PROJECT MANUAL

Including Specifications
for Construction of:

THE COUNTY OF MENDOCINO

911 SERVER UNINTERRUPTED POWER SUPPLY REPLACEMENT AND TEMPORARY GENERATOR PROVISION

BID 44-19

589 Low Gap Road
Ukiah, CA 95482

Prepared by:
FACILITIES & FLEET DIVISION
851 LOW GAP ROAD
UKIAH, CA 95482
Tel: (707) 234-6054

Date of Issue:
JANUARY 15, 2020

SECTION 00002

PROJECT DIRECTORY

OWNER:	County of Mendocino 501 Low Gap Road Ukiah, CA 95482
AGENT:	Mendocino County Executive Office Facilities and Fleet Division 851 Low Gap Road Ukiah, CA 95482 (707) 234-6054 Doug Anderson, Assistant Facilities Manager

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SECTION 00020

NOTICE INVITING BIDS

Notice is hereby given that sealed bids will be received at the Executive Office, Facilities and Fleet Division, County of Mendocino, 851 Low Gap Road, Ukiah, California 95482 until the hour of 2:00 p.m., as determined by the clock on the wall of the Facilities and Fleet Division Office, County of Mendocino, on Tuesday, February 11, 2020 at 2:00 PM and then publicly opened and read aloud in the Executive Office, Facilities and Fleet Division, County of Mendocino, 851 Low Gap Road, Ukiah, California for the following project:

Mendocino County BID 44-19
REPLACE 911 SERVER UPS AND TEMPORARY GENERATOR PROVISION

License required for this Project is: "C-10" License

Electronic Plans and Documents may be seen or downloaded from the Mendocino County Web Page for Open RFP, Quotes & Bids: https://www.mendocinocounty.org/government/executive-office/open-rfp-quotes-bids. Additionally plans and documents have been distributed to builder's exchange plan rooms throughout Northern California. For printed plans in Mendocino County, electronic copies of the plans and documents have been supplied to:

Creative Workshop
759 S. State St.
Ukiah, CA 95482
707-468-0251

Bids shall be made on a form provided by the County and accompanied by a Certified Check, Cashier's Check, or Bidder's Bond for ten percent (10%) of the amount bid, made payable to the County of Mendocino. The above-mentioned check or Bid Bond shall be given as a guarantee that the Bidder shall execute the contract if it be awarded to it in conformity with the contract documents and shall provide the surety bond or bonds required, sign the contract and commence work as set forth in the Instructions to Bidders of the contract documents.

The successful Bidder will be required to furnish a Labor and Material Bond and a Faithful Performance Bond in an amount equal to one hundred percent (100%) of the contract price. Bonds shall each be obtained from a surety company satisfactory to the County of Mendocino.

Federal Laws, including The Davis-Bacon Act and The Americans with Disabilities Act of 1990, are applicable to the project.

Bidders' attention is called to Instruction to Bidders and other related documents for full directions and information as to bidding and other requirements.

Pursuant to California Public Contract Code Section 22300, the Contractor may substitute securities for any money withheld by the County to insure performance under the Contract. Said securities shall be in a form and of a type acceptable to the County.

A mandatory pre-bid conference and site inspection will be held on Tuesday, January 28 2020, @ 9:00 AM at the Project site, 589 Low Gap Road, Ukiah, California 95482.

PAYMENT OF PREVAILING WAGES

Pursuant to the provisions of the Labor Code of the State of California, the Department of Industrial Relations has made a determination of the rate of per diem wages to be paid on the prevailing rate of pay for regular, holiday and overtime work in the locality in which the public work is to be performed, for each craft, classification, or type of workman needed to execute the contract. All County of Mendocino projects greater than $1,000 require that contractors adhere to Prevailing Wage requirements (California Labor Code, Sections 1770 through 1775). The rates can be found online here: https://www.dir.ca.gov/OPRL/DPreWageDetermination.htm.

CONTRACTOR REGISTRATION

Per Labor Code Section 1771.1(a) A contractor or subcontractor shall not be qualified to bid on, be listed in a bid proposal, subject to the requirements of Section 4104 of the Public Contract Code, or engage in the performance of any contract for public work, as defined in this chapter, unless currently registered and qualified to perform public work pursuant to Section 1725.5. It is not a violation of this section for an unregistered contractor to submit a bid that is authorized by Section 7029.1 of the Business and Professions Code or by Section 10164 or 20103.5 of the Public Contract Code, provided the contractor is registered to perform public work pursuant to Section 1725.5 at the time the contract is awarded.

CERTIFIED PAYROLL RECORDS

Per Labor Code Section 1776 each contractor and subcontractor shall keep accurate payroll records. A certified copy of all payroll records for work performed under this contract shall be furnished upon request to a representative of the awarding body. Per SB 854 contractors and subcontractors are required to furnish certified payroll reports directly to the Department of Industrial Relations.

EMPLOYMENT OF APPRENTICES

Each contractor and subcontractor performing work in an apprenticeable craft or trade shall comply with Section 1777.5 relating to Apprentices on public works projects.

MENDOCINO COUNTY BUSINESS LICENSE

Pursuant to Mendocino County Code Section 6.0 – Business Licenses and Regulations, at the time of contract award, the contractor shall supply a copy of their current County of Mendocino business license.

LAWS AND GOVERNANCES

In the performance of the work contemplated by this contract, the contractor shall conform to and abide by all labor requirements and provisions of State and Federal Laws and City and County Ordinances and Regulations which may in any manner affect those engaged or employed on the work project, including but not limited to the overtime provisions of the Labor Code section 1813 and 1815 of the State of California.

END OF SECTION

SECTION 00100

INSTRUCTIONS TO BIDDERS

PART 1 – GENERAL

1.1 BIDS RECEIVED

A. Sealed bids for the **Mendocino County Replace 911 Server Uninterrupted Power Supply (UPS) and Temporary Generator Provision (BID 44-19)** will be received at the Facilities and Fleet Division Office, County of Mendocino, 851 Low Gap Road, Ukiah, California, until 2:00 p.m. as determined by the clock on the wall of the Facilities and Fleet Division Office, on Tuesday February 11, 2020 at 2:00PM, and then publicly opened and read aloud in the Facilities and Fleet Division Office, County of Mendocino.

B. Late bids will not be accepted. It is Bidder's responsibility to assure that its bid is delivered and received at the location noted above on or before the date and hour set for the bid opening.

1.2 LICENSE REQUIREMENT

A. The license required for this Project is “C10” License.

B. Pursuant to Mendocino County Code Section 6.0 – Business Licenses and Regulations, at time of contract award, the contractor shall supply a copy of their current County of Mendocino business license.

1.3 SECURING OF PLANS AND DOCUMENTS

Electronic Plans and Documents may be seen at, or downloaded from the Mendocino County Web Page for Bidding Opportunities – Construction: https://www.mendocinocounty.org/government/executive-office/open-rfp-quotes-bids

Additionally plans and documents have been distributed to builder’s exchange plan rooms throughout Northern California. In Mendocino County, printed plans may be obtained from:

Creative Workshop
759 S. State St.
Ukiah, CA 95482
707-468-0251

1.4 BIDS

Bids, to be considered, must be in accordance with the following instructions:

A. Bids must be submitted on the bid form provided by County, properly and completely filled out with numbers stated both in writing and in figures and with signatures of all persons signing in longhand/cursive.

