



MINNEAPOLIS PUBLIC SCHOOLS

Request for Proposal (RFP) for Northrop Elementary at Ericsson Building Electrical Switchgear Installation Only RFP: 24-22

Minneapolis Public Schools - Special School District No. 1
1250 West Broadway Ave.
Minneapolis, Minnesota 55411-2533

[Ann Cerney, CPCM Project Manager](mailto:Ann.Cerney@mpls.k12.mn.us)
Ann.Cerney@mpls.k12.mn.us

Issued: March 8, 2024

NOTICE: Pursuant to section 13.591 subdivision 3(b) of the Minnesota Statutes, after a government entity has completed negotiating a contract with the selected vendor, **all data in RFP responses are public** except for trade secret information as defined in section 13.37 subdivision 1(b). A statement that submitted data are copyrighted or otherwise protected does not prevent public access to the data.

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7. American Midwest Power Shop Drawings dated 7/18/2022 (54 pages)
8. American Midwest Power Installation Operation & Maintenance Manual (11 pages)
9. Hallberg Engineering Plan Sheets E000 & E010 dated 2/18/2022
10. DIVISION 26 - ELECTRICAL SPECIFICATIONS:
 - a. 26 00 00 General Requirements – Electrical
 - b. 26 01 00 Operation and Maintenance of Electrical Systems
 - c. 26 01 05 Submittals, Closeout Documents, Training and Spare Parts
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SECTION I: OVERVIEW

A. Project Objective

Minneapolis Public Schools (MPS) is seeking proposals from commercial electrical contractors wishing to provide **INSTALLATION ONLY** of Electrical Switchgear at Northrop Elementary School, located in the Ericsson Building. Material has been pre-ordered by MPS and is on-site, ready to be installed.

Minneapolis Public Schools or Special School District Number 1 (SSD #1) is a school district that is coterminous with the City of Minneapolis, Minnesota. With authority granted by the state legislature, the school board makes policy, selects the superintendent, and oversees the district's budget, curriculum, personnel, and facilities. Students speak ninety different languages at home and most school communications are printed in English, Hmong, Spanish, and Somali. The District covers over 70 school programs at 65 sites, with approximately 28,500 students and 3,200 teaching staff.

The District intends to select one organization to provide the **INSTALLATION ONLY** of the electrical switchgear. To facilitate the submission and evaluation of proposals, this proposal provides additional background information regarding MPS that will be relevant to the proposal of the **INSTALLATION OF ELECTRICAL SWITCHGEAR**.

RFP Primary Objective 1:

To select a commercially licensed electrical contractor to install only the new AMP electrical switchgear equipment that is currently located on-site at Northrop Elementary School in the Ericsson building. This RFP intends that the contracting partner have knowledge of MPS district-wide electrical standards and procedures, and has past implementation history with MPS.

B. Schedule of Proposal

1. Issue RFP: 3/8/2024
2. Pre-Bid Meeting 3/13/2024 2:00 PM
Meet on-site at Northrop Elementary School
4315 S 31st Ave, Minneapolis, MN 55406
Meet at Main Entrance Door #1 on West Side of School
3. Intention to Submit: 3/18/2024 4:00 pm (mandatory document)
4. Written Questions Due: 3/26/2024 4:00 pm
5. Responses to Questions: 3/29/2024 4:00 pm
6. Proposals Due: 4/3/2024 2:00 pm
7. Award bid - Selection: 4/10/2024 4:00 pm
8. District Approval 4/16/2024 7:00 pm
9. Implementation: Work to be done Summer 2024
Last Day of School: June 14, 2024
Last Day for Staff: June 17, 2024
Juneteenth Holiday: June 19, 2024 (All MPS Buildings Closed)
Construction Commences: June 20, 2024
Dates of electrical disconnect to be coordinated with Ann Cerney, PM
Substantial Completion: August 16, 2024 (All power restored)
MPS Staff back in Building: August 19, 2024,
Final Completion: August 30, 2024
First day of School: September 3, 2024

C. Mandatory Intent to Submit Proposal

In order for your organization to receive updates to this Request for Proposal, including responses to submitted questions from all participating firms, please complete Appendix 1: Intent to Submit a Proposal by 3/18/2024. Email this document to both Ann.Cerney@mpls.k12.mn.us AND to RFX@mpls.k12.mn.us. This will allow the District to provide timely information to interested parties. **This document is a mandatory document**, if this is not submitted by 3/18/2024; the organization will not be able to participate in RFP-24-22

D. Submission of Written Questions

All questions about the RFP shall be submitted by e-mail by 4:00 p.m. Central Standard Time on or before 3/26/2024 to both Ann.Cerney@mpls.k12.mn.us AND to RFX@mpls.k12.mn.us. The District will provide written responses to questions from prospective Proposers no later than 3/29/2024 4:00 pm. There will be an opportunity at the Pre-Bid meeting to ask additional questions; however after 3/26/2024, no questions or inquiries will be allowed.

E. Mandatory Pre-Bid Conference

The District will hold a mandatory pre-bid meeting on 3/13/2024 IN-PERSON . starting promptly at 2:00 pm.

Meet on-site at Northrop Elementary School
4315 S 31st Ave, Minneapolis, MN 55406
Meet at Main Entrance Door #1 on West Side of School

F. Changes to the RFP

Vendors who are registered with MPS for this RFP will be notified by email of any changes in the specifications contained in this RFP. If any changes are issued to this RFP, a good faith attempt will be made to deliver the additional information to those persons or firms who, according to the records of MPS, have previously received a copy of and are registered (on the Intent to Submit form) with the District for this RFP.

G. Preparation of Proposal

1. Careful attention must be paid to all requested items contained in this Request for Proposal. Please read the entire package before bidding. Each proposal shall be prepared simply and economically avoiding the use of elaborate promotional materials beyond what is sufficient to provide a complete, accurate, and reliable presentation.
2. For ease of review, the proposals must follow the outline in Section III and IV of this request for proposal. Each response should be clearly numbered and the full question listed.
3. Each page of the proposal must be sequentially numbered and include the proposing organization's name.
4. Some questions in this RFP will require organizations to submit documents as an Appendix. Applicants may wish to submit additional supplemental materials to support responses to questions in Section III and IV. If an applicant intends to include supplemental materials with responses to questions in Sections III and IV of the RFP, separate appendices for each part must be developed. Each appendix should be clearly labeled (e.g., Appendix A: References, etc.).
5. All appendix materials (e.g., sample letters, curricula, lesson plans, progress reports, academic effectiveness data, etc.) must be labeled with the name of the organization and reference the appropriate section and question (e.g., Section C: Description of Expected Services 1a). **Although there is no page limitation for the Appendix, the appendix should not be excessive in length. Applicants should also ensure the appendix items are appropriately described and referenced in the narrative section of the RFP.**

6. The RFP must be submitted in the appropriate order. Each part of the RFP should be separated with a section divider page listing the *title* of the next part of the RFP that is enclosed. All RFPs should follow the order below:
 - a. Organization Information Cover Page (Provided in attached Appendix 2)
 - b. Table of Contents
 - c. Section III- General Business Information
 - d. Section IV- Project Scope
 - e. Appendix Materials
7. Additional circumstances that may lead to RFP not being reviewed and/or selected:
 - a. RFP was received after the deadline, which includes not on the deadline date but also after the deadline time.
 - b. Applicant does not intend to complete criminal history checks on employees.
 - c. Applicant's previous clients have significant complaints regarding the quality of the Title services, communication issues, or other problems.
 - d. Any section of the RFP is missing or incomplete.
 - e. The RFP does not meet length, font, or other formatting requirements.

H. Submission of Proposals

In order to be considered for selection, organizations must submit a signed electronic (.pdf) response to this solicitation no later than 2:00 p.m. on 4/3/2024. Late proposals shall not be accepted. Electronic copies must be submitted to both Ann.Cerney@mpls.k12.mn.us AND to RFX@mpls.k12.mn.us.

No other distribution of the proposal shall be made by the organization. It is the sole responsibility of the organization to assure that the proposal is delivered to the designated district office in Item H, above, prior to the deadline. No proposal received after the deadline will be considered. No unsolicited corrected or resubmitted proposals will be accepted after the proposal submission deadline.

No paper submission is required.

I. Withdrawal of Proposals

A proposal may be withdrawn by the vendor prior to the date and time for submittal of proposals by means of a written request signed by the vendor or its properly authorized representative. Such written request must be delivered to both Ann.Cerney@mpls.k12.mn.us AND to RFX@mpls.k12.mn.us. This written request can be either electronic or a hard copy format.

J. Finalist's Presentation and Proof of Concept (POC)

Not applicable.

K. Evaluation and Selection Process

1. The RFP 24-22 Evaluation Committee members will include, but is not be limited to a minimum of one member from at least two departments to be named. Potential participating committee members could include, but not be limited to:
 - a. Curtis Hartog, PE, Executive Director, Capital Planning, Construction & Maintenance
 - b. Grant Lindberg, Director, Plant Maintenance
 - c. Justin Greif, General Foreman, Electrician, Maintenance & Operations
 - d. Ann Cerney, Project Manager, Capital Planning, Construction & Maintenance
 - e. Liban Jama, Senior Buyer, Procurement Department

2. Proposals, responses, presentations and references, and Proof of Concept if necessary will be included as the Evaluation Committee recommends a solution for the District. Upon approval from the authorized District signer, the District will then proceed with contract discussions with the selected vendor(s). The District has no liability to any vendor participating in this RFP process prior to when the authorized District signer signs a contract to that vendor.
3. Consensus on proposal selection will be determined by the Evaluation Committee reaching consensus on the selection.
4. The Evaluation Committee shall evaluate all proposals to determine which meet the minimum service/product requirements, without regard to price. This evaluation may, at the Evaluation Committee's discretion, be augmented by verbal or written requests for clarification, or additional information as necessary to determine whether the technical requirements can be met. The Evaluation Committee can contact references supplied in vendor proposals. Findings from these inquiries will be included in the assessment of products for selecting finalists.
5. The Evaluation Committee will then only consider those proposals that meet the minimum service requirements for further evaluation. The Evaluation Committee will evaluate and score the vendor with regard to the scoring rubric that will be provided at the Pre-Bid Conference or no later than when the Responses to Questions are due.

L. Effective Period of Proposals

Proposals must state the period for which the proposal shall remain in effect (i.e., how much time does the District have to accept or reject the proposal under the terms proposed). Such period shall not be less than 120 days from the proposal date. Note that the work cannot proceed until school is out for the summer.

M. Bid Reservations

Notwithstanding any other provisions of this RFP, the District reserves the right to award this contract to the organization(s) that best meet the requirements of the RFP, and not necessarily, to the lowest cost Proposer. Further, the District reserves the right to reject any or all bids, to award in whole or part, and to waive minor immaterial defects in bids. The District may consider, at its sole discretion, any alternative bid.

N. Notifications of Unsuccessful Vendors

The Evaluation Committee shall notify all Vendors after the Finalists' Presentations but no later than the award recommendation and approval to proceed being placed on the School Board agenda on 4/16/2024.

O. Contract Negotiations

Negotiations may include all aspects of services and fees. After a review of the proposals, and in-person presentations, the District intends to enter into contract negotiations with the selected organization(s). If a contract with the selected organization is not finalized within 90 days, the District reserves the right to open negotiations with the next ranked organization(s).

P. Award of Contract

The District reserves the right to award by Service Area or as a whole, whichever is deemed most advantageous to the District.

The selected firm(s) shall be required to enter into a written contract or contracts with the District in a form approved by legal counsel for the District. This RFP and the proposal, or any part thereof, may be incorporated into and made a part of the final contract(s). The District reserves the right to negotiate the terms and conditions of the contract(s) with the selected Proposer(s).

Q. Contract Term

It is the intent to award the contract(s) for an initial one (1) year period with no renewal. All work shall be completed within one year of award.

Proposers must agree to fix contract fees for the contract period. If the organization intends to revise its fee schedule, it must give written notice to the District 90 days in advance of any fee change. Fees may be changed only on the contract expiration date with 90-day notice. These fees are subject to negotiation and approval by the District.

R. Disposition of and Public Access to Proposals

All materials submitted in response to this RFP will become the property of the District. Pursuant to section 13.591 subdivision 3(b) of the Minnesota Statutes, virtually all information submitted is considered public and may be disclosed to third parties. The exception is trade secret information, as defined and classified in section 13.37 subdivision 1(b). Trade secret information should not be included in a response unless absolutely necessary.

S. Cost Incurred in Responding

This solicitation does not commit the District to pay any costs incurred in the preparation and submission of proposals or in making necessary studies for the preparation thereof, nor to procure or contract for services.

T. Assignment

The successful proposer shall not assign, transfer, convey, or otherwise dispose of the contract, or right, title of interest, or power to execute such a contract to any person, firm, or corporation without the previous consent in writing by the District.

U. Causes for Termination

Causes for termination of the agreement may include any of the following: Failure to promptly and faithfully provide the services required at the prices indicated in the Proposal; violation of any law governing services provided to the District; failure to cooperate upon receiving any reasonable request for information or service; or improper actions of the officers or employees, which in the opinion of the District, would adversely affect its interest, or endanger the structure of the proposing organization such as a spin off or merger which materially affects the terms of this agreement. The District may terminate the agreement without cause with a 90-day notice. The District may terminate the agreement with cause with a 30-day notice.

SECTION II: SCOPE OF SERVICES

A. Project Background

This section begins with some background information on the Minneapolis Public School District and then discusses the overall expectations for the RFP 24-22, as well as the district's specific needs. It also describes existing services and equipment that the Vendor may wish to incorporate into its design and the issues that need to be considered.

The Minneapolis Public Schools is the third largest K-12 District in Minnesota. Minneapolis, located in Hennepin County, is the largest city in the state of Minnesota, and is the 48th largest in the United States. The District covers 70 school programs at 65 sites, with approximately 28,500 students and 3,200 teaching staff.

70 school programs include:

- ✓ K-5 Schools: 19
- ✓ K-8 Schools: 17
- ✓ Middle Schools (6-8): 5
- ✓ High Schools (9-12): 7
- ✓ Special Education Schools: 2
- ✓ Specialty Schools: 1
- ✓ District Alternative Schools: 4
- ✓ Contract Alternative Schools: 12

Growth projection: Stable

Superintendent: Dr. Lisa Sayles-Adams

Chief Financial Officer: Ibrahima Diop

Director, Strategic Procurement and Contract Management: Girish Bhatnagar

B. RFP 24-22 Product/Service Goals

Complete installation of new electrical switchgear which has been purchased directly by MPS.

Switchgear equipment is onsite at Northrop Elementary school and is located in the school cafeteria.

American Midwest Power Packing Slip, As-Built plans, Shop Drawings, and Installation Operation & Maintenance Manual are included in attached appendix.

Prevailing Wage required per MPS Project Labor Agreement.

C. Capital Planning, Construction & Maintenance

To help ensure students are in safe and welcoming learning environments, Capital Planning, Construction & Maintenance (CPCM) oversees 72 buildings and more than 8 million gross square feet of area.

D. Description of Expected Services

- ✓ MPS expects the highest level of quality, professionalism, and results from the vendor and product and the development and implementation of services provided by them, including, but not limited to the following:
 - a. Consultant shall comply with all applicable federal, state, and local statutes, laws, ordinances, rules and regulations, including securing and maintaining in force such permits and licenses as are required by law in connection with the furnishing of services pursuant to this agreement.
- ✓ MPS expects that success of the vendors' performance and product will be determined at the sole discretion of MPS.
- ✓ MPS expects that success of the consultant's performance and product will be determined by both qualitative and quantitative means of data collection and analysis.

SECTION III: GENERAL BUSINESS INFORMATION**A. General Business Requirements**

1. Provide a general overview and brief history of your organization, including parent and/or subsidiary organizations, number of employees, and number of years of experience in the field related to this RFP.
2. Describe your organization's policy on changing the account manager on an account in the event MPS asks for a different representative or if it's at the discretion of the organization.
3. Do you have any existing or potential conflict of interest, direct or indirect, with MPS?
 - a. If yes, please state the potential conflict of interest.
4. Within the past seven years, has your organization been and/or is involved as a defendant in any lawsuits or administrative charges/complaints? Include those filed by or for customers or employees of customer companies.
 - a. If yes, provide a brief summary of the case and its current status.
5. In the past seven years, has your organization experienced any major debt restructure or bankruptcy proceedings?
 - a. If yes, provide a brief summary.
6. List any contracts or business arrangements currently and/or formerly in place between your organization and MPS.
7. Provide 4 current (no more than three years old) customer references. For each reference, provide the following information in a table format in Appendix A:

	Response
Customer Name	
Customer Address	
Current Telephone # of a rep. most familiar with the project/program	
Time period over which each project was completed	
List of products installed and operational	

B. Qualifications and Experience

1. Describe the experience of your organization in providing electrical solutions for other organizations.
2. Describe your organization's most important success in the past 2 years pertaining to the services in this RFP.

C. Supplier and Employee Equity & Diversity, Sustainability and Community Engagement

1. One of the District's values is equity and diversity for employees, suppliers, and the products that are purchased. We support organizations who support and exhibit equity and diversity in many different areas. Please explain, be specific, how your organization supports and demonstrates this MPS value in regard to Supplier Diversity and Employee Diversity.
2. Is your organization a certified, through a formal certification process from a Diverse Supplier organization i.e. MMSDC, WBENC, Quorum, etc. or 51% owned or controlled by an individual who represents a diversity category?
 - a. If yes, please state which one.

3. If yes, please provide a copy of your certification documentation. If yes, but you do not have a certification document please state that here; MPS will also accept a notarized letter of affidavit.

D. Business Ethics

Not applicable

E. Service Level Expectations

1. Describe your organization's efforts and processes to ensure that services provided to us will completely satisfy or exceed our expectations.
2. Who will be the main point of contact for MPS?
3. A sample MPS contract is attached in Appendix 3. This contract is included to provide a sample of the level of service that will be required by MPS.

F. Fees and Costs

1. See Bid Form in Appendix 4.
2. Describe in detail your base bid, and any additional costs, or cost savings.
3. If there are any other costs MPS can anticipate that have not been identified in this RFP, please describe them and assign dollar value(s) for each.

G. Billing and Payment

1. MPS pays its organizations on a net 30-day term.
2. To manage our Vendor Master profile in our procurement system, we prefer to remit payments to one central location only.

SECTION IV: PROJECT SCOPE

Furnish labor, materials, equipment, and incidentals as needed for installation only of AMP electrical switchgear equipment per plans and specifications by Hallberg Engineering, Plan Sheets E000 & E010 dated 2/18/2022. See attached appendix.

Switchgear equipment is onsite at Northrop Elementary school and is located in the school cafeteria.

American Midwest Power Packing Slip, As-Built plans, Shop Drawings, and Installation Operation & Maintenance Manual are included in attached appendix.

The proposed **RFP 24-22** must include, but not limited to, the following components:

1. Include installation of Owner Provided Switchgear.
2. Includes relocating switchgear equipment from school cafeteria area to lower level boiler room where existing electrical equipment is located.
3. Include electrical permit.
4. Include an Arc Flash/Coordination Study Allowance of \$ 5,000.00.
5. Include temporary electric only required to complete installation task; no other building backup to be provided.
6. Include material, labor and state/local tax.
7. Include removal and disposal of existing switchboard.

8. Include coordination of electrical shut-down with Xcel Energy and MPS Project Manager, Ann Cerney.
9. Exclude all energy provider costs.
10. Exclude X-ray & GPR.
11. No premium time included.
12. Performance bond required on proposals over \$75,000.
13. Bid bond required on proposals over \$75,000.
14. Affirmative Action Plan required on proposals over \$100,000.
15. MPS Board Approval required on proposals over \$100,000.
16. Prevailing Wage required per MPS Project Labor Agreement.

A. Wrap up to Project Scope Information

1. The District's key objective is to get the best overall value, taking into account quality, cost, service, diversity, community involvement, sustainability and other relevant factors, for the services we intend to acquire. Because one of our objectives is to reduce our total cost of doing business, we ask you to summarize how you will help us accomplish this objective without compromising the overall value we receive from you.
2. Identify and describe any and all other related services or concepts that your organization is offering as part of this proposal.
3. Is there any further information or comments pertinent to this RFP that you wish to add?

SECTION V: Appendix Requirements

- A. References: Please see section III. A. Question 8 for table
- B. Bid Form: See Appendix 4. Copy and paste onto your company's letterhead.

SECTION VI: MPS Appendix Documents

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 - l. 26 05 53 Identification for Electrical Systems
 - m. 26 24 00 Switchboards and Panelboards
 - n. 26 28 16 Enclosed Switches and Circuit Breakers

APPENDIX 1

INTENTION TO SUBMIT A PROPOSAL

In order to provide timely updates to this Request for Proposal, including the responses to questions submitted, we ask that potential organizations complete the follow form and return it by email to BOTH Procurement at RFX@mpls.k12.mn.us and ann.cerney@mpls.k12.mn.us

Business Name:
RFP Point of Contact:
RFP Contact Email:
Physical Address:
Mailing Address:
Phone #
Fax #:
Diverse Organization?: If no, please select "None of the Above". If yes, please select which classification: <ul style="list-style-type: none">- Disadvantage Business Enterprise- GLBT- Veteran Owned- Woman Owned and Controlled- Minority Owned and Controlled- Service Disabled Veteran- Non Profit- None of the Above

☐ Yes, we plan to submit a proposal to provide the request product/service. Please continue to provide updates to the individual named above.

☐ No, we do not plan to submit a proposal.

Reason: _____

Organization Name (Print name): _____

Signature of Authorized Individual: _____

Printed Name of Authorized Individual: _____

Printed Title of Authorized Individual: _____

Date: _____

APPENDIX 2

Organization Information Cover Page

<u>Organization Information</u>
Name of Organization:
RFP Contact Person's Full Name and Title:
RFP Contact Person's Email Address:
RFP Contact Person's Phone Number:
Main Office Address:
Date (Month/Year) the organization was formed:

APPENDIX 3

MINNEAPOLIS PUBLIC SCHOOLS CONTRACT

CONTRACT FOR SERVICES (\$25,000+)

This Contract is entered into between Special School District No. 1, "District", a special school district created and existing under the laws of Minnesota, and «CompanyName», "Contractor" (collectively "parties") to provide «ContractPurpose» to «ContractGroup».

1 TERM OF CONTRACT

- 1.1 This Contract is effective on «EffectiveDate» or the date of the last signature of the parties, whichever is later, and shall remain in effect until «OriginalExpirationDate», or until all obligations set forth in this Contract have been satisfactorily fulfilled, or the Contract has been terminated, whichever occurs first. Contractor shall have a continuing obligation, after said Contract period, to comply with any provision of this Contract intended for District's protection or benefit, or that that by its sense and context, is intended to survive the completion, expiration or termination of this Contract.
- 1.2 Contractor understands that NO WORK SHOULD BEGIN UNDER THIS CONTRACT until all required signatures on this Contract have been obtained and the Contract has been authorized and/or approved by the District's Board. Any work performed by Contractor prior to such time shall be considered as having been performed at Contractor's OWN RISK and as a volunteer.

2 SCOPE OF WORK

- 2.1 Contractor shall perform all of the services set forth herein and any exhibits attached hereto as Exhibit A ("Scope of Work"). Contractor understands that time is of the essence in this Contract and agrees to meet all milestones indicated in this section, in the Contract herein and any exhibits attached hereto.

3 CONSIDERATION AND TERMS OF PAYMENT

The consideration for all services (and goods if any) performed or supplied by Contractor under this Contract shall be paid by District as described below.

3.1 Total Obligation.

District's total obligation to Contractor under this Contract, including compensation for goods, services, and reimbursable expenses, shall not exceed \$«ContractValue». Contractor shall not receive any additional reimbursement for materials or subsistence expenses incurred in the performance of this Contract.

3.2 Frequency of Invoicing and Terms of Payment.

Subject to the conditions herein, payment shall be made by District within thirty (30) days upon receipt of Contractor's invoice for goods delivered or services rendered pursuant to this Contract. The Contractor's standard invoice shall be submitted after satisfactory completion of services on

a monthly basis. District has no obligation to pay for services that are not satisfactorily performed or performed in violation of federal, state or local law, ordinance, rule or regulation. In the case of a dispute about satisfactory performance of services, the parties agree to work in good faith to resolve any disputes. If either party does not dispute an invoice in writing within 180 days of receipt of the invoice, no action challenging the invoice may be taken.

As applicable, for all agreed upon work performed by Contractor or Contractor's personnel in the provision of goods and/or services stipulated herein, District shall pay Contractor at the hourly or per diem rates as set forth in the applicable Exhibit B. Payment shall be made to Contractor based on the hours recorded provided such hours are in accordance with the terms of this Contract. Notwithstanding anything to the contrary, and without limitation, District has not promised or guaranteed any minimum amount of work, and Contractor understands and acknowledges same. District has no obligation to pay for overtime or holiday work, nor will it pay premiums for overtime and holidays.

3.3 Taxes.

District is exempt from paying Minnesota sales and use taxes on certain purchases, as provided in Minnesota Statute, Section 297A.70. Contractor shall not charge District for such sales and use taxes. Alternatively, Contractor shall be responsible for the payment of any and all sales taxes to the Minnesota Department of Revenue relating to the following taxable items sold pursuant to this Contract; construction materials, leasing of motor vehicles, food and lodging, [See Minnesota Statute 297A.70]. Contractor shall promptly reimburse District for any and all such sales and use taxes paid by District to any governmental authority on behalf of Contractor including penalties and interest with respect thereto, and including any and all expenses (including attorneys' fees) or damages that result from a failure by Contractor to properly remit or reimburse District for any and all such sales and use taxes provided above.

District may be obligated by state and federal law to withhold state and federal taxes from the consideration stated herein. These taxes may consist of, but are not limited to, the Minnesota state entertainer tax, Minnesota state nonresident withholding tax, federal withholding on payments to foreign nonresident aliens, and federal backup withholding.

3.4 Fund Availability; Federal Funds Contingency.

Financial obligations of District payable after the current fiscal year are contingent upon funds for that purpose being appropriated, budgeted and otherwise made available. If this Contract is funded in whole or in part with federal funds, District's payment obligations are subject to and contingent upon the continuing availability of federal funds for the purposes hereof.

4 GENERAL TERMS AND CONDITIONS

- 4.1 The terms and conditions contained in this Contract shall govern and shall take precedence over any different or additional terms and conditions which Contractor may have included in any documents attached to or accompanying this Contract. Any handwritten changes on the face of this document shall be ignored and have no legal effect unless initialed by all parties. If this Agreement was made pursuant to a Request for Proposal (RFP) or Request for Information (RFI), the following order of precedence shall apply: (1) this Contract and its Exhibits, (2) District's RFP or RFI, and (3) Contractor's Response to District's RFP or RFI.

5 AFFIRMATIVE ACTION, EQUAL EMPLOYMENT OPPORTUNITY

5.1 The District is committed to the policy that all persons shall have equal access to its programs, facilities, and employment without regard to race, color, creed, religion, sex, national origin, age, marital status, disability, public assistance status, veteran status, or sexual orientation and is committed to transacting business only with firms who follow these practices. Contractor must apply every good faith effort to ensure implementation of this policy in their practices of employment, upgrade, demotion or transfer, recruitment, or recruitment advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship. As applicable, Contractor shall also develop and have on file for each of its establishments, written Affirmative Action Plans, as may be required by the rules and regulations of the Secretary of Labor. If applicable, Contractor certifies that it has received a certificate of compliance from the Minnesota Commissioner of Human Rights for its affirmative action plan. By accepting this Contract, Contractor certifies that it complies with all applicable federal and state laws as well as District policies related to non-discrimination, equal employment opportunity, and affirmative action.

6 BACKGROUND CHECKS

6.1 Contractor shall screen Contractor and all paid and volunteer employees and agents, including interviews, reference checks, credit history (if handling district funds), driving history and insurance coverage (if transporting district staff, students or families). And, Contractor shall conduct criminal background checks in accordance with state and federal law and District policy for Contractor and all paid and volunteer employees and agents who will have direct contact with children under this Contract. Background checks will be done prior to any contact with children, and shall be done in accordance with applicable state and federal laws, including but not limited to Minn. Stat. Sections 299C.61-.64; Minn. Stat. Section 123B.03; 42 U.S.C. Section 5119a and 42 U.S.C. Section 14501-05.

6.2 Contractor is responsible for ensuring that all paid and volunteer employees and agents who will be in contact with District staff and students are appropriate persons to conduct such work.

7 DATA PRIVACY

7.1 Contractor agrees that any information it creates, collects, receives, stores, uses, or disseminates during the course of its performance, which concerns the personal, financial, or other affairs of the District, its Board, officers, employees or students shall be kept confidential and in conformance with all state and federal laws relating to data privacy, including, without limitation, the Minnesota Government Data Practices Act, Minnesota Statute, Chapter 13. Contractor must comply with any applicable requirements as if it were a governmental entity. The remedies in Minn. Stat. § 13.08 apply to the Contractor. The Contractor will report immediately to the District any requests from third parties for information related to this Contract. The District will respond to such data requests. All subcontracts, if allowed, shall contain the same or similar data practices compliance requirements.

8 OWNERSHIP OF MATERIAL

8.1 The Contractor expressly waives to the District any claim to copyright pertaining to all new materials, publications, and documents produced as a result of this Contract and agrees that the District shall have exclusive right to and responsibility for their distribution, publication,

copyrighting (when applicable) and all other matters relating to dissemination of the materials. Contractor shall not use, willingly allow or cause to have such materials used for any purpose other than performance of Contractor's obligations under this Contract without prior written consent of the District.

9 USE OF DISTRICT NAME OR LOGO

9.1 Contractor agrees not to use the name, logo, or any other marks (including, but not limited to, colors and music) owned by or associated with the District or the name of any representative of the District in any sales promotion work or advertising, or any form of publicity, without the written permission of the District.

10 INDEPENDENT CONTRACTOR

10.1 Contractor shall perform its duties hereunder as an independent contractor and not as an employee of the District. Neither Contractor nor any agent or employee of Contractor shall be or shall be deemed to be an agent or employee of the District. Contractor shall pay when due all required employment taxes and income tax withholding, including all federal and state income tax on any monies paid pursuant to this Contract. Contractor acknowledges that Contractor and its employees are not entitled to tax withholding, worker's compensation, unemployment compensation, or any employee benefits, statutory or otherwise. Contractor shall have no authorization, express or implied, to bind District to any agreements, liability, or understanding except as expressly set forth herein. Contractor shall be solely responsible for the acts of Contractor, its employees and agents.

10.2 Contractor shall hold District completely harmless from and against any such contributions, premiums and taxes described above and from all claims and liability pertaining to those or any other item for which Contractor is responsible under this Contract, and from all attorney's fees and other costs incurred by District in contesting or defending against any responsibility therefore which is asserted against District.

11 WORKER HEALTH, SAFETY AND TRAINING

11.1 Contractor shall be solely responsible for the health and safety of its employees and/or self in connection with the work performed under this Contract. Contractor shall make arrangements to ensure the health and safety of all subagents and other persons who may perform work in connection to this Contract. Contractor shall ensure all personnel, subagents and/or self are properly trained and supervised and, when applicable, duly licensed or certified appropriate to the tasks performed under this Contract. Contractor shall comply with federal, state and local occupational safety and health standards, regulations, and rules promulgated pursuant to the Occupational Health and Safety Act that are applicable to the work performed by Contractor. Contractor shall develop and implement an emergency plan and procedures to follow in emergencies.

12 BUREAU OF CITIZENSHIP & IMMIGRATION SERVICES REQUIREMENTS

12.1 Contractor shall comply with all applicable requirements of the BCIS relating to employment including but not limited to confirming nationality for all employees and complying with requirements for employing aliens if appropriate.

13 INSURANCE

13.1 At all times during its performance under this Contract, Contractor shall obtain and keep in force comprehensive general liability insurance, including coverage for death, bodily or personal injury, property damage, liability and automobile coverages, with limits of not less than \$1,500,000 each claim and \$1,500,000 each occurrence covering claims that arise out of its acts and operations in providing services to the District or at limits established for a municipal corporation by Minnesota Statute Section 466.04. All such certificates evidencing such insurance shall name District as additional insured. Contractor may meet the limits above \$1,000,000 per occurrence through umbrella or excess coverage.

13.2 Contractor represents that it has worker's compensation insurance to the extent required by law and agrees to furnish proof of such insurance for worker's compensation and the liability insurance, upon request. Contractor also represents that it has professional liability insurance with limits of not less than \$1,500,000 each claim and \$1,500,000 each occurrence covering claims that arise out of its acts and operations in providing services to the District, but shall not name the District as an additional insured to the coverage.

13.3 Contractor or its members shall also maintain property insurance coverage for the facility in which the program is located if it is not in a district building. Contractor and its members shall obtain and maintain insurance covering claims for the loss of or damage to its personal property that may be caused by students attending its programs.

13.4 Contractor shall provide all such certificates to District. Contractor shall not cancel or revise any insurance coverage required by this section during the term of this Contract, and shall require its insurer to mail the District a notice if the coverage is cancelled or revised.

14 INDEMNIFICATION

14.1 Contractor agrees to release, defend, indemnify, and hold harmless District, its board, officers, students, employees, and agents from all liability, injuries, claims, damages (including claims of bodily injury, property damage, or negligence), or loss, including costs, expenses, and attorneys' fees, which arise in connection with, in relation to, or as a result of Contractor's negligent acts or omissions or in connection with Contractor's breach of warranties. The foregoing agreement to release, defend, indemnify and hold harmless shall not apply to the extent such liability, injuries, claims, damages, or loss was caused by the intentional, willful, or wanton acts of District. Contractor shall not settle or compromise any claim in which the District has been named a party and for which Contractor must indemnify the District without a signed agreement approved by the District.

15 LIMITATION ON LIABILITY

15.1 In no event shall the District be liable for any indirect, consequential, incidental, lost profits or like expectancy damages arising out of the Contract. District's maximum obligation under this Contract shall not exceed the amount set forth herein.

16 CONFLICT OF INTEREST/CODE OF ETHICS

16.1 Contractor agrees that it will not represent any other party or client which may create a conflict of interest in its representation with the District. Contractor agrees to be bound by the District's Code of Ethics. In particular, Contractor: (i) certifies that it has not paid kickbacks directly or indirectly to any District employee for the purpose of obtaining this or any other District Contract; (ii) agrees to cooperate fully with any investigation involving a possible violation; and (iii) agrees to report any suspected violations to the District. Contractor certifies that it has provided no fees, gifts, gratuities, compensation, or anything of value in violation any applicable laws or District policies.

17 COMPLIANCE WITH LAWS AND DEBARMENT

17.1 Contractor certifies that all goods or services furnished under this Contract shall comply with all applicable federal, state, and local laws and regulations, as well as District policies and procedures, regardless of whether such laws and regulations are specifically set forth in this Contract. Contractor represents that it is not currently debarred or suspended by any federal agency from doing business with the federal or state government. Contractor shall notify District if it becomes debarred or suspended during the term of this Contract. District may immediately terminate this Contract in the event of such termination or suspension and Contractor shall be responsible for any costs incurred by District in connection therewith.

18 TERMINATION

18.1 The District and/or Contractor may terminate this Contract at any time without cause, upon thirty (30) days written notice to the other Party. In the event of such termination, Contractor shall be entitled to payment, calculated on a pro rata or other equitable basis, determined by District in its sole discretion, for work or services satisfactorily performed. In no event shall Contractor be paid for work performed or costs incurred after termination, or for costs incurred by suppliers or subcontractors which reasonably could have been avoided.

18.2 District may terminate this Contract in whole or in part for cause upon seven (7) days written notice if Contractor fails to comply with any material term or condition of this Contract, becomes insolvent or files for bankruptcy protection, or fails to comply in a material way with the requirements of this Contract. Late delivery of goods or services, or delivery of goods or services that are defective or do not conform to the Contract shall, without limitation, be causes allowing District to terminate for cause. If a determination is made that District improperly terminated this Contract for Cause, then such termination shall be deemed to have been for without cause.

18.3 Notwithstanding the above, Contractor shall not be relieved of liability to the District for damages sustained by the District as a result of any breach of this Contract by the contractor. The District, may, in such event, withhold payments due to the Contractor for the purpose of set-off until such time as the exact amount of damages due to the District is determined. The rights or

remedies provided here shall not limit the District, in case of any default, error or omissions, by the Contractor, from asserting any other right or remedy allowed by law. Nothing in this Contract shall be construed as a waiver of any right, remedy, liability limit or immunity of the District under law.

19 RETURN OF DATA

19.1 Within fifteen (15) days of the completion or earlier termination of this Contract, or upon earlier request of the District, Contractor shall return all documents, data and other information provided by the District to Contractor, or Contractor's employees or agents in connection with this Contract. Additionally, Contractor, upon the request of the District, shall destroy all copies of such District provided data, documents, or information in Contractor's possession or control, and provide District with proof of such destruction.

20 RECORDS MANAGEMENT AND MAINTENANCE

20.1 District shall have the right to inspect and copy such books, records, and documents (in whatever medium they exist) as well as all accounting procedures and practices of Contractor, its agents, and subcontractors to verify Contractor's performance and all expenses submitted pursuant to the terms of this Contract. Contractor shall make such items available for inspection during normal business hours at Contractor's place of business. Such records may be subject to copy, review and/or audit by District, State Auditor and/or the Comptroller General of the United States, or a duly authorized representative, if federal funds are used for any work under this Contract. All such items shall be retained by Contractor during the term of this Contract and for a period of six (6) years after the delivery of the goods and/or services. Any items relating to a claim arising out of the performance of this Contract shall be retained by Contractor, its agents and subcontractors, if any, until the claim has been resolved.

21 NOTICES/ADMINISTRATION

Except as otherwise provided in this Contract, all notices, requests and other communications that a party is required or elects to deliver shall be in writing and shall be delivered personally, or by facsimile or electronic mail (provided such delivery is confirmed), or by a recognized overnight courier service or by United States mail, first-class, certified or registered, postage prepaid, return receipt requested, to the other parties at the address set forth below or to such other address as such party may designate by notice given pursuant to this section.

Special School District No. 1
«ContractGroupCO»
Attn: Dept. Manager First and Last Name
1250 W. Broadway Ave.
Minneapolis, MN 55411
Email:
Fax:

«CompanyNameVC»

Attn: _____

Address: _____

Email: _____

Fax: _____

22 ACKNOWLEDGMENT

22.1 In signing, Contractor certifies under penalties of perjury (see Section 6109 of the IRS Code for further penalties) that: (1) the taxpayer ID number (TIN) provided to District is correct; (2) it is not subject to back up withholding because (a) it is exempt from such withholding, (b) it has not been notified by the IRS that it is subject to backup withholding as a failure to report all interest or dividends, or (c) the IRS has notified it that it is no longer subject to backup withholding; (3) it is a U.S. person (including a U.S. resident alien); and (4) it has full authority to execute this Contract and perform its obligation under this Contract. Contractor must cross out and initial item (2) and notify District in writing, if Contractor has been notified by the IRS that it is currently subject to backup withholding because of under reporting interest or dividends on its tax return. Contractor must cross out item (3) above if it is not a U.S. person for tax purposes or U.S. resident alien.

22.2 Notwithstanding this certification, Contractor hereby acknowledges that District has the right to withhold amounts for federal backup withholding if such withholding is required by written notice from the Internal Revenue Service issued subsequent to the date this Contract is executed.

23 NON-WAIVER

23.1 No waiver by any party of any default or nonperformance shall be deemed a waiver of any subsequent default or nonperformance.

