REINSTALL EXISTING DEVICES AND EQUIPMENT MOUNTED IN THE CEILING.

DEMOLISH EXISTING CEILING TILE AND GRID. PROVIDE NEW 2x2 CEILING GRID AND FRP CEILING TILE. REFER TO ELECTRICAL FOR LIGHTING AND ELECTRICAL SCOPE. REINSTALL EXISTING DEVICES AND EQUIPMENT MOUNTED IN THE CEILING. MATCH EXISTING CEILING HEIGHT.

DEMOLISH EXISTING CEILING TILE. PROVIDE NEW CEILING TILE. REFER TO ELECTRICAL FOR LIGHTING AND ELECTRICAL SCOPE. REINSTALL EXISTING DEVICES AND EQUIPMENT MOUNTED IN THE CEILING.

EXISTING GRID AND CEILING TILE REMAINS. REFER TO ELECTRICAL FOR LIGHTING AND ELECTRICAL SCOPE.

OVERALL FIRST FLOOR REFLECTED CEILING PLAN

1/16" = 1'-0"

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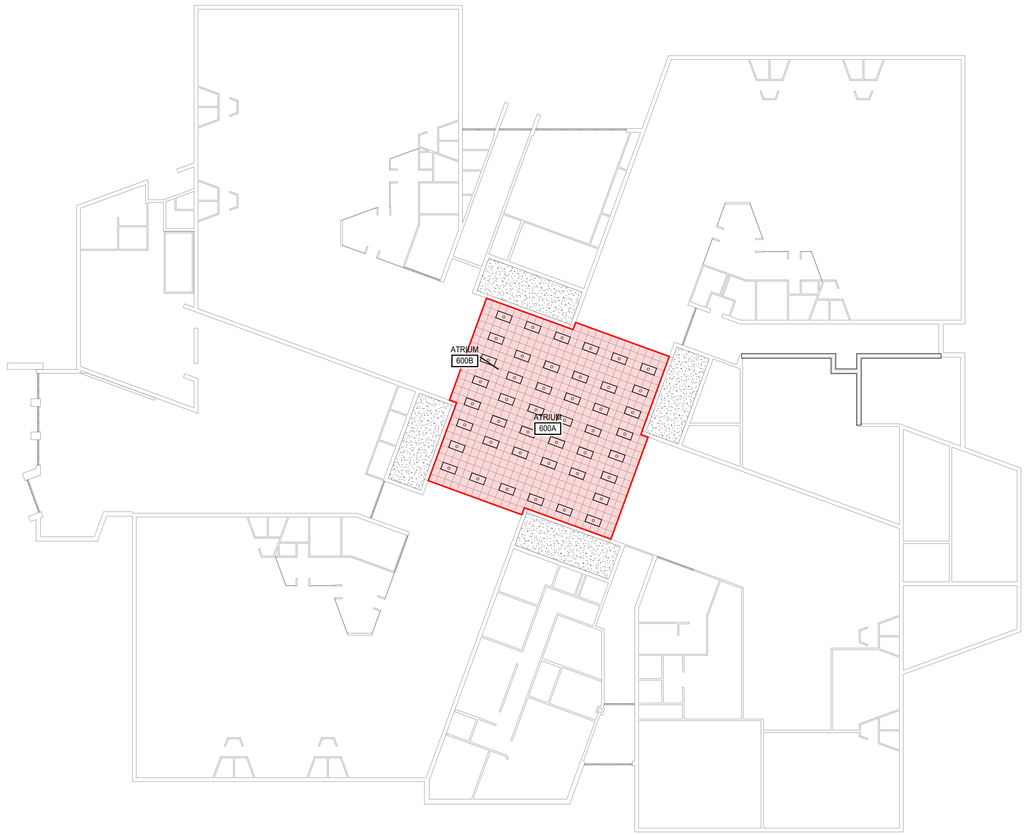
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REFLECTED CEILING PLAN

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OVERALL ATRIUM & GYMNASIUM REFLECTED CEILING PLAN

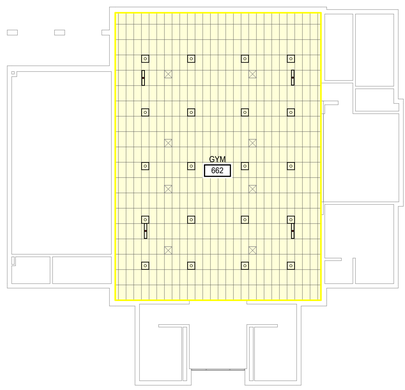
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EXISTING GRID AND CEILING TILE REMAINS. REFER TO ELECTRICAL FOR LIGHTING AND ELECTRICAL SCOPE.



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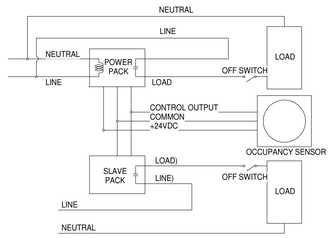
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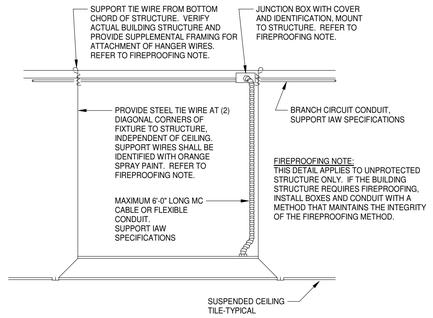
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OCCUPANCY SENSOR DIAGRAM AUXILARY RELAY PACK SENSOR

NO SCALE



RECESSED, LAY-IN, FLUORESCENT LIGHT FIXTURE MOUNTING DETAIL

NO SCALE

LIGHT FIXTURE SCHEDULE

TYPE	DESCRIPTION	MANUFACTURER	SERIES NO.	MVOLT	WATTAGE	LUMENS	TYPE	COLOR TEMP.	MOUNTING	OPTIONS	COMMENTS
A2	2X2 FLAT PANEL	LITHONIA	CPX 2X2	MVOLT	22	3400 lm	LED	4000 K	RECESSED		
A4	2X4 FLAT PANEL	LITHONIA	CPX 2X4	MVOLT	42	5400 lm	LED	4000 K	RECESSED		
F4	VANITY LIGHT	LITHONIA	BLWP4	MVOLT	36	2960 lm	LED	4000 K	WALL		
G4	DOWNLIGHT	WAC	R4ERDR	MVOLT	18	1200 lm	LED	4000 K	RECESSED		RETROFIT
G4E	DOWNLIGHT	WAC	R4ERDR	MVOLT	18	1200 lm	LED	4000 K	RECESSED		RETROFIT - DAMP LOCATION LISTED.
G4S	WALL WASHER		LED -PAR REPLACEMENT	MVOLT	18	2000 lm	LED	4000 K	RECESSED		RETROFIT
J4	4' INDUSTRIAL	LITHONIA	CSS	MVOLT	45	5500 lm	LED	4000 K	SURFACE/PENDANT		
K2	2' SURFACE MOUMT	LITHONIA	BLWP2	MVOLT	27	2000 lm	LED	4000 K	SURFACE		
L2	2' WALL MTD	LITHONIA	BLWP2	MVOLT	27	2000 lm	LED	4000 K	WALL		
L4	4' WALL MTD	LITHONIA	BLWP4	MVOLT	36	4000 lm	LED	4000 K	WALL		
M2	GYM LIGHT	LITHONIA	VRT	MVOLT	120	9000 lm	LED	4000 K	RECESSED		2X4 FIXTURE WITH EQUIVALENT LUMEN OUTPUT IS ACCEPTABLE.
N1	CANOPY LIGHT	LITHONIA	CNY	MVOLT	43	4500 lm	LED	4000 K	SURFACE		
V1	VAPOR TIGHT	LITHONIA	VAP	MVOLT	33	4000 lm	LED	4000 K	SURFACE		MED DISTRIBUTION
V2	VAPOR TIGHT-EM	LITHONIA	VAP	MVOLT	33	4000 lm	LED	4000 K	SURFACE	10W BATTERY	MED DISTRIBUTION
W1	EMERGENCY BATTERY PAK	LITHONIA	EU2C	<varies>	15		LED		WALL		
X3	SINGLE FACE EXIT W/ HEADS	LITHONIA	LQM	<varies>	15		LED		UNIVERSAL	BATTERY	TWO INTERGAL HEADS
Y1	EXTERIOR WALL PACK	LITHONIA	TWX	MVOLT	60	7000 lm	LED	5000 K	WALL		TYPE 2 DISTRIBUTION

LIGHTING LEGEND

SYMBOL DESCRIPTION

NOTE: REFER TO 'TYPICAL DEVICE ELEVATION DETAIL' FOR DEVICE MOUNTING REQUIREMENTS.

$ LIGHT SWITCH, RATED 120/277 VOLTS, 20-AMPS.

SUBSCRIPT/SUPERSCRIPT LETTERS, NUMBERS, AND SYMBOLS INDICATES SWITCH TYPE AS FOLLOWS:

3	INDICATES 3-WAY LIGHT SWITCH
4	INDICATES 4-WAY LIGHT SWITCH
D	INDICATES DIMMER SWITCH
D3	INDICATES 3-WAY DIMMER LIGHT SWITCH
D4	INDICATES 4-WAY DIMMER LIGHT SWITCH
OS	INDICATES SWITCH WITH INTEGRAL OCCUPANCY SENSOR
OD	INDICATES DIMMER SWITCH WITH INTEGRAL OCCUPANCY SENSOR

LOWER CASE LETTER INDICATES LIGHT FIXTURE CONTROL DESIGNATION

OMNI-DIRECTIONAL LIGHTING CONTROL OCCUPANCY DETECTOR, CEILING MOUNT.

LIGHT FIXTURE, CEILING MOUNT.

LIGHT FIXTURE WITH BATTERY DRIVER, CEILING MOUNT.

LIGHT FIXTURE, WALL MOUNT, HEIGHT AS INDICATED.

LIGHT FIXTURE WITH BATTERY DRIVER, WALL MOUNT, HEIGHT AS INDICATED.

EMERGENCY EGRESS LIGHTING FIXTURE, WALL MOUNT, HEIGHT AS INDICATED.

EXIT SIGN, CEILING MOUNT. DIRECTIONAL ARROWS AS INDICATED. SHADING INDICATES FACE(S) OF SIGN.

EXIT SIGN, WALL MOUNT. DIRECTIONAL ARROWS AS INDICATED. SHADING INDICATES FACE(S) OF SIGN.

GENERAL NOTES

A. THE CONTRACT DOCUMENTS ARE COMPLEMENTARY AND WHAT IS REQUIRED BY ONE SHALL BE AS BINDING AS IF REQUIRED BY ALL. IN THE CASE OF A CONFLICT, DISAGREEMENT, OR AMBIGUITY, PROVIDE THE BETTER QUALITY. IN THE CASE OF A CONFLICT, DISAGREEMENT, OR AMBIGUITY, PROVIDE THE GREATER QUANTITY OF WORK.

B. FOLLOW MOUNTING HEIGHTS INDICATED IN THE ELECTRICAL LEGEND UNLESS OTHERWISE INDICATED, INCLUDING ON ARCHITECTURAL ELEVATIONS. MEASURE ALL MOUNTING HEIGHTS FROM THE DEVICE CENTER LINE UNLESS OTHERWISE INDICATED.

C. PROVIDE AS-BUILT DRAWINGS INDICATING ACTUAL BRANCH CIRCUIT ARRANGEMENT. PROVIDE TYPEWRITTEN PANELBOARD DIRECTORIES INDICATING ACTUAL BRANCH CIRCUIT ARRANGEMENT. HAND WRITTEN SCHEDULES ARE NOT ACCEPTABLE.

D. PROVIDE ALL ELECTRICAL DEMOLITION WORK REQUIRED TO INSTALL THE WORK INDICATED. REMOVE, REROUTE, AND RECONNECT ALL BRANCH CIRCUITS THAT WILL REMAIN IN USE BUT INTERFERES WITH THE WORK.

E. REMOVE ALL EXISTING CONDUITS THAT WILL NOT BE REUSED AND WHERE THEY WILL BE EXPOSED AFTER COMPLETION. ABANDON ALL OTHERS IN THE WALLS ONLY. DISCONNECT ALL WIRING INDICATED AND/OR REQUIRED TO BE REMOVED FROM ALL POWER SOURCES. REMOVE ALL WIRING FROM ABANDONED CONDUITS AND PROVIDE BLANK COVER PLATES FOR BOXES NOT UTILIZED FOR THE WORK.

F. MAINTAIN CONTINUITY OF ALL EXISTING CIRCUITS TO REMAIN OR PORTIONS THEREOF AFFECTED BY THE WORK.

G. BEFORE DEMOLITION, VERIFY WITH THE OWNER ALL EQUIPMENT TO BE SALVAGED TO OWNER AND NOT REMOVED FROM THE SITE. FOR ALL REMAINING EQUIPMENT INDICATED FOR REMOVAL (AND NOT RELOCATED), REMOVE AND DISPOSE IN A LEGAL MANNER.

H. EXERCISE CARE IN REMOVING DEMOLITION ITEMS. REPAIR OR REPLACE ALL DAMAGE CAUSED TO EXISTING CONSTRUCTION AND EQUIPMENT TO REMAIN.

I. DRAWINGS ARE BASED UPON EXISTING PLANS AND FIELD INVESTIGATION WITHOUT DEMOLITION. VISIT THE EXISTING BUILDING AND BECOME FAMILIAR WITH ALL EXISTING CONDITIONS AND EXAMINE ALL DRAWINGS TO AVOID CONFLICTS.

J. DEMOLITION FLOOR PLANS ARE PROVIDED FOR REFERENCE ONLY TO AID IN DEFINING THE SCOPE OF DEMOLITION WORK.

DEMOLITION LEGEND

SYMBOL DESCRIPTION

REMOVE DEVICES, EQUIPMENT, IN ACCORDANCE WITH THE GENERAL DEMOLITION NOTES.

DEVICES ARE EXISTING TO REMAIN.

WITHIN HATCHED AREAS, DISCONNECT AND REMOVE ALL ELECTRICAL MATERIALS INCLUDING BUT NOT LIMITED TO LIGHTS, DEVICES, EQUIPMENT, SPEAKERS, FIRE ALARM, COMMUNICATIONS, AND CIRCUITRY.

POWER DEVICE / EQUIPMENT LEGEND

SYMBOL DESCRIPTION

NOTE: REFER TO 'TYPICAL DEVICE ELEVATION DETAIL' FOR DEVICE MOUNTING REQUIREMENTS. FOLLOWING DEVICES ARE DENOTED AS KEYNOTE TWO IN DETAIL:

EQUIPMENT POWER CONNECTION.

JUNCTION BOX, CONCEALED ABOVE CEILING, UNO.

JUNCTION BOX, WALL MOUNTED. MOUNTING HEIGHT AS INDICATED ON PLANS.

PANELBOARD OR SWITCHBOARD, PROVIDE 6 INCH CONCRETE HOUSEKEEPING PAD FOR ALL GROUND MOUNTED EQUIPMENT UNLESS NOTED OTHERWISE. DENOTED BY PANELBOARD/SWITCHBOARD TAG PER ONE-LINE DIAGRAM.

TRANSFORMER, PROVIDE 4 INCH CONCRETE HOUSEKEEPING PAD UNLESS NOTED OTHERWISE. DENOTED BY TRANSFORMER TAG PER ONE-LINE DIAGRAM.

FEEDER TAG. REFER TO FEEDER SCHEDULE ON DWG E5.1.

BRANCH CIRCUIT RUN CONCEALED, UNO. DASHED INDICATES CIRCUITRY REQUIRED TO BE RUN BELOW SLAB.

BRANCH CIRCUIT HOME RUN TO PANELBOARD AND CIRCUIT INDICATED.

DUPLEX RECEPTACLE, NEMA 5-20R.

DOUBLE DUPLEX RECEPTACLE, NEMA 5-20R.

GFCI DUPLEX RECEPTACLE, NEMA 5-20R.

SINGLE RECEPTACLE, NEMA 5-20R.

SWITCHED DUPLEX RECEPTACLE WITH SPLIT YOKE, THE BOTTOM OUTLET IS SWITCHED & THE TOP OUTLET IS UNSWITCHED, NEMA 5-15R.

DUPLEX RECEPTACLE, NEMA 5-20R.

DOUBLE DUPLEX RECEPTACLE, NEMA 5-20R.

GFCI DUPLEX RECEPTACLE, NEMA 5-20R.

SINGLE RECEPTACLE, NEMA 5-20R.

DUPLEX RECEPTACLE, NEMA 5-20R.

GFCI DUPLEX RECEPTACLE, NEMA 5-20R.

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G. WHERE DEMOLITION OF TELECOMMUNICATIONS DEVICES OCCUR, REMOVE CABLING NOT INDICATED TO REMAIN BACK TO POINT OF ORIGIN.

H. DEMOLITION FLOOR PLANS ARE PROVIDED FOR REFERENCE ONLY TO AID IN DEFINING THE SCOPE OF DEMOLITION WORK.

ABBREVIATIONS

1P	SINGLE PHASE
3P	THREE PHASE
3R	WEATHERPROOF (NEMA 3R)
A	AMPS
AFF	ABOVE FINISHED FLOOR
AL	ALUMINUM
ATS	AUTOMATIC TRANSFER SWITCH
BFC	BELOW FINISHED CEILING
BFG	BELOW FINISHED GRADE
BKR	BREAKER
C	CONDUIT
CATV	COMMUNITY ANTENNA TELEVISION (CABLE)
CB	CIRCUIT BREAKER
CBL	CABLE
CCTV	CLOSED CIRCUIT TELEVISION
CKT	CIRCUIT
CLG	CEILING
CLR	CLEAR
CO.	COMPANY
COMB	COMBINATION
COMM	COMMUNICATIONS
CU	COPPER
DIA	DIAMETER
DISC	DISCONNECT
DIV	DIVISION
DWG	DRAWING
EBH	ELECTRIC BASEBOARD HEATER
EC	EMPTY CONDUIT
ECS	EMERGENCY COMMUNICATIONS STATION
ELEC	ELECTRICAL
ELEV	ELEVATOR
EPO	EMERGENCY POWER OFF
EQ	EQUIPMENT
ETR	EXISTING TO REMAIN
EWC	ELECTRIC WATER COOLER
EX	EXISTING
EXT	EXTERIOR
FA	FIRE ALARM
FAAP	FIRE ALARM ANNUNCIATOR PANEL
FACP	FIRE ALARM CONTROL PANEL
FAGP	FIRE ALARM GRAPHIC PANEL
FAXP	FIRE ALARM EXTENDER PANEL
FFSCP	FIRE FIGHTER'S SMOKE CONTROL PANEL
FLA	FULL LOAD AMPS
FPMR	FUSE PER MANUFACTURERS REQUIREMENTS/RECOMMENDATIONS
FPND	FUSE PER NAMEPLATE DATA
G	GROUND
GE	GROUND FAULT PROTECTION FOR EQUIPMENT, 6-50mA PER NEC 427.22 (PROVIDE ACCESSORY FOR INDICATED BREAKER)
GFCI	GROUND FAULT CIRCUIT INTERRUPT
GFP	GROUND FAULT PROTECTION FOR PERSONNEL, 4-6mA (PROVIDE ACCESSORY FOR INDICATED BREAKER)
HKP	HOUSEKEEPING PAD
HP	HORSEPOWER
HPS	HIGH PRESSURE SODIUM
Hz	HERTZ
IAW	IN ACCORDANCE WITH
IG	ISOLATED GROUND
J-BOX	JUNCTION BOX
KHFSS	KITCHEN HOOD FIRE SUPPRESSION SYSTEM
KHz	KILOHERTZ
KVA	KILOVOLT AMPS
KW	KILOWATTS
KWH	KILOWATT HOURS
L	LOCKOUT TO PREVENT UNAUTHORIZED SWITCHING (PROVIDE ACCESSORY FOR INDICATED BREAKER)
LC	ROUTE CIRCUIT TO LOAD VIA LIGHTING CONTACTOR. REFER TO LC SCHEDULE
LED	LIGHT EMITTING DIODE
LTG	LIGHTING
LTS	LIGHTS
MAX	MAXIMUM
MCA	MINIMUM CIRCUIT AMPACITY
MCB	MAIN CIRCUIT BREAKER
MCC	MOTOR CONTROL CENTER
MH	METAL HALIDE
MHz	MEGAHERTZ
MIN	MINIMUM
ML	MAINTENANCE LOCK (PROVIDE ACCESSORY FOR INDICATED BREAKER)
MLO	MAIN LUG ONLY
MNS	MASS NOTIFICATION SYSTEM
MOCP	MAXIMUM OVER CURRENT PROTECTION.
MTD	MOUNTED
N	NEUTRAL
N/C	NORMALLY CLOSED
N/O	NORMALLY OPEN
NO.	NUMBER
OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
P	PILOT LIGHT (AT THE SWITCH HANDLE)
PBD	PANELBOARD
PD	PROTECTIVE DEVICE
RCPT	RECEPTACLE
REC	RECEPTACLE
SEC	SECURITY
SPD	SURGE PROTECTIVE DEVICE
SPEC.	SPECIFICATION(S)
ST	SHUNT TRIP, 120V COIL (PROVIDE ACCESSORY FOR INDICATED BREAKER)
SW	SWITCH
SWBD	SWITCHBOARD
TBB	TELECOMMUNICATIONS BONDING BACKBONE
TC	TELECOMMUNICATIONS CLOSET
TELECOM	TELECOMMUNICATIONS
TGB	TELECOMMUNICATIONS GROUNDING BUS BAR
TMGB	TELECOMMUNICATIONS MAIN GROUNDING BUS BAR
TYP	TYPICAL
UNO	UNLESS NOTED (INDICATED) OTHERWISE
V	VOLTS
VFD	VARIABLE FREQUENCY DRIVE
VIF	VERIFY IN FIELD
W	WATTS
W/	WITH
WG	WIRE GUARD
WP	WEATHERPROOF
XFER	TRANSFER
XFMR	TRANSFORMER

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NORTH CAROLINA REGISTERED ARCHITECTURE ENGINEERING CORPORATION C-3469 NORTH CAROLINA CHARLOTTE, NC

HEMBY BRIDGE ELEM LIGHTING REPLACEMENT

6701 Indian Trail Fairview Rd, Indian Trail, NC 28079
Union County Public Schools

PROJECT NO: 641923
DATE: DECEMBER 22, 2024

REVISIONS	
DATE	DESCRIPTION

LEGENDS, ABBREVIATIONS AND GENERAL NOTES

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HEMBY BRIDGE ELEM LIGHTING REPLACEMENT

6701 Indian Trail Fairview Rd, Indian Trail, NC 28079
Union County Public Schools

PROJECT NO: 641923
DATE: DECEMBER 22, 2024

DATE	DESCRIPTION

ELECTRICAL
DEMOLITION PLANS

E1.1

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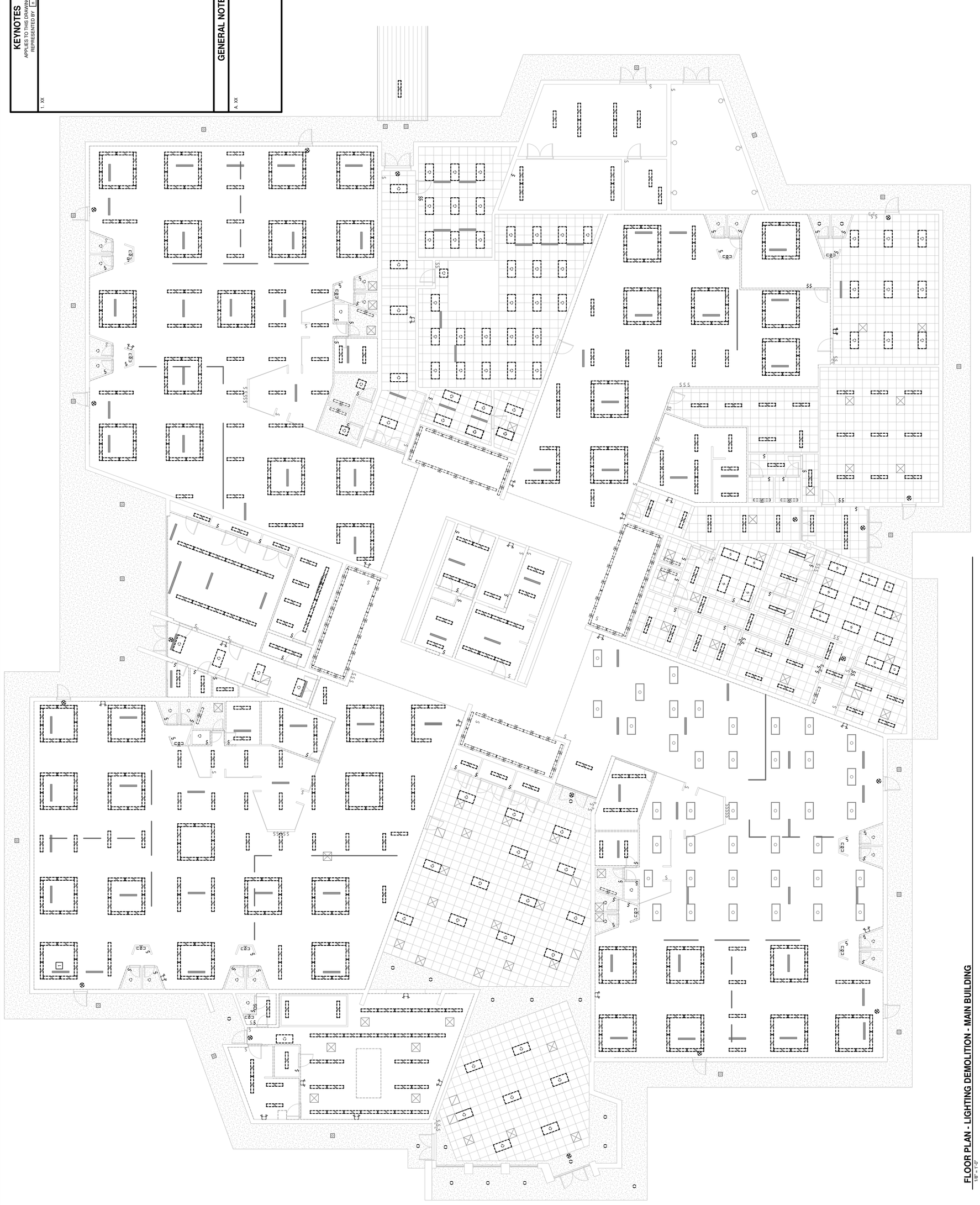
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KEYNOTES
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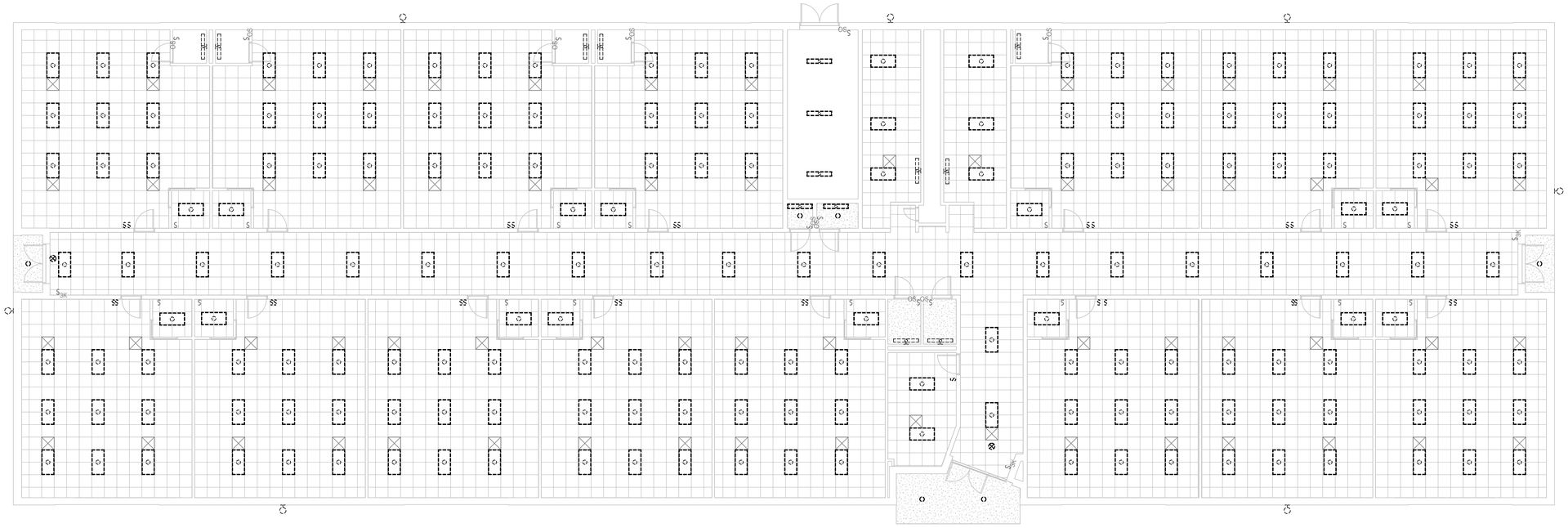
GENERAL NOTES