B. The completed form shall be without erasures or interlineation and shall not contain recapitulations of the work to be done. Only written proposals will be permitted.

C. A Bid Bond or Certified Cashier's Check made payable to the County of Mendocino for an amount equal to at least ten percent (10%) of the bid

amount shall accompany each bid. Such guaranty to be forfeited should the Bidder to whom the contract is awarded fail to enter into the contract.

1.5 PRE-BID CONFERENCE AND SITE ACCESS

A. A mandatory pre-bid conference will be held, Tuesday January 28, 2020 @ 9:00 AM at the site, 589 Low Gap Road, Ukiah, California. Following the meeting, a site review will be conducted to acquaint Bidders with the Project.

B. The County reserves the right to schedule an additional mandatory pre-bid conference to ensure adequate bid representation.

C. Failure to attend at least one of the pre-bid conferences will disqualify a non-attending bidder from the bid.

1.6 SUBCONTRACTORS LISTED

A. In accordance with California Public Contract Code Sections 4100 et seq., inclusive, each bidder shall provide a list of subcontractors (Section 00430), giving the name and location of place of business and contractor's license number of each subcontractor who will perform a portion of the contract work in an amount in excess of one-half of one percent (0.5%) of the total contract price. In each instance, the nature and portion of the work to be subcontracted shall be described.

B. Failure of Bidder to specify a subcontractor for any portion of the work in an amount in excess of one-half of one percent (0.5%) of the total contract price constitutes an agreement for Bidder to perform that portion of the work itself. After bids are opened, no subcontractor may be designated or substituted except as provided for in Sections 4107 et seq. of the Public Contract Code.

C. All Bidders must supply with their Bids the required information on all subcontractors who will perform any portion of the work including labor, rendering of service or specially fabricating and installing a portion of the Work or improvement according to detailed drawings contained in the plans and specifications, in excess of one-half of one percent (0.5%) of total bid. Violation of this requirement may result in Bid being deemed non-responsive and not being considered.

1.7 AWARD OR REJECTION OF BIDS

The contract shall be awarded to the lowest responsible bidder complying with these instructions, provided the bid is deemed reasonable and in the best interest of the County of Mendocino. County reserves the right to reject any and all bids, and to waive any informality on bids received whenever the rejection or waiver is in the best interest of County. The competency and dependability of the bidders will be considered when making the award.

Additive and Deductive Items: Method of Determining Lowest Bid. Pursuant to Public Contract Code section 20103.8, if this bid solicitation includes additive and/or deductive items, the checked [X] method shall be used to determine the lowest bid: [check one]

[ ] (a) The lowest bid shall be the lowest bid price on the base contract without consideration of the prices on the additive or deductive items.

[ ] (b) The lowest bid shall be the lowest total of the bid prices on the base contract and those additive or deductive items that were specifically identified in

the bid solicitation or Bid Form as being used for the purpose of determining the lowest bid price.

[ ] (c) The lowest bid shall be the lowest total of the bid prices on the base contract and those additive or deductive items taken in order from a specifically identified list of those items that, when in the solicitation, and added to, or subtracted from, the base contract, are less than, or equal to, a funding amount publicly disclosed by the County before the first bid is opened.

[ ] (d) The lowest bid shall be determined in a manner that prevents any information that would identify any of the bidders or the proposed Subcontractors or suppliers from being revealed to the public entity before the ranking of all bidders from lowest to highest has been determined.

*If no method is checked, sub-paragraph (a) shall be used to determine the lowest bid.

Notwithstanding the method used by the County to determine the lowest responsible bidder, the County retains the right to add to or deduct from the contract any of the additive or deductive items included in the bid solicitation.

The award of the contract, if awarded, is expected to be made within thirty (30) days and in no event later than eighty (80) days after the bid opening. After award, County shall notify the successful Bidder in writing, and forward with the notification original contracts for Bidder's execution. Within eight (8) working days after such notification, the successful Bidder shall return the signed contracts to County, accompanied by all required Surety Bonds, insurance policies and endorsements.

1.8 TIME OF COMPLETION

Bidder agrees to commence work on or before a date to be specified in the written "Notice to Proceed" from County and to fully complete the project within Thirty (60) calendar days from date of the written "Notice to Proceed".

1.9 ADDENDUM

Any addendum issued during the time of bidding and before bid opening shall be included in the bid. The addendum issued by County shall become part of the agreement. Questions to be considered for inclusion in an addendum must be in writing and in the hands of County not less than seven (7) days prior to bid opening date.

1.10 INTERPRETATION OF DRAWINGS AND DOCUMENTS

Should a Bidder find discrepancies in, or omissions from, the drawings or documents, or should it be in doubt as to their intent, it should at once notify County, which will then send responsive written instructions in the form of addenda to all Bidders. County will not be responsible for any oral instructions. Any verbal conversations with County during the bidding period are not to be construed as instructions. Any changes in the Contract documents will be issued by written addendum only.

1.11 WITHDRAWAL OF BID

Bids may be withdrawn prior to, but not later than, the time of bid opening.

1.12 BONDS

The successful Bidder is required to furnish a Labor and Material Payment Bond and a Performance Bond each in the amount equal to one hundred percent (100%) of the contract price. In addition, the successful Bidder is required to furnish a Bid Bond or Certified Cashier's Check made payable to the County of Mendocino for an amount equal to at least ten percent (10%) of the bid amount. Said Bonds shall be obtained from a surety company satisfactory to County.

1.13 SUBSTITUTIONS

Any substitution shall be made in accordance with instructions contained in Section 01340 – Submittals and Substitutions included herein. Questions concerning substitutions will not be entertained during the bidding period.

1.14 LIQUIDATED DAMAGES

In case of failure on the part of Contractor to complete the work within the time stipulated plus any duly authorized extension of time granted in writing by County, Contractor shall pay to County the sum of $250.00 per calendar day for each day's delay beyond the time prescribed as liquidated damages, but not as a penalty. The language in the paragraph of the General Conditions entitled "Time of Completion and Liquidated Damages" is incorporated herein.

1.15 BIDDER'S QUALIFICATIONS

A. All Bidders, Contractors and Subcontractors bidding under joint venture agreements shall be duly licensed as provided for under Sections 7000 et seq. of the Business and Professions Code.

B. A corporation which is awarded the Contract will be required to furnish certification attesting to its corporate existence, as well as evidence that the Officer signing the contract is duly authorized to do so.

C. Bidders and their subcontractors may be required to furnish evidence satisfactory to County that they have sufficient means and have had experience in the class of work called for to enable them to complete the contract in a satisfactory manner.

D. No person, firm or corporation shall make or file or be interested in more than one bid for the same work, except insofar as alternate bids may be called for. No person, firm or corporation shall submit a collusive or sham bid or seek directly or indirectly to induce any other bidder to submit a collusive or sham bid or to refrain from submitting a bid or to seek in any way to control or fix the price of the bid or any portion of the bid price in order to secure an advantage against County or any other person interested in the proposed contract. However, a person, firm or corporation submitting a sub-proposal to a bidder or quoting prices on materials to a bidder is not hereby disqualified from submitting sub-proposals or quoting prices to other bidders.

