BOARD OF CONTRACT AND SUPPLY
CITY OF PROVIDENCE, RHODE ISLAND

REQUEST FOR PROPOSALS

Item Description: DAVEY LOPES RECREATION CENTER GENERATOR AND MAIN SWITCHGEAR

Procurement/MinuteTraq #: 48364

Date to be opened: 3/10/2025

Issuing Department: Department of Public Property

QUESTIONS

- Please direct questions relative to the specifications outlined (beginning on page 13) to the issuing department's subject matter expert:
  - Name: Ben Lobaugh
  - Title: Senior Capital Improvements Project Manager
  - Email Address: blobaugh@providenceri.gov
- Please direct questions related to the bidding process, how to fill out forms, and how to submit a bid (Pages 1-6) to the Purchasing Department.
  - Email: purchasing@providenceri.gov
    - Please use the subject line "**Solicitation Question**"
- Please direct questions relative to the Minority and Women's Business Enterprise Program and the corresponding forms (Pages 14-15) to the MBE/WBE Outreach Director for the City of Providence, Grace Diaz
  - Email: gdiaz@providenceri.gov
    - Please use subject line "**MBE WBE Forms**"

Pre-bid Conference

There will be a **Mandatory** Pre-Bid Conference
Date: Tuesday, February 18, 2025 Time: 10:00am
Location: Davey Lopes Recreation Center, 227 Dudley Street, Providence, RI 02907

Deadline for questions submissions: Friday, February 28, 2025 at 12:00pm

BOARD OF CONTRACT AND SUPPLY
CITY OF PROVIDENCE, RHODE ISLAND

INSTRUCTIONS FOR SUBMISSION

Meeting Date: March 10, 2025
Bids may be submitted up to **2:15 P.M.** on the above meeting date at the **Department of the City Clerk. Room 311, City Hall. 25 Dorrance Street, Providence.** At 2:15 P.M. all bids will be publicly opened and read at the Board of Contract Meeting in Conference Room 305, on the 3rd floor of City Hall.

- Bidders must submit **2 copies** of their bid in sealed envelopes or packages labeled with the captioned **Item Description** and the **City Department to which the solicitation and bid are related and must include the company name and address on the envelope as well**. (On page 1).
- If required by the Department, please keep the original bid bond and check in only one of the envelopes.
- Communications to the Board of Contract and Supply that are not competitive sealed bids (i.e. product information/samples) should have "**NOT A BID**" written on the envelope or wrapper.
- Only use form versions and templates included in this solicitation. If you have an old version of a form do not recycle it for use in this bid.
- The bid envelope and information relative to the bid must be addressed to:

  Board of Contract and Supply
  Department of the City Clerk – City Hall, Room 311
  25 Dorrance Street
  Providence, RI 02903

****PLEASE NOTE: This bid may include details regarding information that you will need to provide (such as proof of licenses) to the issuing department before the formalization of an award.**

This information is NOT requested to be provided in your initial bid by design.

All bids submitted to the City Clerk become public record. Failure to follow instructions could result in information considered private being posted to the city's Open Meetings Portal and made available as a public record. The City has made a conscious effort to avoid the posting of sensitive information on the City's Open Meetings Portal, by requesting that such sensitive information be submitted to the issuing department only at their request.

BOARD OF CONTRACT AND SUPPLY
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BID PACKAGE CHECKLIST

Digital forms are available in the City of Providence Purchasing Department Office or online at **http://www.providenceri.gov/purchasing/how-to-submit-a-bid/**

The **Technical Proposal for Qualification** bid package **MUST** include the following, in this order:

- Bid Form 1: Bidder's Blank as the cover page/ 1st page (*see page **6** of this document*)
- Bid Form 2: Certification of Bidder as 2nd page (*see page 7 of this document*)
- Bid Form 3: Certificate Regarding Public Records (*see page **8** of this document)*
- Bid Form 4: Affidavit of City Vendor (*see pages **9 and 10** of this document*)
- Forms from the Minority and Women Business Enterprise Program: Based on Bidder Category. *See forms and instructions enclosed (page **12-14** of this document)*

***Please note: MBE/WBE forms must be completed for EVERY bid submitted and must be inclusive of ALL required signatures. Forms without all required signatures will be considered incomplete.**

- Bidder's Proposal/Packet: Formal response to the specifications outlined in this RFP, including pricing information and details related to the good(s) or service(s) being provided. Please be mindful of formatting responses as requested to ensure clarity.
- Financial Assurance, *if requested* (as *indicated on page 5 of this document under "Bid Terms")*

All of the above listed documents are REQUIRED. (With the exception of financial assurances, which are only required if specified on page 5.)

******Failure to meet specified deadlines, follow specific submission instructions, or enclose all required documents with all applicable signatures will result in disqualification, or in an inability to appropriately evaluate bids.***

BOARD OF CONTRACT AND SUPPLY
CITY OF PROVIDENCE, RHODE ISLAND

NOTICE TO VENDORS

1. The Board of Contract and Supply will make the award to the lowest qualified and responsible bidder.
2. In determining the lowest responsible bidder, cash discounts based on preferable payment terms will not be considered.
3. Where prices are the same, the Board of Contract and Supply reserves the right to award to one bidder, or to split the award.
4. No proposal will be accepted if the bid is made in collusion with any other bidder.
5. Bids may be submitted on an "equal in quality" basis. The City reserves the right to decide equality. Bidders must indicate brand or the make being offered and submit detailed specifications if other than brand requested.
6. A bidder who is an out-of-state corporation shall qualify or register to transact business in this State, in accordance with the Rhode Island Business Corporation Act, RIGL Sec. 7-1.2-1401, et seq.
7. The Board of Contract and Supply reserves the right to reject any and all bids.
8. If the City Department that is seeking the within described bids deems that it is in the City's best interest, the City reserves the right to waive any requirement of this RFP.
9. Competing bids may be viewed in person at the Department of the City Clerk, City Hall, Providence, immediately upon the conclusion of the formal Board of Contract and Supply meeting during which the bids were unsealed/opened. Bids may also be accessed electronically on the internet via the City's Open Meetings Portal.
10. As the City of Providence is exempt from the payment of Federal Excise Taxes and Rhode Island Sales Tax, prices quoted are not to include these taxes.
11. In case of error in the extension of prices quoted, the unit price will govern.
12. The contractor will **NOT** be permitted to: a) assign or underlet the contract, or b) assign either legally or equitably any monies or any claim thereto without the previous written consent of the City Purchasing Director.
13. Delivery dates must be shown in the bid. If no delivery date is specified, it will be assumed that an immediate delivery from stock will be made.
14. A certificate of insurance will normally be required of a successful vendor.
15. For many contracts involving construction, alteration and/or repair work, State law provisions concerning payment of prevailing wage rates apply (RIGL Sec. 37-13-1 et seq.)
16. No goods should be delivered, or work started without a Purchase Order.
17. **Submit 2 copies of the bid to the City Clerk, unless the specification section of this document indicates otherwise.**
18. Bidder must certify that it does not unlawfully discriminate on the basis of race, color, national origin, gender, gender identity or expression, sexual orientation and/or religion in its business and hiring practices and that all of its employees are lawfully employed under all applicable federal, state and local laws, rules and regulations. (See Bid Form 2.)

BOARD OF CONTRACT AND SUPPLY
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BID TERMS

1. Financial assurances may be required in order to be a successful bidder for Commodity or Construction and Service contracts. If either of the first two checkboxes below is checked, the specified assurance **must accompany** a bid, or the bid will not be considered by the Board of Contract and Supply. The third checkbox indicates the lowest responsible bidder will be contacted and required to post a bond to be awarded the contract.

   a) ☐ A certified check for **$**_____ must be deposited with the City Clerk as a guarantee that the Contract will be signed and delivered by the bidder.

   b) ☒ A bid bond in the amount of **5** per centum (%) of the proposed total price, must be deposited with the City Clerk as a guarantee that the contract will be signed and delivered by the bidder; and the amount of such bid bond shall be retained for the use of the City as liquidated damages in case of default. Any person signing a bid bond as an attorney-in-fact shall include with the bid bond an original, or a photocopy or facsimile of an original, power of attorney.

   c) ☒ A performance and payment bond with a satisfactory surety company will be posted by the bidder in a sum equal to one hundred per centum (100%) of the awarded contract.

   d) ☐ No financial assurance is necessary for this item.

2. Awards will be made within **nighty (90) days of bid opening**. All bid prices will be considered firm, unless qualified otherwise. Requests for price increases will not be honored.
3. Failure to deliver within the time quoted or failure to meet specifications may result in default in accordance with the general specifications. It is agreed that deliveries and/or completion are subject to strikes, lockouts, accidents, and Acts of God.

The following entry applies only for COMMODITY BID TERMS:

4. Payment for partial delivery will not be allowed except when provided for in blanket or term contracts.

The following entries apply only for CONSTRUCTION AND SERVICE BID TERMS:

5. Only one shipping charge will be applied in the event of partial deliveries for blanket or term contracts.
6. Prior to commencing performance under the contract, the successful bidder shall attest to compliance with the provisions of the Rhode Island Worker's Compensation Act, RIGL 28-29-1, et seq. If exempt from compliance, the successful bidder shall submit a sworn Affidavit by a corporate officer to that effect, which shall accompany the signed contract.
7. Prior to commencing performance under the contract, the successful bidder shall, submit a certificate of insurance, in a form and in an amount satisfactory to the City.

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BID FORM 1: Bidders Blank

1. Bids must meet the attached specifications. Any exceptions or modifications must be noted and fully explained.
2. Bidder's responses must be in ink or typewritten, and all blanks on the bid form should be completed.
3. The price or prices proposed should be stated both in **WRITING** and in **FIGURES**, and any proposal not so stated may be rejected. **Contracts exceeding twelve months must specify annual costs for each year.**
4. Bids **SHOULD BE TOTALED** so that the final cost is clearly stated (unless submitting a unit price bid), however **each item should be priced individually**. Do not group items. Awards may be made on the basis of ***total*** bid or by ***individual items***.
5. All bids **MUST BE SIGNED IN INK.**

Name of Bidder (Firm or Individual): _____

Contact Name: _____

Business Address: _____

Business Phone #: _____

Contact Email Address: _____

Agrees to bid on (Write the "Item Description" here): _____

If the bidder's company is based in a state *other than Rhode Island*, list name and contact information for a local agent for service of process that ***is located within Rhode Island*** _____

Delivery Date (if applicable): _____

Name of Surety Company (if applicable): _____

Total Amount in Writing*: _____

Total Amount in Figures*: _____

If you are submitting a unit price bid, please insert "Unit Price Bid"

Use additional pages if necessary for additional bidding details.

_____
Signature of Representation

_____
Title

BOARD OF CONTRACT AND SUPPLY
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BID BREAKDOWN

Base Bid as defined and noted in the Request for Proposal:

A. GENERATOR AND ATS, LUMP SUM	$
B. MAIN SWITCHGEAR, LUMP SUM	$
C. TOTAL BASE BID	**$**

The above lump sum costs shall include all necessary labor and materials, inclusive of general conditions and all insurance, overhead and profit, etc. to deliver a complete project per the Construction Documents.

_____
Signature of Representation

_____
Title

BOARD OF CONTRACT AND SUPPLY
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BID FORM 2: Certification of Bidder
(Non-Discrimination/Hiring)

Upon behalf of_____ (Firm or Individual Bidding),

I,_____(Name of Person Making Certification),

being its_____(Title or "Self"), hereby certify that:

1. Bidder does not unlawfully discriminate on the basis of race, color, national origin, gender, sexual orientation and/or religion in its business and hiring practices.
2. All of Bidder's employees have been hired in compliance with all applicable federal, state and local laws, rules and regulations.

I affirm by signing below that I am duly authorized on behalf of Bidder, on this_____day of_____20____.

_____
Signature of Representation

_____
Printed Name

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BID FORM 3: Certificate Regarding Public Records

Upon behalf of_____ (Firm or Individual Bidding),

I,_____(Name of Person Making Certification),

being its_____(Title or "Self"), hereby certify an

understanding that:

1. All bids submitted in response to Requests for Proposals (RFP's) and Requests for Qualification (RFQ's), documents contained within, and the details outlined on those documents become public record upon receipt by the City Clerk's office and opening at the corresponding Board of Contract and Supply (BOCS) meeting.
2. The Purchasing Department and the issuing department for this RFP/RFQ have made a conscious effort to request that sensitive/personal information be submitted directly to the issuing department and only at request if verification of specific details is critical the evaluation of a vendor's bid.
3. The requested supplemental information may be crucial to evaluating bids. Failure to provide such details may result in disqualification, or an inability to appropriately evaluate bids.
4. If sensitive information that has not been requested is enclosed or if a bidder opts to enclose the defined supplemental information prior to the issuing department's request in the bidding packet submitted to the City Clerk, the City of Providence has no obligation to redact those details and bears no liability associated with the information becoming public record.
5. The City of Providence observes a public and transparent bidding process. Information required in the bidding packet may not be submitted directly to the issuing department at the discretion of the bidder in order to protect other information, such as pricing terms, from becoming public. Bidders who make such an attempt will be disqualified.

I affirm by signing below that I am duly authorized on behalf of Bidder, on

this_____day of_____20____.

_____

Signature of Representation

_____

Printed Name

BOARD OF CONTRACT AND SUPPLY
CITY OF PROVIDENCE, RHODE ISLAND

BID FORM 4: Affidavit of City Vendor

Per our Code of Ordinances Sec. 21.-28.1 (e), this form applies to a) the business, b) any political action committee whose name includes the name of the business, c) all persons holding ten (10) percent or greater equity interest or five thousand dollars ($5,000.00) or greater cash value interest in the business at any time during the reporting period, d) all executive officers of the business entity, e) any spouse or dependent child of any individual identified in a) though d) above.

Executive officers who are not residents of the state of Rhode Island are exempted from this requirement.

Per R.I.G.L. § 36-14-2, "Business" means a sole proprietorship, partnership, firm, corporation, holding company, joint stock company, receivership, trust, or any other entity recognized in law through which business for profit or not for profit is conducted.

Name of the person making this affidavit: _____

Position in the "Business" _____

Name of Entity _____

Address: _____

Phone number: _____

The number of persons or entities in your entity that are required to report under Sec. 21.-28.1 (e): _____

Read the following paragraph and answer one of the options:

Within the 12 month period preceding the date of this bid submission with the City of Providence, or with respect to the contracts that are not in writing within the 12 month period preceding the date of notification that the contract has reached the $100,000 threshold, have you made campaign contributions within a calendar year to (please list all persons or entities required under Sec. 21.-28.1 (e)).

a. Members of the Providence City Council? ☐ Yes ☐ No
   - If Yes, please complete the following:
     Recipient(s) of the Contribution:
     Contribution Date(s): Contribution Amount(s):

b. Candidates for election or reelection to the Providence City Council? ☐ Yes ☐ No
   - If Yes, please complete the following:
     Recipient(s) of the Contribution:
     Contribution Date(s): Contribution Amount(s):

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c. The Mayor of Providence? ☐ Yes ☐ No
- If Yes, please complete the following:
  Recipient(s) of the Contribution:
  Contribution Date(s): Contribution Amount(s):

d. Candidates for election or reelection to the office of Mayor of Providence? ☐ Yes ☐ No
- If Yes, please complete the following:
  Recipient(s) of the Contribution:
  Contribution Date(s): Contribution Amount(s):

_____
Signed under the pains and penalties of perjury.

_____
Position

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City MBE/WBE Participation Plan

Please complete separate forms for each MBE/WBE subcontractor/supplier to be utilized on the solicitation.

Bidder's Name:	
Bidder's Address:	
Point of Contact:	
Telephone:	
Email:	
Procurement #:	
Project Name:	
Which one of the following describes your business' status in terms of Minority and/or Woman Owned Business Enterprise certification with the State of Rhode Island? (Check all that apply).	☐MBE ☐WBE ☐Neither MBE nor WBE

This form is intended to capture commitments between the prime contractor/vendor and MBE/WBE subcontractors and suppliers, including a description of the work to be performed and the percentage of the work as submitted to the prime contractor/vendor. Please note that all MBE/WBE subcontractors/suppliers must be certified by the Office of Diversity, Equity and Opportunity at the time of bid. The MBE/WBE Directory can be found here. Please visit, the City's MBE/WBE page for details of the program (e.g. instructions and requirements).

- **Nonprofit organizations are not required to complete the rest of this form.**
- **Construction projects unable to identify subcontractors prior to bid submission (e.g. Design Build) are required to provide updates to the MBE/WBE Outreach Office**

Name of Subcontractor/Supplier:					
Type of RI Certification:	☐MBE ☐WBE ☐Neither				
Address:					
Point of Contact:					
Telephone:					
Email:					
Detailed Description of Work to Be Performed by Subcontractor or Materials to be Supplied by Supplier Per the Scope of Work provided in the RFP					
Total Contract Value ($):		Subcontract Value ($):		Participation Rate (%):	
Anticipated Date of Performance:					

I certify under penalty of perjury that the forgoing statements are true and correct.

Prime Contractor/Vendor Signature	**Title**	**Date**
Subcontractor/Supplier Signature	**Title**	**Date**

***If you did not meet the 20% MBE/WBE combined participation goal, submit a Waiver Request Form.**

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City MBE/WBE Waiver Request Form

Fill out this form only if you did not meet the City's 20% MBE/WBE participation goal.
State-certified MBE or WBE Prime Bidders are NOT REQUIRED to fill out this form.

Submit this form to the City of Providence MBE/WBE Outreach Director, Grace Diaz, at gdiaz@providenceri.gov, for review **prior to bid submission.** This waiver applies only to the current bid which you are submitting to the City of Providence and does not apply to other bids your company may submit in the future. **In case a waiver is needed, City Department Directors should not** recommend a bidder for an award if this form is not included, absent or is not signed by the city of Providence MBE/WBE director**.**

Prime Bidder: _____ Contact Email and Phone_____
Company Name, Address: _____ Trade _____
Project /Item Description (as seen on RFP):
_____
_____

To receive a waiver, you must list the certified MBE and/or WBE companies you contacted, the name of the primary individual with whom you interacted, and the reason the MBE/WBE company could not participate on this project.

MBE/WBE Company Name	Individual's Name	Company Name	Why did you choose not to work with this company?

I acknowledge the City of Providence's goal of a combined MBE/WBE participation is 20% of the total bid value. I am requesting a waiver of _____ % MBE/WBE (20% minus the value of **Box F** on the Subcontractor Disclosure Form). If an opportunity is identified to subcontract any task associated with the fulfillment of this contract, a good faith effort will be made to select MBE/WBE certified businesses as partners.

_____	_____	_____
Signature of Prime Contractor / or Duly Authorized Representative	Printed Name	Date Signed
_____	_____	_____
Signature of City of Providence MBE/WBE Outreach Director / or Duly Authorized Representative	Printed Name of City of Providence MBE/WBE Outreach Director	Date Signed

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State MBE Utilization Plan

In addition to the City MBE forms, the Contractor must submit an MBE Utilization Plan to the RI Department of Administration (DOA) for State MBE/DBE compliance per grant funding requirements on the project. The form is available as Attachment C at the end of this RFP. A draft of the State Utilization Plan must be submitted with the response to this RFP. Once a Contractor is recommended for award, the form must be submitted to the State Department of Administration (DOA) MBE Compliance Office. A contract will only be issued once the MBE Utilization Plan has been approved by the MBE Compliance Office.

The awarded Contractor must comply with the following State laws:

RIGL 37-14.1: https://webserver.rilegislature.gov/Statutes/TITLE37/37-14.1/INDEX.htm

RIGL 37-2.2: https://webserver.rilegislature.gov/Statutes/TITLE37/37-2.2/INDEX.htm

RICR 220-RICR-80-10-2: https://rules.sos.ri.gov/regulations/Part/220-80-10-2

Per the above laws and regulations, this contract is required to award 15% of the total dollar value to MBE/WBE firms certified in the State of Rhode Island.

MBE Compliance Affidavit:

I acknowledge and understand the provisions of Chapter 14.1 and Chapter 2.2 of Title 37 of the Rhode Island General Laws, and the resulting obligation to meet the Aggregate Utilization Rate, and that those provisions apply to this Request for Proposals. I additionally understand the provisions and responsibilities of 220 RICR 80-10-2.8.E, and that they also apply to this Request for Proposals.

_____

Signature of Representation

_____

Printed Name

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BID PACKAGE SPECIFICATIONS

This project includes electrical infrastructure, plumbing, and sitework associated with a standby generator and new electrical and gas services for the Davey Lopes Recreation Center located at 227 Dudley Street, Providence, Rhode Island. See Construction Drawings and Specifications package under Attachment A.

PROVISIONS OF THIS PROJECT

- Upon the Issuance of the Award from the Board of Contract – the City shall issue a Contract to be executed by the City and the vendor incorporating the bid specifications. All Provisions of the Specifications are binding.
- Any Permits Required by the City of Providence and/or State of Rhode Island Shall be Obtained by the Vendor – Permit Fees by the City of Providence Shall be Waived – the State ADA/Levy Fee must be paid by each trade seeking a permit.
- This project qualifies for prevailing wages per the Davis Bacon Act (HUD). Certified payrolls will need to be submitted to the owner for all hours worked on site for this project. The Wage Decision for this project shall be as recorded on the Bid Date and is available at https://sam.gov/content/wage-determinations. Weekly Certified payrolls must be Submitted with Pay Requests Including Monthly Utilization Form.
- Prime Contractor must have a Unique Entity ID (UEI) from sam.gov.
- Prime Contractor must be enrolled in a registered apprenticeship program.
- An Insurance Certificate Shall be Submitted to the City Within 10 Days of Award
- A Copy of the Vendors Contractor's License Must be Submitted within 10 Days of Award
- All On-Site Personnel Shall be Licensed (If Required) and Shall have Proof of All Licenses Required by the State of Rhode Island to Perform the Work Required
- All Subcontractors Shall be Listed on the Bid Form – All Insurance & Payroll Requirements Apply
    - General Contractor Shall be the Insurance Certificate Holder and the City Shall be Named as 'Additionally Insured' with Respect to Liability Insurance
- A Submittal Log Must be Submitted within 10 Days of Award

CLOSE OUT DOCUMENTS

- Prior to Final Payment the Vendor Shall Provide the Following:
    - Copies of Permits Signed off and Approved (If Any)
    - Operating Manuals and Warranties Shall Be Transferred and/or Delivered
    - Full and Completed As-Built Drawings Shall be Submitted for Approval
    - Training Shall be Provided to City Personnel (If Required)
    - Certification by Manufacturers Representative (If Required)

QUALIFICATIONS

Qualifications will be evaluated on the basis of similar project experience for:

a. Completion of similar projects within the last 5 years.
b. Size and dollar value of similar completed projects.
c. Contractor's performance with similar projects. (references will be checked)
d. Relevant experience of individuals assigned to the project.

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SUPPLEMENTAL INFORMATION

If the issuing department for this RFP determines that your firm's bid is best suited to accommodate their need, you will be asked to provide proof of the following prior to formalizing an award.

An inability to provide the outlined items at the request of the department may lead to the disqualification of your bid.

This information is <u>NOT</u> requested to be provided in your initial bid that you will submit to the City Clerk's office by the "date to be opened" noted on page 1. This list only serves as a list of items that your firm should be ready to provide on request.

<u>All bids submitted to the City Clerk become public record</u>. Failure to follow instructions could result in information considered private being posted to the city's Open Meetings Portal and made available as a public record.

You must be able to provide:

- Business Tax ID will be requested after an award is approved by the Board of Contract and Supply.
- Proof of Insurance.
- Certificate of Good Standing with the Rhode Island Secretary of State.

The following attachments are included as part of this RFP:

- Attachment A – Construction Documents
- Attachment B – Apprentice and First Source Requirements
- Attachment C – Minority Business Enterprise (MBE) Utilization Plan

BOARD OF CONTRACT AND SUPPLY
CITY OF PROVIDENCE, RHODE ISLAND

CITY OF PROVIDENCE STANDARD TERMS & CONDITIONS

1. The terms "you" and "your" contained herein refer to the person or entity that is a party to the agreement with the City of Providence ("the City") and to such person's or entity's employees, officers, and agents.
2. The Request For Proposals ("RFP") and these Standard Terms and Conditions together constitute the entire agreement of the parties ("the Agreement") with regard to any and all matters. By your submission of a bid proposal or response to the City's RFP, you accept these Standard Terms & Conditions and agree that they supersede any conflicting provisions provided by bid or in any terms and conditions contained or linked within a bid and/or response. Changes in the terms and conditions of the Agreement, or the scope of work thereunder, may only be made by a writing signed by the parties.
3. You are an independent contractor and in no way does this Agreement render you an employee or agent of the City or entitle you to fringe benefits, workers' compensation, pension obligations, retirement or any other employment benefits. The City shall not deduct federal or state income taxes, social security or Medicare withholdings, or any other taxes required to be deducted by an employer, and this is your responsibility to yourself and your employees and agents.
4. You shall not assign your rights and obligations under this Agreement without the prior written consent of the City. Any assignment without prior written consent of the City shall be voidable at the election of the City. The City retains the right to refuse any and all assignments in the City's sole and absolute discretion.
5. Invoices submitted to the City shall be payable sixty (60) days from the time of receipt by the City. Invoices shall include support documentation necessary to evidence completion of the work being invoiced. The City may request any other reasonable documentation in support of an invoice. The time for payment shall not commence, and invoices shall not be processed for payment, until you provide reasonably sufficient support documentation. In no circumstances shall the City be obligated to pay or shall you be entitled to receive interest on any overdue invoice or payment. In no circumstances shall the City be obligated to pay any costs associated with your collection of an outstanding invoice.
6. For contracts involving construction, alteration, and/or repair work, the provisions of applicable state labor law concerning payment of prevailing wage rates (R.I. Gen. Laws §§ 37-13-1 et seq., as amended) and the City's First Source Ordinance (Providence Code of Ordinances §§ 21-91 et seq., as amended) apply.
7. With regard to any issues, claims, or controversies that may arise under this Agreement, the City shall not be required to submit to dispute resolution or mandatory/binding arbitration. Nothing prevents the parties from mutually agreeing to settle any disputes using mediation or non-binding arbitration.
8. To the fullest extent permitted by law, you shall indemnify, defend, and hold harmless the City, its employees, officers, agents, and assigns from and against any and all claims, damages, losses, allegations, demands, actions, causes of action, suits, obligations, fines, penalties, judgments, liabilities, costs and expenses, including but not limited to attorneys' fees, of any nature whatsoever arising out of, in connection with, or resulting from the performance of the work provided in the Agreement.
9. You shall maintain throughout the term of this Agreement the insurance coverage that is required by the RFP or, if none is required in the RFP, insurance coverage that is considered in your industry to be commercially reasonable, and you agree to name the City as an additional insured on your general liability policy and on any umbrella policy you carry.
10. The City shall not subject itself to any contractual limitations on liability. The City shall have the time permitted within the applicable statute of limitations, and no less, to bring or assert any and all causes of action, suits, claims or demands the City may have arising out of, in connection with, or resulting from the performance of the work provided in the Agreement, and in no event does the City agree to limit your liability to the price of the Agreement or any other monetary limit.
11. The City may terminate this Agreement upon five (5) days' written notice to you if you fail to observe any of the terms and conditions of this Agreement, or if the City believes your ability to perform the terms and conditions of this Agreement has been materially impaired in any way, including but in no

way limited to loss of insurance coverage, lapsing of a surety bond, if required, declaration of bankruptcy, or appointment of a receiver. In the event of termination by the City, you shall be entitled to just and equitable compensation for any satisfactory work completed and expenses incurred up to the date of termination.

12. Written notice hereunder shall be deemed to have been duly served if delivered in person to the individual or member of the firm or entity or to an officer of the entity for whom it was intended, or if delivered at or sent by registered or certified mail to the last business address known by the party providing notice.
13. In no event shall the Agreement automatically renew or be extended without a writing signed by the parties.
14. You agree that products produced or resulting from the performance of the Agreement are the sole property of the City and may not be used by you without the express written permission of the City.
15. For any Agreement involving the sharing or exchange of data involving potentially confidential and/or personal information, you shall comply with any and all state and/or federal laws or regulations applicable to confidential and/or personal information you receive from the City, including but not limited to the Rhode Island Identity Theft Protection Act, R.I. Gen. Laws § 11-49.3-1, during the term of the Agreement. You shall implement and maintain appropriate physical, technical, and administrative security measures for the protection of, and to prevent access to, use, or disclosure of, confidential and/or personal information. In the event of a breach of such information, you shall notify the City of such breach immediately, but in no event later than twenty-four (24) hours after discovery of such breach.
16. The Agreement is governed by the laws of the State of Rhode Island. You expressly submit yourself to and agree that any and all actions arising out of, in connection with, or resulting from the performance of the Agreement or relationship between the parties shall occur solely in the venue and jurisdiction of the State of Rhode Island or the federal court located in Rhode Island.
17. The failure of the City to require performance of any provision shall not affect the City's right to require performance at any time thereafter, nor shall a waiver of any breach or default of this Agreement constitute a waiver of any subsequent breach or default or a waiver of the provision itself.
18. If any term or provision of this Agreement, or the application thereof to any person or circumstance shall, in any extent, be invalid or unenforceable, the remainder of this Agreement shall not be affected thereby, and each term and provision shall be valid and enforceable to the fullest extent permitted by law.

Davey Lopes Recreation Center

Generator and Main Switchgear

Construction Documents January 17, 2025

SURVEY

SV-100	Davey Lopes Recreation Center Limited Content Boundary Survey

CIVIL

C101	Civil Site Plan

PLUMBING

P101	Plumbing Underground & First Floor Plan

ELECTRICAL

E000	ELECTRICAL Legend & Notes
E101	ELECTRICAL Basement & First Floor Plan
E200	ELECTRICAL One-Line Diagrams

PROJECT DESCRIPTION:
The project includes electrical infrastructure, plumbing and sitework associated with a standby generator and new electrical and gas services for the Davey Lopes Recreation Center located at 227 Dudley Street, Providence, Rhode Island.

ARCHITECT
bh+a
Bargmann Hendrie + Archetype, Inc.
9 Channel Center Street, Suite 300
Boston, MA 02210
(617) 350 0450

PROJECT NAME
Davey Lopes Recreation Center
GENERATOR AND MAIN SWITCHGEAR

227 Dudley Street
Providence, RI 02907

CLIENT
City of Providence

25 Dorrance Street
Providence, RI 02903

PROJECT TEAM

Civil Engineer
CDW
4 California Street Ste. 301
Framingham, MA 01701
508-875-2657

Land Surveyor
Narragansett Engineering, Inc.
3102 East Main Road
Portsmouth, RI 02871
401-683-6630

Structural Engineer
RSE Associates, Inc.
64 Pleasant Street
Watertown, MA 02472
617-926-9300

MEP/FP Engineer
Allied Consulting Engineering Services, Inc.
270 Littleton Road, Ste. 11
Westford, MA 01886
978-443-7888

REVISIONS

DATE

DRAWING TITLE
Cover Sheet

DRAWING INFORMATION

1/17/2025
DATE OF ISSUE
Construction Documents
DESCRIPTION
SCALE
Author
DRAWN BY
Project Number
PROJECT #
revit.rvt
FILE NAME

DRAWING NUMBER
A000

V.2.1

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1/17/2025 3:26:48 PM Author

SURVEY NOTES:
1. ZONING INFORMATION SHOW FROM RECORD INFORMATION, MAPS AND / OR GIS. ZONING DATA MAY VARY BASED ON USE, LOT SIZE, ORIENTATION AND OTHER FACTORS AND IS SHOWN FOR REFERENCE INFORMATION ONLY.
2. ZONING DATA MUST BE CONFIRMED WITH ZONING OFFICIAL AND / OR LEGAL COUNSEL FOR USE IN DESIGN OR PERMITTING.
3. COORDINATE SYSTEM IS RI3800 / NAVD 88.
4. PLAN ELEMENTS ARE IN U.S SURVEY FEET.
5. TOPOGRAPHY IS MIX OF ON GROUND SHOTS, RECORD DATA AND RI SPRING 2011 LIDAR.
6. ORTHOPHOTOGRAPHY SHOWN PER RIGIS STATEWIDE DIGITAL MULTISPECTRAL ORTHORECTIFIED AERIAL PHOTOGRAPHS. DATED FALL 2022
7. LOCATION SHOWN WITH * PER GIS SEE NOTE 6
8. ALL PROPOSED ITEMS MUST BE LAID OUT BY REGISTERED SURVEYOR AS NOTED.
9. PLAN IS NOT AS-BUILT UTILITY PLAN.
10. ABUTTING PROPERTY LINES & ABUTTING PLANEMETRIC FEAUTURES / LINEWORK SHOWN APPROXIMATELY PER TOWN GIS OR BEST AVAILABLE INFORMATION
11. FLOOD ZONE LINE IS SHOWN PER GRAPHIC PLOTTING ONLY, UNLESS OTHERWISE NOTED ON PLAN.
12. THIS SURVEY WAS PREPARED WITHOUT THE BENEFIT OF A TITLE REPORT OF PROBATE SEARCH, AND IS SUBJECT TO THE RESTRICTIONS, COVENANTS AND/OR EASEMENTS THAT MAY BE CONTAINED THEREIN.
13. LOCATION OF SUBSURFACE MAINS, SURFACE FEATURES, AND LATERALS ARE OMITTED. CONTRACTOR TO CALL DIG SAFE AND/OR APPLICABLE UTILITY COMPANIES PRIOR TO ANY CONSTRUCTION. DIG SAFE TEL. #:1-800-344-7233 (1-800-DIG-SAFE).
   A. WATER - SURFACE FEATURES PER FIELD SURVEY, SUBSURFACE FEATURES SHOWN APPROX. PER PROVIDENCE WATER FIELD CARD & PER DIGSAFE MARKINGS
   B. SEWER/STORM - SURFACE FEATURES PER FIELD SURVEY, SUBSURFACE FEATURES SHOWN APPROX. PER CITY OF PROVIDENCE ENGINEERS DEPARTMENT PLAN No. 175-18, 162-14,170-63,170-64.
   C. GAS -SURFACE FEATURES PER FIELD SURVEY, SUBSURFACE FEATURES SHOWN APPROX. PER NATIONAL GRID & PER DIGSAFE MARKINGS
   D. ELECTRIC - SURFACE FEATURES PER FIELD SURVEY, SUBSURFACE FEATURES SHOWN APPROX. PER NATIONAL GRID & PER DIG SAFE MARKINGS. UNDERGROUND ELECTRIC CONNECTIONS TO ON SITE LIGHT POLES ARE UNKNOWN.

ALL SUBSURFACE UTILITIES SHOWN APPROXIMATELY PER RECORD PLAN OR DIG SAFE MARKINGS. NO GPR OR INVERT SURVEY CONDUCTED.
ALL UTILITIES DEPICTED AT ASCE QUALITY LEVEL D

ZONING NOTES:
*NO PERMITTED MAXIMUM MUNICIPAL PERCENT LOT COVER

*NO MINIMUM LOT AREA REQUIRED

PER ZONING ORDINANCE ART. 10, 10002

CORNER LOTS AS SUCH WILL HAVE CORNER AND INTERIOR SETBACKS. CORNER SIDE SETBACKS OF 10' WILL BE ON THE SIDE FACING PRARIE AVENUE. INTERIOR SETBACKS OF 6' WILL BE ON THE SIDE FACING TANNER STREET. PER CALL WITH CITY OF PROVIDENCE ZONING OFFICER ON 11-07-24

ARTICLE 10. OPEN SPACE AND PUBLIC SPACE DISTRICTS

1002 DIMENSIONAL STANDARDS

Table 10-1: Open Space and Public Space District Dimensional Standards establish the dimensional standards for the open space districts. These regulations apply to all uses within each district unless a different standard is listed for a specific use. Because of the unique nature of a conservation area, there are no dimensional standards for the CD District.

TABLE 10-1: OPEN SPACE AND PUBLIC SPACE DISTRICT DIMENSIONAL STANDARDS

	OS	PS
Bulk Standards		
Minimum Lot Area	0	0
Minimum Lot Width	0	0
Maximum Building Height	50'	50'
Minimum Setback Requirements		
Front Setback	10'	10'
Interior Side Setback	6'	6'
Corner Side Setback	10'	10'
Rear Setback	25'	25'

DEED RESEARCH & PLAN REFERENCE

NO.	PLAT	LOT	BOOK	PAGE	OWNER OF RECORD	DEED	PLAN
1	23	373	12675	205	PROVIDENCE PUBLIC BLDG AUTHORITY & C/O MAL A SALVADORE, ESQ	X	
2	23	373	11803	122	PROVIDENCE PUBLIC BLDG AUTHORITY & C/O MAL A SALVADORE, ESQ	X	
					"ADMINISTRATIVE SUBDIVISION FOR COMMUNITY PREPARATORY SCHOOL AND SHELTER SERVICES INC., PROVIDENCE, RHODE ISLAND, DATED APRIL 28, 2006, SCALE 1" = 20 ' REVISED APRIL 11, 2008		
3	23		89	80			X
4	23		0	0	"THE CITY OF PROVIDENCE RHODE ISLAND PLAT NO. 023"		X
5	23		3880	214	"PLAT OF LAND CONDEMNED FOR THE PROVIDENCE REDEVELOPMENT AGENCY UPPER SOUTH PROVIDENCE REDEVELOPMENT AREA"		X
6	23		0	0	"ADMINISTRATIVE SUBDIVISION AP 23, LOT 893 COMMUNITY PREPARATORY SCHOOL 126 SOMERSET STREET, PROVIDENCE, RHODE ISLAND (0360" SCALE 1" = 20', DATED: 11-13-2015 BY DIPRETE ENGINEERING		X
7	23		0	0	"PROVIDENCE R.I., P.W. DEPT. ENGINEERING OFFICE, CITY PROPERTY SECTION, PLAN NO. 061658. DATE JANUARY 28, 1958," MAY 10, 1991		X

LEGEND

100.00'	DIMENSION - EXISTING	CATCH BASIN	STRUCTURE, EXISTING
100.00' (D)	DIMENSION - PROPOSED	DRAINAGE MANHOLE	STRUCTURE, PROPOSED
100.00' (S)	PLAN / DEED DIMENSION	ELECTRICAL MANHOLE	SPOT GRADE - EXISTING
	SURVEY DIMENSION	SANITARY MANHOLE	SPOT GRADE - PROPOSED
	PROPERTY LINE - ABUTTING	TELEPHONE MANHOLE	DRILL HOLE
	PROPERTY LINE - EXISTING	MONITORING WELL	GRANITE BOUND
	PROPERTY LINE - PROPOSED	GATE VALVE	REBAR / STEEL PIPE FOUND
	SETBACKS	WATER SHUT OFF	SPIKE
100.00	GRADE CONTOUR - EXISTING	FIRE HYDRANT	WETLAND FLAG LOCATION
100.00	GRADE CONTOUR - PROPOSED	ELECTRIC BOX (ETC)	BENCHMARK
OHE	ELECTRIC - OVERHEAD (OHE)	UTILITY POLE	BORING
ETC	ELECTRIC - TELEPHONE - CABLE (ETC)	TREE	TH No. 48" SHGWT 80" LEDGE
UGE	ELECTRIC - UNDERGROUND (UGE)	CURB INLET	SOIL EVALUATION
GAS	GAS (G)	DOWNSPOUT	FLOW ARROW
SAN	SANITARY SEWER (S)		DETAIL REFERENCE
SD	STORM DRAIN (SD)		
W	WATER		
LOD	LIMIT OF DISTURBANCE (LOD)		
SED	SEDIMENT CONTROL (SED)		
LOD / SED	LOD / SED		
	EDGE OF PAVEMENT - EXISTING		
	FENCE - METAL		
	FENCE - WOOD		
	STONE WALL		
	BRUSH LINE (APPROXIMATE)		
	WETLAND LIMIT		

NEI Narragansett Engineering Inc.
Civil • Survey Structural Environmental Design
3102 East Main Road, Portsmouth RI 02871
Tel. 401.683.6630 www.nei-cds.com

SHEET TITLE
DAVEY LOPES RECREATION CENTER
LIMITED CONTENT BOUNDARY SURVEY

STEVE SHETLER, ASSOCIATE PRINCIPAL
BH+A
BARGMANN HENDRIE + ARCHETYPE, INC.
9 CHANNEL CENTER STREET, SUITE 300, BOSTON, MA 02210
T.617 350 0450 MAIN
T.617 456 2279 DIRECT
C.781 475 9516
E.SSHETLER@BHPLUS.COM

DAVEY LOPES RECREATION CENTER [DLRC]
PROPERTY RECORD
227 DUDLEY STREET, PROVIDENCE, RI 02907
PLAT: 23, LOT: 373
ZONE: PS, AREA: 1.91 ACRES
N/F: PROVIDENCE PUBLIC BLDG AUTHORITY
YEAR BUILT: 1978
BOOK/PAGE: 12675-205

PROJECT NO.	DATE	BY
24.0161	11-04-24	AS

CERTIFICATION
THIS SURVEY HAS BEEN CONDUCTED AND THE PLAN HAS BEEN PREPARED PURSUANT TO 435-RICR00-00-1.9 OF THE RULES AND REGULATIONS ADOPTED BY THE RHODE ISLAND STATE BOARD OF REGISTRATION FOR PROFESSIONAL LAND SURVEYORS ON DECEMBER 31, 2020 (EFFECTIVE DATE), AS FOLLOWS:
LIMITED CONTENT BOUNDARY - CLASS I
CLASS III (PHYSICAL FEATURES)
TOPOGRAPHIC SURVEY (T-2)
THE PURPOSE FOR THE CONDUCT OF THE SURVEY AND FOR THE PREPARATION OF THE PLAN IS AS FOLLOWS: THE PREPARATION OF A EXISTING CONDITIONS & PROPERTY LINE SURVEY FOR USE IN FUTURE PLANNING.