24 ASSIGNMENT

24.1 Contractor may not assign any obligations of this Contract without the prior written consent of District. In the event of any assignment, Contractor shall remain responsible for its performance and that of any assignee under this Contract. This Contract shall be binding upon Contractor, and its successors and assigns, if any. Any assignment attempted to be made in violation of this Contract shall be void. Notwithstanding any notice of assignment, District's tender of payment to Contractor named herein, or to any person reasonably believed by District to be entitled to payment, shall satisfy District's obligation to pay, and in no event shall District be obligated to pay twice or be liable for any damages due to failure to pay the correct party.

25 CHOICE OF LAW, FORUM SELECTION, ENTIRE CONTRACT AND AMENDMENT

25.1 This Contract shall be construed under Minnesota law (without regard for choice of law considerations). Any action arising out of this Contract shall be heard by a state court in Minnesota. For this purpose, Contractor specifically consents to jurisdiction in Minnesota. This Contract constitutes the entire Contract and understanding of the parties and replaces any prior or contemporaneous agreement, whether written or oral. Any amendments to this Contract shall be in writing and executed by same parties who executed the original Contract, or their successors in office.

26 WARRANTY

26.1 Contractor expressly warrants and guarantees that the services performed under this Contract will be of the highest professional standards and quality. Contractor further represents that all services and goods (if any and as applicable) provided under this Contract: (i) are free from defects in material and workmanship; (ii) are of the quality, size and dimensions ordered; (iii) are fit for the particular needs and purposes of District as may be communicated to Contractor; (iv) comply with the highest warranties and representations expressed by Contractor orally or in any written document provided to or in the possession of District; (v) comply with all applicable laws, codes and regulations (including any published by any national or statewide association or groups); and (vi) are not restricted in any way by patents, copyrights, trade secrets, or any other rights of third parties. If any of the foregoing warranties are breached, Contractor agrees to correct all defects and nonconformities at Contractor's sole expense, to be liable for all direct damages suffered District and any other persons, and to defend, indemnify, and hold harmless District and its Board, officers, students, employees, and agents from any claim asserted by any person resulting in whole or in part from such breach. The foregoing warranties and guarantees shall not be deemed waived by reason of the acceptance of the goods or services or payment by District.

27 SEVERABILITY

27.1 If any provision of this Contract shall be invalid or unenforceable with respect to any party, the remainder of the Contract, or the application of such provision to persons other than those as to which it is held invalid or unenforceable, shall not be affected and each provision of the remainder of the Contract shall be valid and be enforceable to the fullest extent permitted by law.

28 SURVIVABILITY

28.1 The terms, provisions, representations, and warranties contained in this Contract that by their sense and context are intended to survive the performance thereof by any of the parties hereunder shall so survive the completion of performance and termination of this Contract, including the making of any and all payments hereunder.

[The remainder of this page intentionally left blank.]

SPECIAL SCHOOL DISTRICT NO. 1

By: _____

Name: «DistrictSigner» «DistrictSignerLast»
(Printed)

Title: _____

Date: _____

«CompanyNameSigBlock»

By: _____

Name: _____
(Printed)

Title: _____

Date: _____

EXHIBIT A: SCOPE OF WORK

Description of Services and Service Delivery

«Description»

Service Outcome

«DeliverablesOutcomes»

Method of Evaluation

«MethodOfEvaluation»

EXHIBIT B: PAYMENT TERMS

APPENDIX 4

Bid Form

COPY & PASTE THIS INFORMATION ON TO YOUR COMPANY'S FORMAL LETTERHEAD

To: Minneapolis Public Schools (MPS), Special School District No. 1
1250 West Broadway Avenue
Minneapolis, MN 55411

Project: Electrical Switchgear Installation Only RFP: 24-22
Northrop Elementary at Ericsson Building
4315 S 31st Ave, Minneapolis, MN 55406

Company Name: _____

Contact Person: _____ Email: _____ Phone: _____

I have examined the work site and the Bidding Documents, and hereby propose and agree to furnish all labor, materials, equipment, and incidentals required to complete the work per RFP 24-22.

Base Bid:

Written: _____ (\$ _____)

Are there any other costs MPS can anticipate that have not been identified in this RFP?

Describe fully _____

ALTERNATES: Voluntary Alternates are accepted and encouraged.

CONTRACT TIME: I agree to substantially complete the work by _____.

SITE VISIT: I have visited the work site to verify existing conditions regarding RFP 24-22.

BID GUARANTY PERIOD

I agree to hold these bids open for a period of _____ days after the bid opening. If this bid is accepted within that period, I agree to execute a contract with MPS.

PROJECT LABOR AGREEMENT

If awarded a Contract, all labor employed on the Project will comply with the paying of the Project Labor Agreement (PLA). ☐ yes ☐ no

EQUAL EMPLOYMENT AND AFFIRMATIVE ACTION

- a. I agree to comply with requirements for Equal Employment Opportunity and Affirmative Action.
- b. For construction projects or related materials and supplies over \$10,000 but under \$100,000, I have attached to this Bid Form a compliance statement on my company stationary assuring that the contracting firm is an Equal Opportunity/Affirmative Action Employer.

- c. For construction projects or related materials and supplies over \$100,000:
I have attached to this Bid Form verification of having an Affirmative Action Plan approved by
Minneapolis Public Schools.

SIGNATURE

- a. Name: _____ Title: _____
- b. Signature: _____ Date: _____
- c. Firm: _____
- d. Address: _____
(Street) (City) (State) (Zip Code)
- e. Telephone: _____ Email: _____
- f. If a partnership, list name and address of all partners. If a corporation, affix corporate seal and
list State of Incorporation.
- g. The person signing this form is a person authorized to bind the company they are signing for.

END OF DOCUMENT



AMP Manufacturing & Supply

3131 Vicksburg Lane N
Minneapolis, MN 55447 USA

Phone: 763 551 1555

Fax: 763 551 9275

Packing Slip No. 44988

Shipping Payment PP

Page 1 of 1

Invoice To: **GRAYBAR**

P.O. Box 78099

VEND CODE: VC0033415

St. Louis, MO 63178

USA

Ship To: JUSTIN GREIF

ISD 1 - MINNEAPOLIS SCHOOL DISTRICT

Mark: MPLS-NORTHROP/File# 378192332

ATTN: ACCOUNTS PAYABLE

4315 SOUTH 31ST AVENUE

MINNEAPOLIS, MN 55406-3801

Phone: 612-461-1460

Ship Date **3/5/2024**

Ship Via PRIORITY COURIER EXPERTS

RFP 24-22: APPENDIX 5

Line	Order Qty	Ship/BO Qty	Part ID/Description	U/M	Your Order	Our Order
1.00	1.000	1.000	AMP CUSTOM 'F' NEMA 1	EA	4703462093	104810
		0.000	Rev	FOB	FACTORY	
			TYPE 'F' NEMA 1	Terms	Net 30 Days	
			1200A 208/120V 3Ø 4W NEMA 1, AI	Salesperson	STEVE WEIDENBACH	
			bus, U/L listed, SUSE rated, 65K AIC			
			1 - 1200A 3P LSIG 100% rated Main			
			Circuit Breaker with arc energy			
			reduction maintenance switch			
			1 - 800A 3P circuit breaker			
			1 - 600A 3P circuit breaker			
			1 - 200A 3P circuit breaker			
			6 - 150A 3P circuit breakers			
			1 - 70A 3P circuit breaker			
			1 - T45120Y150AWAJ1C : 120/208V			
			3PH 4W 150kA/Mode, 300kA/Phase			
			Surge Protective Device - Overcurrent			
			integrated into the wiring			
			compartment (not taking up chassis			
			space) (UPDATED PN TO CHANGED			
			AN 'L' TO A 'J' FOR NO			
			ENCLOSURE TO MATCH			
			DRAWING. -TL 2/16/24)			
			1 - PM5563 Power meter with CTs			
			included			
			* Two section board - 72"W x			
			90"H x 24"D *			

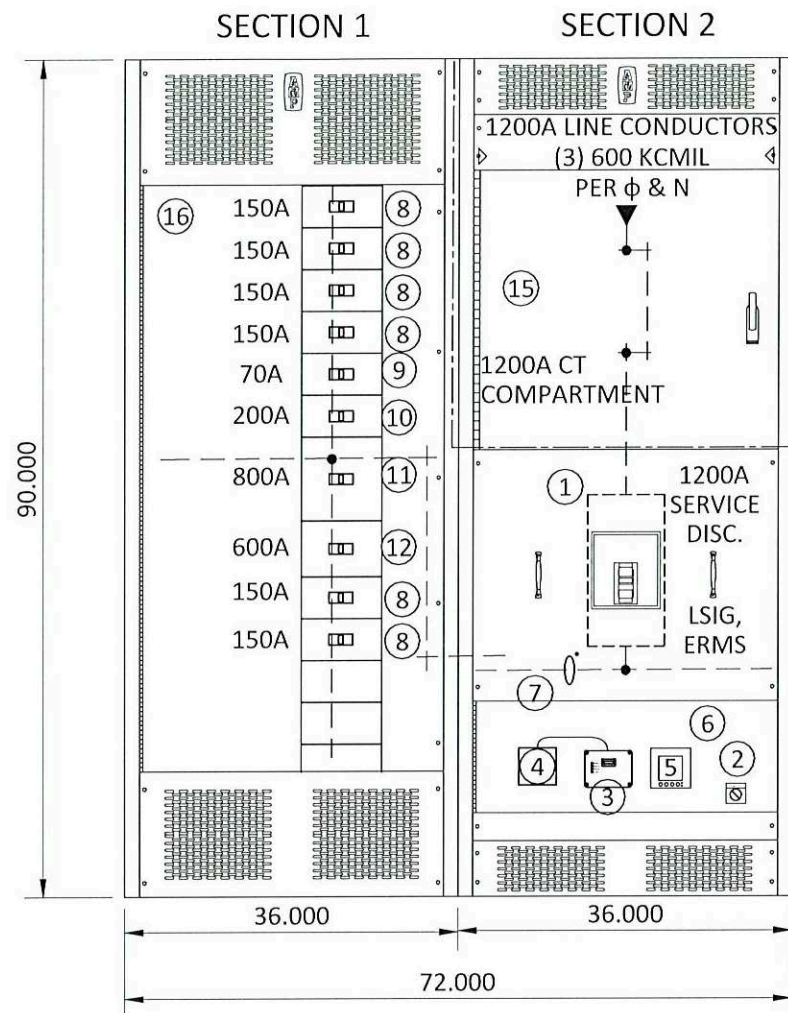
2/1250

3762751612-461-1460
Vance x 344R

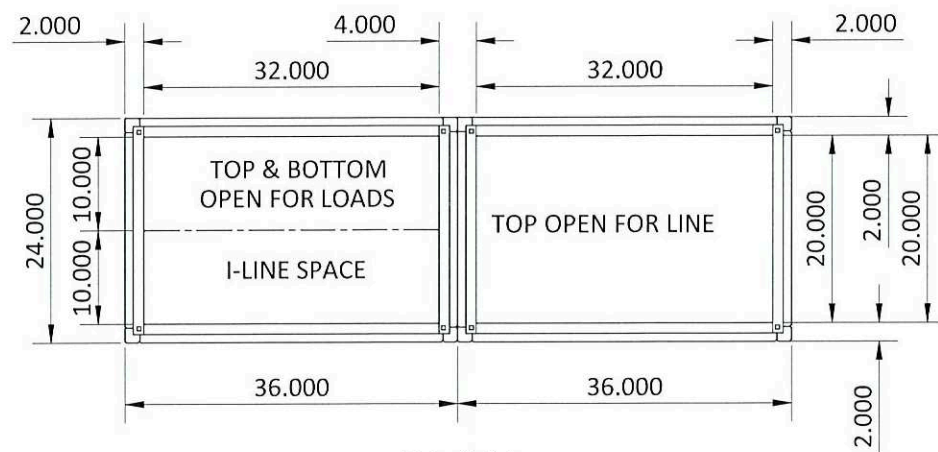
17523781

3/5/24
NAB

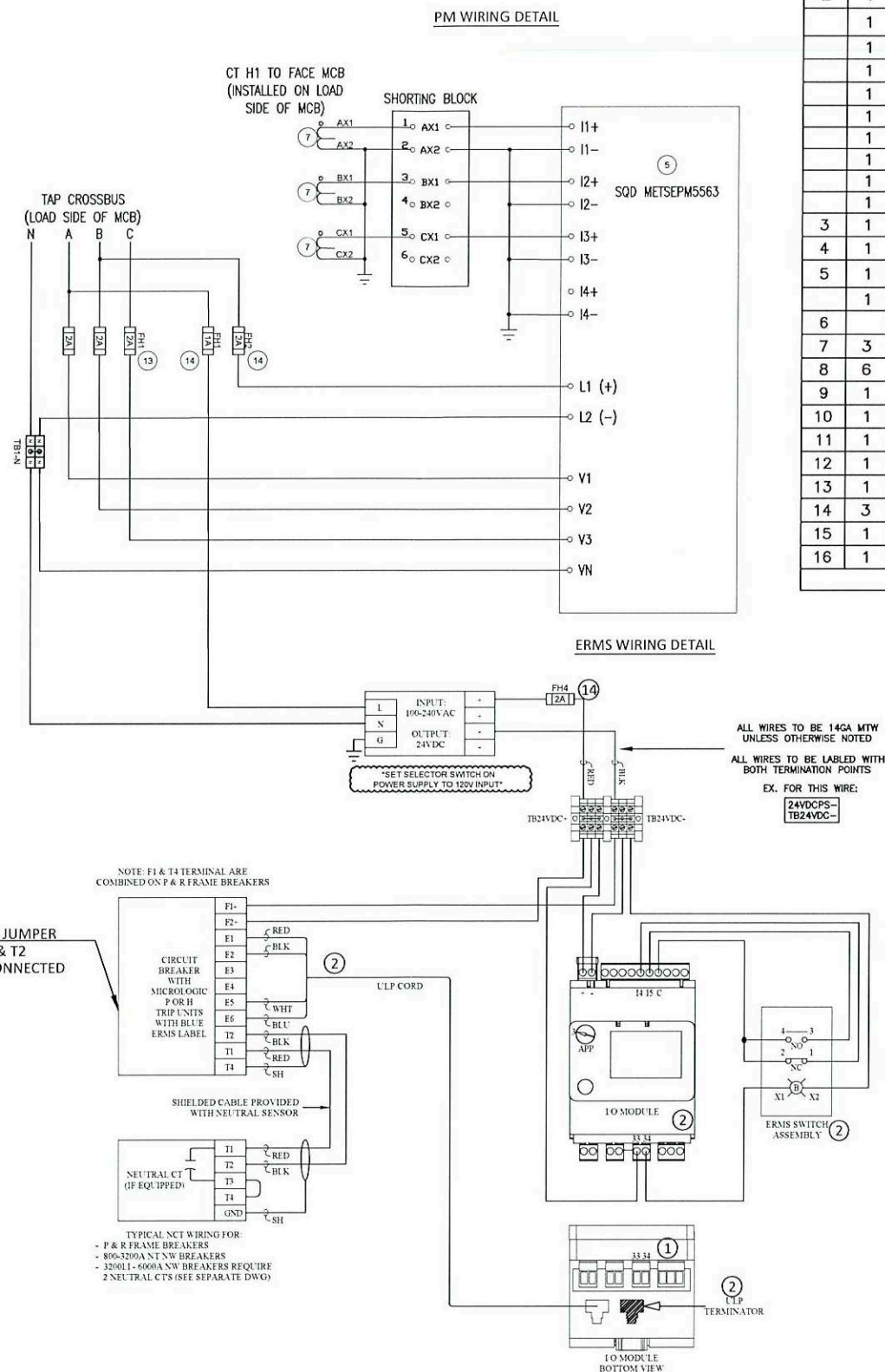
RFP 24-22: APPENDIX 6



FRONT ELEVATION



PLAN



BILL OF MATERIALS				
ITEM	QTY	PART NUMBER	DESCRIPTION	SUPPLIER
1	1	PGF36120CU64AE1JE	1200A 3P LSI G BREAKER W/ERMS	SQD
	1	S33576	NEUTRAL CT FOR RESIDUAL GROUNDING SYSTEM	SQD
2	1	LV434063	CB I/O MODULE	SQD
	1	LV434196	CB ULP CORD (4.37 FT)	SQD
	1	84956	ERMS INST. KIT	SQD
	1	TRV008800	ULP TERMINATOR	SQD
	1	M2SS5-11L	2 POS. SELECTOR SWITCH W/BUE HANDLE	ABB
	1	MCBH-00	CONTACT HOLDER	ABB
	1	MLBL1-01L	24V BLUE LED	ABB
	1	MCB-10	N.O. CONTACT	ABB
	1	MCB-01	N.C. CONTACT	ABB
	1	6EP13321LB00 2.5A	120V-24VDC POWER SUPPLY	SIEMENS
3	1	T45120Y150AWAJ1C	300KA PER PHASE SPD	SOUTHERN TIER
4	1	PT321	30A 3P CLASS 'I' FUSED PULL OUT FOR SPD	BOLTSWITCH
5	1	METSEPM5563RD	POWER METER W/REMOTE DISPLAY	SQD
	1	1706SC	6PT SHORTING BLOCK	MARTHON
6				
7	3	120-122	1200:5 CT FOR POWER METER	GE
8	6	HGA36150	150A 3P THERMAL MAGNETIC CIRCUIT BREAKER	SQD
9	1	HGA36070	70A 3P THERMAL MAGNETIC CIRCUIT BREAKER	SQD
10	1	JGA36200	200A 3P THERMAL MAGNETIC CIRCUIT BREAKER	SQD
11	1	MGA36800	800A 3P THERMAL MAGNETIC CIRCUIT BREAKER	SQD
12	1	LGA36600U31X	600A 3P LI CIRCUIT BREAKER	SQD
13	1	E93/30CC	3P FUSE BLOCK	ABB
14	3	E91/30CC	1P FUSE BLOCK	ABB
15	1	CT12	1200A 3PH UTILITY CT COMPARTMENT	AMP
16	1	CF16R63C	1600A 3PH SINGLE ROW CU I LINE CHASSIS	SQD

SEE AMP DRAWING "AMPSTL" FOR DEVICE LUG SIZES

REV. 9/14/23	XCEL MINNESOTA
TAMPER PROOFING	UTILITY TERM COMP: SEALING STUDS
HOT SEQUENCE SELF CONTAINED	240V UP TO 400A 480V UP TO 200A
COLD SEQUENCE SELF CONTAINED	240V N/A 480V N/A
CT REQUIREMENTS	240V ABOVE 400A 480V ABOVE 200A 12" MIN. TO BOTTOM OF ALL ACCESS DOORS
PT REQUIREMENTS	240V N/A 480V N/A
METER HEIGHT	Indoor: 24"-78" Outdoor: 36"-78"
CT HEIGHT	24"-72"
3R CONFIGURATION	FMUR
ADDITIONAL NOTES	

TYPE F SWITCHBOARD SPECIFICATION			
SYSTEM	AMPACITY	1200A	VOLTAGE 208Y/120V
	PHASE	3PH	WIRE 4W
	FREQUENCY	60HZ	SCCR 65,000A
	BUS MAT.	AL	CONFIG MAIN BREAKER
ENCL	TYPE NEMA 1, VENTED		
	FINISH ASA 49 GRAY		
STANDARDS	CERTIFICATION U.L. LISTED 891		
	SE	SUSE	SUITABLE FOR USE AS SERVICE ENTRANCE
	UTILITY XCEL ENERGY OF MINNESOTA		
GENERAL	FREE STANDING, FRONT ACCESSIBLE CLASS 1, DEADFRONT, FORMED 12 GA. STEEL FRAMING WITH 14 GA. STEEL PAN FORMED COVER PLATES POWDER PAINTED, TIN PLATED ALUMINUM AND/OR SILVER PLATED COPPER BUS		

JOB NAME:	NORTHROP SAFE & WELCOME
DIST/CUST:	GRAYBAR/ISD 1 MINNEAPOLIS
CUST PO#	4703462093

AMP AMERICAN MIDWEST POWER
3131 VICKSBURG LANE PH (763)551-1555
MINNEAPOLIS, MN 55447 FAX (763)551-9275

MISC. NOTES:			MINNEAPOLIS, MN 55447		FAX (763)551-9275	
DATE	BY	DESCRIPTION	THIS DRAWING AND THE INFORMATION THEREON ARE THE PROPERTY OF AMERICAN MIDWEST POWER AND ARE NOT TO BE COPIED, REPRODUCED, OR DISCLOSED TO OTHERS WITHOUT THE EXPRESS WRITTEN CONSENT OF AMERICAN MIDWEST POWER			1:20 SCALE
04/08/22	SMB	APPROVAL	SALES APPROVAL INITIAL: _____ DATE: _____ QUOTE# 33829 SALESPERSON: STEVE WEIDENBACH JOB# 22-104810 SHEET 1 OF 1			
05/19/22	SMB	INCOM. TOP SECT 2				
06/10/22	SMB	ADDED CT COMPARTMENT				
10/17/23	SMB	UPDATED SPD PART #				
02/26/24	TDK	AS BUILT				

AS BUILT 02/26/24

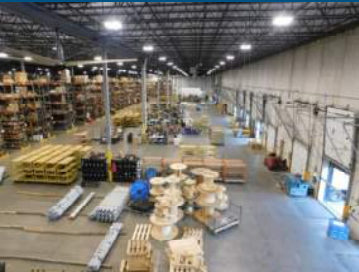
RFP 24-22: APPENDIX 7

Project Name: NORTHROP ELEMENTARY
Company: ISD-1 MSD
Prepared for: SEAN MCNAMARA
Notes: MPLS-NORTHROP



Ask about our Service Solutions that can help save you time and money

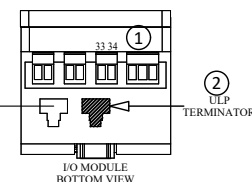
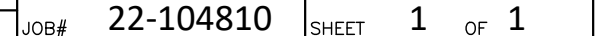
- Stage and Storage
- Material, Conduit, and Fixture Carts
- Graybar Managed Inventory (VMI)
- Kitting
- On-Site Customer Prefabrication
- After-Hours Pickup
- Mobile Trailers
- Strut Cutting
- Wire Management



ISMAEL MONTANEZ
INDUSTRIAL CSR
Ismael.montanez@graybar.com
612-728-2596

MINNESOTA LOCATIONS:

Minneapolis – 2300 E 25th St / 612-721-3545
Brooklyn Park – 7601 Setzler Pkwy N / 763-898-5600
Saint Paul – 308 State St / 651-222-4438
Saint Cloud – 1106 Sunridge Dr / 320-203-1442
Rochester – 910 7th St NW / 507-282-4444
Mankato – 1600 N Riverfront Dr / 507-388-6201
Duluth – 2601 W Superior St / 218-722-6685



ALL WIRES TO BE 14GA MTW
UNLESS OTHERWISE NOTED

ALL WIRES TO BE LABELED WITH
BOTH TERMINATION POINTS

EX. FOR THIS WIRE:

24VDCPS-
TB24VDC-

— — — =ONE-LINE
 — — — =BARRIER
 ⤵ =SEALING STUD
 ⤵ =CARRIAGE BOLT
 S.U. = SHIPPING UNIT
 SP = SPACE

MISC. NOTES:

DATE	BY	DESCRIPTION	THIS DRAWING AND THE INFORMATION THEREON ARE THE PROPERTY OF AMERICAN MIDWEST POWER AND ARE NOT TO BE COPIED, REPRODUCED, OR DISCLOSED TO OTHERS WITHOUT THE EXPRESS WRITTEN CONSENT OF AMERICAN MIDWEST POWER	1:20 SCALE
04/08/22	SMB	APPROVAL		
05/19/22	SMB	INCOM. TOP SECT 2	SALES	
06/10/22	SMB	ADDED CT COMPARTMENT	APPROVAL INITIAL: DATE:	
			QUOTE# 33829 SALESPERSON: STEVE WEIDENBACH	
			JOB# 22-104810	SHEET 1 OF 1

Product data sheet

Specifications



Circuit breaker, PowerPact P,
1200A, 3 pole, 600VAC, 18kA,
busbar, Micrologic 6.0P, 100%,
modbus

PGF36120CU64AE1

Main

Range	PowerPact
Product name	PowerPact P
Product or Component Type	Circuit breaker
Device Application	Distribution

Complementary

Line Rated Current	1200 A
Number of Poles	3P
Control Type	Toggle
Breaking capacity code	G
Breaking capacity	AIR 65 kA 240 V AC 50/60 Hz UL 489 AIR 35 kA 480 V AC 50/60 Hz UL 489 AIR 18 kA 600 V AC 50/60 Hz UL 489 Icu 50 kA 240 V AC 50/60 Hz IEC 60947-2 Icu 35 kA 380/415 V AC 50/60 Hz IEC 60947-2
[Ue] rated operational voltage	600 V AC 50/60 Hz UL 489
Network Frequency	50/60 Hz
[Ics] rated service breaking capacity	25 kA 240 V AC 50/60 Hz IEC 60947-2 20 kA 380/415 V AC 50/60 Hz IEC 60947-2
[Uimp] rated impulse withstand voltage	8 kV IEC 60947-2
Trip unit technology	Electronic, power, Micrologic 6.0 P, LSI
Continuous current rating	100 %
[Ui] rated insulation voltage	750 V IEC 60947-2
Trip unit name	Micrologic 6.0 P
Accessory / separate part type	Modbus connecting cable
AWG gauge	4 x AWG 3/0...500 kcmil aluminium/copper
Local signalling	Overload 1 trip indicator green) 1 trip indicator green) Trip causes 1 trip indicator green)
Mounting mode	Unit mount busbar)
Mounting Support	Busbar
Electrical connection	Busbar connection line Busbar connection load

Terminal identifier	AL1200P25K
Long time pick-up adjustment range	0.4...1 x Ir
Tightening torque	442.54 lbf.in (50 N.m) 0.15...0.37 in² (95...240 mm²) (4 x AWG 3/0...500 kcmil) 8.85...11.51 lbf.in (1.0...1.3 N.m)
Number of slots	2 auxiliary switch OF plug-in) 1 alarm switch SD plug-in) 1 overcurrent trip switch SDE plug-in) 1 voltage release MN or MX plug-in)
Power wire stripping length	1.18 in (30 mm)
Height	16.16 in (410.46 mm)
Width	8.27 in (210.06 mm)
Depth	8.05 in (204.47 mm)
Net Weight	32 lb(US) (14.51 kg)
Quantity per Set	1
Communication interface	Modbus

Environment

Quality labels	CE
Standards	UL CSA NEMA NOM-003-SCFI-2000 IEC 60947-2
Product certifications	UL CSA NOM
IP degree of protection	Front cover IP40
Pollution degree	3 IEC 60947-1
Ambient Air Temperature for Operation	28...158 °F (-2...70 °C)
Ambient Air Temperature for Storage	-58...185 °F (-50...85 °C)
Operating altitude	< 6561.68 ft (2000 m) without derating 13123.36 ft (4000 m) with derating

Ordering and shipping details

Category	01215-PG,H,J,K,L,N UNIT MT BREAKERS
Discount Schedule	DE2
Nbr. of units in pkg.	1
Package weight(Lbs)	32.00 lb(US) (14.515 kg)
Returnability	Yes
Country of origin	US

Packing Units

Unit Type of Package 1	PCE
Package 1 Height	16.14 in (41 cm)
Package 1 width	8.27 in (21 cm)
Package 1 Length	8.03 in (20.4 cm)

Offer Sustainability

Sustainable offer status	Green Premium product
California proposition 65	WARNING: This product can expose you to chemicals including: DINP, which is known to the State of California to cause cancer, and DIDP, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov
REACH Regulation	REACH Declaration
EU RoHS Directive	Compliant EU RoHS Declaration
Mercury free	Yes
RoHS exemption information	Yes
China RoHS Regulation	China RoHS declaration Product out of China RoHS scope. Substance declaration for your information.
Environmental Disclosure	Product Environmental Profile
Circularity Profile	End of Life Information
PVC free	Yes

Contractual warranty

Warranty	18 months
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PowerPac™ M-, P- and R-Frame, and ComPact™ NS630b–NS3200 Circuit Breakers

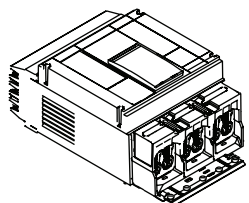
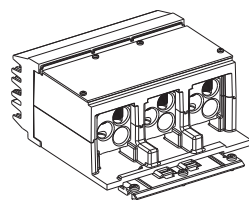
Section 9—Accessories

Table 97: Locks and Interlocking

Device	Description	M- and P-Frame		R-Frame	
		Factory-Installed Cat. No. Suffix	Field-Installed Cat. No.	Factory-Installed Cat. No. Suffix	Field-Installed Cat. No.
Handle Padlocking Device	Removable (Lock Off or On)	—	—	—	—
	Removable (Lock Off Only)	—	S44936	—	S33996
	Fixed (Lock Off or On)	YP	S32631	YP	S32631
	Fixed (Lock Off Only)	YQ	MPRPAF	YQ	MPRPAF
Interlocking (Not UL listed)	Mechanical for Circuit Breakers with Rotary Handles ¹	—	S33890	—	—
Key Locking	Provision Only, Vertical Mount, 1 key interlock including padlock provision, open position only	Kirk	JE¹	—	JE ¹
	Provision Only, Vertical Mount, 1 or 2 Locks	Kirk	JA	—	—
	Provision Only, Horizontal Mount	Kirk	JK	—	JK
	1 Lock, M- and P-Frame	Ronis	—	—	JB
	1 or 2 Locks, R-Frame	Profalux	—	—	JD
	Provision and 1 Lock, Vertical Mount	Kirk	JG	—	—
	Provision and 1 Lock, Horizontal Mount	Kirk	JL	—	JL
		Ronis	—	—	JC
		Profalux	—	—	JF
	Provision and 2 Locks Keyed Alike, Vertical Mount	Kirk	JN	—	—
	Provision and 2 Locks Keyed Alike, Horizontal Mount	Kirk	—	—	JN
	Provision and 2 Locks Keyed Differently, Vertical Mount	Kirk	JP	—	—
	Provision and 2 Locks Keyed Differently, Horizontal Mount	Kirk	—	—	JP

¹ Not available on M-frame, motor-operated P-frame, or I-Line circuit breakers.

Sub-Feed Lugs



Sub-feed lug kits are UL Listed for use on Listed equipment. They have plug-on jaw construction and plug on to the I-Line bus stack in the same manner as branch circuit breakers. Lugs on these devices accommodate the same wire sizes as the equivalent ampere rated circuit breakers.

Table 98: I-Line Sub-Feed Lug Kit Terminations

Plug-On Lug Kit Cat. No.	Poles	Mounting Height	Ampere Rating	Lug		
				Catalog No.	Wire Size	Conductors Per Lug
SL800M5	3		800 A	—	3/0 AWG–500 kcmil (95–240 mm ²)	3
SL1200P5	3		1200 A	—	3/0 AWG–500 kcmil (95–240 mm ²)	4
SL1200P6	3		1200 A	—	350–600 kcmil (185–300 mm ²)	3
SL1200P7	3		1200 A	—	3/0 AWG–750 kcmil (95–400 mm ²)	2
S33931	3	9 in.	1200 A	AL1200P24K	3/0 AWG–500 kcmil (95–240 mm ²)	4
S33930	3	15 in.	1200 A	AL1200R53K	3/0 AWG–600 kcmil (95–300 mm ²)	4

Product data sheet

Specifications



Neutral current transformer, PowerPact P, MasterPact, 400A to 1600A sensor

S33576

Product availability : Stock - Normally stocked in distribution facility

Price* : 1,914.00 USD

Main

Range of Product	PowerPact P MasterPact NT
Product or Component Type	Sensor
Circuit breaker type	NT P-frame

Complementary

Product compatibility	MasterPact NT Masterpact PowerPact P PowerPact
Line Rated Current	250 A
Mounting Location	External
Product destination	Current transformer
Tightening torque	300.92 lbf.in (34 N.m)

Ordering and shipping details

Category	01290-MASTERPACT ACCESSORIES
Discount Schedule	DE2F
GTIN	785901942764
Nbr. of units in pkg.	1
Package weight(Lbs)	5.70 lb(US) (2.586 kg)
Returnability	No
Country of origin	US

Packing Units

Unit Type of Package 1	PCE
Package 1 Height	5.12 in (13 cm)
Package 1 width	2.99 in (7.6 cm)
Package 1 Length	8.19 in (20.8 cm)

Offer Sustainability

California proposition 65	WARNING: Cancer and Reproductive Harm - www.P65Warnings.ca.gov
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* Price is “List Price” and may be subject to a trade discount – check with your local distributor or retailer for actual price.

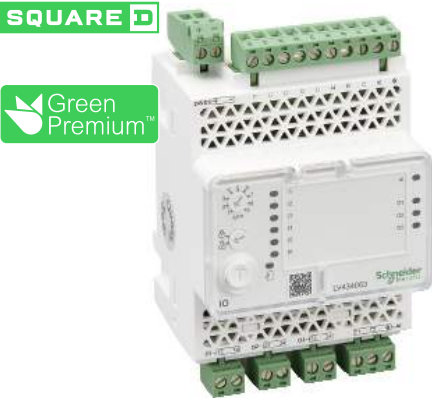
EU RoHS Directive	Under investigation
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Contractual warranty

Warranty	18 months
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Product data sheet

Specifications



I/O (input/output) application module, Enerlin'X

LV434063

Product availability : Stock - Normally stocked in distribution facility

Price* : 1,500.00 USD

Main

Device short name	I/O
Product or Component Type	I/O module
Range compatibility	MasterPact MTZ MasterPact NT MasterPact NW ComPact NSX ComPact NS630b...1600 ComPact NS1600b...3200 PowerPact J PowerPact L PowerPact H PowerPact P PowerPact R
Product name	Enerlin'X IO

Complementary

Communication network type	Universal Logic Plug 2 RJ45 connectors
[Us] rated supply voltage	24 V DC - 20...10 %
Current Consumption	165 mA
Electromagnetic compatibility	Electrostatic discharge immunity test EN/IEC 61000-4-2 Immunity to radiated fields 10 V/m EN/IEC 61000-4-3 Surge immunity test EN/IEC 61000-4-5
Number of Inputs	6 digital 1 analog
Input type	Digital state 1 19.8...25.2 V - DC - 6.1...8.8 mA Digital state 0 0...19.8 V - DC - 0 mA
Number of Outputs	3 digital
Output type	Digital 250 V - AC - 5 A
Cable length	32.81 ft (10 m)
Mounting Mode	By clips
Mounting Support	35 mm DIN rail
Control Type	By software
Time delay	0...20 s
Vibration frequency	5...8.4 Hz
Connections - Terminals	Screw terminal block
Product Certifications	FCC GOST

* Price is “List Price” and may be subject to a trade discount – check with your local distributor or retailer for actual price.

	CE cULus
Standards	IEC 60947-6-2 UL 60950 IEC 60950 UL 508
Depth	2.78 in (70.6 mm)
Height	4.57 in (116 mm)
Width	2.82 in (71.7 mm)
Net Weight	8.10 oz (229.5 g)

Environment

Relative humidity	5...85 %
IP degree of protection	Connectors IP2x Front panel IP4X Other parts IP3x
Ambient Air Temperature for Operation	-4...158 °F (-20...70 °C)
Ambient Air Temperature for Storage	-40...185 °F (-40...85 °C)
Pollution degree	3
Flame retardance	V0 conforming to UL
Shock resistance	1000 m/s²

Ordering and shipping details

Category	01103-H,J,COMPACT NS UL/IEC CIRCUIT BREAKER ACCESSORIES
Discount Schedule	DE2
GTIN	3606480631146
Nbr. of units in pkg.	1
Package weight(Lbs)	10.48 oz (297.0 g)
Returnability	Yes
Country of origin	ID

Packing Units

Unit Type of Package 1	PCE
Package 1 Height	3.54 in (9 cm)
Package 1 width	3.46 in (8.8 cm)
Package 1 Length	4.92 in (12.5 cm)
Unit Type of Package 2	P06
Number of Units in Package 2	192
Package 2 Weight	157.03 lb(US) (71.228 kg)
Package 2 Height	30.31 in (77 cm)
Package 2 width	31.50 in (80 cm)
Package 2 Length	23.62 in (60 cm)
Unit Type of Package 3	S03
Number of Units in Package 3	24
Package 3 Weight	17.09 lb(US) (7.752 kg)
Package 3 Height	11.81 in (30 cm)

Package 3 width	11.81 in (30 cm)
Package 3 Length	15.75 in (40 cm)

Offer Sustainability

Sustainable offer status	Green Premium product
California proposition 65	WARNING: Cancer and Reproductive Harm - www.P65Warnings.ca.gov
REACH Regulation	REACH Declaration
EU RoHS Directive	Compliant EU RoHS Declaration
Mercury free	Yes
RoHS exemption information	Yes
China RoHS Regulation	China RoHS declaration Product out of China RoHS scope. Substance declaration for your information.
Environmental Disclosure	Product Environmental Profile
Circularity Profile	End of Life Information
WEEE	The product must be disposed on European Union markets following specific waste collection and never end up in rubbish bins.

Contractual warranty

Warranty	18 months
----------	-----------

Product data sheet

Specifications



communication cable, breaker ULP
cord, 1.3 m length

LV434196

Main

Device short name	cord L = 1.3 m
Product or component type	Single-end prefabricated cable
Range compatibility	ComPact NS630b...1600 ComPact NS1600b...3200 MasterPact MTZ MasterPact NT MasterPact NW

Complementary

Localisation on device	External Internal
Connector type	1 RJ45
Length	1.3 m
Accessory / separate part category	Spare part

Packing Units

Unit Type of Package 1	PCE
Number of Units in Package 1	1
Package 1 Weight	44.0 g
Package 1 Height	3.5 cm
Package 1 width	5.6 cm
Package 1 Length	11.6 cm
Unit Type of Package 2	S02
Number of Units in Package 2	111
Package 2 Weight	5.217 kg
Package 2 Height	15 cm
Package 2 width	30 cm
Package 2 Length	40 cm

Offer Sustainability

Sustainable offer status	Green Premium product
REACH Regulation	REACH Declaration

REACH free of SVHC	Yes
EU RoHS Directive	Compliant EU RoHS Declaration
Toxic heavy metal free	Yes
Mercury free	Yes
RoHS exemption information	Yes
China RoHS Regulation	China RoHS declaration Pro-active China RoHS declaration (out of China RoHS legal scope)
Environmental Disclosure	Product Environmental Profile
Circularity Profile	End of Life Information
WEEE	The product must be disposed on European Union markets following specific waste collection and never end up in rubbish bins
California proposition 65	WARNING: Cancer and Reproductive Harm - www.P65Warnings.ca.gov

Contractual warranty

Warranty	18 months
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Product data sheet

Specifications



ULP Line terminations, set of 10 parts

TRV00880

Main

Device short name	ULP line terminators
Product or component type	Line terminator
Accessory / separate part category	Communication accessory
Range compatibility	ComPact NSX ComPact NSX DC PowerPact Multistandard ComPact NS630b...1600
Quantity per set	Set of 10

Complementary

Accessory / separate part category	Spare part ComPact NS630b...1600
------------------------------------	----------------------------------

Packing Units

Unit Type of Package 1	PCE
Number of Units in Package 1	1
Package 1 Weight	1.27 oz (36.0 g)
Package 1 Height	0.79 in (2 cm)
Package 1 width	2.76 in (7 cm)
Package 1 Length	2.76 in (7 cm)
Unit Type of Package 2	S03
Number of Units in Package 2	100
Package 2 Weight	9.70 lb(US) (4.4 kg)
Package 2 Height	11.81 in (30 cm)
Package 2 width	11.81 in (30 cm)
Package 2 Length	15.75 in (40 cm)

Offer Sustainability

REACH Regulation	REACH Declaration
REACH free of SVHC	Yes
EU RoHS Directive	Compliant EU RoHS Declaration

Toxic heavy metal free	Yes
Mercury free	Yes
RoHS exemption information	Yes
China RoHS Regulation	China RoHS declaration Pro-active China RoHS declaration (out of China RoHS legal scope)
WEEE	The product must be disposed on European Union markets following specific waste collection and never end up in rubbish bins

Contractual warranty

Warranty	18 months
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Product data sheet

Specifications



Circuit breaker, PowerPact M, 800A, 3 pole, 600VAC, 18kA, I-Line, ET 1.0, 80%, ABC

MGA36800

Product availability : Stock - Normally stocked in distribution facility

Price* : 10,608.00 USD

Main

Range	PowerPact
Product name	PowerPact M
Product or Component Type	Circuit breaker
Device Application	Distribution

Complementary

Line Rated Current	800 A
Number of Poles	3P
Control Type	Operating handle
Breaking capacity code	G
Breaking capacity	AIR 65 kA 240 V AC 50/60 Hz UL 489 AIR 35 kA 480 V AC 50/60 Hz UL 489 AIR 18 kA 600 V AC 50/60 Hz UL 489 Icu 50 kA 240 V AC 50/60 Hz IEC 60947-2 Icu 35 kA 380/415 V AC 50/60 Hz IEC 60947-2
[Ue] rated operational voltage	600 V AC 50/60 Hz UL 489
Network Frequency	50/60 Hz
[Ics] rated service breaking capacity	25 kA 240 V AC 50/60 Hz IEC 60947-2 20 kA 380/415 V AC 50/60 Hz IEC 60947-2
[Uimp] rated impulse withstand voltage	8 kV IEC 60947-2
Trip unit technology	Electronic, basic, ET 1.0,
Magnetic tripping current	1600...8000 A
Continuous current rating	80 %
[Ui] rated insulation voltage	750 V IEC 60947-2
Trip unit name	ET 1.0
Suitability for isolation	Yes IEC 60947-2
Utilisation category	Category A
AWG gauge	3 x AWG 3/0...3 x 500 kcmil aluminium/copper
Local signalling	1 trip indicator green)
Mounting mode	I-Line bracket)

* Price is “List Price” and may be subject to a trade discount – check with your local distributor or retailer for actual price.