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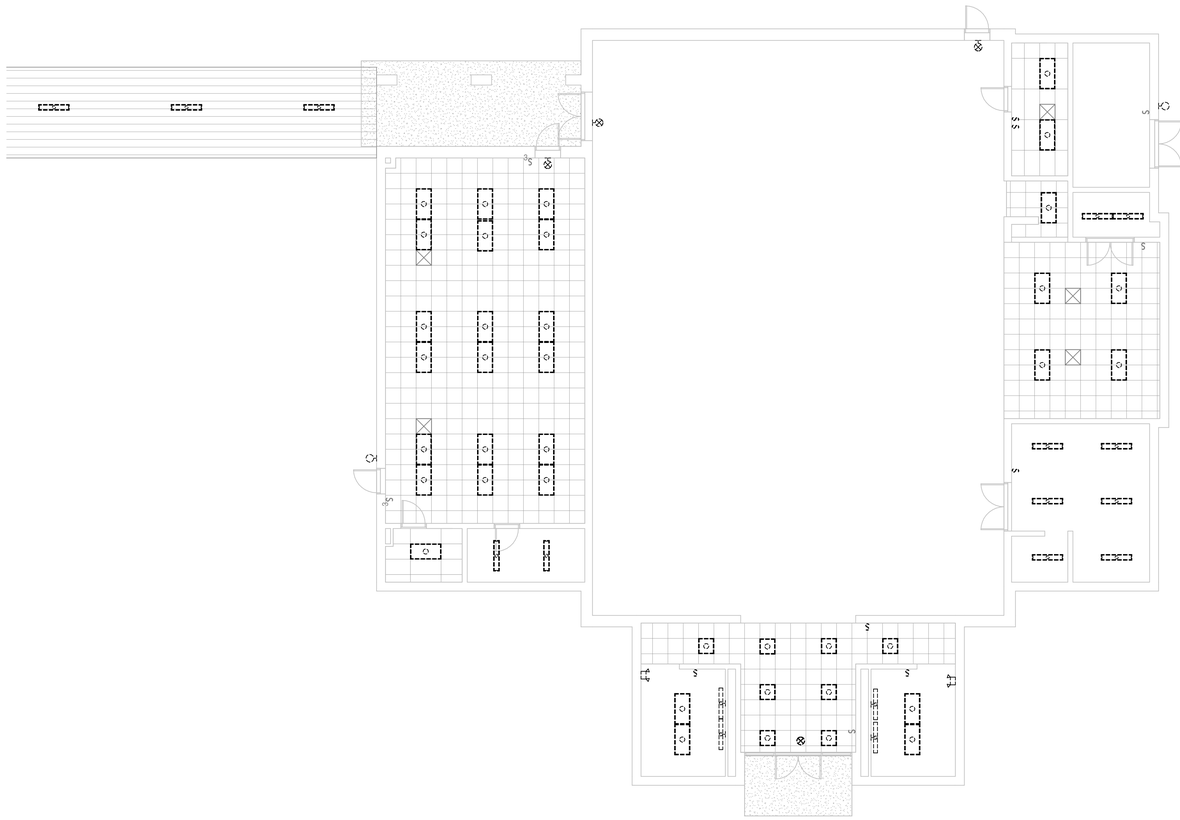
FLOOR PLAN - LIGHTING DEMOLITION - MAIN BUILDING
1/8" = 1'-0"

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FLOOR PLAN - LIGHTING DEMOLITION - CLASSROOMS

1/8" = 1'-0"



FLOOR PLAN - LIGHTING DEMOLITION - GYM

1/8" = 1'-0"

KEYNOTES

APPLIES TO THIS DRAWING REPRESENTED BY [n]

1. XX

GENERAL NOTES

A. XX

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HEMBY BRIDGE ELEM LIGHTING REPLACEMENT

6701 Indian Trail Fairview Rd, Indian Trail, NC 28079
Union County Public Schools

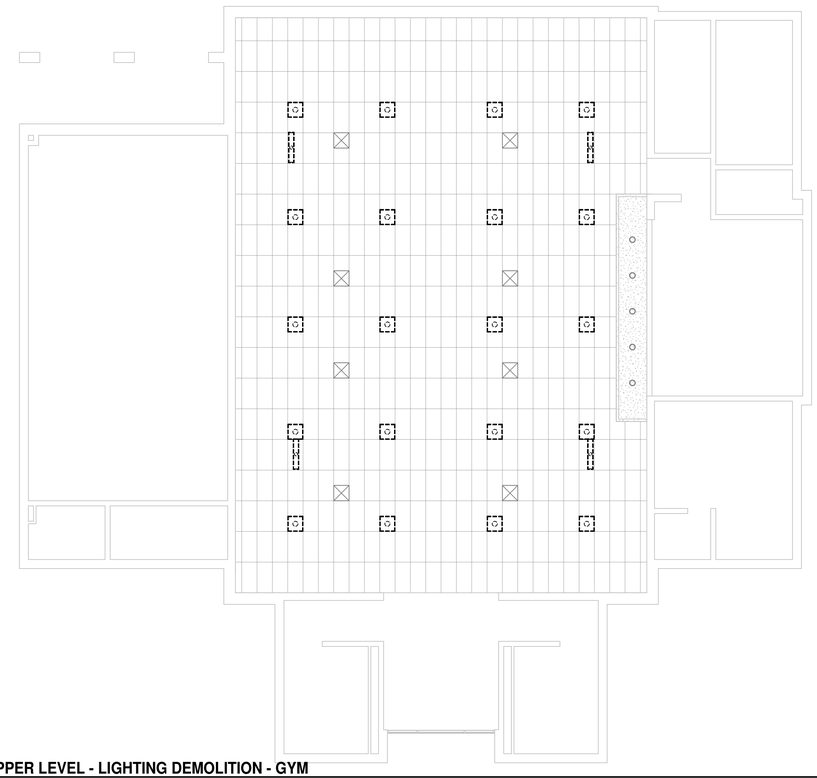
PROJECT NO: 641923
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REVISIONS	
DATE	DESCRIPTION

ELECTRICAL
DEMOLITION PLANS

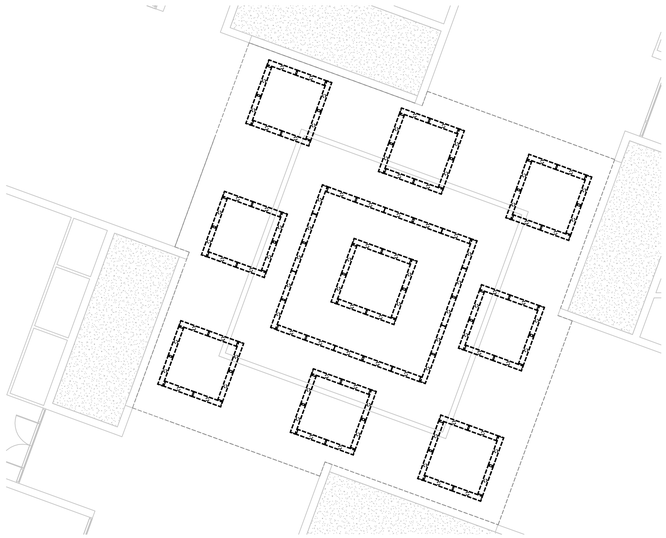
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UPPER LEVEL - LIGHTING DEMOLITION - GYM

1/8" = 1'-0"



UPPER LEVEL -LIGHTING DEMOLITION - MAIN BUILDING

1/8" = 1'-0"

KEYNOTES

APPLIES TO THIS DRAWING
REPRESENTED BY [n]

1. XX

GENERAL NOTES

A. XX

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HEMBY BRIDGE ELEM LIGHTING REPLACEMENT

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ELECTRICAL DEMOLITION PLANS

E1.3

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KEYNOTES

APPLIES TO THIS DRAWING
REPRESENTED BY [n]

1. FIELD VERIFY THE SWITCH GROUP FOR THIS AREA . THE OCCUPANCY SENSOR(S) INDICATED SHALL CONTROL ONLY THE AREA CONTROLLED BY THE SWITCH GROUP .
2. RETAIN EXISTING STAGE LIGHTING BUS. FURNISH OWNER WITH TWENTY FOUR (24) 3000 LUMEN PAR TO LED REPLACEMENT LAMPS (OWNER SHALL COLOR AND INSTALL)
3. REPLACE EXISTING PAR LAMPS WITH 3000 LUMEN LED REPLACEMENT LAMPS. FIELD VERIFY THE APERTURE AND EXISTING LAMP SIZE.

GENERAL NOTES

A. REPLACE THE LIGHTING AND CONTROLS IN ALL SPACES UNO, MAINTAINING THE SWITCHING ARRANGEMENT (BI-LEVEL, DIMMING, ETC) IN THE SPACE.

B. PROTECT EXISTING CEILING DEVICES DURING CONSTRUCTION (SPEAKERS, FIRE ALARM SECURITY, ETC) IN TILES TO BE REPLACED AND REWORK INTO REPLACEMENT TILE IN THE SAME LOCATION UNO. IF TILE IS OCCUPIED BY A REPLACEMENT LIGHTING FIXTURE , MOVE TO THE ADJACENT TILE.

C. ALL LIGHTING FIXTURES SHALL COMPLY WITH DESIGN LIGHTING CONSORTIUM (DLC) OR ENERGY STAR PRODUCT REQUIREMENTS AND OTHER REQUIREMENT TO QUALIFY FOR THE DUKE ENERGY REBATES.

D. FIELD VERIFY ALL FIXTURE QUANTITIES BEFORE BEGINNING THE INSTALLATION. REPORT ANY CHANGES TO THE OWNER BEFORE ORDERING FIXTURES.

E. CONTRACTOR SHALL APPLY FOR THE DUKE ENERGY REBATES ON THE OWNERS BEHALF. ARCHITECT CAN ASSIST IN THIS PROCESS. REFER TO THE SPECIFICATIONS FOR THE APPLICATION FORM OR THE URL TO APPLY ON LINE.

F. FIELD IDENTIFY CEILING MOUNTED FIXTURES WITH EMERGENCY BATTERIES AND REPLACE WITH FIXTURE INDICATED. EXTEND UNSWITCHED LOCAL LIGHTING CIRCUIT TO REPLACEMENT WALL MOUNTED EM FIXTURE (TYPE W3) INDICATED ON THE PLANS.

FLOOR PLAN - LIGHTING - MAIN BUILDING

1/8" = 1'-0"

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HEMBY BRIDGE ELEM LIGHTING REPLACEMENT

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Union County Public Schools

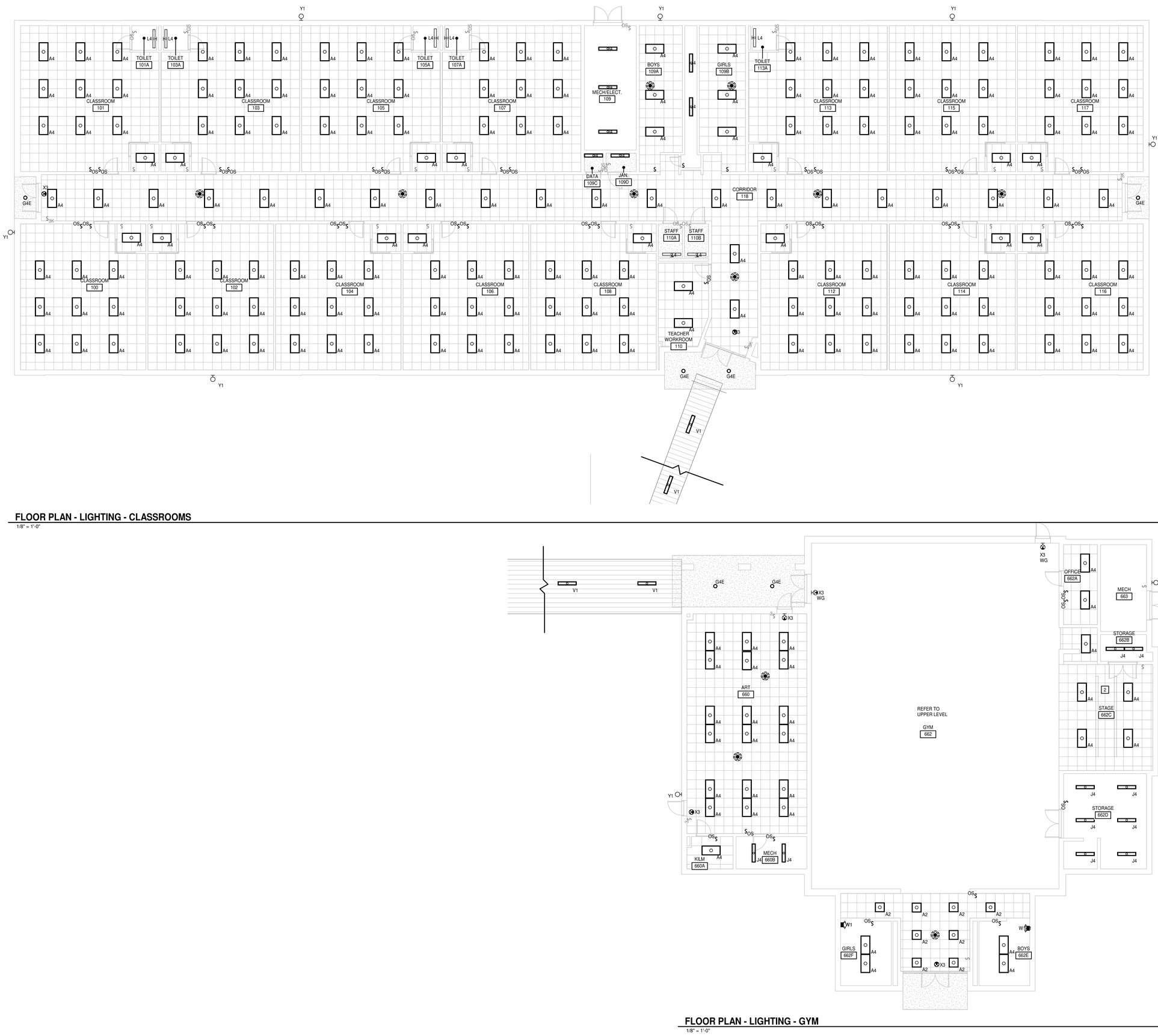
PROJECT NO: 641923
DATE: DECEMBER 22, 2024

REVISIONS	
DATE	DESCRIPTION

ELECTRICAL LIGHTING PLANS

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FLOOR PLAN - LIGHTING - CLASSROOMS

1/8" = 1'-0"

FLOOR PLAN - LIGHTING - GYM

1/8" = 1'-0"

KEYNOTES

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HEMBY BRIDGE ELEM LIGHTING REPLACEMENT

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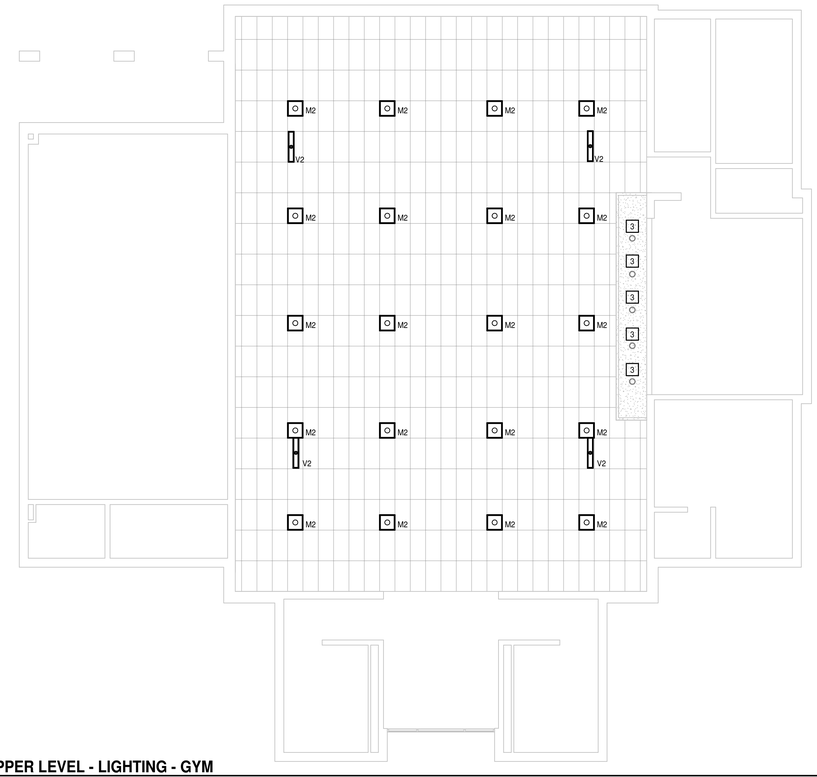
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ELECTRICAL LIGHTING PLANS

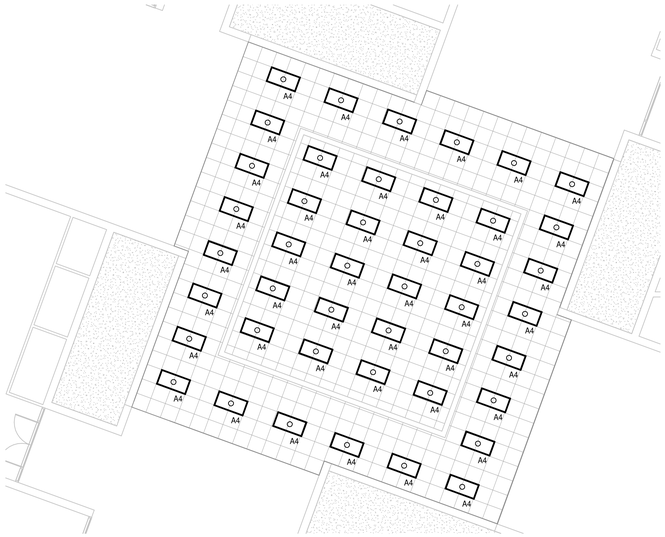
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UPPER LEVEL - LIGHTING - GYM

1/8" = 1'-0"



UPPER LEVEL - LIGHTING - MAIN BUILDING -

1/8" = 1'-0"

KEYNOTES

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HEMBY BRIDGE ELEM LIGHTING REPLACEMENT

6701 Indian Trail Fairview Rd, Indian Trail, NC 28079
Union County Public Schools

PROJECT NO: 641923
DATE: DECEMBER 22, 2024

REVISIONS	
DATE	DESCRIPTION

ELECTRICAL LIGHTING PLANS

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SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

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

1.3 SUBMITTALS

A. Provide drawings depicting the layout of each electrical room, electrical closet, security electronics room or any other similar space in which electrical equipment will be installed using a minimum scale of 1/2"=1'-0'. The drawings shall use the dimensions of the actual equipment being supplied for the project and shall include all NEC working clearances around the equipment. Drawings shall also include any the work of any other trade that will performing work in the space. Rough in may not begin until the submittal is approved by the engineer.

1.4 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 of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed.

1.5 QUALITY ASSURANCE

A. Third party agencies shall be amongst those accredited by the NCBCC (North Carolina Building Code Council) to Label Electrical & Mechanical Equipment".

PART 2 - PRODUCTS

2.1 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. Sleeves for Rectangular Openings: Galvanized sheet steel.

1. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE SEALS

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

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

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

2. Sealing Elements: NBR 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: Plastic. Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 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.

2.4 SECURITY FASTENERS:

A. Description: Accessories, anchorage inserts, and security fasteners providing a complete tamperproof installation.

B. Exposed Security Fasteners:
1. Fastener: Provide **torx-head** (star with center reject pin) security fasteners for anchoring work in exposed security areas.
2. Finish: Finish shall match that specified of the item anchored.
3. Tools: Provide tools for fastening devices.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1-2006. Mounting heights indicated in contract documents supersede 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 piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL 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. 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.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

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 indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry

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.

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.

K. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe 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.

3.3 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall and floor 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. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly.

3.5 SECURITY FASTENERS

A. All fasteners exposed in security areas shall be security fasteners. Where standard fasteners on manufactured devices and equipment are accessible, they shall be replaced with security fasteners.

END OF SECTION 260500

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.3 DEFINITIONS

A. RACEWAY: An enclosed channel of metal or nonmetallic materials designed expressly for holding wires or cables. Raceways include, but are not limited to, rigid metal conduit, rigid nonmetallic conduit, intermediate metal conduit, liquidtight flexible conduit, flexible metallic tubing, flexible metal conduit, electrical nonmetallic tubing, and electrical metallic tubing.
1. Cables such as MC, AC, or Greenfield are NOT raceways.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

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

1. Cerro Wire LLC.
2. General Cable; General Cable Corporation.
3. Southwire Company.
4. Encore Wiring Corporation.

B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-2-THWN-2.

D. Multiconductor Cable:
1. Shall only be allowed where specially indicated on the drawings.
2. Comply with NEMA WC 70/ICEA S-95-658 for metal-clad cable, Type MC with ground wire.

2.2 CONNECTORS AND SPLICES

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

1. 3M.
2. Hubbell Power Systems, Inc.
3. ILSCO.
4. Tyco Electronics Corp.

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

2.3 SYSTEM DESCRIPTION

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. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Cooper unless Aluminum specifically indicated on the drawings
1. When aluminum feeders are allowed, provide Copper for feeders smaller than No. 4 AWG; copper or aluminum for feeders No. 4 AWG and larger. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN-2-THWN-2, conductors in raceway or Type XHHW-2, single conductors in raceway. Type SE or Type USE multiconductor cable are not allowed.

B. Exposed Feeders: Type THHN-2-THWN-2, conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-2-THWN-2, conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2 conductors in raceway.

E. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-2-THWN-2, conductors in raceway

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-2-THWN-2, conductors in raceway.

G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, conductors in raceway, Type XHHW-2, conductors in raceway.

H. Feeders and Branch Circuits are not permitted to be installed in Cable Tray

3.3 INSTALLATION OF CONDUCTORS AND CABLES

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

B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. 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.

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

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

F. Branch Circuits Concealed in Casework: MC cable may be used to feed to outlet boxes fish concealed in built-in casework. Route cable supported tight in upper inside corners of casework, not in conflict with drawers or cabinet doors.

G. Branch Circuits Concealed Existing to Remain Drywall Partitions: MC cable may be used to feed to outlet boxes fish concealed in the drywall partition. Convert to conduit and conductor with 3' of exiting the partition.

H. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

I. Whips from Junction Box Concealed in Ceilings to Lighting Fixtures:
   1. Type MC Cable or FMC, with minimum #12AWG copper THHN/THWN and full size equipment grounding conductor. Maximum whip length 72".

2. MC Cable and FMC shall be supported within 24" of fixture connection so that whip is not in contact with ceiling or grid. Securing to fixture support wires with batwings is acceptable but not to ceiling support wires.
3. Do not connect fixture whips from fixture to fixture (daisy chain). No more than 4 whips shall be connected to any one junction box.

J. AC cable is not acceptable in any application.

K. All single-phase circuits shall include a dedicated neutral (grounded) and grounding conductor, unless specifically noted otherwise.
1. The intent of this is to eliminate multiwire branch circuits and allow disconnection of one circuit without requiring disconnection of other(s) as would be required to comply with NEC 210.4(B). Per NEC 310.15(B)(b) each of these neutral (grounded) conductor is not considered to be load-bearing so derating is not required.

L. Contract drawings are based upon a maximum of 3 current-carrying conductors in a conduit. Contractor may rework indicated circuitry to install a maximum of (6) L-N circuits (120 or 277V) in a single conduit. There shall be no more than 2 each A, B, C phase conductors per homerun. Each shall have dedicated neutral (grounded) conductor.
1. Do not group L-L circuits in a homerun, unless specifically indicated on the drawings.
2. Where there are more than 3 current-carrying conductors in a conduit, derate conductor ampacities in accordance with NEC Table 310.15(B)(2)(a).
3. When running more than 3 ungrounded conductors in a raceway, increase size of conduits beyond those indicated in contract documents, as required to not exceed NEC Chapter 9, Table 1 conduit-fill requirements. As-built drawings shall clearly indicate which circuits are grouped in homeruns.

M. Unless otherwise indicated, minimum conductor size shall be 12 AWG.

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-486B.

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

1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors where permitted.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.

    a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
    b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
    c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

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

1. Procedures used.
2. Results that comply with requirements.
3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

C. Cables will be considered defective if they do not pass tests and inspections. Remove and replace malfunctioning cables and retest as specified above.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes grounding and bonding systems and equipment

1.3 ACTION SUBMITTALS

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

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Burndy; Part of Hubbell Electrical Systems.
2. ERICO International Corporation.
3. Galvan Industries, Inc.; Electrical Products Division, LLC.
4. ILSCO.
5. O-Z/Gedney; an EGS Electrical Group brand; an Emerson Industrial Automation business.

2.2 SYSTEM DESCRIPTION

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

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Grounding Electrode Conductors: For the main service and transformers within the building shall be bare stranded copper and shall be sized no smaller than that indicated on the drawings or in the NEC table 250-66.

C. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.5 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet.

1. Termination: Factory-attached No. 4/0 AWG bare conductor at least 48 inches long.
2. Backfill Material: Electrode manufacturer's recommended material.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches below grade.

C. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, tele-data rooms and elsewhere as indicated.

D. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING SEPARATELY DERIVED SYSTEMS

A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

3.4 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

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

C. Metallic Fences:.

1. Grounding Conductor: Bare copper, not less than No. 8 AWG.
2. Gates: Shall be bonded to the grounding conductor with a flexible bonding jumper.
3. Barbed Wire: Strands shall be bonded to the grounding conductor.

3.5 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. When provided, Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting 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, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2. For grounding electrode system, 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, and connect to the service grounding electrode conductor.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install 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; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed 10 ohms.

F. 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 01 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. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

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

C. 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 QUALITY ASSURANCE

A. Comply with 2005 NFPA 70.

1.6 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Two Hole 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:

a. Cooper B-Line, Inc.; a division of Cooper Industries.
b. ERICO International Corporation.
c. Thomas & Betts Corporation.
d. Unistrut; an Atkore International company.

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101 and as required by NEC except in secure areas, the distance between supports shall be one half that specified by NEC. (twice as many supports as required by NEC).

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

D. 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.

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

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

1. 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:

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, 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:

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 05 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 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 two-bolt conduit clamps.

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. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
6. To Light Steel: Sheet metal screws.
7. 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.

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

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Division 05 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. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 033000 "Cast-in-Place Concrete."

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Comply with requirements in Division 09 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

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

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SECTION 260533 - RACEWAYS AND BOXES 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 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. RGS: Rigid Galvanized Steel conduit.

C. FMC: Flexible metal conduit.

D. IMC: Intermediate metal conduit.

E. LFMC: Liquidtight flexible metal conduit.

F. LFNC: Liquidtight flexible nonmetallic conduit.

G. NBR: Acrylonitrile-butadiene rubber.

H. RNC: Rigid nonmetallic conduit.

I. PVC: Schedule 40 PVC

J. ACCESSIBLE: Conduit less than 12' above the finished floor that is capable of being exposed without damaging the building structure or finish or not permanently closed in by the structure or finish of the building. Example: Conduit below 12' AFF that is above a removable ceiling tile is considered "Accessible"

K. RACEWAY: An enclosed channel of metal or nonmetallic materials designed expressly for holding wires or cables. Raceways include, but are not limited to, rigid metal conduit, rigid nonmetallic conduit, intermediate metal conduit, liquidtight flexible conduit, flexible metallic tubing, flexible metal conduit, electrical nonmetallic tubing, and electrical metallic tubing.
   1. Cables such as MC, AC, or Greenfield are NOT raceways.

1.3 ACTION SUBMITTALS

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

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

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

1. Allied Tube & Conduit.
2. O-Z/Gedney; an EGS Electrical Group brand; an Emerson Industrial Automation business.
3. Robroy Industries.
4. Thomas & Betts Corporation.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. IMC: Comply with ANSI C80.6 and UL 1242.

E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch, minimum.

F. EMT: Comply with ANSI C80.3 and UL 797.

G. FMC: Comply with UL 1; zinc-coated steel.

H. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

I. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
1. Fittings for EMT: Steel compression type.

2. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

J. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, AND FITTINGS

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

1. AFC Cable Systems, Inc.
2. Electri-Flex Company.

3. RACO; Hubbell.
4. Thomas & Betts Corporation.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. PVC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

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

1. Cooper B-Line, Inc.; a division of Cooper Industries.
2. Hoffman; a brand of Pentair Equipment Protection.
3. Square D.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled NEMA 3R, Flanged-and-gasketed type, and marked for intended location and application.