NEAL HINGORANY REG. 2515
COA: A38

INTERNAL REVIEW

No	CHECK	CAD	DESCRIPTION/NOTES
1	LD	LD	FINAL DRAFT - REVIEW
	12-13-24	12-13-24	
2	AJP	AJP	FINAL PROPERTY LINES &
	12-10-24	12-10-24	MONUMENTS REFERENCED

FORMAL PLAN REVISIONS

No	DATE	STAGE/DESCRIPTION	BY

nei-cds.com

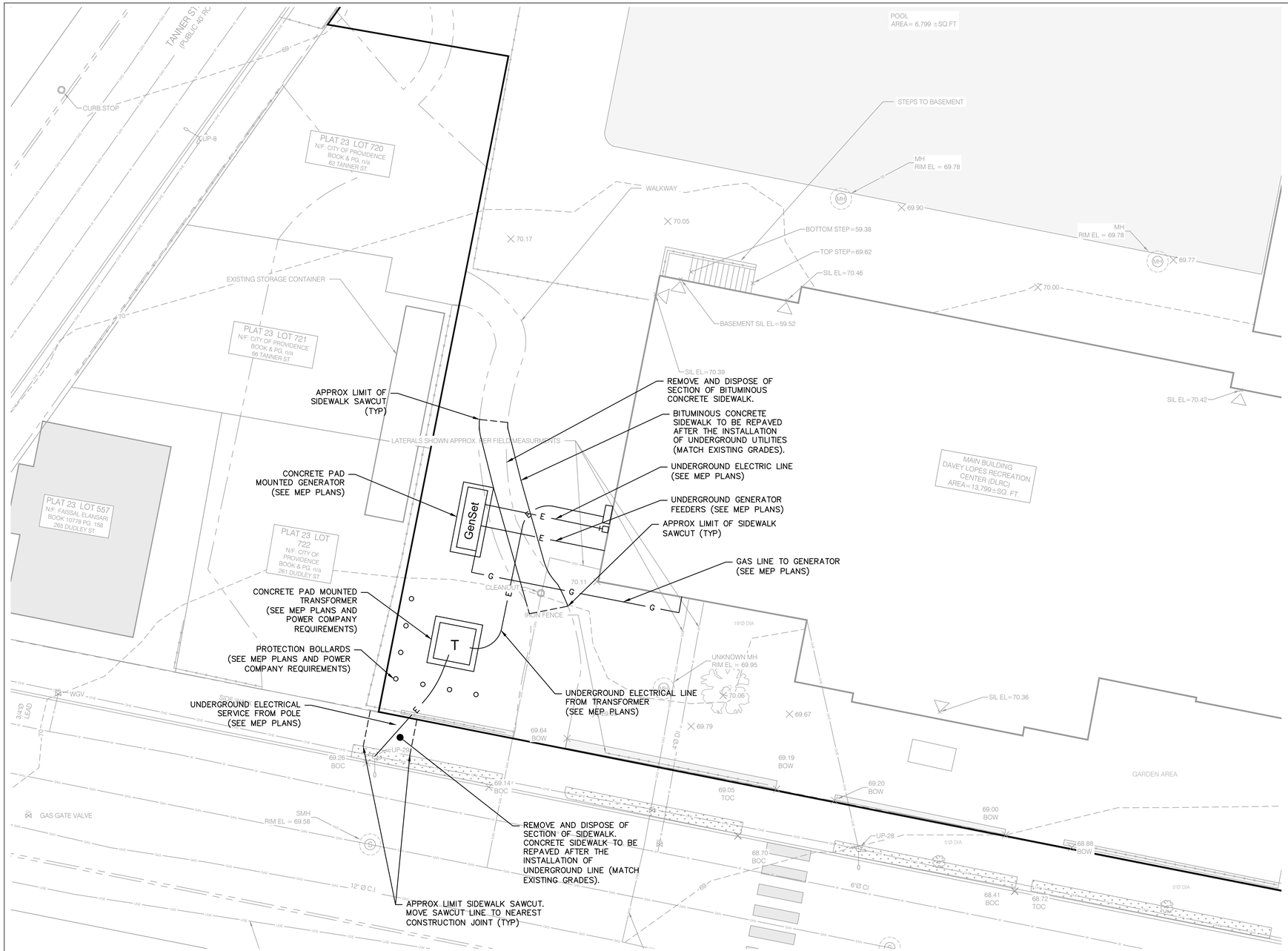
DRAWINGS MUST BE PRINTED IN COLOR TO BE VALID. THIS NOTE SHOULD BE BLUE. IF THIS NOTE IS NOT BLUE, PLEASE REPRINT IN COLOR OR CONTACT NEI.

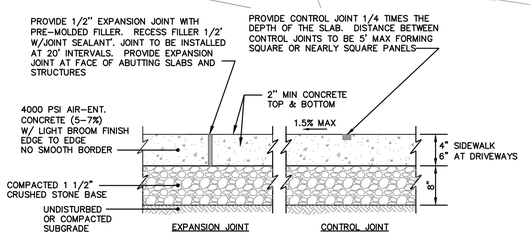
LOCUS MAP

SCALE
1" = 20'

SV-100

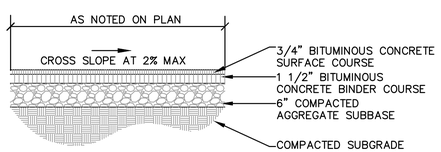
N:\PROJECTS\24.0161 - BH+A ARCH+DAVEY LOPES\SURVEY\24.0161_BH+A ARCH+DAVEY LOPES_SURVEY.DWG SV-100 NEI-Standard.ctb 12/13/2024 Liam Donovan





1. MAXIMUM CROSS SLOPE = 1.5%
2. MAXIMUM GRADIENT = 5%
3. PROVIDE EXPANSION JOINT AT FACE OF ABUTTING SLABS, STRUCTURES, AND CURBS
4. PROVIDE CURBING AS SHOWN ON PLANS
5. SIDEWALK SHALL BE IN ACCORDANCE WITH SECTION 905 OF THE RI STANDARD SPECIFICATIONS.
6. GRAVEL BORROW BASE SHALL COMPACT TO ACHIEVE SOIL DENSITY VALUES OF 95% MODIFIED PROCTOR DENSIT (AASHTO T180).

1 CONCRETE SIDEWALK
(NOT TO SCALE)



2 BITUMINOUS CONCRETE SIDEWALK
(NOT TO SCALE)

GRAPHIC SCALE

10 0 5 10 20 40

(IN FEET)
1 INCH = 10 FT.

N

EXISTING CONDITIONS/SURVEY NOTES:

1. EXISTING CONDITIONS, INCLUDING TOPOGRAHIC AND UTILITY INFORMATION, IS BASED ON A PLAN PREPARED BY NARRAGANSETT ENGINEERING, INC., ENTITLED "DAVEY LOPES RECREATION CENTER LIMITED CONTENT BOUNDARY SURVEY, DATED NOVEMBER 4, 2024, REVISED 12-23-24, AND MARKED "DRAFT FOR REVIEW ONLY". SEE SURVEY PLAN FOR EXISTING CONDITION AND OTHER RELATED SURVEY NOTES.

GENERAL CONSTRUCTION AND DEMOLITION NOTES:

1. PRIOR TO THE START OF CONSTRUCTION. NOTIFY "DIG-SAFE" AT 1-888-344-7233 AT LEAST 72 HOURS PRIOR TO ANY SITE DEMOLITION OR EXCAVATION. THE CONTRACTOR IS ADVISED THAT THE LOCATIONS OF ALL EXISTING UTILITIES ARE APPROXIMATE AND THAT ALL UTILITIES MAY NOT BE SHOWN. PRIOR TO THE START OF CONSTRUCTION THE CONTRACTOR SHALL FIELD VERIFY THE LOCATIONS OF ALL EXISTING UTILITIES. THE CONTRACTOR IS RESPONSIBLE FOR ALL DAMAGE TO EXISTING UTILITIES NOT SCHEDULED FOR DEMOLITION.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR WHEEL CLEANING OF ALL CONSTRICTION VEHICLES BEFORE EXISTING THE SITE. ANY TRACKED DIRT FROM CONTRACTOR OR SUBCONTRACTOR VEHICLES ONTO THE ACCESS ROAD OR PUBLIC RIGHTS OF WAY SHALL BE SWEPT UP AT THE CONTRACTORS EXPENSE.
3. REMOVAL OF ANY WORK OR ITEM SHALL INCLUDE OFFSITE LEGAL DISPOSAL OF SAME. ALL REMOVAL AND DISPOSAL WORK SHALL BE PERFORMED IN A SAFE AND LEGAL MANNER. THE CONTRACTOR'S DISPOSAL PRACTICE OF ANY EXCESS MATERIAL SHALL COMPLY WITH ALL FEDERAL, STATE, AND MUNICIPAL WASTE MANAGEMENT LAWS AND REGULATION.
4. ALL EXISTING STRUCTURES, INCLUDING BUT NOT LIMITED TO BUILDINGS, UTILITIES, WALKWAYS, RETAINING WALLS, PLANTING BEDS, TREES, FENCES, BENCHES, AND PLANTING GRATES NOT SUBJECTED TO THE SCOPE OF WORK SHALL BE PROTECTED DURING THE WORK.
5. THE CONTRACTOR SHALL RESTORE ALL LANDSCAPING AND HARDSCAPING AFFECTED BY THE DEMOLITION AND CONSTRUCTION ACTIVITIES IN KIND. THE CONTRACTOR SHALL PROVIDE LOAM AND SEED TO THE AREA AFFECTED BY THE INSTALLATION OF TRANSFORMER, GENERATOR, AND TRENCHING FOR ASSOCIATED UNDERGROUND CONDUIT THROUGH THE LAWN AREA. MATCH ALL EXISTING GRADES IN THE AFFECTED AREA.
6. ANY ITEM OR STRUCTURE DAMAGED BEYOND THE LIMITS OF WORK SHALL BE REPLACED IN KIND BY THE CONTRACTOR, AT HIS OWN EXPENSE.

UTILITY NOTES

1. ALL SITE WORK SHALL MEET OR EXCEED THE SITE WORK SPECIFICATIONS PREPARED FOR THIS PROJECT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THAT THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS DO NOT CONFLICT WITH ANY KNOWN EXISTING OR OTHER PROPOSED IMPROVEMENTS. IF ANY CONFLICTS ARE DISCOVERED, THE CONTRACTOR SHALL NOTIFY THE DESIGNER PRIOR TO ANY SITE WORK WHICH WOULD BE AFFECTED.
2. ALL SITE CONSTRUCTION SHALL BE IN CONFORMANCE WITH THE RHODE ISLAND DEPARTMENT OF TRANSPORTATION (DOT) STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, AND THE CITY OF PROVIDENCE PUBLIC WORKS.
3. EXCAVATION REQUIRED WITHIN THE PROXIMITY OF EXISTING UTILITY LINES SHALL BE DONE BY HAND. CONTRACTOR SHALL REPAIR ANY DAMAGE TO EXISTING UTILITY LINES OR STRUCTURES INCURRED DURING CONSTRUCTION OPERATIONS AT NO COST TO THE OWNER.
4. INSTALL ALL UTILITIES (INCLUDING CONCRETE PADS) PER UTILITY COMPANY AND DPW STANDARDS.
5. THE LOCATIONS OF THE TRANSFORMER, BOLLARDS, GENERATOR PAD, AND NEW UNDERGROUND UTILITIES, INCLUDING CONCRETE PAD SIZES ARE BASED ON A PLAN PROVIDED BY ALLIED CONSULTING ENGINEERING SERVICES, INC.

ARCHITECT

bh+a

Bargmann Hendrie + Archetype, Inc.
9 Channel Center Street, Suite 300
Boston, MA 02210
(617) 350 0450

PROJECT NAME

Davey Lopes Recreation Center

GENERATOR AND MAIN SWITCHGEAR

227 Dudley Street
Providence, RI 02907

CLIENT

City of Providence

25 Dorrance Street
Providence, RI 02903

PROJECT TEAM

Civil Engineer
CDW
4 California Street Ste. 301
Framingham, MA 01701
508-875-2657

Land Surveyor
Narragansett Engineering, Inc.
3102 East Main Road
Portsmouth, RI 02871
401-683-6630

Structural Engineer
RSE Associates, Inc.
64 Pleasant Street
Watertown, MA 02472
617-926-9300

MEP/FP Engineer
Allied Consulting Engineering Services, Inc.
270 Littleton Road, Ste. 11
Westford, MA 01886
978-443-7888

REVISIONS

DATE

DRAWING TITLE

Civil Site Plan

DRAWING INFORMATION

1/17/2025
DATE OF ISSUE

Construction Documents
DESCRIPTION

1" = 10'-0"
SCALE

PS
DRAWN BY

64076
PROJECT #

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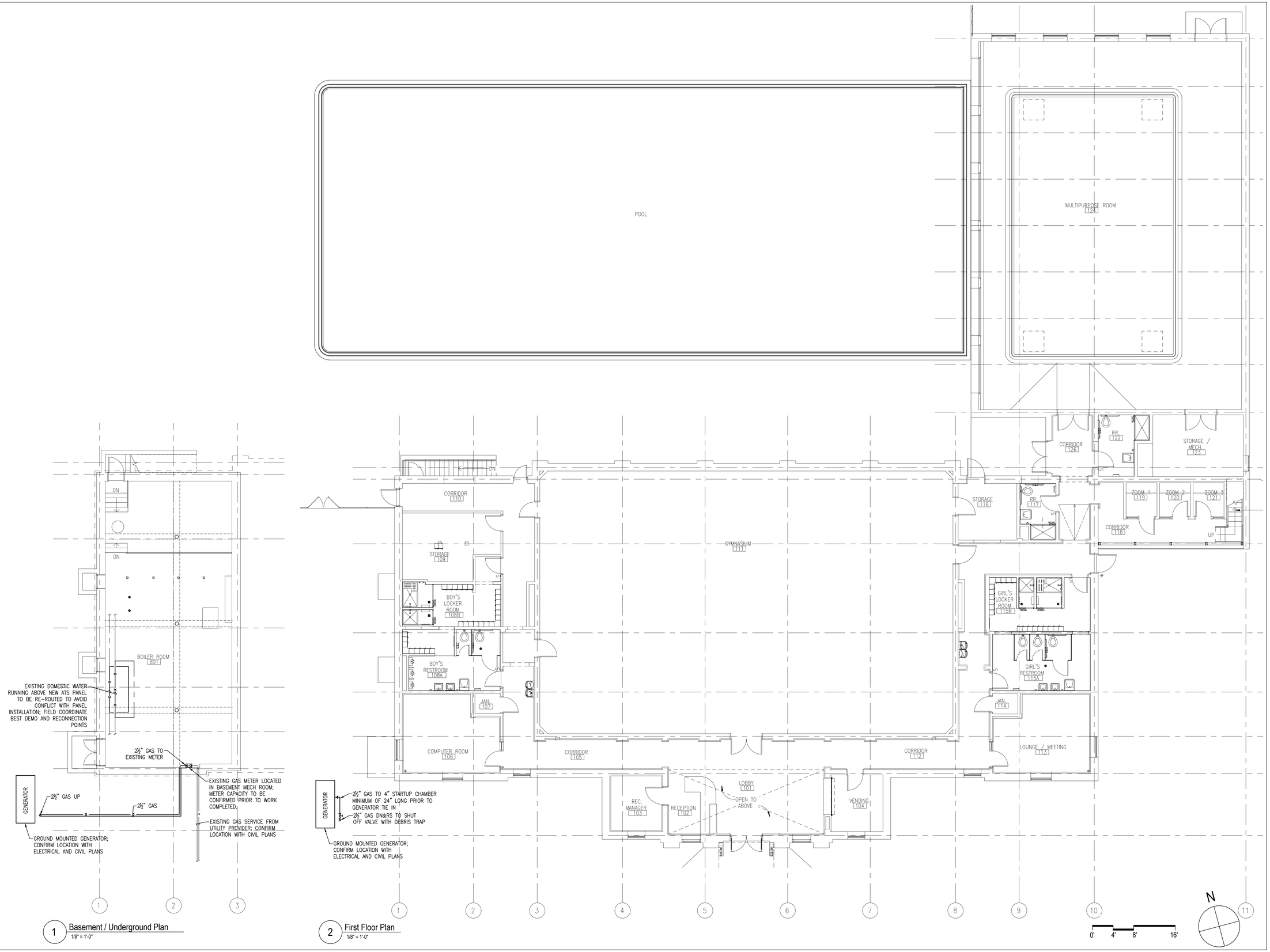
FILE NAME

DRAWING NUMBER

C101

V.2.1



1 Basement / Underground Plan
1/8" = 1'-0"

2 First Floor Plan
1/8" = 1'-0"

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ARCHITECT

bh+a

Bargmann Hendrie + Archetype, Inc.
9 Channel Center Street, Suite 300
Boston, MA 02210 (617) 350 0450

PROJECT NAME

Davey Lopes Recreation Center

GENERATOR AND MAIN SWITCHGEAR

227 Dudley Street
Providence, RI 02907

CLIENT

City of Providence

25 Dorrance Street
Providence, RI 02903

PROJECT TEAM

Civil Engineer
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4 California Street Ste. 301
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64 Pleasant Street
Watertown, MA 02472
617-926-9300

MEP/FP Engineer

Allied Consulting Engineering Services, Inc.
270 Littleton Road, Ste. 11
Westford, MA 01886
978-443-7888

John Wood
No. 13858
REGISTERED PROFESSIONAL ENGINEER
(Mechanical)

REVISIONS

DATE

DRAWING TITLE

Plumbing Underground & First Floor Plan

DRAWING INFORMATION

1/17/2025
DATE OF ISSUE

Construction Documents
DESCRIPTION

1/8" = 1'-0" — SCALE
PP/KS — DRAWN BY
64076 — PROJECT #
64076-P101.dwg — FILE NAME

DRAWING NUMBER

P101

V.2.1

COORDINATE THE TIMING AND PHASING OF ALL WORK TO BE PERFORMED. ALL ELECTRICAL, LIFE-SAFETY LIGHTING AND FIRE ALARM WORK IS TO BE KEPT ACTIVE DURING CONSTRUCTION AND DEMOLITION IN AREAS THAT ARE TO BE USED – REPAIR ANY WORK THAT IS INADVERTENTLY DISRUPTED DURING THIS PROCESS. ALSO, SEE DEMO NOTES. PROVIDE A FIREWATCH FOR TIMES THAT THE FIRE ALARM SYSTEM IS DEACTIVATED AND THE BUILDING IS STILL OCCUPIED.

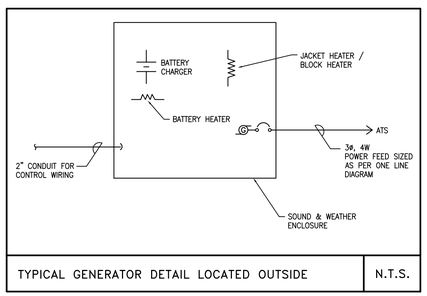
ELECTRICAL DEMOLITION NOTES

DEMOLITION NOTES:

1. VISIT THE SITE PRIOR TO SUBMISSION OF THE BIDS TO BECOME FAMILIAR WITH THE ACTUAL CONDITIONS AND EXTENT OF THE WORK.
2. TRACE AND LABEL ALL EXISTING SYSTEMS WITHIN THE DEMOLITION AREA AND BEYOND PRIOR TO DISCONNECTION AND REMOVAL TO ENSURE THAT NO AREA OUTSIDE THE DEMOLITION AREA IS AFFECTED. REVIEW IN DETAIL WITH THE GENERAL CONTRACTOR AND OWNER WHAT IS TO BE REMOVED AND REMAIN PRIOR TO WORK COMMENCING THE DEMOLITION. THERE SHALL BE NO INTERRUPTION OF SERVICES OUTSIDE THE DEMOLITION AREA WITHOUT APPROVAL FROM THE OWNER'S REPRESENTATIVE.
3. NOTIFY THE OWNER'S REPRESENTATIVE IMMEDIATELY OF ANY UNANTICIPATED HIDDEN CONDITIONS ENCOUNTERED DURING THE DEMOLITION.
4. ALL ITEMS REMOVED SHALL BE OFFERED TO THE OWNER FOR SALVAGE. IF THE OWNER DOES NOT TAKE POSSESSION, DISPOSE OF THE ITEMS IN A SAFE AND LEGAL MANNER. ALL ITEMS CLASSIFIED AS HAZARDOUS SHALL BE DISPOSED AS HAZARDOUS WASTES AND A UNIFORM HAZARDOUS WASTE MANIFEST SHALL BE PROVIDED TO THE OWNER.
5. NOTIFY UTILITY COMPANIES IN ACCORDANCE WITH THEIR REQUIREMENTS PRIOR TO DEMOLITION. VERIFY THAT THE UTILITIES HAVE BEEN DISCONNECTED, CAPPED AND MADE SAFE PRIOR TO DEMOLITION.
6. ENSURE THE SAFE PASSAGE OF PERSONS IN AND AROUND THE BUILDING DURING DEMOLITION. PREVENT INJURY TO PERSONS AND DAMAGE TO PROPERTY. PROVIDE ADEQUATE SHORING AND BRACING TO PREVENT COLLAPSE. IMMEDIATELY REPAIR DAMAGED PROPERTY TO THE CONDITION BEFORE BEING DAMAGED. TAKE EFFECTIVE MEASURES TO PREVENT WINDBLOWN DUST.
7. DE-ENERGIZE AND REMOVE ALL CONDUCTORS AND RACEWAYS TO THEIR POINTS OF ORIGIN WITHIN THE AREA OF DEMOLITION SCOPE. ITEMS IDENTIFIED FOR DEMOLITION SHALL NOT BE ABANDONED IN PLACE. RACEWAYS THAT ENTER MASONRY WALLS AND FLOORS SHALL BE CUT FLUSH AT THE SURFACE FOR PATCHING BY OTHERS. ALL CIRCUIT BREAKERS ASSOCIATED WITH THE DEMOLITION SCOPE SHALL BE DE-ENERGIZED AND LABELED SPARE.

ELECTRICAL DEMOLITION GENERAL NOTES:

1. THE ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR SECURING ALL EXISTING TO REMAIN WORK PRIOR TO DEMOLITION. THE ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR DAMAGE CAUSED TO SUCH MATERIALS DURING THE DEMOLITION PHASE.
2. ALL EXISTING PANELS ARE TO BE REMAIN OTHERWISE SPECIFICALLY NOTED.
3. ELECTRICAL CONTRACTOR SHALL VISIT THE SITE PRIOR TO BID AND PERFORM A WALK-THROUGH TO FAMILIARIZE THEMSELVES WITH ALL EXISTING CONDITIONS AND APPLICABLE SCOPE OF WORK. QUESTIONS REGARDING SCOPE SHALL BE SUBMITTED PRIOR TO BID FOR CLARIFICATION. THE WORK SHALL BE COORDINATED SUCH THAT THE EXISTING OWNER'S DOWNTIME IS MINIMIZED. ALL DISCONNECTION OF POWER, ETC. SHALL BE COORDINATED WITH AND APPROVED BY THE BUILDING OWNER.
4. ALL PENETRATIONS (NEW AND EXISTING) OF THE FIRE RATED BARRIERS SHALL BE FIRE STOPPED USING U.L. APPROVED METHODS AND MATERIALS.



TYPICAL GENERATOR DETAIL LOCATED OUTSIDE | N.T.S.

GENERAL NOTES

1. ALL WIRING AND RACEWAY SHALL BE CONCEALED UNLESS OTHERWISE NOTED.
2. THE SIZES OF ELECTRICAL RACEWAY SHALL BE AS INDICATED ON THE CONTRACT DRAWINGS AND SHALL MEET THE REQUIREMENTS OF THE LOCAL AUTHORITY HAVING JURISDICTION.
3. ALL WIRE AND CABLE FOR CONTROL INDICATION, ALARM, SIGNAL AND COMMUNICATION SYSTEM, UNLESS OTHERWISE NOTED, SHALL BE SELECTED BY THE SYSTEM SUPPLIER FOR EACH SYSTEM.
4. MINIMUM WIRE SHALL BE #12 FOR BRANCH CIRCUIT RUNS UP TO 100' TO THE LAST OUTLET; OVER 100'–#10; OVER 150'–#8 AND INCREASE CONDUIT SIZE AS REQUIRED BY LOCAL ELECTRICAL CODE.
5. ALL WIRING INSTALLATION SHALL BE COLOR CODED AS PER CODE. CONDUCTORS SIZED #10 AND LOWER SHALL BE SOLID; #8 AND HIGHER STRANDED.
6. ALL WORK SHALL BE INSTALLED IN FULL ACCORDANCE WITH LOCAL CODES, STATE AND LOCAL AUTHORITIES. FILE ALL PLANS, OBTAIN ALL PERMITS, PAY ALL FEES, SCHEDULE ALL INSPECTIONS, MAKE ALL TESTS AND OBTAIN ALL APPROVALS REQUIRED. THE ELECTRICAL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE LATEST EDITION OF NATIONAL ELECTRIC CODE AND LOCAL AUTHORITIES HAVING JURISDICTION. ALL COMPONENTS SHALL BE UL APPROVED AND LISTED.
7. WHERE CONFLICTS ARE FOUND BETWEEN DRAWINGS, SPECIFICATIONS, & LAWS & ORDINANCES, THE MOST STRINGENT SHALL APPLY.
8. SUBMIT FOR APPROVAL, COMPLETE SHOP DRAWINGS, LIST OF MATERIALS AND DETAILED DATA OF EQUIPMENT GIVING THE MANUFACTURERS NAME, CATALOG NUMBER, SIZE, CAPACITY AND DIMENSIONS. NO EQUIPMENT SHALL BE INSTALLED OR FABRICATED WITHOUT OBTAINING APPROVAL.
9. CIRCUIT RUNS ARE SHOWN DIAGRAMMATICALLY ONLY AND SHALL BE INSTALLED IN A MANNER TO PREVENT CONFLICTS WITH EQUIPMENT AND STRUCTURAL CONDITIONS. CONDUITS AND CABLES SHALL BE INSTALLED PARALLEL TO BEAMS AND WALLS.
10. CABLES/CONDUCTORS SHALL BE TERMINATED SO AS TO PERMIT NEAT CONNECTIONS TO MOTORS AND OTHER EQUIPMENT.
11. THE QUANTITY AND SIZE OF WIRES AND CONDUIT SHOWN ON DRAWINGS AND WIRING DIAGRAMS REPRESENT A SUGGESTED ARRANGEMENT BASED UPON SELECTED STANDARD COMPONENTS OF ELECTRICAL EQUIPMENT. MODIFICATIONS ACCEPTABLE TO THE ENGINEER MAY BE MADE BY THE CONTRACTOR TO ACCOMMODATE EQUIPMENT ACTUALLY PURCHASED. THE BASIC SEQUENCE AND METHOD OF CONTROL MUST BE MAINTAINED AS INDICATED ON THE DRAWINGS.
12. ALL PANELBOARDS AND ATS SHALL BE MOUNTED SO THAT THE DISTANCE FROM THE TOP CIRCUIT BREAKER OPERATING HANDLE TO THE FLOOR SHALL NOT EXCEED 6'–7".
13. ALL WORK SHALL BE DONE IN A NEAT AND WORKMANLIKE MANNER AND THE CONTRACTOR SHALL KEEP HIS PORTION OF THE WORK CLEAN AND ORDERLY.
14. ALL EXTERIOR EQUIPMENT IS TO BE NEMA-3R.

ABBREVIATIONS

AIC	AMPERES INTERRUPTING CAPACITY
ATS	AUTOMATIC TRANSFER SWITCH
EC	ELECTRICAL CONTRACTOR
NTS	NOT TO SCALE
TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSION
WP	WEATHER PROOF
UE	UNDERGROUND ELECTRICAL LINES

BRANCH CIRCUIT WIRING

1. ALL BRANCH CIRCUIT WIRING SHALL BE COPPER – TYPE AS LISTED IN THE SPECIFICATIONS UNLESS OTHERWISE NOTED.
2. FOR CLARITY, ALL BRANCH CIRCUIT WIRING IS NOT SHOWN, HOWEVER A COMPLETE BRANCH CIRCUIT WIRING SYSTEM IS TO BE INSTALLED IN ACCORD WITH THE DEVICES AND CIRCUIT NUMBERS SHOWN.
3. WIRING SHOWN ON DRAWINGS IS FOR SPECIFIC ROUTES OR SPECIAL CONDITIONS
4. ALL BRANCH CIRCUITS SHALL HAVE DEDICATED NEUTRALS. NO SHARED NEUTRALS WILL BE ALLOWED. A GREEN GROUNDING CONDUCTOR SHALL BE RUN WITH ALL CIRCUITS..
5. TYPICAL CIRCUITING
   a □ b – "a" DENOTES FIXTURE TYPE,
   P1A,3,5 "P1A,3,5" DENOTES PANEL & CIRCUIT NUMBER,
   "b" DENOTES SWITCH CONTROL
   ALTERNATIVELY CIRCUITING MAY BE LOOPED

NOTES:

1. ALL WORK INSIDE THE PROPERTY LINE INSTALLED BY THE E.C. & G.C. TO UTILITY CO. STANDARDS

1) PRIMARY SERVICE:
   NEW CONDUITS AS SHOWN – CONDUITS BY CONTRACTOR. WIRE BY UTILITY COMPANY.

1) SECONDARY SERVICE:
   a. SIZED PER THE POWER RISER AND RUN BETWEEN TRANSFORMER PAD, NEW A.T.S. AND SERVICE ENTRANCE ELECTRICAL ROOM.
   b. BURY 36" DEEP, PROVIDE SERVICE ENTRANCE FEEDER WITH DRAG LINE
   c. PROVIDE SECONDARY TERMINATIONS BOTH ENDS
   d. MARKER TAPE 6" BELOW GRADE
   e. TRENCHING AND BACKFILLING

POWER LEGEND

SYMBOLS	DESCRIPTION
	20A, 125 VAC 2P., 3W., GROUNDING TYPE, DUPLEX RECEPTACLE. FLUSH WALL MOUNTED.
	RECEPTACLE, DUPLEX GFCI
WP	DUPLEX GFCI RECEPTACLE WITH WEATHER PROOF COVER/BOX
	SURFACE PANEL – SEE RESPECTIVE SCHEDULE.
	HOMERUN TO PANEL
	FUSED DISCONNECT SWITCH, FUSE SIZE TO MATCH MFR. RECOMMENDATIONS
S_T	SAFETY SWITCH, HORSEPOWER RATED
J	JUNCTION BOX
	CONNECTION TO GROUND
	DISTRIBUTION PANEL/SWITCHBOARD
	NEMA-3R AUTOMATIC TRANSFER SWITCH
GANN	GENERATOR ANNUNCIATOR – LOCATE IN SUPERVISED LOCATION

GENERAL NOTES:

1. THE ELECTRICAL CONTRACTOR IS TO COORDINATE THE LOCATION OF ALL UNDERGROUND UTILITIES IN THE FIELD. THE CONTRACTOR IS RESPONSIBLE FOR ANY DAMAGE OF EXISTING WORK DURING TRENCHING/EXCAVATION PERFORMED FOR THE WORK SHOWN ON THIS PLAN. OBTAIN DIG-SAFE AS NECESSARY.
2. ALL SECONDARY AND EXTERIOR UNDERGROUND CONDUIT IS TO BE RUN IN A DUCTBANK (SEE DETAILS AND SPECIFICATIONS) AT 36" BELOW FINISHED GRADE. PRIMARY CONDUIT SHALL BE 36" BELOW GRADE.
3. CONDUIT ROUTING IS SHOWN DIAGRAMMATIC. COORDINATE WITH ALL TRADES TO AVOID CONFLICTS SUCH AS WATER PIPES, EXISTING CONDUITS, FOOTINGS, FOUNDATIONS, ETC. IT SHALL BE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO REPAIR/REIMBURSE ANY COSTS ASSOCIATED WITH DAMAGES TO EXISTING IN-GROUND WORK.
4. A MINIMUM DISTANCE OF 12" SHALL BE MAINTAINED BETWEEN ALL CONDUITS AND OTHER TRADE WORK.
5. FIELD VERIFY EXACT LOCATIONS PRIOR TO RUNNING THE CONDUITS. MOUNT PER DETAILS SHOWN ON LANDSCAPING, CIVIL AND ARCHITECTURAL PLANS.

KEYNOTES:

1. SERVICE ENTRANCE FEEDERS. REFER TO ELECTRICAL RISER FOR SIZING. PROVIDE CONDUIT WITH SWEEPING 90'S.
2. ALL CONCRETE REMOVED WHEN DIGGING THE TRENCH IS TO BE REPLACED TO MATCH EXISTING CONDITIONS. AFTER THE TRENCH HAS BEEN FILLED, THE GROUND IS TO BE TAMPED USING A TAMPING MACHINE. EXISTING SIDEWALKS / ROADS / ASPHALT ARE TO BE RE-PAVED – THE GENERAL CONTRACTOR IS RESPONSIBLE FOR ANY DAMAGE CAUSED TO SIDEWALKS AND ROADS DURING THE INSTALLATION OF CONDUITS AND ANY RELATED TRENCHING. ALL RELATED WORK IS TO BE PERFORMED BY THE GENERAL CONTRACTOR OR THEIR SUB WHO IS QUALIFIED TO PERFORM SUCH WORK.
3. THE ELECTRICAL CONTRACTOR IS TO FEED THE NEW CIRCUIT FROM THE PANEL "MDP" IN THE BUILDING THAT HAS A SPARE SPACE. FIELD VERIFY THE LOCATION OF THE ELECTRICAL PANEL. A NEW 20 AMP, 1-POLE 22,000 A.I.C. BREAKER COMPATIBLE WITH THE PANEL IS TO BE PROVIDED AND INSTALLED IN THE SPARE SPACE (FIELD VERIFY THE EXACT SPARE SPACE WITHIN THE PANEL). NEW 2#12, 1#12G, 3/4" CONDUIT IS TO BE RUN FROM THE NEW BREAKER TO FEED THE NEW CIRCUIT. THE PANEL CIRCUIT DIRECTORY IS TO BE UPDATED AS REQUIRED.
4. THE ELECTRICAL CONTRACTOR IS TO FEED THE NEW CIRCUIT FROM THE PANEL "MDP" IN THE BUILDING THAT HAS A SPARE SPACE. FIELD VERIFY THE LOCATION OF THE ELECTRICAL PANEL. A NEW 30 AMP, 2-POLE 22,000 A.I.C. BREAKER COMPATIBLE WITH THE PANEL IS TO BE PROVIDED AND INSTALLED IN THE SPARE SPACE (FIELD VERIFY THE EXACT SPARE SPACE WITHIN THE PANEL). NEW 2#10, 1#10G, 1" CONDUIT IS TO BE RUN FROM THE NEW BREAKER TO FEED THE NEW CIRCUIT. THE PANEL CIRCUIT DIRECTORY IS TO BE UPDATED AS REQUIRED.
5. EXISTING ELECTRICAL EQUIPMENT IN THIS ROOM IS TO REMAIN ACTIVE AT ALL TIMES. MAINTAIN EQUIPMENT FOR BUILDING OWNER AND INSTALL NEW EQUIPMENT PER NEW WORK PLANS. PHASING OF DEMOLITION AND RELOCATION WORK IS TO BE CLOSELY COORDINATED WITH THE G.C. AND OWNER.
6. TRANSFORMER PAD PER POWER COMPANY. VERIFY ALL REQUIRED CLEARANCES AROUND THE TRANSFORMER WITH THE POWER COMPANY AND ADJUST THE LOCATION ACCORDINGLY. G.C. TO INCLUDE BOLLARDS AROUND TRANSFORMER. TRANSFORMER TO BE LOCATED SUCH THAT CLEARANCES FROM OPENINGS (DOORS, BUILDING, WINDOWS, ETC MEET UTILITY REQUIREMENTS.
7. TO THE SERVING UTILITY EASEMENT / POLE. THE ELECTRICAL CONTRACTOR IS TO PROVIDE AND INSTALL ANY NECESSARY COMPONENT OF THE ELECTRICAL SERVICE WORK MUST BE COORDINATED WITH THE CORRESPONDING UTILITY COMPANIES AND INSTALLED PER THEIR REQUIRED SPECIFICATIONS.

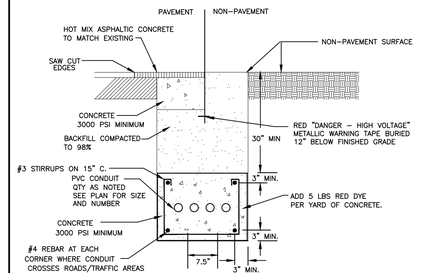
LEGEND

UE — ELECTRICAL POWER CONDUITS WITH PULLSTRINGS, 36" BELOW GRADE. SIZE AS SHOWN ON PLANS. PRIMARY FEEDERS (WIRE) BY UTILITY (INCLUDE COST IN BID PRICE). SECONDARY FEEDERS SIZED PER POWER RISER.

UT — TELECOMMUNICATIONS CONDUIT WITH PULL STRING, 24" BELOW GRADE. TELECOMMUNICATIONS SERVICE BY VERIZON/COMCAST (INCLUDE COST IN BID PRICE).

INCLUDE WARNING TAPE (12" BELOW FINISHED GRADE) ABOVE ALL UNDERGROUND FEEDS:
RED "DANGER – HIGH VOLTAGE" METALLIC WARNING TAPE FOR POWER
YELLOW METALLIC WARNING TAPE TO READ "WARNING – BURIED TELECOMM. CABLE" FOR TELECOMM.

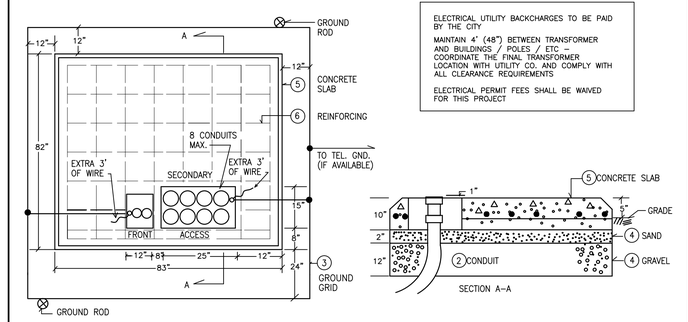
ELECTRICAL CONTRACTOR SHALL PROVIDE CONDUITS EXTENDING FROM TRANSFORMER TO ELECTRICAL SERVICE SIZED PER THE POWER RISER. RACEWAY TO BE INSTALLED UNDER NOT LESS THAN 5" OF CONCRETE BENEATH THE BUILDING. PATHWAYS SHALL BE CONFIRMED WITH BOTH ARCHITECT AND UTILITY. EC SHALL TAKE BEST ROUTE TO AVOID FOOTINGS AND OTHER SYSTEMS. CONDUIT SHALL BE CAPPED. CONFIRM ALL REQUIREMENTS WITH POWER COMPANY REPRESENTATIVE PRIOR TO ROUGH-IN.



ELECTRICAL FEEDER DUCT CROSS SECTION DETAIL | N.T.S.