Disclaimer: This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications

Mounting Support	Bracket
Electrical connection	I-Line connection line Lugs load
Terminal identifier	AL800M23K
Long time pick-up adjustment range	300...800 A
Mounting Height	9 in (228.60 mm)
Tightening torque	442.54 lbf.in (50 N.m) 0.15...0.37 in² (95...240 mm²) (3 x AWG 3/0...3 x 500 kcmil)
Number of slots	2 auxiliary switch OF plug-in) 1 alarm switch SD plug-in) 1 voltage release MN or MX plug-in)
Power wire stripping length	0.98 in (25 mm)
Color	Black
Height	12.86 in (326.64 mm)
Width	8.27 in (210.06 mm)
Depth	8.05 in (204.47 mm)
Net Weight	29 lb(US) (13.15 kg)
Quantity per Set	1

Environment

Quality labels	CE
Standards	UL CSA NEMA NOM-003-SCFI-2000 IEC 60947-2
Product certifications	UL CSA NOM
IP degree of protection	IP40
Pollution degree	3 IEC 60947-1
Ambient Air Temperature for Operation	-13...158 °F (-25...70 °C)
Ambient Air Temperature for Storage	-58...185 °F (-50...85 °C)
Operating altitude	< 6561.68 ft (2000 m) without derating 13123.36 ft (4000 m) with derating

Ordering and shipping details

Category	01200-MG, MJ I-LINE BREAKER
Discount Schedule	DE2
GTIN	00785901496793
Nbr. of units in pkg.	1
Package weight(Lbs)	29.14 lb(US) (13.218 kg)
Returnability	Yes
Country of origin	US

Packing Units

Unit Type of Package 1	PCE
Package 1 Height	10.80 in (27.432 cm)
Package 1 width	12.00 in (30.48 cm)

Package 1 Length	18.10 in (45.974 cm)
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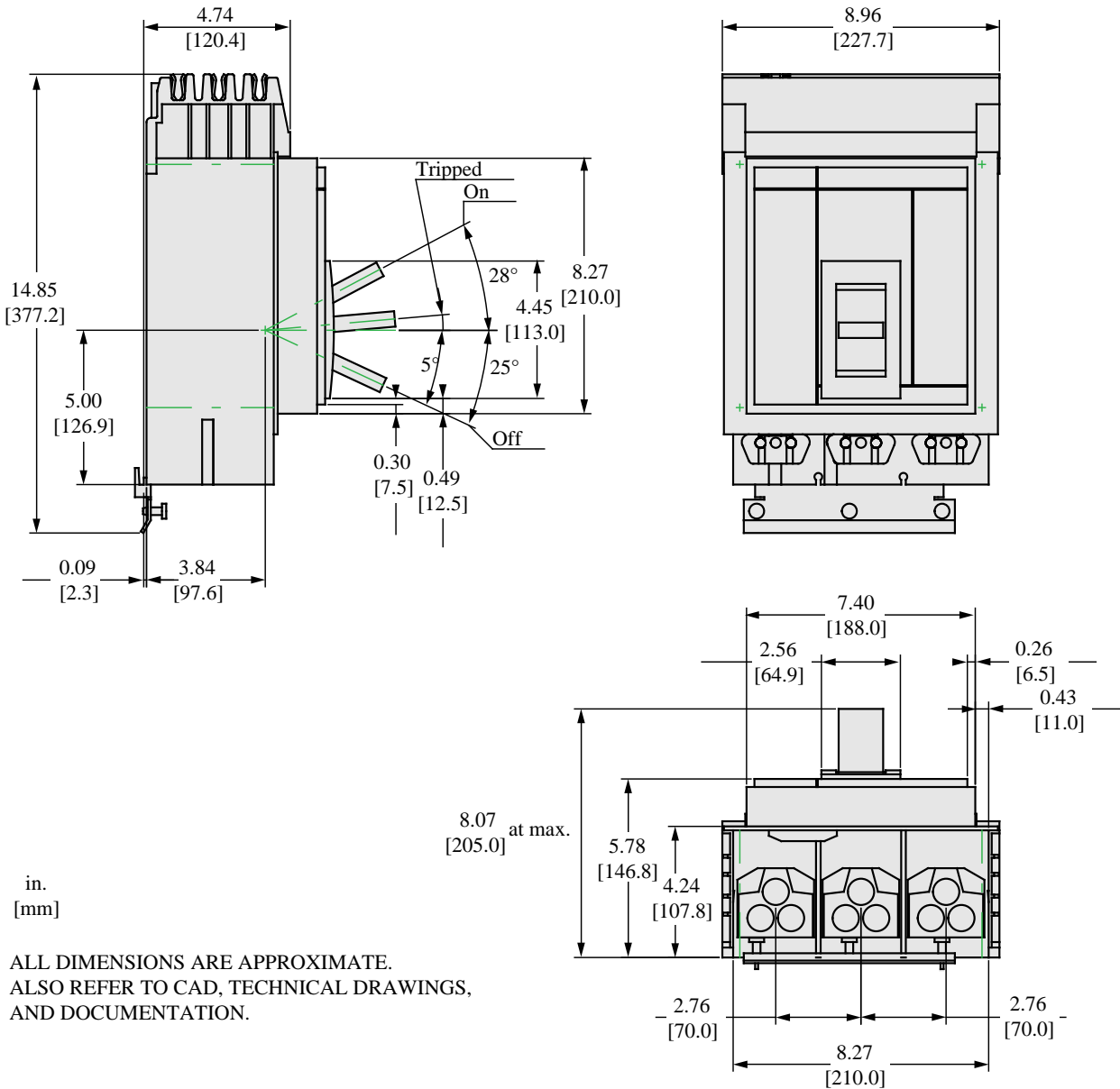
Offer Sustainability

Sustainable offer status	Green Premium product
California proposition 65	WARNING: This product can expose you to chemicals including: DINP, which is known to the State of California to cause cancer, and DIDP, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov
REACH Regulation	REACH Declaration
EU RoHS Directive	Compliant EU RoHS Declaration
Mercury free	Yes
RoHS exemption information	Yes
China RoHS Regulation	China RoHS declaration Product out of China RoHS scope. Substance declaration for your information.
Environmental Disclosure	Product Environmental Profile
Circularity Profile	End of Life Information
PVC free	Yes

Contractual warranty

Warranty	18 months
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Dimensions



Product data sheet

Specifications



Circuit breaker, PowerPact L, 600A, 3 pole, 600VAC, 18kA, I-Line, Micrologic 3.3, 80%, ABC

LGA36600U31X

Product availability : Stock - Normally stocked in distribution facility

Price* : 7,779.00 USD

Main

Range	PowerPact
Product name	PowerPact L
Device short name	L-Frame
Product or Component Type	Circuit breaker
Device Application	Distribution

Complementary

Line Rated Current	600 A
Number of Poles	3P
Control Type	Toggle
Breaking capacity code	G
Breaking capacity	65 kA 240 V AC 50/60 Hz UL 489 35 kA 480 V AC 50/60 Hz UL 489 18 kA 600 V AC 50/60 Hz UL 489 20 kA 250 V DC UL 489 20 kA 500 V DC UL 489
[Ue] rated operational voltage	600 V AC 50/60 Hz IEC 60947-3
Network Frequency	50/60 Hz
[Ics] rated service breaking capacity	65 kA 220/240 V AC 50/60 Hz IEC 60947-2 35 kA 380/440/415 V AC 50/60 Hz IEC 60947-2 18 kA 500/525 V AC 50/60 Hz IEC 60947-2 20 kA 250 V DC IEC 60947-2 20 kA 500 V DC IEC 60947-2
[Uimp] rated impulse withstand voltage	8 kV IEC 60947-2
Trip unit technology	Electronic, standard, Micrologic 3.3, LI
Continuous current rating	80 %
[Ui] rated insulation voltage	750 V IEC 60947-2
Trip unit name	Micrologic 3.3
Protection technology	Current limiter
Suitability for isolation	Yes IEC 60947-2
Utilisation category	Category A
AWG gauge	2 x AWG 2/0...500 kcmil aluminium/copper

* Price is “List Price” and may be subject to a trade discount – check with your local distributor or retailer for actual price.

Local signalling	Ready 1 LED green) Alarm 1 LED 90 % Ir orange) Alarm LED 105 % Ir red) Switched off (OFF) 1 trip indicator green)
Mounting mode	I-Line bracket)
Mounting Support	Bracket
Electrical connection	I-Line connection line Lugs load
Terminal identifier	AL600LF52K3
Long time pick-up adjustment range	0.25...1 x In
Mounting Height	6 in (152.40 mm)
Tightening torque	442.54 lbf.in (50 N.m) 0.11...0.37 in² (70...240 mm²) (2 x AWG 2/0...500 kcmil)
Number of slots	2 auxiliary switch OF plug-in) 1 alarm switch SD plug-in) 1 overcurrent trip switch SDE plug-in) 1 voltage release MN or MX plug-in)
Power wire stripping length	1.22 in (31 mm)
Color	Black
Height	13.39 in (340 mm)
Width	5.51 in (140 mm)
Depth	4.33 in (110 mm)
Net Weight	13.67 lb(US) (6.2 kg)
Phase connection	ABC
Communication interface	Modbus Ethernet

Environment

Standards	UL CSA NEMA NOM-003-SCFI-2000 IEC 60947-2
Product certifications	UL CSA NOM
IP degree of protection	Front cover IP40
Pollution degree	3 IEC 60947-1
Ambient Air Temperature for Operation	28...158 °F (-2...70 °C)
Ambient Air Temperature for Storage	-58...185 °F (-50...85 °C)
Operating altitude	< 6561.68 ft (2000 m) without derating 5000 m with derating

Ordering and shipping details

Category	01118-L ELEC TRIP I-LINE BREAKER/SW
Discount Schedule	DE2
GTIN	00785901989813
Nbr. of units in pkg.	1
Package weight(Lbs)	19.00 lb(US) (8.618 kg)
Returnability	No
Country of origin	US

Packing Units

Unit Type of Package 1	PCE
Package 1 Height	8.80 in (22.352 cm)
Package 1 width	14.00 in (35.56 cm)
Package 1 Length	31.70 in (80.518 cm)

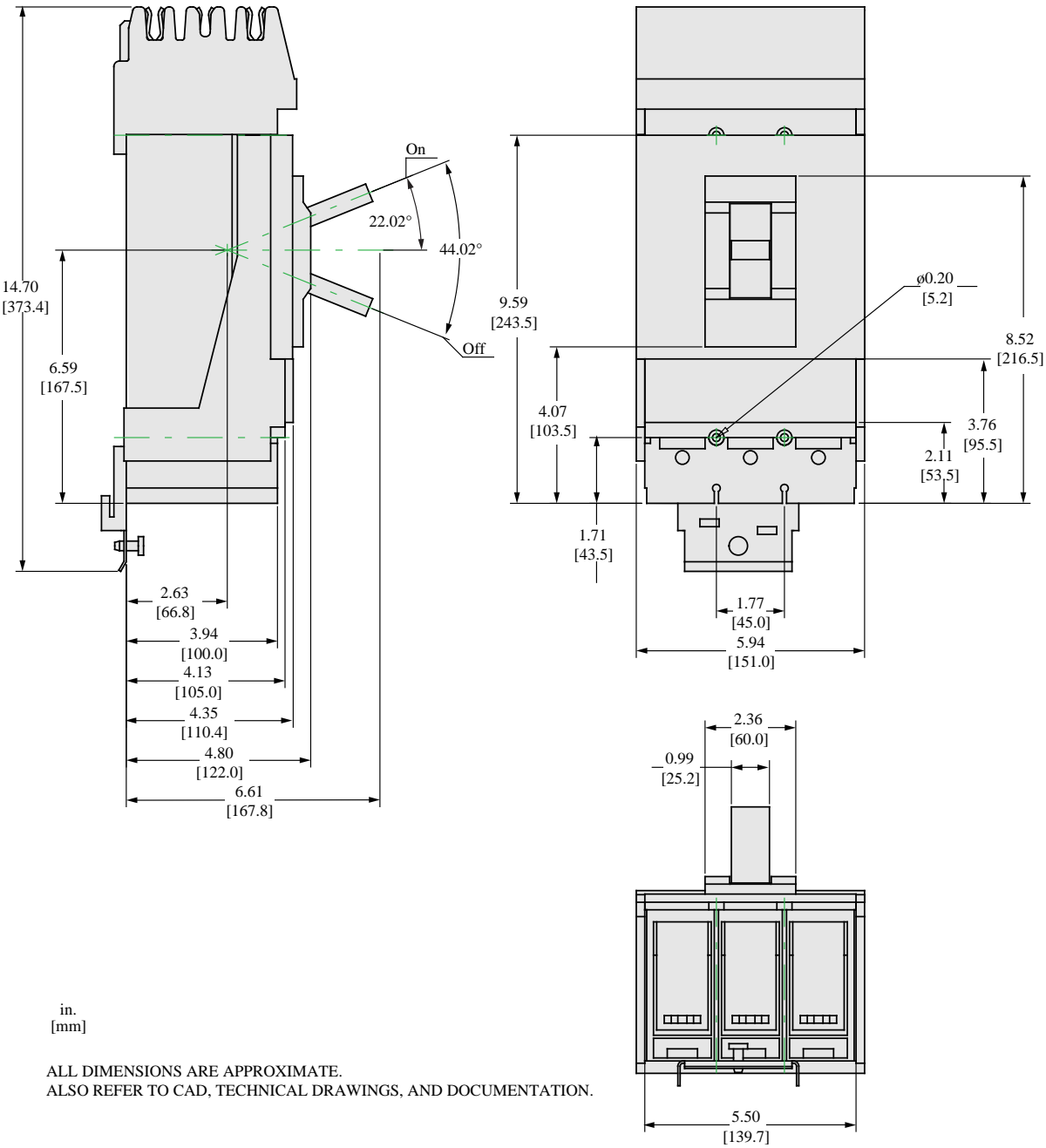
Offer Sustainability

Sustainable offer status	Green Premium product
California proposition 65	WARNING: This product can expose you to chemicals including: DINP, which is known to the State of California to cause cancer, and DIDP, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov
REACH Regulation	REACH Declaration
EU RoHS Directive	Compliant EU RoHS Declaration
Mercury free	Yes
RoHS exemption information	Yes
China RoHS Regulation	China RoHS declaration Product out of China RoHS scope. Substance declaration for your information.
Environmental Disclosure	Product Environmental Profile
Circularity Profile	End of Life Information
PVC free	Yes

Contractual warranty

Warranty	18 months
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Dimensions



Product data sheet

Specifications

SQUARE D

Green Premium™



Circuit breaker, PowerPact J, 200A, 3 pole, 600VAC, 18kA, I-Line, thermal magnetic, 80%, ABC

JGA36200

Product availability : Stock - Normally stocked in distribution facility

Price* : 3,968.00 USD

Main

Range	PowerPact
Product name	PowerPact J
Product or Component Type	Circuit breaker
Device Application	Distribution

Complementary

Line Rated Current	200 A
Number of Poles	3P
Control Type	Toggle
Breaking capacity code	G
Breaking capacity	65 kA 240 V AC 50/60 Hz UL 489 35 kA 480 V AC 50/60 Hz UL 489 18 kA 600 V AC 50/60 Hz UL 489 20 kA 250 V DC UL 489 20 kA 500 V DC UL 489
[Ue] rated operational voltage	600 V AC 50/60 Hz IEC 60947-3
Network Frequency	50/60 Hz
[Ics] rated service breaking capacity	65 kA 220/240 V AC 50/60 Hz IEC 60947-2 35 kA 380/440/415 V AC 50/60 Hz IEC 60947-2 18 kA 500/525 V AC 50/60 Hz IEC 60947-2 20 kA 250 V DC IEC 60947-2 20 kA 500 V DC IEC 60947-2
[Uimp] rated impulse withstand voltage	8 kV IEC 60947-2
Trip unit technology	Thermal-magnetic
Magnetic tripping current	2000 A
Magnetic hold current	1000 A
Continuous current rating	80 %
[Ui] rated insulation voltage	750 V IEC 60947-2
Protection Type	Overload protection Short-circuit protection
Suitability for isolation	Yes IEC 60947-2
Utilisation category	Category A

* Price is “List Price” and may be subject to a trade discount – check with your local distributor or retailer for actual price.

AWG gauge	AWG 3/0...350 kcmil aluminium/copper terminals
Local signalling	Switched off (OFF) 1 trip indicator green)
Mounting mode	I-Line bracket)
Mounting Support	Bracket
Electrical connection	I-Line connection line Lugs load
Terminal identifier	AL250JD
Long time pick-up adjustment range	0.25...1 x In
Mounting Height	4.5 in (114.30 mm)
Tightening torque	221.27 lbf.in (25 N.m) 0.15...0.29 in² (95...185 mm²) (AWG 3/0...350 kcmil)
Number of slots	2 auxiliary switch OF plug-in) 1 alarm switch SD plug-in) 1 overcurrent trip switch SDE plug-in) 1 voltage release MN or MX plug-in)
Power wire stripping length	0.98 in (25 mm)
Height	7.52 in (191 mm)
Width	4.09 in (104 mm)
Depth	3.39 in (86 mm)
Net Weight	5.29 lb(US) (2.4 kg)
Phase connection	ABC
Communication interface	Modbus Ethernet

Environment

Quality labels	CE
Standards	UL CSA NEMA NOM-003-SCFI-2000 IEC 60947-2
Product certifications	UL CSA NOM
IP degree of protection	Front cover IP40
Pollution degree	3 IEC 60947-1
Ambient Air Temperature for Operation	28...158 °F (-2...70 °C)
Ambient Air Temperature for Storage	-58...185 °F (-50...85 °C)
Operating altitude	< 6561.68 ft (2000 m) without derating 5000 m with derating

Ordering and shipping details

Category	01117-HG, HJ, JG, JJ I-LINE BREAKER/SWITCH
Discount Schedule	DE2
GTIN	785901430735
Nbr. of units in pkg.	1
Package weight(Lbs)	7.05 lb(US) (3.198 kg)
Returnability	Yes
Country of origin	MX

Packing Units

Unit Type of Package 1	PCE
Package 1 Height	6.10 in (15.494 cm)
Package 1 width	8.50 in (21.59 cm)
Package 1 Length	15.00 in (38.1 cm)

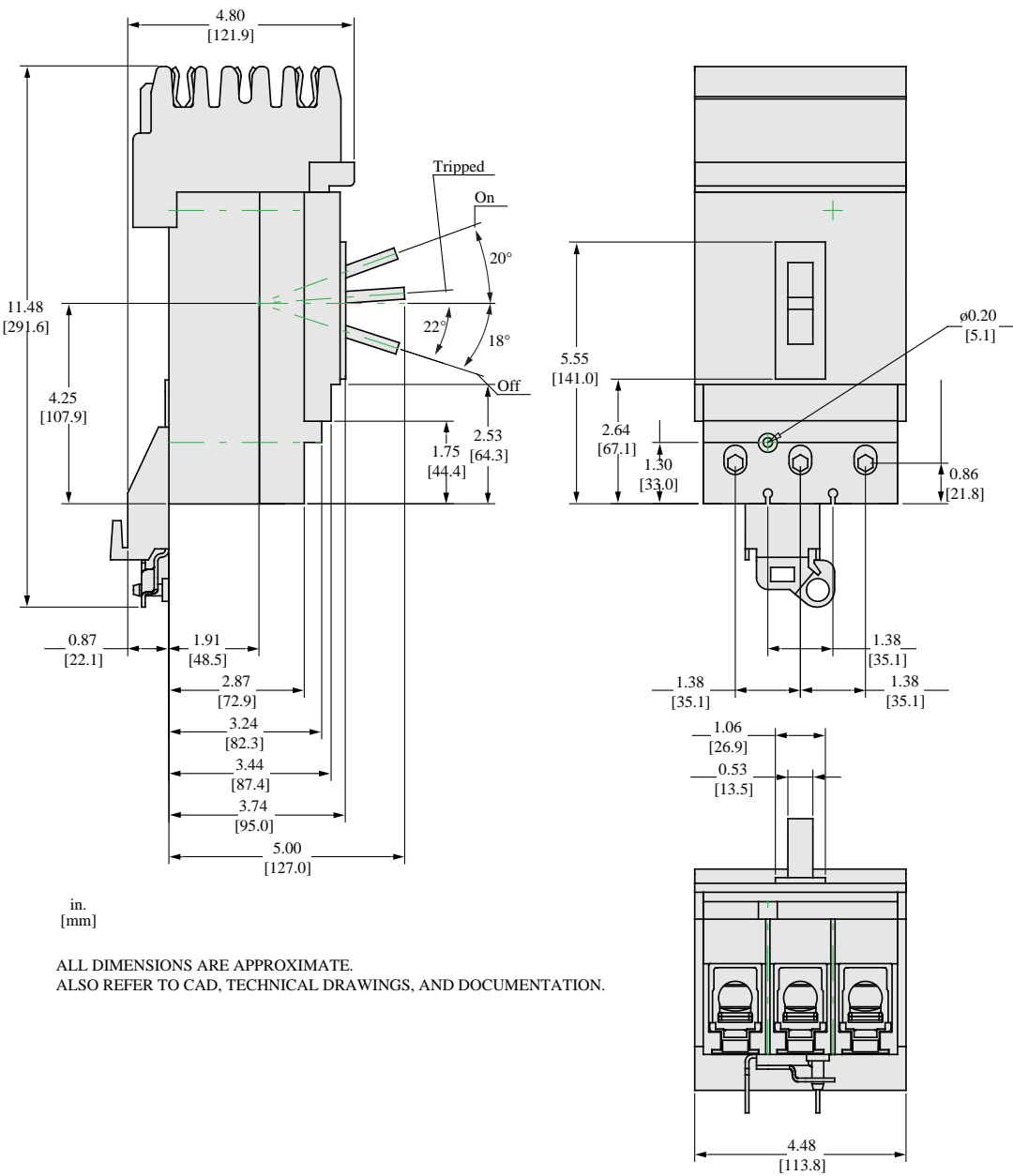
Offer Sustainability

Sustainable offer status	Green Premium product
California proposition 65	WARNING: This product can expose you to chemicals including: DINP, which is known to the State of California to cause cancer, and DIDP, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov
REACH Regulation	REACH Declaration
EU RoHS Directive	Compliant EU RoHS Declaration
Mercury free	Yes
RoHS exemption information	Yes
China RoHS Regulation	China RoHS declaration Product out of China RoHS scope. Substance declaration for your information.
Environmental Disclosure	Product Environmental Profile
Circularity Profile	End of Life Information
PVC free	Yes

Contractual warranty

Warranty	18 months
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Dimensions



Product data sheet

Specifications



Circuit breaker, PowerPact H, 150A, 3 pole, 600VAC, 18kA, I-Line, thermal magnetic, 80%, ABC

HGA36150

Product availability : Stock - Normally stocked in distribution facility

Price* : 3,779.00 USD

Main

Range	PowerPact
Product name	PowerPact H
Product or Component Type	Circuit breaker
Device Application	Distribution

Complementary

Line Rated Current	150 A
Number of Poles	3P
Protected poles description	3t
Control Type	Toggle
Breaking capacity code	G
Breaking capacity	65 kA 240 V AC 50/60 Hz UL 489 35 kA 480 V AC 50/60 Hz UL 489 18 kA 600 V AC 50/60 Hz UL 489 20 kA 250 V DC UL 489 20 kA 500 V DC UL 489
[Ue] rated operational voltage	690 V AC 50/60 Hz IEC 60947-3
Network Frequency	50/60 Hz
[Ics] rated service breaking capacity	65 kA 220/240 V AC 50/60 Hz IEC 60947-2 35 kA 380/440/415 V AC 50/60 Hz IEC 60947-2 18 kA 500/525 V AC 50/60 Hz IEC 60947-2 20 kA 250 V DC IEC 60947-2 20 kA 500 V DC IEC 60947-2
[Uimp] rated impulse withstand voltage	8 kV IEC 60947-2
Trip unit technology	Thermal-magnetic
Magnetic tripping current	1700 A
Magnetic hold current	900 A
Continuous current rating	80 %
[Ui] rated insulation voltage	750 V IEC 60947-2
Suitability for isolation	Yes IEC 60947-2
Utilisation category	Category A
AWG gauge	AWG 14...AWG 3/0 aluminium/copper terminal

* Price is “List Price” and may be subject to a trade discount – check with your local distributor or retailer for actual price.

Local signalling	Switched off (OFF) 1 trip indicator green)
Mounting mode	I-Line bracket)
Mounting Support	Bracket
Electrical connection	I-Line connection line Lugs load
Terminal identifier	AL150HD
Mounting Height	4.5 in (114.30 mm)
Tightening torque	44.25 lbf.in (5 N.m) 0.00...0.01 in² (2.5...6 mm²) (AWG 14...AWG 10) 123.91 lbf.in (14 N.m) 0.02...0.15 in² (10...95 mm²) (AWG 8...AWG 3/0)
Number of slots	2 auxiliary switch OF plug-in) 1 alarm switch SD plug-in) 1 overcurrent trip switch SDE plug-in) 1 voltage release MN or MX plug-in)
Power wire stripping length	0.63 in (16 mm)
Color	Black
Height	6.42 in (163 mm)
Width	4.09 in (104 mm)
Depth	3.39 in (86 mm)
Net Weight	4.85 lb(US) (2.2 kg)
Quantity per Set	1
Phase connection	ABC
Communication interface	Modbus Ethernet

Environment

Quality labels	CE
Standards	UL CSA NEMA NOM-003-SCFI-2000 IEC 60947-2
Product certifications	UL CSA NOM
IP degree of protection	Front cover IP40 IEC 60529
Pollution degree	3 IEC 60947-1
Ambient Air Temperature for Operation	28...158 °F (-2...70 °C)
Ambient Air Temperature for Storage	-58...185 °F (-50...85 °C)
Operating altitude	< 6561.68 ft (2000 m) without derating 5000 m with derating

Ordering and shipping details

Category	01117-HG, HJ, JG, JJ I-LINE BREAKER/SWITCH
Discount Schedule	DE2
GTIN	785901795070
Nbr. of units in pkg.	1
Package weight(Lbs)	5.90 lb(US) (2.676 kg)
Returnability	Yes
Country of origin	MX

Packing Units

Unit Type of Package 1	PCE
Package 1 Height	6.10 in (15.494 cm)
Package 1 width	8.30 in (21.082 cm)
Package 1 Length	15.00 in (38.1 cm)

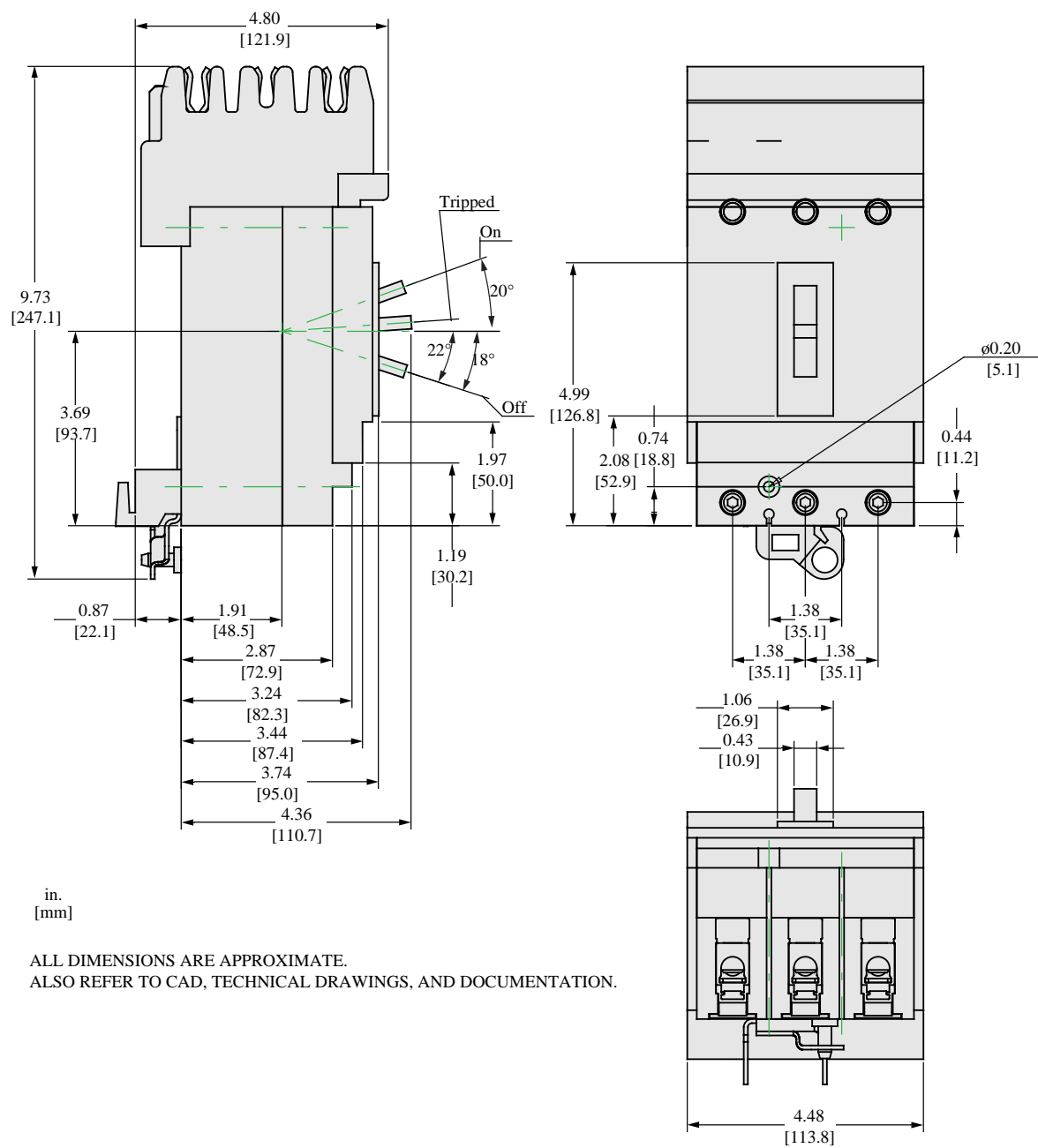
Offer Sustainability

Sustainable offer status	Green Premium product
California proposition 65	WARNING: This product can expose you to chemicals including: DINP, which is known to the State of California to cause cancer, and DIDP, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov
REACH Regulation	REACH Declaration
EU RoHS Directive	Compliant EU RoHS Declaration
Mercury free	Yes
RoHS exemption information	Yes
China RoHS Regulation	China RoHS declaration Product out of China RoHS scope. Substance declaration for your information.
Environmental Disclosure	Product Environmental Profile
Circularity Profile	End of Life Information
PVC free	Yes

Contractual warranty

Warranty	18 months
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Dimensions



Product data sheet

Specifications

SQUARE D

Green Premium™



Circuit breaker, PowerPact H, 70A, 3 pole, 600VAC, 18kA, I-Line, thermal magnetic, 80%, ABC

HGA36070

Product availability : Stock - Normally stocked in distribution facility

Price* : 1,772.00 USD

Main

Range	PowerPact
Product name	PowerPact H
Product or Component Type	Circuit breaker
Device Application	Distribution

Complementary

Line Rated Current	70 A
Number of Poles	3P
Protected poles description	3t
Control Type	Toggle
Breaking capacity code	G
Breaking capacity	65 kA 240 V AC 50/60 Hz UL 489 35 kA 480 V AC 50/60 Hz UL 489 18 kA 600 V AC 50/60 Hz UL 489 20 kA 250 V DC UL 489 20 kA 500 V DC UL 489
[Ue] rated operational voltage	690 V AC 50/60 Hz IEC 60947-3
Network Frequency	50/60 Hz
[Ics] rated service breaking capacity	65 kA 220/240 V AC 50/60 Hz IEC 60947-2 35 kA 380/440/415 V AC 50/60 Hz IEC 60947-2 18 kA 500/525 V AC 50/60 Hz IEC 60947-2 20 kA 250 V DC IEC 60947-2 20 kA 500 V DC IEC 60947-2
[Uimp] rated impulse withstand voltage	8 kV IEC 60947-2
Trip unit technology	Thermal-magnetic
Magnetic tripping current	1450 A
Magnetic hold current	800 A
Continuous current rating	80 %
[Ui] rated insulation voltage	750 V IEC 60947-2
Suitability for isolation	Yes IEC 60947-2
Utilisation category	Category A
AWG gauge	AWG 14...AWG 3/0 aluminium/copper terminal

* Price is “List Price” and may be subject to a trade discount – check with your local distributor or retailer for actual price.