C. Fittings and Accessories: Include covers, 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. Wireway Covers: Screw-cover type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.4 SURFACE RACEWAYS

A. Listing and Labeling: Surface raceways shall be listed and labeled as defined in NFPA 70, and marked for intended location and application.

B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect].

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

a. MonoSystems, Inc.
b. Panduit Corp.
c. Wiremold / Legrand.

2.5 BOXES, ENCLOSURES, AND CABINETS

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

1. EGS/Appleton Electric.
2. Erickson Electrical Equipment Company.
3. Hoffman; a brand of Pentair Equipment Protection.
4. Hubbell Incorporated.
5. O-Z/Gedney; an EGS Electrical Group brand; an Emerson Industrial Automation business.
6. RACO; Hubbell.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy or aluminum, Type FD, with gasketed cover.

E. Metal Floor Boxes:

1. Material: Cast metal.
2. Shape: Rectangular.
3. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

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

H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum or galvanized, cast iron with gasketed cover.

I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

J. Gangable boxes are not prohibited.

2.6 FLOOR BOXES AND SERVICE FITTINGS

1. Floor boxes mounted in grade slabs shall be manufactured from cast-iron and be approved for use on grade and above grade floors.

2. Floor boxes not in grade slab shall be manufactured from stamped-steel and be approved for use on above-grade floors.

3. All floor boxes shall have four independent wiring compartments that allow capacity for up to four duplex receptacles and/or communication services. The box shall provide two 1" and two 1 1/4" conduit hubs. The box shall be fully adjustable...

4. Activation covers shall be available in flanged and flangeless versions of cast aluminum. Covers shall be available with options for tile or carpet inserts, flush covers, or furniture feed. Unless indicated otherwise, provide the following cover configurations:
    1) Power/Telecom Outlets: Brushed aluminum flanged with blank lid flush with floor and carpet/tile cutouts.
    2) Furniture Floor Feed: Brushed aluminum flanged with 1" trade size screw plug opening and one combination 1 1/4" and 2" trade size screw plug openings.
    3) Color and materiel shall be selected by the Architect
    4) The activation cover shall be listed by UL to meet the applicable U.S. and Canadian safety standards for scrub water exclusion when used on tile, terrazzo, wood, and carpet covered floors.

2.7 POKE-THRU ASSEMBLIES

1. 8" Poke-thru devices provide an interface between power, communication and audio/visual (A/V) cabling in an above grade concrete floor and the workstation or activation location where power, communication and/or A/V device outlets are required. These devices provide recessed device outlets that will not obstruct the floor area.

2. Insert: Insert body shall recess the devices a minimum of 2-3/4 inches (69mm) and have a polyester based backing enamel finished interior; ivory color. Furnish with necessary channels to provide complete separation of power and communication services. Provide compartments that allow for up to four duplex receptacles and/or communication ports

3. Body consists of an intumescent firestop material to maintain fire rating of the floor slab. Provide insert with a retaining feature to hold the poke-thru device in the floor slab without additional fasteners. Poke-thru insert shall also consist of a 3/4-inch trade size conduit stub that is connected to the insert body and a stamped steel junction box for wire splicing and connections. Stamped steel junction box shall also contain the means necessary to electrically ground the poke-thru device to the system ground

4. Activation Cover: Manufactured of die-cast aluminum alloy; finished in powder-coated color selected by the Architect. Provide with gaskets to maintain scrub water tightness. Provide cover with spring-loaded slides to allow cables to egress out of the unit and maintain as small an egress opening as possible.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: GRC.
3. Concealed in Masonry: GRC or PVC grouted solid after installation. Convert to metallic conduit per this specification prior to exiting the wall above ground
4. Concealed in Poured Concrete Walls: GRC or PVC. Convert to metallic conduit per this specification prior to exiting the wall above ground
5. Underground Conduit: Type PVC, direct buried.
6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
7. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed and Subject to Physical Damage: GRC. Raceway locations include the following:
   a. Loading dock.
   b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
   c. Mechanical rooms.
3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
4. Concealed in Masonry: GRC or PVC grouted solid after installation. Convert to metallic conduit per this specification prior to exiting the wall above ground
5. Concealed in Poured Concrete Walls: GRC or PVC. Convert to metallic conduit per this specification prior to exiting the wall above ground
6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
7. Damp or Wet Locations: GRC.
8. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

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

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Whips from Junction Box Concealed in Ceilings to Lighting Fixtures:
1. Above non-removeable or security type ceilings, junction boxes are not acceptable. Provide conduit between the fixtures.

F. AC is not acceptable in any application

G. Do not install aluminum conduits, boxes, or fittings.

H. Install surface raceways only where indicated on Drawings.

I. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. All conduit shall be tight to the structure and securely with two-hole steel conduit straps.

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

D. Complete raceway installation before starting conductor installation.

E. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

F. Arrange stub-ups so curved portions of bends are not visible above finished slab.

G. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

H. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

I. All conduit to be installed on exterior masonry shall not run continuously within the wall cavity.

J. Support conduit within 6 inches of enclosures to which attached.

K. Raceways Embedded in Slabs are not permitted, except as required for entry into recessed floor boxes. Conduits shall be routed below the slab within the porous fill and stub-up at the required location. Transition from PVC to RGS with RGS elbow before rising above the floor. After RGS elbow, stub-up conduit shall be type indicated in Part 3.1 above. PVC shall not be permitted exposed above the floor

L. 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.

M. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.

N. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

O. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

P. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

Q. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

R. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

S. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

T. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

U. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

V. Special Fittings and Installations:

1. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
    d. Attics: 135 deg F temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.

4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

W. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
1. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

X. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements and also refer to Architectural elevations. Install boxes with height measured to center of box unless otherwise indicated.

Y. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box. Retain the fire rating of any fire rated wall or assembly

Z. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

AA. Locate boxes so that cover or plate will not span different building finishes.

BB. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

CC. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

DD. Set metal floor boxes level and flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom for pipe less than 6 inches in nominal diameter.
2. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
3. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

4. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.

D. Install handholes with bottom below frost line, below grade.

3.5 CONDUIT COLOR CODING

A. All outlet boxes, junction boxes and pull boxes shall have their covers and exterior visible surfaces painted with colors to match the surface color scheme outlined below. This includes covers on boxes above lift-out and other type accessible ceilings, where identification shall also include branch circuit designation. Mark conduit a minimum of each 10'-0"

1. Blue for 120/208-volts normal circuits
2. Black for 277/480-volts normal circuits
3. Bright red for all conduit related to fire alarm system.
4. Dark red (burgundy) for all conduit related to security.
5. Green for all conduit related to NEC 701 and 702 emergency systems
6. Orange for all conduit related NEC 700 emergency systems
7. Brown for all conduit related to data systems.
8. White for all conduit related to paging systems.
9. Purple for all conduit related to TV systems or other LV systems.

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Maintain the fire rating of all fire rated walls and assemblies in which electrical raceway or boxes are installed.

END OF SECTION 260533

SECTION 260548.16 - SEISMIC CONTROLS 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Restraint channel bracings.
2. Restraint cables.
3. Seismic-restraint accessories.
4. Mechanical anchor bolts.
5. Adhesive anchor bolts.

B. Related Requirements:

1. Section 260529 "Hangers and Supports for Electrical Systems" for commonly used electrical supports and installation requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.

    a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
    b. Annotate to indicate application of each product submitted and compliance with requirements.

B. Delegated-Design Submittal: For each seismic-restraint device.

1. Include design calculations and details for selecting seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Design Calculations: Calculate static and dynamic loading caused by equipment weight, operation, and seismic forces required to select seismic restraints and for designing vibration isolation bases.

a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.

3. Seismic Restraint Details:

a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
c. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
d. Preapproval and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show coordination of seismic bracing for electrical components with other systems and existing equipment with new equipment in the vicinity, including other supports and seismic restraints.

B. Welding certificates.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated and that is acceptable to authorities having jurisdiction.

B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

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

D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis. They shall bear anchorage preapproval from OSHPD in addition to preapproval, showing maximum seismic-restraint ratings, by ICC-ES or another agency acceptable to authorities having jurisdiction. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) that support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

E. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:
1. Assigned Seismic Use Group or Building Category as Defined in the IBC: C

a. Component Importance Factor: 1.5.
b. Component Response Modification Factor: 2.5.
c. Component Amplification Factor: 1.0.

2.2 RESTRAINT CHANNEL BRACINGS

A. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end, with other matching components, and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.3 RESTRAINT CABLES

A. Restraint Cables: ASTM A603 galvanized-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; with a minimum of two clamping bolts for cable engagement.

2.4 SEISMIC-RESTRAINT ACCESSORIES

A. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections or Reinforcing steel angle clamped to hanger rod.

B. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings and restraint cables.

C. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings and matched to type and size of anchor bolts and studs.

D. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings and matched to type and size of attachment devices used.

E. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.5 MECHANICAL ANCHOR BOLTS

A. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E488.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for reinforcement and cast-in-place anchors to verify actual locations before installation.

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

3.2 APPLICATIONS

A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.

B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods caused by seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.3 SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork.

B. Equipment and Hanger Restraints:

1. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch (3.2 mm).
2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

E. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

F. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.

B. Seismic controls will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.6 ADJUSTING

A. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 260548.16

SECTION 260553 - IDENTIFICATION 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.3 ACTION SUBMITTALS

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

1.4 QUALITY ASSURANCE

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

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, 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 POWER AND CONTROL RACEWAY 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 size.

B. Colors for Raceways Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

C. Colors for Raceways Carrying Circuits at More Than 600 V:

1. Black letters on an orange field.
2. Legend: "DANGER CONCEALED HIGH VOLTAGE WIRING."

D. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

E. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

F. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

G. Tape and Stencil for Raceways Carrying Circuits More Than 600 V: 4-inch- wide black stripes on 10-inch centers diagonally over orange background that extends full length of raceway or duct and is 12 inches wide. Stop stripes at legends.

H. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

I. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.2 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 cable size.

B. Colors for Cables Carrying Circuits at 600 V and Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

C. Colors for Cables Carrying Circuits at More Than 600 V:

1. Black letters on an orange field.
2. Legend: "DANGER HIGH VOLTAGE WIRING."

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

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

F. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around cable it identifies. Full shrink recovery at a maximum of 200 deg F. Comply with UL 224.

2.3 POWER AND CONTROL 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 cable size.

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

C. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil- thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the cable diameter such that the clear shield overlaps the entire printed legend.

D. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around cable it identifies. Full shrink recovery at a maximum of 200 deg F. Comply with UL 224.

E. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

F. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

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

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

2.4 CONDUCTOR 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. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil- thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the conductor diameter such that the clear shield overlaps the entire printed legend.

C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.

D. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.

E. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around conductor it identifies. Full shrink recovery at a maximum of 200 deg F. Comply with UL 224.

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

G. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
2. Labels for Tags: Self-adhesive label, machine-printed with permanent, waterproof, black ink recommended by printer manufacturer, sized for attachment to tag.

2.5 FLOOR MARKING TAPE

A. 2-inch- wide, 5-mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

2.6 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE,.
3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE,.

C. Warning Tape:

1. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Overall Thickness: 5 mils.
3. Foil Core Thickness: 0.35 mil.
4. Weight: 28 lb/1000 sq. ft..
5. 3-Inch Tensile According to ASTM D 882: 70 lbf, and 4600 psi.

2.7 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.

1. Warning labels and signs shall include, but are not limited to, the following:
    a. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
    b. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES"
    c. Arc Flash Hazard Warning: Refer to Section 260574 for requirements.

2.8 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches 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.

B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.

2.9 EQUIPMENT IDENTIFICATION LABELS

A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

2.10 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black.

C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F.
5. Color: Black.

2.11 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding 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.

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. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

I. 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 or concrete envelope exceeds 16 inches overall.

J. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl label. Install labels at 10-foot maximum intervals.

B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:

1. Emergency Power.
2. Power.
3. UPS.

C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.

a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
b. Colors for 208/120-V Circuits:

1) Phase A: Black.
2) Phase B: Red.
3) Phase C: Blue.
4) Grounded (Neutral): White.
5) Ground: Green.

c. Colors for 480/277-V Circuits:

1) Phase A: Brown.
2) Phase B: Orange.
3) Phase C: Yellow.
4) Grounded (Neutral): Gray.
5) Ground: Green.

d. 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.

D. Power-Circuit Conductor Identification, More than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use nonmetallic plastic tag holder with adhesive-backed phase tags, and a separate tag with the circuit designation.

E. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

F. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive, self-laminating polyester labels with the conductor or cable designation, origin, and destination.

G. Control-Circuit Conductor Termination Identification: For identification at terminations provide heat-shrink preprinted tubes or self-adhesive, self-laminating polyester labels with the conductor designation.

H. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source.

I. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal 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 the 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.

1. Limit use of underground-line warning tape to direct-buried cables.
2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

K. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

L. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For 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.

M. Operating Instruction Signs: 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.

N. Emergency Operating Instruction Signs: 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 and load shedding.

O. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the 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: Adhesive film label with clear protective overlay. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.
    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.
    d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

    a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be, laminated acrylic or melamine label.
    b. Enclosures and electrical cabinets.
    c. Access doors and panels for concealed electrical items.
    d. Switchboards.
    e. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
    f. Emergency system boxes and enclosures.
    g. Enclosed switches.
    h. Enclosed circuit breakers.
    i. Enclosed controllers.
    j. Variable-speed controllers.
    k. Push-button stations.
    l. Power transfer equipment.
    m. Contactors.
    n. Remote-controlled switches, dimmer modules, and control devices.
    o. Battery-inverter units.
    p. Power-generating units.
    q. Monitoring and control equipment.
    r. UPS equipment.

END OF SECTION 260553

SECTION 262200 - LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUBMITTALS

A. Product Data: Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer indicated.

B. Percent Impedance for each transformer type.

C. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

D. Source quality-control test reports.

E. Field quality-control test reports.

F. Operation and Maintenance Data: For transformers to include in emergency, operation, and maintenance manuals.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain each transformer type through one source from a single manufacturer.

1.4 COORDINATION

A. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate installation of wall-mounting and structure-hanging supports with actual transformer provided.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include limited to the following:
   1. Eaton Electrical Inc.; Cutler-Hammer Products.
   2. General Electric Company.
   3. Siemens Energy & Automation, Inc.
   4. Square D; Schneider Electric. (Basis of Design)

2.2 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.

B. Cores: Grain-oriented, non-aging silicon steel.

C. Coils: Continuous windings without splices except for taps.

   1. Internal Coil Connections: Brazed or pressure type.
   2. Coil Material: Aluminum or Copper.

2.3 DISTRIBUTION TRANSFORMERS

A. Comply with NEMA ST 20, and list and label as complying with UL 1561.

B. Cores: One leg per phase.

C. Indoor Transformers
   1. Enclosure: Ventilated, NEMA 250, Type 2.
      a. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.

D. Outdoor Transformers

   1. Enclosure: Totally enclosed, nonventilated.

   2. NEMA 250, Type 3R: Core and coil shall be encapsulated within resin compound, sealing out moisture and air.

E. Transformer Enclosure Finish: Manufacturer's standard color. Comply with NEMA 250.

F. Taps for Transformers Smaller Than 3 kVA: None.

G. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.

H. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.

I. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 115 deg C rise above 40 deg C ambient temperature.

J. Energy Efficiency for Transformers Rated 15 kVA and Larger:
1. Minimum transformer efficiencies must satisfy efficiencies promulgated within United States Code of Federal Regulations CFR Title 10 Chapter II Part 431 (Appendix A of Subpart K 2016); these efficiency levels are commonly referred to as the "DOE 2016 Efficiency.

K. Wall Brackets: Manufacturer's standard brackets.

L. Low-Sound-Level Requirements: Minimum of 3 dBA less than NEMA ST 20 standard sound levels when factory tested according to IEEE C57.12.91.

2.4 IDENTIFICATION DEVICES

A. Nameplates: Engraved, laminated-plastic or metal nameplate for each transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Division 26 Section "Identification for Electrical Systems."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.

B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.

C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.

D. Verify that ground connections are in place and requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.

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

3.2 INSTALLATION

A. Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.

B. Construct concrete bases and anchor floor-mounting transformers according to manufacturer's written instructions.

3.3 CONNECTIONS

A. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

C. Remove and replace units that do not pass tests or inspections and retest as specified above.

D. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

3.5 ADJUSTING

A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.

B. Output Settings Report: Prepare a written report recording output voltages and tap settings.

3.6 CLEANING

A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

3.7 WARRANTY

A. Warranty Period: Provide a warranty to repair or replace for One year from date of **Final Acceptance**.

END OF SECTION 16461

SECTION 262416 - PANELBOARDS

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. Distribution panelboards.
   2. Lighting and appliance branch-circuit panelboards.

1.3 DEFINITIONS

A. SVR: Suppressed voltage rating.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

   1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
   2. Detail enclosure types and details for types other than NEMA 250, Type 1.
   3. Detail bus configuration, current, and voltage ratings.
   4. Short-circuit current rating of panelboards and overcurrent protective devices.
   5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
   6. Provide a coordination drawing of each electrical room or space contain electrical equipment using the actual dimensions of the equipment to be supplied indicating clearances and equipment dimensions.

C. Field Quality-Control Reports:

   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.

D. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

E. Coordination Study Report: The findings of the Section 260573 Coordination Study Report (CSR) may affect the overcurrent protective devices and fault-current withstand requirements for switchboards, panelboards, and transfer switches. Also, the preparation of the CSR is dependent on the manufacturer's data for this equipment. Therefore until Submittal final Approval is granted for the CSR, these materials shall be considered at best "Approved, pending Approval of the CSR" and not released for order.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

B. Comply with NFPA 70.

1.6 PROJECT CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

a. Ambient Temperature: Not exceeding minus 22 deg F (minus 30 deg C) to plus 104 deg F (plus 40 deg C).
b. Altitude: Not exceeding 6600 feet (2000 m).

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet (2000 m).

1.7 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.8 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period: One year from date of Final Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Enclosures:

1. Rated for environmental conditions at installed location.
   a. Indoor Locations: NEMA 250, Type 1.
   b. Exterior Locations: NEMA 250, Type 3R
   c. Kitchen and areas subject to water and corrosion: NEMA 250, Type 4X

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Finishes:

   a. Panels and Trim: galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
   b. Back Boxes: Same finish as panels and trim.

4. Directory Card: Inside panelboard door, mounted in transparent card holder, with metal frame.

B. Incoming Mains Location: Top or bottom.

C. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

D. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type.
3. Ground Lugs and Bus-Configured Terminators: Mechanical type.

E. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

F. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

G. All branch breakers over 60A in panelboards on the life safety, legally required and optional standby systems shall have LSI (long time, short time and instantaneous) settings. All main breakers in panelboards on the life safety, legally required and optional standby systems shall be LI mission critical breakers. Upsize the breaker frame size as required.

2.2 DISTRIBUTION PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work limited to the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric. (Basis of design)

B. Panelboards: NEMA PB 1, power and feeder distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.

D. Mains: Circuit breaker.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include limited to the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.

4. Square D; a brand of Schneider Electric. (Basis of Design)

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker.

D. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

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

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles.
    b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
    c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
    d. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.

C. Arc Energy Reduction. Where the highest continuous current trip setting of a circuit breaker is rated or can be adjusted to is 1200 A or higher.
1. Provide one of the following methods to reduce clearing time
    a. Zone-selective interlocking
    b. Differential relaying
    c. Energy-reducing maintenance switching with local status indicator
    d. Energy-reducing active arc flash mitigation system
2. Indicate the method of compliance in the submittals
3. Provide documentation how the breaker is authorized to be installed, operated, and/or inspected

4. Contractor shall adhere to the documentation and post the information at the location of the circuit breaker(s).

2.5 MINI UNIT SUBSTATIONS

A. UL Listed and tested assembly consisting of
   1. Primary and Secondary Main Circuit Breaker
      a. Circuit breaker ratings are selected to meet National Electrical Code (NEC) requirements and to coordinate with transformer magnetizing inrush current
   2. Sealed Step-Down Transformer
      a. 185°C (365°F) insulation with 115°C (239°F) temperature rise
      b. Sealed, epoxy-resin encapsulated transformer
   3. Distribution Panelboard
      a. Panel section has copper bus and uses standard circuit breakers. Tandem breakers are not allowed.
      b. Feeder circuit breakers are standard plug-on type

2.6 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Each panelboard section shall not exceed 42 single poles.

C. Panelboards 400A and less shall not exceed 20 in. (508 mm) wide by 5.75 in. (223 mm) deep

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

C. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated.

D. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

E. Install overcurrent protective devices and controllers not already factory installed.

F. Install filler plates in unused spaces.

G. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

H. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 26 Section "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. This includes thermo graphic survey. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

C. Panelboards will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports, including a report that identifies panelboards included and that describes scanning results. Include IR color photos of each panel scanned. For panels with defects found, include "before" and "after" defect is repaired. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION 262416

ELECTRICAL EQUIPMENT REPLACEMENT SCHEDULE

TAG	VOLTAGE	AMPS	MAINS	PH	POLES	MOUNTING	ROOM #	ROOM NAME
MDP	480	1600 A	MCB	3	24	SURFACE	406	MECHANICAL
PHA	480	600 A	MLO	3	36	SURFACE	406	MECHANICAL
PHB	480	400 A	MLO	3	30	SURFACE	392A	STORAGE
PKB	208	225 A	MLO	3	42	RECESSED	392B	KITCHEN
PLA	480	100 A	MLO	3	24	SURFACE	406	MECHANICAL
PLB	480	100 A	MLO	3	24	SURFACE	392A	STORAGE
PPE	480	100 A	MLO	3	24	SURFACE	406	MECHANICAL
PRA	208	225 A	MCB	3	42	SURFACE	406	MECHANICAL
PRB	208	100 A	MCB	3	42	SURFACE	314	MEDIA CENTER
PRC	208	100 A	MCB	3	42	SURFACE	406	MECHANICAL
XFMR	480			3	3		314	MEDIA CENTER

KEYNOTES

APPLIES TO THIS DRAWING
REPRESENTED BY n

1. REPLACE THE DENOTED PANEL AND RECONNECT BRANCH CIRCUITS AND FEEDER. REFER TO SCHEDULE FOR PANEL CHARACTERISTICS. FIELD VERIFY THE SHORT CIRCUIT RATING (KAIC) AND REPLACE IN KIND. FOR PANELS THAT ARE LESS THAN 42-POLE, REPLACE WITH A 42-POLE PANEL WHERE SPACE ALLOWS AND LEAVE ADDITIONAL POSITIONS BLANK. PROVIDE A NEW PANEL SCHEDULE. NOTIFY THE OWNER AT LEAST 10 WORKING DAYS PRIOR TO ANY OUTAGE.
2. REPLACE THE DENOTED TRANSFORMER WITH SIZE INDICATED AND RECONNECT FEEDERS. NOTIFY THE OWNER AT LEAST 10 WORKING DAYS PRIOR TO ANY OUTAGE.



FLOOR PLAN - POWER.
1/8" = 1'-0"

12/19/2024 11:11:07 AM

MOSELEY ARCHITECTS
6210 ARDREY KELL ROAD • THE HUB AT WAVERLY, SUITE 425 • CHARLOTTE, NC 28277
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NORTH CAROLINA PROFESSIONAL SEAL 024242 ENGINEER WILLIAM J. CARTER

MOSELEY ARCHITECTS, P.C. ENGINEERING CORPORATION C-3469 NORTH CAROLINA CHARLOTTE, NC

HEMBY BRIDGE ELEM POWER REPLACEMENT

6701 Indian Trail Fairview Rd, Indian Trail, NC 28079
Union County Public Schools

PROJECT NO: 641923
DATE: DECEMBER 20, 2024

REVISIONS	
DATE	DESCRIPTION

ELECTRICAL POWER PLANS

E1.0

UNION COUNTY PUBLIC SCHOOLS

307 E Jefferson St Monroe, NC 28112
Craig Reeder
craig.reeder@ucps.k12.nc.us
ucps.k12.nc.us

Purchasing and Contracts

ADDENDUM 1

BID#: 5-97648020

Project: Hemby Bridge Elementary School Lighting Replacement, Electrical Panel Replacement and Ceil Grid Replacement

DUE DATE: Thursday, March 6, 2025, at 2:00PM

Contractor shall fulfill all requirements listed within the bid documents, including additions and changes noted below.

Pre-Bid 2-17-2025 at 10:00am Mandatory
Questions 2-27-2025 by 2:00pm
Bids due 3-6-2025 by 2:00pm

Substantial Completion 8-7-2025
Final Completion 8-14-2025
Can start working on project on 6-12-2025

There is a mandatory Pre-BID meeting on February 17, 2025 at 10:00 AM.

End of Addendum 1

In compliance with federal law, UCPS administers all educational programs, employment activities and admissions without discrimination against any person on the basis of gender, race, color, religion, national origin, age or disability.

UNION COUNTY PUBLIC SCHOOLS

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ADDENDUM 2

BID#: 5-97648020

Project: Hemby Bridge Elementary School Lighting Replacement, Electrical Panel Replacement and Ceil Grid Replacement

DUE DATE: Thursday, March 6, 2025, at 2:00PM

Contractor shall fulfill all requirements listed within the bid documents, including additions and changes noted below

Please see the attached questions and answers for Hemby Bridge Elementary Lighting Project.

Please see the attached approval for the alternate product submission.

End of Addendum #2

In compliance with federal law, UCPS administers all educational programs, employment activities and admissions without discrimination against any person on the basis of gender, race, color, religion, national origin, age or disability.

Please review and confirm which is correct. Will we need to include sales tax in bid submission or Question: per review of the bid specifications section noted above. There are two forms shown. will there be an Affidavit of Capital Improvement provided for this project?

Yes. UCPS is not sales tax exempt. Per review of the bid document

Per review of the bid documents no start date of completion date has been provide. Provide start date and completion date information?

a. Start Date: On or about June 12, 2025

b. Substantial Completion 8/7/2025

c. Final Completion 8/14/2025

Per review of the bid documents no information was provided dealing with asbestos survey being completed by UCPS. Confirm no asbestos materials are existing and will not be required to be removed during project?

UCPS has an active AHERA plan at the front of each school building. UCPS will work with the awarded contractor to provide any/ all information pertaining to AH ERA guidance.

Per review of the bid documents. No information has been provided stating the GC will be responsible to move/relocate all of the existing furniture/fixtures in work areas. On past projects all furniture/fixtures have been relocated/moved out of work areas to allow clearance to complete scope of work shown on plans by UCPS personnel?

UCPS will not be moving all of the furniture out of the work areas.

Per review of the bid above noted El.0 and review of existing field conditions on site during pre-bid. Several existing electrical panels are not located as shown on above plan sheet. This was reviewed with Craig Reeder during pre-bid site visit. The panel PKB is shown on electrical equipment replacement schedule but no notes have been shown for this panel location on this El.0. Note needs to be added?

Only the panels and the transformer indicated the "Electrical Equipment Replacement Schedule" on drawing E1.0 are to be replaced. Note 1 applies to panel PKB.

Per review of the bid documents for this project. No formal electrical panel schedules showing number of breakers and size for each breaker has been provided. This information will need to be provided to price correctly. Please provide complete panel schedule for each panel being replaced to shown number of breakers and size required for each panel?

Refer to Addenda AD 1

Per review of with suppliers dealing with lead times on delivery of new electrical panels and light fixture package. It will take 4 to 6 months once submittals are approved for new electrical panels to be made and delivered to the site. It will take 13-15 weeks once submittals are approved for new light fixture package to be made and delivered to the site. This will affect the start date of this project and the completion date of this project. Final construction schedule will be set once submittal packages for these two items have been approved by the owners A0R/Engineers. Noting these issues via CRFI to be park of the bid package submittal?

Bidder will submit proposed schedule with bid package.

It mentions on bullet point 4 that the power panel replacement is a separate project and bid. Will we be required to send in two different bids that cover each scope, or will submitting a bid specific for the retrofit of the lighting be sufficient?

Refer to Addenda ADI

There are no controls shown for the cafeteria, kitchen and gym. Could you confirm if we need to provided controls for those areas?

Reuse the existing controls.

On site there were a lot of partitions separating the classrooms, is the contractor responsible for removing these and re-installing them, or will the School District take care of this?

UCPS would request, where feasible, that the contractor work around the partition walls. However, if a partition wall is required to be moved, it would be part of the scope of work for the contractor.

What is the available fault current at feeder breakers?

Refer to Addenda AD1

Will 35 KAIC be acceptable at feeder breakers with series rated downstream from there?

Refer to Addenda AD1

Would any of the following value engineering be accepted?

Retrofit panel interior replacement, if available.

Please confirm the only panels being replaced are listed on the schedule.

Confirmed

Please confirm there will be no shunt trip or GFCI/AFCI breakers required in the panels.

Refer to addendum AD1

Please confirm the existing lighting does not use a master/ satellite ballast configuration?