E. A licensed contractor shall not submit a bid to a public agency unless (1) its contractor's license number appears clearly on the bid, (2) the license expiration date is stated, and (3) the bid contains a statement that the representations made therein are made under penalty of perjury. Any bid not containing this information, or a bid containing information which is subsequently proven false, shall be considered non-responsive and shall be rejected by County.

1.16 EXAMINATION OF SITE AND DOCUMENTS

By submitting a bid, Bidder agrees and warrants that (1) it has examined the site and all documents, drawings and specifications; (2) it is satisfied that the same are adequate to produce the required results; and (3) its bid covers the cost of all items required in the agreement. The work to be performed includes all of the items mentioned in these specifications and/or as shown on the plans and other documents included as a part of the project.

1.17 ENVIRONMENTAL AND PLANNING CONDITIONS OF APPROVAL

Bidder agrees to perform its work in conformance with all environmental and planning conditions of approval applicable to the project. Bidders' attention is directed to specification section 00801 Supplementary General Conditions and the source documents for specific conditions of approval

1.18 AGREEMENT

Contract documents include the Agreement which the successful Bidder, as Contractor, will be required to execute.

1.19 PRE-CONSTRUCTION CONFERENCE

The successful bidder shall be available for a pre-construction conference with County at a mutually convenient time.

1.20 QUALIFICATIONS OF BIDDERS

A. The work to be performed under this contract is of a very specialized nature. It is the desire of County to secure the best work attainable and to maintain a very critical and condensed schedule. Bidders considered for award will be limited to those firms who can show to the satisfaction of County that they have the facilities and experience necessary to perform the required construction in accordance with specifications proposed for this project. The terms under which bidders will be evaluated and the rules that will be applied are attached to the bid documents herein as Section 00120, "Qualification Application".

END OF SECTION

SECTION 00306

ANTITRUST CLAIM ASSIGNMENT

Pursuant to California Labor Code Section 7103.5, the following certification is hereby set forth and made a part of these specifications:

In entering into a public works contract or a subcontract to supply goods, services, or materials pursuant to a public works contract, the contractor or subcontractor offers and agrees to assign to the awarding body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sec. 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, services, or materials pursuant to the public works contract or the subcontract. This assignment shall be made and become effective at the time the awarding body tenders final payment to the contractor, without further acknowledgment by the parties.

SECTION 00307

NON-COLLUSION AFFIDAVIT

In accordance with California Public Contract Code Section 7106, the following affidavit must be completed by the Bidder:

Non-Collusion Affidavit to be executed by Bidder
and submitted with bid

State of California)
) ss.
County of Mendocino)

_____, being first duly sworn, deposes and says that he or she is _____ of _____ the party making the foregoing bid that the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and, further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

_____
Signature

SECTION 00310

BID FORM FOR MENDOCINO COUNTY

REPLACE 911 SERVER UPS AND TEMPORARY GENERATOR PROVISION

TO: Mendocino County Purchasing Agent

It is understood that this bid is based upon completion of the work within the time of completion requirements contained in the Instructions to Bidders.

It is agreed that this bid may not be withdrawn for a period of eighty (80) days from the opening hereof.

The undersigned has carefully checked all its figures and understands that the County will not be responsible for any error or omissions on the part of the undersigned in making up this bid.

If awarded the Contract, the undersigned agrees to complete the Work sixty (60) calendar days from the date of Notice to Proceed.

The undersigned, having become completely familiar with all conditions affecting the cost of the work at the place where the work is to be done, and with the drawings, specifications and other contract documents prepared and issued thereof and now on file at the General Services Agency Office, hereby proposes and agrees to perform everything required to be performed, and to provide and furnish any and all required labor, materials, equipment, transportation and services necessary to erect and complete in the best workmanlike manner, all as shown and specified.

The following bid amounts are as defined and clarified in the Bids Required portion of these specifications:

BASE BID:

_____Dollars ($_____)

SALES TAX

All bids shall include required California State Sales Tax, cost of all bonds and insurance as required and all other items of expense incidental to the contract. The County of Mendocino is exempt from Federal Excise Tax.

A licensed Contractor shall not submit a bid to a public agency unless its Contractor's License number appears clearly on the bid, the license expiration date is stated, and the bid contains a statement that the representations made therein are made under penalty of perjury. Any bid not containing this information, or a bid containing information which is subsequently proven false, shall be considered nonresponsive and shall be rejected by the public agency.

Name of Organization_____

Name of Organization_____

Type of Organization_____
(Corporation, Partnership, etc.)

Address_____

Name of State where incorporated_____

CONTRACTORS LICENSE NO. _____EXPIRATION DATE_____

☐ **Contractor has registered with the State of California's DIR (Department of Industrial Relations) website.**

DIR Registration #: _____

☐ **Contractor is currently licensed to do business in the County of Mendocino.**

Mendocino County Business License #: _____

ADDENDA: CONTRACTOR TO ACKNOWLEDGE RECEIPT

I have received the following Addenda pertaining to this project and they have been included as part of my bid.

Numbers:_____

The undersigned hereby certifies under penalty of perjury that this bid is genuine and not collusive, that all the information is correct and that he/she has carefully checked all of the above figures and understands that the County will not be responsible for any errors or omissions on the part of the undersigned on making up this bid.

Signature _____

Corporate Seal

SECTION 00430

SUBCONTRACTORS LISTING FORM

911 SERVER UPS REPLACEMENT

In accordance with the provisions of Section 4100 *et seq.* of the Public Contract Code of the State of California, each bidder shall list below the name, license number, Department of Industrial Relations (DIR) Registration Number, and location of place of business of each subcontractor who will perform a portion of the contract work in an amount in excess of one-half of one percent (0.5%) of the total contract price. In each such instance, the nature and portion of the work to be subcontracted shall be described.

PORTION OF WORK	SUBCONTRACTOR'S NAME	CONTRACT LIC. DIR REG #	LOCATION

SECTION 00500

AGREEMENT FOR LUMP SUM BID

THIS AGREEMENT, made on the _____day of_____in the year 2019, between the County of Mendocino, hereinafter called COUNTY, and _____, hereinafter called CONTRACTOR.

COUNTY and CONTRACTOR, for the consideration described below named, agree as follows:

FIRST: CONTRACTOR shall furnish all labor, materials, equipment, mechanical workmanship, transportation, and services for the installation and completion of the **Mendocino County Replace 911 Server Uninterrupted Power Supply (UPS) and Temporary Generator Provision**, in accordance with the contract documents, including the Addenda thereto, all as adopted by COUNTY.

SECOND: The work under this contract described below shall be completed within sixty (60) calendar days from the date of the "Notice to Proceed".

THIRD: The Contract consists of the following documents, all of which are fully a part hereof as if herein set out in full, whether or not hereto attached:

1. Invitation to Bid
2. Instructions to Bidders
3. Agreement
4. Contractor's Guarantee
5. Close-Out Items including all Warranties
6. Coordination
7. Construction Temporary Facilities
8. Drawings & Specifications
9. General and Technical Conditions of the Specifications
10. All modifications thereof incorporated before execution of the Contract

FOURTH: COUNTY shall pay to CONTRACTOR, if CONTRACTOR is successful bidder, as full consideration for the faithful performance of the Contract the sum of:

This sum constitutes the bid for the following project components (referenced hereunder to specifications section). This sum includes the following alternate bids:

NO ALTERNATES

Payment shall be made each month to CONTRACTOR in accordance with and subject to the provisions embodied in the Documents made a part of this Contract.