Local signalling	Switched off (OFF) 1 trip indicator green)
Mounting mode	I-Line bracket)
Mounting Support	Bracket
Electrical connection	I-Line connection line Lugs load
Terminal identifier	AL150HD
Mounting Height	4.5 in (114.30 mm)
Tightening torque	44.25 lbf.in (5 N.m) 0.00...0.01 in² (2.5...6 mm²) (AWG 14...AWG 10) 123.91 lbf.in (14 N.m) 0.02...0.15 in² (10...95 mm²) (AWG 8...AWG 3/0)
Number of slots	2 auxiliary switch OF plug-in) 1 alarm switch SD plug-in) 1 overcurrent trip switch SDE plug-in) 1 voltage release MN or MX plug-in)
Power wire stripping length	0.63 in (16 mm)
Color	Black
Height	6.42 in (163 mm)
Width	4.09 in (104 mm)
Depth	3.39 in (86 mm)
Net Weight	4.85 lb(US) (2.2 kg)
Quantity per Set	1
Phase connection	ABC
Communication interface	Modbus Ethernet

Environment

Quality labels	CE
Standards	UL CSA NEMA NOM-003-SCFI-2000 IEC 60947-2
Product certifications	UL CSA NOM
IP degree of protection	Front cover IP40 IEC 60529
Pollution degree	3 IEC 60947-1
Ambient Air Temperature for Operation	28...158 °F (-2...70 °C)
Ambient Air Temperature for Storage	-58...185 °F (-50...85 °C)
Operating altitude	< 6561.68 ft (2000 m) without derating 5000 m with derating

Ordering and shipping details

Category	01117-HG, HJ, JG, JJ I-LINE BREAKER/SWITCH
Discount Schedule	DE2
GTIN	785901491293
Nbr. of units in pkg.	1
Package weight(Lbs)	5.47 lb(US) (2.48 kg)
Returnability	Yes
Country of origin	MX

Packing Units

Unit Type of Package 1	PCE
Package 1 Height	5.91 in (15 cm)
Package 1 width	8.58 in (21.8 cm)
Package 1 Length	14.80 in (37.6 cm)

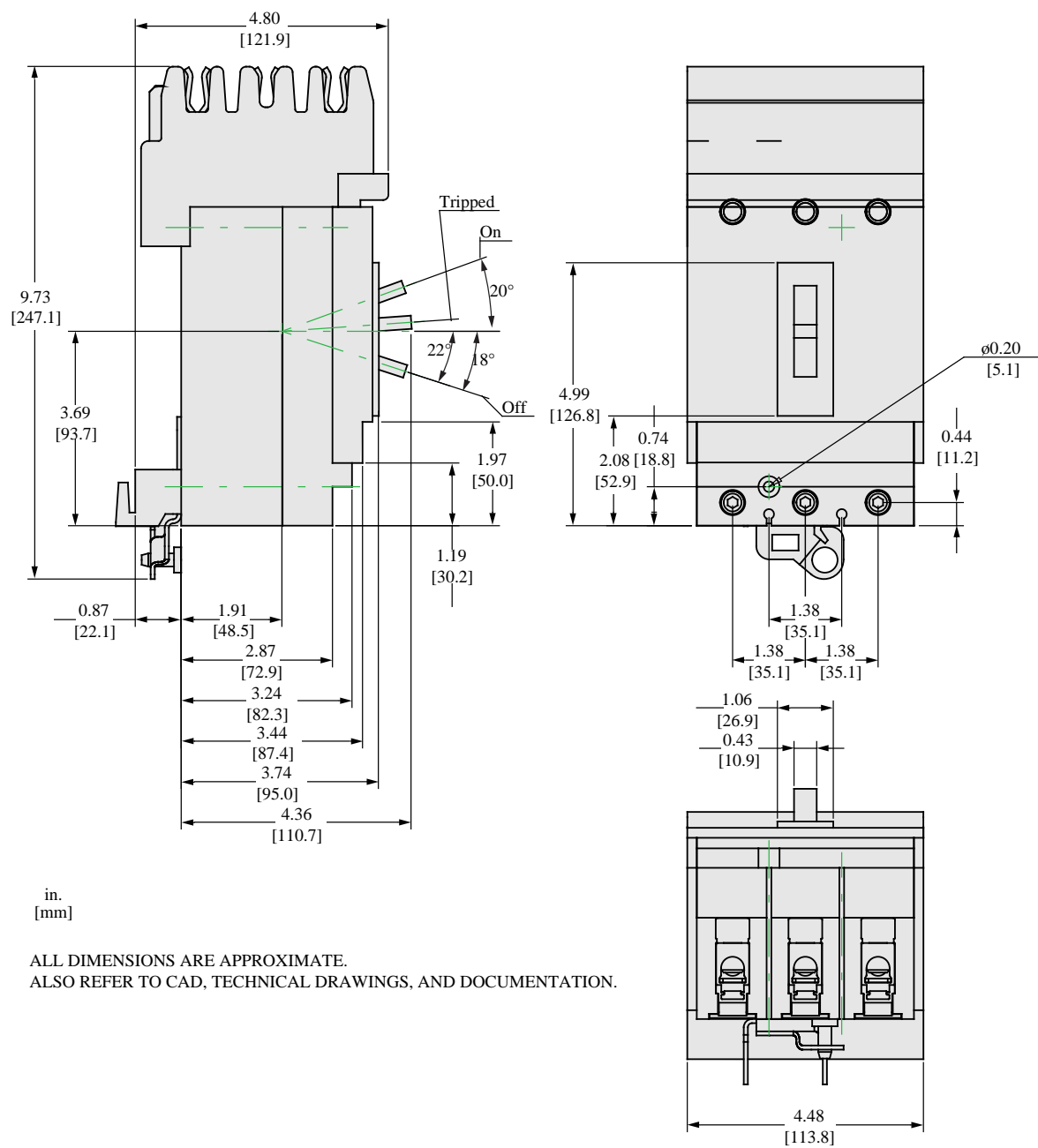
Offer Sustainability

Sustainable offer status	Green Premium product
California proposition 65	WARNING: This product can expose you to chemicals including: DINP, which is known to the State of California to cause cancer, and DIDP, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov
REACH Regulation	REACH Declaration
EU RoHS Directive	Compliant EU RoHS Declaration
Mercury free	Yes
RoHS exemption information	Yes
China RoHS Regulation	China RoHS declaration Product out of China RoHS scope. Substance declaration for your information.
Environmental Disclosure	Product Environmental Profile
Circularity Profile	End of Life Information
PVC free	Yes

Contractual warranty

Warranty	18 months
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Dimensions



Product data sheet

Specifications



PM5563 Meter, 2 ethernet, up to 63th H, 1,1M 4DI/2DO 52 alarms, w remote display

METSEPM5563RD

Main

Range	PowerLogic
Product name	PowerLogic PM5000
Device short name	PM5563
Product or component type	Power meter

Complementary

Power quality analysis	up to the 63rd harmonic
Metering type	Measured neutral current Calculated ground current
Device application	Gateway Power monitoring WAGES metering Multi-tariff
Type of measurement	Current Voltage Frequency Power factor Energy Active and reactive power
Supply voltage	125...250 V DC 100...480 V AC 45...65 Hz
Network frequency	50 Hz 60 Hz
[In] rated current	1 A 5 A
Type of network	1P + N 3P 3P + N
Maximum power consumption in VA	10 VA at 480 V
Ride-through time	35 ms 120 V AC typical 129 ms 230 V AC typical
Display type	Remote LCD display
Display resolution	128 x 128 pixels
Sampling rate	128 samples/cycle
Measurement current	5...10000 mA
Analogue input type	Voltage (impedance 5 MOhm) Current (impedance 0.3 mOhm)
Measurement voltage	20...400 V AC 45...65 Hz between phase and neutral

	20...690 V AC 45...65 Hz between phases
Frequency measurement range	45...65 Hz
Number of inputs	4 digital
Measurement accuracy	Apparent power +/- 0.5 % Frequency +/- 0.05 % Active energy +/- 0.2 % Reactive energy +/- 1 % Active power +/- 0.2 % Voltage +/- 0.1 % Power factor +/- 0.005 Current +/- 0.1 %
Accuracy class	Class 0.2S active energy conforming to IEC 62053-22
Number of outputs	2 digital
Information displayed	Tariff (8)
Communication port protocol	Modbus RTU and ASCII at 9.6, 19.2 and 38.4 kbauds even/odd or none - 2 wires, insulation 2500 V JBUS Modbus TCP/IP at 10/100 Mbit/s, insulation 2500 V Ethernet Modbus TCP/IP daisy chain BACnet IP
Communication port support	RS485 Ethernet
Communication gateway	Ethernet/serial
Data recording	Time stamping Data logs Maintenance logs Event logs Alarm logs Min/max of instantaneous values
Memory capacity	1.1 MB
Web services	Diagnostic via predefined web pages Real time viewing of data Web server Alarm notification by e-mail
Ethernet service	SNTP client SNMP-Traps
Connections - terminals	Voltage circuit: screw terminal block4 Control circuit: screw terminal block2 Current transformer: screw terminal block6 RS485 link: screw terminal block4 Digital input: screw terminal block8 Digital output: screw terminal block4 Ethernet network: RJ45 connector2
Mounting mode	Clip-on
Mounting support	DIN rail
Standards	EN 50470-3 EN 50470-1 IEC 62053-22 IEC 60529 UL 61010-1 IEC 62053-24 IEC 61557-12 ANSI C12.20
Product certifications	CE conforming to IEC 61010-1 CULus conforming to UL 61010-1 BTL
Width	96 mm
Depth	72 mm
Height	96 mm
Net weight	450 g

Environment

Electromagnetic compatibility	Limits for harmonic current emissions class A conforming to IEC 61000-3-2 Conducted RF disturbances level 3 conforming to IEC 61000-4-6 Magnetic field at power frequency level 4 conforming to IEC 61000-4-8 Conducted and radiated emissions class B conforming to EN 55022
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	Limitation of voltage changes, voltage fluctuations and flicker in low-voltage conforming to IEC 61000-3-3 Electrostatic discharge - test level: 8 kV level 4 conforming to IEC 61000-4-2 Radiated radio-frequency electromagnetic field immunity test conforming to IEC 61000-4-3 Electrical fast transient/burst immunity test level 4 conforming to IEC 61000-4-4 Surge immunity test level 4 conforming to IEC 61000-4-5 Voltage dips and interruptions immunity test conforming to IEC 61000-4-11
IP degree of protection	IP52 front: conforming to IEC 60529 IP30 body: conforming to IEC 60529
Relative humidity	5...95 % at 50 °C
Pollution degree	2
Ambient air temperature for operation	-25...70 °C
Ambient air temperature for storage	-40...85 °C
Operating altitude	3000 m

Packing Units

Unit Type of Package 1	PCE
Number of Units in Package 1	1
Package 1 Weight	996.0 g
Package 1 Height	15.2 cm
Package 1 width	12.3 cm
Package 1 Length	17.2 cm
Unit Type of Package 2	BB1
Number of Units in Package 2	1
Package 2 Weight	980.0 g
Package 2 Height	15 cm
Package 2 width	17.5 cm
Package 2 Length	12.5 cm
Unit Type of Package 3	S03
Number of Units in Package 3	8
Package 3 Weight	8.552 kg
Package 3 Height	30 cm
Package 3 width	30 cm
Package 3 Length	40 cm

Offer Sustainability

Sustainable offer status	Green Premium product
REACH Regulation	REACH Declaration
REACH free of SVHC	Yes
EU RoHS Directive	Compliant EU RoHS Declaration
Toxic heavy metal free	Yes
Mercury free	Yes
RoHS exemption information	Yes
China RoHS Regulation	China RoHS declaration
Environmental Disclosure	Product Environmental Profile
Circularity Profile	End of Life Information

WEEE	The product must be disposed on European Union markets following specific waste collection and never end up in rubbish bins
California proposition 65	WARNING: Cancer and Reproductive Harm - www.P65Warnings.ca.gov



Tier 400SPD Series

450 Surge Protective Device



The Tier 400SPD series of surge protective devices (SPDs) feature the industry's most advanced metal oxide varistor (MOV) technology. Its thermally protective and arc extinguishing design have a significant advantage when subjected to abnormal over-voltage and high fault current. The 450 family of products incorporates this technology in a compact, easy to install package. The 450 is available in a wide range of surge levels, suitable for any environment or location, making this SPD an ideal choice for any business that relies on microprocessor driven equipment.

Why Install surge protection?

Transients generated by lightning, utility switching or an internal process can significantly impact your facility's power quality. These power anomalies can easily disrupt your process or damage important equipment, leading to costly downtime and equipment repair.

Features:

- Thermally Protected MOV
- Surge Current Levels:
 - 50 kA/Mode; 100 kA/Phase
 - 75 kA/Mode; 150 kA/Phase
 - 100 kA/Mode; 200 kA/Phase
 - 125 kA/Mode; 250 kA/Phase
 - 150 kA/Mode; 300 kA/Phase
 - 200 kA/Mode; 400 kA/Phase
- ANSI/UL 1449 4th Edition, CSA
- Short Circuit Rating: 200 kAIC
- Sine Wave Tracking: Type 2
- Surge Impulse Rated and Tested
- Warranty: 10 Years

Innovative Solutions for Clean, Reliable Power



Tier 400SPD Series

450 Surge Protective Device

Install SPDs Throughout Your Building

The IEEE (Institute of Electrical and Electronics Engineers) recommends cascading surge protection throughout your facility. Placing high surge capacity SPDs at the service entrance (or conductor entry points), followed by SPDs at critical downstream distribution and branch locations.

General Technical Specifications	
Connection Type	Parallel, Wire Lead: 10AWG
Maximum Continuous Operating Voltage	120 VAC; 150%, all others 115%
Short Circuit Current Rating (SCCR)	200kAIC
Protection Modes	All Connected Modes: L-N, L-L, L-G, N-G
Operating Frequency Range	47 - 63 Hz
UL 1449 Location Type	Type 1/ Type 2
UL 1449 Nominal Discharge Current (In)	20 kA
Connection	Wire Lead, Terminal Block, or Disconnect
Status Indication	Blue/Red LEDs, Form C, Surge Counter (opt)
Enclosure	NEMA 4X (Std), NEMA 4 (Steel) optional
50 Ohm EMI/RFI Attenuation	60 /40dB Max
Response Time	<0.5 nanoseconds
Operating Temperature	-40°C to +75°C
Operating Humidity	0% to 95% non-condensing
Size/Weight	
Non-Modular (4x): 25 kA/Mode	5.12"x3.15"x3"; 1.03lb
Non-Modular (4x): 50-150 k/Mode	7.9"x5.9"x3.9", 3.5lb
Non-Modular (Metal): 50 -150 kA/Mode	10.63"x7.87"x4.72", 9.5lb
Modular: Up to 150/Mode	16"x14"x8", 30lb
Modular: 200 - 300kA/Mode	20x16"x9", 40lb
Warranty	10 Years

Table A: Voltage & Source Configuration		
Model Code	Voltage	Source Configuration
120S	120/240	Single Phase, 3W+G (L1, L2, N, G)
120Y	120/208	Three Phase Wye, 4W+G (L1, L2, L3, N, G)
240D	240	Three Phase Delta, 3W+G (L1, L2, L3, G)
277Y	277/480	Three Phase Wye, 4W+G (L1, L2, L3, N, G)
480D	480 VAC	Three Phase Delta, 3W+G (L1, L2, L3, G)

Table B: Surge Current Capacity		
Model Code	Surge Capacity /Mode	Surge Capacity /Phase
050	50 kA	100 kA
075	75 kA	150 kA
100	100 kA	200 kA
125	125 kA	250 kA
150	150 kA	300 kA
200	200 kA	400 kA
250	250 kA	500 kA
300	300 kA	600 kA

Tier400SPD Series, 450 Family Ordering Information: Example Model Number: T45120Y100AWJ1S								
Positions: 1-3 Product Family	Positions: 4-7 Voltage / Phase Configuration	Positions: 8-10 Surge Capacity	Position: 11 Protected Modes	Position: 12 Connection Type	Position: 13 Status	Position: 14 Enclosure	Position: 15 UL Type	Position: 16 Options
T45 = 450 Family	See Table A	See Table B	A = All connected modes	W= Wire Lead L = Lug D = Disconnect	A =LED, Form C Contact	J=NEMA 4X; Non-metallic M =NEMA 4; Steel	1 =UL Type 1 2 =UL Type 2	S = Standard /No Options C = Surge Counter



Solutions For Power

RFP 24-22: APPENDIX 8

**DEADFRONT DISTRIBUTION SWITCHBOARDS
600V OR LESS**


***INSTALLATION OPERATION & MAINTENANCE
MANUAL***

American Midwest Power

3131 Vicksburg Lane • Box 47036
Minneapolis, MN 55447-0036
ampmfg.com

IL #SWBOM11/11

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LIMITED WARRANTY

American Midwest Power warrants that the equipment delivered by it will be of the kind and quality described in the order or contract and will be free of defects in workmanship and material. Should any failure to conform to this warranty appear within one year after date of shipment, American Midwest Power shall, upon prompt notification, with the knowledge that the equipment has been stored, installed, operated and maintained in accordance with American Midwest Power recommendations and standard industry practice, correct such nonconformities, at its option, either by repairing any defective part or parts or by supplying a repaired or replacement part or parts F.O.B. factory. However, if American Midwest Power has installed the equipment or furnished field engineering services with respect to its installation, and if the Purchaser has not delayed the installation, the one-year shall run from the completion of the installation. The total warranty period shall not exceed 18 months from the date of shipment in any case.

In no event shall American Midwest Power be responsible for providing working access to the defect, including the removal, disassembly, replacement or reinstallation of any equipment, materials or structures to the extent necessary to permit American Midwest Power to perform its warranty obligations, or transportation costs to and from the American Midwest Power factory. The conditions of any tests shall be mutually agreed upon and American Midwest Power shall be notified of, and may be present at all tests that may be made.

The warranties set forth in this provision are exclusive and in lieu of all other warranties whether statutory, express or implied (including all warranties of merchantability and fitness for particular purpose and all warranties arising from course of dealing or usage of trade), except of title and against patent infringement. The remedies provided above are the Purchaser's sole remedies for any failure of American Midwest Power to comply with its obligations. Correction of any non-conformity in the manner and for the period of time provided above shall constitute fulfillment of all the liabilities of American Midwest Power whether the claims of the purchaser are based in contract, in tort (including negligence) or otherwise with respect to or arising out of the equipment furnished hereunder.

WARRANTY IMPLEMENTATIONS AND CONDITIONS

On those occasions where service help is required, American Midwest Power should be notified at once through its Service Department. No charges or expenses should be incurred except as authorized by the Company, in writing. Making unauthorized corrections or doing unauthorized work voids this Warranty and renders reimbursement impossible.

The above in no way prejudices the right of American Midwest Power to correct, as stipulated in the Warranty, any problems that may occur in equipment manufactured by American Midwest Power.

HANDLING

CARE IN HANDLING

Handle the switchboard with care to avoid damaging the frame or painted finish. Dropping or jarring the switchboard can crack insulating components.

UPRIGHT POSITION

The switchboard should be kept in an upright position at all times unless special arrangements have been made with AMP and the switchboard has been provided with extra shipping supports and or lay down bracing.

CONCEALED DAMAGE

When receiving a shipboard delivery and prior to signing for it, unpack it sufficiently to inspect it thoroughly for concealed damage. If any damage is evident, note it with the shipper and file a freight claim.

SHIPPING SKID

The switchboard should remain secured to the shipping skid to prevent distortion of the bottom of the frame during moving.

FORK LIFTING

A forklift truck will offer the most convenient method of handling the switchboard. Balance the load carefully and use a safety strap when handling or moving switchboards with a forklift. Switchboards are provided with an open bottom, so care should be taken to ensure that the forks clear the rear bottom rails while sliding the forks under the switchboard. Verify that the handling equipment capacity is sufficient for the weight of the switchboard.

OVERHEAD HOISTING

When provided with eye bolts, AMP switchboards are suitable to be lifted with an overhead hoist or crane.

RIGID SPREADERS AND SPANNER BARS

Rigid spreaders or spanner bars are to be used to insure vertical lift on the eye bolts and lifting slings, and to avoid crushing or otherwise damaging the frame or its finish. Lifting bars on long lineups may require additional spreaders to reduce the horizontal compressive force.

UNEQUAL WEIGHT DISTRIBUTION

Switchboard sections may have unequal weight distribution. Rigging lengths should be adjusted to compensate and maintain the switchboard in the upright position.

SAFETY HOOKS OR SHACKLES

Do not pass ropes or cables through the lift holes in bars, angles, or channels. Use slings with safety hooks or shackles

STORAGE

CLEAN AND DRY SPACE

Switchboards that are not immediately installed and energized should be stored in a clean, dry space that has a uniform temperature to prevent condensation. Preferably, it should be stored in a climate controlled shelter and protected from dirt, fumes, water, and physical damage. Packaging should be left intact until the switchboard is located at the final installation location. Any

openings should be covered to protect the equipment against dust and other debris from entering the enclosure during the construction period.

OUTDOOR SWITCHBOARDS ARE NOT WEATHER RESISTANT UNTIL INSTALLED

Outdoor switchboards are not weather resistant until completely and properly installed and should be treated exactly the same as indoor switchboards until after it is installed. (See sections below **"BOLT SECTIONS TOGETHER"** for additional information and requirements.)

UN-ENERGIZED SWITCHBOARDS SHOULD BE KEPT DRY

All un-energized switchboards should be kept dry internally and externally.

INSTALLATION OF SWITCHBOARD

LOCATION

The switchboard should be located in an area suitable for its intended means and designation. Additional precautions may be necessary, during installation, to prevent moisture, or other contaminants from entering into the enclosure.

CLEARANCE FROM WALLS/WORKING CLEARANCE

Clearance from walls to the rear or side of the switchboard (not rear or side accessible) shall be 1/4" minimum. Switchboard vents shall be clear from obstructions of at least 6". If vented on the side or rear of the enclosure, the switchboard must be spaced 6" minimum from the wall. Working clearances vary by voltage and specific application. Please consult the National Electric Code section 110.26.

CONDUIT RACEWAYS

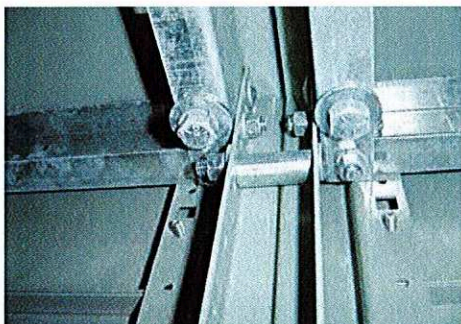
Locate the switchboard over the raceways or floor openings so as to provide cable bending space and clearances to energized parts or other obstructions.

BOLT SECTIONS TOGETHER

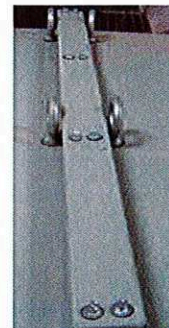
Bolt adjoining switchboard section frames together front and back using the hardware and section spacers provided (**See Picture #1**). Please review the enclosed "As Built Drawing" that is shipped with the switchboard to ensure proper section arrangement.

If unit is a type 3R outdoor switchboard with multi sections install roof cap over shipping sections joints, sealing the roof joints at each shipping section. (**See Picture #2**)

(Picture #1) Typical
(3x in the front 3x in back for
each shipping section connection)

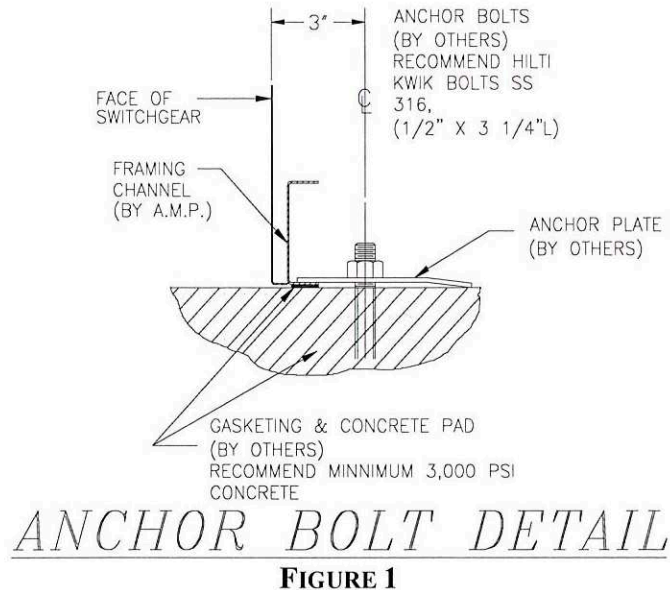


(Picture #2) Typical Roof cap
(No Roof Cap) (W/ Roof Cap)



LEVELING AND SECURING

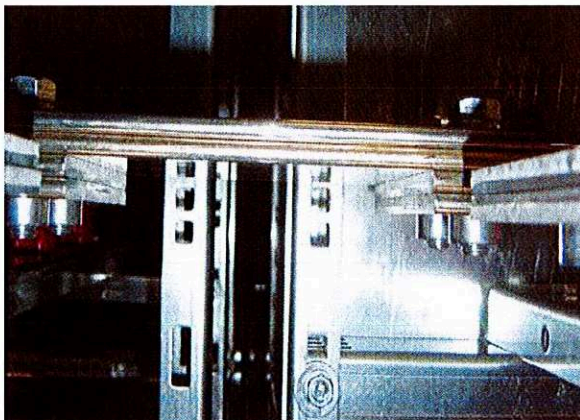
The switchboard should be installed level with the section frames bolted together. The switchboard should be anchored to the pad or floor as shown in Figure 1.



SPLICE PLATES

Connect all through and ground bus at shipping breaks, using the splice bus and hardware supplied with the switchboard. The splice plates and hardware are shipped loose in a box usually located in the bottom of one on the switchboard sections. Most AMP switchboards utilize captive nuts on the back of the cross bus, so tightening is only required from the front usually. Mount bus links on face of cross bus (opposite side of captive nut **See Pictures #3 & #4.**) Follow the torque specifications listed in Tables 1-3.

(Picture #3)
(Cross Bus Link)
CORRECT



(Picture #4)
(Cross Bus Backside do not install on this side)
WRONG do not install links on top of captive nuts



INTERNAL CABLING & CABLING BETWEEN SECTIONS

Factory supplied cable connections between sections may be utilized. Please refer to the "As Built Drawing" provided with the switchboard to identify correct termination locations for cross cable connections. If fine stand wire has been supplied for cross cable connections, the stripped ends should be wrapped in copper foil prior to installing in pressure terminal lugs. Terminations should be tightened to specifications listed in **Tables 1-3**.

GROUNDING AND BONDING

AMP switchboards are provided with a continuous ground bus located at the bottom of each section. Ground the switchboard frame and any ground bus by means of an equipment grounding conductor having a size in accordance with section 250 of the National Electrical Code.

SERVICE ENTRANCE GROUNDING

If the switchboard is labeled suitable for use as service entrance, a bonding jumper will be installed in the main section, bonding the neutral to the ground bus.

NEUTRAL DISCONNECTING LINK

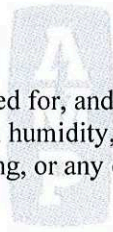
Do not connect any grounding conductors to the load side of any neutral disconnecting link or any sensor used for ground fault protection. Do not connect equipment grounding conductors directly to the grounded neutral bus.

UNUSED OPENINGS

All unused openings in the switchboard enclosure should be securely closed prior to putting the switchboard into service.

SERVICE CONDITIONS

Standard AMP switchboards are not intended for, and should not be used in locations that will be exposed to high ambient temperatures, high humidity, corrosive or explosive fumes and vapor, dust, standing water, vibration, jarring, tilting, or any other unusual service condition.



INSTALLATION OF CONDUIT AND CONDUCTORS

PREVENT MOISTURE FROM ENTERING

Conduits should be installed to prevent moisture/water from entering into the enclosure. Outdoor or slab on grade indoor switchboards with conduits entering from below through a pad or slab should be sealed between the pad and the conduit to prevent ground moisture for entering the enclosure.

CONDUCTOR LOCATIONS

Please refer to the enclosed "As Built Drawing" to locate the acceptable cable and conduit areas for each section. Care should be taken to avoid structural members, and live parts. Cable ties should be utilized to secure conductors and prevent them from rubbing on structural members. Conductors should be located in the switchboard so that they will be free from physical damage and to avoid overheating. Conductors should not be located where they will interfere with any moving components.

CABLE LASHING

AMP switchboards do not require cable lashing on services 85,000AIC and lower. For ratings higher than 85,000AIC, please refer to all labeling and drawings provided with the switchboard in regards to the requirement of lashing.

PROPER WIRING METHODS

Refer to Article 300 of the National Electrical Code for proper wiring methods.

BEFORE ENERGIZING**TIGHTEN ELECTRICAL CONNECTIONS**

Tighten all accessible electrical connections to the specifications provided in Tables 1-3. During transit mechanical pressure connections can vibrate and become loose.

TABLE 1: TIGHTENING TORQUE FOR SCREWS (POUND-INCHES)

WIRE SIZE INSTALLED IN CONNECTOR	SLOTTED HEAD # 10 OR LARGER-INCH (MM)		HEXAGONAL HEAD EXTERNAL DRIVE SOCKET WRENCH	
	SLOT WIDTH 0.047 (12) & LESS SLOT LENGTH 1/4 (6.4) & LESS	SLOT WIDTH OVER 0.047 (12) SLOT LENGTH OVER 1/4 (6.4)	SPLIT BOLT CONNECTORS	OTHER CONNECTORS
AWG 18 - 10	20	35	80	75
8	25	40	80	75
6, 4	35	45	165	110
3	35	50	275	150
2	40	50	275	150
1	-	50	275	150
1/0, 2/0	-	50	385	180
3/0, 4/0	-	50	500	250
MCM 250, 300, 350	-	50	650	325
400	-	50	825	325
500	-	50	825	375
600, 700, 750	-	50	1000	375
800, 900, 1000	-	50	1100	500
1250, 1500	-	-	1100	600
1750, 2000	-	-	1100	600

TABLE 2: TORQUE - BOLT DIAMETER

BOLT DIAMETER	TIGHTENING TORQUE
#8 (5/32")	15 INCH POUNDS
#10 (3/16")	20 INCH POUNDS
1/4"	7 FOOT POUNDS
5/16"	12 FOOT POUNDS
3/8"	20 FOOT POUNDS
7/16-1/2"	50 FOOT POUNDS
5/8"	95 FOOT POUNDS
3/4"	155 FOOT POUNDS

TABLE 3: TORQUE - SOCKET HEAD SCREWS

SOCKET SIZE (ACROSS FLATS) INCHES (MM)	TIGHTENING TORQUE POUND-INCHES (N-m)
1/8 (3.2)	45 (5.1)
5/32 (4.0)	100 (11.3)
3/16 (4.8)	120 (13.6)
7/32 (5.6)	150 (16.9)
1/4 (6.4)	200 (22.6)
5/16 (7.9)	275 (31.1)
3/8 (9.5)	375 (42.4)
1/2 (12.7)	500 (56.5)
9/16 (14.3)	600 (67.8)

INSULATION RESISTANCE TESTING

Before ENERGIZING the equipment, Insulation Resistance Testing should be performed to insure there are NO SHORT CIRCUITS or GROUND FAULTS. If this testing is conducted with over-voltage source, be sure to disconnect any control transformers or other voltage sensitive equipment in the system to avoid damage. Follow industry accepted practices for performing this test.

BUS MOUNTING

Check the integrity of all bus bar mountings and insulators. Make sure that insulators are not cracked and are free from damage.

ENCLOSURE

Check the enclosure to make sure it has not been damaged in such a way the spacing between current carry components has been reduced.

OPERATING MECHANISMS

Manually exercise all switches, circuit breakers and other operating mechanisms to make certain that they operate freely. Bolted pressure switches with GFI should not be opened manually. Please refer to the instruction manual provided with and attached to the bolted pressure switch behind the fuse door.

GROUND FAULT SYSTEMS

If the switchboard has been provided with ground fault, field test the ground protection system in accordance to the instruction sheet provided with this information packet.

FOREIGN MATERIAL

Remove all foreign material from inside the switchboard before closing the enclosure.

COVERS & DOORS

Replace all covers, close all doors and make certain that no conductors are pinched and that all enclosure parts are properly aligned and tightened.

ENERGIZING

QUALIFIED PERSONNEL

Only qualified personnel should energize this equipment. Conditions caused by damage to this equipment or incorrect installation can result in serious personal injury and extreme damage.

NO LOAD ON SWITCHBOARD

All devices should be turned off. There should be no load on the switchboard while it is being energized.

SEQUENCE OF ENERGIZING

The switchboard should be energized in sequence starting with the main (or main device closest to source in six disconnect board), followed by feeder devices starting with those closest to main source and successively working away from the source.

MAINTENANCE

DANGER – HAZARDOUS VOLTAGE

Hazardous voltages in electrical equipment can cause severe injury or death. Do not remove covers, open doors, or work on equipment unless power has been turned off, and all circuits de-energized and disconnected. Disconnect, de-energize, lock-out and properly ground all circuits before working on this equipment. Use proper safety precautions when working on this equipment.

SAFETY

Before any checking or maintenance of this switchboard can be performed the following must be observed: Only qualified personnel may operate, inspect or maintain this switchboard. It is the responsibility of the purchaser, installer or ultimate user to insure that warning signs are attached and to make sure that all access doors and operating handles are securely locked when the switchboard is left unattended by qualified persons, even momentarily.

All Safety codes, standards, and regulations as they may be applied to this type of equipment must be strictly adhered to. Before any adjustments, servicing, parts replacement or any other act is performed requiring any physical contact with the electrical components or wiring of this equipment, the power supply must be disconnected. Refer to *ANSI Standard Z 244.1: Personnel Protection – Lockout/Tag-out of Energy Sources Minimum Safety Requirements*

QUALIFIED PERSONNEL

This switchboard should only be operated and maintained by qualified persons who are thoroughly trained and who understand the hazards involved. As with any electrical apparatus, the thorough knowledge of the engineering safety, inspection, and maintenance of this particular gear is mandatory. This manual does not provide sufficient instructions for inexperienced lineman or unqualified persons to do any maintenance or repair to this switchboard

SWITCHBOARD INSPECTION/MAINTENANCE

Inspect and perform scheduled maintenance outlined herein at least once per year

CLEANING

Clean any dirt and dust out of the switchboard using a soft brush, vacuum cleaner or lint free rags. Avoid blowing dust into circuit breakers and other components, by not using compressed air or blowers.

INSPECT ALL ELECTRICAL JOINTS AND TERMINALS

Carefully visually inspect all electrical bus connections and terminals in the wiring to make sure that they are clean and secure. Look for signs of loose connections such as pitting or melting as well as discoloration or flaking of insulation. Loose connections should be cleaned and re-torqued to the specifications listed in Tables 1 - 3. Damaged parts should be replaced.

FUSE CLIP CONTACT PRESSURE

Inspect fuse clips for contact pressure. If there is any sign of looseness, contact AMP for replacement of parts or switch.

CORRECT DEVICE RATINGS

Check all circuit breakers, switches and fuses for correct amperage, voltage and interrupting ratings.

OPERATE DEVICES

Exercise each circuit breaker and switch several times to ensure that all mechanisms operate properly and freely to their full on and off position. If an automatic transfer switch is installed in the switchboard, follow the maintenance instructions described in the separate instruction manual provided for that device

LUBRICATION

In general most switches should not need to be re-lubricated, however if they do, only a clean, non-metallic, non-current carrying light grease such as petroleum jelly should be used. Do not lubricate molded case circuit breakers.

INSULATORS AND INSULATING MATERIAL

Inspect all insulators and insulating material to ensure that it is not cracked or damaged in any way. Be sure to inspect cable insulation as well as insulating bus supports.

INTERIOR MOISTURE AND CONDENSATION

Look for signs of previous moisture inside enclosure. Eliminate the source and also seal around bottom fed conduits to prevent ground moisture from entering enclosure. Make sure that all insulating material is thoroughly dry and clean. Any device or insulating material that has moisture damage should be replaced. Contact AMP for replacement.

SEVERE ELECTRICAL SHORT CIRCUIT

Extreme mechanical forces will result from excessive currents during a short. The forces will cause distortion in the bus, thermal damage and metal deposits. Insulating bus supports can crack and break under these extreme mechanical forces. Contact AMP for correction or replacement.

GROUND FAULT PROTECTION

Test the ground fault protection system (if provided) in accordance with the instructions provided on the front of the switchboard above the relay (if bolted pressure switch) or the separately provided manual (if circuit breaker).

**MINNEAPOLIS
PUBLIC SCHOOLS**
4315 31ST. AVE. S. MINNEAPOLIS, MN.



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ARCHITECTS ■ ENGINEERS ■ SCIENTISTS ■ SURVEYORS

HALLBERG
ENGINEERING

Mechanical / Electrical Consulting Engineers
1750 Commerce Court, White Bear Lake, MN 55110
(651) 748-1100 Fax: (651) 748-4370

HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS
PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY
LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF
MINNESOTA

AUL J. FETTINGER LIC # 43079

[illegible]

NORTHROP
COMMUNITY
ELEMENTARY
SCHOOL
SWITCHGEAR
REPLACEMENT

ELECTRICAL SYMBOLS AND ABBREVIATIONS

Project number	R21-4268.000
Date	February 18, 2022
Drawn by	SDM
Checked by	DEZ

E000

Scale $1/8" = 1'-0"$

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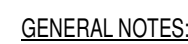
PAUL J. FETTINGER LIC # 43079

[illegible]

ELECTRICAL OVERALL PLAN - STREET LEVEL

E010

Scale	As indicated
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- A. REFER TO THE ARCHITECTURAL SPECIFICATIONS DIVISION 0 AND DIVISION 1 FOR PHASING AND SCHEDULING REQUIREMENTS. MAINTAIN SERVICES TO OCCUPIED AREAS OF THE BUILDING DURING CONSTRUCTION. PROVIDE TEMPORARY SERVICES AS REQUIRED.
- B. PROVIDE ALL CUTTING AND PATCHING OF FLOORS, WALLS OR CEILINGS FOR DIVISION 26 WORK. MATCH ADJACENT SURFACES.
- C. PROVIDE #10 AWG WIRING FOR ALL HOME RUNS IN EXCESS OF 80 FEET (120V), IN EXCESS OF 180 FEET (277V), UNLESS NOTED OTHERWISE.
- D. REFER TO ELECTRICAL POWER RISER DIAGRAM AND SCHEDULES FOR ADDITIONAL ELECTRICAL DISTRIBUTION INFORMATION.

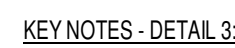
KEY NOTES - DETAILS 1 & 2:

- | | |
|---|--|
| 1 | EXISTING PANLEBOARD TO REMAIN. SHOWN FOR INFORMATION ONLY. |
| 2 | EXISTING FIRE ALARM ANNUNCIATOR PANEL TO REMAIN. SHOWN FOR INFORMATION ONLY. |
| 3 | EXISTING MAIN SWITCHBOARD TO BE REPLACED. REFER TO RISER DIAGRAM, AND SCHEDULE FOR SCOPE OF WORK. |
| 4 | EXISTING SIMPLEX 4100 FIRE ALARM PANEL TO REMAIN. SHOWN FOR INFORMATION ONLY. |
| 5 | EXISTING DISTRIBUTION BOARD TO REMAIN. SHOWN FOR INFORMATION ONLY. |
| 6 | LOCATION OF BOILER ROOM BELOW. REFER TO DETAIL 2 THIS SHEET FOR ADDITIONAL INFORMATION. |
| 7 | DIVISION 28 CONTRACTOR TO MAKE MODIFICATIONS TO EXISTING CIRCUIT BREAKER. REFER TO THE POWER RISER DIAGRAM FOR ADDITIONAL INFORMATION. |
| 8 | EXISTING OF TO REMAIN. SHOWN FOR INFORMATION ONLY. |
| 9 | EXISTING UTILITY PAD MOUNT TRANSFORMER TO REMAIN. SHOWN FOR INFORMATION ONLY. |

$$1/16'' = 1'-0''$$

NOTES:

1. SIZE CIRCUIT BREAKER FOR SPD PROVIDED AS PART OF THE SWITCHBOARD



- | | |
|----|--|
| 4 | EXISTING PANELBOARD TO REMAIN. SHOWN FOR INFORMATION ONLY. |
| 5 | EXISTING DISTRIBUTION BOARD TO REMAIN. SHOWN FOR INFORMATION ONLY. |
| 6 | EXISTING ELEVATOR TO REMAIN. SHOWN FOR INFORMATION ONLY. |
| 7 | EXISTING FEEDER TO REMAIN. SHOWN FOR INFORMATION ONLY. |
| 8 | EXISTING UTILITY MOUNTED TRANSFORMER TO REMAIN. SHOWN FOR INFORMATION ONLY. |
| 9 | UPGRADE EXISTING UTILITY LATERAL FEEDER (3" 40%WC ALUMINUM) DEMOLISH CONDUITS AND MAINTAIN EXISTING FEEDER. PROVIDE NEW UTILITY LATERAL IN EXISTING CONDUITS. 4900KCMIL COPPER EACH. |
| 10 | DEMOLISH EXISTING MAIN SWITCHBOARD MSB-1. RETAIN ALL EXISTING FEEDERS FOR RECONNECTION. INSTALL NEW MAIN SWITCHBOARD MSB-1. MSB-1 PURCHASED BY SCHOOL DISTRICT AND INSTALLED BY SUBCONTRACTOR. PROVIDE ALL FINAL CONNECTIONS FOR A COMPLETE INSTALLATION. REFER TO SWITCHBOARD SCHEDULE FOR ALL CONNECTIONS. |
| 11 | PROVIDE 4" HIGH MAXIMUM CONCRETE HOUSING KEEPING PAD. |
| 12 | EXISTING 80 AMP CIRCUIT BREAKER. REMOVE CIRCUIT BREAKER AND MAINTAIN HOUSING FOR USE AS A PULL BOX. PROVIDE NEW COVER. SPURCE SPICE EXISTING CONDUCTORS. |
| 13 | DEMOLISH EXISTING FEEDER AND DISCONNECT SPURCE PANELBOARD 16. |
| 14 | PROVIDE NEW FEEDER REFER TO EXISTING PANELBOARD 2" 4016 IN 80.0D. |
| 15 | REPLACE EXISTING PULLBOX ABOVE SWITCHBOARD TO ACCOMMODATE NEW SWITCHBOARD. INSTALL NEW SPURCE FEEDER TO THE TOP OF THE SWITCHBOARD TO RECONNECTION TO THE INCREASED SWITCHBOARD HEIGHT. |

ELECT

15

**MPS Electrical Specification Sections
SECTION 00 01 10
TABLE OF CONTENTS**

DIVISION 26 - ELECTRICAL

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26 01 26	Maintenance and Testing of Electrical Systems
26 05 00	Common Work Results
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26 05 19	Low Voltage Cables and Conductors (600 Volts & Below)
26 05 25.01	Tracing of Circuits
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26 05 29	Hangers and Supports for Electrical Systems
26 05 33	Raceways and Boxes
26 05 53	Identification for Electrical Systems
26 24 00	Switchboards and Panelboards
26 28 16	Enclosed Switches and Circuit Breakers

END OF DOCUMENT

RFP 24-22: APPENDIX 10

SECTION 26 00 00
GENERAL REQUIREMENTS - ELECTRICAL

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: All labor, materials, equipment, services, and tools necessary for the complete installation of all electrical systems as specified and/or shown on Drawings. In general, consisting of wiring for light and power, installation of wireways for miscellaneous systems, and installation of lighting fixtures and other equipment specified. Work shall include removal and remodeling of existing equipment and alterations to building construction where necessary to accomplish the Work. Electrical work shall be complete with wiring, fittings, equipment, and connections as specified or required. Work shall also include testing, adjustment, start-up, and troubleshooting of electrical equipment, and training of Owner's operating personnel in its operation and maintenance. Omission of express reference to any parts and labor necessary for, or reasonably incidental to, a complete installation shall not be construed as releasing the Contractor from furnishing such parts and labor. Electrical Drawings, which include work of this Specification Section, are indexed on first sheet of Drawings. Before submitting a proposal on the Work of the Electrical Specifications and Drawings, bidders shall examine the site and check as to the means of making connections to services and shall familiarize themselves with existing conditions and limitations. No extras will be allowed because of Contractor's misunderstanding of amount of work involved, or lack of knowledge of site conditions that may affect Work. Any apparent variance of Drawings or Specifications from existing conditions shall be called to Engineer's attention. Contractor shall assume full responsibility for additional costs which may result from unauthorized deviations from the Contract Documents. Existence of wires, conduits, pipes, ducts, or other facilities are shown only in a general way. Contractors are duty bound to visit site and make exact determination of existing conditions prior to submission of bids.
1. "Electrical Contractor" and "Contractor" designations are identical for all Section 26 work.
 2. "Engineer" and "Architect" designations may be interchanged, and shall bear equal weight for purposes of Contract Documents.
 3. Contractor warrants that submitted bid includes necessary and sufficient allowances for coordination of this work to work of all trades.
 4. Other Specification Sections may require special coordination of craft personnel to work composite crews.
 5. Coordinate all electrical work with General Contractor, local electric utility, and Owner for all temporary and permanent power requirements for the Project.