Yes, this has been confirmed

Will the use of a surface mount panel over the existing recessed location be acceptable?

Yes

Please confirm the reuse of existing circuitry, wiring, and raceways will be acceptable.

Confirmed

Please confirm recessed can light size for callout G4 and G4E.

Confirmed

SECTION 095100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

B. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

D. ASTM E1264 - Standard Classification for Acoustical Ceiling Products.

1.02 SUBMITTALS

A. Shop Drawings: Indicate grid layout and related dimensioning.

B. Product Data: Provide data on suspension system components, acoustical units, and specialty ceiling products as indicated.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. Refer to Section 016000 - Product Requirements, for additional provisions.
2. Extra Acoustical Panels: Quantity equal to 2 percent of total installed, of each type.

D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.03 QUALITY ASSURANCE

A. Source Limitations: Provide each acoustical ceiling assembly (ceiling panel and suspension system) from a single manufacturer to obtain manufacturer's system warranty.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver until building is weather-tight and conditioned.

B. Store materials in dry and clean location until needed for installation. During installation, handle in a manner that will prevent damage and to prevent marring and soiling of finished surfaces.

1.05 FIELD CONDITIONS

A. Maintain uniform temperature and humidity at occupancy conditions during and after acoustical unit installation. Allow products to acclimatize prior to installation.

1.06 WARRANTY

A. System Warranty: Provide a single source system warranty covering both acoustical ceiling panels and suspension system.

1. Warranty shall cover material failures including sag, warping, shrinkage, or delamination, biologic growth including mold or mildew, and rusting of suspension system.
2. Warranty Period: Minimum 15 years, from date of Substantial Completion.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Surface Burning Characteristics: Each acoustical ceiling shall be Class A rated, with flame spread index of 25 or less, smoke developed index of 50 or less, when tested in accordance with ASTM E84.

2.02 ACOUSTICAL PANELS

A. Acoustical Panels - General: ASTM E1264, Class A.
   1. VOC Content: Third-party tested and certified, according to California Department of Public Health (CDPH) Standard Method (CA Section 01350).
   2. Antibacterial/Antimicrobial Treatment: Provide acoustical panels that have been factory-treated by manufacturer for resistance to bacteria, mold, mildew, and fungus.
   3. Humidity/Sag Treatment: Provide acoustical panels that have been factory-treated by manufacturer for humidity and sag-resistance.
   4. Formaldehyde-Free: Provide acoustical panels with formaldhyde-free compositon.

B. Acoustical Panels ACP: Painted mineral fiber, with the following characteristics:
   1. Classification: ASTM E1264 Type III.
      a. Form: 2, water felted.
   2. Size: 24 by 24 inches.
   3. Thickness: 3/4 inch.
   4. Light Reflectance: Not less than 0.82, determined in accordance with ASTM E1264.
   5. NRC Range: Not less than 0.70, determined in accordance with ASTM E1264.
   6. Panel Edge: Square.
   7. Color: White.
   8. Suspension System: Exposed grid.
   9. Products:
      a. Armstrong World Industries, Inc; School Zone Fine Fissured - Item #1713.
      b. CertainTeed Ceilings, Inc; Fine Fissured High NRC - Item #HHF-457 HNRCX.
      c. USG Corporation; Radar High-NRC Acoustical Panels - Item #22421.
      d. Substitutions: See Section 016000 - Product Requirements.

2.03 SUSPENSION SYSTEM(S)

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.
   1. Materials:
      a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.
   2. Cross Tee/Main Runner Connection: Override (stepped).
   3. Main Runner End Coupling: Bayonet ("stab") type; knuckle type is not acceptable.

B. Exposed Suspension System- for replacement of components of existing to remain exposed suspension system too damaged to reuse: Hot-dipped galvanized steel grid and cap.
   1. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
   2. Profile: Tee; 15/16 inch face width.
   3. Finish: Baked enamel.

4. Products:
   a. Armstrong World Industries, Inc; Prelude XL 15/16".
   b. CertainTeed Ceilings, Inc; 15/16" EZ Stab Classic System.
   c. USG Corporation; Donn Brand DX/DXL 15/16 inch Acoustical Suspension System.
   d. Substitutions: See Section 016000 - Product Requirements.

2.04 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.

C. Perimeter Moldings: Same metal and finish as grid.
   1. Acoustical Sealant For Perimeter Moldings: Refer to Section 079200 - Joint Sealants for acoustical sealant for use in conjunction with suspended ceiling system.

D. **Ceiling Grid Covers (ALTERNATE #1): vinyl; for installation over existing suspension system components, size and type to suit application, fire rating, seismic requirements, and ceiling system flatness requirement specified. (*AD-01)**
   1. **Products: Basis of Design - Ceilume; EZ-On Grid Cover System or comparable product from available manufacturers. (*AD1)**

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 PREPARATION

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

3.03 INSTALLATION - SUSPENSION SYSTEM

A. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

B. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.

C. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.
   2. Apply acoustical sealant in a continuous bead at top edge of vertical legs of moldings after they are installed.

D. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
   1. Do not hang suspension system directly from steel floor or roof deck.

E. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

F. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

G. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

H. Do not eccentrically load system or induce rotation of runners.

3.04 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:

1. Make field cut edges of same profile as factory edges.

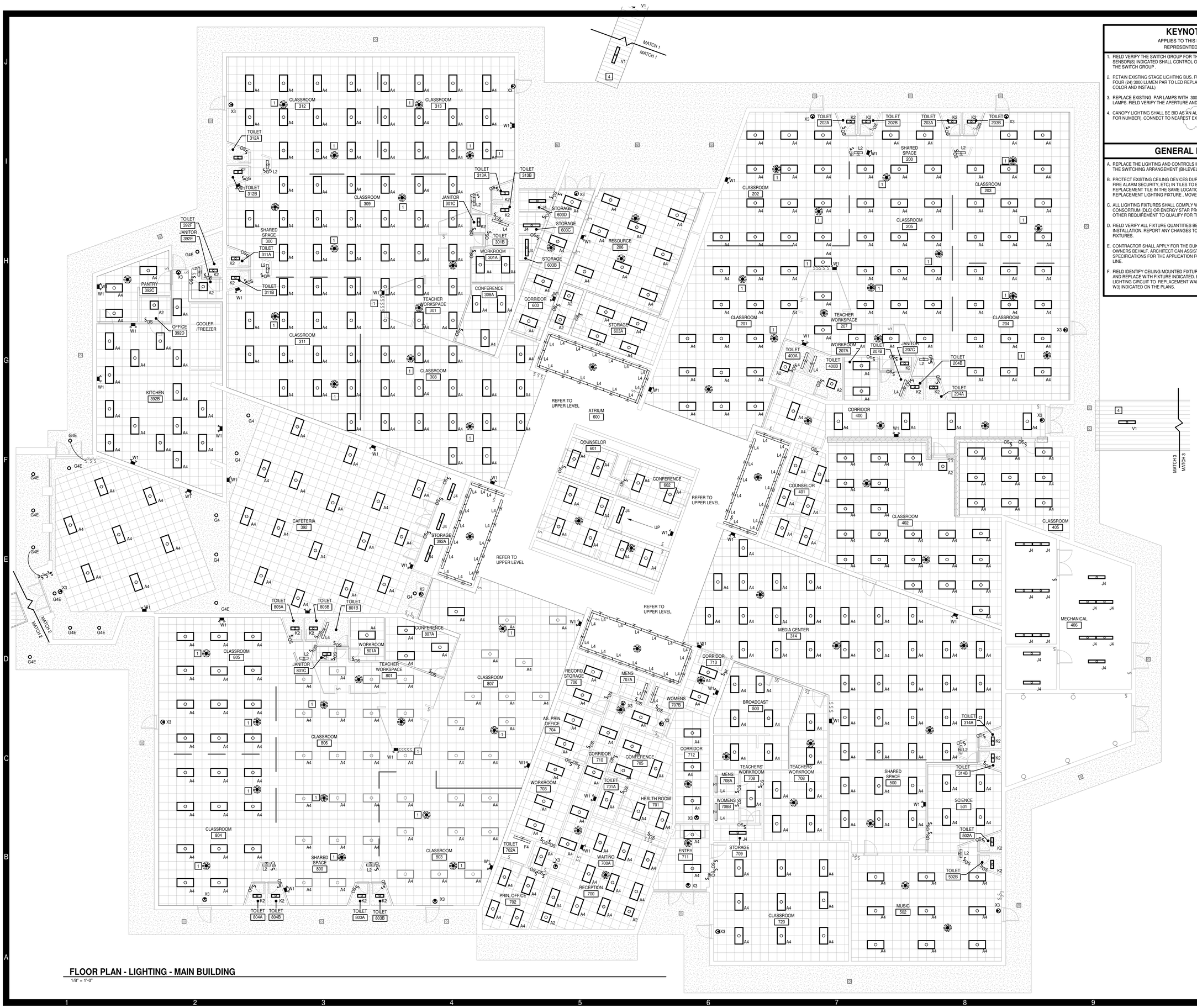
F. Where round obstructions and bullnose concrete block corners occur, provide preformed closures to match perimeter molding.

3.05 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION 095100



FLOOR PLAN - LIGHTING - MAIN BUILDING

1/8" = 1'-0"

KEYNOTES

APPLIES TO THIS DRAWING
REPRESENTED BY [n]

1. FIELD VERIFY THE SWITCH GROUP FOR THIS AREA . THE OCCUPANCY SENSOR(S) INDICATED SHALL CONTROL ONLY THE AREA CONTROLLED BY THE SWITCH GROUP .
2. RETAIN EXISTING STAGE LIGHTING BUS. FURNISH OWNER WITH TWENTY FOUR (24) 3000 LUMEN PAR TO LED REPLACEMENT LAMPS (OWNER SHALL COLOR AND INSTALL)
3. REPLACE EXISTING PAR LAMPS WITH 3000 LUMEN LED REPLACEMENT LAMPS. FIELD VERIFY THE APERTURE AND EXISTING LAMP SIZE.
4. CANOPY LIGHTING SHALL BE BID AS AN ALTERNATE (REFER TO BID SHEET FOR NUMBER). CONNECT TO NEAREST EXISTING EXTERIOR POWER CIRCUIT.

GENERAL NOTES

A. REPLACE THE LIGHTING AND CONTROLS IN ALL SPACES UNO, MAINTAINING THE SWITCHING ARRANGEMENT (BI-LEVEL, DIMMING, ETC) IN THE SPACE.

B. PROTECT EXISTING CEILING DEVICES DURING CONSTRUCTION (SPEAKERS, FIRE ALARM SECURITY, ETC) IN TILES TO BE REPLACED AND REWORK INTO REPLACEMENT TILE IN THE SAME LOCATION UNO. IF TILE IS OCCUPIED BY A REPLACEMENT LIGHTING FIXTURE , MOVE TO THE ADJACENT TILE.

C. ALL LIGHTING FIXTURES SHALL COMPLY WITH DESIGN LIGHTING CONSORTIUM (DLC) OR ENERGY STAR PRODUCT REQUIREMENTS AND OTHER REQUIREMENT TO QUALIFY FOR THE DUKE ENERGY REBATES.

D. FIELD VERIFY ALL FIXTURE QUANTITIES BEFORE BEGINNING THE INSTALLATION. REPORT ANY CHANGES TO THE OWNER BEFORE ORDERING FIXTURES.

E. CONTRACTOR SHALL APPLY FOR THE DUKE ENERGY REBATES ON THE OWNERS BEHALF. ARCHITECT CAN ASSIST IN THIS PROCESS. REFER TO THE SPECIFICATIONS FOR THE APPLICATION FORM OR THE URL TO APPLY ON LINE.

F. FIELD IDENTIFY CEILING MOUNTED FIXTURES WITH EMERGENCY BATTERIES AND REPLACE WITH FIXTURE INDICATED. EXTEND UNSWITCHED LOCAL LIGHTING CIRCUIT TO REPLACEMENT WALL MOUNTED EM FIXTURE (TYPE W3) INDICATED ON THE PLANS.

MOSELEY ARCHITECTS
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HEMBY BRIDGE ELEM LIGHTING REPLACEMENT

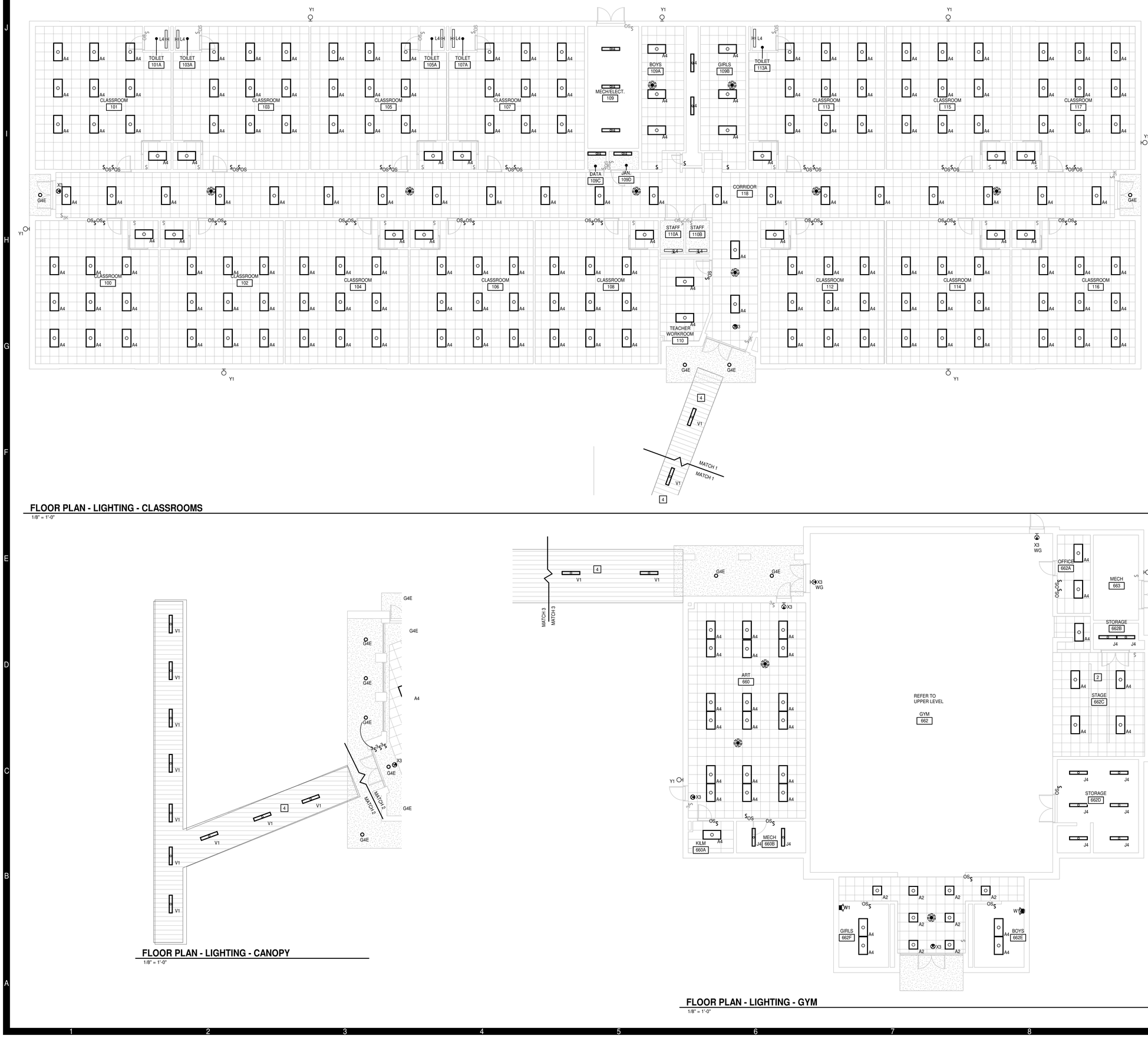
6701 Indian Trail Fairview Rd, Indian Trail, NC 28079
Union County Public Schools

PROJECT NO: 641923	
DATE:	DECEMBER 20, 2024
REVISIONS	
DATE	DESCRIPTION
2-28-25	AD1

ELECTRICAL LIGHTING PLANS

E2.1

2/28/2025 10:23:03 AM



FLOOR PLAN - LIGHTING - CLASSROOMS

1/8" = 1'-0"

FLOOR PLAN - LIGHTING - CANOPY

1/8" = 1'-0"

FLOOR PLAN - LIGHTING - GYM

1/8" = 1'-0"

KEYNOTES

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GENERAL NOTES

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C. ALL LIGHTING FIXTURES SHALL COMPLY WITH DESIGN LIGHTING CONSORTIUM (DLC) OR ENERGY STAR PRODUCT REQUIREMENTS AND OTHER REQUIREMENT TO QUALIFY FOR THE DUKE ENERGY REBATES.

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HEMBY BRIDGE ELEM LIGHTING REPLACEMENT

6701 Indian Trail Fairview Rd, Indian Trail, NC 28079
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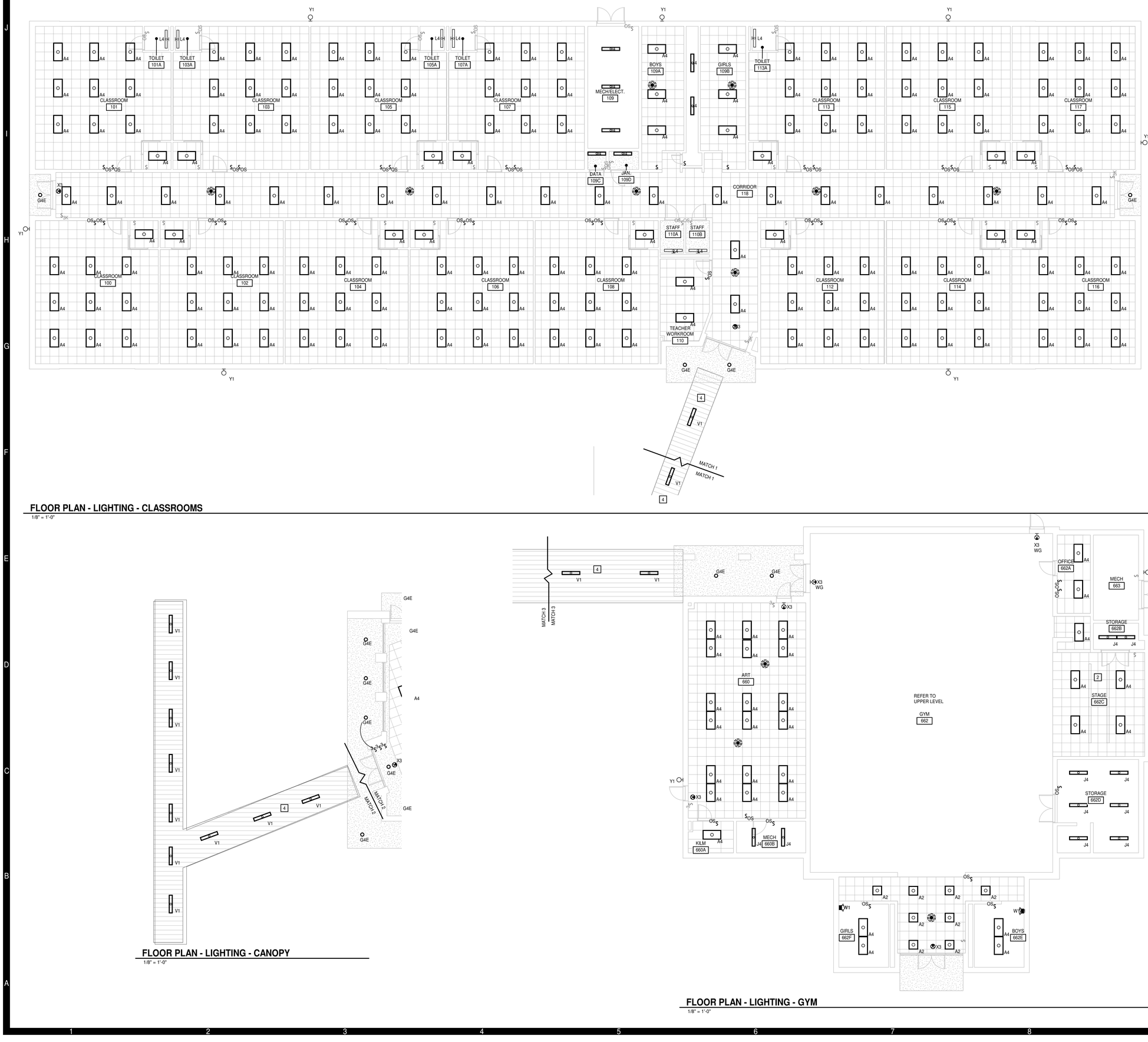
PROJECT NO: 641923
DATE: DECEMBER 20, 2024

REVISIONS	
DATE	DESCRIPTION
2-28-25	AD1

ELECTRICAL LIGHTING PLANS

E2.2

2/28/2025 10:20:45 AM



FLOOR PLAN - LIGHTING - CLASSROOMS

1/8" = 1'-0"

FLOOR PLAN - LIGHTING - CANOPY

1/8" = 1'-0"

FLOOR PLAN - LIGHTING - GYM

1/8" = 1'-0"

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6701 Indian Trail Fairview Rd, Indian Trail, NC 28079
Union County Public Schools

PROJECT NO: 641923
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REVISIONS	
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2-28-25	AD1

ELECTRICAL LIGHTING PLANS

E2.2

2/28/2025 10:20:45 AM

ELECTRICAL EQUIPMENT REPLACEMENT SCHEDULE

TAG	VOLTAGE	AMPS	MAINS	PH	CURRENT POLES	REPLACEMNT POLES	MOUNTING	ROOM #	ROOM NAME
E	480	100 A	MLO	3	12	24	SURFACE	406	MECHANICAL
HA	480	600 A	MLO	3	36	42	SURFACE	406	MECHANICAL
HB	480	400 A	MLO	3	30	36	SURFACE	392A	STORAGE
KB	208	225 A	MLO	3	42	42	RECESSED	392B	KITCHEN
LA	480	100 A	MLO	3	24	24	SURFACE	406	MECHANICAL
LB	480	100 A	MLO	3	24	36	SURFACE	392A	STORAGE
MDP	480	1600 A	MCB	3	24	36	SURFACE	406	MECHANICAL
RA	208	225 A	MCB	3	42	42	SURFACE	406	MECHANICAL
RB	208	100 A	MCB	3	24	36	SURFACE	314	MEDIA CENTER
RC	208	100 A	MCB	3	24	36	SURFACE	406	MECHANICAL
XFMR	480			3		3		314	MEDIA CENTER

KEYNOTES

APPLIES TO THIS DRAWING
REPRESENTED BY n

1. REPLACE THE DENOTED PANEL AND RECONNECT BRANCH CIRCUITS AND FEEDER. REFER TO "ELECTRICAL EQUIPMENT REPLACEMENT SCHEDULE" FOR PANEL CHARACTERISTICS AND ADDITIONAL INFORMATION. ALL PANELS SHALL HAVE A SHORT CIRCUIT RATING OF 22 KAIC. FOR PANELS IN WHICH THE POLE COUNT IS BEING INCREASED, LEAVE ADDITIONAL POSITIONS BLANK. PROVIDE A NEW PANEL SCHEDULE. NOTIFY THE OWNER AT LEAST 10 WORKING DAYS PRIOR TO ANY OUTAGE.
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CLASSROOM 312
CLASSROOM 313
TOILET 312A
TOILET 312B
SHARED SPACE 300
CLASSROOM 309
TOILET 313A
TOILET 313B
STORAGE 603D
STORAGE 603C
STORAGE 603B
JANITOR 301C
TOILET 301B
WORKROOM 301A
RESOURCE 206
TOILET 311A
TOILET 392F
TOILET 311B
JANITOR 392E
PANTRY 392C
OFFICE 392D
TEACHER WORKSPACE 301
CONFERENCE 308A
CORRIDOR 603
PCLP
STORAGE 603A
STORAGE 206A
KB 1
PKA
CLASSROOM 311
KITCHEN 392B
CLASSROOM 308
ATRIUM 600
COUNSELOR 601
CONFERENCE 602
XFMR (30KVA)
RB 1
PRB2
2
STORAGE 392A
LB 1
HB 1
P1KM
CAFETERIA 392
TOILET 202A
TOILET 202B
TOILET 203A
TOILET 203B
SHARED SPACE 200
CLASSROOM 202
CLASSROOM 203
CLASSROOM 205
CLASSROOM 201
TEACHER WORKSPACE 207
CLASSROOM 204
TOILET 400A
TOILET 400B
WORKROOM 207A
JANITOR 207C
TOILET 207B
TOILET 204B
TOILET 204A
CORRIDOR 400
COUNSELOR 401
CLASSROOM 405
CLASSROOM 402
PMPB
MECHANICAL 405
MECHANICAL 406
P1C
PLA
MDP
PPA
MECHANICAL 406
RA 1
RC 1
E 1
LA 1
HA 1
MDP 1
MEDIA CENTER 314
TOILET 805A
TOILET 805B
TOILET 801B
WORKROOM 801A
CONFERENCE 807A
JANITOR 801C
TEACHER WORKSPACE 801
CLASSROOM 805
RECORD STORAGE 706
MENS 707A
WOMENS 707B
CORRIDOR 713
CORRIDOR 710
BROADCAST 503
CLASSROOM 807
AS. PRIN. OFFICE 704
CONFERENCE 705
CLASSROOM 806
CORRIDOR 712
MENS 708A
WOMENS 708B
TEACHERS' WORKROOM 708
SHARED SPACE 500
TOILET 314A
TOILET 314B
WORKROOM 703
TOILET 701A
HEALTH ROOM 701
SCIENCE 501
STORAGE 709
CLASSROOM 804
CLASSROOM 803
TOILET 702A
WAITING 700A
ENTRY 711
TOILET 502A
TOILET 502B
SHARED SPACE 800
TOILET 804A
TOILET 804B
TOILET 803A
TOILET 803B
PRIN. OFFICE 702
RECEPTION 700
CLASSROOM 720
MUSIC 502

FLOOR PLAN - POWER.
1/8" = 1'-0"

2/28/2025 10:27:05 AM

MOSELEY ARCHITECTS
6210 ARDREY KELL ROAD • THE HUB AT WAVERLY, SUITE 425 • CHARLOTTE, NC 28277
PHONE (704) 540-3755 FAX (704) 540-3754
MOSELEYARCHITECTS.COM

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 024242 WILLIAM J. CARR JR.

MOSELEY ARCHITECTS PROFESSIONAL ENGINEERING CORPORATION C-3469 NORTH CAROLINA CHARLOTTE, NC

HEMBY BRIDGE ELEM POWER REPLACEMENT

6701 Indian Trail Fairview Rd, Indian Trail, NC 28079
Union County Public Schools

PROJECT NO: 641923
DATE: DECEMBER 20, 2024

REVISIONS	
DATE	DESCRIPTION
2-28-25	AD1

ELECTRICAL POWER PLANS

E3.0



PANEL MDP



PANEL MDP



PANEL MDP



PANEL E



PANEL HA



PANEL HA



PANEL HA



PANEL LA



PANEL LA



PANEL RA



PANEL RA



PANEL RA



PANEL RC



PANEL RC



PANEL HB



PANEL HB



PANEL LB



PANEL LB

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NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 024242 WILLIAM J. CARTER

MOSELEY ARCHITECTS PROFESSIONAL ENGINEERING CORPORATION C-3469 NORTH CAROLINA CHARLOTTE, N.C.

HEMBY BRIDGE ELEM POWER REPLACEMENT

6701 Indian Trail Fairview Rd, Indian Trail, NC 28079
Union County Public Schools

PROJECT NO: 641923
DATE: DECEMBER 20, 2024

REVISIONS	
DATE	DESCRIPTION
2-28-25	AD1

ELECTRICAL POWER DETAILS

E3.1

2/28/2025 10:27:14 AM

netZero usa®
LED LIGHTING SOLUTIONS

Request for Approval of Alternate Equipment or Products

Union County Public Schools
Hemby Bridge Elementary School
Bid Number 5-97648020

Please accept the following NetZero USA lighting products as alternate solutions for the following fixtures for the LED Lighting Project at Hemby Bridge Elementary School (5-97648020). Included are product specification sheets for your review and convenience.