IN WITNESS WHEREOF

DEPARTMENT FISCAL REVIEW:

_____
DEPARTMENT HEAD DATE

Budgeted: ☐ Yes ☐ No

Budget Unit: _____

Line Item: _____

Grant: ☐ Yes ☐ No

Grant No.: _____

CARMEL J. ANGELO, Chief Executive Officer

By: _____

PURCHASING AGENT

Date:_____

INSURANCE REVIEW:

By: _____
Risk Management

Date:_____

EXECUTIVE OFFICE/FISCAL REVIEW:

By: _____
Deputy CEO

Date:_____

CONTRACTOR/COMPANY NAME

By:_____

Date:_____

NAME AND ADDRESS OF CONTRACTOR:

_____

_____

_____

By signing above, signatory warrants and represents that he/she executed this Agreement in his/her authorized capacity and that by his/her signature on this Agreement, he/she or the entity upon behalf of which he/she acted, executed this Agreement

COUNTY COUNSEL REVIEW:

APPROVED AS TO FORM:

CHRISTIAN M. CURTIS,
Acting County Counsel

By:_____
Deputy

Date:_____

Signatory Authority: $0-25,000 Department; **$25,001- 50,000 Purchasing Agent;** $50,001+ Board of Supervisors
Exception to Bid Process Required/Completed ☐ _____
Mendocino County Business License: Valid ☐
Exempt Pursuant to MCC Section: _____

SECTION 00501

WORKERS' COMPENSATION CERTIFICATION

Pursuant to California Labor Code Section 1861, the Contractor hereby certifies the following:

I am aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the work of this contract.

Dated_____

Contractor Signature_____

SECTION 00510

CONTRACTOR GUARANTEE

911 SERVER UPS REPLACEMENT

Contractor hereby guarantees that the labor and material furnished for this project is in accordance with the drawings and specifications. Contractor agrees to repair or replace any or all of the work, together with any other adjacent work which may be displaced in so doing, that may prove to be defective in its workmanship or material within a period of ONE (1) YEAR from date of acceptance of the above named project by County without any expense whatsoever to County, ordinary wear and tear and unusual abuse or neglect excepted.

In the event of Contractor's failure to comply with the above-mentioned conditions within fifteen (15) calendar days after being notified in writing by County, Contractor authorizes County to proceed to have said defects repaired and made good at Contractor's expense. Contractor shall honor and pay the costs and charges therefore upon demand.

SIGNED_____

COUNTERSIGNED_____

CONTRACTOR_____

DATED_____

DATE OF BUILDING ACCEPTANCE_____

SECTION 00650

CONSTRUCTION SITE STORM WATER POLICY

PART I – GENERAL

1.1 SUMMARY

A. Mendocino County Ordinance No. 4313 STORM WATER RUNOFF POLLUTION PREVENTION PROCEDURE (Mendocino County Code Chapter 16.30 et.seq.) requires any person performing construction and grading work anywhere in the county shall implement appropriate Best Management Practices (BMP) to prevent the discharge of construction waste, debris, sediment or contaminants from construction materials, tools and equipment from entering the storm drainage system or natural waterways (off-site).

B. By commencing work in this contract, the contractor agrees to comply with Mendocino County Code Section 16.30.140 Inspection and monitoring. The County may enter the worksite whenever necessary to perform inspections related to the Storm Water Runoff Pollution Prevention Procedures for the project including inspection of BMP's and records relating to storm water plan compliance.

1.2 SUBMITTALS

A. Prior to beginning construction activities, submit construction site Best Management Practice (BMP) Plans and Specifications prepared by a Qualified Storm Water Developer (QSD) or the Contractor referencing Mendocino County Building and Planning Services Documents noted below:

1. Construction Best Management Practices for over-the-counter building permits for projects that do not disturb any soil.
2. Small Construction Site Storm Water Erosion and Sediment Control Plan Template for projects that will disturb any soil.

B. Submittal shall include a project specific BMP plan for all areas of soil disturbance and possible contamination source generated by the project. Attach copies of the relevant current BMP fact sheets from the California Storm Water BMP Handbook Portal planned to address each potential source of contamination generated by the project.

C. A County approved BMP plan is required prior to beginning work on the project.

Part 2 – PRODUCTS

2.1 MATERIALS

A. Provide Materials in Compliance with Approve BMP fact sheets in appropriate quantities to mitigate possible runoff, sedimentation and/or contamination in accordance with the approved BMP plan.

Part 3 – EXECUTION

3.1 PREPARATION

A. Prepare BMP schedule to identify dates when BMP's will be installed.

B. Ensure that BMP Materials are on site in the event of an untimely rain event and prior to October 15th.

C. Identify and mark Storm Drain Inlets and drainage features leading to storm drains or natural waterways.

D. Identify and provide instruction and training to on site personnel responsible for installation and management of BMP's.

3.2 INSTALLATION

A. Complete BMP installation Prior to October 1st or prior to ground disturbance activities between October 1st and April 15th, and call the project manager for an inspection of the installed BMP plan. Do not start grading activities without BMP's in place.

B. Comply with installation guidelines included with BMP fact sheets and suitable to site conditions.

C. Remove Contamination and Sediment BMP's after sources of sedimentation, or contamination have been removed from the site or final soil stabilization is complete. Do not remove Erosion Control BMP's until permanent Erosion Control features are established unless directed by the County.

3.3 INSPECTION

A. It is the responsibility of the Contractor to provide regular inspection of BMP's throughout the rainy season. Maintain and replace all BMP's in accordance with the approve BMP plan.

B. Prior to significant rain events, inspect installed BMP's to ensure all potential sources of contamination, sedimentation or erosion are protected by approved BMP's.

C. During significant rain events verify that installed BMP's are adequate to the flows on the project site.

D. Record inspection findings as required by approved BMP plan.

E. Maintain Inspection records and a copy of the approved BMP plan on the project

site for inspection by County and NCWRCB.

F. Failure of the Contractor to comply with the requirements of these specifications and the provisions of the approved Storm Water pollution Prevention Plan or BMP plan may result in work stoppage, a written citation, monetary fine or any combination thereof.

END OF SECTION

SECTION 007000

GENERAL CONDITIONS

1. DEFINITIONS

Whenever in the Specifications and other Contract Documents the following abbreviations and terms are used, the intent and meaning shall be interpreted as follows:

A. "Owner" - Board of Supervisors, County of Mendocino, or its authorized agents or assignees.

B. "Agent" - The Agent acting for the County, which shall be either the County General Services Agency Director or his/her designee, or the County Executive Officer or his/her designee.

C. "Contractor" - The person or persons, partnership, corporation, or combination thereof, private or municipal, who have entered into a contract with the County, as party or parties of the second part or his/her or their legal representatives.

D. "Specifications" - The directions, provisions and requirements contained in these Specifications as supplemented by the Supplementary Conditions. Whenever the term "These Specifications" is used in this book, it means the provisions as set forth in this book.

E. "Paragraph" - The particular section of subdivision herein designated by a number.

F. "Laboratory" - The designated laboratory authorized by the County to test materials and work involved in the Contract.