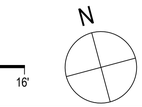
FOUNDATION – PAD MOUNT TRANSFORMER

1. SCOPE
   THIS STANDARD COVERS SPECIFICATIONS FOR THE CONSTRUCTION OF PAD MOUNT TRANSFORMER FOUNDATION AND GROUNDING.
   NOTE: GROUNDING BY ELECTRICAL CONTRACTOR
2. CONDUIT
   INSTALL AS SHOWN BEFORE SLAB IS POURED. USE 36" RADIUS BENDS, WITH COUPLINGS, NIPPLES AND BUSHINGS AS REQUIRED (MATERIAL MAY BE GALVANIZED STEEL OR PVC).
   TERMINATIONS OF CONDUITS SHALL BE LOCATED EXACTLY AS SHOWN. THE NIPPLE AND BUSHING SHOULD BE INSTALLED AFTER THE TRANSFORMER IS PLACED AND BEFORE THE CABLES ARE PULLED.
3. GROUND GRID
   INSTALL #1/0 7 STRAND BARE COPPER WIRE LOOP 1'-0" BELOW GRADE. BOND TO ALL EXPOSED METALLIC CONDUIT AND LEAVE 3'-0" OF WIRE ABOVE PAD FOR GROUNDING TRANSFORMER AT TWO OPPOSITE POINTS IN THE CABLE CONDUIT OPENINGS. INSTALL TWO 8' (3/4") GROUND RODS AND TWO APPROVED GALVANIZED CONNECTORS BELOW GROUND. LEAVE GRID EXPOSED UNTIL INSPECTED BY THE UTILITY COMPANY.
4. GRAVEL AND SAND
   GRAVEL AND SAND SHALL BE PLACED AS SHOWN. THE GRAVEL BEING COMPACTED AND THE SAND THOROUGHLY WETTED JUST BEFORE PLACING THE CONCRETE.
5. CONCRETE SLAB
   INSTALL CONCRETE IN ACCORDANCE WITH UTILITY COMPANY STANDARDS UNLESS OTHERWISE SPECIFIED. ALL EXPOSED EDGES TO HAVE 3/4" CHAMFER.
6. REINFORCING
   REINFORCING TO BE #4 – GRADE 60 BARS AND SHALL CONFORM TO ASTM STD. A-615 OF LATEST DATE. REINFORCING RODS TO BE LOCATED IN CENTER OF THE SLAB, WITH A MINIMUM OF 2" CLEARANCE FROM FACE OF CONCRETE.



PAD MOUNTED TRANSFORMER DETAIL | N.T.S.

NOTE: PAD SIZE WILL VARY WITH KVA, REFER TO UTILITY COMPANY STANDARDS



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GENERATOR AND MAIN SWITCHGEAR

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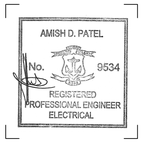
REVISIONS
DATE

DRAWING TITLE
ELECTRICAL Legend & Notes

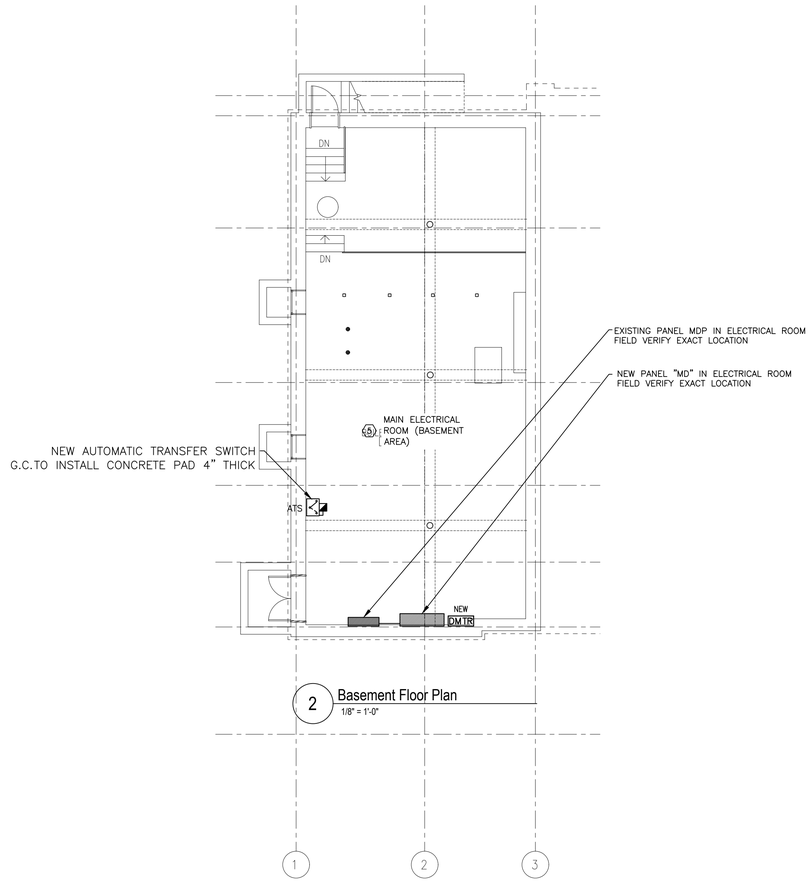
DRAWING INFORMATION



1/17/2025
DATE OF ISSUE
Construction Documents
DESCRIPTION
1/8" = 1'-0"
SCALE
AP/RB
DRAWN BY
64076
PROJECT #
64076-E000.dwg
FILE NAME

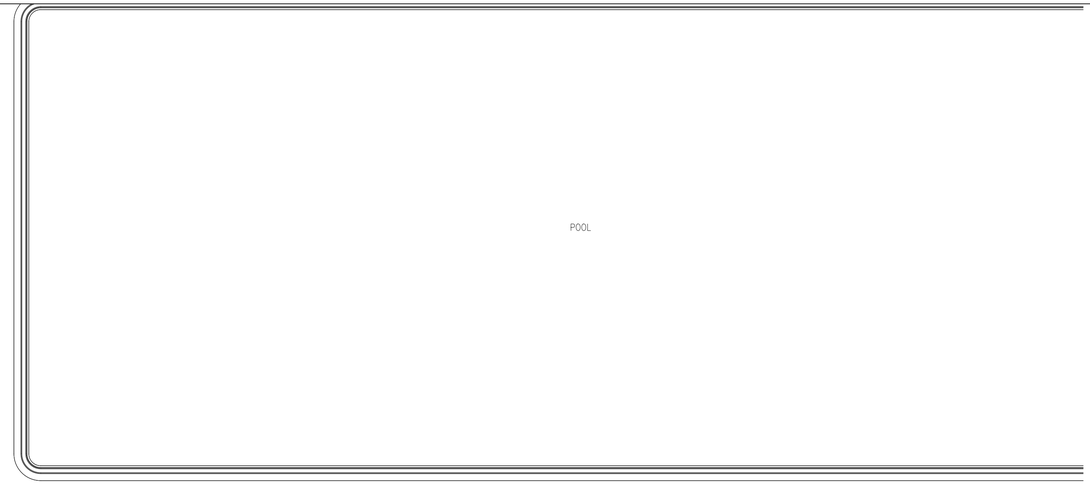
DRAWING NUMBER
E000

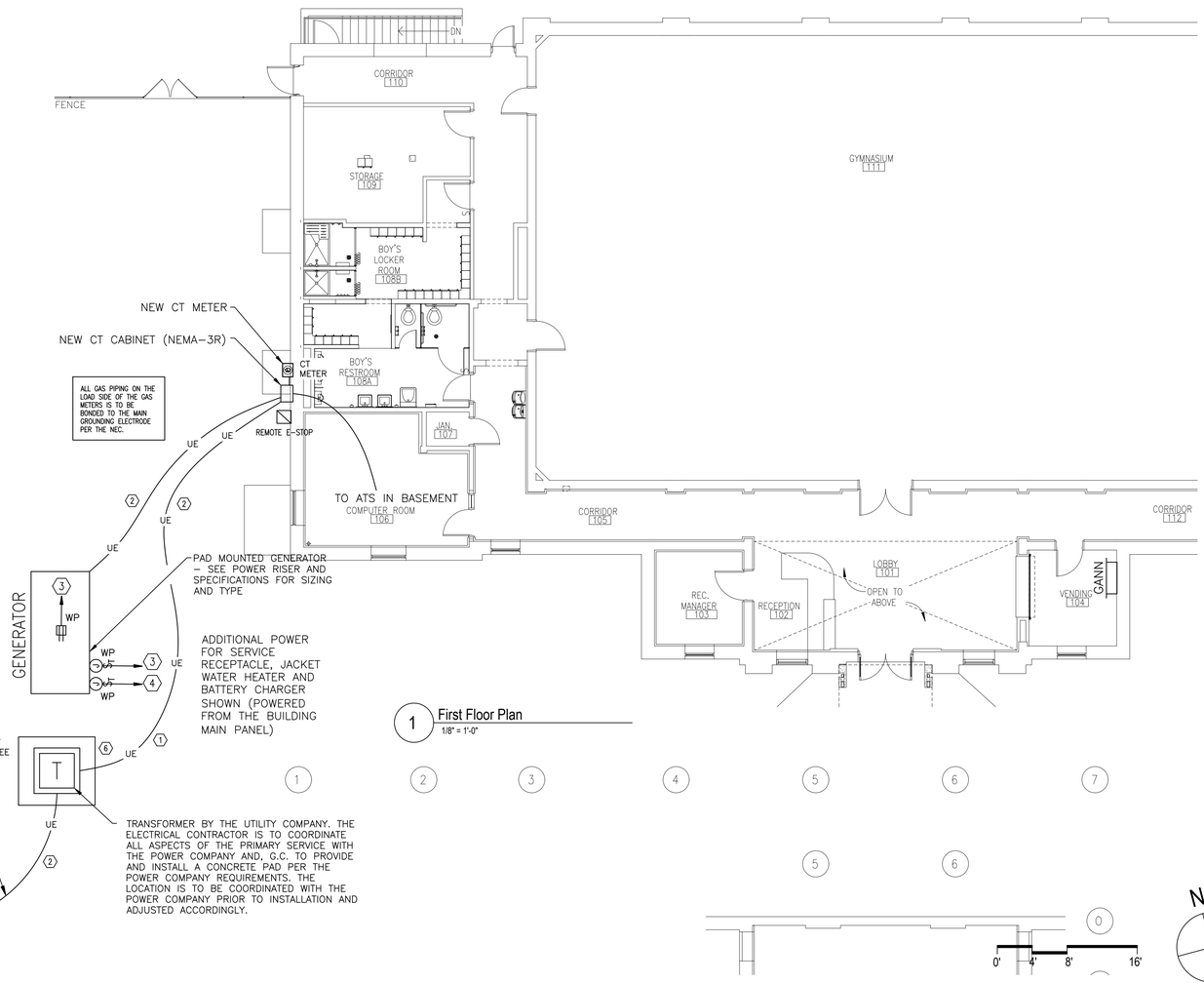
 V.2.1



2 Basement Floor Plan
1/8" = 1'-0"

PANEL "MD" SCHEDULE					VOLTAGE: 208Y120 VOLT – 3 PH. – 4 WIRE 1000 AMP MAIN BREAKER; SURFACE MOUNTED REMARKS: PROVIDE WITH GROUND BAR, MINIMUM A.I.C. RATING = 65,000 AMPS SYM.								
CKT NO.	LOAD DESCRIPTION	WIRE ø	BREAKER POLE	BREAKER AMP	CONN. LOAD (KVA) PH. "A"	PH. "B"	PH. "C"	BREAKER AMP	BREAKER POLE	WIRE ø	LOAD DESCRIPTION	CKT NO.
1	SPARE	·	3	200	·			200	3	3/0	POWER PANEL "MDP" (EXISTING)	2
–	" "	·	·	·		·		·	·	·	" "	–
–	" "	·	·	·			·	·	·	·	" "	–
3	SPARE	·	3	400	·			400	3	·	SPARE	4
–	" "	·	·	·		·		·	·	·	" "	–
–	" "	·	·	·			·	·	·	·	" "	–
5	TVSS	10	3	30	·			600	3	·	SPARE	6
–	" "	·	·	·		·		·	·	·	" "	–
–	" "	·	·	·			·	·	·	·	" "	–
	TOTALS PER PHASE				·	·	·	NEW PANEL				W/TVSS
	TOTAL LOAD				. kVA							





1 First Floor Plan
1/8" = 1'-0"

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REVISIONS

DATE

DRAWING TITLE

ELECTRICAL Basement & First Floor Plan

DRAWING INFORMATION

AMISH D. PATEL
No. 9534
REGISTERED PROFESSIONAL ENGINEER ELECTRICAL

1/17/2025
DATE OF ISSUE

Construction Documents
DESCRIPTION

1/8" = 1'-0" — SCALE
AP/RB — DRAWN BY
64076 — PROJECT #
64076-E101.dwg — FILE NAME

DRAWING NUMBER

E101

V.2.1

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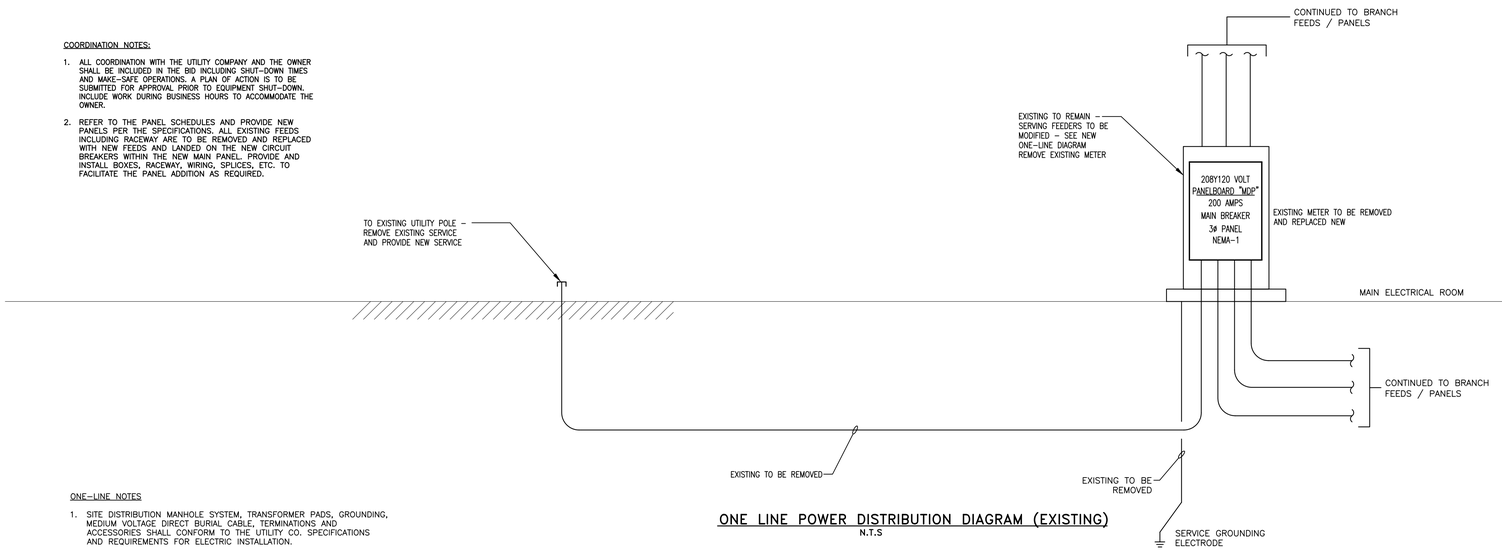
COORDINATION NOTES:

1. ALL COORDINATION WITH THE UTILITY COMPANY AND THE OWNER SHALL BE INCLUDED IN THE BID INCLUDING SHUT-DOWN TIMES AND MAKE-SAFE OPERATIONS. A PLAN OF ACTION IS TO BE SUBMITTED FOR APPROVAL PRIOR TO EQUIPMENT SHUT-DOWN. INCLUDE WORK DURING BUSINESS HOURS TO ACCOMMODATE THE OWNER.
2. REFER TO THE PANEL SCHEDULES AND PROVIDE NEW PANELS PER THE SPECIFICATIONS. ALL EXISTING FEEDS INCLUDING RACEWAY ARE TO BE REMOVED AND REPLACED WITH NEW FEEDS AND LANDED ON THE NEW CIRCUIT BREAKERS WITHIN THE NEW MAIN PANEL. PROVIDE AND INSTALL BOXES, RACEWAY, WIRING, SPLICES, ETC. TO FACILITATE THE PANEL ADDITION AS REQUIRED.



ONE LINE POWER DISTRIBUTION DIAGRAM (EXISTING)
N.T.S

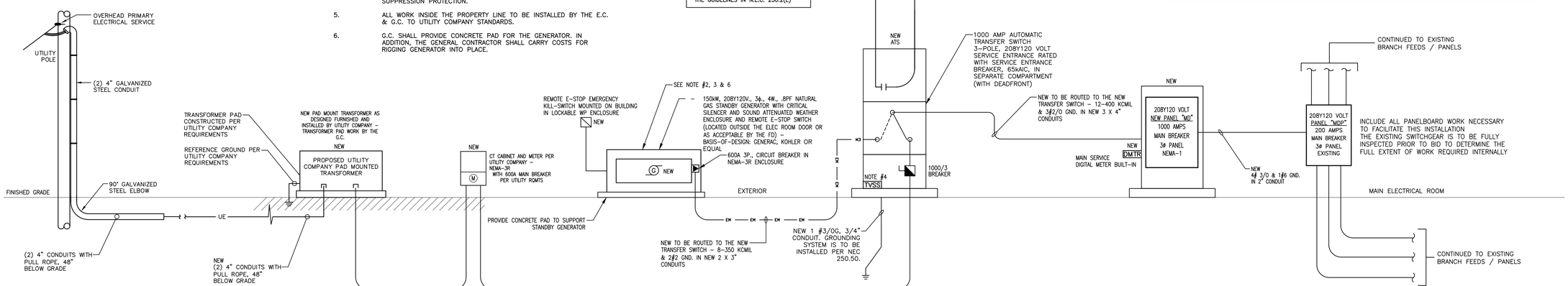
ONE-LINE NOTES

1. SITE DISTRIBUTION MANHOLE SYSTEM, TRANSFORMER PADS, GROUNDING, MEDIUM VOLTAGE DIRECT BURIAL CABLE, TERMINATIONS AND ACCESSORIES SHALL CONFORM TO THE UTILITY CO. SPECIFICATIONS AND REQUIREMENTS FOR ELECTRIC INSTALLATION.
2. PROVIDE SUFFICIENT SLACK CABLE FOR UTILITY TO EXTEND PRIMARY TO TOP OF POLE TO MAKE FINAL CONNECTION.
3. SITE ELECTRICAL PRIMARY DISTRIBUTION, PLACEMENT OF TRANSFORMERS AND MANHOLE SYSTEM TO BE DETERMINED BY UTILITY CO. EXACT LOCATION OF PRIMARY CONNECTION TO BE CONFIRMED WITH UTILITY.
4. ALL WORK INSIDE THE PROPERTY LINE TO BE INSTALLED BY THE E.C. & G.C. TO UTILITY COMPANY STANDARDS.
5. ALL WORK INSIDE THE PROPERTY LINE TO BE INSTALLED BY THE E.C./G.C. TO UTILITY COMPANY STANDARDS.
6. CONFIRM METERING REQUIREMENTS WITH UTILITY COMPANY.
7. PROPERLY CONNECT NEUTRAL WIRES TO CONNECT TO NEUTRAL BAR IN TRANSFER SWITCH (LOAD AND LINE SIDE)

ELECTRICAL NOTES

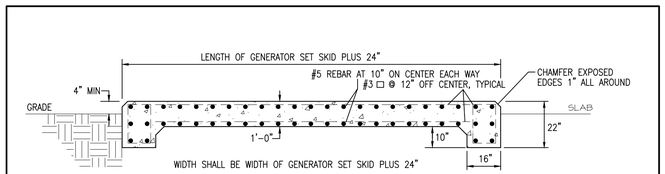
1. ALL PANELS ARE 3Ø, 4W UNLESS OTHERWISE NOTED.
2. STANDBY EMERGENCY GENERATOR IS LOCATED AS SHOWN ON THE SITE PLAN.
3. EC SHALL INSTALL 2" CONDUIT WITH CABLES AS REQUIRED FOR GENERATOR CONTROLS, THE ANNUNCIATOR STATUS CABLE & MISC. POWER, BETWEEN GENERATOR AND BUILDING (LOCATION PER THE OWNER).
4. THE A.T.S. SHALL BE FURNISHED WITH TRANSIENT VOLTAGE SURGE SUPPRESSION PROTECTION.
5. ALL WORK INSIDE THE PROPERTY LINE TO BE INSTALLED BY THE E.C. & G.C. TO UTILITY COMPANY STANDARDS.
6. G.C. SHALL PROVIDE CONCRETE PAD FOR THE GENERATOR. IN ADDITION, THE GENERAL CONTRACTOR SHALL CARRY COSTS FOR RIGGING GENERATOR INTO PLACE.

NOTE:
ALL SERVICE AND BRANCH AREA MAIN CIRCUIT BREAKERS ARE TO BE PROPERLY LABELED PER N.E.C. SECTION 225.37.
EACH SERVICE IS TO BE PROPERLY LABELED INDICATING THE SERVICE DISCONNECT NUMBER AND LOCATIONS OF OTHER SERVICE DISCONNECTS – FOLLOW THE GUIDELINES IN N.E.C. 230.2(E)



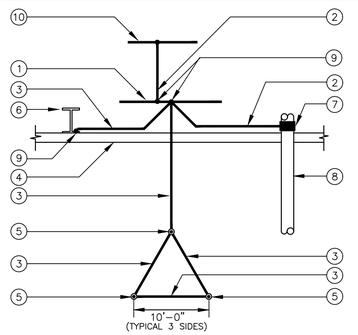
ONE LINE POWER DISTRIBUTION DIAGRAM (NEW)
N.T.S

DMTR = DIGITAL EATON METER PXM350 (WITH MOUNTING ENCLOSURE AND RAIL) DIGITAL METER W/CTs AND NETWORK CONNECTION RATED FOR FEED (INCLUDE OWNER TRAINING AND SETUP) – ALL METERS INTERCONNECTED VIA TWO-PAIR LV WIRING PER MANUFACTURER REQUIREMENTS MOUNT NEXT TO PANEL BEING SERVED. USE EATON OR EQUAL



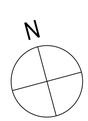
ACTUAL SIZE SHALL BE COORDINATED/VERIFIED WITH ARCHITECT PRIOR TO CONSTRUCTION.
SUBMIT, FOR REVIEW, SHOP DRAWINGS THAT SHOW EQUIPMENT SELECTED AND PAD DIMENSIONS.
PROVIDE FOR ANY OPENINGS REQUIRED.

GENERATOR PAD DETAIL | N.T.S.



1. MAIN SWITCHBOARD GROUNDING BUS
2. #750 MCM CU, GROUNDING CONDUCTOR IN 2" C.
3. #4/0 BARE COPPER GROUNDING CONDUCTOR
4. BUILDING EXTERIOR WALL
5. 10'-0" X 3/4" COPPERWELD GROUND ROD DRIVEN WITH TOP 1'-0" BELOW GRADE
6. STRUCTURAL STEEL
7. GROUNDING CLAMP ON METALLIC PIPE
8. WATER SERVICE PIPE
9. UTILIZE EXOTHERMAL WELDING ON GROUND ROD CONNECTIONS
10. NEUTRAL BUS

GROUND COUNTERPOISE DETAIL | N.T.S.



0' 4' 8' 16'

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Watertown, MA 02472
617-926-9300

MEP/FP Engineer
Allied Consulting Engineering Services, Inc.
270 Littleton Road, Ste. 11
Westford, MA 01886
978-443-7888

REVISIONS
DATE

DRAWING TITLE
ELECTRICAL One-Line Diagrams

DRAWING INFORMATION

AMISH D. PATEL
No. 9534
REGISTERED PROFESSIONAL ENGINEER
ELECTRICAL

1/17/2025
DATE OF ISSUE
Construction Documents
DESCRIPTION
1/8" = 1'-0" | AP/RB
SCALE | DRAWN BY
64076 | 64076-E200.dwg
PROJECT # | FILE NAME

DRAWING NUMBER
E200

V.2.1

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TABLE OF CONTENTS- TECHNICAL SPECIFICATIONS

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SECTION 011000 -GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY OF WORK

A. Project Identification: Davey Lopes Recreation Center- Emergency Electrical Package

B. Project Location: 227 Dudley Street, Providence, RI

C. Owner: City of Providence, RI

D. Architect: Bargmann Hendrie + Archetype, Inc. 9 Channel Center Street, Suite 300, Boston, MA 02210.

E. Consultant: Allied Consulting Engineering Services, 270 Littleton Road, Suite 11, Westford, MA

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents:
   1. Installation of a new backup generator at the Dave Lopes Recreation Center
   2. Work includes, but is not limited to, the following:
      a. Exterior pad mounted generator, duct-banks, automatic transfer switch (ATS), new main breaker panel, conduit, conductors and connections.
      b. New electrical service including duct bank, pad mounted transformer, coordination with utility company, service meter socket, and connection to new ATS.
      c. New gas connection from existing service to generator.
      d. Site preparation including saw cutting and removal of hardscape
      e. Excavation and backfill
      f. Concrete and masonry coring and cutting
      g. Restoration of surfaces at new penetrations.
      h. Restoration of hardscape and landscape.

B. Type of Contract:
   1. Project will be constructed under a single prime contract.

1.4 CONTRACTOR'S USE OF SITE AND PREMISES

A. Restricted Use of Site: Contractor shall have limited use of Project site for construction operations.

B. The Recreation Center will remain open during the work. All work shall be coordinated and scheduled with the City and center staff.

C. Condition of Existing Building: Maintain portions of existing building affected by new work in a weathertight condition throughout construction period. Repair damage caused by construction operations.

D. The City and center staff will work with the Contractor to coordinate:
   1. Staging
   2. Storage
   3. Dumpster Locations
   4. Delivery of materials

1.5 WORK RESTRICTIONS

A. Comply with restrictions on construction operations.
   1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work to between 7 a.m. to 6 p.m., Monday through Friday, unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by City and authorities having jurisdiction.
   1. Contractor shall following requirements of City of Providence Codes and Ordinances and the Department of Inspection & Standards.
      a. https://www.providenceri.gov/inspection-standards/
      b. https://providencenoiseproject.org/laws/providence-municipal-code/

C. Contractor shall file required material to the City of Providence Engineering Division (DPW) for work in the public right-of-way, and the Department of Inspection & Standards for applicable sidewalk and building related permits for plumbing and electrical.
   1. Contractor will be required to by the State of Rhode Island levy fee on the total calculated cost of the permits.

D. Smoking and Controlled Substance Restrictions: Use of tobacco products , alcoholic beverages, and other controlled substances on Owner's property is not permitted.

1.6 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.

C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings and published as part of the U.S. National CAD Standard.
3. Keynoting: Materials and products are identified by reference keynotes. List of keynotes are on the Drawings.

1.7 CODES AND REGULATIONS

A. Comply with all applicable codes, ordinances, regulations, and requirements of authorities having jurisdiction.

B. Submit copies of all permits, licenses, certifications, inspection reports, releases, judgments, and communications from authorities having jurisdiction to the Architect.

1.8 PROGRESS SCHEDULE

A. Provide comprehensive bar chart schedule showing all major and critical minor portions of the work, sequence of work and duration of each activity. Update and reissue regularly, but not less than monthly.

1.9 SCHEDULE OF VALUES

A. Prepare Schedule of Values to coordinate with application for payment breakdown. Submit at least 10 days before first payment application. Update and reissue regularly, but not less than monthly.

B. Schedule of Values shall have the following minimal breakdown:
1. Bonds

2. Insurance
3. Permits
4. General Conditions
5. OH&P
6. Mobilization
7. Closeout Documents
8. As-built Drawings
9. Cutting and Patching
10. Concrete
11. Masonry/Concrete Repair
12. Firestopping
13. Gas Connection
    a. Materials
    b. Installation
14. Electric Service Entrance
    a. Materials
    b. Installation
15. Emergency Generator
    a. Materials
    b. Installation
16. ATS
    a. Materials
    b. Installation
17. Main Breaker Panel
    a. Materials
    b. Installation
18. Duct Bank Construction
    a. Materials
    b. Installation
19. Distribution
    a. Materials
    b. Installation
20. Excavation and Backfill
    a. Materials
    b. Installation
21. Site Improvements
    a. Sidewalk Repair
    b. Site Restoration

C. The City will require breakout pricing on the generator work for funding/grant reporting purposes.

1.10 PAYMENT REQUESTS

A. Provide three copies of each request on completely filled out copies of AIA G702 and continuation sheet G703. Substantiate requests with complete documentation; include change orders to date. Provide partial lien waivers for work in progress and full lien waivers for completed work.

B. Record Drawing Certification: Certify as a part of each application for payment that the project record documents are current at the time of application is submitted. The Contractor shall require such drawings to be current as a condition of approving any payment to the trade Contractor and Subcontractor.

C. Before first payment application, provide the following:

1. List of subcontractors, suppliers, and fabricators.
2. Schedule of values.
3. Progress schedule.
4. Submittal schedule keyed to project schedule.
5. List of Contractor's key project personnel.
6. Contractor's certificate of insurance.
7. Performance and payment bonds if required.

D. Before final payment application, provide and complete the following:

1. Complete closeout requirements.
2. Complete punch list items.
3. Settle all claims.
4. Transmit record documents to Architect.
5. Prove that all fees and similar obligations have been paid.
6. Remove temporary facilities and surplus materials.
7. Clean the work.
8. Submit consent of surety, if any, for final payment.

1.11 PROCEDURES AND CONTROLS

A. Project Meetings: Arrange for and attend meetings with the Architect, Owner, and Owner’s Project Manager (OPM) and such other persons as the Architect requests to have present. The Contractor shall be represented by a principal, project manager, general superintendent, or other authorized main office representative, as well as by the Contractor's field superintendent. An authorized representative of any subcontractor or sub-subcontractor shall attend such meetings if the Architect requests the representative’s presence. Such representatives shall be empowered to make binding commitments on all matters to be discussed at such meetings, including costs, payments, change orders, time schedules and manpower. Any notices required under the Contract may be served on such representatives. Written reports of meeting minutes shall be prepared by the Architect and distributed by the architect to attendees and Owner within five business days.

1. Pre-Construction Conference: Attendance by Owner, OPM, Architect, Contractor, major subcontractors. Agenda shall include: Quality of workmanship, coordination, interpretations, job schedule, submittals, approvals, requisition procedures, testing, protection of construction, indoor air quality, and construction waste management.
2. Progress Meetings: Hold regularly before preparation of payment requests and additional meetings as requested by the Owner, OPM, and Architect. Attendance by Architect, Contractor, and others as determined by Contractor. Agenda shall include work in progress and payment requests.

B. Emergency Contacts: Furnish the Owner and Architect, in writing, the names and telephone numbers of individuals to be contacted in the event of an out-of-hours emergency at the building site.

C. Field Measurements for Fixed Items: Dimensions for items to be supplied under this Contract or separate contracts shall be determined by field measurements taken jointly by the Contractor and the supplier involved. A record of the field measurements shall be kept until time of substantial completion of the project, or until the work has been fully installed and accepted by the Owner, whichever is later. Responsibility for scope items fabricated accurately to field measurements for proper fit and operation shall be that of the Contractor.

D. Matching: Where matching is indicated, the Architect shall be the sole and final judge of what is an acceptable match. Mockups and sample submissions are required.

E. Observation: Notify the Architect and authorities having jurisdiction at least thirty-six hours in advance of concealing any work.

F. Clean-Up: Frequently clean-up all waste, remove from site regularly, and legally dispose of off-site.

G. Installer's Acceptance of Conditions: All installers shall inspect substrates and conditions under which work is to be executed and shall report in writing to the Contractor all conditions detrimental to the proper execution and completion of the work. Do not proceed with work until unsatisfactory conditions are corrected. Beginning work means installer accepts previous work and conditions.

H. Coordination: The Contractor shall be fully responsible for coordinating all trades, coordinating construction sequences and schedules, and coordinating the actual installed location and interface of all work.

1. The Contractor shall be solely liable and responsible for any costs and delays resulting from the Contractor's failure to prepare required or requested coordination drawings or from the negligent preparation of such coordination drawings.

1.12 NAMING CONVENTIONS

A. All documents and forms shall be clearly labelled and numbered as follows:
1. Emails: Subject Lines of Emails shall start with “DLRC-Generator”
2. Documents: All forms shall contain “DLRC Generator” in the file name.
3. All RFI’s shall contain a subject line to describe the RFI
4. All Submittals shall contain the Specification Number and Title of the submittal.

1.13 REQUEST FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified to the Architect, OPM, Owner.

1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.
3. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.
    a. RFIs shall originate with Contractor RFIs submitted by entities other than Contractor will be returned with no response.
4. Content of the RFI: Include a detailed, legible description of item needing interpretation.
5. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow three working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.
6. The following RFIs will be returned without action:
    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for coordination information already indicated in the Contract Documents.
    d. Requests for adjustments in the Contract Time or the Contract Sum.
    e. Requests for interpretation of Architect's actions on submittals.
    f. Incomplete RFIs or RFIs with numerous errors.

1.14 SUBMITTALS

A. Required Submittals: Submit Product data, initial selection samples, verification samples, and all other submittals as specified in individual specification sections.

B. Contractor's Preparation of Submittals: Stamp and sign each submittal to show the Contractor's review and approval of each submittal before delivery to Architect's office; unstamped and unsigned submittals will be returned without action by the Architect. Leave 4" x 6" open space for Architect's "action" stamp.
    1. Electronic Submittals: Provide a copy of all submittals in electronic format to the Architect. Architect will return a file of reviewed submittal in electronic format to the Contractor for distribution to subcontractors, suppliers, fabricators, governing authorities, and others as necessary for proper performance of the Work. Unless otherwise amenable to the Architect, additional hard copies of submittals will not be reviewed by the Architect (or Consultant) and will not be returned to the Contractor.
    2. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
    3. Name file with submittal number or other unique identifier, including revision identifier.
    4. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect and Construction Manager.
    5. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Architect.

C. Product Data: Provide manufacturer's preprinted literature including, without limitation, manufacturer's standard printed description of product, materials and construction, recommendations for application and use, certification of compliance with standards, instructions for installation, and special coordination requirements. Collect data into one

submittal for each unit of work or system; mark each copy to show which choices and options are applicable to project.

D. Samples: Provide units identical with final materials and products to be installed in the work. Where indicated, prepare samples to match Architect's sample. Label each sample with description, source, generic name or manufacturer's name and model number. Architect will review samples for confirmation of visual design intent, color, pattern, texture, and type only; Architect will not test samples for compliance with other Contract requirements which shall remain the exclusive responsibility of the Contractor.

E. Timing of Submittals: Submit submittals in a timely fashion to allow at least 5 business days for each office's review and handling.

F. Architect's Action on Submittals: Architect will review submittals, stamp with "action stamp", mark action, and return to Contractor. Architect will review submittals only for conformance with the design concept of the project. The Contractor is responsible for confirming compliance with other Contract requirements, including without limitation, performance requirements, field dimensions, fabrication methods, means, methods, techniques, sequences and procedures of construction, coordination with other work. The Architect's review and approval of submittals shall be held to the limitations stated in the Owner/Architect Agreement and the Conditions of the Contract. In no case shall approval or acceptance by the Architect be interpreted as a release of Contractor of their responsibilities to fulfill all of the requirements of the Contract Documents.
   1. Required Resubmittal: Unless submittal is noted "reviewed" or "reviewed except as noted, resubmission not required," make corrections or changes to original and resubmit to Architect.
   2. Distribution: When submittal is noted "reviewed" or "reviewed as noted, resubmittal not required," make prints or copies and distribute to Owner, Subcontractors involved, and to all other parties requiring information from the submittal for performance or coordination of related work.

1.15 CONSTRUCTION PHOTOGRAPHS

A. Digital Images: Provide images in uncompressed jpeg format, produced by a digital camera with minimum sensor size of 4.0 megapixels, and at an image resolution of not less than 1024 by 768 pixels.

B. Preconstruction Photographs: Before starting construction, take color , digital photographs of Project site and surrounding properties, including existing items to remain during construction and the work currently in-place from different vantage points, as directed by OPM and Architect.

C. Periodic Construction Photographs: Take color, digital photographs, coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

1.16 CUTTING AND PATCHING

A. Limitations: Do not cut and patch any work in a manner that would result in a failure of the work to perform as intended, decreased energy performance, increased maintenance, decreased operational life, or decreased safety.

B. Cutting and Patching Materials: Use materials identical to materials to be cut and patched. If identical materials are not available or cannot be used, use materials that match existing materials to the greatest extent possible. Provide finished work that will result in equal to or better than existing performance characteristics.

C. Inspection: Before cutting and patching, examine surfaces and conditions under which work is to be performed and correct unsafe and unsatisfactory conditions prior to proceeding.

D. Protection: Protect adjacent work from damage. Protect the work from adverse conditions.

E. Cutting: Cut work using methods least likely to damage adjoining work. Use tools designed for sawing or grinding, not hammering, or chopping. Use saws or drills to ensure neat, accurately formed holes to sizes required with minimum disturbance to adjacent work. Temporarily cover openings; maintain weather tightness and safety.

F. Patching: Patch with seams and joints which are durable and not visible. Comply with specified tolerances for similar new work; create true even planes with uniform continuous appearance. Restore finishes of patched areas and, if necessary, extend finish restoration onto adjoining unpatched area to eliminate evidence of patching and refinishing. Repaint entire assemblies, not just patched area. Remove and replace work which has been cut and patched in a visually unsatisfactory manner as determined by the Architect.

G. Qualifications: Retain experienced and specialized firms, original installers if possible, to perform cutting and patching. Workmen shall be skilled in type of cutting and patching required.

1.17 TEMPORARY FACILITIES AND UTILITIES

A. Scope of Temporary Work: This article is not intended to limit the scope of temporary work required under the Contract. Provide all temporary facilities and utilities needed.

B. Permits and Fees: Contractor shall file and obtain a Building Permit from the City of Providence. Fees for permits issued by the City of Providence are waived.

C. Codes and Authorities Having Jurisdiction for Temporary Facilities and Utilities: Comply with all requirements of authorities having jurisdiction, codes, utility companies, OSHA, and industry standards including, but not limited to the following:

1. NFPA 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations.
2. ANSI-A10 Series, Safety Requirements for Construction and Demolition.
3. NECA National Joint Guideline NJG-6, Temporary Job Utilities and Services.
4. Electrical Service: NEMA, NECA, and UL.

D. Field Offices: Contractor's field offices are not required for the Project but can be provided at the Contractor's option. Location of trailer on site must be approved by the City and Recreation Center Staff.

E. Storage Containers: At Contractor's option, provide storage containers for Contractor's use as needed. Locate sheds where acceptable to City. Prior to completion of construction, temporary storage facilities and surplus stored materials shall be removed from the site.

F. Equipment and Tools: Provide all equipment including, but not limited to, hoists, lifts, scaffolding, machines, tools, and the like, as needed for execution of the work. Provide safe access to all parts of the work.

G. Temporary Enclosures: Provide temporary enclosures to maintain proper temperatures and to prevent weather damage. Always maintain legal means of egress.

H. Snow and Ice: Remove all snow and ice which interferes with work or safety.

I. Streets Walks and Grounds: Maintain public and private roads and walks clear of debris caused by construction operations. Repair all damage caused to streets, drives, curbs, sidewalks, fences, poles, and similar items where disturbed or damaged by building construction and leave them in as good condition after completion of the work as before operations started.

J. Protection: Protect nearby property and the public from construction activities. Provide and maintain barricades, warning signs and lights, railings, walkways, and similar items. Immediately repair damaged property to its condition before being damaged.

K. Construction Barrier: Provide construction barriers as applicable to the project and as required by code to protect personnel, the public, and to control access.

L. Fire Prevention: Take every precaution to prevent fire. Provide and maintain in good operating condition suitable and adequate fire protection equipment and services and comply with recommendations regarding fire protection made by the representative of the fire insurance company carrying insurance on the Work or by the local fire chief or fire marshal. The area within the site limits shall be kept orderly and clean, and all combustible rubbish shall be promptly removed from the site.

M. Egress: Maintain safe and legal means of egress at all times. At all times, provide at least two separate means of egress.

1.18 TEMPORARY UTILITY INSTALLATION AND USE CHARGES

A. Installation, removal, and use charges for temporary facilities to be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Owner, Architect, testing agencies, and authorities having jurisdiction.