1.02 ELECTRIC SERVICE CONTINUITY

- A. General: Building will be in use during operations, and Contractor shall schedule the work and carry it out in such a manner as to least inconvenience occupants due to electrical supply interruptions. Interruptions shall be confined to smallest area possible at any one time and all interruptions shall be approved by Owner. Provide electric service continuity, including any temporary electric connections, services, and generators during the course of the Work. After service has been restored following an interruption, Electrical Contractor shall inspect areas that were affected by interruptions and be responsible for returning automatically controlled electrically operated equipment, to the same operating condition which existed prior to the interruption.

1.03 TEMPORARY SERVICES

- A. General: Electrical Contractor shall carefully examine all parts of this Section for temporary services, such as heating, lighting, power, and other services, and include in their bid an amount to cover their portion of such services, unless otherwise provided.

1.04 CONSTRUCTION LIGHT AND POWER SYSTEM

- A. General: Until construction lighting and power system hereinafter specified is installed, each trade shall arrange for and pay costs for temporary light and power required by their operations.

In addition, each Contractor shall make arrangements for and pay for energy costs for temporary electric service to their own construction offices and storage sheds.

B. Work Included:

1. As soon as Contract is awarded, Electrical Contractor shall furnish and install a construction light and power system for the use of all contractors, and shall immediately arrange with Owner for a 200 amp, 120/208 volt, single phase, 3-wire service to be extended by Contractor from switchboard. Location of temporary service shall be coordinated with all Prime Contractors and Engineer prior to installation to minimize conflict with site storage and shop areas.
2. Contractor shall furnish, install, and maintain lighting and receptacle outlets in accordance with the following:
 - a. Temporary lighting shall be provided at not less than 0.5 watt per square foot with not less than (1) light outlet per room or space.
 - b. Receptacles shall be provided as follows:
 - 1) 20 Amp, 120 Volts, Single Phase Duplex GFI
 - 2) 50 Amp, 240 Volts, Single Phase
 - c. Receptacles shall be located so that no location within the building is more than 75 feet from a receptacle of (2) types described.
 - d. Contractor shall apportion lighting and receptacle outlets throughout each floor or area in an arrangement acceptable to Engineer and other trades.

C. Materials:

1. Materials for construction lighting and power systems need not be new, and need not conform to provisions found elsewhere in the Specifications relating to materials for permanent installation; however, materials shall be in good condition and of quality to ensure adequate operation and safe use, and shall have the listed approval of Underwriters' Laboratories, Inc., where applicable. Materials shall meet requirements of other provisions of this Subsection, where applicable.
2. Temporary receptacles, except where noted otherwise, shall be 20 Amp, 120 Volt duplex grounding Type GFI and shall be installed in suitable outlet boxes with plates.
3. Temporary conductors, where open wiring is permitted, shall be copper and, except for grounding conductors, shall be insulated. Insulation for phase conductors shall be rated for circuit voltage, and insulation of jacketing shall be suitable for conditions to be encountered. Sizes for branch circuit conductors shall be 12 AWG minimum size, except 10 AWG shall be used where length of branch circuit exceeds 100 feet. Splices of temporary conductors shall be soldered or shall utilize approved type of mechanical connectors, and all splices shall be insulated by taping or other approved methods.

D. Installation:

1. Installation of system shall meet requirements of applicable codes and ordinances related to such temporary wiring.
2. Except as otherwise provided herein, completed portions of permanent installation, or materials for use in permanent installation, shall not be used in temporary installation without specific permission of Engineer.
3. Temporary electrical services; circuits in excess of 600 volts between phase conductors; extension of circuits accessible from streets, sidewalks, or other thoroughfares of public access; and extensions into occupied portion of buildings shall be installed in accordance with applicable codes relating to permanent work. Other circuits may be installed open wiring with insulated conductors placed and adequately supported so as not to be readily accessible to unqualified persons. Installed raceways for permanent installation may be used for installation of temporary wiring.
4. Grounding shall comply with applicable codes. Grounding terminals of receptacles and non-current carrying metal parts of equipment of temporary lighting and power system shall be connected to common grounding conductor at service through metallic conduits or through grounding conductors installed with circuit conductors. Permanent grounding system may be utilized for temporary system.

5. Overload protection for circuits and equipment of temporary lighting and power systems shall comply with applicable codes.

E. Costs: Costs of energy for construction lighting and power systems will be paid by Owner.

1.05 USE OF FACILITY

A. General:

1. Normal use of facility shall not be disturbed, except within immediate construction area. Walks, driveways, and entrances shall be kept clear and free of Contractor's equipment.
2. All materials and equipment shall be stored in such a place and in such a manner that a minimum of congestion will result, and materials and equipment are protected from damage. Placing of such materials and equipment shall be subject to Owner's approval.

1.06 INSTALLATION METHODS

A. General: Methods used for installation for electrical systems and equipment shall meet requirements of National Electrical Code (NEC) and the National Electrical Contractors Association (NECA) published "Standard of Installation", except where specifically specified or indicated otherwise.

1.07 DRAWINGS AND SPECIFICATIONS

A. General:

1. Drawings and Specifications have been prepared utilizing best engineering practice. Engineer is sole authority for interpretation of Drawings and Specifications, and for suitability or acceptability of any local construction practices.
2. Consult Drawings and Specifications from all Sections, including respective Shop Drawings and processes of all trades, to successfully execute the work. Included are the following:
 - a. Dimensions
 - b. Furred Spaces
 - c. Suspended Ceiling Spaces
 - d. Locations of Equipment
3. Electrical Drawings are to scale as noted, but are not dimensioned. Dimensions given on Drawings shall take precedence over scaled dimensions; however, Contractor shall refer to Architectural and Structural Drawings for exact location of partitions, walls, beams, shafts, equipment, and other components.
4. Contractor, before roughing in facilities or installation of any equipment, shall consult all Drawings and Specifications for finishes, locations of ceiling, ceiling types, structural members, pipes, ducts, recessed lighting fixtures, conduits, and other components which may affect installation. When installing equipment, Contractor shall leave adequate room for installation of equipment by other Contractors or Subcontractors where space is limited.
 - a. Consideration has been given to such condition of limited space in preparation of Drawings, and locations and dimensions of equipment have been selected accordingly. Contractor shall be warned that in certain instances, space may be limited to the extent that there may be only one arrangement of equipment or facilities that will allow installation of same.
 - b. Where connections are made of equipment furnished by others, Electrical Contractor shall obtain exact location of connection from persons furnishing that equipment.
5. All dimensions shall be coordinated with field conditions.
6. Verify that equipment to be provided will fit available space.
7. Confirm that all maintenance clearances are maintained.
8. Ensure that Work is installed to conform to all required codes.
9. Discrepancies discovered before or after work has begun shall be brought to attention of Project Architect/Engineer in writing immediately. Architect/Engineer reserves the right to require minor changes in work to eliminate such discrepancies with no change in cost.
10. Verify the following before all electrical devices are roughed in:
 - a. Swings of Doors

- b. Equipment, Furniture, Markerboard, and Millwork Locations
- 11. Drawings and Specifications are complementary and what is called for in either one shall be as binding as if called for in both. Where a discrepancy exists between Drawings and Specifications, item or arrangement of better or greater quality or cost shall be included.

1.08 WORK INCLUDED

- A. General: Work includes, but shall not be limited to, the following general summary:
 - 1. Electrical Service(s)
 - 2. Concrete Pads and Vaults at Service Locations
 - 3. Provisions for Power Company Meters
 - 4. Service Entrance Feeders and Duct Banks
 - 5. Service Entrance Switchboards
 - 6. Equipment Housekeeping Pads
 - 7. Distribution Panelboards
 - 8. Circuit Breaker Panelboards

1.09 COORDINATION DRAWINGS

- A. General: Prepare coordination Drawings of sufficient scale to detail major elements, components, and systems in relationship with other systems, installations, and building components. Drawings are intended to indicate locations where space is limited for installation and access, and where sequencing and coordination are of importance to flow of Work. Coordination Drawings shall effectively show the following:
 - 1. Proposed Locations of Major Raceway Systems, Equipment, and Materials
 - 2. Clearance for Servicing and Disassembling Equipment Required for Periodic Maintenance
 - 3. Exterior Wall and Foundation Penetrations
 - 4. Fire Rated Wall and Floor Penetrations
 - 5. Equipment Connections and Support Details
 - 6. Sizes and Location of Required Concrete Pads and Bases
 - 7. Mechanical Equipment Rooms
 - 8. Electrical Equipment Rooms
 - 9. Generator Rooms
 - 10. Cable Tray Routing and Clearances
 - 11. Scheduling, Sequencing, Movement, and Positioning of Large Equipment Into Building During Construction
 - 12. Penetrations in Floors, Walls, and Ceilings and Relationship to Other Penetrations and Installations

1.10 OVER-CURRENT DEVICE COORDINATION STUDY

- A. General: System design shown on Drawings and specified may vary for each manufacturer's equipment type.
 - 1. Study shall meet requirements of current edition of NEC, NFPA 70.
 - 2. Contractor shall provide manufacturer's over-current protective device coordination study based on manufacturer's specific equipment.
 - a. Submit this study with Shop Drawings for approval.

1.11 MATERIALS AND EQUIPMENT

- A. Materials: Materials shall be new, of best throughout, and in accordance with requirements set forth. Materials and equipment shall be adequately protected from damage, dirt, and weather. Engineer has the right to reject materials not in accordance with Specifications, either before or after installation. Contractor shall be held responsible for defects in materials which may appear during warranty period after building has been accepted. Such defects must be repaired or defective material replaced by Contractor at no additional charge to the Owner.
 - 1. Contractor shall be responsible for proper installation of all systems in this Contract, and shall remedy, free of charge, any defects in materials for a period of 12 months from final acceptance by Owner.

2. All incandescent lamps shall be replaced prior to Owner occupancy. All fluorescent, tungsten halogen, HID, LED, and electronic lamps failing within 3 months of Owner occupancy shall be replaced at no additional charge to the Owner.
- B. Underwriters' Laboratories (UL): Materials and equipment shall be UL listed where such standards have been established.
- C. Prior Approval of Substitute Materials and Equipment: Approval of substitute materials shall only be considered prior to submitting bids in accordance with the Instructions to Bidders.
 1. Applications for prior approval shall only be considered from Contractors submitting bids on Project.
 2. Contractors shall determine whether substituted materials receiving prior approval are actually in accordance with Drawings and Specifications.
 3. Additional costs to any trade for modifications due to substituted materials by Electrical Contractor shall be borne by Electrical Contractor.

1.12 WORKMANSHIP AND CONSTRUCTION RULES

- A. Workmanship: Workmanship shall be of best quality throughout. Minimum standards of installation shall conform to NECA "Standard of Installation".
 1. All exposed equipment, conduit, boxes, plates, panels, cabinets, and other electrical components shall be installed square, straight, and true with building construction.
 2. Care shall be taken to rough-in outlet boxes, cabinets, and other electrical components to provide a pleasing appearance. Centerline of outlets shall be aligned vertically and horizontally. Where outlets occur in wood panels, below windows, between doors, and other such conditions of architectural features, outlets shall be centered or otherwise located symmetrical with major feature.
 3. Panelboards and terminal cabinets, where located adjacent to each other or one another, shall be same size, and tops and bottoms shall be aligned.
 4. Contractor will be held responsible for defects in workmanship which may appear during warranty period after building has been accepted. Such defects shall be repaired by Contractor at no additional charge to Owner.
 5. Contractor shall be responsible for proper installation of all systems in this Contract, and shall remedy, free of charge, any defects in workmanship for a period of 12 months from final acceptance by Owner.
- B. Wiring Methods and Hazardous Areas:
 1. In locations exterior to building, wiring methods and equipment shall meet NEMA 3R raintight standards.
 2. Wiring, devices, outlets, and lighting fixtures installed in chemical storage rooms shall be explosion-proof in accordance with National Electrical Code requirements for Class 1, Section 01 hazardous locations. All devices and equipment shall be approved by UL for this type of location.
 3. Where it is necessary to install sealing fittings accessible from finished spaces, a flush wall or ceiling outlet box shall be installed, and conduit to be sealed shall run straight through box with sealing fitting occurring within outlet box. Box shall then be covered with a blank cover plate.
 4. Elsewhere, installation and equipment shall meet NEMA 1 standards.
- C. Correlation of Work: Contractor shall organize work to not interfere with, or delay the work of other trades. The following procedure shall be followed:
 1. Consult Drawings and Specifications which apply to other trades for correlating information.
 2. Confirm mounting height of electrical and technology outlets, panels, or devices either in or on walls and casework.
 3. Prior to installation, verify that specified mounting heights are uniformly adhered to, and that any code-related or ADA heights are not in conflict with them.
 4. Specified mounting heights shall be coordinated with final "on-site" Mechanical and Architectural Drawings and Shop Drawings.

5. Conflicts or interference with work of other trades shall be brought to Engineer's attention, in writing, before installation.
 6. Failure to follow the above procedures, which results in any additional or corrective work by any or all trades, shall be done at Electrical Contractor's expense.
- D. Protection of Materials and Equipment:
1. Contractor shall schedule deliveries and provide for proper receipt, handling, storage, and protection of materials and equipment used in work so as to effectively prevent damage until final acceptance by Owner.
 2. If, during shipment or installation, finish of equipment becomes chipped or scratched, Contractor shall touch up or refinish surfaces to match original finish.
 3. Contractor shall follow manufacturer's recommendations to protect equipment from deterioration.
 4. Materials or equipment sustaining damage or deterioration from any cause whatever, shall be replaced or repaired at Contractor's expense as directed by Engineer.
 5. Switchboards, panelboards, transformers, bus ducts, motor starters, and other electrical components stored or installed on-site shall be protected with a minimum polyethylene or equivalent covering, to protect equipment from moisture, plaster, cement, paint, or other work of other trades.
 6. Protective coverings shall be further constructed of plywood sheeting or other materials for strength if required by site conditions.
- E. Construction Rules: Contractor shall be responsible for means and methods of construction, and for safety of electrical personnel. Contractor shall ensure that Subcontractors are fully aware of this requirement. As a minimum, following rules apply to all electrical equipment:
1. Main service switchboards, distribution panelboards, and motor control centers shall not have any work performed on these units unless said equipment is completely de-energized.
 - a. Contractor shall request an outage from Owner at least (2) weeks prior to scheduled work.
 - b. Contractor shall include all costs for overtime in bid.

1.13 ACCEPTANCE OF MATERIALS AND EQUIPMENT

- A. General:
1. Contractor shall adhere rigidly to Specifications, and shall use exact equipment specified or an approved substitution. Where the words "or equal" are used in Specifications, other manufacturers will be considered for acceptance as substitutions; however, such requests must be submitted for review prior to bidding. If Contractor desires tentative acceptance of a brand of merchandise not specified, sufficient data shall be submitted to Engineer for appraisal 240 hours prior to time set for bids to be received. If any manufacturer or brand other than those specified are acceptable to Engineer, such item(s) will be issued in an Addendum before bids are received; however, such acceptance shall still be obtained as described in the following. Equipment that is not specified or is not approved by Addenda will not be considered.
 2. No later than 48 hours after bid opening, Contractor shall submit a complete list of Subcontractors and Materials and Equipment that Contractor intends to use in execution of Contract when signed. List shall be submitted on forms provided by Engineer, and shall include manufacturer's name and catalog numbers for items designated by Engineer. Acceptance of items on the list shall be considered final unless additional information and submissions are required by Engineer. Items of equipment that are not acceptable shall be resubmitted.
 3. Acceptance of certain items of equipment by Engineer shall be based on manufacturer's Shop Drawings and pamphlets that shall be submitted to Engineer in (6) sets. Contractor shall be prepared to submit samples of equipment or material for appraisal when requested by Engineer or Owner. No materials or equipment shall be installed until Engineer has given acceptance in writing.

4. Contractor shall supply other trades with approved detail drawings of furnished equipment in the event that equipment will affect work of other Contractors.

1.14 OPENINGS, CUTTING, DRILLING, PATCHING, AND GROUTING

- A. General: Openings, cutting, drilling, and patching shall be done by Contractor as required in order to perform the work. Unless noted otherwise, special permission shall be obtained from Architect/Engineer before cutting structural members or finished materials.
 1. X-ray slabs and walls prior to core drilling to eliminate damage or cutting structural elements.
 2. Drilling: Holes made in existing masonry for raceways or other electrical equipment shall be core drilled. Drill holes in masonry with rotary drills. Pneumatic impact tools shall not be used. Penetrations shall be located subject to approval by Engineer or Architect, and after installation of the work, shall be properly sealed with an approved fire rated seal. Fire ratings of walls shall be verified prior to commencement of work and restored by Contractor. Contractor shall be responsible for providing and disposing of water used in core drilling operations. Work shall be scheduled and coordinated with other trades so that damage will not result from use of water.
 3. Sleeves: Electrical Contractor shall provide Schedule 40 steel wall and floor sleeves. Adequately fasten sleeves and check during pours to ensure proper positioning. Floor sleeves shall project 3-inches minimum above finish floor surface. Install a fire rated material to maintain fire rating of floor.
 4. Bushings: Install bushings on both ends of communications sleeves for cables not in conduit.
 5. Patching: Perform patching in such a manner as to leave no visible trace and to return part affected to condition of undisturbed work. Patching shall be performed by workers experienced, skilled, and licensed for particular type of work involved. Inferior work will not be accepted.
 6. Grouting: Contractor shall be responsible for grouting airtight any openings adjacent to raceways and other channels to seal against passage of air, smoke or vapors. Maintain ratings of fire rated partitions. Provide grouting at lighting standards. Provide grouting at other locations where shown on Drawings. Contractor shall allow weepholes to allow drainage of moisture.
 7. Prevent spread of dust, debris, and other material into adjacent areas.

1.15 PAINTING

- A. General: Painting shall be done by others, unless specifically noted otherwise. Contractor shall paint surface metal raceways with (1) finish coat of enamel. Color of finish coat to be as directed by Architect.

1.16 CODES AND FEES

- A. Licenses and Fees: Electrical Contractor shall obtain and pay for permits, inspections, licenses, and any related fees or charges for work before actual work has begun.
- B. Other Fees: Electrical Contractor shall verify utility costs and pay all costs for service connections unless specified elsewhere.
- C. Codes and Ordinances: Contractor shall comply with ordinances, laws, regulations, and codes applicable to work involved. This does not relieve Contractor from furnishing and installing work shown or specified which may be beyond requirements of such ordinances, laws, regulations, and codes. Installation shall meet requirements of Specifications and the following:
 1. State and Local Building Codes
 2. State Board of Health
 3. State Industrial Commission
 4. State and Local Fire Codes and Regulations
 5. National Electric Code
 6. State and Local Electrical Installation Codes
 7. Local Power Company Regulations and Requirements

8. Occupational Safety and Health Administration (OSHA) Rules and Regulations
 9. Americans with Disability Act
- D. Inspections: Regular inspections shall be requested by Electrical Contractor as required by regulations. No work shall be covered until inspections have been completed. Charges for inspections by regulating agencies of installations of Drawings and Specifications shall be paid for by Electrical Contractor. Inspection certificates, or copies of permits (where Inspection certificates are not issued), shall be included in Operation and Maintenance Manuals.
1. Contractor shall provide for the following additional inspections:
 - a. Underfloor: Prior to covering work.
 - b. In Wall: Prior to covering.
 - c. Above Ceiling: After energizing circuits, but prior to covering with tiles or sheet rock.
 2. Contractor, after completion of work, shall furnish to Owner a certificate of final inspection and approval from inspection bureau having jurisdiction.

1.17 MAINTENANCE MANUAL

- A. General: Contractor shall furnish Owner with (1) electronic version and (2) hard copies of Operation and Maintenance Manuals covering operation and maintenance of equipment provided under this Contract.
- B. Electronic Manual: Contractor shall provide electronic files on CD ROM of all information included in hard copies as hereinafter specified. Files shall be retrievable through common software, such as MS Word or Acrobat Reader:
 1. Manufacturer's Data:
 - a. Electrical Switchgear
- C. Hard Copies in Binder: Contractor shall provide a black, 3-ring, loose leaf, heavy duty, steel piano hinged binder, Hytone No. 8711 or Owner approved equal, and submitted to Architect/Engineer for approval. Each manual shall contain the following:
 1. Manufacturer's Data: Provide complete catalog data, including stamped and approved Shop Drawings, manufacturer's literature, equipment wiring diagrams, detailed operating instructions, reduced scale layout drawings, and a complete listing of suppliers and distributors where replacement parts or maintenance services are available for all equipment in the Specification. Contractor shall tab O&M Manuals, using section numbers from Section 26 00 00 index herein contained.
 2. Inspection Documentation: Provide documentation of inspections, consisting of an Inspection Certificate or other suitable document signed by Inspection Authority.
 3. Test Reports: Test reports shall document testing for Grounding, Fire Alarm, Security, Emergency Generator, UPS, indicating that systems are performing correctly, have been certified, and meet applicable requirements.
 4. Manufacturer's Test and Start-Up Reports: Certification documents signed by manufacturer's representative or service organization and Electrical Contractor shall be included for all Emergency Generators, Emergency UPS/Invertor Units, Dimming Systems, Stage Lighting Dimming Systems, Lighting Control Panels, Occupancy Sensors, TVSS Equipment, Sound Reinforcement Systems, Paging Systems, Clock Systems, Elevator Disconnect/Control provided by Section 26. Test reports to indicate that manufacturer has reviewed and/or tested installation, and that systems are in correct working order at time of building turnover. Contractor shall tab reports in O&M Manuals using the Specification Section numbers from Section 26 00 00 index herein contained.
 5. Lighting Rebate Forms: Contractor shall transmit a copy of lighting rebate forms and associated invoices as part of O&M Manual as described in Section 26 50 00, Lighting Rebates.
 6. Fire Alarm Certification: Where a fire alarm system or revisions to an existing fire alarm system are included as a part of this Contract, provide a letter from fire alarm system equipment supplier or installer stating that system has been installed correctly, is working correctly, and thoroughly checked out. Copies of such letters shall be included in O&M Manuals. Provide new points list with the As-Built Drawings.

- a. Contractor shall also include Customized Inspection Form called out in Fire Alarm Specifications to assist Owner in performing regular 6-month or yearly inspections of fire alarm system.
- D. As-Built Drawings and Specifications:
 - 1. Contractor shall mark up a set of Drawings to show conditions which vary from original. Engineer will furnish a newly printed complete set of Drawings which shall be kept on-site at all times, upon which each field change shall be marked. Upon completion of work, Contractor shall turn over (1) set of Drawings and Specifications as described in Section 01 77 00, Contract Closeout. Work shall be completed and accepted by Engineer before approval of final payment. One (1) set of As-Built Drawings and Specifications shall be sent to the MPS Electric Shop.

1.18 OPERATING INSTRUCTIONS AND TESTING

- A. Operating Instructions:
 - 1. Contractor shall furnish, without additional expense to Owner, services of competent instructors who will give full instruction in care, adjustment, operation, and maintenance of all electrical controls, special systems, and communication systems to Owner's permanent employees who are to have charge of equipment. Instructor shall be thoroughly familiar with all parts of installation on which they are to give instructions and shall be trained in operating theory, as well as in practical operation and maintenance work.
 - 2. Factory trained instructors shall be employed wherever available. Instruction shall be given during regular work week and at a time just prior to time equipment is accepted and turned over to Owner for regular operation.
 - 3. Contractor shall include a letter, signed by Owner's Representative and Contractor, stating that training is completed to Owner's satisfaction. Include date, time, place, and names and titles of all personnel present at each training session. Provide one letter for each system provided under this Contract.
 - 4. Contractor shall collect, gather, and assemble books, each to contain installation details, instructions, schematics of actual equipment, and operations directions supplied by manufacturer with equipment. Provide complete listing of suppliers and distributors where replacement parts or maintenance services are available. Include complete panelboard schedules. Final acceptance of the work will be withheld until such data has been presented complete to Engineer for transmission to Owner. Manual shall be available for instruction of operations and maintenance of equipment and systems.
- B. Tests: Contractor shall test equipment installed under this Specification and shall demonstrate its proper operation to Electrical Engineer. No equipment shall be tested or operated for any purpose until it has been fully prepared, connected, and made ready for normal operation, including review by equipment manufacturer's representative or service organization. Damage to equipment occasioned by improper or ill-timed operation or testing by Contractor shall be made good, at Contractor's expense, before final inspection and acceptance.
 - 1. Tests shall consist of the following:
 - a. Function test of equipment, as instructed by manufacturer:
 - 1) Verify power and control circuits are complete.
 - 2) Verify fuse sizes match equipment requirements.
 - 3) Size motor overload heaters.
 - b. Checklist items specified in 26 00 00 have been completed.

1.19 CLEAN-UP

- A. General: Unless specified elsewhere, Contractor shall regularly remove from site all dirt, debris, construction, tools, equipment, and other components used under this Contract. Contractor shall thoroughly clean all light fixtures, wiring devices, cover plates, panel boards, transformer enclosures, and all other similar equipment of all dust, dirt, plaster, and paint over spray, and repair and touch up paint all scratches and damage to equipment.

1.20 ELECTRICAL CHECKLIST FOR PROJECT COMPLETION

- A. General: Contractor shall complete Electrical Checklist for Project Completion by indicating with a check at each of the questions indicated in the Schedule in Appendix following this Section.

1.21 WARRANTY

- A. General: Contractor shall include in Bid Price, a 1-year Parts and Labor Warranty for the Project.

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION

3.01 ELECTRICAL CHECKLIST FOR PROJECT COMPLETION

- A. Submit a copy of this completed form, signed and dated by Contractor, with final project closeout documents.

END OF SECTION 26 00 00

SECTION 26 01 00

OPERATION AND MAINTENANCE OF ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Work consists of furnishing labor, materials equipment and services required for the complete installation of work shown in the Contract Documents and Specifications.
2. Include all parts and labor which are incidental and necessary for a complete and operable installation even though not specifically mentioned in the Contract Documents and Specifications. Such items include nuts, bolts, anchors, brackets, sleeves, offsets, fittings, relays, etc.
3. Some equipment and materials provided under other Sections may require composite work crews because of trade jurisdiction. Where this occurs, include in the bid this portion of the composite crew labor costs. It is the Contractor's responsibility to review all Sections of the Contract Documents and Specifications to determine where these composite crews are required.
4. Arrange with appropriate utility companies to provide temporary and permanent utility services as required and coordinate their installation with construction progress of this project.
5. Obtain all temporary and permanent permits and licenses required in connection with this Section's work. Pay all fees and expenses required for such permits and licenses.
6. Request inspections as required by regulating agencies and/or regulations. Pay all fees for inspections by regulating agencies for the installation of the plans and specifications.
7. Include State and Local sales taxes in the bid. Keep accurate records of these taxes and furnish such records to the Owner upon request.
8. Provide the Owner with a certificate of final inspection and approval by enforcement authorities.
9. The drawings and specifications constitute the Contract Documents. Any item noted in the specifications or shown on the drawings is included in the Contract Documents.
10. All electrical details and drawings are diagrammatic, unless specifically noted. Field-verify all dimensions and notify Engineer of any conflicts of discrepancies, in writing, prior to installation.

B. Commissioning: Mechanical and electrical systems on this project will be commissioned by and independent commissioning agent. Refer to other Sections for electrical responsibilities. Scope of electrical work includes, but is not limited to, the following:

1. Attending all commissioning meetings.
2. Verifying electrical connections and operation of commissioned systems, including low voltage systems.
3. Measuring, testing, and documenting statuses of components within the scope of mechanical and electrical commissioning.
4. Demonstrating electrical systems to the Owner and Commissioning agent.
5. Correcting work as indicated by the Commissioning agent if also directed by the Engineer.

C. Related Sections: All Sections of the Construction Documents and Specifications relate to all other sections. It is the Contractor's responsibility to have working knowledge and understanding of information contained in all Sections of the Construction Documents and Specifications as they relate to each other and this Section.

1.02 UNIT PRICES:

A. Refer to Bid Form and Instructions to Bidders.

1.03 ALTERNATES:

A. Refer to Bid Form and Instructions to Bidders.

1.04 REFERENCES:

- A. Meet or exceed all current applicable codes, ordinances and regulations for all installations. Promptly notify the Engineer, in writing, if the contract documents appear to conflict with governing codes and regulations. Contractor assumes all responsibility and costs for correcting non-complying work installed without notifying the Engineer.
- B. Higher quality of workmanship and materials indicated in the Contract Documents and Specifications takes precedence over that allowed in referenced codes and standards.
- C. Perform all work in compliance with the currently adopted version of the codes and standards.

1.05 QUALITY ASSURANCE:

- A. Regulatory Requirements:
 - 1. Initiate, maintain and supervise all safety precautions required with this work in accordance with the regulations of the Occupational Safety and Health Administration and other governing agencies.
 - 2. The Contractor, after completion of the work, shall furnish the Owner a Certificate of Final Inspection and approval from the inspection bureaus having jurisdiction.
- B. Environmental Requirements:
 - 1. Removal of Existing Building Materials Containing Asbestos and Lead: Refer to Sections 00 31 26.23 Asbestos-Containing Materials and Section 00 31 26.26 Lead-Containing Materials.
 - 2. The Contractor shall separate, store, and dispose of regulated waste according to local, state, and federal regulations.
- C. Provide new, first quality materials for all products specified. Do not reuse materials unless indicated or approved by the Engineer.
- D. Comply with the NEC as applicable to the construction and installation of equipment specified in this Section.
- E. Provide equipment specified in this Section that has been listed and labeled by a nationally recognized testing laboratory.
- F. Comply with ANSI as applicable to equipment specified in this Section.
- G. Comply with NEMA as applicable to equipment specified in this Section.

1.06 PROJECT/SITE CONDITIONS

- A. Site Inspections:
 - 1. Before submitting a proposal on the work contemplated, examine the site of the proposed work and become thoroughly familiar with existing conditions and limitations. No extra compensation will be allowed because of misunderstanding as to the amount of work involved nor bidders lack of knowledge of existing conditions which could have been discovered or reasonably anticipated prior to bidding.
 - 2. Conduits, pipes, ducts, lights, devices, speakers, etc. shown on the drawings as existing have been based on existing plans and casual site observations, and may not be installed as originally shown. It is the Contractor's responsibility to visit the site and make exact determination of the existence, location and condition of such facilities prior to submitting a bid.
- B. Correlation of Work:
 - 1. Consult the drawings and specifications of all other Sections for correlating information and lay out work so that it will coordinate with other trades. Verify dimensions and conditions (i.e. finished ceiling heights, footing and foundation elevations, beam depths, etc.) with Architectural and Structural drawings. Notify the Architect/Engineer of any conflicts that cannot be resolved, in the field, by affected trades. Replacement of work due to lack of coordination and failure to verify existing conditions will be completed at no cost to the Owner.
 - 2. Install all conduit, cable tray, busduct, equipment, etc. allowing proper code and maintenance clearances and to avoid blocking passageways and access panels.

3. Where work must be replaced due to the failure of the Contractor to verify the conditions existing on the job, such replacements must be accomplished at no cost to the Owner. This applies to shop fabricated work as well as to work fabricated in place.
4. Throughout the course of the work, minor changes and adjustments to the installation may be requested by the Engineer. The Contractor shall make adjustments without additional cost to the Owner, where such adjustments are necessary to the proper installation and operation within the intent of the Contract Documents. This does not include work already completed.
5. Equipment outlines shown on detail plans of ¼"=1'-0" scale or larger and/or dimensions indicated on the plans are limiting dimensions. Do not install any equipment that exceeds the equipment outlines shown or reduces indicated clearances.
6. Obtain exact location of connection to equipment, furnished by others, from the person furnishing the equipment.
7. Drawings and specifications are complementary and what is called for in either one is as binding as if called for in both.
8. Include the better quality, greater quantity or higher cost for an item or arrangement where a disagreement exists in the drawings and specifications.

1.07 FIRESTOPPING

- A. Provide firestopping around all penetrations, sleeves, and openings through all partitions, walls, and floors.
- B. Provide UL listed components installed by certified and factory trained personnel.

1.08 SEQUENCING AND SCHEDULING

- A. Refer to General Conditions and Requirements.
- B. If the building is occupied during construction, the Contractor shall schedule the work and carry it out in such a manner as to least inconvenience the occupants due to interruptions of systems. Interruptions shall be confined to the smallest area possible at any one time and all interruptions shall be approved by the Owner and coordinated with all the trades. The normal use of the facility shall not be disturbed, except within the immediate construction area. Walks, driveways, and entrances shall be kept clear and free of Contractor's equipment, materials, and debris. All materials and equipment shall be stored in such a manner that a minimum of congestion will result. The placing of such materials and equipment shall be subject to the approval of the Owner.

PART 2 - PRODUCTS

2.01 TAMPERPROOF HARDWARE:

- A. Where tamperproof hardware is called out, provide torx head with center pin reject hardware for the following electrical work:
 1. Light fixture housing.
 2. Covers to electrical enclosures, pullboxes, cabinets, junction boxes, wireways.
 3. Coverplates (both maximum security and stainless steel coverplates)Light fixture housing.

PART 3 - EXECUTION

3.01 CONSTRUCTION LIGHTING AND POWER SYSTEM

- A. Provide construction power and lighting that adheres to Specifications and the NEC and OSHA.
- B. Contractor may make use of existing outlets and circuitry within the remodeled areas and shall be responsible for replacement and/or repair of any damage or cracked receptacles, plates, equipment, etc.
- C. Furnish, install and maintain a construction lighting and power system, as directed herein for the use of all trades. As soon as a directive to proceed is issued, arrange to:
 1. Provide not less than ½ watt per square foot, or 20 foot-candles (whichever is greater), for temporary lighting with a minimum of one light per room or space. Provide 200 watt, inside frosted, incandescent lamps for each outlet.

2. Provide 20 amp, 120 volt, single phase duplex, grounding type, receptacles and 50 amp, 240 volt, single phase receptacles. Locate receptacles so no location in the building is more than 75 feet from either type of receptacle. Provide ground fault protection as required by the NEC.
 3. Provide a minimum #12 AWG conductors for all 120V branch circuits with a total conductor length less than 75 feet. Provide #10 AWG conductors for branch circuits exceeding 75 feet.
- D. Materials furnished for the temporary light and power system remain Contractor property. Remove when there is no longer any need for temporary light and power or when directed by the Architect.
- E. The cost of energy for construction light and power will be paid by the General Contractor. Refer to Section for Usage Charges

3.02 PREPARATION

- A. Continuity of Service:
1. No Section systems are to remain inactive at the end of the workday. Assure that the systems are all operational at the end of each workday. Coordinate temporary outages with the Owner.
 2. Coordinate/Schedule all work with the Owner to minimize any disruptions. Confine all interruptions to the smallest area possible. Provide temporary connections if required to provide continuity of service.
 3. Inspect all areas affected by the interruption and return all automatically controlled equipment, electrically operated equipment to the same operating condition prior to the interruption.
- B. Use of Facility:
1. Do not disturb normal use of the facility, except within the immediate construction area. Keep walks, driveways, entrances, etc. free and clear of equipment, materials, and debris.
 2. Store all equipment and materials in a place and manner that minimizes congestion and is approved by the Owner.

3.03 INSTALLATION

- A. Material and Workmanship
1. Provide new material and equipment, unless noted otherwise. Protect equipment and material from damage, dirt, and the weather.
 2. Provide the highest quality workmanship and perform all work only by skilled mechanics. Install material and equipment in accordance with manufacturers' recommendations, instructions and current NECA standards.
 3. The Engineer reserves the right to reject material or workmanship not in accordance with the specifications, before or after installation.
 4. All lamps or LED luminaires failing within three months of Substantial Completion shall be replaced at no cost to the Owner.
- B. Excavation and Backfilling:
1. Provide all excavation and backfilling required to complete the installation of the electrical systems.
 2. Bed all conduit and structures on a 6" thick compacted layer of granular material. Should unsatisfactory soil conditions be discovered, the Engineer/Architect will inspect the excavation and determine the necessary additional support required.
 3. Backfill around conduit and structures by hand using coarse sand, pit run gravel or the native material if it is similar to the above. Remove all large stones, frozen lumps, perishable rubbish and excessive amounts of clay. Carefully compact this material in 6" layers to a depth of 8" above the conduit, cable or duct. Compact to not less than 90% outside the building and 95% within the building limits of maximum density given by ASTM D698-70T (Standard Proctor Density). Architect/Engineer reserves the right to required soil compaction tests in any areas which do not appear to be compacted properly with the cost for the test paid for by the Contractor.

4. Replace all existing surface improvements removed or damaged in the course of the work unless such improvements are to be reconstructed under the general contract. Make all necessary arrangements to perform such repairs, pay all costs in connection there within and include them in the bid.
- C. Cutting and Patching:
1. Perform all cutting and patching necessary to work, unless specifically delegated to be performed under a different Section.
 2. Obtain special permission from the Engineer before cutting structural members or finished material.
 3. Perform all patching in a manner as to leave no visible trace and return the area affected to the condition of undisturbed work. Perform all patching by workers experienced, skilled, and licensed for the particular type of work involved. Inferior work will not be accepted.
 4. Patch all holes left as a result of demolition of electrical equipment and devices.
 5. Drill all holes in masonry with rotary drill. Impact tools are not allowed. Core drill all holes in masonry and concrete for electrical raceway. Provide and dispose of all water required for core drilling. Coordinate with other trades to prevent damage from water.
 6. Prevent the spread of dust, debris, and other materials into adjacent areas.
 7. Replace all ceiling tiles damaged during the installation of the work with new tiles.
- D. Painting:
1. Refinish all electrical equipment damaged during shipping and/or installation to its original condition. Remove all rust; prime, and paint per manufacturer's recommendations for finish equal to original.
 2. Contractor shall paint surface metal raceway with one finish coat of enamel. Color of finish coat to be as directed by Architect. Painting shall be done by tradesperson trained, qualified, and licensed in the trade.

3.04 FIRESTOPPING

- A. Provide firestopping around all new penetrations, sleeves, and openings through all partitions, walls, and floors.
- B. Install firestopping on both sides of each partition, completely filling the void around the opening.
- C. Firestopping of interior of conduits and sleeves is by the Contractor providing the cabling inside the conduit or sleeve.
- D. All sleeves thru floors shall extend a minimum of 3" above finished floor.

3.05 FIELD QUALITY CONTROL

- A. Testing: Refer to Section for testing and adjustments to electrical systems.
- B. Final inspection:
 1. A final inspection of the electrical systems will be required before the Contract can be closed out. Request for a final inspection by the Engineer after all systems are fully completed and operational. The Engineer will schedule an inspection and generate a list of items to be corrected or completed before Contract Closeout. If the Engineer is requested to make a final inspection by the Contractors, and the Engineer finds the work is not completed enough to perform that inspection, the Contractor will compensate the Engineer for his time without additional costs to the Owner. The Contractor will then perform the necessary work to complete the project and again request a final inspection.