G. In the case of conflict between the Standard Specification and these Specifications, these Specifications shall take precedence over and be used in lieu of such conflicting portions:

A.W.S.	American Welding Society
A.S.T.M.	American Society for Testing Materials
A.S.A.	American Standard Association
N.B.F.U.	National Board of Fire Underwriters
N.B.S.	National Bureau of Standards
A.S.M.E.	American Society of Mechanical Engineers
A.R.I.	American Refrigeration Institute
N.E.M.A.	National Electrical Manufacturers Association
U.L.	Underwriter's Laboratories
E.T.L.	Electrical Testing Laboratories
A.C.I.	American Concrete Institute
F.A.	Federal Specifications
A.I.S.C.	American Institute of Steel Construction

H. The County and the Contractor are those named as such in the Agreement. They are treated throughout the Contract Documents as if each were of the singular number and the masculine gender.

I. When the words "Approved", "Satisfactory", or "Equal", "As Directed", etc. are used, approval by the County is understood.

J. All Federal, State laws and local laws shall govern the construction of the Contract and all rules, ordinances and requirements of authorized officials shall be complied with.

K. It is understood that any reference to the Specifications or designation of the American Society for Testing Materials, Federal Specifications or other standard, code, or order, refers to the most recent or latest amended specification or designation.

2. EXAMINATION OF PLANS AND SPECIFICATIONS

The Bidder shall examine carefully the site of the work contemplated and the proposal, plans, specifications, and Contract forms thereof. It will be assumed that the Bidder has investigated and is satisfied as to the conditions to be encountered, as to the character, quality, and quantities of work to be performed and material to be furnished, and as to the requirements of these Specifications.

3. DRAWINGS AND SPECIFICATIONS

A. Figured dimensions on the drawings shall govern, but work not dimensioned shall be as directed. Work indicated but not particularly detailed or specified shall be equal to similar parts that are detailed or specified, or as directed. Full-size detailed shall take precedence over scale drawings as to shape and details of construction. It is intended that scale drawings, full-size details and specifications should agree, but should any discrepancy or apparent error occur in plans and specifications or should any work of others affect this work, the Contractor shall notify the County at once; if the Contractor proceeds with the work affected without instruction from the County he shall make good any resultant damage or defect.

B. All misunderstandings of drawings or specifications shall be clarified by the County, whose decision shall be final.

C. Any work called for by the drawings and not mentioned in the Specifications, or vice versa, is to be furnished as though fully set forth by both. Where not specifically stated otherwise, all work and materials necessary for each unit of construction, including special construction for any specific brand or shape of material called for even though only briefly mentioned or indicated, shall be furnished and installed fully and completely as a part of the Contract.

D. Lists, rules and regulations referred to are recognized printed standard and shall be considered as one and a part of these Specifications within the limits specified.

E. "General Conditions" apply with equal force to all of the work, including extra work authorized.

F. For convenience, the Technical Specifications are arranged in Divisions and further divided into various sections. It is to be understood, this separation is for convenience of all parties involved and is not to be considered as the limits of the work required of any separate trade. The terms and conditions of such limitations are wholly between the County and the Contractors during bidding and construction phases; i.e., all work shown, as well as for the proper completion of the project as a whole, shall be coordinated by the Contractor and his Subcontractors during bidding and construction and shall be provided in this Contract.

4. CONDUCT OF WORK

A. The County reserves the right to do other work in connection with the project by contract or otherwise. Contractor shall at all times conduct his work so as to impose no hardship on the County or others engaged in the work. Contractor shall adjust, correct, and coordinate his work with the work of others so that no discrepancies shall result in the whole work.

B. The Contractor shall provide at his own cost and risk all labor, material, water, power tools, machinery, scaffolding, and framework for the execution of the work. Equipment shall be adequate and as approved.

The Contractor shall obtain all necessary measurements from the work and shall check dimensions, levels, and construction and layout and supervise the construction, for correctness of all of which he shall be responsible.

C. Where work of one trade joins or is on other work, there shall be no discrepancy when same is completed. In engaging work with other materials, marring or damaging same shall not be permitted. Should improper work of any trade be covered by another which results in damage or defects, the whole work affected shall be made good without expense to the County.

D. The Contractor must anticipate relation of all parts of the work and at the proper time furnish and set anchorage, blocking or bonding as required. Anchorage and blocking necessary for each trade shall be a part of same, except where stated otherwise.

E. Assistance required by the County in obtaining measurements or information on the work shall be furnished accurately and fully without cost to the County.

5. OWNERSHIP OF DRAWINGS

All plans and specifications shall remain the property of the County and shall be returned to the office of the County Facilities and Fleet Division Manager or shall be accounted for by the Contractor before the final certificate will be issued.

6. PUBLIC AND COUNTY CONVENIENCE AND SAFETY

The Contractor shall furnish, erect, and maintain such fences, barriers, lights and signs as are necessary to give adequate warning to the public at all times and of any dangerous conditions until final acceptance of the work by the County.

7. ACCIDENT PREVENTION

A. It shall be the Contractor's responsibility to keep himself fully informed of all existing and future safety regulations, Codes, OSHA requirements, and other laws and regulations governing the work which may in any manner affect anyone in and around the project or engaged or employed in the work, or materials, equipment, etc. used in the work or which in any way affect the conduct of the work.

B. The Contractor shall appoint a Safety Officer for the project and submit his name to the County.

C. The Contractor shall supply the County with a Material Safety Data Sheet (MSDS) on each hazardous substance to be used by the Contractor on the project.

D. The Contractor and his Safety Officer shall be solely responsible for insuring compliance with those Codes, regulations, OSHA requirements, and for discovering and correcting any code violations or unsafe conditions.

E. Reports of all lost-time accidents shall be promptly submitted to the Owner, giving all pertinent information.

8. RESPONSIBILITY FOR DAMAGE

The County shall not be answerable or accountable in any manner for: (1) any loss or damage that may happen to the work or any part thereof, for any loss or damage to any of the materials or other things used or employed in performing the work; (2) injury to or death of any person or persons, either workers or the public; (3) damage to property from any cause which might have been prevented by the Contractor or his workers or anyone employed by him. The Contractor shall be responsible for any liability imposed by law for injuries to or death of any person including, but not limited to, workers and the public or damage to property resulting from defects or obstructions or from any cause whatsoever during the progress of the work or at any time before its completion and final acceptance. The Contractor shall indemnify, save harmless and defend the County of Mendocino, its elected or appointed officers, agents, employees or volunteers connected with the work, from all claims or actions for injuries or death of any person, or damage to property, resulting from the Contractor's performance of the Contract. With respect to third party claims against the Contractor, the Contractor waives any and all rights to any type of express or implied indemnity against the County of Mendocino, its elected or appointed officers, agents, employees or volunteers.

In addition to any remedy authorized by law, so much of the money due the Contractor under and by virtue of the Contract as shall be considered necessary by the County may be retained by the County until disposition has been made of such suits or claims for damages as aforesaid.

9. LAWS TO BE OBSERVED

The Contractor shall keep himself fully informed of all existing and future State, Federal and local laws, codes and regulations which in any manner affect those engaged or employed in the work, or the materials used in the work, or which in any way affect the conduct of the work, and of all such orders and decrees of bodies and tribunals having any jurisdiction or authority over the same and shall be solely responsible for insuring compliance with those laws, codes and regulations.