B. Water Service: Contractor may use domestic water from the project site at no cost.

C. Electric Power Service: Owner will pay electric-power-service use charges for electricity used by all entities for construction operations.
   1. Basic housekeeping electric power from Owner's existing temporary service system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

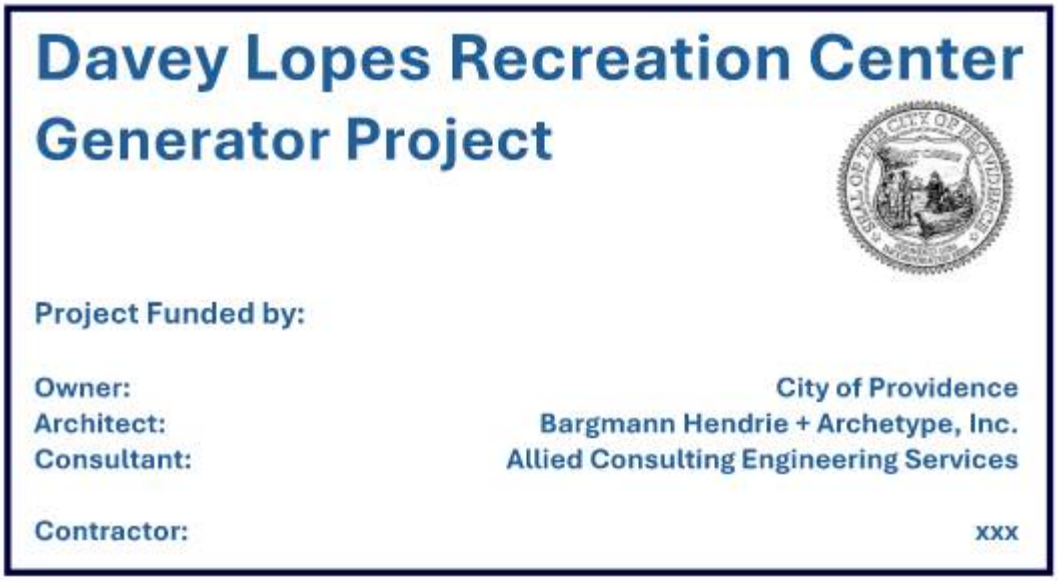
D. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Electronic Communication Service: Contractor’s staff shall have access to cellular phones or tablets capable of voice communications, and transfer of files, images, and email.

1.19 TEMPORARY PROJECT SIGN

A. Project Identification Sign: Prepare Project identification signs in size indicated.
   1. Install Sign as directed by the Owner, OPM and Architect.
   2. Do not permit installation of unauthorized signs.
   3. Engage an experienced sign fabricator to apply graphics for Project identification signs. Comply with details indicated.
   4. Construct sign of exterior-type Grade B-B high-density concrete form overlay plywood in, no less than ½ inch in thickness. Support on posts or framing of preservative-treated wood or steel.
   5. Paint sign panel and applied graphics with exterior-grade alkyd gloss enamel over exterior primer or provide weatherproof acrylic sheet over face of sign.
   6. Paint rear face of sign, edges and supports to protect material
   7. Maintain sign throughout construction; relocate as required. Provide temporary supports system as required.

B. SIGN 1: 4 Feet by 6 feet Sign Text: (Final Artwork and Layout will be provided by Architect in electronic format to Contractor.)



C.

1.20 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

A. Regulatory Requirements: Comply with transportation and disposal regulations of authorities having jurisdiction.

B. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

C. Remove from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
   1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

D. General: Except for items or materials to be salvaged or recycled, remove waste materials, and legally dispose of at designated spoil areas on Owner’s property.

E. Burning: Do not burn waste materials.

1.21 PRODUCTS AND SUBSTITUTIONS

A. Specified Products: In all cases in which a manufacturer's name, trade name or other proprietary designation is used in connection with materials or articles to be furnished under this Contract, whether or not the phrase "or equal" is used after such name, the Contractor shall provide the product of the named manufacturers without substitution, unless a written request for a substitution has been submitted by the Contractor and approved in writing by the Architect.

B. Deviations from Detailed Requirements: If the Contractor proposes to use material which, while suitable for the intended use, deviates in any way from the detailed requirements of the Contract Documents, the Contractor shall inform the Architect in writing of the nature of such deviations at the time the materials is submitted for approval and shall request written approval of the deviation from the requirements of the Contract Documents.

C. Approval of Substitutions: In requesting approval of deviations or substitutions, the Contractor shall provide evidence, including, but not limited to manufacturer's data, leading to a reasonable certainty that the proposed substitution or deviation will provide a quality of result at least equal to that attainable if the detailed requirements of the Contract Documents were strictly followed. If, in the opinion of the Architect, the evidence presented by the Contractor does not provide a sufficient basis for such reasonable certainty, the Architect may reject such substitution or deviation without further investigation.

D. Intent of Contract Documents: The Contract Documents are intended to produce a building of consistent character and quality of design. All components of the building have been selected to have a coordinated design in relation to the overall appearance of the building. The Architect shall judge the design and appearance of proposed substitutes on the basis of their suitability in relation to the overall design of the Project, as well as for their intrinsic merits. The Architect will not approve as equal to materials specified proposed substitutes which in the Architect's opinion, would be out of character, obtrusive, or otherwise inconsistent with the character or quality of design of the Project. In order to permit coordinated design of color and finishes the Contractor shall furnish the substituted material in any color, finish texture, or pattern which would have been available from the manufacturer originally specified, at no additional cost to the Owner.

E. Additional Costs or Impact: Any additional cost, or any loss or damage arising from the substitution of any material or any method for those originally specified shall be borne by the contractor, notwithstanding approval or acceptance of such substitution by the Owner or the Architect, unless such substitution was made at the written request or direction of the Owner and the Architect. Any decrease in the cost of the substitution shall be returned to the Owner.

F. Manufacturers: To the greatest degree possible, provide primary materials and products from one manufacturer for each type or kind. Provide secondary materials as recommended by manufacturers of primary materials.

G. Substitution Requests: Identify product to be replaced by substitute by reference to specification sections and drawing numbers. Provide Contractor's certification and evidence to prove compliance with Contract Document requirements as acceptable to Architect.

H. Substitution Conditions: Substitution requests will be returned without action unless one of the following conditions is satisfied. The Contractor shall state which of the following conditions applies to the requested substitution:

1. Request is due to an "or equal" clause.
2. Specified material or product cannot be coordinated with other work.
3. Specified material or product is not acceptable to authorities having jurisdiction.
4. Substantial advantage is offered Owner in terms of cost, time, or other valuable consideration.
5. Specified material or product is not available.

I. Invalid Substitutions: Contractor's submittal and Architect's acceptance of shop drawings, samples, product data or other submittal is not a valid request for, nor an approval of a substitution unless the Contractor presents the information when first submitted as a Request for Substitution.

J. Compatibility of Materials Used in the Work:

1. Ensure complete compatibility between materials.
2. Compatibility shall include adhesion, erosion, solubility, differential thermal response, and galvanic action.
3. Provide evidence of compatibility.
4. Provide custom testing where evidence is not available.
5. Where materials are not compatible, provide necessary isolation or transition materials and provide details of same.
6. Correct defects resulting from incompatibility including de-construction and re-construction of assemblies – whether materials are part of a submittal and substitution process or not.
7. Proposed substitutions may be rejected where compatibility information is not provided; or where compatibility is not adequately addressed, according to the Architect's judgment; or where incompatible materials would negatively impact the project's success.

1.22 DELIVERY, STORAGE AND HANDLING

A. Manufacturer's Instructions: Strictly comply with manufacturer's instructions and recommendations and prevent damage, deterioration, and loss, including theft. Minimize long-term storage at the site. Maintain environmental conditions, temperature, ventilation, and humidity within range permitted by manufacturers of materials and products used.

1.23 RECORD DOCUMENTS

A. General: Keep record documents neatly and accurately. Record information as the work progresses and deliver it to Architect at time of final acceptance.

B. Specifications: Maintain one clean copy of complete specifications including addenda, modifications, and bulletins with changes, substitutions, and selected options clearly noted. Circle or otherwise clearly indicate which manufacturer and products are actually used.

1.24 PROJECT CLOSE OUT

A. Complete the following prior to Substantial Completion:

1. Provide Contractor's Punch List of incomplete items stating reason for incompletion and value of incompletion.
2. Submit all warranties, maintenance contracts, final certificates, and similar documents.
3. Obtain Certificate of Occupancy and similar releases which permit the Owner's full and unrestricted use of the areas claimed, "Substantially Complete".
4. Submit record documents.
5. Deliver maintenance stocks of materials where specified.
6. Complete clean up and restoration of damaged finishes.

7. Remove all temporary facilities and utilities that are no longer needed.
8. Request Architect's inspection for Substantial Completion.

B. Architect will either issue a Certificate of Substantial Completion or notify Contractor of work which must be performed prior to issue of certificate.

C. Complete the following prior to Final Acceptance and payment:

1. Obtain Certificate of Substantial Completion.
2. Submit final application for payment, showing final accounting of changes in the work.
3. Provide final releases and lien waivers not previously submitted.
4. Submit certified copy of final punch list stating that Contractor has completed or corrected each item.
5. Submit Consent of Surety for final payment.

1.25 CLOSEOUT SUBMITTALS

A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

B. Format: Submit operation and maintenance manuals in the following format:
1. Submit digital media acceptable to the City. Enable reviewer comments on draft submittals.
2. Submit one (1) final copy.

1.26 FORMAT OF MAINTENANCE MANUALS

A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

B. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes.

1.27 CLEANING AND REPAIR

A. Clean Up: Immediately prior to the Architect's inspection for Substantial Completion, the Contractor shall completely clean the premises and clean and prepare the completed work in order for it to be used for its intended purpose in accordance with the Contract Documents.

B. Repairs: Repair and touch-up all damaged and deteriorated products and surfaces

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

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SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Concrete materials.

B. Related Sections:
   1. Section 260000- Electrical for coordination with electrical duct bank
   2. Section 260100-Generator for coordination of generator

1.2 ACTION SUBMITTALS

A. Product data.

B. Design Mixtures: For each concrete mixture, include the following:

   1. Mixture identification.
   2. Compressive strength at 28 days or other age as specified.
   3. Durability exposure classes for Exposure Category F.
   4. Maximum w/cm ratio.
   5. Slump or slump flow limit.
   6. Air content.
   7. Nominal maximum aggregate size.
   8. Reinforcing Steel

1.3 INFORMATIONAL SUBMITTALS

A. Testing Agency: Include documentation indicating compliance with ASTM E329 or ASTM C1077 and copies of applicable ACI certificates for testing technicians or ACI Concrete Construction Special Inspector - MH, ASCC.

B. Material certificates.

C. Material test reports.

PART 2 - PRODUCTS

2.1 CONCRETE STANDARDS

A. ACI Publications: Comply with ACI 301 (ACI 301M) unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

A. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type I gray.

B. Normal-Weight Aggregates:

1. Coarse Aggregate: ASTM C33/C33M, Class 3M.
2. Maximum Coarse-Aggregate Size: 3/4-inch nominal.
3. Fine Aggregate: ASTM C33/C33M.

2.3 ADMIXTURES

A. Air-Entraining Admixture: ASTM C260/C260M.

B. Chemical Admixtures: Do not use calcium chloride or admixtures containing calcium chloride[.
1. Water-Reducing Admixture: ASTM C494/C494M, Type A.

C. High-Range Water-Reducing Admixture: ASTM C 494, Type F or Type G.

D. Water-Reducing, Retarding Admixture: ASTM C 494, Type D.

2.4 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, Grade 60 deformed.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.
1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
    a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, or all-plastic bar supports.

2.5 CURING MATERIALS

A. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.
1. Color:
    a. Ambient Temperature Below 50 deg F (10 deg C): Black.
    b. Ambient Temperature between 50 and 85 deg F (10 and 29 deg C): Any color.
    c. Ambient Temperature Above 85 deg F (29 deg C): White.

B. Water: Potable water that does not cause staining of the surface.

2.6 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3 mm) and that can be feathered at edges to match adjacent floor elevations.

2.7 CONCRETE MIX DESIGN

A. Exterior Concrete and Duct Bank Proportion normal-weight concrete with the following properties:
   1. Compressive Strength (28 Days): 4000 psi
   2. Maximum Slump: 4 inches at point of discharge (at the truck).
   3. Slump may be increased to 6 inches with use of Mid-Range Water Reducing Admixture. (after Field verification of original slump limit)
   4. Air-entrained
   5. Maximum water-cement ratio: 0.44

B. Under no conditions shall water be added to the concrete mixes at the site.

C. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in Work.

D. All pumped concrete shall contain mid-range water reducing admixture or high range water reducing admixture (superplasticizer) added at the site. Maintain slumps as specified above

2.8 ADMIXTURES

A. Use mid-range water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for pumping, placement and workability.

B. Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees F.

C. Use air-entraining admixture in exterior exposed concrete unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus or minus 1-1/2 percent within the following limits:
   1. Concrete structures and slabs exposed to freezing and thawing, deicer chemicals, or hydraulic pressure: 5.0 percent (moderate exposure); 6.0 percent (severe exposure) for 3/4-inch maximum aggregate.

D. Use admixtures for water reduction and set accelerating or retarding in strict compliance with manufacturer's directions.

2.9 CONCRETE MIXING

A. Ready-Mixed Concrete: Comply with requirements of ASTM C 94, and as specified.
   1. When air temperature is between 85 degrees F and 90 degrees F, reduce mixing and delivery time from 1-1/2 hours to seventy-five 75 minutes, and when air temperature is above 90 degrees F, reduce mixing and delivery time to sixty (60) minutes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before placing concrete, verify that installation of concrete forms, accessories, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 TOLERANCES

A. Comply with ACI 117 (ACI 117M).

3.3 INSTALLATION OF STEEL REINFORCEMENT

A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.

B. Accurately position, support, and secure reinforcement against displacement.
   1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
   2. Do not tack weld crossing reinforcing bars.

C. Preserve clearance between bars of not less than 1 inch (25 mm), not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.

D. Provide concrete coverage in accordance with ACI 318 (ACI 318M).

E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

F. Splices: Lap splices:

   1. Bars indicated to be continuous, and all vertical bars to be lapped not less than 36 bar diameters at splices, or 24 inches (610 mm), whichever is greater.
   2. Stagger splices in accordance with ACI 318 (ACI 318M).

G. Verification of Conditions:
   1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
   2. Do not proceed until unsatisfactory conditions have been corrected.

3.4 FORMS

A. General: Design, erect, support, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances and surface irregularities complying with the following ACI 347.

B. Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

3.5 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
   1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
   2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

B. Notify testing and inspection agencies 24 hours prior to commencement of concrete placement.

C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by in writing, but not to exceed the amount indicated on the concrete delivery ticket.

D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 but not to exceed the amount indicated on the concrete delivery ticket.

E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.
   1. If a section cannot be placed continuously, provide construction joints as indicated.
   2. Deposit concrete to avoid segregation.
   3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
   4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301 (ACI 301M).
      a. Do not use vibrators to transport concrete inside forms.
      b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer.
      c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
      d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

3.6 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

1. ACI 301 Surface Finish SF-3.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.
   a. Patch voids larger than 3/4-inch-wide or 1/2 inch deep.
   b. Remove projections larger than 1/8 inch.
   c. Patch tie holes.
   d. Locations: Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

3.7 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
   1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
   2. Comply with ACI 301 and ACI 305.1 (ACI 305.1M) for hot-weather protection during curing.

B. Curing Formed Surfaces: Comply with ACI 308.1 (ACI 308.1M) as follows:
   1. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.

3.8 CONCRETE SURFACE REPAIRS

A. Defective Concrete:
   1. Repair and patch defective areas when approved by Architect.
   2. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

3.9 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.

B. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

3.10 PROTECTION

A. Protect concrete surfaces after placement.

END OF SECTION 033000

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Metal bollards.
   2. Painting of bollards

1.2 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

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

1.3 ACTION SUBMITTALS

A. Product Data:
   1. Metal bollards.
   2. Paint

B. Shop Drawings: Show fabrication and installation details. Provide Shop Drawings for the following:
   1. Metal bollards.

PART 2 - PRODUCTS

2.1 METALS

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

B. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.

2.2 MISCELLANEOUS MATERIALS

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

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

C. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa).

2.3 FABRICATION, GENERAL

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

2.4 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 40 steel

B. Galvanize and Prime steel bollards with compatible with paint system.

C. Coating Applicator: For the purpose of establishing a standard of quality and performance, provide factory-applied metal coatings by Duncan Galvanizing, 69 Norman Street, Everett, MA, 02149, telephone 617-389-8440, fax 617-389-2831, www.duncangalvanizing.com.
   1. Duragalv® Hot-dip galvanizing for iron and steel fabrications.
   2. Option: Primergalv® Hot-dip galvanizing and factory-applied high performance polyamide epoxy primer for iron and steel fabrications.

D. Hot-Dip Galvanizing: For steel exposed to the elements, weather or corrosive environments and other steel indicated to be galvanized, provide coating for iron and steel fabrications applied by the hot-dip process. Galvanizing bath shall contain special high-grade zinc and other earthly materials.

E. Factory-Applied Primer Option over Galvanized Steel: Provide factory-applied polyamide epoxy prime coat over hot-dipped galvanized steel.
   1. Basis-of-Design: PRIMERGALV®.
   2. Primer shall be certified OTC/VOC compliant at less than 2.8 lbs./gal. and conform to EPA and local requirements.
   3. Apply primer within 12 hours after galvanizing or blasting at the same galvanizer's plant in a controlled environment meeting applicable environmental regulations and as recommended by the primer coating manufacturer. Primer shall have a one-year re-coat window for application of finish coat.

2.5 PAINT

A. Ferrous Metal, Galvanized-Metal:
   1. Water-Based Light Industrial Coating System:
      a. Prime Coat: Primer, water based.
         1) S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series, 5.0 to 10.0 mils (0.127 to 0.254 mm) wet, 2.0 to 4.0 mils (0.051 to 0.102 mm) dry.
      b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
      c. Topcoat: Light industrial coating, exterior, water based, semi-gloss.
         1) S-W Pro Industrial Acrylic Semi-Gloss Coating, B66-650 Series, at 2.5 to 4.0 mils (0.064 to 0.102 mm) dry, per coat.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

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

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

3.2 INSTALLATION OF METAL BOLLARDS

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

B. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches (75 mm) above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.

C. Fill bollards solidly with concrete, mounding top surface to shed water.

3.3 PAINTING

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

END OF SECTION 055000

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SECTION 220000 - PLUMBING

1 PART 1 - GENERAL

SCOPE OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this section and, without limiting the generality thereof, including:
   1. Addition and modification to natural gas piping system.
B. Related work in Other Sections:
   1. Cutting and patching.
   2. Excavation, trenching and backfill.
   3. All electric power wiring, except as specified herein.
   4. Installation of access panels.
   5. Painting.

CODES, ORDINANCES AND PERMITS

C. All work shall be installed in accordance with the laws, ordinances, rules and regulations of all local and state authorities having jurisdiction, and the rules and regulations of the International Plumbing and Gas Codes. In case of conflict, the higher standard shall prevail. Extra payment will not be allowed for work or changes required by code enforcement authorities.
D. Apply and pay for inspection permits, certificates of inspection, and license fees in connection with this work, and deliver to the Owner at the completion of the work. All diagrams or drawings required by local or state authorities shall be supplied by This Contractor.

JURISDICTIONAL DISPUTES

E. Subcontract all portions of this work as necessary to avoid jurisdictional disputes and work stoppages that could arise during the installation of this work.

INTENT

F. It is the intention of these specifications and drawings to require the equipment to be furnished complete in every respect, and This Contractor shall furnish all equipment needed and usually supplied in connection with such systems. Equipment, materials and articles incorporated in the work shall be new, and of the best grade of their respective kinds for the type of work involved.

DRAWINGS

G. The drawings show the extent and general arrangement of piping, and locations of the equipment. Piping, fixtures, and equipment are shown diagrammatically. Plumbing Contractor shall be responsible for the locations in the most practical manner, free from interference with other piping or structural features. If any changes from the drawings are deemed advisable, details of such proposed changes shall be submitted for approval. No changes shall be made without such approval. Maintain maximum headroom or space conditions at all points. Where headroom or space conditions appear inadequate, Architect shall be notified before proceeding with the installation.

SHOP DRAWINGS AND SUBMITTALS

H. Within thirty days after award of the contract, provide one electronic copy of schedule of materials proposed to be submitted for approval, prior to submission of any detailed drawings. The Architect will review this schedule and may supplement it with additional items or eliminate some items.

I. Supply manufacturers' drawings of all materials, equipment and apparatus remaining on the list, giving full information as to dimensions, construction, capacity and other pertinent facts, which shall be submitted to the Architect, and approval secured, before apparatus is ordered, built or installed. Samples shall be submitted, if required.

J. Approval by the Architect of shop drawings for any materials, apparatus, devices and layouts shall not relieve the responsibility of furnishing same of proper dimensions, size, quantity, quality and all performance characteristics to efficiently perform the requirements and intent of the contract documents. Such approval shall not relieve This Contractor from responsibility of errors of any sort on the shop drawings. If the shop drawings deviate from the contract documents, advise the Architect of the deviations in writing accompanying the shop drawings, including the reasons for the deviations. Shop drawings without specific notations or without schedules as described herein, may be returned not approved. Each shop drawing for any item shall be clearly identified with codings used on the drawings complete with name and/or locations of equipment. Shop drawings covering more than one item shall be accompanied by a suitable location schedule.

K. Shop drawings are required for:

1. Plumbing equipment.
2. Plumbing fixtures.
3. Pipe and fittings.
4. Valves.
5. Pipe insulation.
6. Drains and appurtenances.
7. Pipe hangers, supports and special equipment.

SUBSTITUTIONS

L. Substitutions of equipment or materials other than those shown on the drawings or named in the specifications may be made only with the written approval of the Architect or Engineer, who reserves the right to require adequate proof of the quality of the substitute before permitting its use.

M. Where this Contractor proposes to use an item of equipment other than that specified or detailed on the drawings, which requires any redesign of the structure, partitions, foundations, piping, wiring, or of any other part of the mechanical, electrical or architectural layout, all such redesign, and all new drawings and detailing required therefore shall, with the approval of the Architect, be prepared by This Contractor at his expense.

N. Where such approved deviation requires a different quantity and arrangement of ductwork, piping, wiring, conduit and equipment from that specified or indicated on the drawings, with the approval of the Architect, This Contractor shall furnish and install any such ductwork, piping, structural supports, insulation, controllers, motors, starters, electrical wiring and conduit, and any other additional equipment required by the system, at no additional cost to the Owner.

COORDINATION DRAWINGS

O. Coordination drawings are for the General Contractor's and the Architect's use during construction and shall not be construed as replacing any shop, "as-built" or record drawings required elsewhere in these contract documents.

WORKMANSHIP

P. The entire work provided in this division shall be constructed and finished in a workmanlike and substantial manner. It is not intended that the drawings show every pipe, fitting and appliance, but This Contractor shall furnish and install all such parts as may be necessary to complete the systems in accordance with the best practice and to the satisfaction of the Architect.

Q. Keep other contractors fully informed as to the shape, size and position of all openings required for apparatus and give full information to the General Contractor and other subcontractors sufficiently in advance of the work so that all openings may be built in advance. Furnish and install all sleeves, supports, etc., specified herein, or required.

R. In case of failure to give proper and timely information, provide cutting and patching or have the same done by the General Contractor, but in any case, without extra expense to the Owner.

S. Obtain detailed information from the manufacturers of apparatus as to the proper method of installing and connecting same. Obtain all information from the General Contractor and other subcontractors which may be necessary to facilitate the work and the completion of the whole project.

ACCESSIBILITY

T. All work shall be installed so that all parts required are readily accessible for inspection, operation, maintenance and repair. Minor deviations from the drawings may be made to accomplish this end, but changes of magnitude shall not be made without prior written approval from the Architect.

PROTECTION

U. Be responsible for work and equipment until finally inspected, tested and accepted. Carefully store materials and equipment which are not immediately installed after delivery to the site. Close open ends of work with temporary covers or plugs during construction to prevent entry of obstructing material.

V. Protect work and material of other trades from damage that might be caused by work or workmen and make good any damage thus caused.

EXAMINATION OF SITE

W. Before submitting proposal, visit the site, examine its condition, and become acquainted with the obstacles and advantages for performing the work. Study the drawings and specifications explanatory of the work to be performed and compare them with the information gathered by the examination of the site.

X. No claim for extra compensation will be recognized if difficulties are encountered which an examination of the site conditions and contract documents prior to executing the contract would have revealed.

TEMPORARY OPENINGS

Y. Ascertain from examination of the architectural drawings, whether any special temporary openings in the building will be required for the admission of apparatus furnished under this contract, and notify the Architect accordingly. In the event of failure to give sufficient notice to the Architect in time to arrange for these openings during construction, assume all costs of providing such openings thereafter.

OPENINGS IN EXTERIOR WALLS

Z. Openings in exterior walls and roofs shall be kept properly plugged and caulked at all times, except when being worked on, to preclude the possibility of flooding due to storms or other causes. After completion of the work, openings for which This Contractor is responsible shall be permanently sealed and caulked in a manner approved by the Architect.

TESTS

AA. Furnish all labor, material, instruments, supplies and services, and bear all costs for the accomplishment of the tests specified herein. Correct all defects appearing under test, and repeat the tests until no defects are disclosed. Leave the equipment clean and ready for use.

BB. Perform all tests, other than specified herein, which may be required by legal authorities or by agencies to whose requirements this work is to conform.

GUARANTEE

CC. Attention is directed to the provisions of the GENERAL CONDITIONS and SUPPLEMENTARY CONDITIONS regarding guarantees and warranties for work under this contract.

DD. Manufacturers shall provide their standard guarantees for work under this section. However, such guarantees shall be in addition to, and not in lieu of, all other liabilities which the manufacturer and contractor may have by law or by other provisions of the Contract Documents.

EE. All materials, items of equipment and workmanship furnished under this section shall carry the standard warranty against all defects in material and workmanship. Any fault due to design which may develop shall be made good by and at the expense of This Contractor, including all other damage done to areas, materials and other systems resulting from this failure.

FF. This Contractor shall guarantee that all elements of the systems are of sufficient capacity to meet the specified performance requirements as set forth herein or as indicated.

GG. Upon receipt of notice from the Owner of failure of any part of the systems or equipment during the guarantee period, the affected part or parts shall be replaced.

HH. Any apparatus that requires excessive service during the guarantee period will be considered defective and shall be replaced.

II. Furnish, before the final payment is made, a written guarantee covering the above requirements.

2 PART 2 - PRODUCTS

PIPE AND FITTINGS

A. Gas piping:
   1. Standard weight black steel pipe, Schedule 40, ASTM-A- 120, Grade B, with steel fittings, threaded for piping 2" and smaller, welded for piping larger than 2".
   2. CSST will be considered as a deduct alternate.

VALVES

B. Each valve type shall be of same manufacturer and appropriate for service in which used; valves shall be Nibco, Watts, Apollo or approved equal.

   Type proposed for each service shall be submitted for approval. In general, shut-off valves, except for exposed stops at fixtures, shall be ball valves.

C. Each system shall be provided with valves as required by Code and as specified. Valves shall be installed for isolation and to facilitate operation, replacement and repair. Provide access panels where valves are concealed behind non- removable ceilings or walls. Provide shut off valves for gas and water supply piping to individual fixtures and appliances.

D. Valves shall be:
   1. Gas valves – Nibco GB1A ½”-1”, Apollo 50 Series 1¼”-2½”.

MISCELLANEOUS PIPING MATERIALS

E. Nipples: Nipples shall conform to WW-N-351 and shall be the same material as the piping in which installed.

F. Unions: Unions shall be brass or bronze, 125 lb., either threaded or with solder joint ends, conforming to WW-U-516 for use in copper tubing. For use in steel piping unions shall conform to WW-U-531.

G. Insulating bushings and Unions: hard rubber threaded bushing inserted between two dissimilar metals.

H. Flanges on steel piping: carbon steel, 150 lb., welding neck or slip-on ASTM A181, Grade 1, ANSI B16.5

HANGERS, SUPPORTS AND INSERTS

I. Pipe - 2 inches and smaller - 1A band type complete with threaded rod hanger nut, lock nut and sized to encompass insulation and pipe supported, similar to Carpenter-Patterson Fig. 1A or 122 CT or equal.

J. Piping - 2-1/2 inches and larger - clevis hanger type complete with threaded rod, locking and adjusting nuts and sized to encompass insulation and pipe supported, similar to Carpenter-Patterson Fig. 100 or equal.

K. Where due to space requirements, pipe must run close to structure above, a roll hanger with two threaded rods and nuts shall be used similar to Carpenter-Patterson Fig. 142 or Fig. 109.

L. Supports for piping from below shall be Carpenter-Patterson Fig. 333 or equal.

M. Extension pipe or friction deck clamp shall be used on all piping except water piping passing through floors, similar to Carpenter-Patterson Fig. 126.

N. Pipe hangers and supports shall be installed for all piping systems as follows:

PIPE SIZE	MINIMUM ROD DIAMETER
to 1 inch	3/8 inch
to 2 inch	3/8 inch
to 3 inch	1/2 inch
to 6 inch & larger	5/8 inch

O. Hangers and supports shall be furnished complete with all appurtenances and shall be Central Iron, Grinnell, Carpenter-Patterson, or equal. Hangers and supports shall be hot-dipped galvanized where exposed and dip painted, where concealed. Copper tubing shall be suspended from copper plated hangers.

SLEEVES

P. Sleeves for piping passing through foundation walls shall be steel pipe, standard weight, two sizes larger than pipe.

Q. Sleeves for piping passing through interior wall shall be twenty gauge galvanized sheet metal and shall be set flush with walls.

R. Sleeves for piping passing through concrete floors shall be black steel pipe and shall extend one inch above floor and be flush below. Within chases 26-gauge galvanized sheet metal may be used.

S. All plumbing piping passing through foundation walls shall be provided with expandable wall hole closure. Closure shall be Link-Seal as manufactured by Thunderline Corp.

T. All sleeve openings around piping other than those provided with Link-seals shall be sealed with fire-retardant silicone foam as manufactured by Chase Technology Corp.

ACCESS PANELS

U. Furnish access panels for access to plumbing equipment. The sizes of the access panels for hidden valves, cocks and cleanouts in walls and ceilings shall be 12 x 12 inches. The panels shall be factory fabricated completely flush with heavy metal door and frame. Frames shall be welded construction of not less than 14-gauge steel, with heavy piano type hinges set flush with frame, and shall be secured in the closed position. In no case shall opening of the door require removal of nuts, bolts, screws, wing-nuts wedges or any other screwed or loose device. Access panels shall have UL rating, conforming to requirements of area in which it is installed. Access panels shall be Milcor, WayLocktor, Jay R. Smith or equal. Access panels shall be turned over to the General Contractor for installation. Access panels shall not be required in removable tile ceilings. Access panels in fire rated ceilings and/or walls shall have U.L. fire ratings comparable to that location installed.

SPECIALTIES AND ACCESSORIES

V. Vacuum breakers shall have bronze body and internal trim with high temperature resisting rubber disc and external trim, similar to Chicago, Beacon, Watts #188, or equal. Furnish at hose bibbs, wall hydrants and at locations shown on the drawings and governed by code.

W. Backflow preventer assemblies shall be equal to Watts, Series 909, Rockwell, Hersey or equal, installed where shown and noted on drawings or as required by code to prevent contamination of the potable water system. Furnish test and rebuilding kits to Owner.

INSULATION

X. All insulation work shall be as manufactured by Johns-Manville, Gustin-Bacon, Owens-Corning Fiberglass Corp. or equal, and be executed by a qualified Insulation Sub-contractor who is thoroughly experienced in this type of work, who has adequate facilities and equipment for erecting same; who is acceptable to the Architect. Application and finish on all pipes, fitting and valves shall be as recommended by manufacturer and approved by the Architect. Details shall be submitted for approval. All jackets and adhesives shall be flame retardant. Insulation shall be provided on all piping, valves and fittings.

Y. All pipe insulation shall have a flame spread rating of 25.

3 PART 3 - EXECUTION

INSTALLATION

A. The plumbing drawings intend to show only the scope of the design, and the Plumbing Contractor shall be responsible for the correct installation of his work in a manner satisfactory to the best practices of his trade and to complete the scope of this work in all respects.

B. The location of piping as indicated on the drawings is shown diagrammatically only, and the exact location shall be determined in the field. The run and arrangement of all pipes shall be approximately as shown on the drawings, as directed during installation, as straight and direct as possible, forming right angles or parallel lines with building wall and other pipes, and neatly spaced. All risers shall be erected true and plumb, parallel with walls and other pipes, and neatly spaced. All horizontal runs of piping except where concealed in partitions, shall be kept as high as possible and close to walls. Wherever possible, adjacent pipe lines, both heating and plumbing, shall be grouped in the same vertical or horizontal planes. All piping shall be concealed and shall have a minimum number of fittings. Piping shall not interfere with the operation or accessibility of doors, windows, access panels, or equipment and shall not encroach on aisles or passageways. All piping shall be installed to preserve access to all valves, traps and equipment.

C. This Contractor shall be responsible for the correctness of field dimensions and shall check for himself all grades, lines, measurements, and other data in any way affecting his work. He shall refer to the project, phasing schedule together with architectural, structural, and drawings of other trades for a full comprehension of the extent of the work to be performed and to avoid interference, and shall not be entitled to any extra compensation for any additional work or expense arising from his failure to do so. In case interference develops, the Architect shall decide which work is to be relocated, regardless of which was first installed. Work installed by the Contractor which is improperly located and/or interferes with or modifies either the phasing schedule or the architectural or structural design, shall be changes as directed by the Architect, and all costs incidental to such changes shall be paid by the Plumbing Contractor.

D. The Plumbing Contractor shall also provide the necessary data and supervision for the provision of all openings in the structure, including bolt hole templates, weights of equipment and manufacturer's recommendations for proper emplacement design. This shall be furnished to the General Contractor and other related trades.

E. No plumbing fixtures, devices, equipment or piping shall be installed which will provide a cross or interconnection between a distributing supply for drinking or domestic hot water system and a polluted supply or drainage system. Backflow preventers and vacuum breakers shall be installed where noted on the drawings, and in conjunction with all hydrants, hose bibbs, water lines to equipment, water closets, service sinks, and where required to prevent polluted back siphonage.

F. All exposed runouts to equipment, materials and fixtures having chrome plated trim and/or fittings shall be chrome plated brass with chrome plated brass fittings, unless otherwise noted.

PIPE JOINTS

G. Joints for cast iron soil pipe shall be made with rubber gaskets conforming to State Plumbing Code.

H. Joints for PVC piping shall be made using a purple primer that conforms to ASTM F 656 and a solvent cement conforming to ASTM D 2564.

I. Soldered joints on water and waste piping shall be made up using lead-free tin antimony solder, conforming to Fed. Spec. QQ-S-571C, and joint shall be filled the full length of the socket. The fitting shall be heated evenly to the proper temperature to run the solder. The ends of the tubing and the inside of the fitting shall be thoroughly cleaned to a bright shining finish before applying flux. Flux shall be non-corrosive type conforming to Fed. Spec. 0-F-506.

VALVES

J. All piping systems shall be provided with valves so located that they can be operated, replaced, repaired and offer complete control to each group of fixtures, appliance, equipment, and each gas, hot and cold water branch. Each fixture, appliance or piece of equipment shall have a separate shut-off valve, furnished and installed, of approved type, for service to be connected to. Locate valves on supply and return, at each piece of equipment or fixture, each side of regulating valves, each side of pumps, each side of meter and on main branches. Drain valves on systems containing water shall be installed at the base of each riser (after the shut-off valve), on down- fed fixtures and at equipment, also at such other locations as required to allow for complete drainage of the system. Valves shall be located as shown on the drawings or as here-in-before specified.

HANGERS AND SUPPORTS

K. Sanitary piping shall have a hanger spacing as specified in the IPC. Water and gas piping shall be supported at all changes in direction, on branch lines regardless of length, at base and at top of risers, and in accordance with local and state code. Piping adjacent to floor, where ceiling hangers are impractical, shall be adequately supported by a suitable hanger, as approved by the Architect, with rod to plate at floor, said plate to be secured to floor.

ACCESS PANELS

L. Access panels shall be turned over to the General Contractor for installation into structure. This Contractor shall direct the General Contractor as to location of access panels.

SLEEVES

M. Provide sleeves for all piping penetrating new walls, ceilings and floors. Where pipes run through sleeves, the annular openings shall be sealed with fire resistant materials as called for under Part 2 - MATERIALS.

PIPE LABELS

N. Label shall be plastic and self-adhesive and shall be installed on the insulation jacket.

O. Labels shall be every 10 feet and not more than 5 feet from changes in direction.

TESTING

P. The Plumbing Contractor shall notify the Architect three working days prior to day tests are to be made. Test all piping and make it gas and water tight, in accordance with the authority having jurisdiction and ordinances, and in the presence and to the satisfaction of the applicable Inspector along with the Architect and his representative.

Q. No piping shall be buried, concealed or insulated before tested and approved. Partial tests shall be made as required, by the progress of the work, and the Plumbing Contractor shall accommodate the testing operations to the progress of the project. Furnish all equipment, labor, services and apparatus, also pay for all costs for pertinent tests. All approvals shall be rendered in writing and submitted to the Architect. Remedy all defective work and replace all defective materials, equipment or fixtures with new ones of the specified grade. No caulking, peening, or wicking of screwed joints or holes will be acceptable. This Contractor shall make and remove all temporary piping and line connections required for the tests and shall dispose of test water and all wastes after tests in a satisfactory and non-damaging manner.

R. Piping Systems

1. Gas piping shall be subjected to a pressure of 150 psi air pressure. Pressure shall be maintained for two hours.

CLEANING AND STERILIZATION OF SYSTEMS

S. The Plumbing Contractor shall be responsible for the cleaning and purging of all pertinent systems after installation and before system operation. Any damage to part of the building, its finish or furnishings, due to This Contractor's failure to properly clean the system, shall be repaired or replaced, at his expense.

T. All finished metal work shall be cleaned, polished and left bright. All equipment, pipe, valves, drains and fittings shall be cleaned of grease, metal cutting and sludge, which may have accumulated during construction and/or testing.

U. The Plumbing Contractor shall refinish and restore to its original condition all plumbing equipment which has sustained damage to the manufacturer's prime and finish coats of paint and/or enamel.

GAS SERVICE

V. Make connections outside the buildings and extend piping into the buildings.

COORDINATION DRAWINGS

W. This Contractor shall indicate all plumbing piping on the set of mylar drawings prepared by the General Contractor for the purposes of coordinating the entire mechanical/electrical systems. These drawings shall be the basis of the piping installation.

END OF SECTION 220000

SECTION 260000 – ELECTRICAL

1 GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT, CONDITIONS OF THE CONTRACT, and all Sections within DIVISION 1 - GENERAL REQUIREMENTS, are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials, and equipment necessary to complete the work of this Section, including, but not limited to, the following:

1. Complete main power distribution system including main distribution switchboard with main service disconnect switch, power distribution section, over current protective devices, all provisions for metering including utility metering, surge protection, and secondary feeders from utility transformer to main service disconnect.
2. Partial building secondary power distribution system with lighting and power distribution panelboards, and all feeders.
3. Main grounding system as required by Article 250 of the National Electrical Code.
4. Complete raceway system with conduits, conduit fittings, outlet boxes, wire ways, hangers, supports, and all incidental items as required for a complete installation. Raceway systems installed exposed in all finished areas shall be specifically designed for the application.
5. All shown wiring devices including duplex receptacles and special power outlets. Provide cover plates for all wiring devices.
6. Vendor services, testing and training.
7. All devices and products under this section are to meet the voltage requirements available on site. It the Electrical Contractor’s responsibility to ensure this.

B. Items to be installed only: Install items as furnished by the following designated sections:

1. PLUMBING (GAS LINE ONLY)

C. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. SECTION GENERAL CONDITIONS OF THE CONTRACT.
    a. Cutting, patching and drilling, except installation of pipe supports and fastenings.
2. EARTHWORK.
    a. All excavation and backfill.
3. CAST-IN-PLACE CONCRETE.
    a. All concrete work.
4. COMMISSIONING – SEE SECTION 018100 AND PROVIDE ACCORDINGLY. All Electrical commissioning requirements in Section 018100 – General Commissioning Requirements.

D. Extent: The work required under this Section, without limiting the generality thereof, includes the furnishing of all labor and materials required to supply and distribute proper

power, including all conduit and controls, to all electrical fixtures, accessories, devices, motors, motor controllers, etc., and the special systems called for under all Sections of the Specifications, and all other materials, equipment, and labor necessary, whether or not such items are specifically indicated on the Drawings or in the Specifications to complete the electrical work, in all respects ready for continuous and trouble free operation.