Type	Description	Manufacture	Serues #	Voltage	Wattage	Lumens
A2 Spec'd	2X2 Flat Panel	Lithonia	CPX 2x2	120-277V	22	3400
A2 Alternate	2X2 Flat Panel	NetZero USA	8240.2	120-277V	25 / 30 / 40	3000-3050 / 3510-3570 / 4400-4480
A4 Spec'd	2X4 Flat Panel	Lithonia	CPX 2x4	120V	42	5400
A4 Alternate	2X4 Flat Panel	NetZero USA	8450.2	120-277V	30 / 40 / 50	3630-3690 / 4680-4760 / 5550-5650
G4 Spec'd	4" Downlight slim	WAC	R4ERDR	120-277V	9	725
G4 Alternate	4" Downlight	NetZero USA	4RSPL9	120-277V	5.5 / 8 / 12	580 / 709 / 1028
G4E Spec'd	4" Downlight slim	WAC	R4ERDR	120-277V	9	725
G4E Alternate	4" Downlight	NetZero USA	4RSPL9	120-277V	5.5 / 8 / 12	580 / 709 / 1028
J4 Spec'd	4' Industrial Light	Lithonia	CSS	120-277V	27 / 36 / 43	3851-5884
J4 Alternate	4' Shop Light	NetZero USA	9445NC.2	120-277V	34 / 38 / 45	4828-4896 / 5320-5358 / 5985-6075
N1 Spec'd	Canopy Light	Lithonia	CNY	120-277V	43	4500
N1 Alternate	Canopy Light	NetZero USA	40260.7	120-277V	40 / 50 / 60	5240-5600 / 6550-7000 / 7860-8400
V1 Spec'd	Vapor Tight	Lithonia	VAP	120-277V	33	4000
V1 Alternate	Vapor Tight	NetZero USA	3454.2	120-277V	34 / 38 / 45	4624-4692 / 5054-5130 / 5850-5940

netZero usa®
LED LIGHTING SOLUTIONS

V2 Spec'd	Vapor Tight	Lithonia	VAP	120-277V	33	4000
V2 Alternate	Vapor Tight	NetZero USA	3454.2	120-277V	34 / 38 / 45	4624-4692 / 5054-5130 / 5850-5940
W1 Spec'd	Emergency Battery Pak	Lithonia	EU2C	VARIES	15	
W1 Alternate	Emergency Battery Pak	NetZero USA	9006.1	120-277V	5	
X3 Spec'd	Single Face Exit with Heads	Lithonia	LQM	VARIES	15	
X3 Alternate	Single Face Exit with Heads	NetZero USA	9010.1	120-277V	5	
Y1 Spec'd	Exterior Wall Pack	Lithonia	TWX	120-277V	60	7000
Y1 Alternate	Exterior Wall Pack	NetZero USA	9006.1	120-277V	28 / 40 / 60	3920-4200 / 5600-6000 / 8400-9000
W1 Spec'd	Emergency Battery Pak	Lithonia	EU2C		15	
W1 Alternate	Emergency Battery Pak	NetZero USA	9006.1	120-277V	5	
Ceiling Occupancy Sensors Alternate	Ceilig OS	SensorWorx	SWX-202-1			
Power Pack for Sensors	Power Pack	SensorWorx	SWX-900	120-277V		

Thank you and please let me know if you have any questions.

Amanda Howard

Amanda Howard
NetZero USA Holdings Inc.
678-331-7379

TYPE - A2

8022 FX FLAT PANEL SERIES

nZLED® AMERICAN ENGINEERED

LED FLAT PANEL 2' X 2'
DUAL 3-WAY SWITCHABLE

TECHNICAL DATA SHEET | NEW CONSTRUCTION

AMERICAN DESIGNED & ENGINEERED · AMERICAN OWNED

PRODUCT FEATURES

- ✓ **Made for Easy Installation**
- ✓ American Designed & Engineered
- ✓ 3-Way Switchable CCT & Input Power
- ✓ Up To 147 lm/W
- ✓ Backlit Illumination
- ✓ 0-10V Dimmable
- ✓ Control Systems Compatible
- ✓ New Construction or Replacement
- ✓ DLC Standard 5.1 Listed
- ✓ UL 1598C Listed
- ✓ Manufacturer-Direct Warranty
- ✓ Performance Guarantee



BUILT FOR THE INSTALLER

LED TECHNOLOGY · SWITCHABLE COLOR · SWITCHABLE POWER · 0-10V + DIMMABLE · IP RATED · RoHS 2002/95/EC · UL LISTED · DLC LISTED · 7 YEAR WARRANTY · AMERICAN DESIGNED & ENGINEERED · AMERICAN OWNED

AT A GLANCE

Max Efficacy	Max Lumens	Switchable CCT	Switchable Power	Voltage	IP Rating
147 lm/W	5543 lm	3500/4000/5000 K	20/30/40 W	120-277 V	IP20

PRODUCT INFO

Series Number	Part Number	Description	Type	Applications
8022 FX	NZ-8240.2	LED Flat Panel 2' X 2' - Dual 3-Way Switchable	New Constr	Interior / Troffer

QUALIFICATIONS

DLC Model Number	DLC Product ID	DLC Classification	Primary Use	UL Registration
NZ-8240.2+(Blank or -EM)	S-5DTULB	Standard 5.1	2x2 Luminaires for Ambient Lighting of Interior Commercial Spaces	E491905

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8022 Fx FLAT PANEL SERIES

nZLED® AMERICAN ENGINEERED

LED FLAT PANEL 2' X 2'
DUAL 3-WAY SWITCHABLE

TECHNICAL DATA SHEET | NEW CONSTRUCTION

AMERICAN DESIGNED & ENGINEERED · AMERICAN OWNED

PRODUCT DETAILS

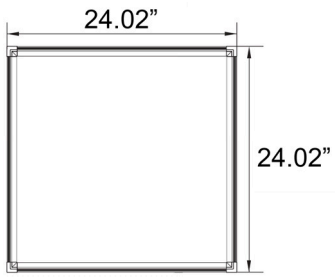
Electrical	
Input Power	20/30/40 W
Voltage	120 - 277 V
Current	0.1629/0.2422/0.3188 A
Power Factor	> 0.9
THD	<20%
Lighting Performance	
Lumens	2843-5543 lm
Efficacy	134-147 lm/W
CCT	3500/4000/5000 K
CRI	80+
Beam Angle	115.4
Light Distribution	Type VS
Dimmable Control	0 - 10 V DC
Environment	
Operating Temp	-14°F to 113°F
w/ Motion Sensor	N/A
IP Rating	IP20
Lifespan	
Avg Life (Hours)	L70 > 100,000 hours
Warranty	7 Years

Construction	
Housing	Aluminum Frame
Dimensions	24.02" x 24.02" x 1.77"
Net Weight	5.95 lbs
Gross Weight	24.25 lbs
Power Supply	Hard wired
Finish	White
Heat Sink Type	Back plate
Optics Material	PS (Frosted)
Diffuser	PS (Frosted)
Number of LEDs	128
Components	
LED Light Source	BRIDGELUX / CREE 2835
Driver	UL Approved
Packaging	
Box Dimensions	25.28" X 7.87" X 27.44"
Box Weight	24.25 lbs
Quantity Per Box	4
Boxes Per Pallet	–

CONFIGURATIONS

	CCT (Kelvin)	Efficacy (lm/W)	Lumen Ouput
20 W	3500 K	142.24	2844.8
	4000 K	143.52	2870.4
	5000 K	146.72	2934.4
30 W	3500 K	138.47	4154.1
	4000 K	139.76	4192.8
	5000 K	142.58	4477.4
40 W	3500 K	133.74	5349.6
	4000 K	133.79	5351.6
	5000 K	138.57	5542.8

PRODUCT DIAGRAM



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8022 FX FLAT PANEL SERIES

nZLED® AMERICAN ENGINEERED

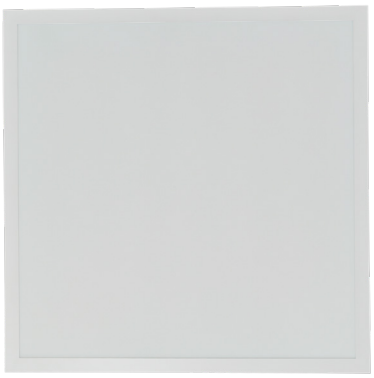
LED FLAT PANEL 2' X 2'
DUAL 3-WAY SWITCHABLE

TECHNICAL DATA SHEET | **NEW CONSTRUCTION**

AMERICAN DESIGNED & ENGINEERED · AMERICAN OWNED

PRODUCT IMAGES

8022 FX – Front View



8022 FX – Back View



8022 FX – Angled Front View



8022 FX – Side View



8022 FX – Side View 2



8022 FX – Side View 3



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ACCESSORIES

	Part Number	Description	Fits Products	Ordering Notes
PHOTO COMING SOON	ACC-8022-SM	2' X 2' Flat Panel Surface Mount	8022 FX	Optional accessory
PHOTO COMING SOON	ACC-8000-BBU	Universal BBU Mounting Bracket	8014 FX, 8022FX, 8024 FX	Optional accessory

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TYPE - A4

8024 FX FLAT PANEL SERIES

nZLED® AMERICAN ENGINEERED

LED FLAT PANEL 2' X 4'
DUAL 3-WAY SWITCHABLE

TECHNICAL DATA SHEET | NEW CONSTRUCTION

AMERICAN DESIGNED & ENGINEERED · AMERICAN OWNED

PRODUCT FEATURES

- ✓ **Made for Easy Installation**
- ✓ American Designed & Engineered
- ✓ 3-Way Switchable CCT & Input Power
- ✓ Up To 146 lm/W
- ✓ Backlit Illumination
- ✓ 0-10V Dimmable
- ✓ Control Systems Compatible
- ✓ New Construction or Replacement
- ✓ DLC Standard 5.1 Listed
- ✓ UL 1598C Listed
- ✓ Manufacturer-Direct Warranty
- ✓ Performance Guarantee



BUILT FOR THE INSTALLER

LED TECHNOLOGY · SWITCHABLE COLOR · SWITCHABLE POWER · 0-10V + DIMMABLE · IP RATED · RoHS 2002/95/EC · UL LISTED · DLC LISTED · 7 YEAR WARRANTY · AMERICAN DESIGNED & ENGINEERED · AMERICAN OWNED

AT A GLANCE

Max Efficacy	Max Lumens	Switchable CCT	Switchable Power	Voltage	IP Rating
146 lm/W	6886 lm	3500/4000/5000 K	30/40/50 W	120-277 V	IP20

PRODUCT INFO

Series Number	Part Number	Description	Type	Applications
8024 FX	NZ-8450.2	LED Flat Panel 2' X 4' - Dual 3-Way Switchable	New Constr	Interior / Troffer

QUALIFICATIONS

DLC Model Number	DLC Product ID	DLC Classification	Primary Use	UL Registration
NZ-8450.2+(Blank or -EM)	S-J7F8Q5	Standard 5.1	2x4 Luminaires for Ambient Lighting of Interior Commercial Spaces	E491905

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8024 Fx FLAT PANEL SERIES

nZLED® AMERICAN ENGINEERED

LED FLAT PANEL 2' X 4'
DUAL 3-WAY SWITCHABLE

TECHNICAL DATA SHEET | NEW CONSTRUCTION

AMERICAN DESIGNED & ENGINEERED · AMERICAN OWNED

PRODUCT DETAILS

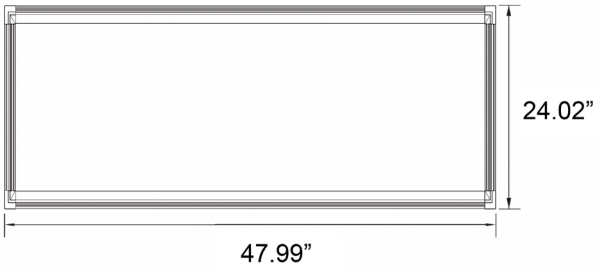
	Electrical
Input Power	30/40/50 W
Voltage	120 - 277 V
Current	0.19/0.25/0.3 A
Power Factor	> 0.9
THD	<20%
	Lighting Performance
Lumens	4196-6886 lm
Efficacy	130-146 lm/W
CCT	3500/4000/5000 K
CRI	80+
Beam Angle	114.5
Light Distribution	Type VS
Dimmable Control	0 - 10 V DC
	Environment
Operating Temp	-14°F to 113°F
w/ Motion Sensor	N/A
IP Rating	IP20
	Lifespan
Avg Life (Hours)	L70 > 100,000 hours
Warranty	7 Years

	Construction
Housing	Aluminum Frame
Dimensions	47.99" x 24.02" x 1.77"
Net Weight	10.8 lbs
Gross Weight	48.5 lbs
Power Supply	Hard wired
Finish	White
Heat Sink Type	Back plate
Optics Material	PS (Frosted)
Diffuser	PS (Frosted)
Number of LEDs	192
	Components
LED Light Source	BRIDGELUX / CREE 2835
Driver	UL Approved
	Packaging
Box Dimensions	49.41" X 7.87" X 27.44"
Box Weight	48.5 lbs
Quantity Per Box	4
Boxes Per Pallet	–

CONFIGURATIONS

	CCT (Kelvin)	Efficacy (lm/W)	Lumen Ouput
30 W	3500 K	139.87	4196.1
	4000 K	145.81	4374.3
	5000 K	143.08	4292.4
40 W	3500 K	135.43	5417.2
	4000 K	142.80	5712
	5000 K	137.58	5503.2
50 W	3500 K	130.38	6519
	4000 K	137.72	6886
	5000 K	132.06	6603

PRODUCT DIAGRAM



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8024 FX FLAT PANEL SERIES

nZLED® AMERICAN ENGINEERED

LED FLAT PANEL 2' X 4'
DUAL 3-WAY SWITCHABLE

TECHNICAL DATA SHEET | **NEW CONSTRUCTION**

AMERICAN DESIGNED & ENGINEERED · AMERICAN OWNED

PRODUCT IMAGES

8024 FX – Angled Front View



8024 FX – Angled Back View



8024 FX – Front View

8024 FX – Back View



8024 FX – Side View



8024 FX – Side View 2



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ACCESSORIES

	Part Number	Description	Fits Products	Ordering Notes
PHOTO COMING SOON	ACC-8024-SM	2' X 4' Flat Panel Surface Mount	8024 FX	Optional accessory
PHOTO COMING SOON	ACC-8000-BBU	Universal BBU Mounting Bracket	8014 FX, 8022FX, 8024 FX	Optional accessory

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4" SELECTABLE LED COMMERCIAL DOWNLIGHT

TYPE - G4

Wattages: 5.5W / 8W / 12W

SELECTABLE LED COMMERCIAL DOWNLIGHT can be widely used in indoor lighting (Damp location) suitable for office,indoor playground,Hotel, shop,indoor entertainment places,and other indoor place.



FEATURES

- Energy efficient: save up to 80% in energy costs
- High lumen output
- Mercury-free
- Instant-on light
- 50,000 hours at 70% lumen maintenance rated life
- CCT:3000K/3500K/4000K
- 5 years manufacturer warranty
- Compatible with most Lutron and Leviton dimmers
- The 1-10V Dimming type is continuous

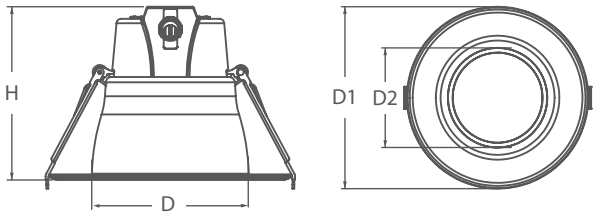


SPECIFICATION	
TYPE	4DL5812W27-33540K
WATTAGE	5.5W/8W/12W
LUMEN	480 lm/709 lm/1028 lm
EFFICACY	> 90 lm/W
SIZE	4 inch
CCT	3000K,3500K,4000K
POWER FACTOR	> 0.9
CRI	> 90
INPUT VOLTAGE	AC120-277V
LIGHTING ANGLE	90
FACTORY SETTINGS	12W & 4000K
LED TYPE	2835
CERTIFICATE	UL,Energy Star, ja8
LIFE TIME	50000 hours
PROTECTION LEVEL	Wet Location
IC RATING	Type IC
WARRANTY	5 year limited

4" SELECTABLE LED COMMERCIAL DOWNLIGHT

Wattages: 5.5W / 8W / 12W

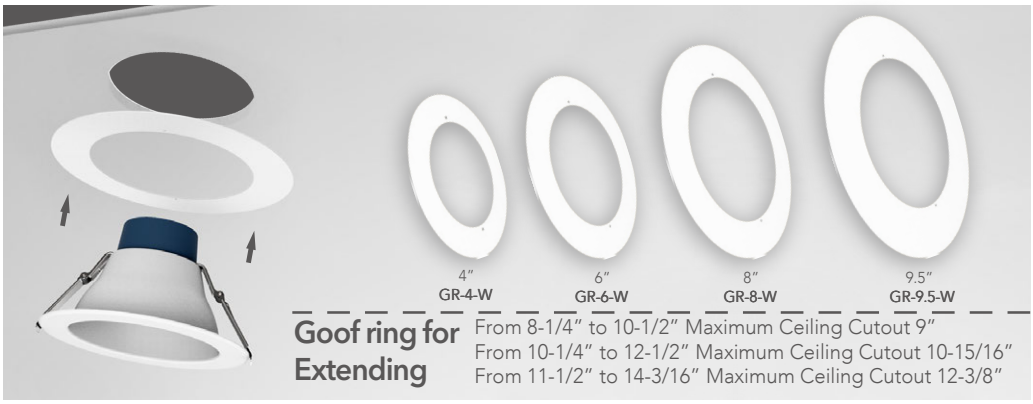
DIMENSION

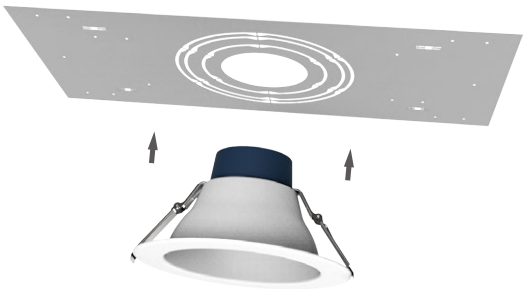


	H	D	D1	D2
4 inch	108 mm(4.25 inch)	Φ98.89 mm (Φ3.89 inch)	Φ151 mm(Φ5.94 inch)	Φ98 mm(Φ3.85 inch)

WATTAGE	4DL5812W27-33540K
NT. WEIGHT	0.90 lbs
BOX DIM.	12.6″ x 12.6″ x 10″ (8 Pcs/CTN)

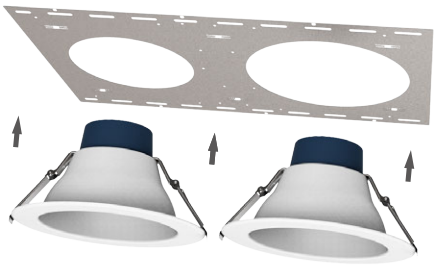
MOUNTING(ACCESSORIES NEED TO PURCHASED SEPARATELY)





New Construction or Remodel Plate for T-grid Ceilings

T-Grid



New Construction Plate for Stud/Joist Ceilings

Stud/Joist

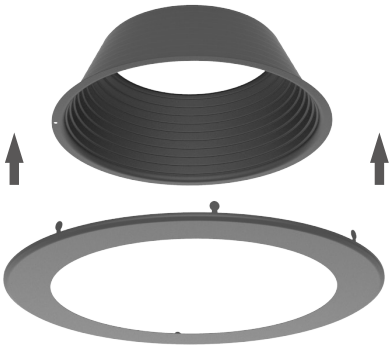
4" SELECTABLE LED COMMERCIAL DOWNLIGHT

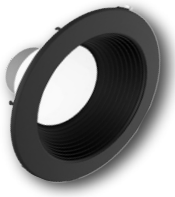
Wattages: 5.5W / 8W / 12W

TRIM & BAFFLE(SOLD SEPARATELY)

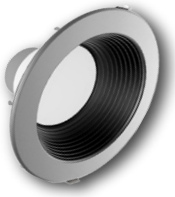
The color of Trim & Baffle can be customized

Suitable and fit for different installation situations;Besides this,step-designed baffle make product free of glare.





Black



Gray

ACCESSORIES (ACCESSORIES NEED TO PURCHASED SEPARATELY)



EML08W27-XX
EML15W27-XX
EML20W27-XX
8W/15W/20W Emergency Backup Battery LED Driver



NAME	Baffle Deco Trim
TYPE	BDTRIM-4-G/BDTRIM-6-G BDTRIM-8-G/BDTRIM-9.5-G
FINISH	Gray
SIZE	4inch/6inch/8inch/9.5inch
USE	Used for 4", 6", 8 ", 9.5 " Leds Installation of COMMERCIAL DOWNLIGHT



NAME	Trim
TYPE	TRIM-4-G/TRIM-6-G TRIM-8-G/TRIM-9.5-G
FINISH	Gray
SIZE	4inch/6inch/8inch/9.5inch
USE	Used for 4", 6 ", 8 ", 9.5 " Leds Installation of COMMERCIAL DOWNLIGHT

NAME	Goof Ring
TYPE	GR-4-W/GR-6-W GR-8-W/GR-9.5-W
FINISH	White
SIZE	4inch/6inch/8inch/9.5inch
USE	Used for 4", 6 ", 8 ", 9.5 " Leds Installation of COMMERCIAL DOWNLIGHT



NAME	Baffle Deco Trim
TYPE	BDTRIM-4-B/BDTRIM-6-B BDTRIM-8-B/BDTRIM-9.5-B
FINISH	Black
SIZE	4inch/6inch/8inch/9.5inch
USE	Used for 4" , 6", 8 ", 9.5 " Leds Installation of COMMERCIAL DOWNLIGHT



NAME	Trim
TYPE	TRIM-4-B/TRIM-6-B TRIM-8-B/TRIM-9.5-B
FINISH	Black
SIZE	4inch/6inch/8inch/9.5inch
USE	Used for 4", 6 ", 8 ", 9.5 " Leds Installation of COMMERCIAL DOWNLIGHT



NAME	T-Grid
FINISH	Silver
USE	New Construction or Remodel Plate for T-grid Ceilings Used for 4", 6 ", 8 ", 9.5 " Leds Installation of COMMERCIAL DOWNLIGHT



NAME	Stud/Joist
FINISH	Silver
USE	New Construction Plate for Stud/Joist Ceilings Used for 4", 6 ", 8 " Leds Installation of COMMERCIAL DOWNLIGHT

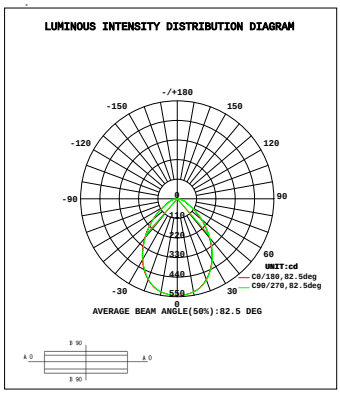
4" SELECTABLE LED COMMERCIAL DOWNLIGHT

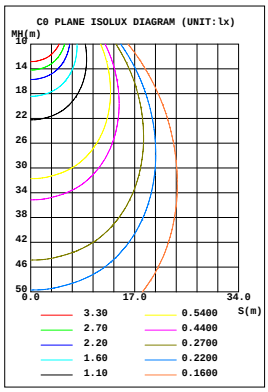
Wattages: 5.5W / 8W / 12W

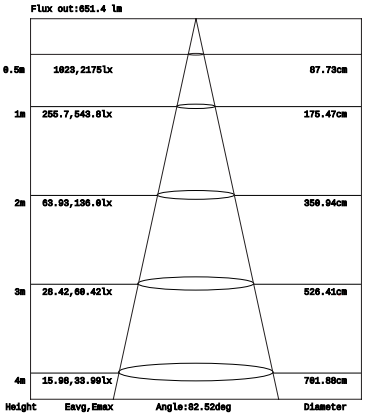
PHOTOMETRICS

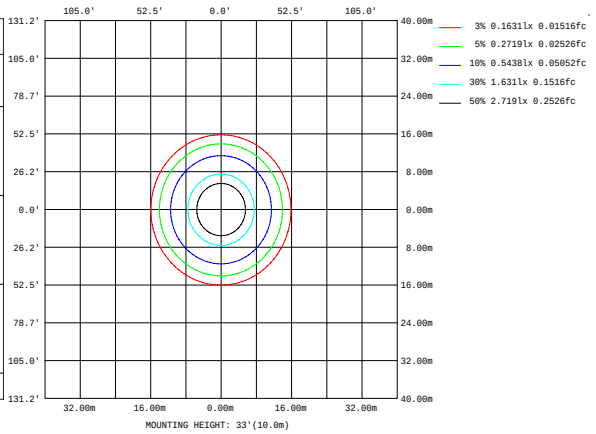
For complete IES files, please visit our website.

4DL5812W27-33540K(12W&4000K)









TYPE - J

2004 LX LINEAR LIGHT SERIES

nZLED® AMERICAN ENGINEERED

LED SHOP LIGHT 4’
DUAL 3-WAY SWITCHABLE

TECHNICAL DATA SHEET | NEW CONSTRUCTION

PRODUCT FEATURES

- ✓ **Made for Easy Installation**
- ✓ American Designed & Engineered
- ✓ 3-Way Switchable CCT & Input Power
- ✓ Up To 152 lm/W
- ✓ Ambient Light Distribution
- ✓ 0-10V Dimmable
- ✓ Control Systems Compatible
- ✓ Surface or Optional Pendant Mount
- ✓ DLC Standard 5.1 Listed
- ✓ UL 1598C Listed
- ✓ Manufacturer-Direct Warranty
- ✓ Performance Guarantee



BUILT FOR THE INSTALLER

LED TECHNOLOGY | SWITCHABLE COLOR | SWITCHABLE POWER | 0-10V + DIMMABLE | IP RATED | RoHS 2002/95/EC | UL LISTED | DLC LISTED | 5 YEAR WARRANTY

AT A GLANCE

Max Efficacy	Max Lumens	Switchable CCT	Switchable Power	Voltage	IP Rating
152 lm/W	6435 lm	3500/4000/5000 K	34/38/45 W	120-277 V	IP20

PRODUCT INFO

Series Number	Part Number	Description	Type	Applications
2004 LX	NZ-9445NC.2-QQ	LED Shop Light 4’ - Dual 3-Way Switchable	New Construction	Interior / Linear

QUALIFICATIONS

DLC Model Number	DLC Product ID	DLC Classification	Primary Use	UL Registration
NZ-9445NC.2-QQ+(MS,EM,Blank,Both)	S-OH3G1T	Standard 5.1	Direct Linear Ambient Luminaires	E498108

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2004 LX LINEAR LIGHT SERIES

nZLED® AMERICAN ENGINEERED

LED SHOP LIGHT 4’
DUAL 3-WAY SWITCHABLE

TECHNICAL DATA SHEET | NEW CONSTRUCTION

AMERICAN DESIGNED & ENGINEERED · AMERICAN OWNED

PRODUCT DETAILS

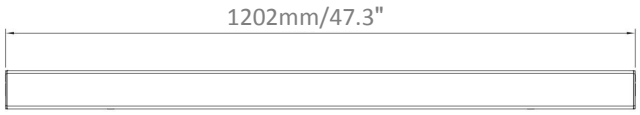
	Electrical
Input Power	34/38/45 W
Voltage	120 - 277 V
Current	0.28/0.32/0.38 A
Power Factor	> 0.9
THD	<20%
	Lighting Performance
Lumens	4828 -6435 lm
Efficacy	133-152 lm/W
CCT	3500/4000/5000 K
CRI	80+
Beam Angle	120
Light Distribution	Type VS
Dimmable Control	0 - 10 V DC
	Environment
Operating Temp	-20°C (-4°F) to 50°C (122°F)
w/ Motion Sensor	N/A
IP Rating	IP20
	Lifespan
Avg Life (Hours)	L70 > 100,000 hours
Warranty	5 Years

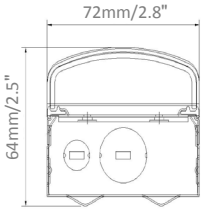
	Construction
Housing	Sheet metal stamping
Dimensions	47.3” x 2.8” x 2.5”
Net Weight	4.4 lbs
Gross Weight	4.6 lbs
Power Supply	Hard wired
Finish	White
Heat Sink Type	Back plate
Optics Material	N/A
Diffuser	PMMA (Frosted)
Number of LEDs	224
	Components
LED Light Source	Bridgelux 2835
Driver	UL Approved
	Packaging
Box Dimensions	48.4” X 9.8” X 5.9“
Box Weight	27.7 lbs
Quantity Per Box	6
Boxes Per Pallet	–

CONFIGURATIONS

	CCT (Kelvin)	Efficacy (lm/W)	Lumen Ouput
34 W	3500 K	142	4828
	4000 K	152	5168
	5000 K	144	4896
38 W	3500 K	140	5320
	4000 K	150	5700
	5000 K	141	5358
45 W	3500 K	133	5985
	4000 K	143	6435
	5000 K	135	6075

PRODUCT DIAGRAM





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2004 LX LINEAR LIGHT SERIES

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LED SHOP LIGHT 4’
DUAL 3-WAY SWITCHABLE