3.06 CLEAN UP

- A. Contractor shall keep the premise free from accumulation of waste materials or rubbish, caused by his employees or work, at all times. Remove rubbish, tools, scaffolding, and surplus materials from and about the building and leave work areas "broom clean" or its equivalent upon completion of the work. Clean electrical equipment and remove temporary identification. In case of dispute the Owner will remove the rubbish and charge the cost to the Contractors.

- B. After tests have been made and accepted, clean light fixtures, panels, and other equipment installed by the Contractor, leaving the entire work area in a clean and complete working order.

3.07 PROTECTION

- A. Cover opening and equipment, where set, to prevent obstruction to conduits, breakage, misuse, or disfigurement of equipment. Cover openings in equipment immediately upon uncrating or receipt at the job site and keep covered until permanent connection is made.
- B. Contractor is responsible for any damage to electrical equipment or materials until final acceptance of the entire project by Owner. Keep all equipment clean until final acceptance of entire project by Owner.
- C. If a portion of the project is to be occupied by the Owner prior to Substantial Completion of the entire project, make arrangements with the Owner to transfer responsibilities for protection and housekeeping.

END OF SECTION 26 01 00

SECTION 26 01 05

SUBMITTALS, CLOSEOUT DOCUMENTS, TRAINING AND SPARE PARTS

PART 1 - GENERAL

1.01 PRIOR APPROVALS

- A. Submit approval form for each request for prior approval.
- B. Submit hard copy, bound, written requests to use unspecified items, to the Engineers, no later than 10 calendar days prior to the bid opening. Submit detailed information for proposed material or equipment specific to the project, clearly indicating all options included in the submittal.
- C. Accepted substitutions will be incorporated in an Addendum to the Contract Documents.
- D. Contractor is responsible for dimensional differences, electrical requirements and any other resulting changes, when using accepted substitutions. Contractor is responsible for any additional costs incurred as a result of substitutions, including other contractors and Architect/Engineer fees.
- E. Material and equipment not specified or accepted in an Addendum will be removed and replaced at no cost or inconvenience to the Owner.

1.02 PAY REQUEST COST BREAKDOWN

- A. Provide Schedule of Values for utilization of submitting a "Pay Request". Allocate appropriate share of overhead and profit to each item. Separate each item into labor and material.
- B. Submit cost breakdown on AIA document G703. Provide minimum breakdown as indicated below. Provide additional breakdown as required for clarity or requested by the Engineer.
 - 1. General Conditions
 - 2. Demolition
 - 3. 600V Conductors and Cables
 - 4. Raceway, Fittings and Boxes
 - 5. Switchboards

1.03 SHOP DRAWINGS AND SAMPLES

- A. Submit in accordance with Section 00 and Section 01. Submit drawings to the Engineer for review within 30 calendar days after award of Contract.
- B. Submit separately bound documents for each submittal listed in the table at the end of this Section. Combination submittals will be returned to the Contractor without review. Do not combine submittals.
- C. Include project name, name of Architect, name of Engineer, Contractor, Sub-contractor, manufacture, supplier, and sales representative, include name, address, and phone number for the sales representative. Clearly identify Section number and description of equipment submitted. Shop drawings not including all of this information will be returned without review.
- D. Examine all shop drawings noting capacity, arrangement and physical dimensions. Clearly mark all relevant items on catalog data and cross-out unrelated information. Review and stamp shop drawings prior to submitting to the Engineer.
- E. Submit a minimum of 6 sets of shop drawings. The Engineer will distribute as follows:
 - 1. Engineer - 1 copy
 - 2. Architect - 1 copy
 - 3. General Contractor - 4 copies (2 copies will be incorporated into the O&M manuals)
- F. All shop drawings must be reviewed and accepted by the Engineer prior to fabrication and installation.
- G. Shop drawings will be reviewed by Engineer, with one of the following actions checked on the submittal stamp:

1. NO EXCEPTIONS TAKEN - Indicates the submittal appears to conform to the design concept of the Work and that the Contractor at his discretion, may proceed with fabrication and/or procurement and installation.
 2. MAKE CORRECTIONS NOTED - Indicates that the submittal, after noted corrections are made, would appear to conform to the design concept of the Work and that the Contractor, at his discretion, may proceed with fabrication and/or procurement and installation, if the corrections are accepted by the Contractor without an increase in Contract Sum or time.
 3. REJECTED - Indicates that the submittal does not appear to conform to the specifications, and that a complete resubmittal is required. The Contractor shall not proceed with fabrication, procurement, or installation.
 4. NO ENGINEER ACTION REQUIRED - Indicated the Contractor may proceed without review of the submittal based on provisions of the Contract Documents.
- H. Allow a minimum of 14 calendar days for the Engineer to review the shop drawings. Time is from the receipt of drawings in the Engineers office until they are shipped out of the office.
- I. If the Engineer rejects (Make corrections noted/Submit corrected copy, Rejected/Submit specified item) two times for the same Section, the Engineer will be compensated for the additional reviews. Compensation will be incorporated by Change Order and deducted from the Contractor's application for payment. Contractor is responsible for delays caused by the resubmittal process.
- J. Refer to the end of this Section for a list of Shop Drawings required for this project.
- K. Provide all other service, commissioning, shop drawing preparation, on-site field-service and testing, etc. for all electrical equipment and materials through local representation.

1.04 CAD DRAWING FILES

- A. The electrical CAD drawing files prepared by the Engineer for this project are Instruments of Service and are for the use solely with respect to this project and will not be made available to the Contractor.
- B. Request CAD drawing files of Architectural floor plans, elevations, sections, etc. directly from the Architect.

1.05 DEMONSTRATION / TRAINING

- A. Fully lubricate, charge, fill, etc. all equipment, per manufacture's recommendation, prior to start-up.
- B. Operate equipment and systems in all their operating modes, to verify proper operation, prior to final inspection and Owner instructions. Notify the Engineer, in writing, that all systems have been tested and are functioning and operating properly.
- C. Fully instruct the Owner's designated representative in the operation of each electrical system at the time it is put into service. Provide instruction using competent instructors and factory trained personnel.
- D. Include documentation of instruction in the O&M manuals
- E. Obtain a written statement from the Owner that his designated personnel have been instructed.
- F. Refer to the end of this Section for training requirements for each system.

1.06 OPERATING AND MAINTENANCE MANUALS (O&M MANUALS)

- A. Submit to the Engineer 3 O&M manuals. Submit in portfolio form neatly edited with similar equipment grouped, tabbed, and indexed. Provide printed or typewritten materials. Provide the following in each manual.
 1. Shop drawings, approved manufacturer's bulletins, and other appropriate data from specific manufacturers of each piece of equipment furnished and/or installed. Shop drawings, manufacturer's bulletin, and other data shall be appropriately marked to reflect the "as-built" condition. Cross out or delete all information shown on shop drawings or literature not applying to this specific project.
 2. Copies of manufacturer's warranties.

3. Operating instruction for equipment.
4. Wiring and installation instructions for equipment.
5. Recommended maintenance schedules and procedures for equipment.
6. Recommended trouble shooting procedures for equipment.
7. Equipment parts list.
8. Completed panelboard schedules in MS Word compatible electronic format, where existing circuit descriptions have not been confirmed they shall be noted as such.
9. Provide a complete list of lamps being installed under this contract in MS Word compatible electronic format.
10. Settings/adjustments/calibrations for systems as required.
11. Adjustable circuit breaker and ground fault settings and field testing procedures.
12. Local equipment suppliers/rep's names, addresses, and telephone numbers.
13. Equipment manufacturers names, addresses, and telephone numbers.
14. Sub-contractors names, addresses, and telephone numbers.
15. Refer to individual Sections for additional requirements.
16. Test reports.

1.07 RECORD DRAWINGS

- A. Provide record drawings in accordance with the requirements of Section 00, Section 01 and this Section.
- B. Preparation of as-built drawings does not constitute authorization to make changes unknown to or unapproved by Owner or the Owners representative.
- C. As work progresses, in a neat and legible manner, record the following information on the record set of plans:
 1. Update the contract documents to show all modifications including but not limited to Addendums, Change Orders, approved Proposal Requests and Architect's Supplemental Instruction. Cut and paste original documents to the as-built set.
 2. Indicate exact location and depth of underground feeders to panelboards, transformers, distribution panels, generators, and motor control centers, complete from each end. Indicate the routing of the conduits as accurately as possible, showing elbows, sweeps, and turns.
 3. Provide plans that indicate exact routing of outside underground feeders and services, showing dimensions from structural foundation walls or columns. Indicate depth and type of conduit.
 4. Provide plans that indicate routing of conduit from outlet to outlet, routing of conduit underfloor, overhead, in walls, or exposed, combining of circuits into a common conduit, exact sizes of conduits and conductors, revisions to circuit breaker quantity or arrangement in panelboards.
 5. Record exact location and elevation of underground conduits dedicated to technology systems including backbone fiber conduits, telephone conduits and cable TV conduits. Where spare underground conduits are terminated underground (i.e. property lines), indicate exact dimensions from two different points of the foundation wall corner or structural columns.
 6. Indicate exact locations and depths of spare conduits stubbed from concrete pole bases.
 7. Record routing of cable trays where it varies from the plans.
 8. Record changes to branch circuit numbers on the plan when they deviate from the circuit numbers shown on the Contract Documents.
 9. Include the locations of the following devices on the record drawings:
 - a. Emergency Lighting Relays mounted above ceilings.
 - b. Occupancy Sensor Power Packs mounted above ceilings.
- D. The Engineer will recommend withholding payment if as-built drawings are not being maintained on-site.
- E. Submit record drawings to the Engineer for review at completion of the Work. Submit final record drawings as part of the O&M manual package after the completion of the project.

1.08 DOCUMENT TURNOVER

A. Construction Document CD's, Owner and O&M manuals, as-built, Specifications and other documents turned over at the completion of the project shall be furnished to the Owner in both paper hard copy and digital Adobe PDF.

1. Construction Documents

- a. PDF Creation: Each roll of drawings shall be scanned or converted to PDF to one single PDF document.
 - 1) Scanning
 - (a) 200DPI Grayscale
 - (b) Cropped to original size
 - (c) Color corrected and despeckled
- b. Bookmarking: Each page of the PDF shall be bookmarked with the number of the sheet.
- c. Naming: The PDF shall be labeled: "Building Name_Year_Title_Spec_Type"
 - 1) Name = Building Name
 - 2) Year = Date of Documents
 - 3) Title = "Addition", "Remodel", etc...
 - 4) CD = Construction Document
 - 5) Type = Architectural, Mechanical, Electrical, Communications, or a combination of the above.

2. Specifications

- a. PDF Creation: All Specifications shall be scanned or converted to one single PDF file.
 - 1) Scanning
 - (a) 200DPI Grayscale
- b. Bookmarking: Not required.
- c. Naming: The PDF shall be labeled: "Building Name_Year_Title_Spec_Type"
 - 1) Name = Building Name
 - 2) Year = Date of Documents
 - 3) Title = "Addition", "Remodel", etc...
 - 4) CD = Construction Document
 - 5) Type = Architectural, Mechanical, Electrical, Communications, or a combination of the above.

3. O&M manuals

- a. O&M's shall be turned over by the Contractor.
- b. PDF Creation: All O&M manuals shall be scanned or converted to one single PDF file.
 - 1) Scanning
 - (a) 200DPI Grayscale
- c. Bookmarking: Bookmarking of O&M manuals shall be extensive.

1.09 WARRANTY

- A. Guarantee and maintain the stability of work and materials and keep same in perfect repair and condition for the period of 1 year after the final completion of the work as evidenced by issuance of the final certificate by the Architect.
- B. Defects of any kind due to faulty work or materials appearing during the above mentioned period must be immediately made good by the Contractor at his own expense to the entire satisfaction of the Owner, Architect, and Engineer. Include damage to the finish or the building resulting from the original defect or repair.
- C. Guarantee does not apply to injuries occurring after final acceptance and due to wind, fire, violence, abuse or carelessness of other Contractors or their employees or the agents of the Owner.

D. Guarantee does not apply where other guarantees for different lengths of time are specifically called for.

E. Refer to the end of this Section for a list of specific warranty items for each system.

1.10 FORMS

Equipment	Shop Drawings Required	Warranty Period	Owner Training	AHJ Certificate Required	System Testing & Report	Spare Parts
Wire & Cable	Yes		No	No	Yes	No
Occupancy Sensor	Yes	5 Yr parts & labor, 5 Yr sensor	Yes	No	Yes	Yes
Lighting Control	Yes	5 Yr Parts Labor	Yes	Yes	Yes	No
Switchboard	Yes	1 Yr	No	No	No	No
Panelboard	Yes		No	No	No	No
Wiring Device	Yes		No	No	No	No
Low Voltage Fuses	Yes		No	No	No	3 fuses of each type and size
Safety Switches	Yes		No	No	No	No
VFD	Yes	2 Yr	Yes	No	Yes	No
Combination Starters	Yes		No	No	No	No
MSS	Yes		No	No	No	No
Overload Relays	Yes		No	No	No	No
Phase Monitoring Relays	Yes		No	No	No	No
Starters	Yes		No	No	No	No
Fire Alarm	Yes	Yes	Yes	Yes	Yes	Yes
Light Fixtures	Yes	5 Yr parts & labor	No	No	No	No
Emergency Lighting	Yes	3 Yr unit, 5 Yr battery	No	Yes	No	No
Exit Lighting	Yes	5 Yr unit, 10 Yr pro-rated battery	No	Yes	No	No

END OF SECTION 26 01 05

SECTION 26 01 26
MAINTENANCE AND TESTING OF ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Testing of electrical systems.
- B. Submission of reports and tests.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Miscellaneous testing equipment as detailed.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Test the equipment and systems and demonstrate their proper operation to the Engineer.
 - 1. Do not test equipment until it has been fully prepared, connected, and made ready for normal operation. Repair any equipment damaged by improper operation or testing at no cost to the Owner before final inspection and acceptance.

3.02 FEEDER TESTING

- A. Megger all feeders. If insulation resistance on any circuit is less than 1 megohm, such circuits are to be considered defective and must be replaced. Submit test results for each phase of each feeder from the output report files of the tester. Document all readings and submit to the Engineer.

3.03 OVERALL ELECTRICAL SYSTEM

- A. Conduct voltage tests at the time of energizing the distribution system in the presences of the Engineer and carry out such corrective measures as may be required.
- B. Adjust all systems and leave in proper operating condition.
- C. Test all wiring and leave free of defective installation and unintentional grounds.
- D. Balancing Three Phase Loads.
 - 1. Prior to turning the building over to the Owner, turn on all equipment in the building including lighting and with an amprobe, read the current drawn on each hot leg of the feeder supplying each distribution panel. If the current in any one leg varies more than 5% +/- from the arithmetic average of the current in all the hot legs, reconnect the branch circuits to obtain a balanced loading.

3.04 GROUND FAULT TESTING

- A. Perform field primary injection testing of ground fault protection system.
- B. Test ground fault protective devices immediately after installation. Submit settings and testing report to the Engineer.
- C. Include a copy of the GF test report in the O&M manual.

END OF SECTION 26 01 26

SECTION 26 05 00
COMMON WORK RESULTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Electric Distribution Characteristics:
 - 1. Receptacles and Motors Less Than 1/2 Horsepower: 120 Volts, Single Phase
 - 2. Motors 1/2 Horsepower and Larger
 - 3. Fluorescent Lighting
 - 4. HID lighting voltage sources shall be as shown on Drawings.
- B. Wiring: Wiring shall be installed in a continuously grounded metallic conduit system. Conduits on Drawings not marked or scheduled contain only (2) 12 AWG wires.
- C. Multi-Wire Branch Circuits: Multi-wire branch circuits are not allowed. Each circuit shall have its own neutral.
 - 1. Multi-wire branch circuits, connected to 2- or 3-pole circuit breakers, may be used in the following situations:
 - a. When a receptacle is split wired.
 - b. Where receptacles, connected to separate circuits, are mounted in same box.
- D. Conduit Sizing: Unless otherwise noted on Drawings, the following apply:
 - 1. No more than (4) No. 12 conductors in a 1/2-inch conduit.
 - 2. No more than (8) No. 12 conductors in a 3/4-inch conduit.
 - 3. No conduit shall contain more than (8) conductors.
 - 4. All other conduits sized as indicated.
- E. Electrical Connections: Electrical system connections noted elsewhere for each item of equipment specified or noted on Drawings:
 - 1. Temporary and Final Connections
 - 2. Function Testing
 - 3. Commissioning, when required
- F. Circuiting: Numerals shown at branch circuit outlets are for loading purposes only. Where there are (2) or more neutrals in a conduit run, each shall be individually coded. Electrical Contractor shall balance panelboard loads between phase conductors as close as possible.

1.02 CONNECTIONS

- A. Motors: Connect as indicated in Motor Schedule.
- B. Kitchen and Dishwashing Equipment: Connect as called for in Equipment Schedule.
 - 1. Do not scale Electrical Drawings for rough-in dimensions.
 - 2. Equipment locations, conduit rough-ins, and dimensions shall be obtained from kitchen equipment supplier's Shop Drawings before conduits are installed.
- C. Classroom and Science Equipment: Duplex receptacles on classroom and science equipment may be provided with equipment, but final connection shall be provided by Electrical Contractor.
 - 1. Connect as called for on Drawings.
 - 2. Do not scale Electrical Drawings for rough-in dimensions.
 - 3. Equipment locations, conduit rough-ins, and dimensions shall be obtained from supplier's Shop Drawings or as directed by Architect's Field Representative.

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION

3.01 CONDUIT STUB-UPS

- A. General Requirements: Conduit stub-ups through floor to equipment or machinery shall have a rigid conduit coupling installed flush with finished floor. Rigid conduit shall be run up to

equipment as required. Where noted to be capped flush with finish floor for future connections, furnish and install a recessed pipe plug in flush coupling.

END OF SECTION 26 05 00

SECTION 26 05 05
ELECTRICAL DEMOLITION

PART 1 - GENERAL

1.01 SUMMARY

- A. Existing Wiring: All existing electrical equipment and wiring shall remain as installed unless otherwise called for on Drawings and Specifications.
 - 1. Where concealed conduits are uncovered within existing construction, reroute as required.
 - 2. Existing work altered during the course of remodeling shall be placed in safe operating condition and shall remain in service, unless otherwise noted.
 - 3. Connections to existing wiring shall be installed in the same manner as called for in new wiring.
 - 4. Unless specifically requested, remove all wiring and conduit back to source during alterations.
 - 5. Reconnect remaining runs of raceway to form continuous raceways with new conductors installed from last remaining outlet box.
 - 6. Existing conductors that have been removed shall not be reinstalled.
 - 7. Contractor shall provide conduit and wiring as required to maintain service to all remaining circuits.
 - 8. Coordinate demolition with the Owner's asbestos abatement contractor to ensure that all required demolition is included in the project. Any demolition work not included in the asbestos abatement contractor's work, but required for the project, shall be included under this Section be the electrical contractor. Coordinate work with the asbestos abatement contractor closely, especially where equipment or devices are noted on the Drawings to be reused or protected.
- B. Abandoned Flush Openings:
 - 1. Wherever devices or equipment are removed from boxes remaining in walls or ceilings, provide blank plates as required. Where clocks or speakers are removed, provide suitable cover plates over the entire opening. Cover plates may be stamped and painted metal to match surrounding surfaces. All covers shall be acceptable to Owner.
- C. Removal of Existing Equipment and Materials:
 - 1. Remove only existing work so noted on Drawings, is herein specified, or necessary to accomplish the Work.
 - 2. Owner retains the right to materials removed under this Contract. Contractor shall verify with Owner which materials, if any, are to be retained, and shall take proper precautions to protect such materials from damage during removal. Retained materials shall be moved to a location as directed by Owner.
 - 3. Items or materials not retained by Owner shall become the property of Contractor and shall be removed from premises.
 - 4. Contractor shall pay for, and provide documentation, that the following items that have been identified as hazardous have been properly disposed of:
 - a. Fluorescent and HID Lamps
 - b. Ballasts Containing PCBs
 - 5. Contractor shall separate and dispose of hazardous materials, including PCB ballasts and lamps. Provide certificates from appropriate agencies demonstrating that these materials have been legally disposed of.

PART 2 - PRODUCTS

2.01 ADDITIONS TO EXISTING PANELBOARDS

- A. General Requirements: Where new circuits are to be added to existing panelboards, Contractor shall furnish and install circuit breakers or fused switches of the same manufacturer and same type as existing.
- B. Carefully remove all T-12 lamps from lights scheduled for demolition and turn over to Owner.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine the building to determine actual conditions and extent of work prior to bidding the project. Refer any unclear details or conflicts to the Architect/Engineer for clarification prior to bidding.
- B. Verify that field measurements and circuiting arrangements are as shown on Drawings.
- C. Verify that abandoned wiring and equipment serve only abandoned facilities.
- D. Demolition Drawings are based on casual field observations and existing record documents. Report discrepancies to Architect/Engineer before disturbing existing installation.
- E. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

- A. Coordinate phasing of the demolition work with the construction sequence schedule.
- B. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.
- C. Coordinate utility service outages with Utility Company.
- D. Identify and provide new supporting means for existing electrical equipment such as low voltage cabling, conduits. Boxes, pullboxes, conduit bodies, and conduit racks that will need additional support due to the demolition of the existing supports including ceilings.
- E. Erect and maintain temporary safeguards, including warning signs and lights and barricades for protection of the public, Owner, Contractor's employees, and existing improvements to remain.
- F. Provide temporary emergency lighting and illumination exit signage as required by the building official or AHJ.
- G. Electrical service: Maintain existing system service throughout construction until new system is complete and ready for service. Disable system only to make switchovers and connections. Notify and obtain permission from Owner and Architect/Engineer at least 72 hours before partially or completely disabling any system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.
- H. Conduct demolition to minimize interference with adjacent and occupied building areas.
- I. Perform noisy work before or after Owner's working hours to minimize disruptions.
- J. Coordinate and sequence demolition so as not to cause shutdown of operation of surrounding areas.
- K. If the building is occupied during construction, the Contractor shall schedule the work and carry it out in such a manner as to least inconvenience the occupants due to interruptions of systems (power, lighting, fire alarm, security, phone/data, technology, etc.). Interruptions shall be confined to the smallest area possible at any one time and all interruptions shall be approved by the Owner and coordinated with all the trades. The normal use of the facility shall not be disturbed, except within the immediate construction area. Walks, driveways, and entrances shall be kept clear and free of Contractor's equipment, materials, and debris. All materials and equipment shall be stored in such a place and in such a manner that a minimum of congestion will result. The placing of such materials and equipment shall be subject to the approval of the Owner.

3.03 DEMOLITION

- A. Demolition electrical systems in walls, floors, and ceilings identified to be demolished.
- B. Demolish and extend existing electrical work under this Section or as indicated on the Drawings. Remove devices, conduits, wire, boxes, and fastening devices to avoid and interference with new installations.
- C. Remove, relocate, and extend existing installations to accommodate new construction or to maintain systems downstream from demolition area.

- D. Provide supports for all existing electrical equipment that was supported previously by demolished walls, floors, ceilings or other structures. Provide new supports from structural members not slated for demolition, prior to any demolition.
- E. Owner reserves the right of first refusal to obtain material shown to be removed under this contract. Any item not retained by the Owner becomes the property of the Contractor and must be removed from the premises.
- F. Demolish and remove all electrical systems indicated for demolition. No portion of these systems may be abandoned in place.
- G. Remove abandoned wiring to source of supply.
- H. Demolish all abandoned low voltage wiring.
- I. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit in walls, floor, or columns back to a point where patching can be adequately performed and patch the surface.
- J. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned. Provide blank cover for abandoned outlets which area not removed.
- K. Disconnect and remove abandoned panelboards and distribution equipment.
- L. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- M. Disconnect and remove abandoned luminaries. Remove brackets, stems, hangers, and other accessories.
- N. Repair adjacent construction and finishes damaged during demolition and extension work.
- O. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.
- P. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified. Relocate and reroute conduit and wiring as required for conduit concealed in walls or structures being altered as part of the remodeling. Maintain continuity to all devices in and downstream of remodeled work.
- Q. Reroute existing raceway and wiring which is exposed due to removal of existing construction. Conceal new raceway and wiring and maintain operation.
- R. If conductors are required to be removed from existing raceways, install with new conductors.
- S. Provide new coverplates throughout the remodeled areas.
- T. Dispose of fluorescent lamps, ballasts, and other hazardous materials in accordance with State and Federal regulations.
- U. Circuit and conduit modifications and/or rerouting should be anticipated.
- V. All existing circuit numbers shall be verified by this Contractor.
- W. Contractor shall furnish all labor and materials needed to preserve the fire, smoke, and water containment ratings and integrity of floors, walls, ceilings, and partitions. All barriers/sealing systems shall be UL Listed and be installed in accordance with all the manufacturer's instructions.

3.04 CONNECTIONS TO EXISTING PANELBOARDS

- A. Ring out circuits in existing panels affected by the Work. Where additional circuits are needed, reuse circuits available or reuse. Reuse breakers if possible. Provide new breakers for new equipment unless breakers are specifically noted on the Drawings to be reused.
- B. Tab unused circuits as spare and turn breakers and/or switches off.
- C. Where existing circuits are indicated to be reused, use sensing and measuring devices to verify circuits feeding project area are not in use.
- D. Remove existing wire no longer in use from panel to equipment.

- E. Provide new updates directories where more than three circuits have been modified or rewired.
- F. Where existing panels are indicated to be demolished, extend any remaining live circuits.

3.05 CLEANING AND REPAIR

- A. Prior to reinstallation of used equipment, thoroughly inspect each item and report any defects to the Architect/Engineer in writing. Instructions for corrective measures will be given at that time and the contract amount may be adjusted accordingly. If no defects are reported, the material will be included under the contractor's one year guarantee.
- B. Warranty installation as outlined in other Section.
- C. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.
- D. Luminaries: Where existing luminaries are indicated to be re-used, remove existing luminaries for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace non-functioning ballasts and broken electrical parts. Provide new lamps.
- E. Repair adjacent construction and finishes damaged during demolition and the work. Patching shall be performed in such a manner as to leave no visible trace. Patching shall be performed by workers experienced, skilled, and licensed for the particular type of work involved. Inferior work will not be accepted.

3.06 INSTALLATION

- A. Install relocated materials and equipment as indicated on the Drawings.

END OF SECTION 26 05 05

SECTION 26 05 19
LOW VOLTAGE CABLES AND CONDUCTORS

PART 1 PART - GENERAL

1.01 SUMMARY

- A. Section Includes: 600-volt wire and cable.
 - 1. Related Documents: Drawings and General Provisions of Contract, including General and Supplementary Conditions and Section 01 Specifications, apply to work in this Section.
 - 2. Section 26 Basic Materials and Methods section, and is part of each Section 26 section making reference to wires and cables specified herein.
- B. Description of Work: Electrical wire and cable work is indicated by Drawings and Schedules.
- C. Submittals: Submit manufacturer's data on electrical wire, cable, and connectors.
- D. Quality Assurance:
 - 1. Firms regularly engaged in manufacture of electrical wire and cable products of types and ratings required.
 - 2. Insulated conductor design shall meet requirements of UL and IPCEA.
- E. Wiring Sizing: Provide wire sizes indicated on Drawings:
 - 1. Copper conductors in sizes specified by American Wire Gage (AWG) numbers.
 - 2. Unless otherwise indicated, no wire smaller than AWG 12 shall be used for branch circuits.
- F. In Conduit: Unless otherwise indicated on Drawings, install conductors in conduit. Conduit fill requirements of Section 26 05 00, Basic Electrical Systems, shall not be exceeded.
- G. MC Cable: No MC or AC cable is allowed.

1.02 CONDUCTORS FOR COMMUNICATION AND OTHER SYSTEMS

- A. General Requirements: Conductors for communication systems shall be specified elsewhere.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers for Building Wire/Cable: Subject to compliance with requirements of the Contract Documents, acceptable manufacturers for wire/cable are as follows:
 - 1. Carol
 - 2. Cerro
 - 3. Encore
 - 4. Essex
 - 5. Southwire
- B. Acceptable Manufacturers for Spring Wire Connectors: Subject to compliance with requirements of the Contract Documents, acceptable manufacturers for spring wire connectors are as follows:
 - 1. Buchanan
 - 2. Ideal
 - 3. 3M
 - 4. T & B
- C. Acceptable Manufacturers for Split-Bolt Connectors: Subject to compliance with requirements of the Contract Documents, acceptable manufacturers for split-bolt connectors are as follows:
 - 1. Burndy
 - 2. O-Z/Gedney
 - 3. Square D
 - 4. T & B

- D. Acceptable Manufacturers for Solderless Crimp Pressure Connectors: Subject to compliance with requirements of the Contract Documents, acceptable manufacturers for solderless crimp pressure connectors are as follows:
 - 1. Burndy
 - 2. Ideal
 - 3. T & B
- E. Acceptable Manufacturers for Plastic Tape: Subject to compliance with requirements of the Contract Documents, acceptable manufacturers for plastic tape are as follows:
 - 1. 3M, Scotch 33
 - 2. Plymouth Rubber Company

2.02 WIRE

- A. General Requirements:
 - 1. Provide copper conductors with 90-degree C insulation system, 600 volt rating, UL approved and listed for specific application. Aluminum conductors are not allowed.
 - 2. Provide conductors for other systems as specified in the sections in which they are described.
 - 3. Provide minimum 12 AWG conductor size, unless noted otherwise.
- B. Indoor, Dry Location, Single Conductor, Insulated Wire:
 - 1. Provide THHN or THWN insulation.
 - 2. 12 AWG and 10 AWG: Provide solid or stranded conductors.
 - 3. 8 AWG and Larger: Provide stranded conductors.
- C. Underground or Wet Location, Single Conductor, Insulated Wire:
 - 1. Provide XHHW or XHHW-2 insulation.
 - 2. 12 AWG and 10 AWG: Provide solid or stranded conductors.
 - 3. 8 AWG and Larger: Provide stranded conductors.

2.03 CONDUCTORS

- A. General: Except where otherwise indicated, provide wire of manufacturer's standard materials as indicated by published product information, designed and constructed as recommended by manufacturer and as required for installation.
- B. Copper Conductors:
 - 1. Conductors shall be soft annealed copper having a conductivity of not less than 98 percent pure copper with 600 volt insulation, unless specified otherwise.
 - 2. Minimum conductor size shall be No. 12, unless otherwise noted. Where no conductor size is given, minimum size shall be used. Conductors of sizes other than minimum shall be so noted. Conductors No. 10 and larger shall be stranded.
 - 3. Conductors for fire alarm and other systems shall be specified in part of Specification in which system is described.
 - 4. Conduit fill shall be based on THHN or THWN conductors; no more than (4) 12 AWG conductors in a 1/2-inch conduit and no more than (8) 12 AWG in a 3/4-inch conduit.

2.04 SOLID AND STRANDED

- A. General Requirements:
 - 1. Wires shall be solid or stranded wire with stab-ons for sizes No. 10 and smaller.
 - 2. Wires shall be stranded for sizes No. 8 and larger.

2.05 INSULATION

- A. Voltage Class: Insulation, unless otherwise noted, shall be 600 volt class.
- B. Insulation Type: Conductor insulation shall be as follows:
 - 1. Service, Feeder, and Branch Circuit Conductors: Type THHN or XHHW with a temperature rating of 90 degrees C.
 - 2. Direct Burial Conductors: No Direct Burial Conductors are allowed. All underground conductors must be in conduit.

3. Continuous Row Fluorescent Fixture Conductors: Conductors shall have high temperature insulation as required by the National Electric Code.
 4. Where connections to equipment or lighting fixtures require conductor insulations with rating greater than those specified above, conductors with insulations of suitable rating shall be used.
- C. Color Code: Color code shall identify the same phase throughout the system from service switch or transformer through all branch circuitry. All secondary service, feeder, and branch circuit conductors shall be color coded as follows:

208/120 VOLT		PHASE	480/277 VOLT	
Switch Legs/Travelers shall be violet or violet with stripe.	BLACK	A	BROWN	Switch Legs/Travelers shall be tan or tan with stripe.
	RED	B	ORANGE	
	BLUE	C	YELLOW	
	WHITE	NEUTRAL	GRAY *	
	GREEN	GROUND	GREEN *	
* REFER TO THE CURRENT EDITION OF THE NEC FOR COLOR CODING NEUTRAL AND GROUNDING CONDUCTORS.				

1. All No. 12 and No. 10 branch circuit conductors, including neutral, shall have solid color compound or solid color coating. 8 AWG and larger phase conductors shall have either:
 - a. Solid color compound or solid color coating.
 - b. Stripes, bands, or hash marks of colors specified above.
 - c. Colored pressure sensitive plastic tape. Tape shall be applied in half overlapping turns for a minimum of 3 inches for all terminal points and in all junction boxes, pull boxes, troughs, manholes, and handholes. Tape shall be 3/4 inch wide with colors as specified above. Last (2) laps of tape shall be applied with no tension to prevent possible unwinding. Where cable markings are covered by tape, apply tags to cable stating size and insulation type.
2. All equipment grounding conductor insulation shall be green in color unless it is bare.
3. Insulated conductor design shall conform to UL and IPCEA standards.
4. For modifications and additions to existing wiring systems, color coding shall match existing wiring system.

2.06 CONNECTORS AND TERMINATIONS

- A. Connectors: Provide factory fabricated metal connectors of sizes, ratings materials, types, and classes as indicated for each service.
1. Conductors 8 AWG and Smaller: Use solderless crimp or indent type pressure connectors with insulating covers for copper wire splices and taps for 8 AWG. For 10 AWG and smaller, use insulated spring wire connectors with plastic caps. Number, size, and combination of conductors as listed on manufacturer's packaging shall be strictly complied with.
 2. Conductors 6 AWG and Larger: Use split bolt connectors for copper wire splices and taps for 6 AWG and larger. Tape uninsulated conductors and connectors with electrical tape to 150 percent of insulation value of conductor.

2.07 CONTROL WIRING

- A. General Requirements:
1. Unless otherwise specified in other sections of the Specifications, control wiring shall be as specified for power and lighting wiring, except minimum size may be 14 AWG.
 2. Wire shall be large enough so that voltage drop under in-rush conditions will not adversely affect operation of controls.

PART 3 - EXECUTION

3.01 GENERAL WIRING METHODS

- A. General Requirements:

1. Use no wire smaller than 12 AWG for power and lighting circuits and no wire smaller than 14 AWG for control wiring.
2. Use 10 AWG conductor for 20 ampere, 120 volt branch circuit home runs longer than 75 feet; and for 20 ampere, 277 volt branch circuit home runs longer than 150 feet.
3. Place an equal number of conductors for each phase of a circuit in same raceway or cable.
4. Splice only in junction or outlet boxes.
5. Neatly train and lace wiring inside boxes, equipment, and panelboards.
6. Make conductor lengths for parallel circuits equal.

3.02 WIRING INSTALLATION IN RACEWAYS

A. General Requirements:

1. Except as otherwise specifically stated or shown on Drawings, all electrical cables and conductors shall be installed in raceway systems.
2. Pull all conductors into a raceway simultaneously where more than one is being installed in a raceway. Use pulling compound or lubricant, where necessary. Compound must not deteriorate conductor or insulation. Use UL listed wire pulling lubricant for pulling 4 AWG and larger wires.
3. Use pulling means, including fish tape, cable, or rope, which cannot damage raceway.
4. Install wire in raceway after interior of building has been physically protected from weather and all mechanical work likely to damage conductors has been completed.
5. Completely and thoroughly swab raceway system before installing conductors.
6. Coordinate cable and wire installation work with electrical raceway and equipment installation work, as necessary for proper interface.
7. Install electrical cables, wires, splices, and connectors in compliance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standards of Installations", and in accordance with recognized industry practices.

3.03 WIRING CONNECTIONS AND TERMINATIONS

A. General Requirements:

1. Splices in conductors shall be in outlet boxes, accessible junction boxes, or approved wireways.
 - a. Splices of 600 volt conductors, 10 AWG or smaller, shall be made with UL approved pressure connectors. Pressure connectors shall be of type which contains or consists of a spring which will provide a continuous pressure on joint under all conditions. Pressure connectors shall be Minnesota Mining "Scotch Loc", Ideal "Wing-Nut", or Buchanan "B-Cap".
 - b. Splices in 600 volt conductors, 8 AWG and larger, shall be made with bolted connectors; Burndy or Blackburn.
 - c. Splices shall be taped if insulated splice connectors are not used. Tape shall be UL approved plastic electrical tape and shall be Minnesota Mining "Scotch 33" or Plymouth Rubber Company. Bolted splice connectors shall be filled with insulation putty.
 - d. Termination of 600 volt conductors, 6 AWG and larger, shall be made with bolted lugs; Burndy or Blackburn.
2. Thoroughly clean wires before installing lugs and connectors.
3. Make splices, taps, and terminations to carry full ampacity of conductors without perceptible temperature rise.
4. Terminate spare conductors with electrical tape.

3.04 FIELD QUALITY CONTROL

A. General Requirements:

1. Prior to energizing, test cable and wire for continuity of circuitry and short circuits. Correct malfunctions when detected.

2. Subsequent to wire and cable hookups, energize circuitry and demonstrate functioning in accordance with requirements.

END OF SECTION 26 05 19

SECTION 26 05 25
TRACING OF CIRCUITS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Trace existing circuit wiring to determine which panel and circuit breaker feeds each load.
- B. Provide new typed panelboard directory inside panelboard door.
- C. It is not the intent of this section to identify the actual routing of the building wiring or conduit, unless it is necessary to do so in order to identify the circuits.

PART 2 - PRODUCTS

2.01 TEST EQUIPMENT

- A. Perform testing using equipment specifically designed to safely test live circuits.

PART 3 - EXECUTION

3.01 EXECUTION

- A. Trace each circuit affected by the work of demolition at existing panelboards.
- B. Provide a new switchboard/panelboard directory (retain the old one) indicating all room numbers and type of branch circuit (example: "Receptacles Rms 201, 202, 203").
- C. Provide circuit number labels if they are absent from the existing switchboard/panelboard.

END OF SECTION 26 05 25

SECTION 26 05 26
GROUNDING AND BONDING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Grounding system in accordance with Contract Documents and National Electrical Code.

1.02 DESCRIPTION OF WORK

- A. Work Includes:
 - 1. All metallic raceways, supports, cabinets, and non-current carrying parts of equipment shall be grounded in accordance with the National Electrical Code. Grounding system shall be as defined in the Code.
 - 2. Equipment ground shall be continuous throughout electrical system. Where flexible metal conduit and liquid tight flexible metal conduit are provided, or where conductors are installed in other than metallic raceways, an equipment grounding conductor shall be installed.
 - 3. Requirements of this Section apply to electrical grounding work specified elsewhere in these Specifications.

1.03 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of electrical connectors, terminals and fittings, of types and ratings required, and ancillary grounding materials, including stranded cable, copper braid and bus, ground rods, and plate electrodes.
- B. NEC Compliance: In accordance with NEC requirements as applicable to materials and installation of electrical grounding systems associated equipment and wiring. Provide grounding products that are listed and labeled by a nationally recognized testing laboratory.
- C. UL Compliance: In accordance with applicable requirements of UL Standards 467 and 869 pertaining to electrical grounding and bonding.
- D. IEEE Compliance: In accordance with applicable requirements of IEEE Standards 142 and 241 pertaining to electrical grounding.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's data on grounding systems and accessories.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. General:
 - 1. Handle electrical grounding accessories and components carefully to avoid damage.
 - 2. Store in original wrappings and protect from dirt and weather.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Grounding System: Provide exothermic or compression type bonds completed with calibrated dies and tools, conductors, connectors, terminals, ground rods, bonding jumpers, and all required accessories for complete installation. Where materials or components are not indicated, provide products meeting requirements of NEC, UL, IEEE, and established industry standards for applications indicated.
 - 1. Conductors: Insulated copper cable; stranded of size noted on Drawings.
 - 2. Bonding Jumper: Copper braided 30 gauge bare copper wires properly sized for indicated applications.
 - 3. Connections: Cast copper.
 - 4. Ground Rods: Copper clad steel, 3/4-inch diameter, a minimum 10 feet in length with screw couplings as required.
 - 5. Ground Bus Bars and Connector Lugs.