E. Intent: It is the intent of the Contract Documents to include all work and materials necessary for erecting complete, ready for continuous use, all electrical and special systems shown on the accompanying Drawings, or as hereinafter described. These Drawings shall be taken in a sense as diagrammatic; branch circuit runs, electrical equipment, etc. and methods of running them are shown, but it is not intended to show every fitting, wire, or device, nor every structural difficulty that will be encountered during the installation of the work.

1.3 SCOPE OF WORK

1. Coordinate all work in this Section with related trades.
2. Furnish all materials, equipment, supplies, transportation and labor, and perform all operations necessary in the installation of all electrical work, complete and in operating condition.
3. Examine the drawings and specifications and determine work to be performed by the electrical and other trades. Provide the type and quantity of electrical materials and equipment necessary to complete this work and place all systems in proper operation, tested and ready for use.
4. Work Included: In general, the electrical work shall consist of, but not be limited to, the following:
    a. Incidental items not indicated on the drawings nor mentioned in the specifications that belong to the work described or are required to provide a complete system as though called out here in every detail.
    b. Acquire all permits as may be necessary to perform the specified work.
5. Work Related to the Mechanical Trade, shall be included under the Electrical Section of the Work. Coordinate work with the Mechanical Contractor.
6. The requirements of authorities shall be the minimum acceptable requirements for the work and nothing described in these specifications or indicated on the drawings shall be construed to permit work not conforming to the most stringent of the applicable codes and regulations.
7. When drawings or specifications call for materials or construction of better quality or larger size than required by codes, laws, rules and regulations, the drawings and specifications shall take precedence.
8. Should any changes to the work indicated on the drawings or described in the specifications be necessary in order to comply with the above requirements, notify the Architect immediately and cease work on all parts of the Contract which are affected until approval for any required modifications to the construction has been obtained from the Architect.

B. WORK RESPONSIBILITIES

1. Examine the site and all electrical, architectural and other drawings and accept such conditions and make allowance for them in preparing the bid. No extra charges will be considered for costs resulting from failure to comply with the above.

2. The drawings indicate diagrammatically the desired locations or arrangements of conduit runs, outlets, equipment, etc. and are to be followed as closely as possible. Proper judgment must be exercised in executing the work so as to secure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference with structural conditions. The contractor is responsible for the correct placing of his work and the proper location and connection of his work in relation to the work of other trades.
3. Locations shown on architectural and ceiling plans and/or wall elevations shall take precedence over electrical plan locations, but where a major conflict is evident, notify the Architect for instructions prior to commencing work on the same.
4. In the event changes in the indicated locations or arrangements are necessary due to developed conditions in the building construction or rearrangement of furnishings or equipment, such changes shall be made without extra costs, providing the change is ordered before the conduit runs, etc. and the work directly connected to same is installed and no extra materials are required.
5. All scaled and figured dimensions are approximate of typical equipment of the class indicated. Before proceeding with any work, carefully check and verify all dimensions, sizes, etc. with the drawings to see that the equipment will fit into the spaces provided without violation of applicable codes.
6. Where equipment is furnished by others, verify voltage characteristics and dimensions and the correct locations of this equipment before proceeding with the roughing-in of connections.
7. Should any changes to the work indicated on the drawings or described in the specifications be necessary in order to comply with the above requirements, notify the Architect immediately and cease work on all parts of the Contract which are affected until approval for any required modifications to the construction has been obtained from the Architect.
8. Perform all work competent and skilled personnel.
9. All work shall be of the highest quality consistent with the best practices of the trade.
10. Replace or repair, without additional compensation, any work which, in the opinion of the Architect, does not comply with these requirements.
11. The Electrical Contractor shall be responsible for the safety and good condition of all materials and equipment until final acceptance by the Owner; for providing adequate and proper storage facilities during the progress of the work; for replacing all damaged and defective work before applying for final acceptance; for erecting and maintaining suitable barriers, protective devices, light and warning signs for the protection of the public and employees; and for all loss, damage or injury to persons or property resulting from any neglect of these responsibilities.
12. The Contractor shall be responsible for all faults and deficiencies in his work during the guarantee period and shall repair, at no cost to the Owner, all such deficiencies that occur immediately upon notification by the Owner. All damage to other work there from, which may occur during the construction and guarantee period, shall be repaired at once, at no cost to the Owner.

C. INTERPRETATION

1. All requests for interpretation of plans and specifications must be made by the Contractor through the Architect. Any such requests made by equipment manufacturer or suppliers will be referred to the Contractor.

D. SELECTION OF MATERIALS AND EQUIPMENT

1. Specified materials and equipment shall be selected within the operating ranges indicated for efficiency, capacities, noise levels, and projected life. In the absence of specific criteria, conservative commercial practice, in the opinion of the Architect, will apply.
2. Items of a similar application shall be of the same manufacturer.
3. The label of listing by Underwriters Laboratories, Inc. shall appear on all materials and equipment for which standards have been established by that agency.
4. Where local or other authorities have jurisdiction, have established label or approval requirements, furnish all materials and equipment with either the required labels affixed, or the necessary written approval.
5. The equipment plans are designed around standard products of one or more of the manufacturer's listed as being acceptable for the product involved. Where one or more manufacturer is listed as being acceptable for a product, each manufacturer listed for that product shall be considered as "equal" and acceptable.
6. All materials to be free of asbestos and urea formaldehyde.

1.4 QUALITY ASSURANCE

A. Execution:

1. The Electrical Subcontractor shall refer to all the Drawings for a full comprehension of the work to be done and for conditions affecting the location and placement of his equipment and materials. These Drawings are intended to be supplementary to the Specifications and any work indicated, mentioned, or implied in either is to be considered as specified by both. Should the character of the work herein contemplated or any matter pertaining thereto be not sufficiently explained in the Specifications or Drawings, the Electrical Subcontractor may apply to the Architect-Engineer for further information and shall conform to such when given, as it may be consistent with the original intent. The Architect-Engineer reserves the right to make any reasonable changes in location prior to installation at no expense to the Owner. All lines are diagrammatic and exact locations are subject to the approval of the Architect-Engineer.
2. Before submitting his bid, the Electrical Subcontractor shall visit the site with the Drawings and Specifications and shall become thoroughly familiar with all conditions affecting his work since the Electrical Subcontractor will be held responsible for any assumption he may make in regard thereto.
3. The Electrical Subcontractor shall, at all times, have a foreman or superintendent on the project authorized to make decisions and receive instructions as if the Electrical Subcontractor himself were present. The Electrical Subcontractor shall employ only competent and experienced workmen at a regular schedule in harmony with the other tradesmen on the job. The Electrical Subcontractor shall also exercise care and supervision of his employees in regard to proper and expeditious layout of his work.

4. When items in the contract drawings and specifications are in conflict, then the more stringent of the two shall take precedence.

B. Products:

1. All materials used in this Section shall be new, full weight, and first class in every respect, without defects, and designed to function properly in that portion of the work for which they are intended and with the same brand of manufacturers for each class of material or equipment.

2. Equality of material or equipment other than those named or described in this Section will be determined in accordance with the provisions of the Contract and as specified further herein.

C. All work installed under these Drawings and Specifications must be installed in strict accordance with the requirements of all local and other departments having jurisdiction, the utility companies, and with the requirements of the Underwriters' Laboratories, Inc., National Bureau of Fire Underwriters, International Building Code, National Electrical Code 2023 (USA), EIA/TIA Building Telecommunication Wiring Standard, and/or similar codes applied hereto.

1.5 CODES AND STANDARDS

A. Workmanship, material and equipment shall be in accordance with Specifications and Drawings and in some instances the requirements exceed those required by codes and standards. Where not exceeded, the codes and standards shall be considered as absolute minimum requirements. Where conflicts occur between codes the most stringent shall apply.

B. All materials, appliances, equipment and devices provided under this contract must meet the requirements of Underwriters Laboratories (UL) Standards.

C. Refer to NEC, for definitions of terms used in the Drawings, Specifications, etc. These definitions, in conjunction with local authorities interpretation, convention and common usage, will apply.

D. International Building Code.

E. International Fire Code

F. Rhode Island State codes

G. NEC 2023.

1.6 REFERENCE ABBREVIATIONS

A. References are made in the various Electrical Sections to technical societies, codes, specifications, trade organizations, and regulatory authorities in accordance with the following abbreviations:

1. ADA - Americans with Disabilities Act (1992).

2. FM - Factory Mutual

3. IEEE - Institute of Electrical and Electronics Engineers.

4. IPCEA - Insulated Power Cable Engineers Association.

5. NEC - National Electrical Code (NFPA Pamphlet No. 70).

6. NEMA - National Electrical Manufacturer's Association.
7. NETA - International Electrical Testing Association, Inc.
8. NFPA - National Fire Protection Association.
9. UL - Underwriters Laboratories, Inc.

1.7 SHOP DRAWINGS AND DATA TO BE SUBMITTED

A. Within 30 days of award of the Contract, the Electrical Subcontractor shall submit, for approval, six (6) copies of a complete list of manufacturer's shop drawings, detail prints and data.

B. **Items with lead times exceeding 6 months shall be submitted within 2 weeks of the contract being accepted. Unusual lead times shall explicitly be stated in the submittal including potential project impacts.**

C. Reference catalog cuts and brochures of products to proper paragraph in Specifications. Furnish numerical index by Specifications paragraph number listing product name, catalog number and reference to page number of submittal brochure.

D. Cross reference individual catalog numbers of substitute products to numbers of specified materials.

E. Bind submittal in booklet form.

F. Requests for permission to use substitute or alternate products shall be accompanied with evidence to prove that the product:

1. Conforms to the standard of performance and quality specified.
2. Will physically fit in the space allocated, with sufficient access and maintenance space.
3. Will not entail changes in details and construction of related work whether mechanical, electrical, or general in nature.
4. Involves no additional costs to the Owner or extended construction time.

G. Requests for permission to use substitute or alternate products shall be immediately brought to the Architect’s attention. In the event that the use of these products may be determined to result in a material or labor savings to the Contractor, then the amount of these savings as a credit to the Owner will be required to assist in determination of acceptability of the product. Provide drawings, specifications, samples, performance data and other information as may be required to assist in determination of acceptability of the product.

H. Equipment Items

1. Submit manufacturer's certified data relative to equipment required for the installation of the electrical systems.
2. Submit adequate engineering data on each piece of equipment to allow a careful check of compliance with the technical requirements of the Contract Documents. Clearly indicate on submitted data the manufacturer's name, piece number, equipment capacity, and other applicable technical data.
3. Data and drawings for Electrical Systems:

a. Wiring Devices
b. Panel boards
c. Raceways and Fittings
d. Switchboards
e. Underground Conduit
f. Wires and Cables
g. Transient Voltage Surge Suppressor
h. Electric metering components

4. Shop Drawings: Submit 1/4-inch minimum scale coordinated Shop Drawings relating to the equipment, and foundations, and dimensioned locations of each, including accessories, and showing clearances for operating and servicing. Provide a detailed layout of electrical rooms.
   a. Major conductor routing
   b. Major electrical equipment.
5. Do not release for shipment, deliver, or install any equipment or material without the prior approval of the Architect-Engineer.

1.8 OPERATING AND MAINTENANCE MANUALS

A. Bind in loose-leaf binders with the words, "Operating and Maintenance Manual" and the Project identification imprinted on the cover. Prepare three complete sets of records for the Owner, with table of contents, index, and tabbed section dividers.

B. During the construction period, accumulate the following for inclusion in the Operating and Maintenance Manuals:
   1. Copies of warranties and guarantees on each piece of equipment installed.
   2. Fixture brochures.
   3. Wiring and control diagrams.
   4. Approved Shop Drawings.
   5. Operating instructions for:
      a. Electrical Systems
   6. Recommended maintenance procedures.
   7. Lists of major items of equipment with name, address, and telephone number of each local representative.

C. Submit the manuals for approval at approximately 75 percent job completion.

D. Each manual shall consist of:
   1. Complete description of each item of equipment and apparatus furnished and installed including ratings, capacities, and characteristics.
   2. Fully detailed parts list, including all numbered parts of each item of equipment and apparatus furnished and installed.

3. Manufacturer's printed instructions describing operation, servicing, maintenance and repair of each item of equipment and apparatus.
4. Typewritten record of all tests made of materials, equipment, and systems. All such records shall state the date tests were conducted, the names of all persons making and witnessing the tests, and citing any unusual conditions relevant to the tests.

1.9 DELIVERY, STORAGE, AND HANDLING

A. The Electrical Subcontractor shall provide for the delivery of all his materials and fixtures to the building site when required so as to carry on his work efficiently and to avoid delaying his work and that of other trades.

B. The Electrical Subcontractor shall, at all times, fully protect his work and materials from injury or loss by others. Any injury or loss, which may occur, shall be made good without expense to the Owner. The Electrical Subcontractor shall be responsible for the proper protection of all his materials until the Owner accepts the building.

1.10 GUARANTEE/WARRANTY

A. The Electrical Subcontractor shall and hereby does warrant that all work executed and all equipment furnished under this Section shall be free from defects of workmanship and materials for a period of one year from date of final acceptance of this work. The Electrical Subcontractor further agrees that he will, at his own expense, repair and replace all such defective work and all other work damaged thereby which becomes defective during the term of the Guarantee/Warranty.

1.11 RECORD DRAWINGS

A. Accumulate Record Drawings during the construction of the project. Keep one (1) set of Contract Drawings at the job site at all times, and mark changes, rerouting or modifications which occur, clearly on the Drawings with dimensions.

B. At completion of the job, obtain electronic drawings from the Architect and transfer the notations indicating changes to them. Reproducible drawings shall be submitted for review prior to final payment. Submit a complete set of reproducible drawings together with AutoCAD 2006 electronic drawings prior to final payment.

1.12 OWNER-FURNISHED, CONTRACTOR-INSTALLED EQUIPMENT

A. Install and make all necessary electrical connections to scheduled/designated Owner-furnished equipment. Scope and content will be defined by the Architect/Owner.

1.13 TEMPORARY LIGHT AND POWER

A. This Contractor shall furnish, install, maintain and remove at completion of work necessary temporary electrical distribution wiring.

B. Outlets shall be located at convenient points so that extension cords of not over fifty (50) feet will reach work requiring temporary light and power.

C. The General Contractor and Subcontractors, individually, shall furnish cords, sockets, motors and accessories for their work.

D. Temporary wiring, service equipment and accessories thereto installed, shall be removed at the expense of this Contractor after they have served their purpose.

E. Temporary work shall be furnished and installed in conformance with OSHA, local codes and ordinances.

F. The Electrical Contractor shall supply power for the General Contractor's and Clerk of the Work's trailers.

1.14 ELECTRIC SERVICES

A. The electrical contractor shall furnish and install the following:

1. Obtain new electric service from the electric company. Owner shall pay fees.
2. Provide raceways conduits, and grounding as required by the electric utility company. Provide the work in accordance with utility standards and specifications.
3. Provide meter sockets, conduits, cables, and terminations of the service entrance cables to the main switchboard.
4. Provide grounding system and terminations to main switchboard and ground bars inside buildings.
5. Test phase rotation and phasing.
6. New power to the building shall be provided as per the drawings.

1.15 MANUFACTURER'S SERVICES

A. Provide manufacturer's services for testing and start-up of the following equipment

1. Main Switchboard (1 day, 1 trip minimum)

B. Provide manufacturer's services for training of plant personnel In operation and maintenance of the equipment furnished under Division 16.

1. Main Switchboard (1/2 day, 1 trip minimum)

C. The training program shall represent a comprehensive program covering all aspects of the operation and maintenance of each system.

D. All training schedules shall be coordinated with and at the convenience of the Owner. Shift training may be required to correspond to the Owner's working schedule.

2 PRODUCTS

2.1 GENERAL PROVISIONS FOR ELECTRICAL WORK

A. SUMMARY

1. The Specifications for accompanying drawings are intended to secure the provision of all material and labor necessary for complete electrical installation tested and ready for service, and as called for herein and as indicated on the drawings. Each system shall be complete and shall include all the necessary appurtenances and minor auxiliaries required to make it functional and complete in every respect.
2. All materials shall be new and shall conform to the standard of the Underwriters Laboratories, Inc. Materials shall be fabricated in accordance with the specifications and approved rules and regulations of NEMA and shall be UL listed and labeled. Materials and apparatus for like services shall be by the same manufacturer.

3. Provide a complete electrical system as described herein and / or as shown on the drawings.

B. CODES AND PERMITS

1. The requirements of the National Electrical Code, the rules and regulations of state and municipal authorities having jurisdiction, the construction requirements of NEMA, NFPA, ANSI, OSHA and BOCA shall be observed and shall govern all materials furnished and installation methods applied.
2. The Contractor of electrical work shall obtain all necessary permits and certificates, in compliance with the codes, applicable laws and municipal regulations, and shall deliver these to the Owner/Engineer before final acceptance of his work.

C. SITE VISIT

1. Bidders, before submitting proposals, shall visit and carefully examine the site affected by this work to familiarize themselves with existing conditions and with the difficulties that may attend the execution of this work. Bidders shall also consider the eventuality of having to perform certain tasks on premium time, outside of normal working hours. Submission of a proposal with appropriate references to potential scheduling concerns will be construed as evidence that such an examination has been made and proper consideration given. Later claims for more labor, equipment or materials, required because of difficulties encountered, will not be recognized.
2. The Contractor for the electrical work shall also examine the general construction and mechanical/plumbing plans and specifications, insofar as labor and materials and type of construction, etc., may affect the electrical examination has been made. No later claims for extra work resulting from failure to do so will be recognized.

D. CUTTING AND PATCHING

1. The Contractor shall seal all conduit/cable penetrations through fire rated walls with approved, UL listed fire sealant to match the required fire ratings.
2. Where required by drawings, the Electrical Contractor shall repair or replace paved areas disturbed by the installation of underground conduits and / or cables. Patched or re-paved areas shall be completed using appropriate and suitable materials and methods to effect a permanent repair.

E. ACCEPTANCE

1. Seven (7) days prior to date of requested Final Inspection, Contractor shall:
    a. After the completion of the work, the electrical contractor shall test and demonstrate to the satisfaction and approval of the Owner, Engineer or their representatives all systems in perfect working order, using instruments or by actual operation of the system.
    b. Furnish engineer required maintenance manual, parts list, operating instructions, wiring diagrams, and electric control diagram.

F. CLEANING AND ADJUSTMENTS

1. Upon completion of work, contractor shall clean and lubricate fans, motors, and other running equipment and apparatus, which he has installed and make certain such apparatus and equipment are in proper working order and ready for tests.

2. Scratched or damaged painting shall be touched up with appropriate materials and methods as necessary to return the painting to a new condition and appearance.

G. RACEWAYS AND CONDUCTORS

1. Electrical metallic tubing shall be thin wall steel pipe, minimum size 1/2", and may be used in hung ceilings, dry hollow partitions, hollow block walls, and exposed in dry locations. Fitting shall consist of compression or set screw type of connectors.
2. Underground rigid nonmetallic conduit shall be NEMA TC2, Schedule 40 PVC with NEMA TC3 fittings.
3. Flexible steel conduit shall be galvanized, minimum ¾", and may be used for final connections to motors and recessed fixtures in dry locations.
4. Liquid tight, flexible conduit shall be zinc coated with PVC jacket. It shall be used for final connections to motors.
5. Conductors shall be 600 V Type THW, THWN, or THHN, color coded, minimum size #12 AWG.
6. All raceways shall be concealed in walls, floors or ceiling. All indoor conduit shall be EMT unless otherwise approved.
7. All conductors shall be copper.
8. Branch circuits more than 100 feet long shall be #10 AWG for the entire length, up to the first outlet or junction box.
9. Exposed conduit shall be painted prior to installation to match the background color.

H. OUTLET BOXES

1. Pressed steel, galvanized, code gauge, and shall be used for wiring devices in concealed work.

I. WIRING DEVICES

1. Receptacles shall have configuration in accordance with NEMA standards, for voltage and current rating as required by capacity of equipment served and corresponding branch circuit protection. As a minimum, receptacles shall be of the grounded type, 15A, 125V AC, Hubbell No. #5262 or approved equal.
2. Ground Fault receptacles, if required, shall be minimum of 20A, 125V in conformance with NEMA WD-1.10 standard.
3. Exposed pull boxes shall be of proper size and type to satisfy the specific application.
4. Safety switches, heavy duty type with or without fuses, size and NEMA enclosure type as shown on drawings.

J. GROUNDING

1. Equipment ground shall consist of grounding all metallic non-current carrying components of electrical system (conduit system, cabinets, frames of motors, panelboards, etc.). Metallic raceways shall effectively and permanently maintain continuity of ground between equipment. Grounding source for equipment ground shall be the same as for the service ground. Mechanical equipment, machinery, etc., shall also be effectively grounded. Equipment grounding conductors shall be run in all raceways.

2.2 ELECTRIC SERVICE

A. The electrical contractor shall furnish and install the following:

1. Obtain new electric service from Utility grid as directed by contract drawings.
2. Provide raceways conduits, and grounding as required by the electric company. Provide the work in accordance with utility standards and specifications.
3. Provide meter sockets, conduits, cables, and terminations of the service entrance cables to the main switchboard.
4. Provide grounding system and terminations to main switchboard and ground bars inside buildings.
5. Test phase rotation and phasing.
6. New power to the building shall be provided as per the drawings.

2.3 BASIC ELECTRICAL MATERIALS AND METHODS

A. SUMMARY

1. This Section includes the following:
   a. Raceways
   b. Building wire and connectors
   c. Supporting devices for electrical components
   d. Electrical identification
   e. Electricity-metering components
   f. Concrete equipment bases
   g. Cutting and patching for electrical construction
   h. Touchup painting

B. DEFINITIONS

1. EMT: Electrical metallic tubing
2. FMC: Flexible metal conduit
3. IMC: Intermediate metal conduit
4. LFMC: Liquid tight flexible metal conduit
5. RNC: Rigid non-metallic conduit

C. COORDINATION

1. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.
   a. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.
2. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the work. Coordinate installing large equipment requiring positioning before closing in the building.
3. Coordinate electrical service connections to components furnished by utility companies.
   a. Coordinate installation and connection of exterior underground and overhead utilities and services, including provisions for electricity metering components.
   b. Comply with requirements of authorities having jurisdiction and of utility

company providing electrical power and other services.

4. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces. Access doors and panels are specified in Section "Access Doors."
5. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.
6. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.

D. RACEWAYS
1. EMT: ANSI C80.3, zinc-coated steel, with set-screw or compression fittings.
2. FMC: Zinc-coated steel
3. IMC: ANSI C80.6, zinc-coated steel, with threaded fittings
4. LFMC: Zinc-coated steel with sunlight resistant and mineral-oil-resistant plastic jacket
5. RNC: NEMA TC2, Schedule 40 PVC, with NEMA TC3 fittings
6. Raceway Fittings: Specifically designed for the raceway type with which used.

E. CONDUCTORS
1. Conductors, No. 10 AWG and Smaller: Solid copper.
2. Conductors, Larger Than No. 10 AWG: Stranded copper.
3. Insulation: Thermoplastic, rated at 75 deg C minimum.
4. Wire Connectors and Splices: Units of size, ampacity rating, material, type, and class suitable for service indicated.

F. SUPPORTING DEVICES
1. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.
2. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.
3. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch diameter slotted holes at a maximum of 2 inches o.c., in webs.
4. Slotted-Steel Channel Supports: Comply with Division 5 Section "Metal Fabrications" for slotted channel framing.
    a. Channel Thickness: Selected to suit structural loading.
    b. Fittings and Accessories: Products of the same manufacturer as channel supports.
5. Non-metallic Channel and Angle Systems: Structural grade, factory formed, glass fiber resin channels and angles with 9/16-inch diameter holes at a maximum of 8 inches o.c., in at least one surface.
    a. Fittings and Accessories: Products of the same manufacturer as channels and angles.
    b. Fittings and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.

6. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps or click type hangers.
7. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
8. Cable Supports for Vertical Conduit: Factory fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable iron casting with hot-dip galvanized finish.
9. Expansion Anchors: Carbon steel wedge or sleeve type.
10. Toggle Bolts: All steel springhead type.
11. Power Driven Threaded Studs: Heat treated steel.

G. ELECTRICAL IDENTIFICATION

1. Identification Devices: A single type of identification product for each application category. Use colors prescribed by ANSI A 13.1, NFPA 70, and these Specifications.
2. Raceway and Cable Labels: Comply with ANSI Al 3.1, Table 3, for minimum size of letters for legend and minimum length of color field for each raceway and cable size.
   a. Type: Preprinted, flexible, self adhesive, vinyl. Legend is overlaminated with a clear, weather- and chemical-resistant coating.
   b. Color: Black letters on orange background.
   c. Legend: Indicates voltage.
3. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape, not less than 1 inch wide by 3 mils thick.
4. Underground Warning Tape: Permanent, bright colored, continuous printed, vinyl tape with the following features;
   a. NOT less man 6 inches wide by 4 mils thick.
   b. Compounded for permanent direct burial service.
   c. Embedded continuous metallic strip or core.
   d. Printed legend that indicates type of underground line.
5. Tape Markers for Wire: Vinyl or vinyl cloth, self-adhesive, wraparound type with preprinted numbers and letters.
6. Color Coding Cable Ties: Type 6/6 nylon, self locking type. Colors to suit coding scheme.
7. Engraved Plastic Labels, Signs, and Instruction Plates: Engraving stock, melamine plastic laminate punched or drilled for mechanical fasteners 1/16-inch minimum thickness for signs up to 20 sq. in. and 1/8-inch minimum thickness for larger sizes. Engraved legend in black letters on white background.
8. Fasteners for Nameplates and Signs: Self tapping, stainless steel screws or No. 10/32 stainless steel machine screws with nuts and flat and lock washers.

H. EQUIPMENT FOR UTILITY COMPANY'S ELECTRICITY METERING

1. Current-Transformer Cabinets: Comply with requirements of electrical power utility company.

2. Meter Sockets: Comply with requirements of electrical power utility company.

I. TOUCHUP PAINT

1. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.
2. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

2.4 ACCEPTABLE MANUFACTURERS

A. Manufacturer's names and catalog numbers are scheduled or specified for the purpose of establishing standard of design, quality, appearance, performance and serviceability, and not to limit competition. Scheduled products (as may be modified by detailed specifications) are those selected as the basis for system design with respect to physical size and space arrangements, required capacity and performance characteristics, and the product quality intended.

B. The Drawings indicate scheduled products physically arranged in the spaces, based on catalog data of specific manufacturers.

C. Listed "Acceptable Manufacturers" are those considered capable of manufacturing products conforming to detailed specifications, and as such, are invited to compete on an equal basis provided the offering is comparable in every respect to scheduled or specified products and actually conforms to the detailed specifications and schedule requirements. Listing herein as "acceptable manufacturers" does not imply "accepted", "approved", "prior approval", or any other such connotation. All product offerings must be submitted for approval after Contract award.

D. Vendors are invited to submit material or equipment bids to bidding contractors on any comparable equivalent product, whether or not the manufacturer of such product is listed herein as an "acceptable manufacturer". Such product bids should clearly indicate offerings that are not listed as "acceptable manufacturers". In the event a bidding contractor, after satisfying himself that such unlisted product is in fact "equal" to the specified product with respect to design, quality, performance and arrangement (space requirements), and the Contractor desires to furnish that product on the Project, he may request the name of the manufacturer be added to the list of acceptable manufacturers as an 'Alternate'.

E. At a bidder's request, an unnamed manufacturer's equipment will be considered to determine additional "acceptable manufacturers" if a request is made in writing no later than six (6) days prior to the bid opening. If such requests are found acceptable, an addendum will be written listing additional acceptable manufacturers. Consideration will be given only to requests of bonafide bidders (contractors), not to those received from vendors.

F. Manufacturers of materials and equipment shall be as specified, scheduled, or as listed in each respective product Specification Article.

2.5 SIGNAGE AND IDENTIFICATION EQUIPMENT

A. Identify electrical equipment with nameplate bearing equipment name and number, using bevel edges, 1/16-inch thick, 1-1/2-inch black laminated bakelite with engraved white letters, 1/2-inch (double line) or 7/8-inch (single line) high, permanently mounted on the equipment in a conspicuous place with screws. Cardholders with card identification will not be accepted.

B. Underground Warning Tapes For Buried Lines-

1. Provide 3-inch wide metallic core brightly colored polyethylene detection tape, shallow buried in the trench above non-metallic conduits, serving the dual purpose of line location and identification. The tape shall be easily detected by any commonly used metal detector and shall bear a printed message (continuous along entire length) describing the contents of the line beneath.

2. Provide 6-inch wide brightly colored polyethylene tape, shallow buried in the trench above metallic conduits, to identify the contents of the line beneath. The tape shall bear a printed message (continuous along entire length) describing the type of the buried line and its contents.

C. Panel boards/Switchboards - Provide nameplates to identify each section as specified for electrical equipment. Type identification cards/panel directory for insertion in cardholder pockets in each lighting and appliance panel board.

D. Miscellaneous:

1. Provide nameplates to identify motor starters, automatic transfer switches, breakers, disconnect switches, time clocks, transformers, and miscellaneous electrical equipment as to systems or mechanical equipment served, source or specific function as appropriate.

E. Nameplates and tags shall correspond to the Record Drawings.

F. Submit complete details of identification legends, color fields, and sizes, coordinated between trades.

G. Provide special signage on breakers and main service equipment as required by the authority having jurisdiction and as shown on the Drawings.

2.6 SLEEVES, INSERTS, ANCHORS AND SUPPORTS

A. Provide in concrete, carpentry or masonry construction, hangers, sleeves, expansion bolts, inserts, supporting steel, or other fixtures necessary for the support of equipment and devices furnished under each Section of the Specifications.

B. Except as otherwise indicated or specified, each conduit, passing through walls, floors, ceilings or partitions shall be provided with sleeves having internal diameters approximately 1-inch larger than the outside diameter of conduit.

C. Sleeves through interior partitions and floors shall be no less than 22 gage-galvanized steel, set flush with the finished surfaces.

D. Sleeves through pre-cast or post-tensioned structures shall be no less than Schedule 40 galvanized steel pipe and shall be subject to the acceptance of the designer of the structure. Submit size, location, and sleeve material for Structural Engineer review and acceptance.

E. Sleeves through grade slabs, basement or exterior wall shall be steel or cast iron conduit with water stop flange, set flush with finished surfaces, and with the space between the pipe and the sleeves packed with oakum or jute twine and caulked watertight.

F. Sleeves in wet or potentially wet floors or spaces such as equipment rooms or sprinkled areas shall be Schedule 40 galvanized steel pipe with water stop flange and with the top

of the sleeve projecting 2-inches above the finished floor, with annular space packed with oakum or jute twine and caulked watertight.

G. Option - Provide link-seal neoprene closure fittings in lieu of packing.

H. Attachments to structure shall be by means of beam clamps wherever practicable. Unavoidable attachments to concrete structure shall be by means of pre-set concrete inserts whenever the need for such attachment can be reasonably foreseen and the locations and sizes of inserts is known prior to pouring of concrete. In instances where it is necessary to make attachments to concrete and proper inserts have not been pre-set, the attachment shall be made by means of drilled holes and expansion anchors of either the bolt stud or flush variety. Design working stress of attachments shall be limited to 25 percent of the average maximum (ultimate) stress values published by the manufacturer.

I. Inserts shall be cast iron or galvanized steel individual type, with accommodations for removable nuts and threaded rods up to 3/4-inch diameter, and permitting lateral adjustment.

J. Fasteners in concrete beams shall be sufficiently above the bottom of the beam to clear reinforcing.

K. Expansion anchors shall be zinc and chromate plated for corrosion protection and conform to the dimensional requirements of Federal Specification FF-S-325. Expansion anchors shall be selected and installed in accordance with the recommendations of Expansion Anchor Manufacturer's Institute (EAMI) and the manufacturer's instructions.

2.7 FIRE-STOPPING

A. Seal annular spaces between sleeves and penetrating materials in fire-rated floors, ceilings, and walls with fireproof and waterproof silicone elastomer applied in accordance with the manufacturers published instructions. Multiple penetrations shall be sealed with silicone foam; single penetrations may be sealed with silicone caulking. Seal material shall be UL classified for use in fire-rated penetration seals, and shall be applied in the manufacturer's recommended thickness for the fire rating of the penetrated structure in accordance with ASTM-E-814 requirements.

B. Acceptable Manufacturers: Dow Corning, General Electric, 3M.

2.8 WATERPROOFING

A. Seal penetrations of wet or potentially wet structures, floors, exterior walls, etc., other than those requiring fire stopping, with sealant to prevent moisture leakage. Apply sealing material (caulking) in accordance with manufacturer's published instructions.

B. Product Research and Chemical Co. "Poly-Sulphide Sealant" PRC-5000.

2.9 WIRE AND CABLE

A. General:

1. Wire and cable for feeder and branch circuits shall conform to the requirements of the current edition of the National Electrical Code, and shall meet applicable ASTM specifications. Conductors shall be soft drawn, annealed, 98 percent conductivity copper. Wire and cable shall be new, shall have size, type of insulation, voltage rating and manufacturer's name permanently marked on the outer covering at regular intervals. Conductors No. 8 AWG and smaller shall be color-coded #6 and larger to

be marked with phasing tape. Colors for each phase and neutral shall be consistent throughout the system.

B. 600 volt insulation:

1. Provide conductors with insulation rated for 600 volts unless specified or indicated otherwise. System design is based on the following U.S. products:
2. NEC Type THW, XHHW, THWN or THHN solid or stranded for Number 12 AWG or smaller.
3. NEC Type THW, XHHW, THWN or THHN stranded for Number 10 and larger.
4. Plenum Cable: Provide UL listed cables, complying with the requirements of the National Electrical Code, insulated with a UL classified fluoro-polymer material for all cable applications within plenums unless enclosed in conduit. Any cables not enclosed in conduits in such plenums shall have insulation classified as low smoke producing and very low flame spread, such as Teflon FEP or Halon ECTFE, and is UL listed for the specific application.
5. Type MTW for battery and DC power circuits.

C. Acceptable Manufacturers: for Wire and Cable: Essex, Okonite, and Southwire.

D. Acceptable Manufacturers for Connectors: Appleton, Blackburn, Bridgeport, Buchanan, Burndy, Ideal, Killark, 3M, O.Z., Penn Union, Thomas & Betts.

2.10 RACEWAYS

A. Metallic conduit and ANSI C80.4 fittings shall be incorporated into the Electrical Work in accordance with the applicable articles of the National Electrical Code.

B. GRC - Galvanized rigid conduit, threaded and coupled steel, ANSI C80.1, UL-6, protected by an overall zinc coating to the inside and outside surfaces of the metal. Coating may be applied by the hot-dip metalizing or sherardizing process.

C. IMC - Intermediate metal conduit, threaded and coupled steel, manufactured in accordance with UL 1242, hot-dip galvanized, installed in accordance with UL general information card DYBY and NEC Article 345, with threaded joints.

D. EMT - Electrical metallic tubing, 'thin wall" zinc coated steel, enameled interior, ANSI C80.3, UL-797, assembled using concrete tight and rain tight cast gland-ring compression threaded insulated throat type fittings for sizes 1-1/4' and smaller. Sizes 1-1/2" and larger can be setscrew type with insulated throat.

E. ENT – Electrical non-metallic tubing.

F. Flex - Flexible steel, UL-1, conduit shall be constructed from interlocking single strip flexible steel tubing, galvanized or sherardized. Connectors shall be galvanized, malleable iron squeeze type, or Tomic twist-in type.

G. Liquid-tight flexible metallic raceway shall be similar to standard flexible steel conduit except encased in liquid tight neoprene outer jacket.

H. PVC - Polyvinyl chloride Schedule 40, NEMA TC2, UL 651, with solvent welded joints.

I. SMR - Surface Metal Raceway - An assembly consisting of base and cover sections, fittings and boxes, constructed of corrosion resistant coated steel with an interior finish to avoid abrasion of electrical conductors, conforming to UL No. 5-1977 and F.S. W-C-582.

J. Acceptable Manufacturers - Walker & Wire mold.

K. Application:

1. Provide electrical metallic tubing (EMT) within structure, except as specified otherwise.
2. EMT connectors - Provide gland ring compression threaded fittings for 1/2" thru 1-1/4". Sizes 1-1/2" and larger shall be setscrew type.
3. Rigid steel conduit (GRC) shall be used in the following locations (except where indicated otherwise):
    a. High voltage raceway.
    b. At or below grade.
    c. In locations where electrical metallic tubing is not permitted and other raceway is not required.
    d. In or beneath slabs on grade.
    e. Hazardous areas as defined by NEC.
    f. Where exposed to physical damage, excessive moisture, rain, etc.
4. Intermediate metal conduit (IMC) may be substituted for GRC for sizes 4-inches and smaller if approved by code authority.
5. PVC may be used:
    a. In or beneath slabs on grade.
    b. In concrete duct banks provide there is 2” spacing with 3" overall coverage.
6. Provide flexible conduit for transformer connections, and at equipment requiring adjustments or removal for service, not subject to moisture.
7. Provide liquid-tight flexible conduit for each motor and rotating device for power and control, computer room and for other equipment requiring adjustments or removal for service in mechanical rooms or where subject to moisture or weather.
8. Non-metallic conduit (and grounding conductor) with rigid steel riser stub-ups may be used for slabs on grade.
9. Conduit and fittings shall be UL listed for the application and location of their intended uses.

L. Acceptable Manufacturers for GRC, IMC, and EMT: Allied, and Triangle & Wheatland.

M. Acceptable Manufacturers for GRC, IMC, and EMT Fittings: AFC, Appleton, Bridgeport, Midwest, Neer, O.Z. Gedney, Raco, and Steel City.

N. Acceptable Manufacturers for flex and liquid-tight flex: American Flex, Alflex, Anaconda, Coleman, Electric-Flex, and International.

O. Acceptable Manufacturers for flex and liquid-tight flex fittings: Appleton, Bridgeport, Berger, Efcor, Electro line, Midwest, Neer, O.Z. Gedney, Raco, and Steel City.

P. Acceptable Manufacturers for PVC and PVC fittings: Cantex, Carlon Certain teed, National, Sedco, and Midwest.

2.11 HANGERS AND SUPPORTS

A. All free standing equipment shall be braced and anchored to the floor. Secure equipment using stainless steel anchor bolts in accordance with the manufacturer’s instructions..

B. Conduits: Support securely from the structure with rigid steel supports. Provide necessary channels, hanger rods, bolts, nuts, locknuts, accessories and devices to provide a complete structural system. The system shall allow free expansion and contraction.

C. Panel boards, disconnects, starters, cabinets, pull and junction boxes, etc. Provide channel supports and miscellaneous steel angles to rigidly support equipment from the structure where required by special conditions and where vertical and/or horizontal support is required other than that provided in the structure.

D. Structural support systems shall be specifically designated as suitable for electrical installations. Bases, dimensions and sizes are to be as required for application, job conditions, loads imposed and manufacturer's recommendations.

E. Channels: Provide continuous slotted channel, #12 gage steel (minimum). Fasten conduits to channels with pipe channel straps.

F. Hanger Rods: Provide steel rods with continuous, free running threads.

G. Straps, Pipe and Conduit Hangers, Inserts, Clamps, Accessories and Devices Provide malleable iron or formed steel, as applicable.

H. Flexible cable, strap or wire hangers and fasteners will not be accepted.

I. Steel and malleable iron shall be zinc chromate electro galvanized.

J. Attachments to Structure - Fastenings to wood shall be by wood screws or screw type nails. Fastenings to hollow masonry units shall be by toggle bolts. Fastenings to concrete or brick shall be by preset inserts or expansion bolts. Fastenings to steel shall be by machine screws, bolts (with flat washers and lock washers), and welded threaded studs or beam clamps designed for the application. Wood plugs and gun fired power driven fasteners will not be accepted.

K. Fasten single runs of conduit directly to the structure or hang on rod hangers with one or two hole pipe straps, "U" bolts, lay-in pipe hangers, conduit and pipe hangers, beam clamps and angle clamps as appropriate.

L. Fasten multiple runs of conduit directly to the structure using continuous channel inserts or continuous surface channels. Trapeze hangers utilizing channels and rod hangers may also be used.

M. Conduit shall be securely fastened within three feet of each outlet or junction box, fitting, cabinet or panel board. Conduit shall be fastened at intervals not to exceed ten (10) feet.

N. Provide riser clamps at floor lines for vertical runs of conduit.

O. Conduits and Raceways with Expansion Joints: Install supports to allow equally distributed expansion and contraction. Use guides, saddles, "U" bolts and/or anchors designated for this application.

P. Cables and Wires in Manholes, Cable Chambers, Cable Chases and Other Locations: Provide hangers, racks, cable cleats and supports designated for the application to insure a neat and secure installation.