TECHNICAL DATA SHEET | **NEW CONSTRUCTION**

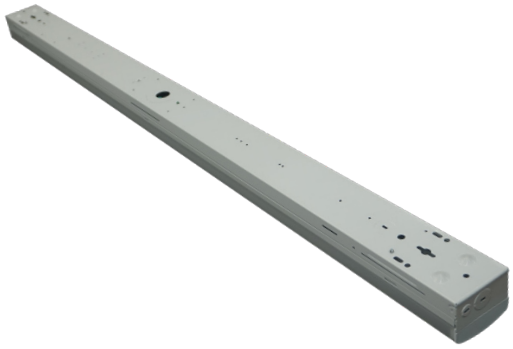
AMERICAN DESIGNED & ENGINEERED · AMERICAN OWNED

PRODUCT IMAGES

2004 LX – Front View



2004 LX – Back View



2004 LX – Top View

2004 LX – Back View



2004 LX – Side View



2004 LX – End View



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ACCESSORIES

	Part Number	Description	Fits Products	Ordering Notes
PHOTO COMING SOON	ACC-9000NC-LK	Shop Light Linkage Kit	2004 LX, 2008 LX	–
PHOTO COMING SOON	ACC-9000NC-WC	Shop Light Wire Cage	2004 LX, 2008 LX	–

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LED SHOP LIGHT 4’
DUAL 3-WAY SWITCHABLE

TECHNICAL DATA SHEET | **NEW CONSTRUCTION**

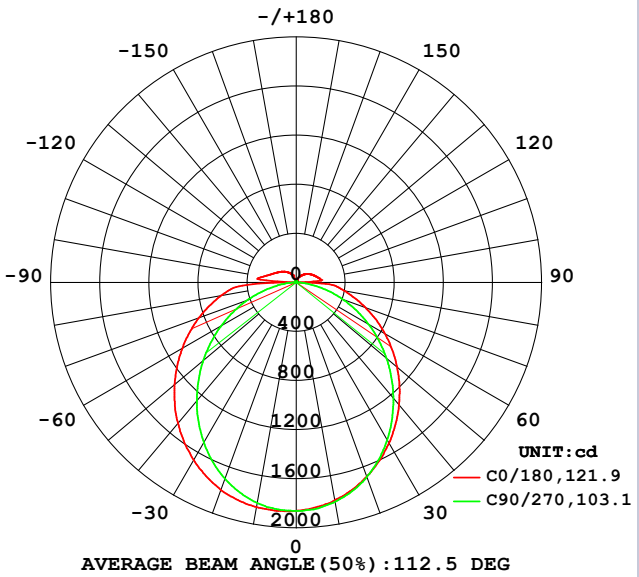
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OPTOMETRIC DATA

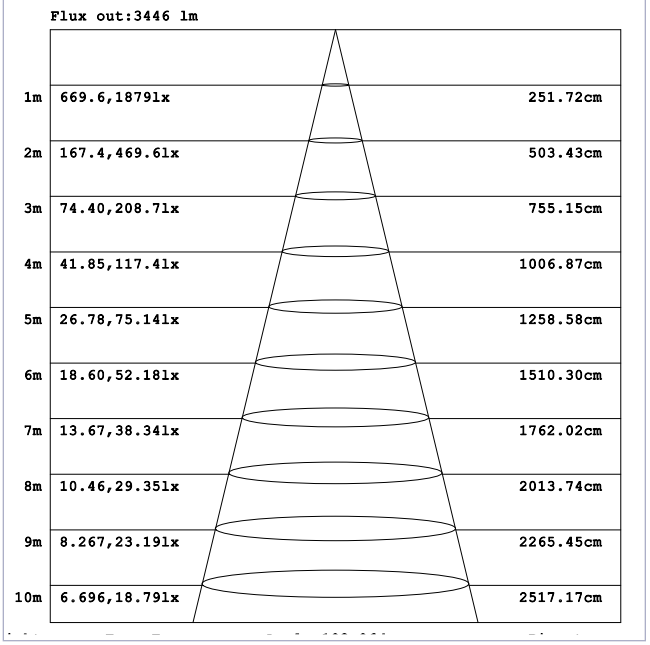
MODEL	NZ-9445NC.2-QQ	Imax(cd)	1867	S/MH(C0/180)	1.33
NOMINAL POWER(W)	45	LOR(%)	100.0	S/MH(C90/270)	1.21
RATED VOLTAGE(V)	120	TOTAL FLUX(lm)	6017.6	η UP,DN(C0-180)	3.8,45.0
NOMINAL FLUX(lm)	6017.55	CIE CLASS	DIRECT	η UP,DN(C180-360)	4.1,47.1
LAMPS INSIDE	1	η up(%)	7.9	CIBSE SHR NOM	1.25
TEST VOLTAGE(V)	120	η down(%)	92.1	CIBSE SHR MAX	1.35

PHOTOMETRIC PLOTS

Luminous Intensity Distribution Curve – 45W



Average Illuminance Effective Figure – 45W



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TYPE - N1

5306 Ax AREA LIGHT SERIES

nZLED® AMERICAN ENGINEERED

LED GARAGE LIGHT 40-60W
DUAL 3-WAY SWITCHABLE

TECHNICAL DATA SHEET | NEW CONSTRUCTION

AMERICAN DESIGNED & ENGINEERED · AMERICAN OWNED

PRODUCT FEATURES

- ✓ **Made for Easy Installation**
- ✓ American Designed & Engineered
- ✓ 3-Way Switchable CCT & Input Power
- ✓ Ceiling Mount
- ✓ Optional PIR Motion-Sensor
- ✓ Up To 145 lm/W
- ✓ 0-10V Dimmable
- ✓ Water & Dust-Tight Enclosure
- ✓ DLC Premium 5.1 Listed
- ✓ UL 1598C Listed
- ✓ Manufacturer-Direct Warranty
- ✓ Performance Guarantee



BUILT FOR THE INSTALLER

LED TECHNOLOGY · SWITCHABLE COLOR · SWITCHABLE POWER · 0-10V + DIMMABLE · IP RATED · RoHS 2002/95/EC · UL LISTED · DLC LISTED PREMIUM · 5 YEAR WARRANTY · AMERICAN DESIGNED & ENGINEERED AMERICAN OWNED

AT A GLANCE

Max Efficacy	Max Lumens	Switchable CCT	Switchable Power	Voltage	IP Rating
145 lm/W	8700 lm	3000/4000/5000 K	40/50/60 W	120-277 V	IP65

PRODUCT INFO

Series Number	Part Number	Description	Type	Applications
5306 AX	NZ-40260.7	LED Garage Light 40-60W - Dual 3-Way Switchable	New Construction	Exterior

QUALIFICATIONS

DLC Model Number	DLC Product ID	DLC Classification	Primary Use	UL Registration
NZ-40260.7-BSP1DA1-abcW30/40/50	S-0TIEVH	Premium 5.1	Parking Garage Luminaires	E498108

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5306 Ax AREA LIGHT SERIES

nZLED® AMERICAN ENGINEERED

LED GARAGE LIGHT 40-60W
DUAL 3-WAY SWITCHABLE

TECHNICAL DATA SHEET | NEW CONSTRUCTION

AMERICAN DESIGNED & ENGINEERED · AMERICAN OWNED

PRODUCT DETAILS

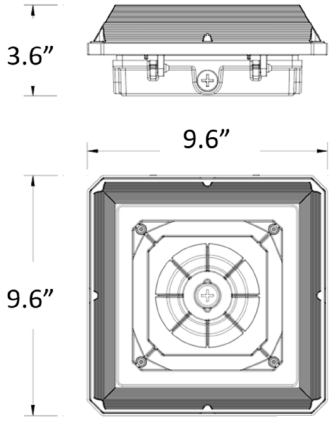
Electrical	
Input Power	40/50/60 W
Voltage	120 - 277 V
Current	0.33/0.42/0.5 A
Power Factor	> 0.9
THD	<20%
Lighting Performance	
Lumens	5240-8700 lm
Efficacy	131-145 lm/W
CCT	3000/4000/5000 K
CRI	80+
Beam Angle	190
Light Distribution	Type IV
Dimmable Control	0 - 10 V DC
Environment	
Operating Temp	-40°F~122°F
w/ Motion Sensor	-22°F~122°F
IP Rating	IP65
Lifespan	
Avg Life (Hours)	L70 > 100,000 hours
Warranty	5 Years

Construction	
Housing	Die-cast Aluminum
Dimensions	9.6” x 9.6” x 3.6”
Net Weight	4.4 lbs
Gross Weight	4.8 lbs
Power Supply	Hard wired
Finish	Brown
Heat Sink Type	Back plate
Optics Material	N/A
Diffuser	Clear Stripe PC
Number of LEDs	448
Components	
LED Light Source	Lumileds 2835
Driver	UL Approved
Packaging	
Box Dimensions	21.1” x 11.6” x 22.8”
Box Weight	41.4 lbs
Quantity Per Box	1
Boxes Per Pallet	–

CONFIGURATIONS

	CCT (Kelvin)	Efficacy (lm/W)	Lumen Ouput
40 W	3000 K	131	5240
	4000 K	145	5800
	5000 K	140	5600
50 W	3000 K	131	6550
	4000 K	145	7250
	5000 K	140	7000
60 W	3000 K	131	7860
	4000 K	145	8700
	5000 K	140	8400

PRODUCT DIAGRAM



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5306 Ax AREA LIGHT SERIES

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LED GARAGE LIGHT 40-60W
DUAL 3-WAY SWITCHABLE

TECHNICAL DATA SHEET | NEW CONSTRUCTION

AMERICAN DESIGNED & ENGINEERED · AMERICAN OWNED

PRODUCT IMAGES

5306 AX – Angled View



5306 AX – Side View



5306 AX – Front View



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ACCESSORIES

	Part Number	Description	Fits Products	Ordering Notes
PHOTO COMING SOON	–	PIR Motion Sensor	5306 AX	Optional accessory

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5306 Ax AREA LIGHT SERIES

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LED GARAGE LIGHT 40-60W
DUAL 3-WAY SWITCHABLE

TECHNICAL DATA SHEET | NEW CONSTRUCTION

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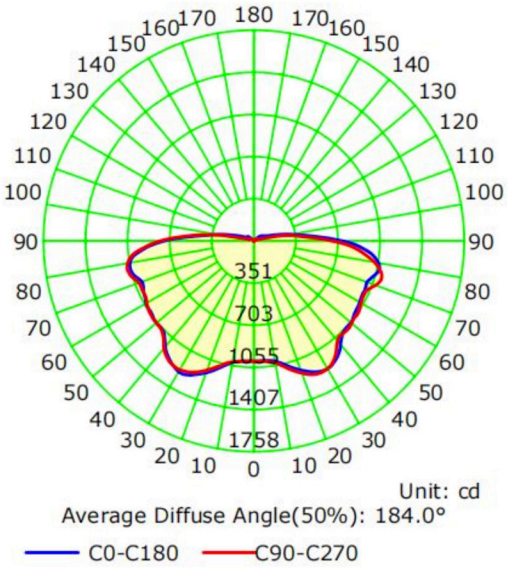
OPTOMETRIC DATA

Model	NZ-40260.7
Current	0.507 A
Voltage	120.0 V
Power	60.06 W
CIE Class	Direct
Total Rated Lamp Lumens	7870.2 lm
Efficiency	100%
Upward Ratio	10%

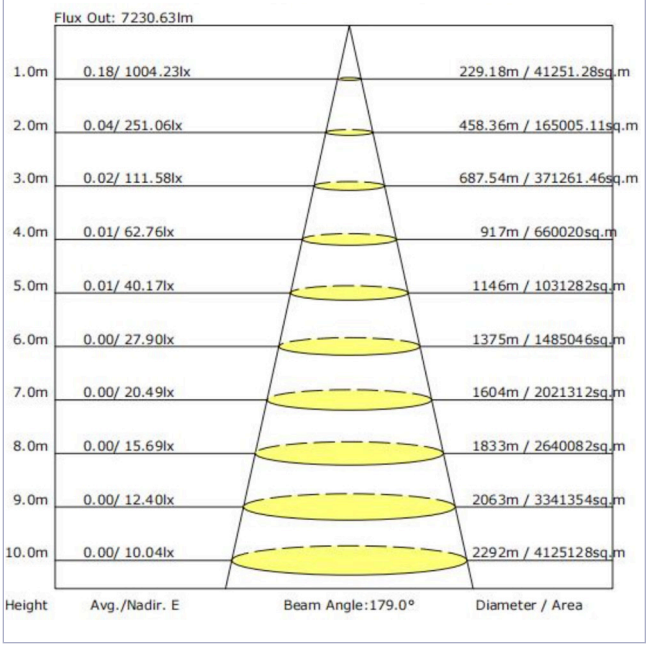
C0r0 Intensity	1004.23 cd
Pos of Max. Intensity	H225 V40
Longitudinal Classification	–
Measurement Flux	7870.2 lm
Downward Ratio	90%
Luminaire Efficacy Rating	131.09
Beam Angle(C0/C180,C90/C270,C45/C225,C135/315)	184.2, 183.7, 176.3, 176.5

PHOTOMETRIC PLOTS

Luminous Intensity Distribution Curve – 60W



Average Illuminance Effective Figure – 60W



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TYPE - V1

2104 LX LINEAR LIGHT SERIES

nZLED® AMERICAN ENGINEERED

LED VAPOR TIGHT 4’
DUAL 3-WAY SWITCHABLE

TECHNICAL DATA SHEET | NEW CONSTRUCTION

PRODUCT FEATURES

- ✓ **Made For Easy Installation**
- ✓ American Designed & Engineered
- ✓ 3-Way Switchable CCT & Input Power
- ✓ Up To 138 lm/W
- ✓ Ambient Light Distribution
- ✓ 0-10V Dimmable
- ✓ Control Systems Compatible
- ✓ Water & Dust-Tight Enclosure
- ✓ DLC Standard 5.1 Listed
- ✓ UL 1598C Listed
- ✓ Manufacturer-Direct Warranty
- ✓ Performance Guarantee



BUILT FOR THE INSTALLER

LED TECHNOLOGY | SWITCHABLE COLOR | SWITCHABLE POWER | 0-10V + DIMMABLE | IP RATED | RoHS 2002/95/EC | UL LISTED | DLC LISTED | 5 YEAR WARRANTY

AT A GLANCE

Max Efficacy	Max Lumens	Switchable CCT	Switchable Power	Voltage	IP Rating
138 lm/W	5940 lm	3500/4000/5000 K	34/38/45 W	120-277 V	IP65

PRODUCT INFO

Series Number	Part Number	Description	Type	Applications
2104 LX	NZ-3454.2-QQ	LED Vapor Tight 4’ - Dual 3-Way Switchable	New Constr	Interior / Linear

QUALIFICATIONS

DLC Model Number	DLC Product ID	DLC Classification	Primary Use	UL Registration
NZ-3454.2-QQ	S-SIQBLD	Standard 5.1	Direct Linear Ambient Luminaires	E498108

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2104 LX LINEAR LIGHT SERIES

nZLED® AMERICAN ENGINEERED

LED VAPOR TIGHT 4’
DUAL 3-WAY SWITCHABLE

TECHNICAL DATA SHEET | NEW CONSTRUCTION

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PRODUCT DETAILS

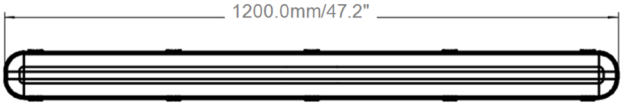
	Electrical
Input Power	34/38/45 W
Voltage	120 - 277 V
Current	0.28/0.32/0.38 A
Power Factor	> 0.9
THD	<20%
	Lighting Performance
Lumens	4624 -5940 lm
Efficacy	130-138 lm/W
CCT	3500/4000/5000 K
CRI	80+
Beam Angle	120
Light Distribution	Type VS
Dimmable Control	0 - 10 V DC
	Environment
Operating Temp	-40°C /-40°F to 45°C /113°F
w/ Motion Sensor	N/A
IP Rating	IP65
	Lifespan
Avg Life (Hours)	L70 > 100,000 hours
Warranty	5 Years

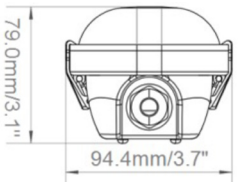
	Construction
Housing	Polycarbonate w/ stainless steel latches
Dimensions	47.2” x 3.7” x 3.1”
Net Weight	4.4 lbs
Gross Weight	5.1 lbs
Power Supply	Hard wired
Finish	Gray
Heat Sink Type	Back plate
Optics Material	N/A
Diffuser	PC (Frosted)
Number of LEDs	392
	Components
LED Light Source	Bridgelux 2835
Driver	UL Approved
	Packaging
Box Dimensions	49.6” X 8.5” X 7.1”
Box Weight	22 lbs
Quantity Per Box	4
Boxes Per Pallet	–

CONFIGURATIONS

	CCT (Kelvin)	Efficacy (lm/W)	Lumen Ouput
34 W	3500 K	136	4624
	4000 K	137	4658
	5000 K	138	4692
38 W	3500 K	133	5054
	4000 K	134	5092
	5000 K	135	5130
45 W	3500 K	130	5850
	4000 K	131	5895
	5000 K	132	5940

PRODUCT DIAGRAM





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LED VAPOR TIGHT 4’
DUAL 3-WAY SWITCHABLE

TECHNICAL DATA SHEET | **NEW CONSTRUCTION**

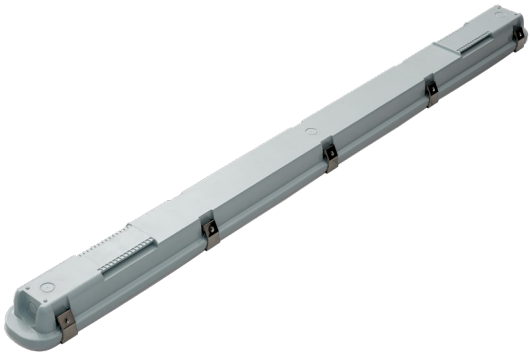
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PRODUCT IMAGES

2004V FX – Front View



2004V FX – Back View



2004V FX – Side View



2004V FX – Top View



2004V FX – End View



2004V FX – Tray View



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LED VAPOR TIGHT 4’
DUAL 3-WAY SWITCHABLE

TECHNICAL DATA SHEET | **NEW CONSTRUCTION**

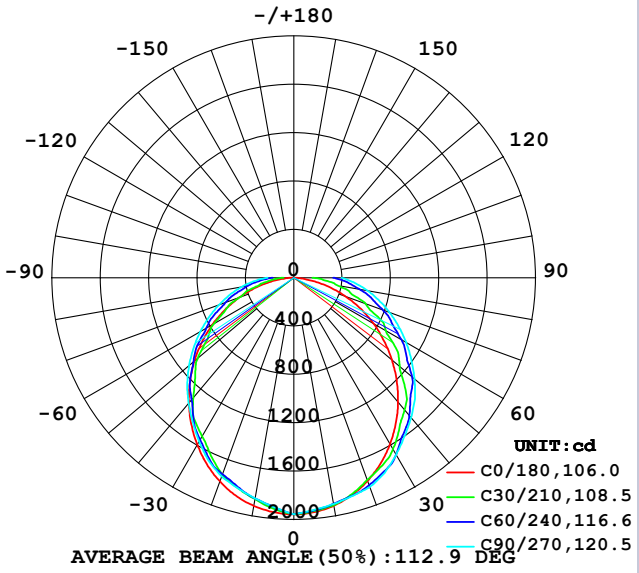
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OPTOMETRIC DATA

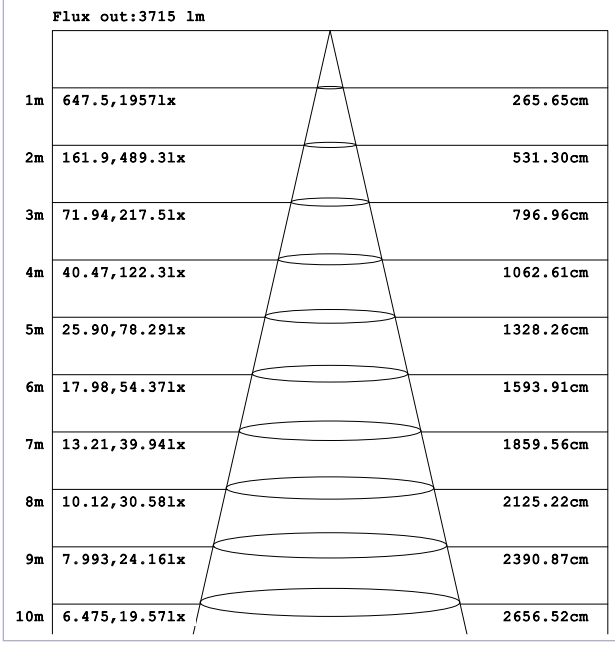
MODEL	NZ-3454.2-QQ	Imax(cd)	1957	S/MH(C0/180)	1.22
NOMINAL POWER(W)	45	LOR(%)	100.0	S/MH(C90/270)	1.20
RATED VOLTAGE(V)	120	TOTAL FLUX(lm)	5846.0	η UP,DN(C0-180)	0.0,52.8
NOMINAL FLUX(lm)	5845.95	CIE CLASS	DIRECT	η UP,DN(C180-360)	0.0,47.2
LAMPS INSIDE	1	η up(%)	0.0	CIBSE SHR NOM	1.25
TEST VOLTAGE(V)	120	η down(%)	100.0	CIBSE SHR MAX	1.35

PHOTOMETRIC PLOTS

Luminous Intensity Distribution Curve – 45W



Average Illuminance Effective Figure – 45W



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SERIES PRODUCTS

TYPE - X3

TYPE - W1

	NZLED® 9008.1	NZLED® 9010.1	NZLED® 9006.1
			
Part Number	9008.1	9010.1	9006.1
Description	LED Exit Sign	LED Dual-Head Exit Emergency Combo	LED Dual-Head Emergency Light
Type	Replacement	Replacement	Replacement
Applications	Interior	Interior	Interior
CCT	–	–	–
Certifications	UL	UL	UL
Dimensions	–	–	–
Driver	–	–	–
Grounded	YES	YES	YES
Housing Color	White w/ Red Letters	White w/ Red Letters	White
Warranty	5 Years	5 Years	5 Years
L70 Lifetime	–	–	–
Lumen Output	–	–	–
Input Power	–	–	–
Input Voltage	AC120-277V	AC120-277V	AC120-277V
Operating Temp.	68°F TO 86°F	68°F TO 86°F	68°F TO 86°F
IP Rating	UL Listed for damp locations (0°C – 50°C)	UL Listed for damp locations (0°C – 40°C)	UL Listed for damp locations (0°C – 50°C)
Battery Info	4.8V long life, maintenance-free, rechargeable NiCd battery	9.6V long life, maintenance-free, rechargeable NiCd battery	3.6V long life, maintenance-free, rechargeable NiCd battery
Emergency Use	Minimum 90-minute emergency illumination	Minimum 90-minute emergency illumination	Minimum 90-minute emergency illumination
Controls Compatible	–	–	–
Dark Sky Compliant	–	–	–
Options	SDT: Self-diagnostic feature performs monthly, bi-annual, and annual tests to ensure reliable operation and meet electrical and life safety codes.	SDT: Self-diagnostic feature performs monthly, bi-annual, and annual tests to ensure reliable operation and meet electrical and life safety codes.	SDT: Self-diagnostic feature performs monthly, bi-annual, and annual tests to ensure reliable operation and meet electrical and life safety codes.
Ordering Notes	White with green lettering avaiable by special order. SDT self-diagnostic feature available by special order.	SDT self-diagnostic feature available by special order.	SDT self-diagnostic feature available by special order.

CERTIFICATIONS

	NZLED® 9008.1	NZLED® 9010.1	NZLED® 9006.1
DLC Model No.	–	–	–
DLC ID	–	–	–
UL No.	✔	✔	✔
ETL No.	–	–	–
Energy Star No.	–	–	–

TYPE - Y1

4006 Wx WALL PACK SERIES

nZLED® AMERICAN ENGINEERED

LED WALL PACK 28-60W
DUAL 3-WAY SWITCHABLE

TECHNICAL DATA SHEET | NEW CONSTRUCTION

PRODUCT FEATURES

- ✓ **Made for Easy Installation**
- ✓ American Designed & Engineered
- ✓ 3-Way Switchable CCT & Input Power
- ✓ Dark-Sky Compliant w/Optional Shield
- ✓ Built-in Photocell
- ✓ 100-277V 10KV Surge Protector
- ✓ Up To 150 lm/W
- ✓ 0-10V Dimmable
- ✓ Water & Dust-Tight Enclosure
- ✓ DLC Premium 5.1 & UL 1598C Listed
- ✓ Manufacturer-Direct Warranty
- ✓ Performance Guarantee



LED TECHNOLOGY | SWITCHABLE COLOR | SWITCHABLE POWER | 0-10V DIMMABLE | IP RATED | RoHS 2002/95/EC | UL LISTED | DLC LISTED PREMIUM | 7 YEAR WARRANTY

AT A GLANCE

Max Efficacy	Max Lumens	Switchable CCT	Switchable Power	Voltage	IP Rating
150 lm/W	9000 lm	3000/4000/5000 K	28/40/60 W	120-277 V	IP65

PRODUCT INFO

Series Number	Part Number	Description	Type	Applications
4006 WX	NZ-4060M.11	LED Wall Pack 28-60W - Dual 3-Way Switchable	New Construction	Exterior

QUALIFICATIONS

DLC Model Number	DLC Product ID	DLC Classification	Primary Use	UL Registration
NZ-4060M.11-BSGDA1-abcWe	S-50XW8M	Premium 5.1	Outdoor Wall-Mounted Area Luminaires	E498108

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LED WALL PACK 28-60W
DUAL 3-WAY SWITCHABLE

TECHNICAL DATA SHEET | NEW CONSTRUCTION

AMERICAN DESIGNED & ENGINEERED · AMERICAN OWNED

PRODUCT DETAILS

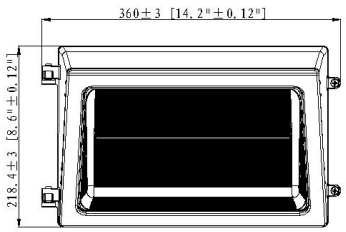
	Electrical
Input Power	28/40/60 W
Voltage	120 - 277 V
Current	0.23/0.33/0.5 A
Power Factor	> 0.9
THD	<20%
	Lighting Performance
Lumens	3920-9000 lm
Efficacy	140-150 lm/W
CCT	3000/4000/5000 K
CRI	80+
Beam Angle	H94*V100
Light Distribution	Type IV
Dimmable Control	0 - 10 V DC
	Environment
Operating Temp	-40°F~122°F | w/BBU: 32°F~122°F
w/ Motion Sensor	-13°F~122°F
IP Rating	IP65
	Lifespan
Avg Life (Hours)	L70 > 100,000 hours
Warranty	7 Years

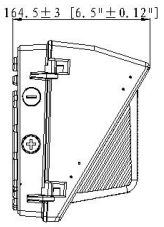
	Construction
Housing	Die-cast Aluminum
Dimensions	14.2" x 8.6" x 6.5"
Net Weight	7.5 lbs
Gross Weight	9.9 lbs
Power Supply	Hard wired
Finish	Brown
Heat Sink Type	Back plate
Optics Material	N/A
Diffuser	Stripe Glass
Number of LEDs	450
	Components
LED Light Source	Lumileds 2835
Driver	UL Approved
	Packaging
Box Dimensions	16.1" X 11.4" X 9.4"
Box Weight	9.9 lbs
Quantity Per Box	1
Boxes Per Pallet	–

CONFIGURATIONS

	CCT (Kelvin)	Efficacy (lm/W)	Lumen Ouput
28 W	3000 K	140	3920
	4000 K	150	4200
	5000 K	142	3976
40 W	3000 K	140	5600
	4000 K	150	6000
	5000 K	142	5680
60 W	3000 K	140	8400
	4000 K	150	9000
	5000 K	142	8520

PRODUCT DIAGRAM





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LED WALL PACK 28-60W
DUAL 3-WAY SWITCHABLE

TECHNICAL DATA SHEET | **NEW CONSTRUCTION**

AMERICAN DESIGNED & ENGINEERED · AMERICAN OWNED

PRODUCT IMAGES

4006 WX – Front View



4006 WX – Back View



4006 WX – Upper View



4006 WX – Side View



4006 WX – Lower View



Optional Dark-Sky Compliant Shield



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ACCESSORIES

	Part Number	Description	Fits Products	Ordering Notes
	ACC-4006-WX-DS	Wall-Pack Dark-Sky Compliant Shield	4006 WX, 4010 WX	Optional accessory
PHOTO COMING SOON	–	Wall-Pack PRI Sensor	4006 WX, 4010 WX	Optional accessory
PHOTO COMING SOON	–	Wall-Pack PRI Sensor Remote	4006 WX, 4010 WX	Optional accessory

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4006 Wx WALL PACK SERIES

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DUAL 3-WAY SWITCHABLE

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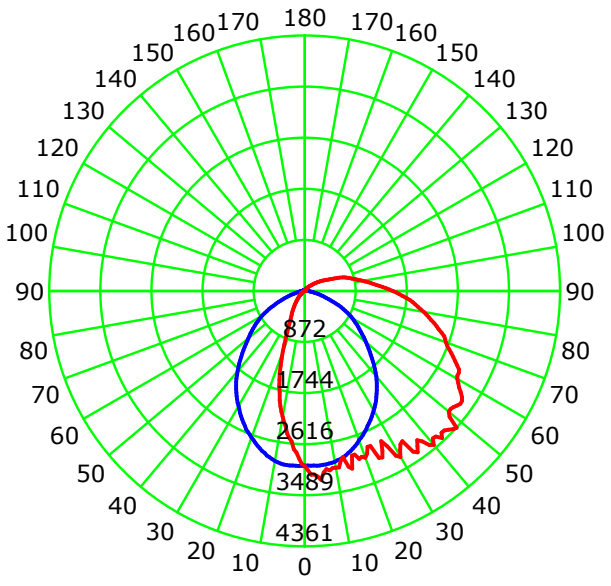
OPTOMETRIC DATA

Model	NZ-4060M.11
Current	0.528 A
Voltage	120.0 V
Power	62.67 W
IES Classification	Type IV
Total Rated Lamp Lumens	8762.0 lm
Efficiency	100%
Upward Ratio	10%

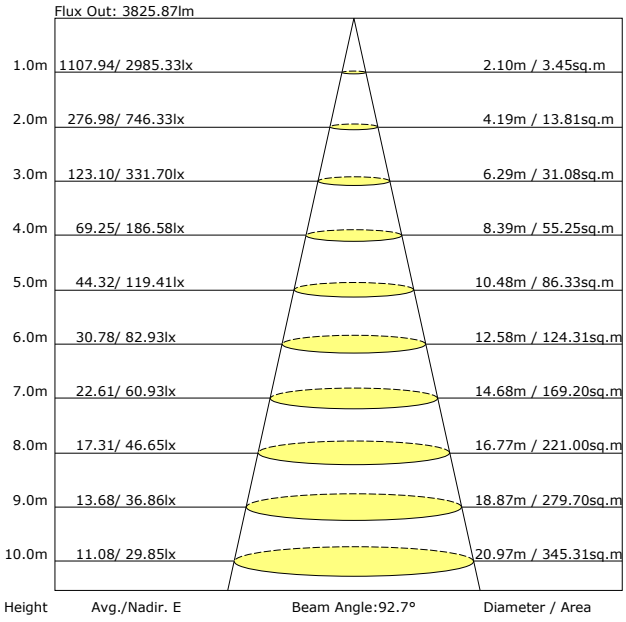
C0r0 Intensity	2985.33 cd
Pos of Max. Intensity	H90 V48
Longitudinal Classification	Very Short
Measurement Flux	8762 lm
Downward Ratio	90%
Luminaire Efficacy Rating	139.86
Max Intensity	3489.03 cd
Beam Angle(C0/C180,C90/C270,C45/C225,C135/315)	92.7, 100.4, 95.5, 94.1

PHOTOMETRIC PLOTS

Luminous Intensity Distribution Curve – 60W



Average Illuminance Effective Figure – 60W



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Catalog Number: Date: Project:



SENSORWORX®

CEILING MOUNT OCCUPANCY SENSOR

LOW VOLTAGE

OVERVIEW

The **SENSOR**WORX® family of ceiling mount occupancy sensors provides a range of control solutions for spaces with finished ceilings (e.g., tiles, sheetrock, and plaster). Preferred by contractors for their simple, yet flexible, mounting methods, **SENSOR**WORX sensors reduce installation time and fuss. **SENSOR**WORX products utilize the latest passive infrared technology and digital signal processing techniques to provide unmatched detection performance. Additionally, **SENSOR**WORX units are available with an integrated microphone to provide overlapping passive acoustic occupancy detection for rooms with obstructions or where occupant motion will be limited. Enhanced options for this sensor family include a photocell that will override lights off if sufficient ambient light is present, active daylight harvesting for 0-10V lighting, and an isolated relay for interfacing external systems (e.g., HVAC/BAS).