6. Raceways and Boxes: Provide raceways and electrical boxes and fittings in accordance with Division 26, Basic Materials and Methods Sections "Raceways" and "Electrical Boxes and Fittings".
- B. Acceptable Manufacturers: Subject to compliance with requirements of the Contract Documents, acceptable manufacturers are as follows:
 1. Cad Weld
 2. Burndy
 3. T & B
 4. Penn-Union

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General Requirements: Install electrical grounding systems where shown to meet requirements of the Contract Documents, NEC, NECA's "Standard of Installation", in accordance with recognized industry practices, and local Electrical Inspector to ensure that products meet requirements and service intended functions.
 1. Install clamp-on connectors only on thoroughly cleaned metal contact surfaces to ensure electrical conductivity and circuit integrity.
- B. Routing: Grounding conductors in buildings may be run exposed, except where required by the National Electric Code or inspection authority, where PVC conduit may be used. Coordinate with other electrical work as necessary to interface installation of electrical grounding system with other work.
- C. Water Service Pipe: Connection of ground electrode conductor shall be made at the point water piping system enters building.
 1. Connection to piping system may be permitted at other locations provided Contractor coordinates location with inspection authority. Provide bonding jumpers around meters, insulating joints, and other electrical components.
- D. Building Footing Ground: Provide at least 20 feet of bare copper conductor not smaller than 4/0 AWG, or bond 20 feet of one or more steel reinforcing rods encased by at least 2 inches of concrete located near bottom of a concrete foundation or footing that is in direct contact with earth. A ground rod electrode system may be provided in lieu of foundation electrode where approved by Electrical Inspector.
- E. Structure Ground: Bond all building structural steel areas together and extend to building service ground(s) to ensure a zero voltage reference for entire building.
- F. Electric Service Ground: Utility transformer secondary service neutral shall be grounded at supply side of service disconnecting means.
- G. Switchboard Grounding: Terminate conduits entering switchboard with grounding bushings bonded to switchboard ground bus.
 1. Provide bonding jumpers at throat connections to switchboards and panelboards.
- H. Equipment Ground: Solidly bond switch boxes, cabinets, motor frames, and other permanently installed electrical equipment to form a continuous equipment ground:
 1. Feeder and Branch Circuits: Install an insulated grounding conductor, sized per Table 250-122 of the National Electric Code, within the following conduits:
 - a. All EMT Conduits 1 1/2 Inches and Larger
 - b. All PVC Conduits
 - c. All Flexible Metal Conduits
- I. Dry Type Transformers: Ground each transformer secondary, at transformer or at first disconnecting means, to building metal frame with a copper conductor sized in accordance with Article 250-30 of the National Electric Code. To this, ground transformer housing, secondary disconnect housing, and conduits.
- J. Swimming Pools: Ground all mechanical equipment and pool accessories in accordance with the National Electric Code.

- K. Generator: Provide grounding conductor, sized per Section 250 of the National Electric Code, from ground bar on generator and each transfer switch to service grounding bus in main service switchboard.

3.02 CONDUITS, BOXES, CABINETS, AND PANELBOARDS

- A. General Requirements:
1. Ground all metallic conduit systems. Ground continuity shall be established by using standard couplings, connectors and fittings, and jumpers at all grounding type wiring devices, motor, and ground terminals.
 2. Bond grounding wires to each pull box, junction box, outlet box, cabinets, and other enclosures through which ground wires pass, except for isolated grounding systems.
 3. Provide lugs in each box and enclosure for ground wire termination where required.

3.03 MISCELLANEOUS EQUIPMENT

- A. Motors and Starters: Provide lugs in motor terminal box and starter housing for ground wire termination and install ground wire between.
- B. Receptacles: Bond receptacles with a green ground wire to outlet box ground screw.
- C. Lighting Fixtures: Fixtures connected with flexible conduit shall have a green ground wire included with power wires from fixture through flexible conduit to first outlet box.
- D. Electrical Equipment: Bond with a ground lug and green ground conductor connected to circuit junction box.
- E. Conduit Sleeves and Stubs: Metallic sleeves shall be grounded when installed as part of a grounded raceway or cable tray system.
1. Conduit stubs that contain non-current-carrying cables (telecommunication systems used with J-hook supports) may not be grounded.

3.04 TESTING

- A. Ground Resistance Testing: Upon completion of installation of electrical grounding system, test ground resistance with ground resistance tester. Measure ground grid resistance and install additional ground rod length, or additional rods and conductors as required until resistance to ground meets the following:
1. Test earth grounding system to ensure that ground resistance from service entrance to the point of attachment from main grounding electrode system, and to the point of attachment of made electrode system, does not exceed 0.5 ohm.
 2. Main grounding electrode shall be tested using method described below to ensure ground resistance does not exceed 3 ohms.
- B. Earth Ground Resistance Test Method: Earth electrodes shall be tested using 3-point fall of potential method. Test instrument shall be a Biddle DET5/4R or Amprobe GP-1 Earth Ground Resistance Tester or equal.
1. Prior to testing, grounding electrode shall be isolated from all other ground connections, including incidental grounds.
 2. Test results shall be plotted on a graph showing resistance versus distance, and shall be submitted to Engineer prior to Project close-out. The form shall show the following:
 - a. Date
 - b. Weather and Soil Moisture Conditions
 - c. Testing Company Name and Telephone Number
 - d. Technician's Name and Telephone Number
 - e. Name, Model, and Serial Number of Test Equipment
 - f. Simple Site Plan, depicting relative position of electrode under test and test electrodes

END OF SECTION 26 05 26

SECTION 26 05 29
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Hangers and Supports for Electrical Equipment and Systems
 - a. Construction Requirements for Concrete Bases

1.02 DESCRIPTION OF WORK

- A. Work Includes:
 - 1. Types of supports, anchors, sleeves and seals specified in this Section include the following:
 - a. Clevis Hangers
 - b. Riser Clamps
 - c. C-Clamps
 - d. I-Beam Clamps
 - e. 1-Hole Conduit Straps
 - f. 2-Hole Conduit Straps
 - g. Round Steel Rods
 - h. Lead Expansion Anchors
 - i. Toggle Bolts
 - j. Wall and Floor Seals
 - k. Roof conduit supports
 - l. Supports, anchors, and sleeves furnished as part of factory-fabricated equipment, are specified as part of equipment assembly in other Sections.

1.03 PERFORMANCE REQUIREMENTS

- A. General:
 - 1. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
 - 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.04 SUBMITTALS

- A. Product Data:
 - 1. Steel Slotted Support Systems
 - 2. Non-Metallic Slotted Support Systems

1.05 QUALITY ASSURANCE

- A. General:
 - 1. Comply with NFPA 70.
 - 2. Comply with NEC as applicable to construction and installation of electrical supporting devices.
 - 3. Comply with applicable requirements of ANSI/NEMA Standards Publications.
 - 4. Comply with NECA's "Standard of Installation"
 - 5. Provide electrical components that are UL listed and labeled.

1.06 COORDINATION

- A. General:
 - 1. Coordinate with other electrical work, including raceway and wiring work, as necessary to interface installation of supporting devices with other work.
 - 2. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and form work requirements are specified in other Sections.
 - 3. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

PART 2 - PRODUCTS

2.01 MANUFACTURED SUPPORTING DEVICES

- A. General: Provide supporting devices; complying with manufacturer's standard materials, design, and construction in accordance with published product information, and as required for a complete installation; and as herein specified. Where more than one type of device meets indicated requirements, selection is installer's option.
 - 1. In chemical storage rooms, supports and anchors shall be stainless steel or equivalent corrosion resistant material.
- B. Supports: Provide supporting devices of types, sizes, and materials indicated, and having the following construction features:
 - 1. Clevis Hangers: For supporting 2-inch rigid metal conduit, galvanized steel, with 1/2-inch diameter hole for round steel rod, approximately 54 pounds per 100 units.
 - 2. Riser Clamps: For supporting metal conduit, black steel, with (2) bolts and nuts and 4-inch ears.
 - 3. C-Clamps: Black malleable iron, 1/2-inch rod size, approximately 70 pounds per 100 units.
 - 4. I-Beam Clamps: Galvanized steel, 1 1/4-inch by 3/6-inch stock, 3/8-inch cross bolt, flange width 2 inches, approximately 52 pounds per 100 units.
 - 5. One-Hole Conduit Straps: For supporting metal conduit, galvanized steel, approximately 7 pounds per 100 units.
 - 6. Two-Hole Conduit Straps: For supporting metal conduit, galvanized steel, 3/4-inch strap width.
 - 7. Hexagon Nuts: For 1/2-inch rod size, galvanized steel, approximately 4 pounds per 100 units.
 - 8. Round Steel Rod: Galvanized steel, 67 pounds per 100 feet.
- C. Anchors: Provide anchors of types, sizes, and materials indicated, and having the following construction features:
 - 1. Lead Expansion Anchors: 1/2-inch approximately 5 pounds per 100 units.
 - 2. Toggle Bolts: 3/16-inch by 4-inch, approximately 5 pounds per 100 units.
 - 3. Drop In Anchors: 1/4-inch, 3/8-inch, 1/2-inch.
- D. Sleeves and Seals: Provide sleeves and seals, of types, sizes, and material indicated, having the following construction features:
 - 1. Provide Schedule 40 galvanized steel pipe sleeves 1-1/2" larger than the O.D. of pipe.
 - 2. Provide a minimum of three concrete anchors for Schedule 40 pipe sleeves.
 - 3. Set all sleeves true to line, grade and position and plumb or level after concrete is poured. Correct any deviations from proper position.
 - 4. Provide factory-assembled wall and floor seals. Provide watertight seals around conduit, pipe, or tubing passing through concrete below grade floors and walls. Construct with steel sleeves, malleable iron body, neoprene sealing grommets and rings, metal pressure rings, pressure clamps, and cup screws. Floor sleeves shall be 3 inches above floor.
 - 5. Caulk spaces between pipe and floor sleeve inside the building with a waterproof caulking material. Caulk spaces between pipe and exterior partition sleeve with glass fiber insulation.
 - 6. Provide sealable penetration pockets compatible with the building roofing system where conduits pass through the roof.
 - 7. Provide fire barriers around conduit, pipe, tubing, bus ducts, and cables passing through floors and fire walls. Fire barriers shall be comprised of an expanding putty, caulk, or rigid panel. Fire barrier seals shall be CP 25, 303 and PSS7904 Series by 3M, or "Flame-Safe" system by Thomas and Betts Corp
 - 8. Subject to compliance with requirements, provide water-tight seals by Thunderline or pre-approved equal.
- E. U-Channel Strut System: Provide U-channel strut system for supporting electrical equipment, 16 gauge hot-dip galvanized steel, or types and sizes indicated; construct with 9/16-inch

diameter holes, 8 inches on center on top surface, with standard green finish, and with the following fittings which mate and match with 1 1/2-inch by 1 1/2-inch U-channel:

1. Fixture Hangers
 2. Channel Hangers
 3. End Caps
 4. Beam Clamps
 5. Wiring Stud
 6. Thinwall Conduit Clamps
 7. Rigid Conduit Clamps
 8. Conduit Hangers
 9. U-Bolts
- F. Roof Supports: Provide UV resistant polyethylene foam pipe piers with galvanized strut channel. Support conduit a minimum of 12" above the top of finished roof. Properly fasten pipe piers to roof. Coordinate with Owner and Engineer. Provide Pipe Pier or pre-approved equal. All roof penetrations need a doghouse, no pitch pockets are allowed, check with owner prior to installation.

2.02 FABRICATED SUPPORT DEVICES

- A. Pipe and Cable Sleeves: Provide sleeves of one of the following:
1. Sheet metal fabricated from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate from the following gauges: 3" and smaller, 20 gauge; 4" to 6", 16 gauge; over 6", 14 gauge. Sheet metal sleeves shall not be used for cable.
 2. Steel-Pipe Sleeves: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.
 3. Iron-Pipe Sleeves: Fabricated from cast-iron or ductile-iron pipe; remove burrs.
- B. Sleeve Seals: Provide fire barrier sleeve seals for sleeves located in floor and firewall. Fire barrier material shall be as described above.

2.03 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Meeting requirements of MFMA-4, factory-fabricated components for field assembly.
1. Acceptable Manufacturers: Subject to compliance with the requirements of the Contract Documents, acceptable manufacturers are as follows:
 - a. Allied Tube & Conduit
 - b. Cooper B-Line, Inc.; a division of Cooper Industries
 - c. Thomas & Betts Corporation
 - d. Unistrut Tyco International, Ltd.
 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied in accordance with MFMA-4.
 3. Non-Metallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied in accordance with MFMA-4.
 4. Painted Coatings: Manufacturer's standard painted coating applied in accordance with MFMA-4.
 5. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- 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 A36/A36M, 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 include the following:
1. 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. Acceptable Manufacturers: Subject to compliance with the requirements of the Contract Documents, acceptable manufacturers are as follows:
 - 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
 2. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; in accordance with MFMA-4 or MSS SP-58.
 3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 4. Through Bolts: Structural type, hex head, and high strength, in accordance with ASTM A325.
 5. Toggle Bolts: All steel springhead type.
 6. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.01 APPLICATION

- A. General: In accordance with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems, except if requirements in the 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 3/8 inch 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 (2) bolt conduit clamps.
- D. Spring Clamps: Spring-steel clamps designed for supporting single conduits without bolts may be used for 1 1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.02 SUPPORT INSTALLATION

- A. General:
 1. Comply with NECA for installation requirements, except as specified in this Section.
 2. Install hangers, anchors, and sleeves in accordance with manufacturer's written instructions and with recognized industry practices to ensure supporting devices meet requirements of NECA, NEC, and ANSI/NEMA. Sleeves shall extend 4 inches above floor surface.
 3. Install hangers, supports, clamps, and attachments to support piping properly from building structure. Arrange for grouping of parallel runs of horizontal conduits to be supported together on trapeze type hangers where possible. Install supports with maximum spacing indicated.
 4. Support wall mounted electrical equipment on 3/4" thick C-D grade exterior fir plywood painted with two coats of ASA-49 gray enamel.
 5. Support all ceiling mounted receptacles with a listed tile bridge spanning the suspended ceiling grid, plus a 1/4" threaded rod anchored to a structurally sound member directly above the outlet box.
 6. Tighten sleeve seal nuts until sealing grommet have expanded to form water-tight seal.
 7. Finish of supporting devices in chemical storage rooms shall be as follows:
 - a. All concrete inserts and pipe straps shall be PVC coated galvanized.

- b. All bolts, nuts, washers, and screws shall be stainless steel.
 - c. Individual hangers and trapeze hangers shall be PVC-coated.
 - d. Individual rods shall be galvanized with (2) coats of epoxy paints.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted by NFPA 70.
- C. 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 pounds.
- D. 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), meeting requirements of MSS SP-69 and spring-tension clamps.
 - 6. To Light Steel: Sheet metal screws.
 - 7. Items Mounted on Hollow Walls and Non-Structural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks.
 - a. Drilling: Drill holes for expansion anchors in concrete at locations and to depth that avoid reinforcing bars.

END OF SECTION 26 05 29

SECTION 26 05 33
RACEWAYS AND BOXES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Electrical raceway systems, fittings, boxes, enclosures, and cabinets for electrical wiring as indicated by Drawings and Schedules.
 2. Conduit type raceway systems, including grouting and fire stops.
 3. Galvanized steel heavy gauge knockout-type device boxes.
 4. Provide pull and junction boxes that are sized to conditions required by spacing to other trades, access, clearance, and applicable utility requirements.
 - a. All pull box and junction boxes, including above grade and underground boxes.
 - b. No attempt is made to show all necessary boxes on Drawings.
 5. Wireways for branch circuit distribution, and for equipment areas containing electrical components.
 6. Surface raceways and surface raceway systems for branch circuits as shown on Drawings.
 7. Floor Boxes:
 - a. Unless otherwise noted, all floor boxes shall be identified as to type and service fittings by capital letters on Drawings.
 - b. Contractor shall coordinate exact location of floor boxes with Architectural Drawings and Shop Drawings of all trades. Coordinate device plate insert requirements for data jacks with Data Cabling Contractor or Owner.
 8. Provide rough-in for technology communications cabling as shown on Drawings.
 - a. Provide rough-in boxes, conduit, and sleeving for future communications cabling as shown on Drawings.
 - b. Refer to Drawings for details of the outlet types.
 - c. Where outlet boxes are in rooms with no accessible ceiling, including exposed, plaster or gypsum type ceilings, conduit from each rough-in box shall be provided to nearest room or corridor with an accessible suspended acoustical tile ceiling.

1.02 QUALITY ASSURANCE

- A. NEC Compliance: Comply with NEC requirements as applicable to construction and installation of raceway systems, electrical wiring boxes, and fittings.
- B. Testing Laboratory Compliance: Comply with applicable requirements of UL or equivalent nationally recognized testing laboratories for raceways, electrical boxes, and fittings.
- C. ANSI/NEMA Standards Compliance: Comply with ANSI C 134.1 (NEMA Standards Publication No. OS 1) as applicable to sheet-steel outlet boxes, device boxes, covers, and box supports.

1.03 SUBMITTALS

- A. Shop Drawings: Shop Drawings shall include product data sheets and drawings for surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
1. For custom enclosures and cabinets, include plans, elevations, sections, details, and detailed attachment to other work.

1.04 REQUIREMENTS

- A. General Requirements:
1. Unless specifically noted or otherwise specified, wiring shall be installed in enclosed raceway systems. Raceways shall be sized in accordance with code for conductors indicated. Where space will not permit the installation of one conduit of sufficient size to contain conductors required, (2) or more conduits shall be provided. Raceway systems shall be complete with all fittings and accessories to make the system complete. Raceway system shall be complete from outlet to outlet, and to cabinets and junction boxes, and

shall enter and be secured to boxes and cabinets in such a manner that the system shall be electrically continuous from point of origin to all outlets.

2. Unless specifically noted or otherwise specified, raceways shall be installed concealed. Generally, raceways may be installed exposed in mechanical equipment rooms and at ceilings of unfinished spaces. In existing areas consisting of block wall or clay tile construction, surface metal raceway shall be used. Surface raceway shall be Wiremold, Cat. No. V700 and larger with ivory finish or equal. Surface mounted EMT shall be acceptable in support (unfinished) areas. Surface mount raceway in any other areas must be approved by the Electrical Engineer and the Owner.
 3. Electrical Contractor shall furnish and install all wireways and raceways for signal and communication systems described in other Specification Sections and as shown on Drawings. Where standard outlet boxes are required for installation of systems described in these sections, those outlet boxes shall be furnished and installed by Electrical Contractor. Special rough-in and outlet boxes required for installation of systems described in these sections will be furnished by systems equipment manufacturer and installed by Electrical Contractor. Each wireway and raceway system shall be complete with fittings, supports, and other components required for the rough-in ready for installation of cable devices.
- B. Types of Raceways: Types of raceways in this Section include the following:
1. Intermediate Conduits
 2. Electrical Metallic Tubing
 3. Flexible Metal Conduit
 4. Liquid-tight Flexible Metal Conduit
 5. Rigid PVC Conduit
 6. Wireways
 7. Surface Metal Raceways
 8. Type MC, AC, NM or Other Manufactured Wiring System Not Allowed
- C. Raceway Size: Raceway sizes are shown on Drawings or specified elsewhere herein.
- D. Conduit Fill: Conduit fill shall be based on THHN or THWN conductor insulation.

1.05 REFERENCES

- A. Rigid Metal Conduit (RMC):
1. Federal Specification WW-C-581
- B. Intermediate Metal Conduit (IMC):
1. Underwriters' Laboratories 1241
 2. Federal Specification WW-C-581
- C. Electrical Metallic Tubing (EMT):
1. Federal Specification WW-C-563
- D. Flexible Metal Conduit:
1. Federal Specification WW-C-566
- E. Liquid-Tight Flexible Metal Conduit:
1. Flexible Galvanized Steel Raceway With Extruded Liquid Tight PVC Jacket
- F. Rigid Non-Metallic Conduit (PVC):
1. NEMA TC2, Schedule 40
 2. Federal Specification W-C-1094; (Polyvinyl Chloride C-200 Compound), Heavy Wall, Rated for 90 Degree C Wire
 3. Underwriters' Laboratories Listed; in accordance with current edition of National Electric Code for Underground and Exposed Use
- G. Surface Metal Raceway:
1. Federal Specification W-C-582
- H. Fiberglass Raceway System:
1. Conduit fill shall be based on THHN or THHW conductor insulation.

- I. Fire Stop Sealants:
 - 1. ASTM E814
 - 2. Underwriters' Laboratories 1479

PART 2 - PRODUCTS

2.01 CONDUIT

- A. General Requirements:
 - 1. Provide conduit, tubing, and fittings of types, grades, sizes, and weights (wall thickness) for each service indicated. Meeting applicable portions of NEC for raceways.
 - 2. Conduit bodies shall be malleable cast iron or copper free aluminum to suit conduit system. Conduit bodies shall not be used for conduits larger than 1 1/2 inches.
- B. Acceptable Manufacturers: Subject to compliance with requirements of the Contract Documents, acceptable manufacturers for steel conduit and fittings are as follows or Owner approved equal:
 - 1. Steel Conduit and Fittings: Galvanized steel by firms regularly engaged in manufacture of raceway systems of type and sizes required.
 - 2. PVC:
 - a. Cantex
 - 3. Fiberglass:
 - a. Champion Fiberglass Products
 - 4. Outlet Junction and Pull Boxes, Fittings, and Wireways:
 - a. Appleton
 - b. Gedney
 - c. Hoffman
 - d. Killark
 - e. Raco
 - f. Square D
 - g. Steel City
 - h. Thomas and Betts
- C. Types:
 - 1. Rigid metal conduit and IMC conduit shall be galvanized standard weight steel, and approved for use in all areas allowed by the NEC.
 - a. Rigid metal conduit is required in the following areas:
 - 1) Conduits Exposed Within 5 Feet of Finished Floor in Shops and Garage Areas
 - 2) Exterior Exposed Runs
 - 3) In Soil With Approved Tape Wrap or Protective Covering
 - 4) In Concrete Slabs-On-Grade
 - 5) All Locations Where Subject to Mechanical Injury
 - 6) Conduit Drops in Shop Areas
 - 7) Conduit Stub-Ups to Equipment or Machinery
 - 8) Hazardous Areas
 - 2. Electrical Metallic Tubing (EMT): Galvanized steel and approved for use in dry locations allowed by the NEC.
 - 3. Flexible Metal Conduit: Minimum 1/2-inch size galvanized steel with malleable fittings, and is permitted only in the following locations, unless otherwise noted on Drawings:
 - a. All motor connections in lengths not less than 12 inches or more than 30 inches.
 - 1) All flexible conduit motor connections in boiler rooms, mechanical equipment rooms, and damp locations shall have a liquid-tight covering.
 - b. Concealed wiring in frame, hollow block, precast panels, and tile walls.
 - c. Connections to light fixtures concealed above ceilings, in lengths not exceeding 6 feet.
 - d. Concealed within special equipment cabinets.

- e. MC cable or any other factory installed conductor in flexible metal conduit shall not be used unless permitted by other portions of this Specification or indicated on Drawings.
- 4. PVC, unless otherwise noted on Drawings, may be used as follows:
 - a. Where run in soil.
 - b. In duct banks, except for bends and elbows where rigid steel shall be used.
 - c. In concrete slabs-on-grade.
 - d. Under roadway or vehicle crossings shall be Schedule 80. Note under heavy loading, reinforced concrete encasement may be required. Check with Civil Engineer.
 - e. Where PVC conduits emerge from slabs in concealed walls, all raceways beyond the first coupling or connector shall be run in EMT or rigid steel. Rigid 90-degree used on PVC and a rigid coupling even with the slab.
 - f. All conduit entries into pole bases or concrete pads shall be rigid steel.
 - g. A grounding conductor, sized in accordance with the current edition of the National Electric Code, shall be added to all non-metallic conduits. Conduit sizes shall be increased as required to accommodate the grounding conductor.
- 5. Surface Metal Raceway: Use surface metal raceway only where specifically called for on Drawings.
- 6. Utility Service Conduit: High density polyethylene conduit for electrical duct and telephone and cable ducts.
 - a. Flying "W" Plastics
- D. Conduit Fittings:
 - 1. Rigid Metal Conduit and Intermediate Metal Conduit:
 - a. Standard threaded steel couplings, locknuts, and bushings.
 - b. Threadless connectors or couplings shall not be used without specific prior approval.
 - c. Bushings shall be metallic insulating type with insulated insert molded into metallic fitting. Bushings made entirely of metal or non-metallic material are not permitted.
 - d. Concrete-tight compression or set-screw fittings shall be designed for concrete installation and be case-hardened steel with hex head and cup point to firmly set in conduit wall for positive ground. Cast or indent type devices are not acceptable.
 - e. Sealing fittings shall be of threaded cast iron type. Provide drain seal type fittings to prevent accumulation of water when exterior conduit runs exceed 20 feet in height, or pass from unheated to heated areas.
 - 1) In concealed work, sealing fittings shall be installed in a flush steel box with blank coverplate having the same finish as that of other electrical plates in room.
 - 2. EMT:
 - a. For conduit 2 inch and smaller, only steel concrete tight compression gland fittings with threaded outer nut or set-screw type.
 - b. For conduit over 2 inches, connectors and couplings shall be set-screw type with (2) screws each end. Set-screws shall be case-hardened steel with hex head and cup point to firmly set in wall of conduit for positive ground.
 - c. Indent type connectors are not permitted.
 - d. Die-cast, pressure-cast zinc alloy, or fittings made of pot metal are not permitted.
 - 3. Flexible Metal: Malleable iron multiple point type threading into internal wall of conduit convolutions or set-screw type.
 - 4. Liquid-Tight Flexible Metal: Malleable iron, threaded grounding type, with cone and steel or plastic compression ring and tightening gland. Connectors shall have insulated throats.
 - 5. Direct Burial PVC: Fittings as recommended by conduit manufacturer for bonding with solvent cement. Use cleaner before glue.
 - 6. Expansion Fittings: Use expansion fittings in conduits installed in concrete slabs or in soil under slabs at the point where conduits cross expansion joints, and building expansion joints. Expansion joint locations shall be verified with concrete installer.

7. Expansion fittings shall be O.Z. Type AX for rigid conduit, O.Z. Gidney Type TX for thinwall conduit, and Carlon Type E945 for rigid non-metallic conduit.
 8. All rigid non-metallic conduits installed at a temperature of 25 degrees F above or below final conduit temperature, as well as all rigid non-metallic conduits installed in temperatures below 50 degrees F, shall be installed with expansion fittings. Provide one expansion fitting for each conduit run up to 100 feet long. For runs over 100 feet in length, provide one additional expansion fitting for each 100 feet or portion thereof.
- E. Fire Stops:
1. Contractor shall seal each penetration through fire rated walls or partitions. Provide a complete fire rated installation in accordance with sealant manufacturer's instructions.
 2. All firestopping products shall be installed by trained, experienced workers. Contractor shall submit manufacturer's appropriate penetration system design criteria and UL approval number for each type of fire stopping design rating system prior to installation.
- F. Grouting: Contractor shall grout airtight all raceway openings through walls. Openings around raceways through floors shall be sealed watertight.

2.02 OUTLET BOXES

- A. Outlet Box Manufacturers:
1. Acceptable Manufacturers: Subject to compliance with requirements of the Contract Documents, acceptable manufacturers are as follows:
 - a. Hubbell
 - b. Raco
 - c. TayMac Corporation "Multi-Mac"
 - d. Thomas & Betts
- B. Materials:
1. Ceiling Boxes: Ceiling boxes shall be standard 1900 box with mud-ring.
 - a. For additional wire space, use 4 11/16-inch square boxes with raised cover flush with ceiling surface.
 - b. Where fixtures will be used, outlet boxes shall be complete with fixture studs.
 - c. For boxes embedded flush in poured concrete ceilings, provide Raco Steel Concrete Rings with back plates.
 2. Wall Boxes: Provide interior outlet wiring boxes, of types, shapes, and sizes, including box depths, to suit each raceway system and respective location and installation; construct with stamped knockouts or with threaded hubs in back and sides, and with threaded screw holes with corrosion resistant screws for securing box covers and wiring devices. Wall boxes shall be 4-inch square size, having a 1- or 2-device raised cover. Tile rings or raised covers shall be flush with finished walls.
 - a. Provide outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension, rings, fixture studs, and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used and fulfilling requirements of individual wiring situations. Choice of accessories is installer's option.
 - b. For additional wire space, use 4 11/16-inch raised covers flush with finished surface.
 - c. In plastered walls, rectangular boxes with more than (2) devices shall be provided with plaster or tile rings with gang openings as indicated on Drawings.
 - d. Where outlet boxes are to be installed in glazed tile, brick, exposed concrete block, and wood paneled walls, or other masonry which will not be covered with plaster or other finish, and where wood or other types of paneling will be installed, boxes shall be 4-inch square type having (1) or (2) devices having a raised tile ring not less than 1 inch deep equal to Steel City No. 52C49 or No. 52C52. Extension in cover shall not be less than 1 inch and raised portion of cover shall have straight sides.
 - e. Where more than (2) gangs are required, or where thickness of masonry will not allow the use of a 4-inch box with raised cover, 3 3/4-inch high masonry boxes, Steel

City No. GW Series or equal, shall be used. Minimum depth of boxes in masonry shall be 3 1/2 inches.

- f. Boxes shall not be installed back-to-back unless otherwise noted.
- g. Round or octagon boxes are not allowed; 4-inch octagonal boxes may be used where by manufacturer of the associated utilization equipment, such as light fixtures.
- h. Outlet boxes for telephone and technology jacks shall be 4 11/16-inch square with single gang cover and plate of same design and finish as device plates, and with 1-inch knock-outs, equal to Raco No. 258 with Raco No. 885 2-gang raised tile ring. Contractor shall provide a plate for all telephone outlets and shall be responsible for the installation of the plates on the outlets. Contractor shall consult telephone company as to type of opening required in plate for each particular outlet.
 - 1) Outlet boxes for signal and communication systems shall be selected to suit device to be installed. All plates shall be of same design and finish as device plates.
 - 2) Where Drawings call for the use of 1 1/4-inch conduit, use Raco No. 259 box.
- i. Where outlets are provided for the future installation of equipment, unless otherwise noted, provide a 4-inch square box with 2-gang cover and blank plate.
- j. Surface mounted boxes shall be 4-inch square type with pressed steel plates, except surface mounted device boxes within 6 feet of floor shall be cast Type "FS" or "FD".
- k. Sectional switch boxes and straight through boxes shall not be used.
- l. Where special equipment or devices are to be installed in outlet boxes, Electrical Contractor shall obtain information from the manufacturers of such equipment or devices to determine size of box required.
- m. Box material shall be as follows:

Raceway System	Installation Method	
	Concealed	Exposed
Rigid Conduit	Steel	Cast Iron
EMT	Steel	Steel
Flexible	Steel	Steel & Cast Iron
IMC	Steel	Cast Iron

- 1) Steel boxes shall be galvanized. Cast iron shall be malleable.
- 3. Masonry Walls: Masonry boxes sized 3 3/4 inches high with concentric 1/2-inch and 3/4-inch knockouts may be installed in block walls prior to blocks being laid. Coordinate with masons to cut block to fit around box.
- 4. Weatherproof and Damp Locations: Provide corrosion-resistant cast metal weatherproof outlet wiring boxes; of types, shapes, and sizes, including depth of boxes, with threaded conduit ends, cast metal face plates with spring-hinged waterproof caps suitable configured for each application, including face plate gaskets and corrosion-resistant fasteners. Provide metal covers suitable for "in-use" applications with weather-resistant rated as required by NEC, with cord access when cover is closed.

2.03 PULL AND JUNCTION BOXES

- A. Acceptable Manufacturers: Subject to compliance with requirements of the Contract Documents, acceptable manufacturers are as follows:
 - 1. Above Grade Locations:
 - a. Hoffman Engineering
 - b. Shallbetter, Inc.
 - 2. Buried Locations Beneath Non-Traffic Areas:
 - a. Associated Plastics, Inc.
 - b. Blackburn
 - 3. Athletic Areas:
 - a. Sports Edge, "ComBox"
 - 4. Buried Locations Beneath Parking or Traffic Areas:

- a. Elk River Concrete
- B. Materials:
 - 1. General: Provide galvanized code-gauge sheet steel junction and pull boxes, with screw-on covers; of types, shapes and sizes to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws, and washers.
 - a. Unless otherwise specified hereunder, pull and junction boxes shall be of code grade steel, galvanized both inside and outside.
 - 2. Buried Pull and Junction Boxes:
 - a. Constructed to carry all surface loads of the area at the surface. Utilize precast concrete where necessary.

2.04 WIREWAYS

- A. Materials:
 - 1. Type: Steel, stainless steel or aluminum trough wireways without knockouts:
 - a. Standard manufacture, approved, with hinged cover.
 - b. Complete with fittings, connectors, and accessories for a complete system.
 - 2. Size: Size shall be for the number of conductors contained, but not be less than 16 square inches in cross section, unless otherwise noted.
 - 3. Finish: Steel wireways shall be coated with a rust inhibitor and finished with ANSI 61 baked enamel. Wireways installed outdoors or other similar corrosive atmosphere shall be approved for such use.

2.05 SURFACE RACEWAYS

- A. Acceptable Manufacturers: Subject to compliance with requirements of the Contract Documents, acceptable manufacturers are as follows:
 - 1. Hubbell
 - 2. Wiremold; Wiremold catalog numbers are used to specify type of raceway required.
- B. Surface Metal Raceway:
 - 1. General Requirements: Surface metal raceways shall be Wiremold No. V700 and larger or equal. Surface metal raceway systems shall be complete with fittings, connectors, and accessories required for a complete system. Routing shall be at Engineer's direction.
 - a. Size raceway as required to accommodate conductors indicated on Drawings. Contractor shall use the smallest size raceway permitted by the manufacturer's wire capacity tables:
 - 1) One-Piece Raceway:
 - (a) V700 and Larger or Owner approved equal
 - 2) Two-Piece Single Channel Raceway:
 - (a) 4000
 - 3) Two-Piece Multiple Channels Raceway:
 - (a) 4000
 - (b) 6000
 - b. Fixture boxes shall have a diameter as small as possible, but slightly larger than fixture canopy.
- C. Multi-Outlet Surface Metal Raceway:
 - 1. 2000 Series: Raceway shall be 2000 Series with removable "snap on" friction held covers. Cover shall be pre-punched hole cuts for receptacles on 6-inch, 12-inch or 18-inch centers.
 - a. Multi-outlet wiring harness shall consist of 20 Amp, 120 Volt, NEMA 5-20R specification grade receptacles. Harness shall be available in single circuit (2 conductors plus ground) or 2-circuit (3 conductor plus ground, alternately wired). The wires shall be 12 AWG solid type THHN conductors, factory assembled to the receptacles.
 - b. Multi-outlet system shall have a factory installed wiring harness with available receptacle spacing of 6-inch, 9-inch, 12-inch or 18-inch centers.

2. 2400 Series: Raceway shall be 2400 Series, 2-piece type consisting of a separate base with divider to separate communication system and electrical system, and a removable "snap on" friction held cover.
 - a. Device boxes shall be available to mount standard devices and Activate inserts by the Wiremold Company with face plates in single and 2-gang configurations. Device bases shall be available for over-the-raceway mounting feature with twist-outs that allow for access into either raceway compartment. Boxes shall be available in 2 3/4-inch depth and painted to match raceway.
 - b. See Drawings for quantity and spacing of boxes.
3. 4000 Series: Raceway shall be 4000 Series with removable divider to separate communication system and electric system, removable "snap-on" friction held covers.
 - a. Device brackets shall be available to install single or 2-gang devices either horizontal or vertical within the raceway. Devices, both power and data/communication shall have the capacity of mounting flush or in conjunction with face plates. Face plates to conceal seam between raceway cover and installed faceplate. Device brackets and plates shall be colored to match the raceway and available with any combination of multiple device opening options.
 - b. See Drawings for quantity, spacing, and wiring of devices.

PART 3- EXECUTION

3.01 RACEWAY

- A. General: Unless otherwise noted or specified, all raceways shall be complete, with proper and approved supports, from connector to connector. Complete installation of electrical raceways before starting installation of cables/wires within raceways. Wherever possible install horizontal raceway runs above water piping.
 1. Upon completion of installation of raceways, inspect interiors of raceways, remove burrs, dirt, and construction debris.
 2. Raceways shall be installed in accordance with NECA Standard of Installation.
 3. In existing areas, wherever possible, existing concealed conduits shall be used. Where it is necessary to install new raceways and extensions to existing raceways, they shall be installed as follows:
 - a. Where walls or ceilings have void spaces above or behind, new raceways shall be "fished" into such void spaces.
 - b. In unfinished areas and equipment spaces, raceways may be installed exposed.
 - c. Where specifically noted on Drawings, surface metal raceway shall be installed.
 - d. Elsewhere new raceways shall be exposed surface metal raceway.
- B. Concealed: Raceways shall be concealed in all finished areas unless otherwise noted.
- C. Under Roof Decking: Raceways installed in exposed or concealed locations under metal corrugated sheet roof decking shall be installed and supported so the nearest outside surface of the raceway is not less than 1 1/2 inches from nearest surface of roof decking.
- D. Roof Mounted Raceways: Raceways installed on top of roofs shall be rigid steel or IMC threaded systems. Provide UV resistant polyethylene foam pipe piers with galvanized strut channel to mount conduit a minimum of 12 inches above the finished roof. Properly fasten pipe piers to roof. Coordinate with Owner and Engineer. Provide expansion joints when raceways are routed over building expansion joints.
- E. Variable Frequency Drive Feeders: Feeders from variable frequency drive units to motors shall be run in separate conduits.
- F. Location Requirements:
 1. Locations for the several raceway types shall be as follows:
 - a. EMT may be used in dry locations above grade, in slabs not in contact with the ground, and elsewhere inside building in non-corrosive atmospheres.
 - b. Liquid-tight flexible metal conduit shall be used for connections to appliances, motors, and motor driven equipment. Type MC, AC, and NM cable not allowed.