Q. Structural support systems, channels, hanger rods, bolts, nuts and accessory items shall be as manufactured by Unistrut or approved equal.

R. All supports shall be directly connected to basic structural elements of the building or site work. Electrical support systems shall be independent of other systems (HVAC, plumbing, suspended ceilings, raised floors, etc.). Support systems may be shared with similar wire way and conduit systems (fire alarm, security, MATV, etc.).

2.12 GROUNDING AND BONDING

A. Rods: Ten (10) feet long, 3/4-inch diameter copper weld rods or as indicated on the drawings.

B. Conductor: Sized no smaller than the following:

1. The size noted on the drawings or otherwise scheduled.

2. The size of the phase conductors in the feeder or branch circuit.

3. The sizes required by Article 250 of the National Electrical Code.

C. Compression Grounding Connectors: Provide Hyground compression system as manufactured by Burndy. Each connector shall have the die index number embossed on application.

D. Grounding connectors shall meet the test requirements of IEEE Standard 837-2002 and shall be exothermic type.

E. All ground conductors shall be copper, and unless specifically noted otherwise, shall be provided with Type THW or THWN, 600-volt insulation.

F. All ground electrode conductors shall be bare copper, sized in accordance with Article 250 of the National Electric Code.

G. Ground busses required for the interconnection of grounding conductors shall be solid copper bars, rigidly supported by metal framework and insulated from the building structure.

H. Conductors shall be supported independently and rigidly attached to the building structure. Attach conductors to the buss with compression type lugs.

2.13 WIREWAYS, PULL AND JUNCTION BOXES

A. Provide wire way, junction and pull boxes indicated and at locations required by the National Electrical Code, and at those locations required to facilitate the pulling of wire, fabricated in accordance with NEMA and National Electrical Code requirements with respect to material, gages, dimensions and methods of fastening. Wire way, junction and pull boxes shall bear the UL label and shall be listed for the application and location of their intended use. Units shall be finished in standard gray enamel, sides and backs spot welded in position, and removable screw cover.

B. Construct wire way and accessories in accordance with UL 870, with hinged, removable, sealable covers, arranged for lay-in conductor installation. Connectors shall be slip-in arrangement with captive mounting screws. Arrange hangers in a "J" configuration to allow conductor lay-in from one side.

C. Interior boxes shall be stamped or fabricated galvanized steel.

D. Exterior boxes not totally protected from exposure to driving rain or from excessive moisture shall be PVC or hot-dip galvanized cast iron, complete with threaded hubs, bolted weatherproof covers, and rubber or neoprene gaskets.

E. Grade level exterior boxes shall be PVC or cast iron with solid covers secured with rubber gaskets and bronze cap screws. Conduit connections shall be drilled and tapped for threaded

F. Construct exterior concrete boxes as detailed with solid cast iron covers secured with rubber gaskets and bronze cap screws.

G. Conduits entering boxes shall be through tight-fitting bored or punched holes, or threaded hubs, and shall be secured firmly.

H. Covers in finished areas shall have prime coat.

I. The volume of the boxes shall be in accordance with the NEC requirements, but shall be no smaller than four (4) inches square in any case.

J. Boxes shall be accessible at job completion. Boxes with covers in finished areas shall be in those physical locations approved by the Architect.

K. Acceptable Manufacturers: Carlon, Circle AW, Hoffman, and Neenah.

2.14 OUTLET BOXES AND ACCESSORIES

A. Interior boxes: Standard, single or multiple gang stamped galvanized steel boxes, of the proper size to accommodate the device and function for which intended, complete with extension or plaster rings where required. Boxes for mounting of surface lighting fixtures shall be 4-inch octagon boxes, with 3/8-inch no-bolt fixture studs used to securely support fixture. Provide proper covers or device plates.

B. Exterior boxes: Hot-dip galvanized cast iron, complete with threaded hubs, bolted weatherproof covers, and rubber or neoprene gaskets.

C. Concrete boxes: Outlet boxes in concrete slabs shall be two-piece concrete boxes not less than 4-inch nominal size with a minimum depth of 2-1/2-inches. If used for lighting fixtures, outlet boxes shall be equipped with fixture stud.

D. Waterproof boxes: Conduit boxes of cast or metal threaded hub type with suitable gasket covers shall be used where waterproof boxes are required.

E. Flush type floor boxes: Fully adjustable (before and after concrete pour), cast iron for slabs on grade, stamped steel for slabs above grade, with surface flush ring finish to match wiring devices and coverlets specified, with waterproof threaded outlets, sized and arranged to receive devices scheduled.

F. Acceptable Manufacturers: Appleton, Adult, Bell, Bowers, Crouse Hinds, Killark, O.A Gedney, Raco, Red Dot, and Steel City.

2.15 WIRING DEVICES

A. Install on each and every outlet box, a wiring device and cover plate, as indicated by symbol on the Drawings. Manufacturer's model numbers are not intended to indicate color of devices. Color of devices is designated under "Device Plates". Toggle switches shall be quiet, ac type, and specification grade, listed by Underwriters Laboratories, Inc., and meeting the requirements of NEMA Standard WD-1-1971. Back or side screw

terminal shall accommodate up to 10 AWG solid or stranded conductors. Contacts shall be rated at 20 amperes, 120/277 volts ac only, single pole, 3-way, 4-way, or key-operated as indicated.

B. General purpose single and duplex receptacles: shall be specification grade rated 125 volts, two-pole, three-wire, grounding type with polarized parallel slots, Style S Series, in accordance with Federal Specification W-C-596, and listed by Underwriters Laboratories, Inc., in accordance with NEMA Standard Publication WD-1, paragraph 3.02. Bodies shall be of phenolic compound supported by mounting strap having plaster ears. Contact arrangement shall be such that contact is made on two sides of an inserted blade. Receptacle shall be side or-back wired with two screws per terminal. The third grounding pole shall be connected to the metal mounting yoke.

C. Device Plates:

1. Provide one-piece coverlets with rounded edges for outlets and fittings to suit the devices installed. Screws shall have countersunk heads, provided in a color to match the finish of the plate. Plates shall be installed with all four edges in continuous contact with finished wall surfaces without the use of mats or similar devices; plaster fillings will not be permitted. Plates shall be installed with an alignment (plumb) tolerance of 1/1 6-inch. The use of sectional-type device plates will not be permitted. Plates installed in wet locations shall be gasketed.

2. Provide smooth zinc finish cast metal or sheet steel plates with ivory color devices in:

a. Unfinished walls.

b. Equipment rooms.

3. Exterior coverlets - Provide Type 302 stainless steel weatherproof plates with spring-hinged cover and PVC plate and cover gaskets with ivory color devices.

4. Provide nylon plastic or stainless steel plates (as chosen by the architect) with matching color devices in all areas unless noted otherwise. Color/finish to be selected by the Architect.

D. Finish color shall be selected by the Architect.

E. Acceptable Manufacturers: Hubbell, Bryant, Pass & Seymor, Leviton, and Cooper Wiring Devices.

2.16 SURGE PROTECTION DEVICES (TVSS)

A. Description: This section describes the materials and installation requirements for integrated surge protection devices (SPD) in switchboards, panelboards, and motor control centers.

B. Approved Vendors: Square D, Siemens or Eaton.

C. Integral Surge Suppressor

1. SPD shall be Listed and Component Recognized in accordance with UL 1449 Second Edition to include Section 37.3 highest fault current category. SPD shall be UL 1283 listed.

2. SPD shall be installed by and shipped from the electrical distribution equipment manufacturer’s factory.

3. SPD shall provide surge current diversion paths for all modes of protection; L-N, L-G, N-G in WYE systems, and L-L, L-G in DELTA systems.
4. SPD shall be modular in design. SPD for service entrance application shall provide two modules per phase for redundant protection. Each mode including N-G shall be fused with a 200kAIC UL recognized surge rated fuse and incorporate a thermal cutout device.
5. Audible diagnostic monitoring shall be by way of audible alarm. This alarm shall activate upon a fault condition. An alarm on/off switch shall be provided to silence the alarm. An alarm push to test switch shall be provided.
6. If a dedicated breaker for the SPD is not provided, the SPD shall include a UL recognized disconnect switch. A dedicated breaker shall serve as a means of disconnect for distribution SPDs.
7. SPD shall meet or exceed the following criteria:
   a. Minimum surge current capability (single pulse rated) per phase shall be:
      1. Service entrance switchboard: 240kA per phase
      2. Panelboard/MCC locations: 160kA per phase
   b. UL 1449 Suppression Voltage Ratings:
   c.

VOLTAGE	LOCATION	L-N	L-G	N-G
240/120V	Service Entrance:	330V	330V	330V
	Distribution:	330V	330V	330V

8. SPD shall have a minimum EMI/RFI filtering of –50dB at 100 kHz with an insertion ratio of 50:1 using MIL-STD-220A methodology.
9. SPD shall be provided with one set of NO/NC dry contacts.
10. SPD shall have a warranty for a period of five years, incorporating unlimited replacement of suppressor parts. Warranty shall be the responsibility of the electrical distribution equipment manufacturer and shall be supported by their respective field service division.

2.17 POWER PANELBOARDS

A. References:

1. The low voltage power panelboards and protection devices in this specification are designed and manufactured according to latest revision of the following standards (unless otherwise noted).
2. ANSI/NEMA PB 1, Panelboards
3. ANSI/NFPA 70, National Electrical Code
4. Federal Specification W-C-375, Rev. B, Amend. 1, Circuit Breakers, Molded Case; Branch Circuit and Service
5. Federal Specification W-P 115, Rev. C, Panel, Power Distribution

6. Federal Specification W-S-865 - Heavy Duty Switches
7. UL 489, Molded-Case Circuit Breakers and Circuit-Breaker Enclosures
8. UL 50, Enclosures for Electrical Equipment
9. UL 67, Panelboards
10. UL 98, Enclosed and Dead Front Switches

B. Definitions:

1. Overcurrent Protective Device - Single pole circuit breaker. Example: A 2-pole device is considered 2 protective devices.

C. System Description:

1. Equipment shall be indoor deadfront power panelboards for molded-case circuit breakers.
2. Panelboards shall meet service entrance requirements when specified.
3. Panelboards shall have integrated short circuit rating. Fully rated panel rating is that of lowest rated device in panelboard. Series rating are for the UL tested main-branch combination.

D. Submittals:

1. Manufacturer shall provide copies of following documents to owner for review and evaluation in accordance with general requirements of Division 1 and Division 16:
2. Product Data on specified product;
3. Shop Drawings on specified product;
4. Trip curves for each specified product;

E. Installation, Operation, and Maintenance Data:

1. Manufacturer shall provide copies of installation, operation and maintenance procedures to owner in accordance with general requirements of Division 1 and Division 16.

F. Quality Assurance (Qualifications):

1. Manufacturer shall have specialized in the manufacture and assembly of low voltage power panelboards for 25 years.
2. Low voltage power panelboards shall be listed and/or classified by Underwriters Laboratories in accordance with standards listed in Section 2.30, A of this specification.

G. Delivery, Storage, And Handling:

1. Contractor shall deliver, store, protect, and handle products in accordance with recommended practices listed in manufacturer's Installation and Maintenance Manuals.
2. Ship each low voltage power panelboard section in individual shipping splits for ease of handling. Each panelboard section shall be mounted on shipping skids and wrapped for protection.

3. Contractor shall inspect and report concealed damage to carrier within specified time.
4. Contractor shall store in a clean, dry space. Maintain factory protection or cover with heavy canvas or plastic to keep out dirt, water, construction debris, and traffic.
5. Contractor shall handle in accordance with manufacturer's written instructions to avoid damaging equipment, installed devices, and finish.

H. Project Conditions (Site Environmental Conditions):

1. Low voltage power panelboards shall be located in well-ventilated areas, free from excess humidity, dust and dirt and away from hazardous materials. Ambient temperature of area will be between minus 30 and plus 25 degrees C. Indoor locations shall be protected to prevent moisture from entering enclosure.

I. Warranty:

1. Manufacturer warrants equipment to be free from defects in materials and workmanship for 1 year from date of installation or 18 months from date of purchase, whichever occurs first.

J. Field Measurements:

1. Contractor shall make all necessary field measurements to verify that equipment shall fit in allocated space in full compliance with minimum required clearances specified in National Electrical Code.

K. Manufacturer:

1. Siemens Company products have been used as the basis for design. Other manufacturers' products of equivalent quality, dimensions and operating features may be acceptable, at the Engineer's discretion, if they comply with all requirements specified or indicated in these Contract documents.

L. Components:

1. Refer to Drawings for: actual layout and location of equipment and components; current ratings of devices, bus bars, and components; voltage ratings of devices, components and assemblies; and other required details.

M. Enclosures:

1. Panel box shall be galvanized code gauge sheet steel with removable end walls.
2. Enclosures shall be surface mounted.
3. Enclosures shall be NEMA type per intended location.

N. Fronts:

1. Provide a four-piece front to cover wiring gutter and wiring access areas. Provide a lockable hinged door with semi-concealed hinges to cover access to circuit breakers.
2. Hinged door fronts, when specified, shall be provided with door-in-door. An inner door shall cover the circuit protective devices and shall be able to be locked.
3. Door locks shall be GE Valox style.

O. Interiors:

1. Panelboard interior shall be designed and assembled such that circuit protective devices shall be solidly connected to the distribution panel vertical bus. The bus bars shall be attached to the feeder device by bolts and to the vertical bus by bolts and anti-turn methods.
2. Circuit breaker connectors shall be designed so that circuit breakers may be removed without disturbing adjacent devices.
3. Panelboards shall be rated as indicated in drawings. Main devices shall have maximum rating of 1200 amperes.
4. Panelboards shall have three vertically aligned bus bars.
5. Bus bars shall be aluminum. The bus bars shall have sufficient cross sectional area to meet UL 67 temperature rise requirements through actual tests. The bus bars shall be standard density rated for 1000 amperes per square inch. Bus bars shall be phase-sequenced and rigidly supported by high impact resistant, insulated bus supporting assemblies to prevent vibration or short circuit mechanical damage.
6. Neutral bus shall be fully rated.
7. All solderless terminations shall be suitable for copper UL listed wire or cable and shall be tested and listed in conjunction with appropriate UL standards. Terminations shall be rated for use with conductor ampacity as assigned in the NEC 75 degree C table.
8. Ground wire terminations shall be provided as an optional kit for installation by panelboard installer without voiding UL label.

P. Main and Branch Devices:

1. Circuit breakers:
2. Main and branch circuit breakers shall be quick-make, quick break, and trip indicating, low voltage molded-case (or equal).
3. Circuit breaker case shall have ON/OFF and International I/O position indicators.
4. Breaker faceplate shall list current rating, UL and IEC certification standards, and AIC ratings.
5. Circuit breakers shall be factory sealed and shall be date coded on breaker case.
6. Breakers shall be UL listed for reverse connection without restrictive line or load markings. Circuit breakers shall be able to mount in any operating position.
7. 3-pole breakers with ampere ratings greater than 150 ampere shall have interchangeable rating plugs.
8. Interrupting rating of breakers shall not be less than maximum short circuit current available at incoming line terminals.
9. Breakers shall have UL listing.
10. Main breakers and lugs shall be convertible by installer for top or bottom incoming feed.
11. Where indicated on the drawings,} the main breaker shall be provided with integral ground fault pick-up and delay settings and adjustable long time settings.

Q. Accessories:

1. Provide through-feed lugs for panels rated 200 Amperes and above.
2. Padlocks
3. Grounding bars. (Neutral bus shall have grounding lug for Service Entrance applications.)
4. Exterior mounted equipment label
5. Furnish nameplates for each device as indicated in drawings. Color schemes shall be as indicated on drawings.

R. Finish:

1. Standard panelboard boxes shall be galvanealed (zinc finished) or galvanized.
2. Fronts shall be coated with phosphatized rust inhibitor and finish coated with ANSI 61 light gray baked on powder coat.
3. Screw fasteners shall be zinc coated to retard corrosion.

S. Examination:

1. The following procedure shall be performed by the contractor:
2. Verify that low voltage panelboards are ready to install.
3. Verify field measurements are as shown on Drawings.
4. Verify that required utilities are available, in proper location and ready for use.
5. Beginning of installation means installer accepts conditions.

T. Installation:

1. Contractor shall install per manufacturer's instructions.
2. Contractor shall install required safety labels.

U. Adjusting:

1. Adjust all circuit breakers, switches, access doors, operating handles for free mechanical and electrical operation as described in manufacturer's instructions.
2. Adjust circuit breaker trip and time delay settings for proper operation of all electrical systems and devices.

V. Cleaning:

1. Clean interiors of switchboards, panels, separate enclosures to remove construction debris, dirt, shipping materials.
2. Repaint scratched or marred exterior surfaces to match original finish.

2.18 SHORT CIRCUIT RATINGS

A. It shall be the responsibility of the electrical contractor and equipment manufacturer to supply devices rated for the available fault current.

B. Electrical equipment, circuit protective devices, bussing, and switches shall be rated to interrupt or withstand short circuit faults greater than the available fault current.

3 EXECUTION

3.1 GENERAL PROVISIONS FOR ELECTRICAL WORK

A. EXECUTION OF WORK

1. Install all materials and equipment in a neat and workmanlike manner and provide for the following:
   a. All work shall be installed so as to be readily accessible for operation, maintenance and repair. Minor deviations from the plans may be made to accomplish this, subject to the approval of the Engineer.
   b. The area of work shall be kept free of litter and debris. Contractor shall clean up the work area at the end of each working day. All scrap material and other waste shall be removed from the site by the contractor.
   c. Electrical contractor shall coordinate the electrical work with other trades, including but not limited to all construction documents, shop drawings, etc. for all structural and mechanical work. Electrical contractor shall secure shop drawings from other contractors and verify exact electrical characteristics of equipment to be wired. This is done before electrical contractor rough-in for subject equipment. If discrepancies are noted between the electrical contract drawings and the other contractor shop drawings, electrical contractor is to notify Engineer at once. Failure by the electrical contractor to perform this duty will not relieve him of the responsibility to correct wiring deficiencies at his expense.
   d. Drawings are diagrammatic, small scale and indicate the general arrangement of systems and work included. Electrical contractor shall apply for detailed information regarding the location of all equipment before rough-in as the final location may differ from that shown on drawings. Outlets, etc., improperly placed because of failure to obtain this information shall be relocated and reinstalled without additional expense. Certain raceways, bends, fittings, boxes, system components, appurtenances and related specialties are not shown, but shall be provided. Do not scale drawings.
   e. All electrical work required for identical items shown on the drawings shall be provided although each specific identical item may not be shown.
   f. Electrical contractor shall submit shop drawings and/or catalog cuts for all equipment, materials and devices for review by the Engineer. Work shall not start until all reviews have been completed and the items to be provided are acceptable. All materials and equipment shall be commonly used acceptable grades in the construction industry and shall bear the UL Label when applicable.
   g. All circuits shall be clearly identified at panelboards with typed circuit schedules. All other electrical equipment shall be labeled with white engraved with black lettering laminated nameplates.
   h. All wiring devices, panelboards, junction boxes, conduits, equipment, etc., shall be properly grounded.
   i. Upon completion of construction, the electrical contractor shall supply the

Engineer with one (1) complete set of equipment manuals and as-built documents accurately showing the locations, sizes and nature of concealed items such as conduit, devices, equipment, etc., and homerun circuit designations as installed. These records (with dimensions where necessary) form a permanent record for future reference.

j. All electrical work performed shall be as shown on the drawings and shall be accomplished to the satisfaction of the Engineer. Wire all fixtures, devices, etc., to respective panel and controls as shown on plans in symbol form. Branch circuit wiring is not completely shown on drawings. Contractor is responsible to wire all devices as circuited symbolically.

k. All branch circuits to contain a separate green insulated grounding conductor.

l. All conduit and/or cable shall be installed above suspended ceilings, and/or installed concealed in walls/floors in all finished areas.

m. Install panelboard accessory items according to NEMA PB 1.1.

n. Circuit Directory: Type directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing.

o. Any spared circuits to be disconnected, and wiring to be removed. Circuit breakers to remain and will be re-labeled accordingly.

p. Provide ground continuity to main electrical ground bus.

2. Field Quality Control: Perform acceptance tests as follows:

a. Make continuity tests of each circuit.

b. Procedures: perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.

c. On completion of work, the wiring system shall be entirely free from grounds, short circuits, opens, overloads and improper voltages, and thorough tests shall be made. Furnish all labor, material and instruments.

3. Install all materials and equipment in a neat and workmanlike manner and provide for the following:

a. All work shall be installed so as to be readily accessible for operation, maintenance and repair. Minor deviations from the plans may be made to accomplish this, subject to the approval of the Engineer.

b. The area of work shall be kept free of litter and debris. Contractor shall clean up the work area at the end of each working day. All scrap material and other waste shall be removed from the site by the contractor.

c. Electrical contractor shall coordinate the electrical work with other trades, including but not limited to all construction documents, shop drawings, etc. for all structural and mechanical work. Electrical contractor shall secure shop drawing from other contractors and verify exact electrical characteristics of equipment to be wired. This is done before electrical contractor rough-in for subject equipment. If discrepancies are noted between the electrical contract drawings and the other contractor shop drawings, electrical contractor is to notify Engineer at once. Failure by the electrical contractor to perform this duty will not relieve him of the responsibility to correct wiring deficiencies at his expense.

d. Drawings are diagrammatic, small scale and indicate the general arrangement of systems and work included. Electrical Contractor shall apply for detailed information regarding the location of all equipment before rough-in as the final location may differ from that shown on drawings. Outlets, etc., improperly placed because of failure to obtain this information shall be relocated and installed without additional expense. Certain raceways, bends, fittings, boxes, system components, appurtenances and related specialties are not shown, but shall be provided. Do not scale drawings.

e. All electrical work required for identical items shown on the drawings shall be provided although each specific identical item may not be shown.

f. All circuits shall be clearly identified at panelboards with printed circuit schedules. All other electrical equipment shall be labeled with white engraved with black lettering laminated nameplates.

B. GUARANTEE

1. Contractor for electrical work shall furnish a guarantee covering all labor, materials and equipment for a period of (1) one year from date of final acceptance of his work. He shall agree to repair and make good, at his own expense, any and all defects which may appear during this time of said guarantee.

3.2 COMMISSIONING

A. The ELECTRICAL Contractor shall assist the Commissioning Agent in the commissioning process. The Commissioning Agent will be a sub-contractor of the Owner. The Electrical Contractor's responsibilities shall include but not be limited to:

1. Providing a mechanic to operate the equipment, open panels, switch breakers, operation of lighting controls, providing lamp information, etc. as required by the Commissioning Agent during functional testing.
2. Verifying and checking off the preliminary "pre-functional" testing forms provided by the Commissioning Agent prior to the functional testing.

3.3 ELECTRICAL GENERAL REQUIREMENTS

A. SLEEVES AND ELECTRICAL PENETRATIONS

1. Location of Openings: Locate all chases, shafts and openings required for the installation of the electrical work during framing of the structure. Do any additional cutting and patching required due to improperly located or omitted openings without cost to the Owner, and with the approval of the Architect. Cutting or drilling in any structural member is prohibited without written approval of the Architect.
2. Location of Sleeves: Wherever conduits pass through concrete walls or suspended slabs, furnish and install sleeves of ample size to permit installation of conduit. Sleeves shall be installed prior to pouring of concrete and shall have ends flush with the wall or extend two (2") inches above floor surfaces. Verify location with the Architects.

3. Where sleeves pierce slabs or walls separating machine room areas from or other quiet areas, the sleeves shall be packed with fiberglass insulation to prevent noise transfer.
4. Where raceways for electrical power, telephone or signal cables penetrate FIRE RATED walls, floors, partitions or slabs, fill and seal all such penetrations with a one-part intumescent caulk/putty sealant creating a fire stop equal to or exceeding fire rating of partition being penetrated. Fire sealant shall have ability to prevent spread of flame, smoke and water throughout the penetration and shall pass three (3) hour test, UL Test ASTM E814 and UL 1479. Fire sealant shall be 3M CP25 caulk and putty 303, installed in accordance with manufacturer's written instructions. Avoid all voids when arranging cables in penetration by using non-flammable fiber damming material wedged between cables.
5. Type of sleeves: Steel pipe or galvanized sheet metal is acceptable.
6. Finish Around Sleeves: Rough edges shall be finished smooth. Space between conduit and sleeves, where conduit passes through exterior walls and walls of existing structure, shall be sealed to permit movement of conduit, but prevent entrance of water.
7. Space between conduit and sleeves, where conduit passes through interior walls and slabs, shall be sealed with an approved sealing compound that is fireproof and will remain pliable.
8. Where faulty installation of sleeves, etc. occurs, the Electrical Contractor shall make all necessary changes and repairs, at no cost to the Owner, to the satisfaction of the Architect.
9. Where openings requested by the Electrical Contractor are left in floors or walls under other contracts, and are not used, such openings shall be filled in to match the adjoining work the Electrical Contractor.
10. All additional openings required and not requested while the work proceeds shall be cut as a part of the work of the appropriate trade and be paid for by the Electrical Contractor.

B. CUTTING AND PATCHING

1. The Electrical Contractor shall, at a time in advance of the work, verify all openings indicated on the drawings. Should the work of this Division require it, he shall furnish new instructions as to his requirements for these openings, subject to the Architect's approval. All additional cutting, patching and reinforcement of the construction of the building (subject to the Architect's approval) shall be performed under the section of the specifications covering the particular materials, but the cost shall be an obligation of this section of the work.
2. The Contractor shall provide and pay for the addition of all structural steel required for the support or bracing of all work furnished and installed.

C. CLEANING AND PAINTING

1. Conduit and Equipment to be Installed: Clean thoroughly to remove plaster, splattered paint, cement and dirt, on both exterior and interior.
2. Conduit and Equipment to be Painted: Clean all conduit exposed to view in completed structure by removing plaster and dirt. Remove grease, oil and

similar material from conduit and equipment by wiping with clean rags and suitable solvents in preparation for paint.

3. All items with Factory Finish: Remove cement, plaster, grease and oil, and leave all surfaces, including cracks and corners, clean and polished. Touch up any scratched or bare spots to match finish. Factory finish may be approved as prime coat by the Architect. See Painting Section.
4. All electrical apparatus and equipment in equipment rooms shall be provided with a factory finish cost. All panels in public spaces, corridors, etc. shall be provided with a factory prime coat.
5. Site Cleaning: Remove from site all packing cartons, scrap materials, and other rubbish relating to electrical installation.

D. TESTS

1. Conduct resistance to ground tests by qualified personnel to measure resistance to ground at all grounding electrodes. Make tests before slabs of affected areas are poured, in order that corrective measures, if required, may be taken. Submit to the Architect a report showing the results of these measurements. If the resistances exceed values specified elsewhere, perform all corrective measures as directed by the Architect.
2. Upon completion of the work and adjustment of all equipment, conduct an operating test for approval at such time as the Architect directs. Conduct the test in the presence of an authorized representative of the Architect. Demonstrate all systems and equipment to operate, in accordance with all requirements of the contract documents, and to be free from all electrical and mechanical defects.
3. All systems shall be free from short circuits and grounds, and shall show an insulation between phase conductors and ground not less than the requirements of the National Electrical Code. Test all circuits for proper neutral connections.
4. Complete all tests prior to final inspection of the project.
5. Preliminary Operations: Should the Owner require that any portion of the systems or equipment be operated prior to the final schedule dates for completion and acceptance of the work, the contractor shall consent. Such operation shall be under the direct supervision of, and at the expense of the Contractor, and shall not be construed as an acceptance of any of the work by the Owner.

E. OPERATING, INSTRUCTIONS AND SUPERINTENDENT

1. The services of an experienced superintendent shall be provided, who shall constantly be in charge of the erection of the systems in this Division, and who shall have complete knowledge of the design, operation and maintenance of all machinery, apparatus and other work installed under his supervision.
2. Upon the completion of the work, and prior to the final completion date, the Contractor shall submit to the Architect a letter signed by the Owner's representative stating that the Owner has been instructed in the proper operation of all installed equipment.

3.4 BASIC ELECTRICAL MATERIAL & METHODS

A. APPLICATION

1. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.
2. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.
3. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
4. Right of Way: Give to raceways and piping systems installed at a required slope.

B. RACEWAY APPLICATION

1. Use the following raceways for outdoor installations:
   a. Exposed: IMC
   b. Concealed: IMC
   c. Underground, Single Run: RNC
   d. Underground, Grouped: RNC
   e. Connection to Vibrating Equipment: LFMC
   f. Boxes and Enclosures: NEMA 250, Type 3R.
   g. Use the following raceways for indoor installations:
      1. Exposed: EMT
      2. Concealed: EMT
      3. Connection to Vibrating Equipment: FMC; except in wet or damp locations, use LFMC
      4. Damp or Wet Locations: IMC
      5. Boxes and Enclosures: NEMA 250, Type 1, unless otherwise indicated.

C. RACEWAY AND CABLE INSTALLATION

1. Conceal raceways and cables, unless otherwise indicated, within finished walls, ceilings, and floors.
2. Install raceways and cables at least 6 inches away from parallel runs of flues and steam or hot water pipes. Locate horizontal raceway runs above water and steam piping.
3. Use temporary raceway caps to prevent foreign matter from entering.
4. Make conduit bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.
5. Use raceway and cable fittings compatible with raceways and cables and suitable for use and location.
6. Install raceways embedded in slabs in middle third of slab thickness where practical, and leave at least 1-inch concrete cover.
   a. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.

b. Space raceways laterally to prevent voids in concrete.

c. Install conduit larger than 1-inch trade size parallel to or at right angles to main reinforcement. Where conduit is at right angles to reinforcement, place conduit close to slab support.

d. Transition from non-metallic tubing to Schedule 80 non-metallic conduit, rigid steel conduit, or IMC before rising above floor.

e. Make bends in exposed parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for exposed parallel raceways.

7. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12-inches of slack at each end of the pull wire.

8. Install signal system raceways, 2-inch trade size and smaller, in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements, in addition to requirements above.

D. WIRING METHODS FOR POWER, LIGHTING, AND CONTROL CIRCUITS

1. Feeders: Type THHN/THWN insulated conductors in raceway as allowed by code.

2. Underground Feeders and Branch Circuits: Type THWN insulated conductors in raceway.

3. Branch Circuits: Type THW or THHN/THWN insulated conductors in raceway where exposed. Metal-clad cable where concealed in ceilings and gypsum board partitions.

4. Remote-Control Signaling and Power-Limited Circuits: Type THHN/THWN insulated conductors in raceway for Classes 1, 2 and 3, unless otherwise indicated.

E. WIRING INSTALLATION

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

2. Install wiring at outlets with at least 12 inches of slack conductor at each outlet.

3. Connect outlet and component connections to wiring systems and to ground. Tighten electrical connectors and terminals, according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

F. ELECTRICAL SUPPORTING DEVICE APPLICATION

1. Damp Locations and Outdoors: Hot-dip galvanized materials or non-metallic, U-channel system components.

2. Dry Locations: Steel materials.

3. Support Clamps for PVC Raceways: Click-type clamp system.

4. Selection of Supports: Comply with manufacturer's written instructions.

5. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb design load.

G. SUPPORT INSTALLATION

1. Install support devices to securely and permanently fasten and support electrical components.
2. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.
3. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
4. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.
5. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.
6. Install ¼-inch diameter or larger threaded steel hanger rods, unless otherwise indicated.
7. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2 inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.
8. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.
9. Simultaneously install vertical conductor supports with conductors.
10. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.
11. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.
12. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.
13. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:
    a. Wood: Fasten with wood screws or screw-type nails.
    b. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.

c. New Concrete: Concrete inserts with machine screws and bolts.
d. Existing Concrete: Expansion bolts.
e. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.
f. Steel: Welded threaded studs or spring-tension clamps on steel.
g. Field Welding: Comply with AWS D1.1.
h. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
i. Light Steel: Sheet-metal screws.
j. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

H. IDENTIFICATION MATERIALS DEVICES

1. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.
2. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.
3. Self-Adhesive Identification Products: Clean surfaces before applying.
4. Identify raceways and cables with color banding as follows:
   a. Bands: Pre-tentioned, snap-around, colored plastic sleeves or colored adhesive marking tape. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side.
   b. Band Locations: At changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
   c. Colors: As follows:
      1. Fire Alarm System: Red.
      2. Security System: Blue and Yellow.
      3. Telecommunication System: Green and Yellow.
5. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.
6. Install continuous underground plastic markers during trench backfilling, for exterior underground power, control, signal, and communication lines located directly above power and communication lines. Locate 6 to 8 inches below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches, overall, use a single line marker.
7. Color-code 208/120-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:
   a. Phase A: Black.
   b. Phase B: Red.
   c. Phase C: Blue.

d. Neutral: White.
e. Ground: Green.

I. UTILITY COMPANY ELECTRICITY-METERING EQUIPMENT
1. Install equipment according to the Utility Company's written requirements.

J. FIRESTOPPING
1. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly.

K. CUTTING AND PATCHING
1. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.
2. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

L. FIELD QUALITY CONTROL
1. Inspect installed components for damage and faulty work, including the following:
a. Raceways.
b. Building wire and connectors.
c. Supporting devices for electrical components.
d. Electrical identification.
e. Electricity-metering components.
f. Concrete bases.
g. Electrical demolition.
h. Cutting and patching for electrical construction.
i. Touchup painting.
2. Test Owner's electricity-metering installation for proper operation, accuracy, and usability of output data.
a. Connect a load of known kW rating, 1.5 kW minimum, to a circuit supplied by the metered feeder.
b. Turn off circuits supplied by the metered feeder and secure them in the "off" condition.
c. Run the test load continuously for eight hours, minimum, or longer to obtain a measurable meter indication. Use a test load placement and setting that ensure continuous, safe operation.
d. Check and record meter reading at end of test period and compare with actual electricity used based on test load rating, duration of test, and sample measurements of supply voltage at the test load connection. Record test results.
e. Repair or replace malfunctioning metering equipment or correct test setup; then retest. Repeat for each meter in installation until proper operation of

entire system is verified.

M. REFINISHING AND TOUCHUP PAINTING

1. Refinish and touch up paint. Paint materials and application requirements are specified in Division 9 Section "Painting."
   a. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
   b. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
   c. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
   d. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

N. CLEANING AND PROTECTION

1. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.
2. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

3.5 GROUNDING & BONDING

A. APPLICATION

1. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.
2. In raceways, use insulated equipment grounding conductors.
3. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections.
4. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.
5. Ground Rod Clamps at Test Wells: Use bolted pressure clamps with at least two bolts.
6. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
   a. Use insulated spacer; space 1 inch from wall and support from wall 6 inches above finished floor, unless otherwise indicated.
   b. At doors, route the bus up to the top of the door frame, across the top of the doorway, and down to the specified height above the floor.
7. Underground Grounding Conductors: Use tinned-copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches below grade or bury 12 inches above duct bank when installed as part of the duct bank.

B. EQUIPMENT GROUNDING CONDUCTORS

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

2. Install equipment grounding conductors in all feeders and circuits.
3. Non-metallic Raceways: Install an equipment grounding conductor in non-metallic raceways unless they are designated for telephone or data cables.
4. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
    a. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a ¼-by-2-by-12-inch grounding bus.
    b. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

C. COUNTERPOISE
1. Ground the steel framework or metal parts of the building with a # 3/0 AWG conductor.

D. INSTALLATION
1. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.
    a. Drive ground rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.
    b. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.
2. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact or damage.
3. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.
4. Metal Water Service Pipe: Provide insulation copper grounding conductors, in conduit, from buildings' main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
5. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.
6. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.

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

E. CONNECTIONS

1. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
   a. Use electroplated or hot tin coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
   b. Make connections with clean, bare metal at points of contact.
   c. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
   d. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
   e. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
2. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
3. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
4. Non-contact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically non-continuous conduits at entrances and exits with grounding and bushings and bare grounding conductors, unless otherwise indicated.
5. Connections at Test Wells: Use compression-Type connectors on conductors and make bolted-and clamped-type connections between conductors and ground rods.
6. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.
7. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
8. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

F. FIELD QUALITY CONTROL

1. Testing: Perform the following field quality-control testing:
   a. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
   b. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.
   c. Provide drawings locating each ground rod and ground rod assembly and other grounding observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
   d. Equipment Rated 500 kVA and Less: 10 ohms.
   e. Substations and Pad-Mounted Switching Equipment: 5 ohms.
   f. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

G. GRADING AND PLANTING
1. Restore surface features, including vegetation, at areas disturbed by Work of this Section. Re-establish original grades, unless otherwise indicated. If sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include application of topsoil, fertilizer, lime, seed, sod, sprig, and mulch. Maintain restored surfaces. Restore disturbed paving as indicated.

3.6 CONDUCTORS & CABLES

A. EXAMINATION
1. Examine raceways and building finishes to receive wires and cables for compliance with requirements for installation tolerances and other conditions affecting performance of wires and cables. Do not proceed with installation unsatisfactory conditions have been corrected.

B. WIRE AND INSULATION APPLICATIONS
1. Service Entrance: Type RHW or THWN, in raceway.
2. Feeders: Type THHN/THWN, in raceway.
3. Branch Circuits: Type THHN/THWN, in raceway.
4. Fire Alarm Circuits: Power-limited, fire-protective, signaling circuit cable.
5. Fire Alarm Circuits: Type THHN/THWN, in raceway.
6. Class 1 Control Circuits: Type THHN/THWN, in raceway.
7. Class 2 Control Circuits: Power-limited tray cable, in cable tray.
8. Class 2 Control Circuits: Power-limited cable, concealed in building finishes.

9. Class 2 Control Circuits: Type THHN/THWN, in raceway.

C. INSTALLATION

1. Install wires and cables as indicated, according to manufacturer's written instructions and NECA's "Standard of Installation."
2. Remove existing wires from raceway before pulling in new wires and cables.
3. Pull Conductors: Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values. Provide pull boxes and splice boxes as required.
4. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
5. Install exposed cables, parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
6. Support cables according to Division 16 Section "Basic Electrical Materials and Methods."
7. Seal around cables penetrating fire-rated elements according to Division 7 Section 07840.
8. Identify wires and cables according to Division 16 Section "Basic Electrical Materials and Methods."
9. Identify wires and cables according to Division 16 Section "Electrical Identification."

D. CONNECTIONS

1. Conductor Splices: Keep to minimum.
2. Install splices and tapes that possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.
3. Use splice and tap connectors compatible with conductor material.
4. Use oxide inhibitor in each splice and tap connector for aluminum conductors.
5. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.
6. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer.
7. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

E. FIELD QUALITY CONTROL

1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.
2. Correct malfunctioning conductors and cables at Project site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

3.7 BRANCH CIRCUITRY

A. For all lighting and appliance branch circuitry, raceway sizes shall conform to industry standard maximum permissible occupancy requirements except where these are exceeded by other requirements specified elsewhere.

B. Circuits shall be balanced on phases at their supply as evenly as possible.

C. Feeder connections shall be in the phase rotation which establishes proper operation for all equipment supplied.

D. Reduced size conductors indicated for any feeders shall be taken as their grounding conductors.

E. Feeders consisting of multiple cables and raceways shall be arranged such that each raceway of the feeder contains one cable for each leg and one neutral cable, if any.

F. For circuitry indicated as being protected at 20 Amps or less, abide by the following:
   1. All 20 amp, 120/208 volt, 3 phase, 3 wire combined branch circuit homeruns shall be provided with a #8 AWG neutral conductor.
   2. Minimum conductor size shall be No. 12 A.W.G. copper.
   3. Conductors operating at 115 volts extending in excess of 100 Ft. or the last outlet or fixture tap shall be No. 10 A.W.G. copper throughout.
   4. Lighting fixtures and receptacles shall not be connected to the same circuit.
   5. Circuits shall be balanced on phases at their supply point as evenly as possible.

3.8 IDENTIFICATION AND TAGGING

A. Identify individually:
   1. Each transformer.
   2. Each panel-board.
   3. Each switch and circuit breaker.
   4. Each feeder, wire or cable of all systems.
   5. Each switchboard.
   6. Each end of nylon pull-wire in empty conduit.

B. Each wire or cable in a feeder shall be identified at its terminal points of connection and in each pull-box, junction box and panel gutter through which it passes.

C. The nomenclature used to identify panel-boards or load center shall designate the numbers assigned to them.

D. The nomenclature used to identify switches or circuit breakers shall:
   1. Where they disconnect mains or services designate this fact.
   2. Where they control feeders, designate the feeder number and the name of the load supplied.
   3. Where they control lighting and appliance branch circuitry, designate the name of the space and the load supplied.

E. The nomenclature used to identify feeder wires and cables shall designate the feeder number.

F. Identification for panel-boards or load centers shall be by means of engraved lama-coid nameplates showing 1/4" high white lettering on a black background fastened to the outside face of the front.