BASIC OPERATION

Sensors detect movement in the infrared energy that radiates from occupants as they move within the devices field-of-view. Once occupancy is identified, the sensor signals a connected power/relay pack to switch on the connected lighting. If equipped with passive dual technology (PIR/Acoustic), the unit's microphone is then also enabled to further enhance detection while the lights are on. An internal timer is set to keep lights on during brief periods of inactivity, and is reset every time occupancy is signaled by either the passive infrared or acoustic detection technologies.

APPLICATIONS

A single sensor can be used in small spaces like a private office, however, multiple low voltage sensors can be easily wired together to provide coverage for larger spaces like an open office.

- Classrooms
- Open Areas
- Conference Rooms
- Hallways
- Small Offices
- Copy Rooms
- Private Restrooms
- Break Rooms

FEATURES

- **Digital Passive Infrared (PIR) Detection**
- **Passive Acoustic Detection (Optional)**
- **360° Coverage Patterns**
- **Compact Size and Matte Finish**
- **Four Contractor Friendly Mounting Methods**
- **Mounting Nipple Attachment with Integrated Hole Saw**
- **Convenient Test Mode and Adjustable Time Delays**
- **Optional Photocell, Daylight Harvesting, & Isolated Relay**

SPECIFICATIONS

ELECTRICAL

OPERATING VOLTAGE
12-24 VAC/VDC

CURRENT DRAW
5mA (PIR models)
7mA (PIR w/ Photocell models)
10mA (Dual Tech. models)
12mA (Dual Tech. w/ Photocell models)

OUTPUT
Logic High VDC (Occupied Mode)

RECOMMENDED POWER PACK
SWX-900 Series (**SENSOR**WORX)

DIMMING CAPACITY (-D OPTION)
50mA

DIMMING COMPATIBILITY
0-10 VDC Ballasts or Drivers
Compliant with IEC 60929 Annex E.2

ISOLATED RELAY RATING
1A @ 30 VDC/VAC

ENVIRONMENTAL

OPERATING TEMP
32°F to 122°F (0°C to 50°C) - Standard
-40° F/C (with **-HE** Option)

RELATIVE HUMIDITY
0-95% Non-Condensing,
Indoor Use Only

PHYSICAL

SIZE
4.00" Diameter x 1.25" H
(10.16 x 3.17 cm)

WEIGHT
4.75 oz

COLOR
White or Black

OPERATION

TIME DELAYS
30 sec to 30 min (typical)
10 minute default
5 sec test mode

CODE COMPLIANCE

Sensors can be used to meet ASHRAE 90.1, IECC, & Title 24 energy code requirements

c UL US LISTED

LEAD FREE RoHS COMPLIANT

BAA COMPLIANT

TAA COMPLIANT

MADE IN THE USA

BUILD AMERICA BUY AMERICA

ORDERING INFO

SAMPLE MODEL # SWX-222-1

	PRODUCT		DETECTION		COVERAGE		VOLTAGE		OPTIONS	
SWX -	Ceiling Mount Sensor	**2**	Passive Infrared (PIR)	**0**	Small Motion 360°	**1**	Low Voltage	**- 1**	Daylight Harvesting (0-10V)	**- D [2]**
			Passive Infrared (PIR) + Photocell	**1**	Large Motion 360°	**2**			Isolated Auxiliary Relay	**- AR**
			Passive Dual Technology (PIR/Acoustic)	**2**	High Bay 360°	**3 [1]**			High Humidity Environment	**- HE**
			Passive Dual Technology (PIR/Acoustic) + Photocell	**3**					Black Cover Lid & Lens	**- BK [3]**

Note 1: Not available on Dual Tech. units

Note 2: Only available on units w/ Photocells

Note 3: Not available on units w/ Photocells

ACCESSORIES

SWX-299-JP - Ceiling Sensor Trim Ring for Mounting to Single Gang Mudring, Handy Box, or 4" Octagon Box

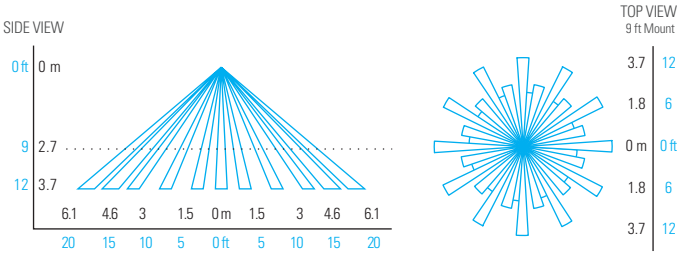
COVERAGE

PASSIVE INFRARED (PIR)

- 8 to 15 ft (2.44 to 4.57 m) mounting height recommended for small and large motion lenses. For 15 to 40 ft (2.44 to 12.20 m) mounting heights use high bay lens.
- Detection range improves when walking across beams as compared to into beams
- Lenses can be swapped in field if necessary, contact technical support for assistance

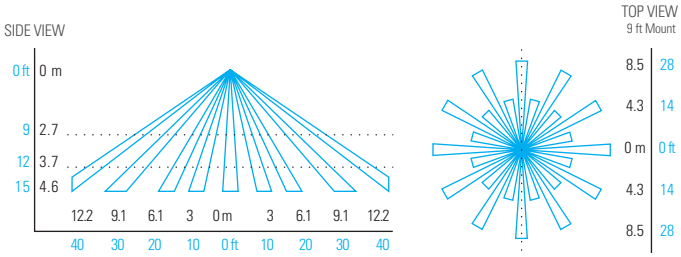
SMALL MOTION 360°

- Best choice for detection of small motions from sitting occupants (e.g., hand motion)
- ~500 ft² of coverage



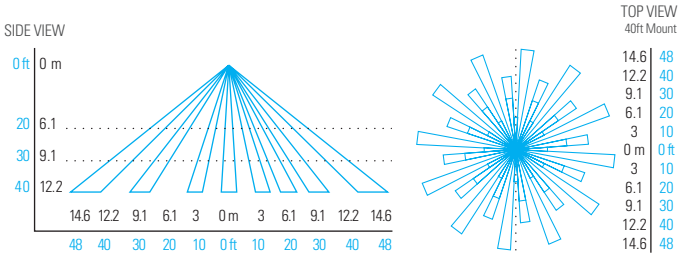
LARGE MOTION 360°

- Best choice for detection of larger motion (e.g., walking)
- ~2000 ft² of coverage
- One of the longer segments of the coverage pattern aligns with the screw hole axis on the sensor (shown as dotted line on Top View diagram below)



HIGH BAY 360°

- Best choice for mounting heights above 15ft
- Recommended for gyms, warehouses, and other high ceiling areas where multiple sensor coverage is required
- Not recommended for areas where occupants are sitting
- Gaps between outer segments get larger as mounting height increases
- Not available with acoustic (dual technology)



DUAL TECHNOLOGY (PIR/ACOUSTIC)

- Units with dual technology (SWX-221-1 and SWX-222-1) have overlapping acoustic detection of the complete PIR coverage area
- A PIR event is required to initially enable acoustic detection
- Sounds indicating occupancy reset the sensor's time delay while non-occupant noises are filtered out
- Occupant sounds alone will not keep lights on indefinitely, PIR motion must be periodically detected for lights to remain on for an extended time
- After sensor time out expires, acoustic detection remains enabled for 15 seconds to enable voice reactivation of lights for additional convenience and safety

DAYLIGHT HARVESTING & PHOTOCELL OPERATION

Units with the integrated photocell option can provide on/off or inhibit only control of lighting. Units with the daylight harvesting option can also directly dim 0-10V lighting.

DAYLIGHT HARVESTING

- Lights will gradually dim in order to maximize energy savings while maintaining desired overall lighting level.
- Recommend for spaces where it is important to not distract occupants (e.g., offices, classrooms).
- Option to dim to low trim or turn lighting off.

ON/OFF PHOTOCELL CONTROL

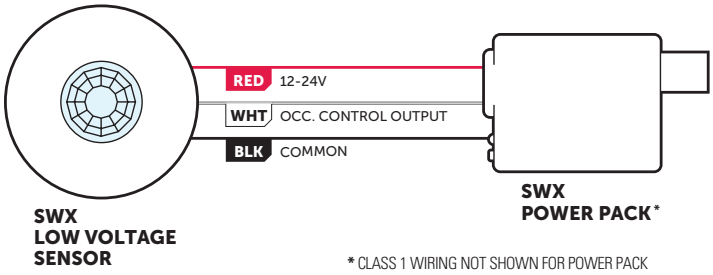
- Lights are switched off if ambient light level surpasses threshold and back on if level drops.
- Recommended for public spaces (hallways, entryways, etc) where fully switching of lighting off and on will not cause distraction of occupants.

INHIBIT ONLY PHOTOCELL CONTROL

- Lighting is held off if sufficient ambient light level is present upon initial occupancy.
- Lighting will turn on if light level drops below setpoint.
- Once on, lighting will only turn off from vacancy or a manual switch, never from daylight.

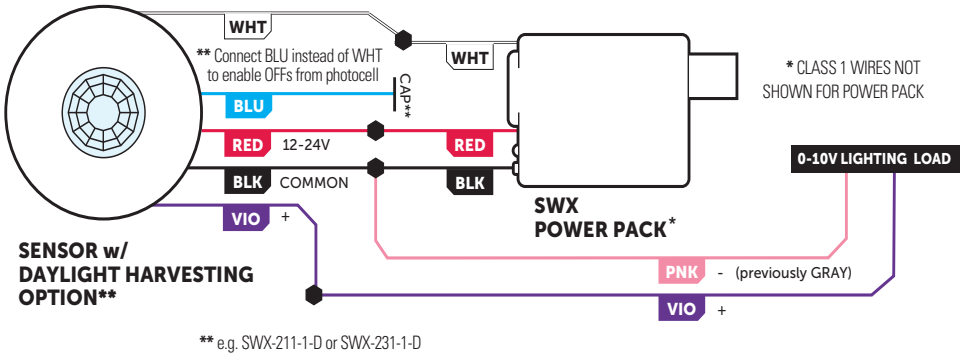
WIRING

STANDARD WIRING



OCCUPANCY + DAYLIGHT HARVESTING

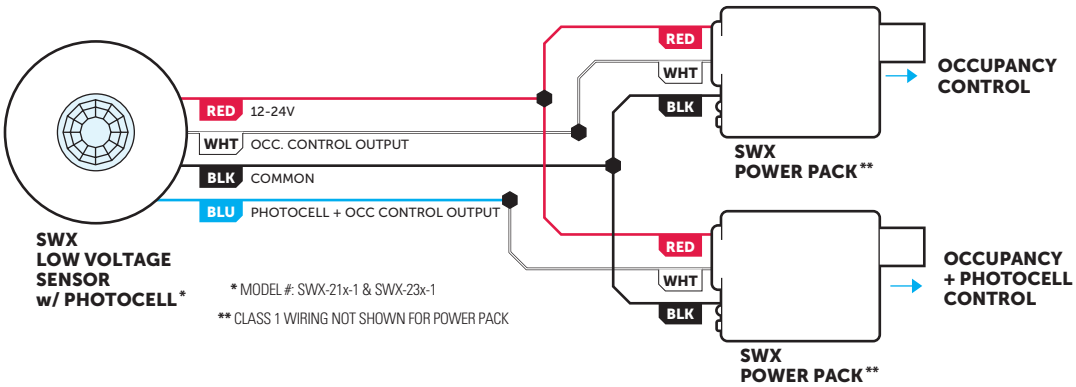
- Lights will gradually dim in order to maximize energy savings while maintaining desired overall lighting level.
- Lights will dim only to low trim if white wire is connected to power pack. Connect blue wire to power pack to switch lighting completely off from daylight.



** e.g. SWX-211-1-D or SWX-231-1-D

SEPARATE OCCUPANCY ZONE & OCCUPANCY + ON/OFF PHOTOCELL ZONE

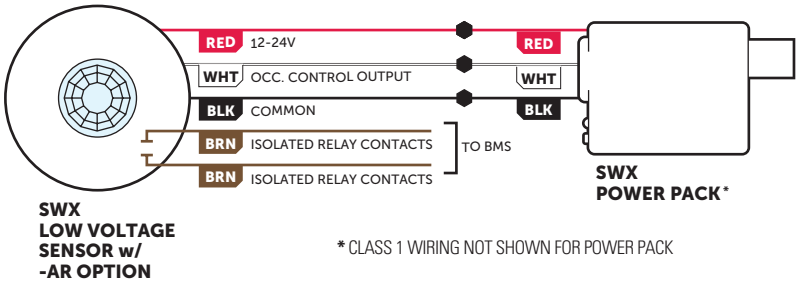
- During occupied state, photocell output (blue wire) will turn lights off if ambient light level surpasses threshold and back on if level drops.
- Also configurable to prevent lights from initially turning on, but not to turn them off once lights are on (i.e. Inhibit Only operation).



WIRING CONT.

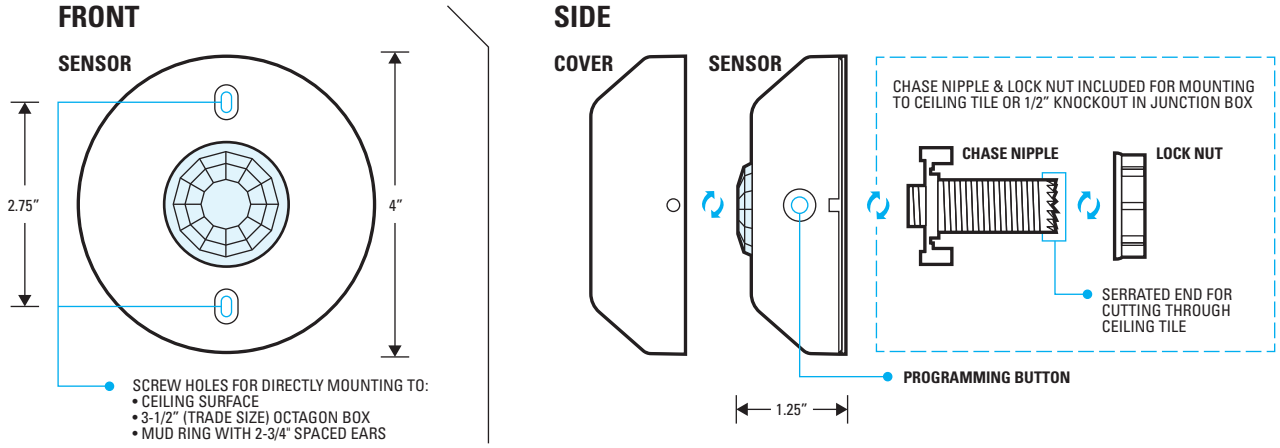
SENSOR INTERFACE TO BMS

- The auxiliary output relay (model option -AR) is designed to interface with many types of BMS, VAV units, and relay panels
- Operation of relay (brown wires) is configurable:
  - By default the relay latches closed when occupancy is detected (white wire goes high)
  - Relay can be configured to alternatively follow the occupancy + photocell (blue wire) output
  - Relay polarity (open vs closed) can also be reversed



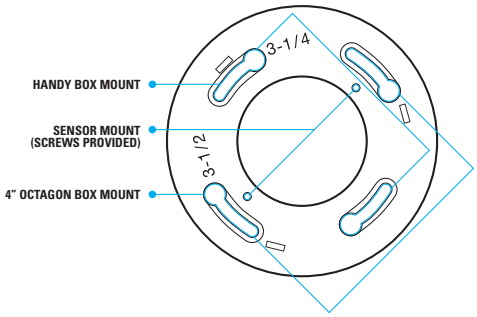
* CLASS 1 WIRING NOT SHOWN FOR POWER PACK

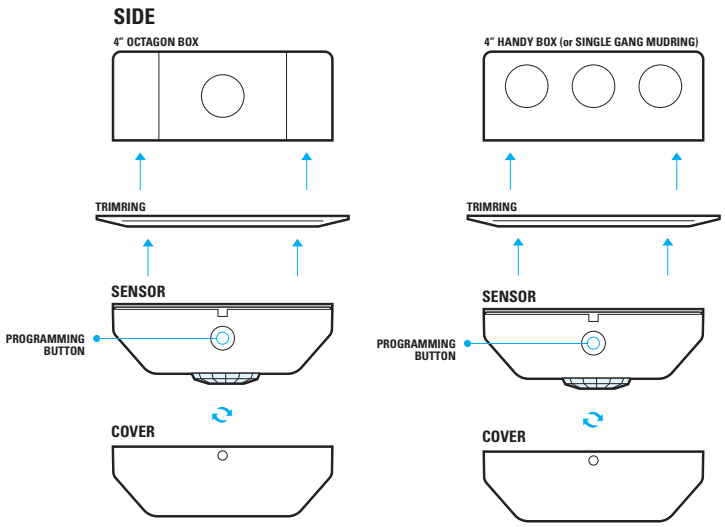
INSTALLATION OPTIONS



Note: If mounting to a Single Gang Mudring, Handy Box, or 4″ Octagon Box, a trim ring is required. Part Number: **SWX-299-JP.**

ADDITIONAL MOUNTING OPTIONS USING SWX-299-JP TRIM RING





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Catalog Number: Date: Project:



SENSORWORX®

POWER PACK CONTROLLER

LINE VOLTAGE

OVERVIEW

SENSORWORX power pack controllers transform incoming line voltage power to Class 2 low voltage as needed by sensors or other control devices. Additionally, they switch on/off power to the connected lighting load as directed by the sensors and controls. **SENSOR**WORX power packs utilize a powerful microprocessor to optimize its switching timing in order to ensure long relay life even when controlling high-inrush LEDs and ballast loads. As with all **SENSOR**WORX products, these power packs are easy to install and incorporate features which reduce contractor labor time. An elongated chase nipple with snaps for quick installation and an optional snap-on low voltage wire chamber make for a hassle free contractor experience. All **SENSOR**WORX products are proudly made in the USA.

BASIC OPERATION

An input signal indicating occupancy from one or more connected sensors will signal the pack's integrated relay to close. Once closed, line voltage will flow through the relay and turn on the connected lighting load. When the input signal indicates the occupied period has ended, the relay will open and lighting will switch off. This pack is also available with an auxiliary switch input to enable manual on, hold on, and hold off configurations. Partial off (e.g. auto off to 50%) and partial on (e.g., auto on to 50%) operation can also be achieved using the optional 0-10V stepped dimming output.

FEATURES

- **Powers Low Voltage Sensors**
- **Switches Line Voltage Loads**
- **Electronically Timed Switching (i.e. Zero Crossing) Ensures Long Relay Life**
- **Integrated Test/Programming Button**
- **Plenum Rated (UL 2043)**
- **Optional Snap-On Attachment Provides Chamber for Low Voltage Wire Connections**
- **Optional Switch Input for Manual On, Hold On, or Hold Off Operation**
- **Optional 0-10V Stepped Dimming Ouput for Partial Off or Partial On Operation**

SPECIFICATIONS

ELECTRICAL

OPERATING VOLTAGE
120/277 VAC

CLASS 2 OUTPUT RATINGS
18 VDC, 150 mA
(SWX-900-AX / SWX-920 only)
Connected device power: 80 mA

LOAD RATINGS (SWX-900 / SWX-900-AX / SWX-910 only)
(relays use zero-cross switching)

20A @ 120 V -
General Purpose Plug Load

20A @ 120/277 VAC -
General Purpose, Tungsten, Magnetic Ballast

16A @ 120/277 VAC -
Electronic Ballast, LED Driver

DC LOAD RATINGS
20A @ 28 VDC (MAX)
1A @ 5 VDC (MIN)

DIMMING LOAD
(Models with -**D2** option only)
50mA, (0-10 VDC ballasts or drivers compliant with IEC 60929 Annex E.2)

MOTOR LOAD
1 HP

ENVIRONMENTAL

OPERATING TEMP
32°F to 122°F (0°C to 50°C) Std.
-40° F/C (with -HE Option)

RELATIVE HUMIDITY
0-95% Non-Condensing, Indoor Use Only

ROHS COMPLIANT

PHYSICAL

SIZE & WEIGHT
3.00" H x 2.25" W x 1.88" D
(7.62 cm x 5.72 cm x 4.78 cm)
6.00 oz.

COLOR
Blue

MOUNTING
1/2" Knockout

RELAY TEST BUTTON

LED STATUS INDICATOR
Bi-color White & Blue

UL US LISTED

LEAD FREE RoHS COMPLIANT

MADE IN THE USA

TAA COMPLIANT

BAA COMPLIANT

BUILD AMERICA BUY AMERICA

ORDERING INFO

SAMPLE MODEL # SWX-900-AX

	PRODUCT		FUNCTIONALITY		VOLTAGE		AUX SWITCH INPUT		ADDITIONAL OPTIONS	
SWX	Power Pack	**9**	Single Relay + 150 mA Supply	**0**	120/277 V	**0**	None	**Blank**	Partial Off / On Control*	
			Secondary Relay 150 mA Supply	**1**			Auxiliary Switch Input	**-AX**	(Stepped Dimming (0-10V)	**-D2***
				2					High Humidity Environment	**-HE**
									Auxiliary Contact Closure Relay**	**-AR****

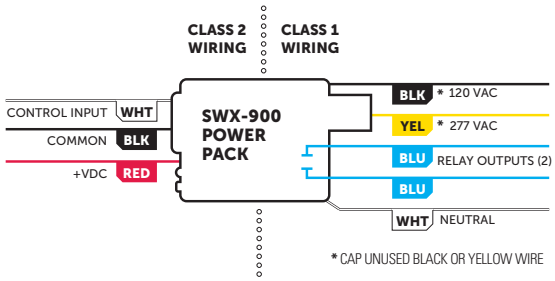
*Requires -AX option **Available with SWX-910 only