- c. Flexible metal conduit shall be used for connections to lighting fixtures in lengths not exceeding 6 feet. Type MC, AC, and NM cable not allowed.
- d. Wireways are to be used where shown or noted and in equipment spaces where electrical equipment is grouped.
- e. Surface metal raceways are to be used only where indicated on Drawings or where specifically stated in Specifications.
- f. Rigid metal conduit or IMC shall be used in locations where the preceding types are not acceptable, and may be used in all locations.
- g. Rigid non-metallic conduit may be used only for the following:
 - 1) Under Slab-On-Grade and Protected From Physical Damage During Installation
 - 2) Outside Footprint of Building
 - 3) Outdoors
 - 4) Buried in accordance with the NEC.
- 2. Raceways crossing building expansion joints shall be approved steel expansion fittings allowing for building contraction, expansion and settlement. Crossing of expansion joints in building construction shall be provided where possible.
- 3. Raceways are not to be mounted on equipment, except where necessary to make connections to electrical devices which are part of or mounted on such equipment. Where raceways must be run on equipment, care shall be taken not to cover access doors, controls, removable panels, and other components, or otherwise hinder the normal maintenance and repair of the equipment.
- 4. Boiler Rooms:
 - a. All fire alarm cabling shall be installed in a complete conduit and J-box system. Fire alarm cable shall not be installed exposed. All flexible conduit serving fire alarm devices shall be liquidtight/sealtite type. (Flow and tamper switches, etc.) Conduits and J-boxes for fire alarm system shall be red.
 - b. All temperature control cabling shall be installed in a complete conduit and J-box system unless otherwise noted. In Mechanical Rooms, temperature control cabling shall be in conduit stubbed up walls then run open. In hallways and classrooms, temperature control cabling shall be above ceiling conduit. In all other areas where ceilings are inaccessible, temperature control cabling shall be in conduit. All flexible conduit serving temperature control equipment/devices shall be liquidtight/sealtite type. (Control wiring to VFDs, sensors, damper actuators, etc.)
 - c. All data, sound, video, security, and voice (Technology, Section 27) cabling shall be installed in a complete, bushed, conduit and J-box system in boiler rooms, even if the use of plenum cabling is allowed elsewhere on Project. Technology, Section 27 cable shall not be installed exposed.
- 5. Mechanical/Electrical, Storage Rooms and Other Non-Finished Exposed Ceiling Areas:
 - a. All fire alarm cabling shall be installed in a complete conduit and J-box system. Fire alarm cable shall not be installed exposed. Conduits and J-boxes for fire alarm shall be red.
 - b. All temperature control cabling shall be installed in a complete conduit and J-box system. Temperature control cable shall not be installed exposed.
 - c. All data, sound, video, security, and voice (Technology, Section 27) cabling shall be installed in a complete, bushed, conduit, and J-box system up to above ceiling or joist space. Technology, Section 27, cable shall then be neatly bundled, and routed using 'J' hooks on 5-foot centers, or in cable tray as called out on Drawings. All wiring shall be routed parallel to building structure, above the bottom chord of joists or beams, and routed to avoid contact with sharp edges, vibrating equipment, or excessive heat such as mechanical steam or hot water piping.
- 6. Gymnasium/Cafetorium Rooms and Other Finished Exposed Ceiling Areas:
 - a. All fire alarm cabling shall be installed in a complete conduit and J-box system. Fire alarm cable shall not be installed exposed. Fire alarm cable shall not be installed exposed. Conduits and J-boxes for fire alarm shall be red.

- b. All temperature control cabling shall be installed in a complete conduit and J-box system. Temperature control cable shall not be installed exposed.
 - c. All data, sound, video, security, and voice (Technology, Section 27) cabling shall be installed in a complete, bushed, conduit and J-box system. Extend raceway up to ceiling/joist space, above bottom chord of joist, and install bushing. Technology, Section 27 cable shall then be neatly bundled, and routed using 'J' hooks on 5-foot centers, or in cable tray as called out on Drawings. All wiring shall be routed parallel to building structure, above the bottom chord of joists or beams, and routed to avoid contact with sharp edges, vibrating equipment, or excessive heat such as mechanical steam or hot water piping.
7. Non-Accessible/Hard Surface Ceiling Spaces:
- a. All fire alarm cabling shall be installed in a complete conduit and J-box system. Fire alarm cable shall not be installed exposed conduits and J-boxes for fire alarm shall be red.
 - b. All temperature control cabling shall be installed in a complete conduit and J-box system. Temperature control cable shall not be installed exposed.
 - c. All data, sound, video, security, and voice (Technology, Section 27) cabling shall be installed in a complete, bushed, conduit and J-box system. Extend raceway to nearest accessible ceiling/joist space, above bottom chord of joist, and install bushing. All wiring shall be routed parallel to building structure.
8. Accessible/Grid Ceiling Spaces:
- a. All fire alarm cabling shall be installed in a complete conduit and J-box system. Fire alarm cable shall not be installed exposed. Conduits and J-boxes for fire alarm shall be red.
 - b. All temperature control cabling shall be installed in a complete conduit and J-box system. Temperature control cable shall not be installed exposed unless plenum cable installation is specified or approved prior to Bid. Contractor shall verify this with Architect prior to bidding Project.
 - c. All data, sound, video, security, and voice (Technology, Section 27) cabling shall be installed in a complete, bushed, conduit and J-box system, up to above accessible ceiling or joist space. Technology, Section 27 cable shall then be neatly bundled, and routed using 'J' hooks on 5-foot centers, or in cable tray as noted on Drawings. All wiring shall be routed parallel to building structure, above the bottom chord of joists or beams, and routed to avoid contact with sharp edges, vibrating equipment, or excessive heat such as mechanical steam or hot water piping.
9. Exposed: Exposed raceways shall be installed in a mechanical and workmanlike manner and shall be rigidly supported by means of pipe hangers or straps. Exposed runs shall parallel the building construction. Bends in exposed raceways shall be right angle. In finished and public spaces, Contractor shall use conduit bodies and junction boxes to keep raceway systems tight to building surfaces, offsets shall not be acceptable in these locations, but may be used in service areas and concealed. Shepherd's hooks shall not be permitted under any circumstance.
- a. Raceways may be installed exposed in the following locations:
 - 1) On Walls and Ceilings of Unfinished Rooms
 - 2) At Mechanical Equipment in Boiler and Equipment Rooms
 - 3) Where indicated on Drawings.
10. Roof: Conduits shall not be run on roof without special permission from Engineer and Owner.
11. Supports: Raceways shall be independently supported from building structure.
- a. Provide seismic supports where required.
 - b. Supports shall be installed from the top of building steel unless otherwise specified by support manufacturer.
12. Interference: Contractor shall coordinate with other trades before installing raceway systems to avoid conflicts between raceways, piping, ductwork, and building components.
- a. Maintain access clearances as required by all equipment.

- b. Contractor shall field route all raceway systems. Locations are subject to approval by Engineer, and shall in no case result in additional cost to Owner.
- 13. Pull Boxes: Installed in raceway runs when necessary to facilitate conductor installation and splicing.
 - a. Unless noted otherwise, provide in unfinished locations for access after building is completed. Pull boxes shall not be placed in finished places without special permission.
 - b. Stencil pull boxes with 1/2-inch letters for easy identification of system and circuits.
- 14. Fire Suppression System:
 - a. Flexible conduit serving flow and tamper switches, etc. shall be liquidtight/sealtight type.

3.02 CONDUIT

- A. Conduit Sizing, Arrangement, and Support:
 - 1. Minimum size to be 3/4 inch. Minimum conduit size for homeruns and conduit in or below slabs shall be 3/4 inch.
 - 2. Conduit systems shall be complete and form a neat appearing, mechanically firm assembly.
 - 3. Clearances: Arrange conduits to maintain access for maintenance, walkways, doorways, and head room.
 - 4. For conduits smaller than 1 inch in diameter, supports shall be spaced not to exceed 7 feet. Conduit support spacing shall be 10 feet for 1 inch and larger. Supports shall be pipe straps or hangers. Perforated strap and/or iron wire is not approved and shall not be used.
 - a. Where conduits are installed on surface of walls, they shall be strapped with 2-hole straps at not greater than 3-foot intervals wherever located below 6 feet above floor.
 - 5. Group conduits in parallel runs where practical by using conduit racks constructed of steel channel with conduit straps/clamps or trapeze hangers with U-bolts or other approved fasteners.
 - 6. Vertical conduit runs shall be supported at each floor slab with approved hangers.
 - 7. Conduit joints shall be cut square, threaded, reamed smooth, and drawn up tight. Bends or offsets shall be made with standard ells, field bends made with an approved bender or hickey, or hub type conduit bodies.
 - 8. Where continuous conduit systems pass through tunnel walls and/or exterior walls below grade, the entrance shall be made watertight by use of OZ/Gedney conduit seal bushings. All underground conduit penetrating the building exterior walls below grade shall slope away from the building without exception.
- B. Conduit Installation: All conduits shall be installed in accordance with the NECA Standard of Installation:
 - 1. General Requirements: All conduits shall be installed in accordance with the NECA Standard of Installation:
 - a. Avoid moisture traps where possible. Provide junction box with drain fitting at conduit low point. Slope conduits to drain, and pitch into manholes, pull boxes or suitable located drain tees.
 - b. Conduit ends shall be capped during construction period.
 - c. Route exposed conduits and conduit above accessible ceilings, parallel and perpendicular to building structural components, walls, and adjacent mechanical systems.
 - d. Conduits shall be secured to cabinets and boxes with sharp edged type locknuts. Provide a locknut on outside and locknut and bushing on inside of enclosure. On conduits 1-inch and larger insulating bushings shall be installed. Threadless connectors or couplings shall not be used without specific approval. Cast type fittings other than malleable iron are not acceptable. Couplings and connectors for EMT shall be threadless type, concrete tight with compression gland and threaded outlet

- nut, or screw type. EMT fittings shall be malleable steel. Cast type fittings are not acceptable. EMT installations may have a single locknut on inside of enclosure.
- e. All conduit connections shall be made up wrench tight.
 - f. Install a No. 12 steel or copper pull wire or heavy duty nylon cord in empty conduits shown for future wiring. Empty conduits shall be labeled with a stamped plastic label indicating the future use. Plug all empty conduits to prevent water/rodent infiltration.
 - g. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using conduit approved straps or clamps secured to structure with machine screws, expansion type anchors.
 - h. Coordinate all conduits with other trades.
 - 1) Consult with Mechanical Contractor before installing conduits for electrical feeders so that conflicts between locations of conduit runs, piping, and ductwork will be adjusted before installation.
 - 2) Large pipe mains and air ducts shall be given priority in available space. Conduit runs shall be installed so as to maintain, wherever practical, a minimum separation of 3 inches from water and waste piping and 6 inches from steam piping.
 - i. Provide sealing fitting, to prevent passage of water vapor, where conduits pass from warm to cold locations.
 - j. Fasteners shall be steel or malleable iron concrete inserts, 1/4-inch minimum diameter steel expansion anchors embedded not less than 1 1/8 inches. Hollow masonry anchors shall be toggle bolts, hollow wall fasteners, or concrete block anchors. Sheetmetal screws shall be used on metal studs and wood screws used on wood construction.
 - k. Flexible conduit connections shall not be less than 12 inches nor more than 18 inches in length, except as specified for lighting fixtures. A ground conductor shall be installed inside flexible conduit installations. If installed outside, conduit box connector shall have integrated ground conductor lug. Fittings shall be malleable steel.
2. Conduits In Pool or Corrosive Areas: All conduits and fittings shall be painted rigid steel or PVC type where permitted by NEC.
 3. Conduits In Soil: Metallic conduit shall have a factory coating of 20 mil bonded PVC or field wrapped with 3M or equivalent tape wrap, coated on outside with asphaltum before installation.
 4. Conduits In Slabs-On-Grade: All conduits shall be at least 8 inches below bottom of slabs-on-grade.
 5. Conduits in Slabs-Not-On-Grade: Conduits shall occupy the middle third when practical and have at least 1 1/4-inch concrete cover. Consult with Architect/Engineer to determine minimum allowable horizontal spacing between conduits to maintain structural integrity of floor slab. Conduits shall be tied to reinforcing rods to prevent movement or sagging during pour.
 6. Conduits In Concrete Joist and Columns: No conduits shall be run in steel reinforced concrete joists, beams or columns without approval of Architect/Engineer; with the exception of switches and receptacles specifically shown in columns.
 7. Conduits In New Masonry Walls: Conduits shall be installed during wall construction or "fished in". No conduit shall be channeled in without special permission of Architect.
 8. Horizontal Runs In Walls: Unless special permission is obtained from Architect, no conduit shall run horizontally in concrete block or brick walls. Horizontal runs shall be made in floor or ceiling construction.
 9. Conduits on Equipment: Conduits shall not be mounted on ductwork or mechanical equipment, except where necessary to make connections. Care shall be taken not to cover access doors, controls or removable panels and shall not hinder normal equipment maintenance and repair.
 10. Conduits Under Boilers: No conduit shall be run under boiler locations, unless Contractor has verified that boiler will not overheat conductors.

11. Conduit Through Roofs: Route conduit through roof openings for piping and ductwork where possible; otherwise, through a doghouse that is big enough to handle mechanical and electrical piping penetrations. Check with Owner prior to installing. All conduit penetrating the roof shall be sealed watertight by the Electrical Contractor in a manner approved by the Architect.
 12. Expansion Fittings: Install expansion fittings where at building expansion joints. Conduits installed in suspended ceiling spaces shall have offsets or bends adjacent to building expansion joints.
 13. Conduits in Demountable Partitions: Conduit shall enter partitions from the wall to facilitate future partition removal. No conduits shall enter from floors. A junction box shall be provided in the wall (match receptacles) at the point where conduit enters partition to facilitate future partition removal.
 14. Conduits Through Exterior Walls: Make watertight by providing pipe sleeves in wall with 1/2-inch minimum clearance around conduit and caulking with as approved non-hardening type caulking compound, or by means of a conduit entrance seal, O.Z./Gedney Company Type "FSK" or as approved by Engineer. Entrance conduits shall be sealed watertight with an approved non-hardening type caulking compound packed around wires.
 15. Conduits In Precast Panels: Contractor shall not penetrate precast panels without precast panel manufacturer's Shop Drawing showing cable locations.
 16. Conduits Above Furred or Suspended Ceilings: Branch circuit conduits and conduits feeding ceiling lighting shall be supported independent of suspended ceiling lighting fixtures, mechanical piping, or air conditioning ducts.
- C. Conduit Stub-Ups Through Floor Slabs: Where conduit is called to be stubbed up at an exposed location, a rigid conduit threaded coupling shall be installed flush with finish floor. Provide a recessed pipe plug, flush with floor, in each stub-up designated for future use.
- D. Empty Conduits: Empty conduits installed for future use or use by others shall have markers and identification at terminations to facilitate locating and recognition. Empty raceway boxes shall be marked with the system named in a visible place inside the box.
- E. Painting: All exposed conduit and fittings located in finished areas shall be painted to match.

3.03 BOXES

- A. General Requirements:
1. Install electrical boxes and fittings where indicated, complying with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standards of Installation", and in compliance with recognized industry practices.
 2. Boxes shall be completely covered with plates or lighting fixtures.
 3. No through-wall boxes shall be used. No boxes shall be recessed back-to-back on opposite sides of a wall. Boxes shall be offset a minimum of 6 inches.
 4. Outlets shall be roughed-in to provide a pleasing appearance.
 - a. Center lines of outlets, including communication boxes, shall be aligned vertically or horizontally.
 - b. Where outlets occur in wood panels, below windows, between doors, and other such conditions of architectural features, outlets shall be centered or otherwise symmetrically located with the major feature.
 5. Adjust box height and horizontal position such that boxes are located symmetrically and adjacent to masonry coarse. Vertical centerline of box should be on a masonry coarse or centered on a masonry unit.
 6. Electrical Contractor shall cooperate with other trades so outlet boxes shall be installed to NECA Standards. Boxes improperly installed are unacceptable.
 7. Where narrow fluorescent fixtures are installed, provide outlet boxes with openings of such a size that they will be completely covered by fixtures.
 8. Ceiling boxes in finished ceiling construction shall be supported from building structural members, bar hangers or steel channels spanning structural framing members or

channels. Exposed ceiling outlet boxes shall be secured to structure by wood screws, toggle bolts or expansion anchors.

9. Regardless of height or location shown on Drawings, Contractor shall check outlet locations against work of others and locate outlets so as not to conflict with other work or equipment. If outlets conflict with work of others, it shall be Electrical Contractor's responsibility to move their outlet at no additional cost to Owner.
 10. Boxes installed in exterior walls shall be installed such that direct contact from the outer wall is eliminated to prevent air infiltration and condensation in the electrical system.
- B. Pull Boxes: Utilize in raceway runs to facilitate conductor installation and splicing.
1. Unless noted otherwise, provide in unfinished locations for access after building is completed.
 2. Stencil pull boxes with 1/2-inch letters for easy identification of system and circuits.

3.04 PULL AND JUNCTION BOXES

- A. Installation: Pull and junction boxes shall be located so they are accessible. They shall not be placed in any finished spaces without special permission of Architect/Engineer. No boxes shall be installed above plaster ceilings without special permission of Architect/Engineer.
1. Where installed above lay-in ceiling tiles, boxes shall be within 24 inches of ceiling for accessibility and shall not conflict with the ability to lift out individual ceiling tiles.
 2. Where installed above accessible panels, boxes shall be within 24 inches of access panel.
 3. Where buried, install boxes to allow surface drainage away from the box.
- B. Conductor In Pull Boxes: Conductors within pull boxes shall be of sufficient length, neatly trained, and properly supported.
- C. Identification:
1. Pull Boxes: Pull box shall be marked to identify the system:
 - a. In non-finished areas, stencil cover plate with 1/2-inch black letters.
 - b. In finished areas, identify with a tag inside of box.
 - c. Pull or junction boxes used on fire alarm system shall be painted red and stenciled "FIRE ALARM".
 - d. In buried locations, provide covers with "ELECTRIC" cast into the cover.
 2. Conductors within a pull box shall be identified in a neat, legible, and permanent manner by means of tags, pressure sensitive tape or cable ties.

3.05 WIREWAY

- A. General Requirements:
1. Provide wireway with a hinged cover where shown on Drawings, or as required by Contractor to facilitate equipment connections.

3.06 SURFACE RACEWAY INSTALLATION

- A. General Requirements:
1. Raceway systems shall be neatly installed with all manufacturer's fittings and hardware and related electrical components necessary for a complete installation.
 2. Provide where indicated on Drawings at heights directed by Architect, only after painting or other wall finish materials are complete. Visible parts shall be the same matching color.
 3. Coordinate with all trades for proper location and construction. Locate as inconspicuously as possible.
 4. Install continuous from outlet to outlet, with tools recommended by the manufacturer.
 5. For remodeled areas, visible parts shall be finished the same matching color. Electrical Contractor shall paint raceway same as wall.
 6. Run parallel or at right angles to casework and architectural features, as close to corners formed by intersection of (2) surfaces as possible.
 - a. Vertical runs shall be close to corner formed by either (2) walls, (1) wall and a door frame, or (1) wall and a window frame.
 - b. Ceiling runs shall be close to corner formed by ceiling and wall.

7. In those buildings where raceways are indicated to cross wood arches or purlins, Contractor shall neatly notch top of arch or purlin to permit such raceway crossing. Do not cut structural members without prior approval of Architect and Structural Engineer.
8. Where unusual methods may have to be resorted to, provide installation procedure for approval by Architect.

END OF SECTION 26 05 33

SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL NOT USED

PART 2 - PRODUCTS

2.01 NAME, BOX, EQUIPMENT, IDENTIFICATION, AND SERVICE ENTRANCE PLATES

- A. Minimum 1/8" thick 5-ply lamacoid: White face with black lettering (white-black-white).
- B. Engrave characters with a minimum height of 1/4".
- C. Minimum plate size: 1" x 3-1/2". Provide larger plate if necessary to fit all lettering on it.
- D. Attach all plates and labels with self-tapping, chrome-headed screws (min. 2 per plate).

2.02 SERVICE IDENTIFICATION NAMEPLATES

- A. Provide signage per the current version of the NEC in force and the AHJ.
- B. Provide nameplates on each main service disconnecting means describing what areas are served by the disconnecting means and where the other disconnecting means are located.

2.03 ARC FLASH WARNING SIGNS

- A. Provide arc flash warning signs on all electrical equipment as required by the current version of the NEC in force and the AHJ. Provide arc flash analysis, calculations, and report (performed by a licensed professional electrical engineer) in order to determine all information required to be included on the warning signs.
- B. Minimum size: 3-1/2" x 5"

2.04 BOX IDENTIFICATION

- A. Stencil or paint both sides of covers for junction and pull boxes.

2.05 CONDUIT IDENTIFICATION

- A. Provide stenciling of conduits located in accessible areas.
- B. Provide black epoxy spray paint and 1" high stenciled lettering.

2.06 WARNING TAPE

- A. Provide 4" wide, detectable-type yellow warning tape with black lettering "WARNING - UNDERGROUND ELECTRICAL" above all underground conduits and ductbanks along the entire length.

2.07 SERVICE ENTRANCE

- A. Provide permanent UV resistant labels every three feet on exposed service entrance conduits. Labels must be suitable for the environment with yellow background and red letters "HIGH VOLTAGE", minimum 1" letters.

PART 3 - EXECUTION

3.01 EQUIPMENT IDENTIFICATION NAMEPLATES

- A. Provide identification plates on the following electrical equipment:
 - 1. Each panelboard, distribution panel, switchboard, each individual over-current or protective device, disconnects, pushbuttons, control stations/switches, relays, motor control centers and switchgear. Provide the following information on each nameplate: panel name, where it is fed from, voltage, wire configuration, feeder conduit size, phase wire size, neutral size, and ground wire. Example:

<p style="text-align: center;">TLP-1-1 FED FROM TLP-1 208/120V, 3P4W 2"C – 3#2/0, #350 NEUT #4 GND, THWN</p>

2. Each overcurrent device in distribution panels, switchboards, motor control centers, and switchgear.
 3. Transformers
 4. Disconnect switches (engrave per the equipment served)
 5. Motor starter switches, motor starters, remote motor control stations (engrave per the equipment served)
 6. Equipment and controls, where remotely located from each other, shall have included in the identification the final room number and unit number of the associated equipment and/or control. Final room numbers will be furnished by the Owner.
- B. Install nameplate parallel to equipment lines.
- C. Install nameplates inside covers in finished areas.
- D. Install nameplates outside covers in unfinished areas.

3.02 BOX IDENTIFICATION

- A. Provide panel and circuit number(s) identification on the cover of all junction boxes and pull boxes located in accessible areas (i.e. above accessible ceilings). Paint both sides of covers for junction boxes and pull boxes for systems (high voltage, fire alarm, security, telephone/data, etc.). color as directed by Owner.
- B. Provide clear, hand-printed lettering using black permanent marker.
- C. Perform stenciling after the building has been painted so that overspray from building painting does not cover up stenciling. Re-label any boxes that have been painted over.

3.03 CONDUIT IDENTIFICATION

- A. Provide stenciling of conduits and pull boxes of the following:
1. Panelboards, distribution panel, switchboard, motor control center and switchgear feeder conduits and pull boxes.
 2. Service entrance conduits and pull boxes.
- B. Degrease and clean surfaces to receive adhesive for identification materials.
- C. Perform stenciling after the building has been painted so that overspray from building painting does not cover up stenciling. Re-label any conduits that have been painted over.
- D. Perform stenciling on 50' centers, maximum, along the entire length of conduits.

3.04 COVERPLATE IDENTIFICATION

- A. Provide engraving or laser-etching on the plate immediately above the wiring device, unless noted otherwise.

END OF SECTION 26 05 53

SECTION 26 24 00
SWITCHBOARDS AND PANELBOARDS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Panelboards and Switchboards as shown in Schedule in this Section or on Drawings.

1.02 SYSTEM DESCRIPTION

- A. Circuit Numbers: Circuit numbers on Drawings shall be used for reference only. Contractor shall provide panelboard circuit directories documenting actual connections in accordance with phasing of cabinet, load balance, and common neutral requirements.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's data, including specifications, installation instructions, and general recommendations for each type of panelboard required. Include data substantiating that units meet requirements. All panelboards shall be of the same manufacturer.
- B. Shop Drawings: Submit dimensioned drawings of panelboards and enclosures showing accurately scaled layouts of enclosures and required individual panelboard devices, including but not necessarily limited to, circuit breakers, fusible switches, fuses, ground-fault circuit interrupters, and accessories. Shop Drawings shall be submitted to Engineer for approval before starting actual fabrication.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements: Construct panelboards to Underwriters' Laboratories standards applicable to panelboards, accessories, and enclosures, and provide UL labels.
1. Meet requirements of NEC as applicable to installation of panelboards, cabinets, and cutout boxes.
 2. Meet requirements of NEC articles pertaining to installation of wiring and equipment in hazardous locations.
 3. Meet requirements of NEMA Standards Publication No. 250, "Enclosures for Electrical Equipment (1000 Volts maximum)", Publication No. 1 "Panelboards", and installation portion of Publication No. PB1.1, "Instructions for Safe Installation, Operation and Maintenance of Panelboards rated 600 Volts or Less".

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements of the Contract Documents, acceptable manufacturers are as follows:
1. Siemens
 2. Square D

2.02 MATERIALS

- A. General:
1. Except as otherwise indicated, provide panelboards, enclosures, and ancillary components of types, sizes, and ratings indicated, which comply with manufacturer's standard materials, design, and construction in accordance with published information; equip with number of unit panelboard devices as required for complete installation.
 - a. Provide panelboard accessories and devices including, but not necessarily limited to, shunt trips, connectors, ground-fault protection units, and other components, for ratings and applications indicated.
 2. Existing panelboards and cabinets shall serve new and revised circuits. Add and modify circuit breakers in existing panels as noted on Drawings. New circuit breakers shall be of same type and manufacturer as those existing in panel in which they are to be installed.

- In all panels in which circuits are added or changed, complete new typewritten panel directories shall be provided which indicate room or area number as furnished by Owner.
3. Panelboards and all components, including circuit breakers, shall be fully rated for short circuit current noted on Schedule. Short circuit rating shall be shown on a nameplate attached to panel by manufacturer.
 4. Branch circuit panelboards shall be designed so that branch circuit connections to the main bus shall have sequence (full distributed) phasing. Bus shall be designed as noted in Schedule and branch circuits shall be balanced on bus by Electrical Contractor.

2.03 ENCLOSURES

- A. General Requirements: Provide dead front type enclosures of galvanized steel cabinet type enclosures, in sizes and NEMA types as indicated, code-gauge, minimum 16 gauge thickness for all panelboards. Construct unit with multiple knockouts and wiring gutters for connecting feeder at top or bottom of panel as shown on Drawings. Equip with copper or silver or tin plated aluminum bus bars and neutral bus when scheduled. Neutral bus shall be full size. Provide a bare un-insulated grounding bar when scheduled suitable for bolting to enclosure. Provide panelboards fabricated by same manufacturer as enclosures, and which mate properly with enclosures.
 1. Provide "door-in-door" construction with full piano hinges to allow access to inside on panel without removing the cover.
 2. For (2) section panelboards, each cabinet shall be identical in size, with a separate trim provided for each section. Cabinets for (2) section panels shall allow 8 inches at lug end.
 3. No cabinets shall be less than 19 inches wide or less than 4 1/2 inches deep.
- B. Lugs: Lugs shall be suitable for both 60 degree C and 75 degree C conductors. Provide solderless pressure type main lug connectors approved for copper conductors. Provide suitable lugs on neutral bus for outgoing circuits requiring neutral connection. Where feed through lugs are scheduled, provide lugs at top and bottom of panel.
- C. Buses: Buses shall be independently supported 98 percent conductivity copper or 55 percent conductivity aluminum. Panel bus capacity shall be equal to that of attached feeder. In 2-section panels, buses of both panels shall be full size.
- D. Gutters: Provide oversized gutters for feed through where required. Side gutters shall be not less than 4 inches, and end gutters not less than 5 inches. Panels rated 400A or more shall have 8-inch gutter at lug end. Where feed through lugs are used, provide 6 1/2-inch side gutters. Where double lugs are not permitted by local code, provide suitable pull box or gutter adjacent to panels for connections. Feeder wiring shall be capable of accepting a clamp-on ammeter.
- E. Circuit Breaker Panels:
 1. Circuit breakers shall be as follows:
 - a. Bolted line and load terminals.
 - b. Operated by a toggle type handle, and shall have a quick-make, quick-break over-center switching mechanism that is mechanically trip free from handle so that contacts cannot be held closed against short circuits and abnormal currents, with thermal magnetic, common trip on multi-pole breakers with a UL short circuit rating of 10,000 symmetrical RMS amperes. All terminals shall be suitable for both 60 degree C and 75 degree C conductors, and shall be box-lug or clamp-type design. Line side terminals shall be bolted to panel bus. Screw head terminals are not acceptable. Tripping due to overload or short circuit shall be clearly indicated by handle automatically assuming a position midway between manual "On" and "Off" positions. All latch surfaces shall be ground and polished. All poles shall be constructed so that they open, close, and trip simultaneously.
 - c. Circuit breakers shall be listed with Underwriters' Laboratories, conform to applicable requirements of NEMA Standard Publication No. AB 1-1975, and meet appropriate classifications of Federal Specification W-C-375a.

- d. Breakers must be completely enclosed in molded case. Non-interchangeable trip breakers shall have their covers sealed; interchangeable trip breakers shall have trip unit sealed to prevent tampering. Ampere ratings shall be clearly visible. Contacts shall be of high pressure butt type and shall be on non-welding silver alloy. Arc extinction must be accomplished by means of DE-ion arc chutes, consisting of metal grids mounted in an insulating support.
 - e. Circuit breaker ratings and modifications shall be as indicated on Drawings. Circuit breakers shall provide inverse time delay overload and instantaneous short circuit protection by means of a thermal magnetic element on each pole.
 - f. Circuit breakers shall be not less than 3/4 inch in width per pole. Tandem type circuit breakers are not acceptable. Provide toggle handle lock-offs for switched circuits, mechanical equipment, emergency circuits, and circuit supplying systems.
 - g. All breakers feeding heating, air conditioning, or refrigeration equipment shall have "HACR" labels.
 - h. All breakers feeding main fire alarm panel and fire alarm remote power supplies shall be equipped with "Lock-Offs" to lock breakers in "ON" position.
 - i. All breakers feeding high-intensity discharge lighting shall have special "HID" rating.
 - 2. Provide door lock flush with cover, locks common keyed, (2) keys for each panel.
 - 3. Provide a clear plastic covered typewritten directory of circuits mounted in a card holder attached to inside of door.
- F. Lighting Circuit Breaker Panels:
- 1. Lighting panels shall be circuit breaker type with integral remote power switching system.
 - 2. Remote power switching system shall be as follows:
 - a. Individual Control For Up To (42) Remotely Controllable Circuit Breakers
 - b. (8) Dry-Contact Inputs for Connection to Either 2-Wire Maintained or 3-Wire Momentary External Control Devices
 - c. Zone Creation and Control of Individual Breakers or Zones
 - d. Run/Halt/Hold/All-On Operation Modes
 - e. Individual and Zone Override
 - f. Breaker Status Monitoring
 - g. Security Access Code
 - h. Expansion Port to Connect Additional Inputs via Expansion Cabinet
 - i. RS232 Port to Connect to Personal Computer
 - j. Non-Volatile EEPROM Memory
 - k. Time Clock Programming Function
 - l. Internal Control System Power Supply Module
 - m. Building Automation System Interface: Open protocol interface with temperature control building automation system specified under Division 23.
 - 3. Provide suitable barrier to separate incoming Class 2 control circuit inputs from power and lighting circuits.
 - 4. Remote power switching system shall consist of a microprocessor based control module, interface module, control busses, remote control circuit breakers, power supply, and Class 2 barriers and open protocol interface module.
 - 5. Provide all wiring connections and programming required to connect new panel(s) to existing lighting control system.
- G. Distribution Panels:
- 1. Distribution panelboards shall be fusible switch type, and shall be convertible distribution type containing modular switch and fuse units. All connections shall be bolted.
 - 2. Quick-make, quick-break fusible switch (QMB or equal) type, equipped with de-ionizing grids and silver alloy butt type contacts readily visible with switch door open. Contacts shall have over-travel to compensate for normal wear and to ensure positive connection. Fuse holders shall be of high pressure type using a compression coil spring located out of heat zone. All switches shall be provided with an external operating handle which can be padlocked in "On" or "Off" position.

3. A cover interlock shall prevent opening door over fuse compartment unless switch is in "Off" position. Provision shall be made to allow voiding of cover interlock for inspection. Individual switch units shall be available in 2- and 3-pole assemblies with capacities of 30A through 1200A. Fuse holders shall be equipped with rejection devices for Type R fuses.
 4. Interiors of panels shall be factory assembled complete with circuits, devices, and other equipment and provisions as shown on Drawings, and shall be designed so that any individual breaker can be replaced without disturbing adjacent units or without removing main bus or branch connectors. Main buses and back pans shall be designed so that branch circuits may be changed without additional machining, drilling or tapping.
 5. Line terminals shall be suitable for both 60 degree C and 75 degree C conductors.
 6. Surface mounted without doors.
- H. Special Panel Requirements:
1. Provide the following:
 - a. Scheduled "Wireways" above or below panel shall consist of conduit enclosures of same size and finish as panelboards with hinged front covers.
 - b. Scheduled "Double Tubs" shall have separate individualized fronts for each tub. Panel trim boxes and trims shall be of same dimensions.
 - c. Scheduled "Lock-Offs" for designated breaker handles.
 - d. Where emergency stop is specified in a circuit breaker panelboard, a main circuit breaker shall be furnished. Main circuit breaker shall have 22,000 amperes minimum short circuit rating with a shunt trip coil.
 - 1) Electrical Contractor shall provide a pushbutton "panic switch", mounted on exterior of panelboard front trim, connected to open main circuit breaker. (Pushbutton shall be momentary contact type with large red mushroom button and separate red pilot light all mounted in steel plate engraved "Emergency Stop".)
 - e. Where emergency stop is specified in a fusible panelboard, a line-side contactor for remote control of panel bus bars shall be furnished built into panel. (Where panel is surface mounted, contactor may be mounted in a separate NEMA 1 enclosure above panel, if Contractor desires.)
 - 1) Contactors shall be ASCO No. 920 or equal of Square D, mechanically held type for 3-wire remote control. Each contactor shall have arcing contacts to protect main contacts and shall be rated for both motor and mixed loads. Contacts shall be rated for 600 volts and coils shall be 120 volts. Each contactor shall have number of poles and ampere rating to match or exceed panelboard bus bars in Panelboard Schedule.
 - 2) Electrical Contractor shall provide a pushbutton "panic switch" mounted on exterior of panelboard front trim, connected to open line-side contactor. (Pushbutton shall be momentary contact type with large red mushroom button and separate red pilot light all mounted in a steel plate engraved "Emergency Stop".)
 - f. Where circuit breakers are specified for remote control switching, Contractor shall provide necessary low voltage DC control voltage power supply, sized to operate all such breakers connected to same control switch at the same time.

2.04 ARC FLASH LABELS

- A. General Requirements: Switchboards, panelboards, industrial control panels, and motor control centers shall be field marked to warn qualified persons of danger of electric arc flash.
1. Provide personal protective equipment (PPE) warning labels that conform to NEC and OSHA standards at each switchboard and panelboard.
 - a. Contact electrical utility to request available MVA at main service.
 - b. Utilize installed manufacturer's overcurrent protective device types, and feeder lengths and sizes to equipment locations, to complete generation of PPE labels.

2.05 SPARE CONDUITS

- A. General Requirements: Provide (4) 3/4-inch empty conduits from each flush mounted panelboard to accessible ceiling space or area above panelboard for future panel connections. Empty conduits shall be capped.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General Requirements:
 - 1. Install panelboards and enclosures where indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in compliance with recognized industry practices to ensure that products fulfill requirements.
 - 2. Coordinate installation of panelboards with cable and raceway installation work.
 - 3. Anchor enclosures firmly to walls and structural surfaces, ensuring that they are permanently and mechanically secure.
 - 4. Provide type written panel directory indicating room or area numbers as furnished by Owner upon completion of installation.
 - 5. Feeder and branch circuit conduits shall meet cabinet squarely and shall be arranged insofar as possible to facilitate training of conductors to their respective terminals.
 - 6. Top of panelboard tubs shall be 6'-6" above finished floor.
 - 7. From each flush mounted panelboard, install (4) 3/4-inch empty conduits in addition to those required for circuits shown on Drawings. These conduits shall terminate in accessible ceiling space for future use. Cap ends and tag both ends with permanent tags as specified in Section 26 05 00.
 - 8. Panelboards or terminal cabinets, where located adjacent to one another, shall be all of same size and tops and bottoms shall be aligned.

3.02 IDENTIFICATION

- A. Panel Identification: Provide black micarta plates with 1/2-inch high white cut letters stating panelboard number and voltage. Labels shall be attached with screws.
 - 1. Where panelboards are in public areas, identification plates shall be inside door.
 - 2. Where panelboards are in mechanical spaces or in storage rooms, identification plates shall be on front exterior of panel.
- B. Circuit Identification:
 - 1. Circuit Breaker Panels: Panels shall have typed circuit directories. Do not use Drawing Room Numbers.
 - a. Room numbers or names used for circuit identification shall correspond to name plates installed on room doors by General Contractor or as selected by Owner.
 - 2. Fused Panels with Doors: Panels shall have typed directories of all circuits.
 - 3. Switchboards and Fused Panels Without Doors: Panels shall have micarta plates with 3/8-inch high white cut letters identifying each circuit or component fastened with screws.

END OF SECTION 26 24 00

SECTION 26 28 16
ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Enclosed switches and circuit breakers for isolation and overcurrent protection where shown on Drawings or herein specified.
 - 1. Provide safety switches, circuit interrupters, overcurrent protective devices, and enclosures as required by NEC.
 - 2. Refer to Motor Schedule.
 - 3. Electrical Contractor shall verify motor horsepower sizes on-site before installing switches, breakers, and overcurrent protection.
 - 4. Provide elevator disconnect/control switch module(s) as shown on Drawings.

1.02 SUBMITTALS

- A. Shop Drawings: Shop Drawings shall be submitted to Engineer for approval before starting actual fabrication.

1.03 QUALITY ASSURANCE

- A. Regulatory Requirement: Construct disconnects and disconnect modules to UL Standards and provide UL labels.

PART 2 - PRODUCTS

2.01 ENCLOSED SWITCHES AND CIRCUIT BREAKERS

- A. Acceptable Manufacturers: Subject to compliance with requirements of the Contract Documents, acceptable manufacturers are as follows:
 - 1. Siemens
 - 2. Square D
- B. Materials:
 - 1. Type:
 - a. Safety switches shall be fused, unless otherwise noted on Drawings.
 - b. Unless otherwise specified, overcurrent devices shall be as follows:
 - 1) NEMA HD (heavy duty) type.
 - 2) Horsepower rated, and of ampere sizes as required by the NEC.
 - 3) Safety switch enclosures shall be NEMA 1, except as follows:
 - (a) Wet or Weatherproof Locations: NEMA 3R Enclosure
 - (b) Corrosive Locations: Stainless Steel NEMA 3R Enclosures
 - (c) Hazardous Locations: NEMA 9 as defined in the NEC.
 - c. Overcurrent devices shall conform to the following:
 - 1) Fusible safety switches shall be complete with provisions for Class R fuses.
 - 2) Circuit breaker protection and coordination shall conform to the requirements of equipment schedules and manufacturer's Shop Drawings.
 - d. Enclosures shall have padlocking provisions and defeater screw mechanisms.
 - e. Provide interlock contacts where so specified.
 - f. Ratings shall be as follows:
 - 1) 250 volts where used on 120/208 or 120/240 volt systems.
 - 2) 600 volts where used on 277/480 volt systems.
 - g. Switches and circuit breakers rated 30 through 100 amperes shall have lugs listed for 60-degree C or 75-degree C conductors. Ratings over 100 amperes shall have lugs listed for 75 degrees C.

PART 3- EXECUTION

3.01 INSTALLATION

- A. Supports:

1. Unless otherwise noted on Drawings, disconnects shall be solidly supported to suit field conditions.
- B. Elevator Control Modules:
1. General Requirements: Module shall be installed in accordance with manufacturer's printed instructions to maintain warranty. All local and national codes shall be observed.
 2. Selective Coordination: Provide selective coordination as required by the NEC.
 3. Tests: Upon completion of installation, system shall undergo complete testing to verify correct operation.

END OF SECTION 26 28 16