G. Identification for switches or circuit breakers shall be by means of the following:
   1. Where individually enclosed -- engraved lama-coid nameplates showing 1/8" high white lettering on a black background fastened on the outside front face of the enclosure.
   2. Where in panel-boards or load centers without doors -- same as for individually enclosed.
   3. Where in panel-boards or load centers with doors -- typewritten directories mounted behind transparent plastic covers, in metal frames fastened on the inside face of the doors.

H. Identification for wires and cables shall be by means of wrap around "brady" type labels.

I. Device plates for local toggle switches, toggle switch type motor starters, pilot lights and the like, whose function is not readily apparent shall be engraved with 1/8" high letters suitably describing the equipment controlled or indicated.

J. These identification letters shall be stamped into the metal of the bus bars of each phase of the main busses of each switchboard and each panel-board. The letters shall be visible from at least one "normal posture" location without having to demount any current carrying or supporting elements.

K. Equip the front face of all switchboard pull boxes junction boxes and the like containing cables, busing or devices operating in excess of 600 volts with enameled sheet metal "red on white" signs reading "DANGER--HIGH VOLTAGE."

L. Identify each outlet box, junction box, and cabinet used in conjunction with empty raceway for wires of a future system by means of indelible markings on the inside denoting the system.

M. Prior to installing identifying tags and nameplates, submit their nomenclature for approval. Conform to all revisions issued by the Architect.

3.9 RACEWAYS AND BOXES

A. EXAMINATION
   1. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of raceway installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. WIRING METHODS
   1. Outdoors: Use the following wiring methods:
      a. Exposed: Rigid steel.
      b. Concealed: Rigid steel or IMC.

c. Underground, Single Run: RNC.
d. Underground, Grouped: RNC.
e. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
f. Boxes and Enclosures: NEMA 250, Type 3R.
g. Others as approved elsewhere in this specification.

2. Indoors: Use the following wiring methods:
   a. Exposed: EMT.
   b. Concealed: EMT.
   c. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except in wet or damp locations, use LFMC.
   d. Damp or Wet Locations: Rigid steel conduit.
   e. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
   f. Damp or Wet Locations: NEMA 250, Type 4, stainless steel or nonmetallic as shown on drawings.
   g. Others as approved elsewhere in this specification.

C. INSTALLATION

1. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.
2. Minimum Raceway Size: 3/4-inch trade size.
3. Conceal conduit and EMT, unless otherwise indicated, within finished walls, ceilings, and floors.
4. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
5. Install raceways level and square and at proper elevations. Provide adequate headroom.
6. Complete raceway installation before starting conductor installation.
7. Support raceways as specified in Division 16 Section "Basic Electrical Materials and Methods."
8. Use temporary closures to prevent foreign matter from entering raceways.
9. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.
10. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.
11. Use raceway fittings compatible with raceways and suitable for use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings, unless otherwise indicated.
12. Run concealed raceways, with a minimum of bends, in the shortest practical distance considering the type of building construction and obstructions, unless otherwise indicated.

13. Raceways Embedded in Slabs: Install in middle third of slab thickness where practical, and leave at least 1-inch concrete cover.
    a. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
    b. Space raceways laterally to prevent voids in concrete.
    c. Run conduit larger than 1-inch trade size parallel to or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
    d. Transition from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.
14. Install exposed raceways parallel to or at right angles to nearby surfaces or structural members, and follow the surface contours as much as practical.
    a. Run parallel or banked raceways together, on common supports where practical.
    b. Make bends in parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
15. Join raceways with fittings designed and approved for the purpose and make joints tight.
    a. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.
    b. Use insulating bushings to protect conductors.
16. Tighten set screws of threadless fittings with suitable tools.
17. Terminations: Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against the box. Where terminations are not secure with 1 locknut, use 2 locknuts: 1 inside and 1 outside the box.
18. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align raceways so the coupling is square to the box and tighten the chase nipple so no threads are exposed.
19. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200lb tensile strength. Leave at least 12 inches of slack at each end of the pull wire.
20. Telephone and Signal System Raceways, 2-Inch Trade Size and Smaller: In addition to the above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.
21. Install raceway sealing fittings according to manufacturer's written instructions. Locate fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar

to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

a. Where conduits pass from warm to cold locations, such as the boundaries of refrigerated spaces.

b. Where otherwise required by NFPA 70.

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

23. Flexible Connections: Use maximum of 6 feet of flexible conduit for recessed and semi recessed lighting fixtures; for equipment subject to vibration, noise transmission,movement; and for all motors. Use liquidtight flexible conduit in wet or damp locations. Install separate ground conductor across flexible connections.

24. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.

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

D. PROTECTION

1. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure coatings, finishes, and cabinets are without damage or deterioration at the time of Substantial Completion.

a. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

b. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

E. CLEANING

1. On completion of installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

3.10 WIRING DEVICES

A. INSTALLATION

1. Install devices and assemblies plumb and secure.

2. Install wall plates when painting is complete.

3. Install wall dimmers to achieve indicated rating after de-rating for ganging as instructed by manufacturer.

4. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.

5. Protect devices and assemblies during painting.

6. Adjust locations at which floor service outlets and telephone/power service poles are installed to suit arrangement of partitions and furnishings.

B. IDENTIFICATION

1. Comply with Division 16 Section "Basic Electrical Materials and Methods."

C. CONNECTIONS

1. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.
2. Tighten electrical connectors and terminals according to manufacturers published torque tightening values. If manufacturers torque values are not indicated, use those specified in UL 486AandUL486B.

D. FIELD QUALITY CONTROL

1. Test wiring devices for proper polarity and ground continuity. Operate each device at least six times.
2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.
3. Replace damaged or defective components.

E. CLEANING

1. Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices.

3.11 PANELBOARDS

A. INSTALLATION

1. Install panelboards and accessories according to NEMA PB 1.1.
2. Mounting: Plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.
3. Circuit Directory: Create directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
4. Install filler plates in unused spaces.
5. Provision for Future Circuits at Flush Panelboards: Stub four 1 inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1 inch empty conduits into raised floor space or below slab not on grade.
6. Wiring in Panelboard Gutters: Arrange conductors into groups and bundle and wrap with wire ties after completing load balancing.

B. IDENTIFICATION

1. Identify field installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section “Basic Electrical Materials and Methods.”
2. Panelboard Nameplates: Label each panelboard with engraved metal or laminated plastic nameplate mounted with corrosion resistant screws.

C. CONNECTIONS

1. Install equipment grounding connections for panelboards with ground continuity to main electrical ground bus.
2. Tighten electrical connectors and terminals according to manufacturer's published torque tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

D. FIELD QUALITY CONTROL

1. Prepare for acceptance tests as follows:
   a. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
   b. Test continuity of each circuit.
2. Testing: After installing panelboards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
   a. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded case circuit breakers. Certify compliance with test parameters.
   b. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Balancing Loads: After Substantial Completion, but not more than 60 days after Final Acceptance, otherwise, replace with new units and retest.
   a. Measure as directed during period of normal system loading.
   b. Perform load balancing circuit changes outside normal occupancy/working schedules of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
   c. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
   d. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

E. ADJUSTING

1. Set field-adjustable switches and circuit breaker trip ranges.

F. CLEANING

1. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris, do not use compressed air to assist in cleaning.

3.12 DISCONNECT SWITCHES AND CIRCUIT BREAKERS

A. INSTALLATION

1. Install disconnect switches and circuit breakers in locations as indicated, according to manufacturer's written instructions.
2. Install disconnect switches and circuit breakers level and plumb.
3. Install wiring between disconnect switches, circuit breakers, control, and indication devices.

4. Connect disconnect switches and circuit breakers and components to wiring system and to ground as indicated and instructed by manufacturer.
5. Tighten electrical connectors and terminals according to manufacturer's published torque tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
6. Identify each disconnect switch and circuit breaker according to requirements specified in Division 16 Section "Basic Electrical Materials and Methods."

B. FIELD QUALITY CONTROL

1. Testing: After installing disconnect switches and circuit breakers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.
3. Perform visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.5 for disconnect switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.

C. ADJUSTING

1. Set field adjustable disconnect switches and circuit breaker trip ranges as indicated.

D. CLEANING

1. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish including chips, scratches, and abrasions.

3.13 TESTS

A. Furnish all labor, material, instruments, supplies and services and bear all costs for the accomplishment of tests herein specified. Correct all defects appearing under test, repeat the tests until no defects are disclosed. Leave the equipment clean and ready for use.

B. The Electrical Contractor shall perform any test other than herein specified which may be specified by legal authorities or by agencies to whose requirements this work is to conform.

3.14 FINAL INSPECTION AND TEST

A. Prior to test, feeders and branches shall be continuous from service contact point to each outlet include: all panels, feeders and devices. Test system free from short circuits and grounds with insulation resistances not less than outlines in the National Electrical Code. Provide testing equipment necessary and conduct test in presence of the Owner's representative.

B. The final inspection and test shall include the following:

1. Testing of the impedance of the grounding system.
2. Testing of each outlet.
3. Testing of branch and feeder conductors for continuity.
4. Testing of panel boards to verify proper current balance and voltage.

3.15 EQUIPMENT SPACE

A. The Drawings indicate scheduled products physically arranged in the spaces, based on catalog data of specific manufacturers.

B. Prepare Shop Drawings indicating the exact physical space requirements for equipment and servicing of equipment actually purchased for each item of equipment involved, and electrical connections, and be fully responsible for costs or modifications required for the installation.

3.16 INTERFERENCES

A. Relocate or reroute wiring, as required to facilitate construction of finished work as planned. Restore surfaces, insulation, and finish to match condition of adjacent work.

3.17 CUTTING AND PATCHING

A. Assume costs and responsibility for cutting and patching required to complete the installation.

B. Patch surfaces to the condition of the adjacent surfaces.

3.18 PAINTING AND FINISHING AND CLEANING

A. Finish painting (other than factory applied) and electrical equipment, and its associated conduit and devices are specified elsewhere in the Specifications. Provide touch-up painting of pre-finished electrical products.

B. Leave surfaces clean and remove debris.

3.19 CONDUIT INSTALLATION

A. Coordinate installation of raceways with building structure and other mechanical trades, complete with bends, fittings, and junction and pull boxes to meet codes and make complete operating systems. Raceways 1-inch and larger shall not be run in concrete slabs without approval of structural engineer.

B. Complete continuous raceway shall be provided for pulling and installation of wires. All wiring shall be run in raceways unless otherwise specified.

C. In general, conduits shall be concealed in finished areas, and may be exposed in unfinished areas, run square to the building construction, and continuous from outlet to outlet, connected mechanically and electrically to assure grounding. Conduits shall be cut square, reamed to full size, shouldered without butting into couplings or fittings. The threads shall be of standard length and diameter required for the size of the conduit used, and graphite bearing thread lubricant shall be used in making up the threads. Running threads will not be acceptable. Conduits shall have a smooth interior surface free of obstructions, shall be capped with conduit seals during the construction period, shall be uniformly sloped to eliminate trapped condensation, shall be thoroughly cleaned and dry before pulling any wire. Conduit installation shall clear hot pipes not less than 6-inches.

D. Rigid conduit or electrical metallic tubing shall not be rigidly connected to vibrating equipment. Use flexible conduit or Sealtite.

E. Conduit installation above accessible ceilings shall be such that there will be no interference with the installation of lighting fixtures, air outlets or other devices.

F. Conduit installed underground, in concrete or masonry:

1. Joints shall be made liquid-tight and shall engage not less than five threads.
2. Conduit in concrete shall be placed so that no portion of the conduit or couplings are exposed, and at a sufficient depth to prevent cracking or spalling. Conduit 1-inch or larger shall not be placed in walls or slabs except as specifically indicated.
3. Provide red colored concrete encasement for scheduled conduit systems installed underground.
4. Steel conduit underground, which is not concrete encased, shall be given cold applied protective tape coating, applied in accordance with manufacturer's instructions.
5. Conduits embedded in slabs except as specifically indicated or written approval is obtained shall not cross structural expansion joints. Provide conduit expansion joints in the event such crossings are permitted.
6. Place all conduit concealed in poured-in-place structure behind reinforcement bars.

G. Exposed conduit shall be parallel with or at right angles to, building lines, beams or ceilings with symmetrical ends or metal boxes placed at changes in direction or at taps.

H. Connections to wiring enclosures - Secure conduits to outlet boxes or wiring enclosures with double lock nuts. Where conduit boxes with threaded hubs are used, conduits shall engage at least five threads in the hubs. Provide plastic insulating bushings for rigid conduits (similar to O.Z. Type A). Provide connectors with plastic insulated throats for electrical metallic tubing termination.

I. Provide cable supports at the top of vertical runs for conductors 4 AWG and larger, and otherwise where required by NEC.

J. Minimum size conduit is 1/2-inch.

3.20 FASTENINGS

A. Fastenings for raceways and boxes shall be made by means of toggle or expansion bolts sized for the loads imposed based on manufacturer's recommendations.

B. Fastenings to masonry or concrete shall be made by means of machine screws sized for the loads imposed based on manufacturer's recommendations.

C. Outlet box supported fixtures - Lighting outlets rigidly supported independently by means of expandable bar hangers or metal strut framing system affording a safe and substantial support for the equipment, and utilizing manufacturer's recommendations for the loads and conditions imposed. Fixtures will not be supported solely from the box cover bolts.

D. Outlet, pull, or junction boxes shall be supported from joists or other structural framing (not finish wall or ceiling panels) by expandable bar hangers or metal strut framing system.

E. Panels may be attached directly only to permanent structural walls. Support panels located on nonpermanent partition walls independent of the wall with metal strut framing system attached to permanent structure (slab or framing members).

3.21 RACEWAY SYSTEMS

A. Provide grounded raceway systems with conduit, cabinets, outlet boxes, junction boxes, backboards, and miscellaneous appurtenances required for complete system. Leave

empty raceway systems complete with poly 200 lb nylon pull cord or #10 gage pull wire, minimum 2 feet extra length at each end, properly tagged to indicate terminal points and length of runs (at junction boxes as well as terminations).

B. Systems shall meet requirements of, be accepted by, and be approved by the code authority, utility, equipment supplier, Owner, Contractor or subcontractor furnishing system equipment and wiring for the system involved.

C. Provide minimum 3/4-inch size empty conduit unless otherwise indicated.

D. Partial raceway systems include systems that allow open wiring installed above accessible ceilings utilized as plenums (with special plenum cables) or where the ceiling cavity is not utilized as an air plenum. Hollow walls with system wall outlets may serve as raceway where approved by code. Provide wall plaster frames, coverlets, and pull wire from box to above accessible ceilings.

E. Furnish and install empty conduit, cabinets, outlet boxes junction boxes, backboards and other miscellaneous appurtenances required for the systems specified. Conduit shall be as specified, and empty systems left complete, with 14-gage steel pull wire in each unit, ends properly tagged. Backboard shall be as specified, and cabinets shall be complete with doors and snap latches as specified for "distribution Panel boards".

F. Underground conduit intended for future use shall be identified by permanent concrete markers indicating location and intended use. Locate at each end and at each change of direction as a minimum.

3.22 CONDUCTOR INSTALLATION

A. Wire and cable No. 10 and smaller shall be factory color-coded. Provide factory color-coding for No. 8 and No. 6 wire and cable or mark conductors on each end and in all junctions or pull boxes with three-inch band of colored pressure sensitive plastic tape or by the use of brilliant waterproof lacquer properly applied. Colors for each phase and the neutral shall be consistent throughout the system.

B. Color coding shall be:

C.

120/208 Volt	Phase
Black	A
Red	B
Blue	C
White	N
Green	G

D. When voltage to ground does not exceed 120 volts, the minimum size conductor for use in lighting and power branch circuits shall be No. 12 AWG, except that the minimum size for control circuits (switch legs) shall be No. 14 AWG. Home runs longer than 100 feet actual wire length from panel shall be no smaller than No. 10 AWG.

E. Cable terminals, taps and splices No. 6 and larger shall be made secure with UL listed solder less indenter compression barrel type connectors wherever practicable. UL listed setscrew lugs may be used on circuit breakers, motor starters, and switches not available with indenter connections. Joints in conductors No. 8 and smaller shall be made by applying a UL listed insulated, cadmium plated, live steel spring type connector in sizes up to the catalog capacity of the connector.

F. If permanently installed, do not install wires in conduit until entire system of conduit and outlet boxes is in place. Conductors shall be pulled using a UL listed wire lubricant.

G. Conductors in conduits shall be continuous and without splices except in junction boxes. Indenter compression barrel type lugs shall be used for stranded conductor terminations except UL listed bolted compression type connectors or lugs, factory furnished on such devices as circuit breakers, switch units and motor starters, may be utilized. Indenter compression type connections shall be used to make splices, taps and motor connections.

H. Insulate splices, taps, and connections such that the insulation of the joint is no less than the insulation of the wire. Insulate with manufactured lock-on splice caps or build up with rubber tape applied directly to the joint, and then cover with thermoplastic electrical tape.

I. Exercise care when installing wire in conduit so as to prevent injury to the conductor insulation. Mechanical means of pulling shall not be used unless approved. Conductors shall be pulled using UL listed lubricant.

J. Whenever wiring leaves the conduit and terminates at a terminal board, the wiring shall be formed and laced with waxed twine, or plastic wire ties.

K. In the event circuits feed through outlet boxes, provide splice and pigtail for device connection, with sufficient slack to pull splice out of box at least 6-inches (for inspection).

3.23 ELECTRICAL TESTING

A. This Section applies to the testing of systems in Division 16 of the Specifications.

B. Qualifications:

1. Competent and experienced personnel, having done similar work in the past, and whose qualifications shall be subject to approval, shall perform testing of systems.

2. Submit names and qualifications of all persons proposed for testing of electrical systems and equipment.

C. Reports:

1. Provide reports and certificates required in each category of testing, adjusting and balancing, signed by both the technician performing the work and the Contractor as representing accurate, factual data, based on readings in the field.

2. Reports shall be in triplicate on 8-1/2 x 11 -inch white bond paper. Submit format for recording data for approval prior to use.

D. Equipment and Material:

1. Provide all meters, instruments, equipment and materials necessary for performance of tests.

2. Testing apparatus, not part of the permanent installation, shall remain the property of the Contractor.

3. Provide gaskets, lubricants and other expendable materials required to be replaced during the execution of the work.

4. Provide fuel, if any, as required for tests.

E. Equipment:

1. Test and adjusted all electrical equipment to insure correct functional performance. Inspect, lubricate, test and adjust equipment and correct defects or damages before connecting the equipment to the system.

F. Wiring:

1. Test power, lighting and control wiring or bus duct for continuity, short circuits and improper grounding.
2. Test each grounding circuit separately for continuity.
3. Values of insulation resistance shall meet the standards established by the National Electrical Code.
4. If faults are detected, the point or points of such fault shall be located and the defective wiring replaced at the Contractor's expense.

G. Acceptance Tests:

1. Leave the entire electrical system installed under this Contract in proper working order. Upon completion of the installation, an acceptance test shall be run to ascertain that starters, circuit breakers, motors, relays, indicating lights, pushbuttons, alarm devices and other electrical equipment and controls are operating correctly as required for the overall operation of the facility.

H. Submit certified reports indicating full compliance with test requirements.

I. Make replacements or repairs to tested products, which are damaged as result of tests.

J. Schedule tests at a time convenient to required witnesses or persons affected by the tests.

K. Give written notification for test procedures, prior to the test.

L. Upon completion of the work, recheck electrical connections, cable to bus, cable to panels, bus to bus, throughout the job for tightness.

M. Check motors for correct rotation.

N. Test electrical systems grounding prior to completion of the work. Note ground resistance together with method of testing. For ground rods, note the soil condition at the time measurements were made. Ground resistance shall not exceed 25 ohms.

O. Test feeder and power circuits No. 8 AWG or larger with a "Megger” from each conductor to ground and between conductors. Record each reading. At the completion of work certify the results of the "Megger" testing.

P. After the electrical equipment and the wiring is installed, and prior to energizing for the first time any section of the electrical system, test phase-to-phase and phase-to-ground insulation on feeders and sub-feeders switchboards, dry-type transformers, motors, and other pieces of electrical equipment to assure that they have the proper insulation and are free of grounds. Systems rated above 250 volts shall be tested with a 1000-volt Megger. Circuits rated at or below 250 volts shall be tested with a 500-volt Megger.

Q. Energize each receptacle outlet and test each outlet with a plug-in receptacle circuit tester with indication for "correct wiring", "open ground', "hot ground", "reversed polarity", "open neutral', "hot unwired", "hot and ground reversed", "GFCI trip', and "GFCI test'. Correct any deficiencies discovered during testing.

R. Branch circuits served from lighting panel boards vary in loading. When entire load is turned on and system is operating at 100 percent demand, the initial unbalance should not exceed 10 percent. In the event greater unbalance exists, report the measured individual branch circuit loads and panel feeder loads and request instructions.

S. Furnish at the completion of the Project a final inspection certificate from the local inspecting authority.

T. Perform the following testing and certify test results-

1. Phase-to-phase and phase-to-ground resistance
    a. At the supply line terminals of each item of electrical distribution system equipment.
    b. At supply side of each feeder and sub-feeder.
    c. At high voltage and at low terminals of each transformer.
    d. At line terminals of each motor.
    e. At any other point required by the Architect.
2. Ground resistance at each panel neutral bus.
3. Voltage to ground on each secondary leg of each transformer at no load and full load.
4. Service voltage at switchboard at full load between phases and to ground.
5. Line current in each line of each power transformer and at switchboard at full load, taken at completion of project.

U. Failures or improper operations shall be corrected. Furnish necessary test equipment and pay cost of testing, replacing and repairing.

END OF SECTION

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SECTION 260100 – GENERATOR (PART OF WORK OF SECTION 260000)

1 ENGINE GENERATOR SPECIFICATION

PART 1 - GENERAL

1.1. DESCRIPTION OF SYSTEM & SITE

A. Provide a 150 kW standby power system to supply electrical power at 208 Volts, 60 Hertz, 3 Phase. The generator shall consist of a liquid cooled spark-ignited engine, a synchronous AC alternator, and system controls with all necessary accessories for a complete operating system, including but not limited to the items as specified hereinafter.
The site is an NEC ordinary location with no specific harsh environment requirements.
The genset shall be applied at the listed ambient and elevation. Bidders to submit the generators rated power output at 100 ambient (˚F) and 500 elevation (Ft).
Bidders are to submit the genset's sound level in dBA at 23 ft based on the configuration specified. Maximum full-load dBA average to be 70dBA.
The on-site gas pressure shall be calibrated to match the selected generator requirements.

F. **Work of this Section is part of Section 260000.**

1.2. REQUIREMENTS OF REGULATORY AGENCIES

A. An electric generating system, consisting of a prime mover, generator, governor, coupling and all controls, must have been tested, as a complete unit, on a representative engineering prototype model of the equipment to be sold.

B. The generator set must conform to applicable NFPA requirements.

C. The generator set must be available with the Underwriters Laboratories listing (UL2200) for a stationary engine generator assembly.

D. The generator set must be pre-certified to meet EPA federal emission requirements for stationary standby. On-site emission testing & certification will not be acceptable for standby applications.

1.3. MANUFACTURER QUALIFICATIONS

A. This system shall be supplied by an original equipment manufacturer (OEM) who has been regularly engaged in the production of engine-alternator sets, automatic transfer switches, and associated controls for a minimum of 25 years, thereby identifying one source of supply and responsibility. Approved suppliers are Kohler (Basis of Design), Generac or Caterpillar.

B. The manufacturer shall have printed literature and brochures describing the standard series specified, not a one of a kind fabrication.

C. Manufacturer's authorized service representative shall meet the following criteria:
   a) Certified, factory trained, industrial generator technicians
   b) Service support 24/7
   c) Service location within 200 miles
   d) Response time of 4 hours
   e) Service & repair parts in-stock at performance level of 95%
   f) Offer optional remote monitoring and diagnostic capabilities

1.4. SUBMITTALS

A. Engine Generator specification sheet
B. Controls specification sheet(s)
C. Installation / Layout dimensional drawing
D. Wiring schematic
E. Sound data
F. Emission certification
G. Warranty statement

1.5. Engine Rating and Performance

A. The prime mover shall be a liquid cooled, spark-ignited, 4-cycle engine. It will have adequate horsepower to achieve rated kW output.
2.1.2. The engine shall support a 100% load step.
2.1.3. The generator system shall support generator start-up and load transfer within 10 seconds.
2.1.4. The generator shall accept a load step of 100% of rated kW with a maximum frequency dip of 12 Hz.

2.2. Engine Oil System

2.2.1. Full pressure lubrication shall be supplied by a positive displacement lube oil pump. The engine shall have a replaceable oil filter(s) with internal bypass and replaceable element(s).

2.2.2. The engine shall operate on mineral based oil. Synthetic oils shall not be required.
Engine Cooling System

2.3.1. The engine is to be cooled with a unit mounted radiator, fan, water pump, and closed coolant recovery system. The coolant system shall include a coolant fill box which will provide visual means to determine if the system has adequate coolant level. The radiator shall be designed for operation in the -20 F - 122 degrees F, (50 degrees C) ambient temperature range.
2.3.2. The engine shall have (a) unit mounted, thermostatically controlled water jacket heater(s) to aid in quick starting. The wattage shall be as recommended by the manufacturer.

2.3.3. Engine coolant and oil drain extensions, equipped with pipe plugs and shut-off valves, must

be provided to the outside of the mounting base for cleaner and more convenient engine servicing.

2.3.4. A radiator fan guard must be installed for personnel safety that meets UL and OSHA safety requirements.

2.4. Engine Starting System

2.4.1. Starting shall be by a solenoid shift, DC starting system.

2.4.2. The engine's cranking batteries shall be lead acid. The batteries shall be sized per the manufacturer's recommendations. The batteries supplied shall meet NFPA 110 cranking requirements of 90 seconds of total crank time. Battery specifications (type, amp-hour rating, cold cranking amps) to be provided in the submittal.

2.4.3. The genset shall have an engine driven, battery charging alternator with integrated voltage regulation.

2.4.4. The genset shall have an automatic dual rate, float equalize, 10 amp battery charger. The charger must be protected against a reverse polarity connection. The chargers charging current shall be monitored within the generator controller to support remote monitoring and diagnostics. The battery charger is to be factory installed on the generator set. Due to line voltage drop concerns, a battery charger mounted in the transfer switch will be unacceptable.Engine Fuel System

2.5.1. The engine shall be configured to operate on pipe line grade natural gas.

2.5.2. The engine shall utilize a fuel system inclusive of carburetor, gas regulator, , low gas pressure switch, and fuel shut-off solenoid.

2.5.3. The engines internal fuel connections shall be terminated to the generator frame via an NPT fitting for easy installation.

2.5.4. The gas pressure shall be 8-14 H2O (2.0-3.5 kPA)

2.6. Engine Controls

2.6.2. Engine speed shall be controlled with an integrated isochronous governor function with no change in alternator frequency from no load to full load. Steady state regulation is to be 0.25%.

2.6.3. Not used.

2.6.1. Engine sensors used for monitoring and control are to be conditioned to a 4-20ma signal level to enhance noise immunity.

2.6.2. All engine sensor connections shall be sealed to prevent corrosion and improve reliability.

2.7. Engine Exhaust & Intake

2.7.1. The engine exhaust emissions shall meet the EPA emission requirements for standby power generation.

2.7.2. The manufacturer shall supply its recommended stainless steel, flexible connector to couple the engine exhaust manifold to the exhaust system. A rain cap will terminate the exhaust pipe after the silencer. All components must be properly sized to assure operation without excessive back pressure when installed.

2.7.3. The manufacturer shall supply a critical grade exhaust silencer as standard. For applications with site specific sound requirements (reference section 1.1), the silencer shall be selected to achieve site sound levels.

2.7.4. For gensets in a weather or sound attenuated enclosure, all exhaust piping from the turbo-charger discharge to the silencer shall be thermally wrapped to minimize heat dissipation inside the enclosure.

2.7.5. The engine intake air is to be filtered with engine mounted, replaceable, dry element filters.

3. Alternator

3.1. The alternator shall be the voltage and phase configuration as specified in section 1.1.1.

3.2. The alternator shall be a 4-pole, revolving field, stationary armature, synchronous machine. The excitation system shall utilize a brushless exciter with a three phase full wave rectifier assembly protected against abnormal transient conditions by a surge protector. Photo-sensitive components will not be permitted in the rotating exciter.The alternator shall include a permanent magnet generator (PMG) for excitation support. The system shall supply a minimum short circuit support current of 300% of the rating (250% for 50Hz operation) for 10 seconds.
Three phase alternators shall be 12 lead, broad range capable of supporting voltage reconnection. Single phase alternators shall be four lead and dedicated voltage designs (600v) shall be six lead. All leads must be extended into a NEMA 1 connection box for easy termination. A fully rated, isolated neutral connection must be included by the generator set manufacturer.
The alternator shall use a single, sealed bearing design. The rotor shall be connected to the engine flywheel using flexible drive disks. The stator shall be direct connected to the engine to ensure permanent alignment.
The alternator shall meet temperature rise standards of UL2200 (120 degrees C). The insulation system material shall be class "H" capable of withstanding 150 degrees C temperature rise.
The alternator shall be protected against overloads and short circuit conditions by advanced control panel protective functions. The control panel is to provide a time current algorithm that protects the alternator against short circuits. To ensure precision protection and repeatable trip characteristics, these functions must be implemented electronically in the generator control panel -- thermal magnetic breaker implementation are not acceptable.

Controls

4.1. The generator control system shall be a fully integrated microprocessor based control system for standby emergency engine generators meeting all requirements of NFPA 110 level 1.
The generator control system shall be a fully integrated control system enabling remote diagnostics and easy building management integration of all generator functions. The generator controller shall provide integrated and digital control over all generator functions including: engine protection, alternator protection, speed governing, voltage regulation, air-fuel-ratio control (as required) and all related generator operations. The generator controller must also provide seamless digital integration with the engine's electronic engine control module (ECM) if so equipped. Generator controller's that utilize separate voltage regulators and speed governors or do not provide seamless integration with the engine management system are considered less desirable.

4.3. Communications shall be supported with building automation via the Modbus protocol without network cards. Optional internet and intranet connectivity shall be available.
The control system shall provide an environmentally sealed design including encapsulated circuit boards and sealed automotive style plugs for all sensors and circuit board connections. The use of non-encapsulated boards, edge cards, and pc ribbon cable connections are considered unacceptable.

4.5. Circuit boards shall utilize surface mount technology to provide vibration durability. Circuit boards that utilize large capacitors or heat sinks must utilize encapsulation methods to securely support these components.
A predictive maintenance algorithm that alarms when maintenance is required. The controller shall have the capability to call out to the local servicing dealer when maintenance is required.A remote e-stop switch shall be installed in a lockable enclosure and installed outside the generator room at the entry. A plastic label shall be installed indicating the purpose of the switch.
Diagnostic capabilities should include time-stamped event and alarm logs, ability to capture operational parameters during events, simultaneous monitoring of all input or output parameters, callout capabilities, support for multi-channel digital strip chart functionality and .2 msec data logging capabilities.
In addition to standard NFPA 110 alarms, the application loads should also be protected through instantaneous and steady state protective settings on system voltage, frequency, and power levels.

4.10. The control system shall provide pre-wired customer use I/O: 4 relay outputs (user definable functions), communications support via RS232, RS485, or an optional modem. Additional I/O must be an available option.

4.11. Customer I/O shall be software configurable providing full access to all alarm, event, data logging, and shutdown functionality. In addition, custom ladder logic functionality inside the generator controller shall be supported to provide application support flexibility. The ladder logic function shall have access to all the controller inputs and customer assignable outputs.

4.12. The control panel will display all user pertinent unit parameters including: engine and alternator operating conditions; oil pressure and optional oil temperature; coolant temperature and level

alarm; fuel level (where applicable); engine speed; DC battery voltage; run time hours; generator voltages, amps, frequency, kilowatts, and power factor; alarm status and current alarm(s) condition per NFPA 110 level 1.

5. Engine / Alternator Packaging

5.1. The engine/alternator shall be mounted with internal vibration isolation onto a welded steel base. These units shall not need external vibration isolation for normal pad mounted applications. A mainline, thermal magnetic circuit breaker carrying the UL mark shall be factory installed. The breaker shall rated between 100 to 125% of the rated ampacity of the genset. The line side connections are to be made at the factory. Output lugs shall be provided for load side connections. A second mainline, thermal magnetic circuit breaker carrying the UL mark shall be factory installed. The line side connections are to be made at the factory. Output lugs shall be provided for load side connections.

5.4. The generator shall include a unit mounted 120 volt convenience outlet.

6. Loose Items
Supplier to itemize loose parts that require site mounting and installation. Preference will be shown for gensets that factory mount items like mufflers, battery chargers, etc.

6.2. Flexible fuel hose for use in gas piping installation.

6.3. Spare Parts:
6.3.1. Fuses: One spare set
6.3.2. Filters One spare set (air, fuel, oil)

7. Enclosure

6.3.1. The genset shall be packaged with a sound attenuating enclosure. Level 2.

6.3.2. The enclosure shall be completely lined with sound deadening material. This material must be of a self extinguishing design.

6.3.3. The enclosure shall be made of steel with a minimum thickness of 14 gauge. The enclosure is to have hinged, removable doors to allow access to the engine, alternator and control panel. The hinges shall allow for door fit adjustment. Hinges and all exposed fasteners will be stainless steel or JS5000. The use of pop-rivets weakens the paint system and not allowed on external painted surfaces. Each door will have lockable hardware with identical keys.

6.3.4. The enclosure shall be coated with electrostatic applied powder paint, baked and finished to manufacturer's specifications. The color will be manufacturer’s standard.
The enclosure shall utilize an upward discharging radiator hood. Due to concerns relative to radiator damage, circulating exhaust, and prevailing winds, equipment without a radiator discharge hood will not be acceptable.

6.3.6. The genset silencer shall be mounted on the discharge hood of the enclosure. Due to architectural concerns, silencers mounted on the top of the generator enclosure are not acceptable. Gensets with silencers mounted inside the main generator compartment are acceptable only if the silencer is thermally wrapped to minimize heat stress on the surrounding components.

8. Additional project requirements

7.1. Factory testing

7.1.1. Before shipment of the equipment, the engine-generator set shall be tested under rated load for performance and proper functioning of control and interfacing circuits. Tests shall include:

7.1.1.1. Verify voltage & frequency stability.
7.1.1.2. Verify transient voltage & frequency dip response.
7.1.1.3. Load test the generator for 30 minutes.

7.2. OWNER'S MANUALS

7.2.1. Three (3) sets of owner's manuals specific to the product supplied must accompany delivery of the equipment. General operating instruction, preventive maintenance, wiring diagrams, schematics and parts exploded views specific to this model must be included.

7.3. INSTALLATION

7.3.1. Contractor shall install the complete electrical generating system including all external fuel connections in accordance with requirements of NEC, NFPA, and the manufacturer's recommendations as reviewed by the Engineer.

7.4. SERVICE

7.4.1. Supplier of the genset and associated items shall have permanent service facilities in this trade area. These facilities shall comprise a permanent force of EGSA certified and factory trained service personnel on 24 hour call, experienced in servicing this type of equipment, providing warranty and routine maintenance service to afford the owner maximum protection. Delegation of this service responsibility for any of the equipment listed herein will not be considered fulfillment of these specifications. Service contracts shall also be available.

7.5. WARRANTY

7.5.1. The standby electric generating system components, complete genset and instrumentation panel shall be warranted by the manufacturer against defective materials and factory workmanship for a period of five (5) years. Such defective parts shall be repaired or replaced at the manufacturer's option, free of charge for parts, labor and travel.

7.5.2. The warranty period shall commence when the standby power system is first placed into service. Multiple warranties for individual components (engine, alternator, controls, etc.) will not be acceptable. Satisfactory warranty documents must be provided. Also, in the judgment of the specifying authority, the manufacturer supplying the warranty for the complete system must have the necessary financial strength and technical expertise with all components supplied to provide adequate warranty support.

7.6. STARTUP AND CHECKOUT

7.6.1. The supplier of the electric generating plant and associated items covered herein shall provide factory trained technicians to checkout the completed installation and to perform an initial startup inspection to include:

7.6.1.1. Ensuring the engine starts (both hot and cold) within the specified time.

7.6.1.2. Verification of engine parameters within specification.

7.6.1.3. Verify no load frequency and voltage, adjusting if required.

7.6.1.4. Test all automatic shutdowns of the engine-generator.

7.6.1.5. Perform a load test of the electric plant, ensuring full load frequency and voltage are within specification by using building load.

7.6. Training

7.6.1. Training is to be supplied by the start-up technician for the end-user during commissioning. The training should cover basic generator operation and common generator issues that can be managed by the end-user.

PART 2 - TRANSFER SWITCH

A. Work Included

1. Automatic Transfer Switches

B. System

1. Furnish the automatic transfer switches to automatically transfer between the normal and emergency power source. The transfer switch shall be supplied as part of the engine/generator package for system responsibility.

C. Applicable Standards

1. The automatic transfer switches covered by these specifications shall be designed, tested, and assembled in strict accordance with all applicable standards of ANSI, UL, IEEE and NEMA.

D. Submittals

1. Manufacturer shall submit shop drawings for review, which shall include the following, as a minimum:

a. Descriptive literature

b. Plan, elevation, side, and front view arrangement drawings, including overall dimension, weights and clearances, as well as mounting or anchoring requirements and conduit entrance locations.

c. Schematic diagrams

d. Wiring diagrams

e. Accessory list

TRANSFER SWITCH REQUIREMENTS

A. ACCEPTABLE MANUFACTURERS

1. Kohler, Generac, ASCO or Caterpillar

B. CONSTRUCTION

1. The automatic transfer switch shall be furnished as shown on the drawings. Voltage and continuous current ratings and number of poles shall be as shown.

2. A 3-pole switch shall be provided.

3. The transfer switch shall be mounted in a NEMA 1 enclosure, unless otherwise indicated. Enclosures shall be fabricated from 12 gauge steel. The enclosure shall be sized to exceed minimum wire bending space required by UL 1008.

4. The transfer switch shall be equipped with an internal welded steel pocket, housing an operations and maintenance manual.

5. The transfer switch shall be top and bottom accessible.

6. The main contacts shall be capable of being replaced without removing the main power cables.

7. The main contacts shall be visible for inspection without any major disassembly of the transfer switch.

8. All bolted bus connections shall have Belleville compression type washers.

9. When a solid neutral is required, a fully rated bus bar with required AL-CU neutral lugs shall be provided.

10. Control components and wiring shall be front accessible. All control wires shall be multiconductor 18 gauge 600 volt SIS switchboard type point to point harness. All control wire terminations shall be identified with

tubular sleeve-type markers.

11. The switch shall be equipped with 90 degrees C rated copper/aluminum solderless mechanical type lugs.

12. The complete transfer switch assembly shall be factory tested to ensure proper operation and compliance with the specification requirements. A copy of the factory test report shall be available upon request.

C. Automatic Transfer Switch
   1. The transfer switch shall be double throw, actuated by two electric operators momentarily energized, and connected to the transfer mechanism by a simple over center type linkage. Minimum transfer time shall be 400 milliseconds.

   2. The normal and emergency contacts shall be positively interlocked mechanically and electrically to prevent simultaneous closing. Main contacts shall be mechanically locked in both the normal and emergency positions without the use of hooks, latches, magnets, or springs, and shall be silver-tungston alloy. Separate arcing contacts with magnetic blowouts shall be provided on all transfer switches. Interlocked, molded case circuit breakers or contactors are not acceptable.

   3. The transfer switch shall be equipped with a safe load break external manual operator, designed to prevent injury to operating personnel. The manual operator shall provide the same contact to contact transfer speed as the electrical operator to prevent a flashover from switching the main contacts slowly. The external manual operator shall be safely operated from outside of the transfer switch enclosure while the enclosure door is closed.

D. Automatic Transfer Switch Controls

   1. The transfer switch shall be equipped with a microprocessor based control system, to provide all the operational functions of the automatic transfer switch. The controller shall have two asynchronous serial ports. The controller shall have a real time clock with Nicad battery back-up.

   2. The CPU shall be equipped with self diagnostics which perform periodic checks of the memory I/O and communication circuits, with a watchdog/power fail circuit

   3. The controller shall use industry standard open architecture communication protocol for high speed serial communications via multidrop connection to other controllers and to a master terminal with up to 4000 ft of cable, or further, with the addition of a communication repeater. The serial communication port shall be RS422/485 compatible.

4. The serial communication port shall allow interface to either the manufacturer's or the owner's furnished remote supervisory control.