A partial, though not necessarily complete listing of laws to be observed by the Contractor is as follows:

A. Federal Americans with Disabilities Act of 1990.

B. Federal Labor Standards Act.

C. The Anti Kick-Back regulations found in 29 CFR Part 3.

D. All contract clauses required by 29 CFR 5.5 (a) and (c), 20 U.S.C. 1232b ; 40 U.S. C. 276a, 276c, 327-332; 29 CFR Parts, (926).

E. Nondiscrimination clause and Certification of Non-Segregated Facilities prescribed by Executive Order No. 11246, September 24, 1965 as amended by Executive Order 11375.

F. Executive Order No. 11288 of July 7, 1966 (31 FR 9261) "Prevention, Control and Abatement of Water Pollution".

G. Executive Order 11988, relating to evaluation of flood hazards.

H. Compliance with all Federal, State and local requirements for handicapped access, fire safety and seismic resistance.

10. BONDS REQUIRED

The successful bidder shall furnish bonds as required in the document entitled "Instructions to Bidders" which is part of these Contract documents.

11. INSURANCE

The Contractor, at his expense, shall secure and maintain at all times during the entire period of performance under this Contract, insurance as set forth below with insurance companies acceptable to the County of Mendocino.

The Contractor shall provide to the County of Mendocino certificates of insurance with endorsements properly executed by an officer or authorized agent of the issuing insurance company evidencing coverage and provisions as stated below:

A. INSURED

Name the County of Mendocino, its elected or appointed officials, employees, agents and volunteers as additional insured with regard to damages and defense of claims arising from: (a) activities performed by or on behalf of the Named Insured, (b) products and completed operations of the Named Insured, (c) Premises owned, leased or used by the Named Insured, or (d) Ownership, operation, maintenance, use, loading or unloading of any vehicle owned, leased, hired or borrowed by the Named Insured, regardless of whether liability is attributable to the Named Insured or a combination of the Named Insured and the County of Mendocino, its elected or appointed officials, employees, agents and volunteers.

B. SEVERABILITY OF INTEREST

Provide that the inclusion of more than one named insured shall not operate to impair the rights of one insured against another insured, and the coverages afforded shall apply as though separate policies had been issued to each insured.

C. CONTRIBUTION NOT REQUIRED

Provide that as respects: (a) work performed by the Named Insured on behalf of the County of Mendocino; or (b) products sold by the Named Insured to the County of Mendocino; or (c) premises leased by the Named Insured from the County of Mendocino; or (d) ownership, operation, maintenance, use, loading or unloading of any vehicle owned, leased, hired or borrowed by the Named Insured, the insurance afforded by this policy shall be primary insurance as respects the County of

Mendocino, its elected or appointed officials, employees, agents and volunteers; or stand in an unbroken chain of coverage excess of the Named Insured's scheduled underlying primary coverage. In either event, any other insurance maintained by the County of Mendocino, its elected or appointed officials, employees, agents and volunteers shall be excess of this insurance and shall not contribute with it.

D. COVERAGE BELOW MINIMUM REQUIRED NOTICE

Provide that the limits of insurance afforded by this policy shall not fall below the minimum requirements of the County of Mendocino without notice to the County of Mendocino by certified mail return receipt requested. Such notice shall be addressed to: County of Mendocino, 501 Low Gap Road, Ukiah, Calif. 95482, Attn: Risk Management.

E. CANCELLATION NOTICE

Provide that the insurance afforded by this policy shall not be suspended, voided, canceled, non-renewed or reduced in coverage or in limits except after thirty (30) day's prior written notice, delivered in person or by First Class U.S. Mail, has been given to the County of Mendocino. Such notice shall be addressed to: County of Mendocino, 841 Low Gap Road, Ukiah, Calif. 95482, Attn: Risk Management.

Contractor shall furnish to the County of Mendocino certificate(s) of insurance evidencing Workers Compensation Insurance coverage to cover its employees. The Contractor shall require all subcontractors similarly to provide Workers Compensation Insurance as required by the Labor Code of the State of California for all of the Contractor's and subcontractors' employees.

The Contractor shall not commence work, nor shall he allow his employees or subcontractors or anyone to commence work until all insurance required and provisions contained herein have been submitted to and accepted by the County of Mendocino. Failure to submit proof of insurance as required herein may result in awarding said Contract to another bidder. Failure to comply with the insurance requirements set forth herein shall constitute a material breach of contract and, at County of Mendocino's option, shall subject this Contract to termination.

Insurance coverage in the minimum amounts set forth herein shall not be construed to relieve the Contractor for liability in excess of such coverage, nor shall it preclude the County of Mendocino from taking such other action as is available to it under any other provisions of this Contract or otherwise in law.

SCOPE OF LIABILITY COVERAGES

Contractor shall furnish to the County of Mendocino certificates of insurance evidencing at the minimum the following:

1. Public Liability-Bodily Injury (not auto) $500,000 each person; $1,000,000 each accident,

and

Public Liability-Property Damage (not auto) $500,000 each occurrence; $1,000,000 aggregate.

---or---

Combined Single Limit Bodily Injury Liability and Property Damage Liability (not auto) $1,000,000 each occurrence.

2. Vehicle-Bodily Injury $500,000 each person, $1,000,000 each occurrence,
and
Vehicle-Property Damage $1,000,000 each occurrence.
---or---
Combined Single Limit Vehicle Bodily Injury and Property Damage Liability $1,000,000 each occurrence.

12. WORKERS COMPENSATION CERTIFICATION

Contractor certifies as follows:

"I am aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for Workers Compensation or to undertake self-insurance in accordance with the provisions of that Code, and I will comply with such provisions before commencing the performance of the work of this Contract". (Labor Code Section 1861)

13. CONTRACTOR'S RESPONSIBILITY FOR WORK

Until the formal acceptance of the work by the County, the Contractor shall have the charge and care thereof and shall bear the risk of injury or damage to any part thereof or to materials or thing employed in doing the work or stored on the site by the action of the elements or from any other cause, whether arising from the execution or from the non-execution of the work. The Contractor shall rebuild, repair, restore, replace, and make good all injuries or damages to any portion of the work occasioned by any of the above caused before final acceptance and shall bear the expense thereof, except such injuries or damages occasioned by acts of the Federal Government or the public enemy. The Contractor's responsibility also extends to adjoining property as related to the construction operation.

14. RESPONSIBILITY OF COUNTY

The County shall not be held responsible for the care or protection of any material or parts of the work prior to final acceptance, except as expressly provided in these Specifications.

15. COOPERATION BETWEEN CONTRACTORS

Where two or more contractors are employed on related or adjacent work, each shall conduct his operations in such a manner as not to cause any unnecessary delay or hindrance to the other. Each contractor shall be responsible to the other for all damage to work, to person or property, or for loss caused by failure to furnish the work within the time specified for completion.

Should the Contractor, through acts of neglect on the part of any Contractor, suffer loss or damage to the Work, the Contractor agrees to settle with such other Contractor by agreement. If such other Contractor should file claim against the County on account of alleged damages to be sustained, the County shall notify the Contractor who shall, at his expense, indemnify and save harmless the County against any such claim.

16. SUBCONTRACTING AND ASSIGNMENT

The Contractor shall give his personal attention to the fulfillment of the Contract and shall keep the work under his control. Should the Contractor subcontract any part of his

Contract, the Contractor shall be fully responsible to the County for the acts and omissions of his subcontractor and of the persons either directly or indirectly employed by the subcontractor as he is for the acts and omissions of persons directly employed by himself.