ACCESSORY	DESCRIPTION
SWX-999	Snap-On Low Voltage Wiring Chamber

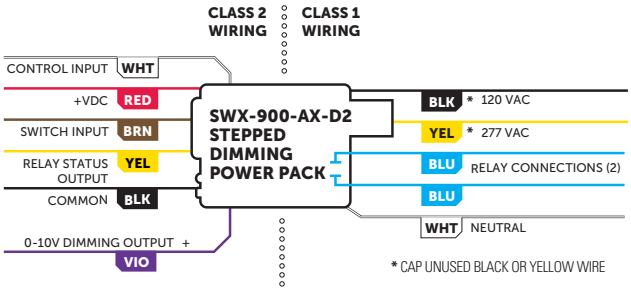
WIRING

BASIC SENSOR WIRING

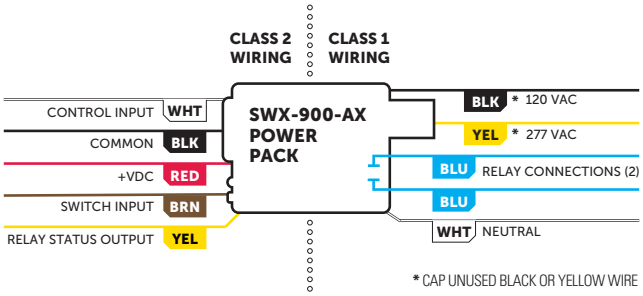
MODEL #: SWX-900



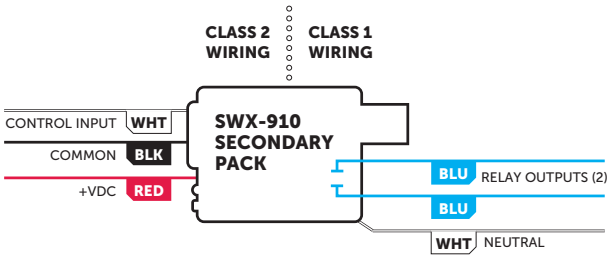
MODEL #: SWX-900-AX-D2



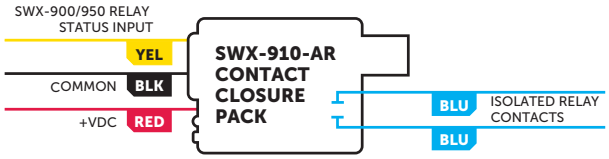
MODEL #: SWX-900-AX



MODEL #: SWX-910

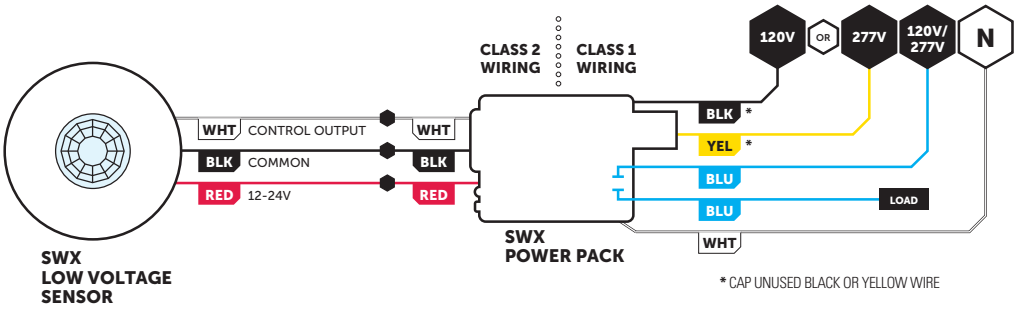


MODEL #: SWX-910-AR

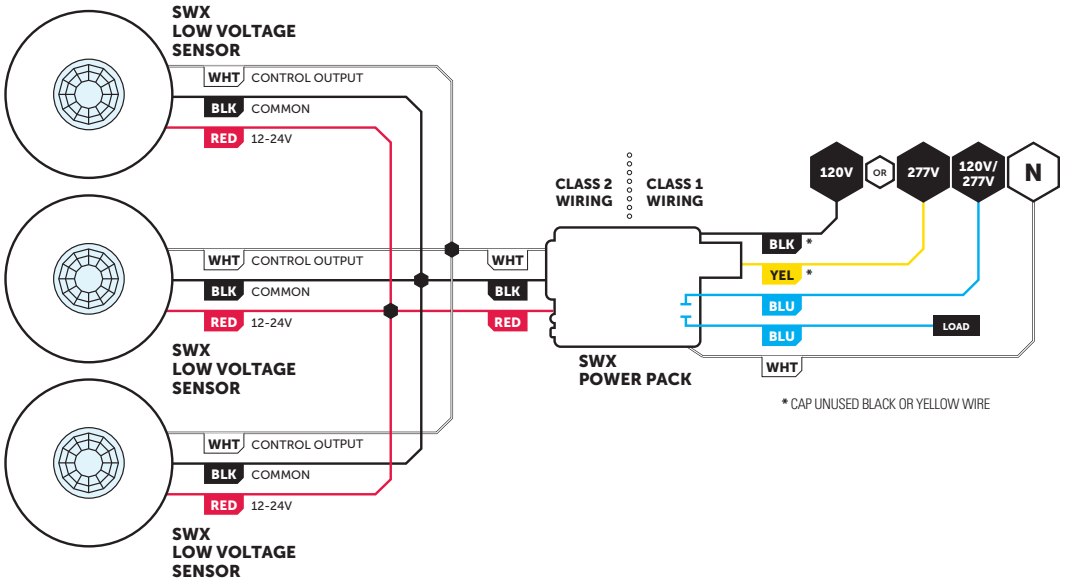


COMMON WIRING CONFIGURATIONS

SINGLE SENSOR

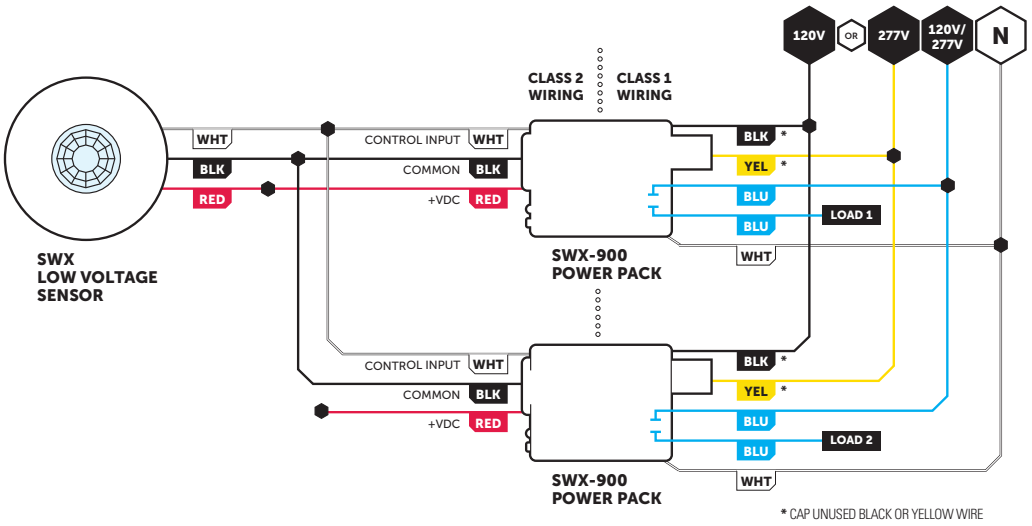


MULTIPLE SENSOR

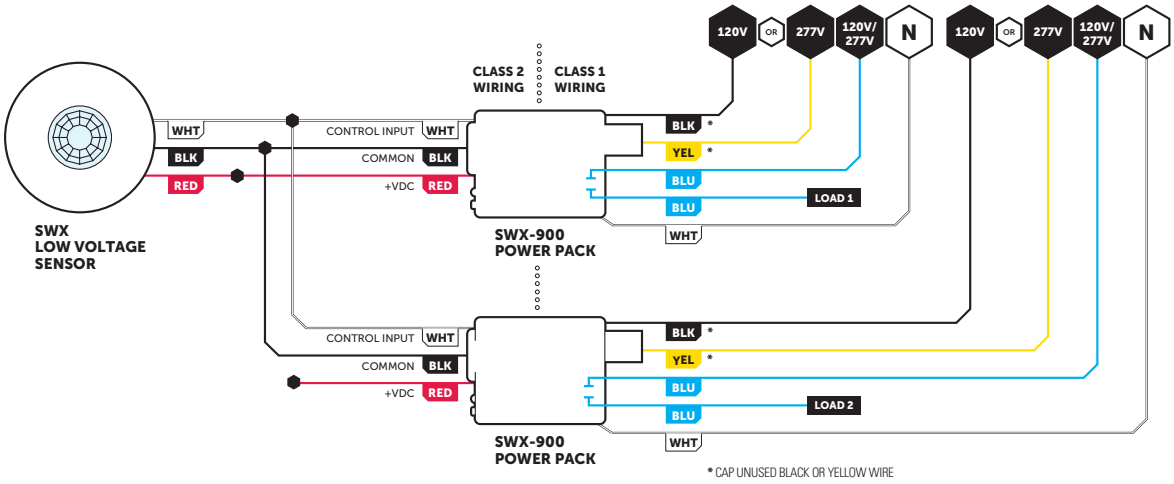


WIRING CONT.

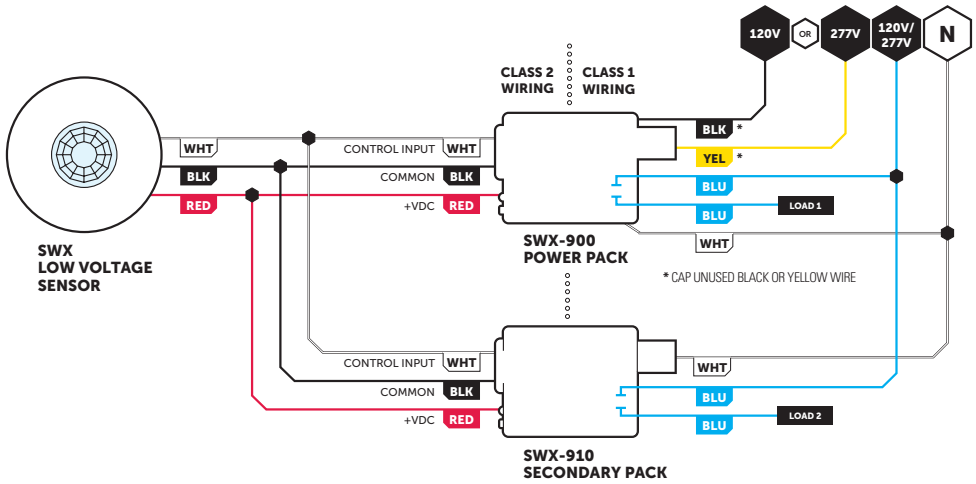
MULTIPLE POWER PACKS WITH COMMON LINE FEEDS



MULTIPLE POWER PACKS WITH SEPARATE LINE FEEDS



POWER PACK w/ SECONDARY RELAY PACK

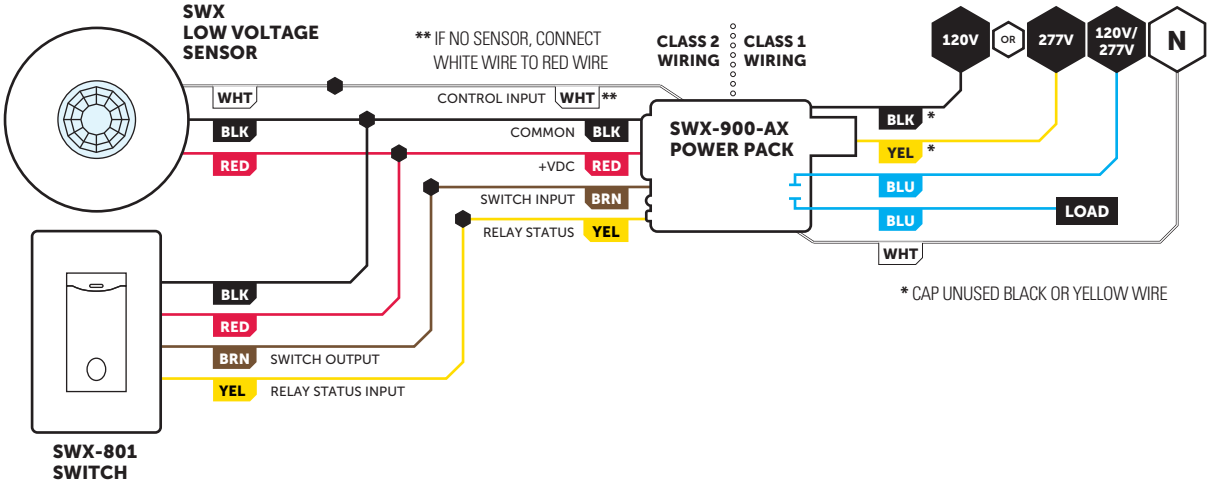


WIRING CONT.

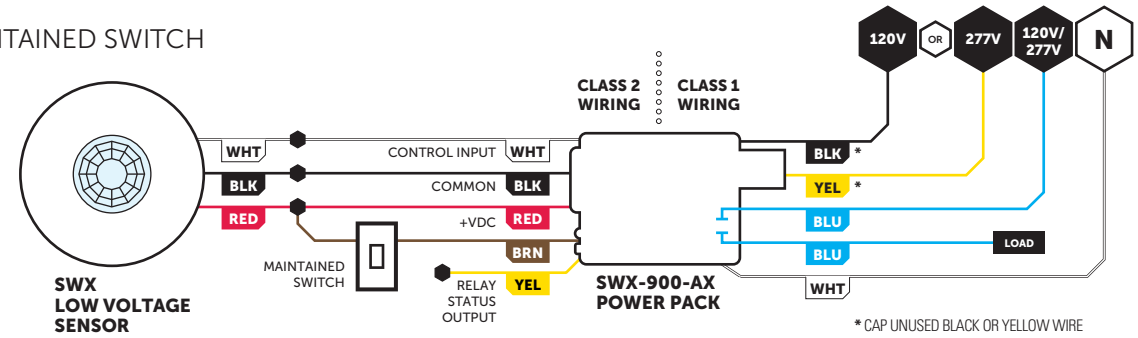
POWER PACK CONNECTED TO SWITCH (requires -AX option)

- Some energy codes require **Manual On** (also called **Vacancy**) operation where an occupant is required to initially switch on lighting. The sensor then ensures lights are turned off once the space is unoccupied
- Interfacing momentary switches such as the SWX-801-xx or SWX-803-xx are recommended, however maintained switches can also be utilized
- For momentary switches, the power pack will react on the leading edge of a pulse on the brown input wire
- For maintained switches, any change of state on the brown wire that lasts longer than 0.5 seconds will be read by the power pack as one action
- If no sensor is present, tie power pack low voltage white wire to low voltage red wire

MOMENTARY SWITCH

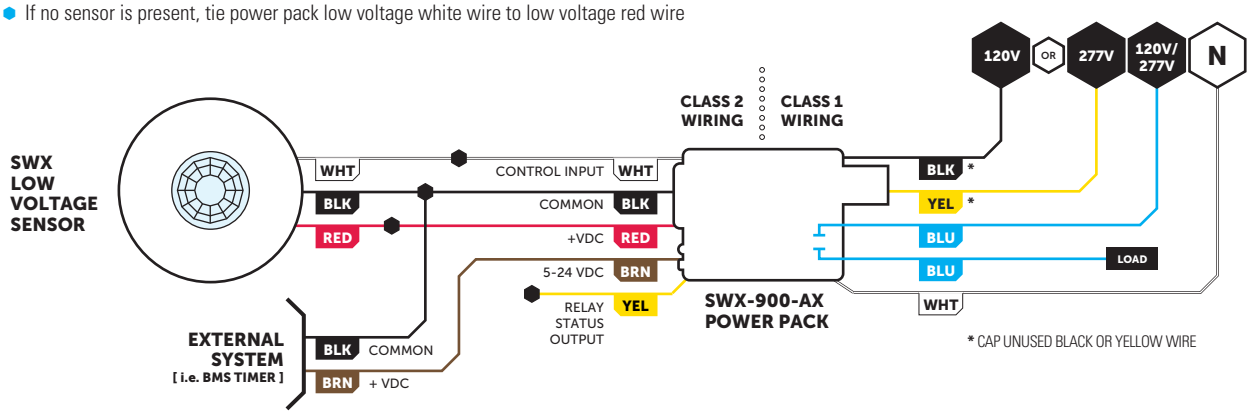


MAINTAINED SWITCH



POWER PACK w/ SWITCH SIGNAL FROM EXTERNAL SYSTEM

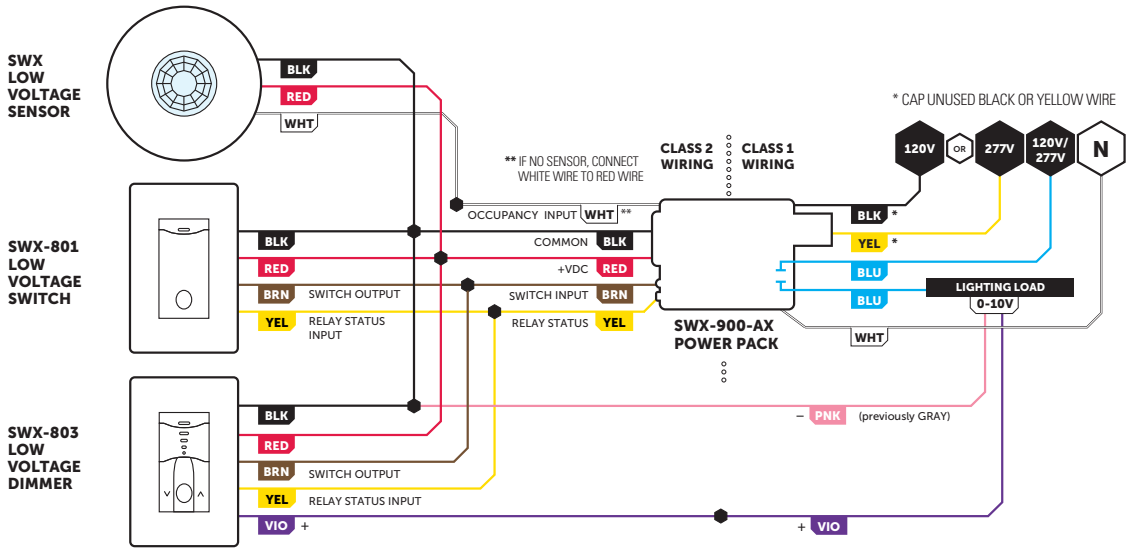
- Typical for Hold On and Hold Off applications
- BROWN switch input can be activated by external signals +5VDC or higher (i.e. logic high)
- For hold on and hold off applications, switch input can also be configured to activate on logic low
- If no sensor is present, tie power pack low voltage white wire to low voltage red wire



WIRING CONT.

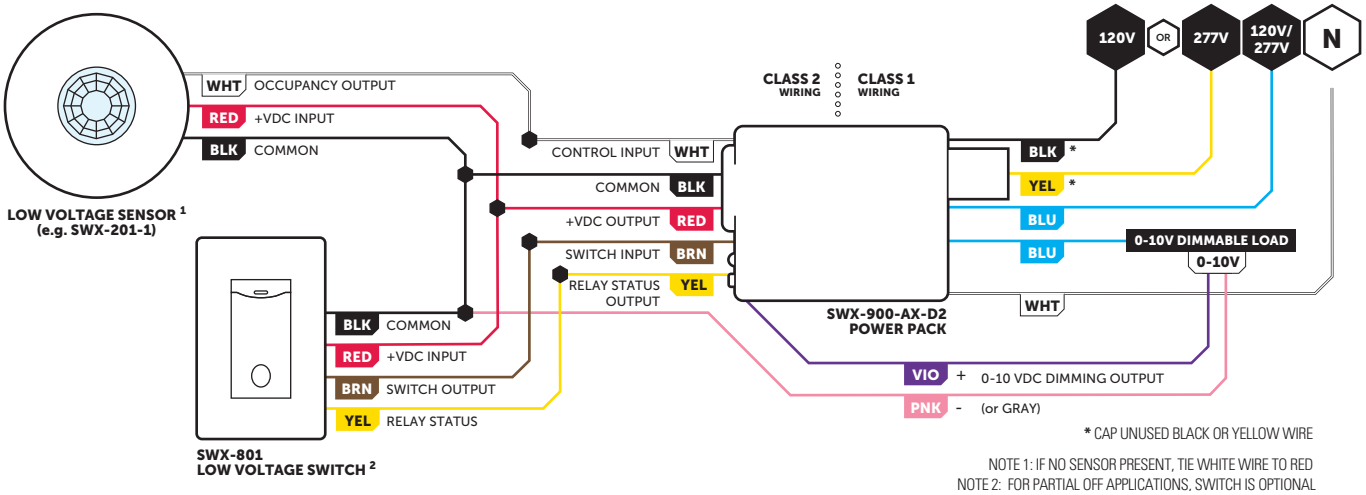
MULTI-WAY SWITCHING (requires -AX option)

- Switching a powerpack from multiple locations (i.e., 3-way, 4-way switching) can be achieved using multiple **SENSORWORX** model# **SWX-801-xx** switches or a combination of one model# **SWX-803-xx** dimmer and one or more model# **SWX-801-xx** switches.
- Note that only one dimmer should be used per multi-way application.
- If no sensor is present, tie power pack low voltage white wire to low voltage red wire



PARTIAL OFF or PARTIAL ON OPERATION (requires -AX-D2 options)

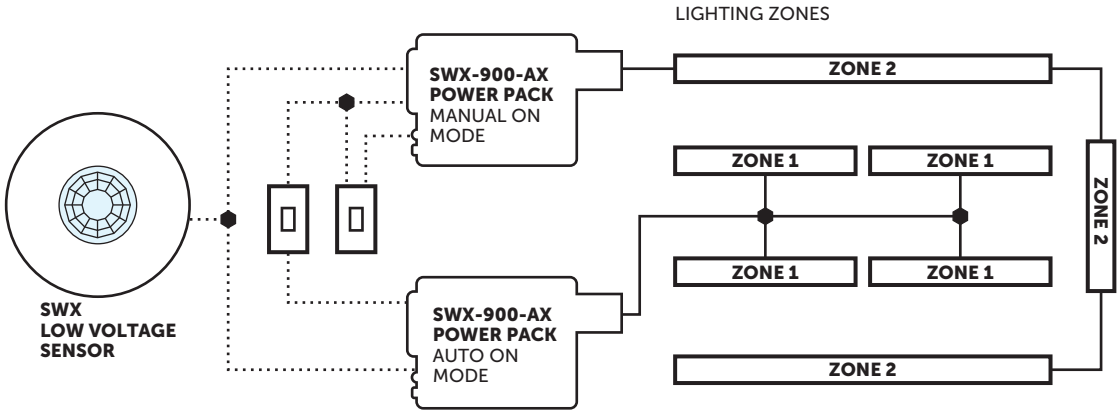
- For areas such as stairwells, the **SWX-900-AX-D2** unit can be used to achieve **Partial Off** operation where lighting is at the full bright level when occupied and dropped to the 50% level during unoccupied periods.
- **Partial On** operation is also enabled by the **SWX-900-AX-D2** unit. In this configuration lighting is only allowed to automatically turn on to a 50% level. Once on, an occupant may step lighting to the 100% level by pressing a wall switch. The sensor then ensures lights are turned off once the space is unoccupied.
- When in partial on mode the **SWX-900-AX-D2** unit will turn on connected 0-10V lighting to 50% (level is user configurable) once initially triggered from an occupancy sensor or manual switch. The unit will then step lighting up to 100% (level is user configurable) when the connected switch is pressed. Lighting will turn off if another switch press is detected or when all connected sensors go to their unoccupied state.
- Additional configurable parameters include; Turn On Dim Level, Turn Off Scheme, Fade On/Fade Off Rates, and High/Low Dimming Trim Levels.
- Using the **SENSORWORX** model# **SWX-801-xx** momentary switch is recommended for this application, however other manufacturers switches may also be utilized.



APPLICATION NOTES

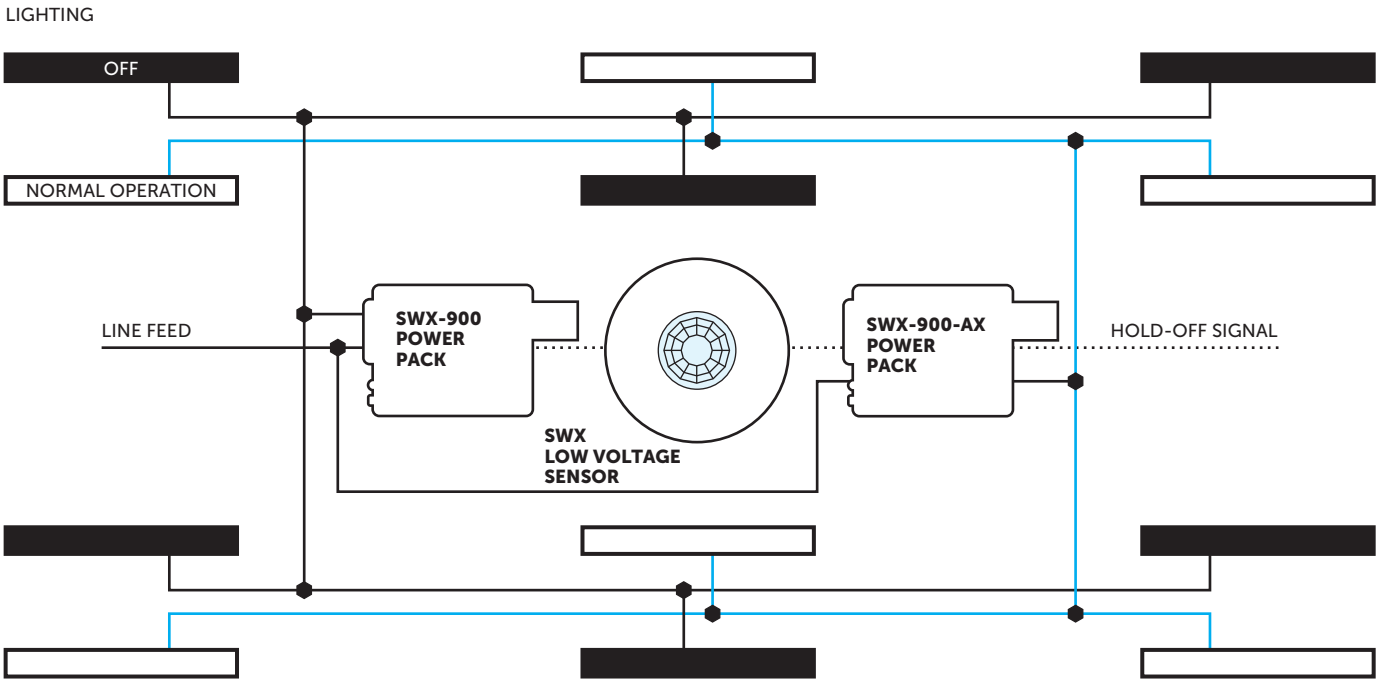
MULTI-ZONE AND BI-LEVEL SWITCHING

Rooms with multiple lighting zones or bi-level lighting often want one zone/level to switch on automatically, with the occupant able to manually switch on the additional zone/level if desired. Both zones/levels are then switched off automatically by the sensor once unoccupied. Two **SWX-900-AX** power packs are wired to switches, however one unit is set to Automatic On mode while the other is set to Manual On mode. In this configuration, lighting can be switched off manually or automatically via the occupancy sensor.



LOAD SHED / HOLD OFF APPLICATION (e.g. OPEN OFFICES)

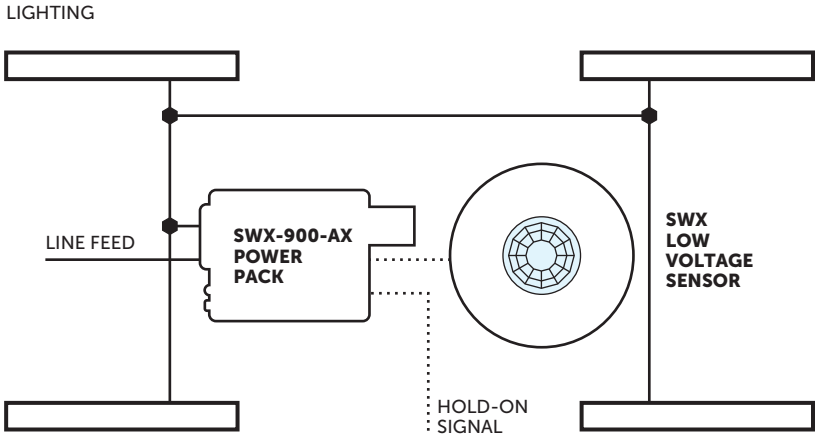
The occupancy sensor connected to both power packs normally keeps all lights on when the space is occupied. When a load shed (override off) command is given (by BMS, utility meter, etc.), lights connected to **SWX-900-AX** are held off. Remaining lights connected to **SWX-900** are still controlled by the sensor.



APPLICATION NOTES CONT.

SENSOR OVERRIDE / HOLD ON APPLICATION (e.g. RETAIL)

During open hours, a signal from a time clock (connected to the BROWN switch input on the **SWX-900-AX**) holds lights on, regardless of occupancy. After hours, the clock's schedule releases the hold on signal enabling the occupancy sensor to take over.



POWER PACK CAPACITY

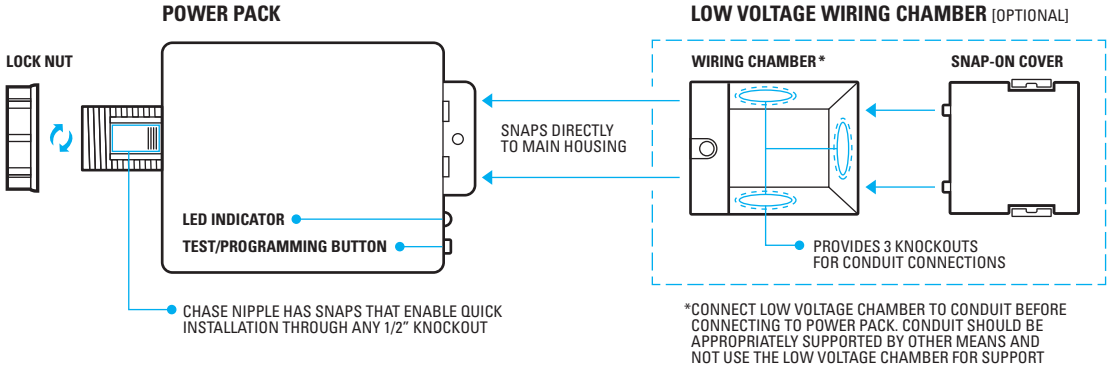
SWX-900 series power packs can supply power to several occupancy sensors and additional secondary relay packs. Following the below formula ensures adequate power will be available. Note the **SWX-900's** relay has already been factored into the formula.

[(# of PIR SENSORS*) **x5mA] + [(#** of DUAL TECH SENSORS**) x10mA] + [(#** of **SWX-910) x70mA] < [(#** of **SWX-900) x80 mA]**

EXAMPLE COMBINATIONS

PIR SENSORS		+	DUAL TECH SENSORS		+	SECONDARY PACKS SWX-910		=	TOTAL POWER REQUIRED	<	POWER SUPPLIED BY ONE SWX-900
#	POWER REQUIRED		#	POWER REQUIRED		#	POWER REQUIRED				
10	50mA	+	0	0	+	0	0	=	50mA	<	80mA
1	5mA	+	0	0	+	1	70mA	=	75mA	<	80mA
0	0	+	4	40mA	+	0	0	=	40mA	<	80mA
3	15mA	+	3	30mA	+	0	0	=	45mA	<	80mA

INSTALLATION OPTIONS



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