5. The controller shall have password protection required to limit access to qualified and authorized personnel.

6. The controller shall include a 20 character, LCD display, with a keypad, which allows access to the system.

7. The controller shall include three phase over/under voltage, over/under frequency, phase sequence detection and phase differential monitoring on both normal and emergency sources.

8. The controller shall be capable of storing the following records in memory for access either locally or remotely:

    a. Number of hours transfer switch is in the emergency position (total since record reset).
    b. Number of hours emergency power is available (total since record reset).
    c. Total transfer in either direction (total since record reset).
    d. Date, time, and description of the last four source failures.
    e. Date of the last exercise period.
    f. Date of record reset.

E. Sequence of Operation

1. When the voltage on any phase of the normal source drops below 80% or increases to 120%, or frequency drops below 90%, or increase to 110%, or 20% voltage differential between phases occurs, after a programmable time delay period of 0-9999 seconds factory set at 3 seconds to allow for momentary dips, the engine starting contacts shall close to start the generating plant.

2. The transfer switch shall transfer to emergency when the generating plant has reached specified voltage and frequency on all phases.

3. After restoration of normal power on all phases to a preset value of at least 90% to 110% of rated voltage, and at least 95% to 105% of rated frequency, and voltage differential is below 20%, an adjustable time delay period of 0-9999 seconds (factory set at 300 seconds) shall delay retransfer to allow stabilization of normal power. If the emergency power source should fail during this time delay period, the switch shall automatically return to the normal source.

4. After retransfer to normal, the engine generator shall be allowed to operate at no load for a programmable period of 0-9999 seconds, factory set at 300 seconds.

F. Automatic Transfer Switch Accessories

1. Programmable three phase sensing of the normal source set to pickup at 90% and dropout at 80% of rated voltage and overvoltage to pickup at 120% and dropout out at 110% of rated voltage. Programmable frequency pickup at 95% and dropout at 90% and over frequency to pickup at 110% and dropout at 105% of rated frequency. Programmable voltage differential between phases, set at 20%, and phase sequence monitoring.

2. Programmable three phase sensing of the emergency source set to pickup at 90% and dropout at 80% of rated voltage and overvoltage to pickup at 120% and dropout out at 110% of rated voltage programmable frequency pickup at 95% and dropout at 90% and over frequency to pickup at 110% and dropout at 105% of rated frequency. Programmable voltage differential between phases set at 20%, and phase sequence monitoring.

3. Time delay for override of momentary normal source power outages (delays engine start signal and transfer switch operation). Programmable 0-9999 seconds. Factory set at 3 seconds, if not otherwise specified.

4. Time delay to control contact transition time on transfer to either source. Programmable 0-9999 seconds, factory set at 3 seconds.

5. Time delay on retransfer to normal, programmable 0-9999 seconds, factory set at 300 seconds if not otherwise specified, with overrun to provide programmable 0-9999 second time delay, factory set at 300 seconds, unloaded engine operation after retransfer to normal.

6. Time delay on transfer to emergency, programmable 0-9999 seconds, factory set at 3 seconds.

7. A maintained type load test switch shall be included to simulate a normal power failure, keypad initiated.

8. A remote type load test switch shall be included to simulate a normal power failure, remote switch initiated.

9. A time delay bypass on retransfer to normal shall be included. Keypad initiated.

10. Contact, rated 10 Amps 30 volts DC, to close on failure of normal source to initiate engine starting.

11. Contact, rated 10 Amps 30 volts DC, to open on failure of normal source for customer functions.

12. Light emitting diodes shall be mounted on the microprocessor panel to indicate switch is in normal position, switch is in emergency position and controller is running.

13. A plant exerciser shall be provided with (10) 7 day events, programmable for any day of the week and (24) calendar events, programmable for any month/day, to automatically exercise generating plant programmable in one minute increments. Also include selection of either "no load" (switch will not transfer) or "load" (switch will transfer) exercise period. Keypad initiated.

14. Provision to select either "no commit" or "commit" to transfer operation in the event of a normal power failure shall be included. In the "no commit position," the load will transfer to the emergency position unless normal power returns before the emergency source has reach 90% of it's rated values (switch will remain in normal). In the "commit position" the load will transfer to the emergency position after any normal power failure. Keypad initiated.

15. Two auxiliary contacts rated 10 Amp, 120 volts AC (for switches 100 to 800 amps) 15 amp, 120 volts AC (for switches 1000 to 4000 amps), shall be mounted on the main shaft, one closed on normal, the other closed on emergency. Both contacts will be wired to a terminal strip for ease of customer connections. These contacts shall be used for normal power sense signal to the new auxiliary relays for the emergency lighting.

16. A three phase digital LCD voltage readout, with 1% accuracy shall display all three separate phase to phase voltages simultaneously, for both the normal and emergency source.

17. A digital LCD frequency readout with 1% accuracy shall display frequency for both normal and emergency source.

18. An LCD readout shall display normal source and emergency source availability.

19. Include (2) time delay contacts that open simultaneously prior to transfer in either direction. These contacts close after a time delay upon transfer. Programmable 0-9999 seconds after transfer.

20. Two position selector to provide either automatic or manual retransfer operation (with pushbutton).

G. Approval

1. As a condition of approval, the manufacturer of the automatic transfer switches shall verify that their switches are listed by Underwriters Laboratories, Inc., Standard UL-1008 with 3 cycle short circuit closing and withstand as follows:

	RMS Symmetrical Amperes Current Limiting	
Amperes	Closing and Withstand	Fuse Rating
100-400	42,000	200,000
600-800	65,000	200,000
1000-1200	85,000	200,000
1600-4000	100,000	200,000

2. During the 3 cycle closing and withstand tests, there shall be no contact welding or damage. The 3 cycle tests shall be performed without the use of current limiting fuses. The test shall verify that contacts separation has not occurred, and there is contact continuity across all phases. Test procedures shall be in accordance with UL-1008, and testing shall be certified by Underwriters' Laboratories, Inc.

3. When conducting temperature rise tests to UL-1008, the manufacture shall include post-endurance temperature rise tests to verify the ability of the transfer switch to carry full rated current after completing the overload and endurance tests.

4. The microprocessor controller shall meet the following requirements:

   - Storage conditions - 25 degrees C to 85 degrees C
   - Operation conditions - 20 degrees C to 70 degrees C ambient
   - Humidity 0 to 99% relative humidity, noncondensing
   - Capable of withstanding infinite power interruptions
   - Surge withstand per ANSI/IEEE C-37.90A-1978

5. Manufacturer shall provide copies of test reports upon request.

H. Manufacturer

1. The transfer switch manufacturer shall employ a field service organization.

2. The manufacture shall include a telephone number, for field service contact, affixed to each enclosure.

3. The manufacturer shall maintain records of each transfer switch, by serial number, for a minimum 20 years.

9. TRANSFER SWITCH INSTALLATION

A. APPLICATION: Per plans

B. INSTALLATION

1. Floor-Mounted Switch: Level and anchor unit to floor.
2. Annunciator Mounting: Flush in wall, unless otherwise indicated.
3. Identify components according to Division 16 Section “Basic Electrical Materials and Methods.”

C. WIRING TO REMOTE COMPONENTS

1. Match type and number of cables and conductors to control and communications requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

D. CONNECTIONS

1. Ground equipment as indicated and as required by NFPA 70.

E. FIELD QUALITY CONTROL

1. Testing: Perform the following field quality-control testing under the supervision of the manufacturer’s factory-authorized service representative in addition to tests recommended by the manufacturer:
   a. Before energizing equipment, after transfer-switch products have been installed:
      1. Measure insulation resistance phase-to phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Meet manufacturer’s specified minimum resistance.
      2. Check for electrical continuity of circuits and for short circuits.
      3. Inspect for physical damage; proper installation and connection; and integrity of barriers, covers, and safety features.
      4. Verify that manual transfer warnings are properly placed.
      5. Perform manual transfer operation.
   b. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.
      1. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
      2. Simulate loss of phase-to-ground voltage for each phase of normal source.
      3. Verify pickup and dropout voltages by data readout or inspection of control settings.

4. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, re-transfer time delay on restoration of normal power, and engine cool-down and shutdown sequence.

2. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.
   a. Assist in verifying grounding connections and locations and ratings of sensors.
   b. Assist in observing reaction of circuit-interrupting devices when simulated fault current is applied at sensors.
3. Coordinate tests with tests of generator plant and run them concurrently.
4. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

F. CLEANING

1. After completing equipment installation, inspect unit components. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.
2. Clean equipment internally, on completion of installation, according to manufacturer's written instructions.

G. DEMONSTRATION

1. Engage a factory-authorized service representative to train Owner's personnel to adjust, operate, and maintain transfer switches and related equipment as specified below:
   a. Coordinate this training with that for generator equipment.
   b. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment.
   c. Review data in maintenance manuals.
   d. Schedule training with Owner, through Architect, with at least seven days' advance notice.
   e. Provide a minimum of four hours of instruction.

END OF SPECIFICATION

SECTION 310000 - EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the documents identified in Division 00 Procurement and Contracting Requirements and Division 01 General Requirements.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials, and equipment necessary to install the generator, transformer, underground utilities, and sidewalk adjustments as shown on the plans, including but not limited to the following.
   1. Excavating, backfilling and compacting the Site as required to complete the Work shown on the Drawings and as specified herein, including selective excavation as required.
   2. Preparing subgrades.
   3. Removal of underground utilities if applicable.
   4. Subbase course for concrete pavements and equipment pads.
   5. Subbase and base course for asphalt paving.
   6. Excavating and backfilling for utility trenches and utility structures.
   7. Coordination and maintenance of safe path of travel for the public.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections.
   1. Division 02, 22, 23, and 26 Sections for installing underground mechanical and electrical utilities and buried mechanical and electrical structures.

1.3 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

   1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
   2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Course placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
   1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed. Authorized additional excavation and replacement material will be paid for according to Contract provisions.
   2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
   3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by the Architect. Unauthorized excavation, as well as remedial work directed by the Architect, shall be without additional compensation.

F. Fill: Soil materials used to raise existing grades.

G. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Subbase Course: Course placed between the subgrade and base course for hot-mix asphalt pavement, or course placed between the subgrade and a cement concrete pavement, or a cement concrete or hot-mix asphalt walk.

J. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables.

1.4 SUBMITTALS

A. Product Data: For the following:
   1. Controlled low-strength material, including design mixture.

B. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
   1. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for fill and backfill.
   2. Laboratory compaction curve according to ASTM D 1557 for each onsite and borrow soil material proposed for fill and backfill.
   3. Test reports for compliance with ASTM D2940 requirements for subbase material.
   4. Particle size Analysis in accordance with ASTM D422.

C. Pre-excavation Photographs and Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by earthwork operations. Submit before earthwork begins. Maintain catalog of up-to-date photographs at the site.

D. Plan to Maintain Safe Path of Travel: Submit plans for maintaining safe paths of travel for the general public during the entire project, including requirement for police details of necessary.

1.5 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving occupied facilities unless permitted in writing by the Architect and then only after arranging to provide temporary utility services according to requirements indicated.
   1. Notify the facilities not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without written permission.
   3. Contact utility-locator service for area where Project is located before excavating.

B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

1.6 EXAMINATION OF SITE CONDITIONS AND DOCUMENTS

A. It is hereby understood that the Contractor has carefully examined the site and all conditions affecting work under this Section. No claim for additional costs will be allowed because of lack of full knowledge of existing conditions as indicated in the Contract Documents, or obvious from observation at the Site.

B. Plans, surveys, measurements, and dimensions under which the work is to be performed are believed to be correct, but the Contractor shall have examined them for himself during the bidding period, as no allowance will be made for any errors or inaccuracies that may be found except as otherwise provided herein.

1.7 COORDINATION

A. Prior to the start of earthwork, the Contractor shall arrange an onsite meeting with the Architect, and the testing agency for the purpose of establishing the Contractor's schedule of operations, and scheduling observation and testing procedures and requirements.

B. As construction proceeds, the Contractor shall be responsible for notifying the testing agency prior to the start of earthwork operations requiring observation and/or testing.

C. The work of this Section shall be coordinated with that of other trades affecting, or affected by, this work, as necessary to ensure the steady progress of all work of the Contract.

1.8 PERMITS, CODES AND SAFETY REQUIREMENTS

A. Work shall conform to the Drawings and Specifications and shall comply with applicable codes and regulations. Present in writing to the Architect, all conflicts between the Drawings, Specifications, and applicable codes and regulations, for resolution before commencing the Work.

B. Comply with all local rules, regulations, laws and ordinances and the State of Rhode Island, and of all other authorities having jurisdiction. All labor, materials, equipment, and services necessary to make the work comply with such requirements, shall be provided without additional cost to the Owner.

C. The Contractor shall so conduct his operations as to interfere as little as possible with the use ordinarily made of roads, driveways, sidewalks, or other facilities near enough to the work to be affected thereby.

D. The Contractor shall procure and pay for all permits and licenses required for the complete work specified herein and shown on the Drawings at no additional cost to the Owner. Arrange and pay for legal off-site disposal of all excess excavated materials, obtain proper disposal receipts from the applicable disposal facility for verification.

E. Notify "Dig Safe" and the Owner before starting work; comply fully with utility company requirements.

1.9 LAYOUT AND GRADES

A. The Contractor shall maintain and/or re-establish benchmarks and survey monuments shown on the Contract Drawings or found to exist on the site to provide a base reference for the construction. Replace any that may become destroyed or disturbed. The Contractor shall employ and pay all costs for a registered Land Surveyor who is licensed within the jurisdiction of the project site to lay out all lines and grades in accordance with the Contract Drawings and Specifications, and as necessary or required for the construction.

1.10 DISPOSITION OF EXISTING UTILITIES

A. Active utilities existing on the site shall be carefully protected from damage and relocated or removed by others as specified in the Documents. When an active utility line is exposed during construction, its location and elevation shall be plotted on the record Contract Drawings and both the Architect and Utility Owner notified in writing.

B. Inactive or abandoned utilities encountered during construction operations shall be removed. The location of such utilities shall be noted on the record Contract Drawings and reported in writing to the Architect.

C. In removing existing abandoned utilities within the new building area, the Contractor shall also excavate all associated backfill material and replace with compacted Structural Fill.

1.11 DISPOSAL

A. The Contractor shall re-use on-site excavated soils on-site as Ordinary Fill as indicated below. Solid waste consisting of brick, concrete, asphalt, cobbles, and boulders that measure less than two cubic yards in volume shall become the property of the Contractor and be legally disposed of off-site at no additional cost to the Owner. Excavated on-site soils which are suitable for re-use at the time of excavation but become frozen or too wet for re-use due to poor material handling practices shall be disposed of off-site and replaced as necessary at no additional cost to the Owner.

B. Solid waste resulting from screening or culling operations shall become the property of the Contractor and be legally disposed of off-site at no additional cost to the Owner.

1.12 MEASUREMENT AND PAYMENT

A. The base bid lump sum price shall include all costs of whatever nature associated with the content of this specification section and earthwork shown on the Contract Drawings including, but not limited to: demolition and removal of existing abandoned utilities and associated structures and appurtenances as indicated on the Contract Drawings, excavation for site improvements, removal of existing subsurface obstructions, segregating and all screening operations, stockpiling, handling and re-use of excavated materials, earthwork for paved areas, utilities, and site improvements, construction dewatering, off-site disposal of all solid waste, placement and compaction of the specified fill materials in accordance with procedures documented herein, loading of all materials to be disposed of off-site and trucking and disposal of all Unregulated soil and solid waste.

B. The Contractor shall include in his lump sum price all costs associated with excavating all existing fill, topsoil, subsoil and natural soil materials down to the surface of the design bearing strata consisting of the natural soil, followed by replacement with compacted fill as specified herein.

C. The Contractor shall include in his lump sum price all costs associated with segregating, culling, and screening operations required for rendering the on-site fill material suitable for reuse on this project as Ordinary Fill material as defined herein.

D. If any part of the excavation is carried through error beyond the depth directed by the Architect and the dimensions indicated on the Contract Drawings, or called for in the Specifications, the Contractor, at his own expense, shall furnish and install compacted Gravel Borrow, Crushed Stone or lean concrete as directed by the Architect up to the required level and/or dimensions.

E. Compensation for all work required under this Section and not specifically covered elsewhere, shall be included in the Contract Lump Sum Price for Earthwork.

1.13 FIELD QUALITY CONTROL

A. The Owner may retain and pay for the services of an independent testing agency to monitor backfill operations and to perform field density tests, and a Geotechnical Engineer to periodically observe the earthwork operations and observe the preparation of the subgrade for

paved areas, equipment pads, and utility trenches and structures. The Geotechnical Engineer may from time-to-time request that the contractor excavate tests pits ahead of excavation to confirm subsurface conditions.

B. The Contractor shall make provisions for allowing observations and testing of Contractor's Work by the Geotechnical Engineer and by the independent testing and inspection firm.

C. Costs related to retesting due to unacceptable quality of work and failures discovered by testing shall be paid for by the Contractor at no additional expense to Owner, and the costs thereof will be deducted by the Owner from the Contract Sum.

D. The Owner's Geotechnical Consultant's and/or Testing Agency's presence does not include supervision or direction of work by the Contactor, his/her employees, or agents. Neither the presence of the Owner's Geotechnical Consultant and/or Testing Agency nor any observations performed by him/her, or any notice or failure to give notice, shall excuse the Contractor from deficiencies in the work.

1.14 SOIL MATERIALS

A. General: Provide soil materials when sufficient satisfactory soil materials are not available from on-site excavations.

B. Satisfactory Soils: ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.
   1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
   2. Onsite material for use in compacted fill shall be natural inorganic granular soil taken from areas of cut after removal of pavement, topsoil, or other unsuitable materials. Onsite materials should be tested for compliance with the specifications before placement. Onsite materials with less than 40 percent fines and with maximum particle size of 6 inches or less can be reused. Onsite materials that do not meet the gradation requirements of the specification should be used in landscaped areas, relocated onsite if directed by the Owner, or disposed of offsite.

D. Ordinary Fill shall consist of inert, hard, durable sand and gravel, free from ice and snow, organic matter, clay, surface coatings, and deleterious materials, and shall have a plasticity index of less than 6. Ordinary fill shall be placed in 12-inch loose lifts and shall conform to the following gradation requirements:

Sieve Size	Percent Passing by Weight
6-inches	100
1-inch	50-100
No. 4	20-100
No. 20	10-70
No. 60	5-45

No. 200	0-20

E. Crushed Stone shall consist of durable crushed rock or durable crushed gravel stone, free from ice and snow, sand, clay, loam, or other deleterious material, conforming to SSHB, Section M2.01.0 through M2.01.6 size as indicated on Drawings. Crushed stone shall be uniformly blended and conform to the following gradation requirements.

	Percent Passing by Weight		
Sieve Size	1/2-Inch Stone	3/4-Inch Stone	1.5-Inch Stone
2 inches	100	100	100
1-1/2 inch	100	100	95-100
1 inch	100	100	35-70
3/4 inch	100	90-100	0-25
5/8 inch	100	---	---
1/2 inch	85-100	10-50	---
3/8 inch	15-45	0-20	---
No. 4	0-15	0-5	---
No. 8	0-5	---	---

F. Dense Graded Crushed Stone for base course shall be naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand, consisting of angular material, that is hard, durable and free from clay, loam or other plastic material. Gradation shall conform to MHD Specification Designation, M2.01.7, and the following:

Sieve Size	Percent Passing by Weight
2 inches	100
1-1/2 inches	70-100
3/4 inch	50-85
No. 4	30-55
No. 50	8-24
No. 200	3-10

G. Sand shall consist of clean inert, hard, durable grains of quartz or other hard durable rock, free from clay, organics, surface coatings or other deleterious material, confirming to SSHB Section M1.04.1. Sand shall conform to the following gradation:

Sieve Size	Percent Passing by Weight
1/2-inch	100
3/8-inch	85-100
No. 4	60-100
No. 16	35-80
No. 50	10-55
No. 100	2-10

1.15 USE OF MATERIALS

A. Use of materials shall be as described below and as shown in the Drawings.

B. Ordinary Fill: Use Ordinary Fill as general site fill outside of the new building footprint area for embankments, landscaping, and beneath Processed Gravel for Subbase in paved areas where specified material such as Crushed Stone, Structural Fill, Crushed Stone and Sand are not indicated.

C. Crushed Stone - Use crushed stone as indicated on the Drawings.

D. Processed Gravel - Use for Subbase under paved areas.

E. Dense Graded Crushed Stone - Use for base under paved areas.

F. Sand – Use sand for bedding for utility bedding, setting bed for concrete block pavers, and as indicated elsewhere on the drawings.

PART 2 - EXECUTION

2.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Prepare subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface.

2.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area. Dispose of contaminated water in accordance with regulations of authorities having jurisdiction.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
   1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
   2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

2.3 EXPLOSIVES

A. Explosives: Do not use explosives.

2.4 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil

materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
   a. 24 inches outside of concrete forms other than at footings.
   b. 12 inches outside of concrete forms at footings.
   c. 6 inches outside of minimum required dimensions of concrete cast against grade.
   d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
   e. 6 inches beneath bottom of concrete slabs on grade.
   f. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.

2.5 EXCAVATION FOR CONCRETE PADS

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
   1. Excavation for Underground Tanks, Manholes, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

2.6 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

2.7 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.
   1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.
   1. Clearance: 12 inches each side of pipe or conduit.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
   1. For pipes and conduit less than 6 inches in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.

2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
3. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

2.8 SUBGRADE INSPECTION

A. Notify Geotechnical Engineer when excavations have reached required subgrade.

B. If Designer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the building slabs and pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
2. Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Designer, and replace with compacted backfill or fill as directed.

D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Designer, without additional compensation.

2.9 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi may be used when approved by Designer.
1. Fill unauthorized excavations under other construction or utility pipe as directed by Designer.

2.10 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
2. Stockpile soil materials in a location, acceptable to the facility, that will preclude having to relocate stockpiled soil materials that would otherwise delay or impact the Work.

2.11 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:
   1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
   2. Surveying locations of underground utilities for Record Documents.
   3. Testing and inspecting underground utilities.
   4. Removing concrete formwork.
   5. Removing trash and debris.
   6. Removing temporary shoring and bracing, and sheeting.
   7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

2.12 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings.

D. Place and compact initial backfill of subbase material free of particles larger than 1 inch in any dimension, to a height of 12 inches over the utility pipe or conduit.

   1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

E. Backfill voids with satisfactory soil while installing and removing shoring and bracing.

F. Place and compact final backfill of satisfactory soil to final subgrade elevation.

2.13 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:
   1. Under grass and planted areas, use satisfactory soil material.
   2. Under walks and pavements, use satisfactory soil material.
   3. Under steps and ramps, use engineered fill.
   4. Under building slabs, use engineered fill.
   5. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

2.14 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

2.15 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent; and areas within 10 feet of structures, building slabs, steps, and pavements at 92 percent.
2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
3. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

2.16 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
1. Lawn or Unpaved Areas: Plus, or minus 1 inch.
2. Walks: Plus, or minus 1 inch.
3. Pavements: Plus, or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

2.17 SUBBASE AND BASE COURSES

A. Place subbase and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase and base course under pavements and walks as follows:

1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place base course material over subbase course under hot-mix asphalt pavement.
3. Shape subbase and base course to required crown elevations and cross-slope grades.
4. Place subbase and base course 6 inches or less in compacted thickness in a single layer.
5. Place subbase and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
6. Compact subbase and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

C. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

2.18 FIELD QUALITY CONTROL

A. Independent Testing Agency: Cooperate with the Independent Testing Agency engaged by the facility for field quality control activities for the Work of this Section. Refer also to Section 01 43 25 - TESTING AGENCY SERVICES.

B. Cooperate with field quality control personnel.

C. Additional inspections and retesting of materials which fail to comply with specified material and installation requirements shall be performed at Contractor's expense.

D. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least 1 test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than 3 tests.

2. Foundation Wall Backfill: At each compacted backfill layer, at least 1 test for each 100 feet or less of wall length, but no fewer than 2 tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least 1 test for each 150 feet or less of trench length, but no fewer than 2 tests.

F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify, and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

G. Notify the Independent Testing Agency a minimum of 72 hours prior to start of earthwork operations, to comply with Code requirement that a registered design professional be present at all times during backfill to assure adequate compaction with no bridging effects.

2.19 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
1. Scarify or remove and replace soil material to depth as directed by Designer; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

2.20 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off the User Agency's property.

END OF SECTION 310000

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Protection of work area
2. Protecting existing vegetation to remain.
3. Removing existing vegetation.
4. Clearing and grubbing.
5. Stripping and stockpiling topsoil.
6. Demolition and removal of selected portions of site elements.
7. Removing above- and below-grade site improvements.
8. Temporary erosion and sedimentation control.

B. Related Requirements:

1. Section 011000 “General Requirements” for temporary facilities and controls for temporary construction measures.

C. MATERIAL OWNERSHIP

D. Cleared materials shall become Contractor's property and shall be removed from Project site.

1.3 INFORMATIONAL SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
1. Use sufficiently detailed photographs.

1.4 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining street, sidewalk, and the recreation center during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

B. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing. Dig Safe, call or 811, or www.digsafe.com.

C. Do not commence site clearing operations or selective demolition until temporary erosion- and sedimentation-control and plant-protection measures are in place.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Portable Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized-steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top and bottom rails. Provide concrete or galvanized-steel bases for supporting posts.

B. Plastic Tree Protection-Zone Fencing: Plastic construction fencing constructed of high-density extruded and stretched polyethylene fabric with 2-inch (50-mm) maximum opening in pattern and weighing a minimum of 0.4 lb./ft. (0.6 kg/m); remaining flexible from minus 60 to plus 200 deg F (minus 16 to plus 93 deg C); inert to most chemicals and acids; minimum tensile yield strength of 2000 psi (13.8 MPa) and ultimate tensile strength of 2680 psi (18.5 MPa); secured with plastic bands or galvanized-steel or stainless steel wire ties; and supported by tubular or T-shape galvanized-steel posts spaced not more than 96 inches (2400 mm) apart.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and protection measures in place.

C. Protect existing site improvements to remain from damage during construction.

D. Tree Protection Fencing: Install protection-zone fencing along edges following the dripline of trees.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

D. Site Enclosure Fence: Before construction operations begin furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose entire work area of Project site sufficient to accommodate construction operations.

3.3 EXISTING UTILITIES

A. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Owner, OPM and Architect not less than seven (7) days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to extent required by new construction and as indicated.

B. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished and then break up and remove.

3.5 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, planters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut a long line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.

3.6 CLEARING AND GRUBBING

A. Remove obstructions, planters, lawn areas trees and other vegetation to permit installation of new construction.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
   1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches (200 mm) and compact each layer to a density equal to adjacent original ground.

3.7 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to depth of 6 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.

   1. Remove subsoil and non-soil materials from topsoil, including clay lumps, gravel, and other objects larger than 2 inches (50 mm) in diameter; trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.
   1. Do not stockpile topsoil within protection zones.
   2. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 311000

SECTION 320190 – LAWN RESTORATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes lawn renovation of areas disturbed by construction operations.

B. Related Sections include the following:
   1. Section 310000- Earthmoving
   2. Section 311000 – Site Preparation for clearing and grubbing and stripping topsoil

1.3 SCHEDULING

A. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

PART 2 - PRODUCTS

2.1 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species: State-certified seed of grass species, Proportioned by weight as follows:
   1. 50 percent Kentucky bluegrass (Poa pratensis).
   2. 30 percent chewings red fescue (Festuca rubra variety).
   3. 10 percent perennial ryegrass (Lolium perenne).
   4. 10 percent redtop (Agrostis alba).

2.2 TOPSOIL

A. Topsoil stripped and stockpiled on the site under Site Clearing Section may be used.

2.3 TOPSOIL ADDITIVES AND OTHER MATERIALS

A. Compost: Shall be mature, stable, weed free, and produced by aerobic decomposition of organic matter. Compost feedstock may include, but is not limited to: agricultural, food or industrial residuals; class A biosolids as defined in the EPA CFR Title 40, Part 503; yard trimmings, or source-separated municipal solid waste. The product must not contain any visible refuse or other physical contaminants, substances toxic to plants, or over 5% sand, silt, clay or rock material by dry weight. The product shall possess no objectionable odors. The product must meet all applicable USEPA CFR, Title 40, Part 503 Standards for Class A biosolids. The moisture level shall be such that no visible water or dust is produced when handling the material.

B. Commercial Fertilizer: Shall be complete fertilizer and shall be a standard product complying with State and United States fertilizer laws. Fertilizer shall be delivered to the site in original unopened containers which shall bear the manufacturer's name and guaranteed statement of analysis. At least 50 percent by weight of the nitrogen content of the fertilizer shall be derived from organic materials. Fertilizer shall be a slow-release fertilizer with equal portions of nitrogen, phosphorus, and potassium by weight of ingredients or as otherwise indicated by topsoil test results. NOTE: Fertilizer shall not be used in conjunction with the disturbed area seed mix unless recommended by soil testing.

C. Ground Limestone: Shall be dolomitic limestone, shall contain not less than 85 percent of total carbonates and magnesium; and shall be ground to such fineness that 50 percent will pass a 100 mesh sieve and 90 percent will pass through a 20 mesh sieve. Coarser material will be accepted provided the specified rates of application are increased proportionately on the basis of quantities passing the 100-mesh sieve.

D. Water: Will be furnished by the Owner at existing hydrants, and shall be suitable for irrigation and free from ingredients harmful to plant life. Hose and all other watering equipment required for the work shall be furnished under this Section.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas requiring restoration of lawns and grass for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

3.3 LAWN RENOVATION/REPAIR

A. Renovate existing lawn damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.

B. Remove topsoil containing foreign materials resulting from Contractor's operations, including oil drippings, fuel spills, stone, gravel, and other construction materials, and replace with new topsoil.

C. Apply soil amendments and initial fertilizers required for establishing new lawns and mix thoroughly into top 4 inches (100 mm) of existing soil. Provide new planting soil to fill low spots and meet finish grades.

D. Apply seed and protect with straw mulch as required for new lawns.

E. Water newly planted areas and keep moist until new lawn is established.

3.4 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period and remove after lawn is established.

END OF SECTION 320190

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SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the documents identified in Division 00 Procurement and Contracting Requirements and Division 01 General Requirements.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials, and equipment necessary to install the generator, transformer, underground utilities, and sidewalk adjustments as shown on the plans, including but not limited to the following.
   1. Hot-mix asphalt paving, including walkways, ramps, and curbs.
   2. Hot-mix asphalt patching.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
   1. Section 310000 - EARTH MOVING for aggregate subbase and base courses and for aggregate pavement shoulders.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

   1. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.

B. Material Certificates: For each paving material, from manufacturer.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements for hot mix asphalt paving work in the State of Rhode Island.

1. Comply with the requirements of the RIDOT including supplemental specifications and special provisions.
2. Comply with requirements of the Americans with Disabilities Act (ADA) and Rhode Island's Commission on Disabilities. If these requirements cannot be met with the grades and slopes indicated on the plans, notify the Designer immediately.

B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.
1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:
   a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
   b. Review condition of subgrade and preparatory work.
   c. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
   d. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.

B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.6 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
B. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
1. Tack Coat: Minimum surface temperature of 60 deg F.
2. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
3. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.

B. Fine Aggregate: ASTM D 1073 or AASHTO M 29, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.

C. Mineral Filler: ASTM D 242 or AASHTO M 17, rock or slag dust, hydraulic cement, or other inert material.

D. Reclaimed Asphalt Pavement (RAP): Provide material obtained from the highways or streets by crushing, milling, or planing existing hot mix asphalt pavements.

1. The proportion of RAP to virgin aggregate for base course mixtures and intermediate course mixtures shall be limited to a maximum of 40% for drum mix plants and 20% for modified batch plants. The maximum amount of RAP for surface course mixtures shall be 10%.

2.2 ASPHALT MATERIALS

A. Asphalt Binder Performance Graded: AASHTO M320 or AASHTO MP 1a, performance grade as required by RIDOT Specifications.

B. Tack Coat: AASHTO M 140 emulsified asphalt, or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

2.3 AUXILIARY MATERIALS

A. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.

2.4 ASPHALT MIXES

A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by RIDOT Specifications, HMA Binder for binder courses, HMA Surface Standard Top for surface courses, and MHW 3/8” Top for sidewalks, designed according to procedures in AI MS-2, "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types".

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

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

3.2 COLD MILLING

A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.

3.3 PATCHING

A. Existing Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. Existing Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.

1. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.

C. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a minimum rate of 0.05 to 0.15 gal./sq. yd.

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

D. Patching: Fill excavated pavements with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

3.4 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.

C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd.

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.5 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Spread mix at minimum temperature of 250 deg F.
2. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.6 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
3. Offset transverse joints, in successive courses, a minimum of 24 inches.
4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."

3.7 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: ASTM D 2041, per RIDOT Specifications.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

G. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.8 INSTALLATION TOLERANCES

A. Accessibility: Comply with requirements of ADAAG and Rhode Island Commission on Disabilities. Remove and replace paving that does not meet required tolerances, when measured with a 2-foot straightedge.

B. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch.
2. Surface Course: Plus 1/4 inch, no minus.

C. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within RIDOT Specification tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas.

3.9 FIELD QUALITY CONTROL

A. Independent Testing Agency: Cooperate with the Independent Testing Agency engaged by the facility for field quality control activities for the Work of this Section.

B. Test the plane of the finished surfaces of base, binder, and surface courses with a 16-foot straightedge, except use a 10-foot straightedge on vertical courses and on the top course of resurfaced streets which contain manhole covers, valve boxes, and the like.

C. Carefully apply the straightedge immediately after the first compaction by rolling, and from then on as may be necessary until and after the final compaction of the material in place. Hold the straightedge in successive positions parallel to the road centerline and in contact with the road surface; check the entire area from one side of the pavement to the other.

D. Correct irregularities which vary 3/8 inch from a true finished surface in base and binder courses, and 1/4 inch in top courses.

E. Irregularities which may develop before the completion of rolling and while the material is still workable, may be remedied by loosening the surface mixture and removing or adding material as necessary. Should any unsatisfactory irregularities or defects remain after final compaction,

correct the defective work by removing and replacing with new material to form a true and even surface.

3.10 OPENING TO TRAFFIC

A. No vehicular traffic or loads shall be permitted on the newly completed pavement until adequate stability has been attained, and the material has cooled sufficiently to prevent distortion or loss of fines, and the pavement has achieved a maximum temperature of 140 degrees F.

B. If the climatic or other conditions warrant it, the period of time before opening to traffic may be extended at the discretion of the Architect.

3.11 DISPOSAL

A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

END OF SECTION 321216

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CITY OF PROVIDENCE

Brett P. Smiley, Mayor

MEMORANDUM

To:	Department of Public Property; Parks Department
From:	Law Department
Re:	Compliance with apprenticeship and "First Source" ordinances
Date:	April 21, 2023

The City of Providence has hired "Building Futures," an outside consulting group, to assist with monitoring the City's compliance with ordinances relating to construction projects. Specifically, Building Futures is monitoring the City's compliance with two (2) ordinances that require the City to maximize utilization of apprentices and Providence residents in City construction projects.

1) Providence Code of Ordinances Sec. 21-28.1, governing construction contracts of $100,000 or more, requires that no less than 15% of the total labor hours performed by contractors and subcontractors on any given project are to be completed by apprentices registered in state-registered apprenticeship programs. This requirement pertains to all labor hours for a given project, not just those for new hires.

The Law Department recommends the inclusion of the following notice (or one substantially similar) in all RFP's for construction projects valued at $100,000 or more:

> **APPRENTICE REQUIREMENTS.**
> Attention of prospective bidders is called to the fact that this project is to be bid upon and executed under the City of Providence Code of Ordinances Chapter 21 Art. II Section 21-28.1 c(1) and (2) related to utilizing apprentices in the contract. This ordinance outlines requirements for utilizing not less than 15% of total hours worked by apprentices. The City may lower this percentage only if it determines in writing that compliance is not feasible or that it would be unduly cost prohibitive to the project. The attention of prospective bidders is also called to the fact that reporting the efforts undertaken and progress towards achieving the requirements in this ordinance is a condition for payment. Compliance reporting shall be submitted with any contract payment requisition, in a format to be specified by the City. This demonstration of compliance through such reports shall be a condition of the requisition for payment to be processed. Upon the contract being awarded to the successful bidder, a mandatory meeting will be scheduled to review the project

> requirements relative to apprenticeship requirements and the process and protocols by which these goals will be achieved. At this meeting, specific forms and procedures for the documentation and achievement of these requirements by the successful bidder will be provided, discussed and agreed upon for the execution of the contract.

2) Providence "First Source" Ordinance Sec. 21-91 – Sec. 21-96 requires that when hiring new workers for a construction project, employers seek to hire Providence residents when available. If the awarded contractor, regardless of tier, is a signatory to a Collective Bargaining Agreement that governs the contractor's hiring and referral process, the contractor must contact both Building Futures and the local hiring halls to request apprentices or journey workers who are residents of Providence. In the case of apprentices, this is a way to meet the requirements of both ordinances with one hire.

The Law Department recommends the inclusion of the following notice (or one substantially similar) in all RFP's for City construction projects:

> **"FIRST SOURCE" REQUIREMENTS.**
> Attention of prospective bidders is called to the fact that this project is to be bid upon and executed under the City of Providence Code of Ordinances Chapter 21 Art. III 1/2 First Source Agreements Sec. 21-91 through 21-96. This ordinance outlines requirements for hiring Providence residents to work on this project. The City may waive this requirement only upon a determination in writing that qualified residents of Providence are not available for the project, pursuant to Sec. 21-94(e). The attention of prospective bidders is called to the fact that reporting the efforts undertaken and progress towards achieving the requirements in this ordinance is a condition for payment. Compliance reporting shall be submitted with any contract payment requisition, in a format to be specified by the City. This demonstration of compliance through such reports shall be a condition of the requisition for payment to be processed. Upon the contract being awarded to the successful bidder, a mandatory meeting will be scheduled to review the project requirements relative to the First Source Agreements and the process and protocols by which these goals will be achieved. At this meeting, specific forms and procedures for the documentation and achievement of these requirements by the successful bidder will be provided, discussed and agreed upon for the execution of the contract.

If your department or any of your contractors has difficulty securing registered apprentices or Providence residents to participate in construction projects, you are encouraged to contact Building Futures, who may be able to assist:

William Bryan, AUP Manager, Renowned Advising <renownedadvising@gmail.com>
or
Rita Holahan, Building Futures <rholahan@bfri.org>

Department of Administration
Division of Equity, Diversity & Inclusion (DEDI)
One Capitol Hill, 3rd Floor
Providence, RI 02908

www.dedi.ri.gov
mbe.compliance@doa.ri.gov
(401) 574-8606 - RI Relay 711

MINORITY BUSINESS ENTERPRISE (MBE) UTILIZATION PLAN

Company Name: _____

Contact Person: _____

Street Address: _____

City, State, Zip: _____ Telephone: _____

Email: _____ Project Location: _____

Bid or Project #: _____ Date of Tentative Selection Letter: _____

Description of Work: _____

Total Contract $: _____ MBE Utilization %: _____

Total # of **All** Subcontractors/Suppliers used: _____ # of MBE Subcontractors/Suppliers used: _____

List All Subcontractors/Suppliers/Consultants/Independent Contractors

Subcontractor / Supplier	Dollar Award	Scope/Description of Work	RI Certified MBE/ WBE? Yes/No

Pursuant to R.I. Gen. Laws § 37-14.1 et seq. and the regulations promulgated thereto, all state contracts and procurements are required to award 15% of their total dollar value to MBE/WBE certified firms. As part of this requirement, prime vendors are subject to monthly MBE project reporting. MBE/WBE firms must be certified by the Division of Equity, Diversity & Inclusion (DEDI), Minority Business Enterprise Compliance Office to receive credit. MBE/WBE firms must perform 100% of the work, or subcontract to another RI certified MBE/WBE firm to receive participation credit. *Please note: MBE/WBE suppliers receive 60% participation credit. MBE/WBE brokers receive participation credit for the fees and commissions charged for the procurement of goods and materials, but not for the cost of the goods and materials themselves. For assistance identifying MBE/WBE firms, please refer to the MBE/WBE directory at: www.dedi.ri.gov/directory

The above referenced contract will not be released until this MBE Utilization Plan has been approved by the MBE Compliance Office.

If you have any questions and would like to contact the MBE Compliance Office directly, you can call 401-574-8606 or email mbe.compliance@doa.ri.gov

Signature of Authorized Agent: _____ Date: _____

Email Completed Form and Tentative Award Letter to MBE.Compliance@doa.ri.gov