No subcontractor will be recognized as such, and all persons engaged in the work on construction shall be considered as employees of the Contractor.

17. PERMITS AND LICENSES

The Contractor shall procure all permits and licenses, pay all charges and fees, and file all notices necessary and incidental to the due and lawful prosecution of the work.

18. PATENTS

The Contractor shall assume all responsibilities arising from the use of patented materials, equipment, devices or processes used on or incorporated in the work.

19. LIENS

Liens shall be enforced as provided by California State Law pertaining to Public Works.

20. CHANGES IN THE WORK

A. The County may order changes in the work, in which event the Contract sum shall be adjusted by one or more, or a combination of, the following methods:

1. Unit bid prices previously approved or as may be agreed upon.

2. An agreed lump sum substantiated by Contractor, itemizing labor, material, equipment, overhead, profit, bond, etc.

3. By ordering Contractor to proceed with work and keep correct account with vouchers the actual cost of:

   a. Labor, including foreman;
   b. Materials entering permanently into the work;
   c. The ownership or rental cost of construction plant and equipment during the time of use on the extra work;
   d. Power and consumable supplies for the operation of power equipment;
   e. Insurance;
   f. Social Security and old age and employment contribution.

B. To the cost under (2) and (3), there may be added a fixed fee to be agreed upon but not to exceed fifteen percent (15%) for the estimated cost of the work. The fee shall be compensation to cover the cost of administrative overhead, and profit.

C. On changes which involve a credit to the County, no allowances for overhead need be figured.

D. All such change orders and adjustments shall be in writing. Claims by Contractor for extra cost shall be made in writing before executing the work involved.

E. All change orders shall be reviewed and approved by the County.

21. COUNTY'S RIGHT TO TERMINATE CONTRACT

If the Contractor should refuse or neglect to properly perform or prosecute the work or if he should substantially violate any provision of the Contract, then the County may, without prejudice to any other right or remedy upon seven (7) days written notice to the Contractor, terminate the services of the Contractor and take possession of the premises, and all materials, tools, and equipment thereon and complete the work. The expense thereof shall be deducted from the balance otherwise due the Contractor. If such expense should exceed such unpaid balance, then the Contractor shall pay the difference to the County.

22. CONTRACTOR'S RIGHT TO STOP WORK OR TERMINATE CONTRACT

If the work is stopped for a period of thirty (30) days under an order of any court or other public authority having jurisdiction, or as a result of an act of government, such as a declaration of a national emergency making materials unavailable, through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing any of the work under a contract with the Contractor, or if the work should be stopped for a period of thirty (30) days by the Contractor because no certificate for payment has issued as provided in Paragraph 25 or because the County has not made payment thereon as provided in Paragraph 25, then the Contractor may, upon seven (7) additional days' written notice to the County, terminate the Contract and recover from the County payment for all work executed and for any proven loss sustained upon any materials, equipment, tools, construction equipment and machinery, including reasonable profit and damages.

23. TIME OF COMPLETION AND LIQUIDATED DAMAGES

A. In case all the work called for under the Contract is not completed before or upon the expiration of the time limit as set forth in these specifications, damage will be sustained by the County, and it is impracticable to determine the actual damage which the County will sustain in the event of and by reason of such delay. It is therefore agreed that the Contractor will pay to the County the sum of money per calendar day for each day's delay beyond the time prescribed as required in the document entitled "Instructions to Bidders", which is a part of these Contract Documents. The Contractor agrees to pay such liquidated damages as herein provided, and in case the same are not paid, agrees that the County may deduct the amount thereof from any money due or that may become due the Contractor under the Contract.

B. In case the work called for under the Contract is not finished and completed in all parts and requirements within the time specified, the County shall have the right to extend the time for completion or not, as may best serve the interest of the County. If the County decides to extend the time limit for the completion of the Contract, the County shall further have the right to charge the Contractor, his heirs, assigns or sureties, and to deduct from the final payment for the work, all or any part, as it may deem proper, of the actual cost of County, including inspections, superintendence, and other overhead expenses directly chargeable to the Contract, and which accrue during the period of such extension. The cost of final inspections shall not be included in such charges.

C. The Contractor shall not be assessed with liquidated damages nor the cost of County's services and inspection during any delay in the completion of the work caused by acts of God or the public enemy, acts of the County, fire, flood, earthquake, epidemics,

quarantine restrictions, strikes, freight embargoes, shortages of materials, labor, fixtures or equipment (provided the Contractor furnishes satisfactory and acceptable proof that he has made diligent attempts to obtain same) and unusually severe weather or delays of subcontractors due to such causes, provided the Contractor shall within ten (10) days from the beginning of such delay notify the County in writing of the delay. County's findings of fact thereon shall be final and conclusive.

D. The County agrees that changes in work ordered pursuant to Paragraph 20 and extensions of completion time made necessary by reasons thereof, shall in no way release any guarantee given by the Contractor or the Contract let hereunder, nor shall such changes in the work relieve or release the sureties on bonds executed pursuant to these specifications. Sureties shall be deemed to have expressly agreed to any change in the work and to any extension of time made by reason thereof.

24. ACCEPTANCE

A. The Contract will be accepted as completed only when the whole and entire Contract shall have been completed satisfactorily to the County. In judging the work, no allowance for deviations from the original plans and specifications will be made unless already approved in writing at proper times and in a manner as called for herein.

B. Should it become necessary to occupy a portion of the work before the Contract is fully completed, such occupancy shall not constitute acceptance.

25. PARTIAL PAYMENTS

Prior to submitting and as a condition of approval of the first progress payment application, the Contractor shall submit a schedule of values acceptable to the County providing a breakdown of the contract value by trade division such that the County can accurately assess the percentage completion of the project.

On the twenty-fifth (25th) day of each month, the Contractor shall submit to the County an application for payment, on a form acceptable to the County, showing an itemized statement for work that has been performed on a percent complete basis based on the previously approved schedule of values. The County within thirty (30) days of receipt of application that meets the County's approval shall issue to the Contractor a certificate for ninety percent (95%) of the amount the County finds due for work that has been performed.

Contractor shall submit certified copy of payroll showing payment of Davis-Bacon Act wages with each request for payment submitted.

26. FINAL PAYMENT

Upon completion of the Contract, the County will cause to be made a final estimate of the amount of work done, and the value of such work. After approval by the County representative, the County shall pay the remainder due on the contract (with the exception of retainage) after deducting there from, all previous payments. All amounts retained (retainage) under the provisions of the Contract shall be due and payable 30 days from the date of acceptance in writing of the completion of Contract and / or Notice of Completion issued by the County representative. All prior partial estimates and payments shall be subject to correction in the final estimate and payments. Payment and the final estimate is due within thirty-five (35) days from the recorded date of the Notice of Completion,

provided all as-built drawings, equipment manuals, instructions to the owner and guarantees have been received and accepted by the County.

27. PAYMENT WITHHELD

The County may withhold or, on account of subsequently discovered evidence, may nullify the whole or part of any certificates to such extent as may be necessary to protect the County from (1) defective work not remedied, (2) asserted claims against Contractor, (3) failure of the Contractor to make payments properly to employees or for material or labor, (4) any reasonable doubt that the Contract work can be completed for the balance then unpaid, or (5) damage to another contractor.

28. FAULTY WORK AND MATERIALS

The Contractor shall promptly remove from the premises all materials condemned by the County as failing to conform to the Contract, whether incorporated in the work or not. The Contractor shall promptly replace and re-execute his own work in accordance with the Contract and without expense to the County. The Contractor shall bear the expense of making good all work of other contractors destroyed or damaged by such removal.

If the Contractor does not remove such condemned work and materials within reasonable time, fixed by written notice, the County may remove them and may store the materials at the expense of the Contractor. If the Contractor does not pay the expenses of such removal within ten (10) days thereafter, the County may upon ten (10) days written notice, sell such materials at auction or at private sales and shall account for the net proceeds thereof after deducting all costs and expenses that should have been borne by the Contractor.

29. TEMPORARY SUSPENSION OF WORK

The County shall have the authority to suspend the work wholly or in part, for such period as it may deem necessary, due to unsuitable weather or to such other conditions as are considered unfavorable for the suitable progression of the work, or for such time as it may deem necessary due to the failure of the Contractor to carry out orders given by County, or to perform any provision of the Contract. The Contractor shall immediately obey such order of the County and shall not resume work until ordered in writing by the County.

30. SAMPLES

When requested, the Contractor shall submit for the County's review samples of the various materials, together with the finish thereof, as specified for and intended for use in the work. Samples of bulk materials shall be selected by the lab. All materials and workmanship shall in all respects be equal to the samples so submitted and reviewed. Samples shall be sent or delivered to the County, samples and delivery charges paid by Contractor. Samples will be returned to the Contractor if requested, shipping or delivery charges collect.

31. CLEANING AND REMOVAL OF DEBRIS

The Contractor shall, as directed by the County during the progress of the work or as indicated elsewhere in these documents, remove and properly dispose of dirt and debris and shall keep the premises reasonably clean. Upon completion of the work, the Contractor shall remove all of his equipment and unused materials provided for the work, and shall put the building and appurtenances in a neat and clean condition and shall do all cleaning and washing required by the specifications.

32. OBSTRUCTIONS

The Contractor may be required to work around public utility facilities and other improvements which are to remain in place within the construction area. The Contractor shall be held liable to the owners of such facilities and improvements for any damage or interference with service resulting from the Contractor's operation.

The exact location of underground facilities and improvements within the construction area, whether shown on the drawings or not, shall be ascertained by the Contractor before using equipment that may damage such facilities or interfere with their service.

33. SUPERINTENDENT IN CHARGE

The Contractor shall keep on the work at all times and until the acceptance certificate is issued a competent superintendent or foreman for the purpose of receiving and executing without delay any orders from County in keeping with the terms of the Contract. This foreman shall have charge of the plans and specifications kept on the job. He shall be instructed to familiarize himself closely with all provisions of the plans and specifications and to follow the same accurately.

34. STORAGE OF MATERIALS AND EQUIPMENT

Materials and equipment shall not be stockpiled or placed outside of the site property lines unless written permission is obtained by the appropriate owner or political subdivision having jurisdiction over the adjacent property, roads, streets, etc.

35. GENERAL GUARANTY

Neither the final payment nor any partial payment, nor partial or entire use of the premises by occupancy by the County shall constitute an acceptance of the work not completed in accordance with the Contract. Final Payment or partial payment or partial or entire use of the premises by occupancy shall not relieve the Contractor of liability with respect to any warranties or responsibilities for faulty materials or workmanship. The Contractor shall remedy any defect in the work and pay for any damage to other work resulting therefrom which shall appear within a period of one (1) year from the date of final acceptance of the work, unless a longer period is specified elsewhere in these specifications. The County shall notify the Contractor of observed defects with reasonable promptness.

36. MATERIALS SUBMITTALS AND SUBSTITUTIONS

Materials and substitutions shall be governed by the relevant sections elsewhere in these documents. If not specified, the following shall govern.

A. Specific reference to materials, appliances, fixtures and equipment by trade name is intended to be used as standard, but this implies no right on the part of the Contractor to use other materials, fixtures, appliances, equipment, until review by the County.

B. The County alone shall determine what will be considered as equal, but the burden of proof as to quality, utility and function, etc. shall be upon the Contractor.

If the Contractor desires to substitute any item, he shall in writing state the cost of such item and the original item named in the specifications if requested and shall submit a substitution warranty in the format shown in the specifications.

C. As soon as practicable and within twenty (20) days after official award of Contract and before any fixtures, materials or equipment are purchased, the Contractor shall submit to the County a complete list of materials, fixtures and equipment giving the manufacturers' names, catalog numbers, etc., and, when requested, the original and substitute item of each article which he proposes to install as a substitution.

D. Requests for substitution will not be considered after the above period of time unless the item specified is not obtainable or, in the opinion of the County, such substitution would serve the County's interest.

37. CONSTRUCTION, MATERIAL AND LABOR COST SCHEDULES

A. The successful Contractor shall submit the following schedules to the County within ten (10) days after commencing the work:

1. A construction schedule indicating the start and finish of each phase of the work.
2. A detailed statement of the cost of material and labor included in the original estimate for each phase of the work so arranged that the value of the work as it progresses may be readily determined.

38. CONFERENCES

At any time during the progress of the work, the County may request the Contractor to attend a conference of any or all of the Contractors engaged on the work, and any notice of such conference shall be duly observed and complied with by the Contractor.

39. INSPECTION AND PAYMENTS - NOT ACCEPTABLE

The fact that the work and materials have been inspected by the County of Mendocino and payments on account have been made does not relieve the Contractor from the responsibility of replacing and making good any defective work or materials that may be discovered within one (1) year from the date of the completion of the work by the Contractor and its acceptance by the County. [Five (5) years for roof.]

40. RETURN OF DRAWINGS AND SPECIFICATIONS

All plans and specifications shall be returned to the Office of the County Director of General Services or shall be accounted for by the Contractor before the final certificate will be issued.

41. ARRANGEMENT OF SPECIFICATION SECTION

A. For convenience, these specifications are arranged in several sections, but such separation shall not be considered as limiting any work required to a particular trade. The Contractor shall in cooperation with other contractors establish responsibility

for any work required by the plans and specifications which may be improperly arranged or not included in the appropriate section.

B. In areas where one trade meets another for joining, the Contractor is responsible to be certain that all work shown is included in his bid.

42. QUALITY OF MATERIALS AND LABOR

All materials used on this Contract shall be new and the best market quality, unless specified or shown otherwise. All labor used on this Contract shall be competent and skilled for the work. All work executed under this Contract shall be done in the best, most thorough, substantial and workmanlike manner.

All material and labor not meeting these standards shall be removed. The County may refuse to issue any certificate of payment until all defective materials or work have been removed, and other material of proper quality substituted therefor.

43. INCOMPETENT WORKERS

If at any time any foreman or worker who shall be employed by the Contractor shall be declared by the County to be incompetent or unfaithful in executing the work, the Contractor, on receiving written notice, shall forthwith initiate appropriate action to dismiss such person from the work.

44. COUNTY TO DECIDE

All matters of color, texture, design, interpretation of plans and specifications shall be referred by the Contractor to County, whose decision thereon shall be final.

45. CODES

All work and materials shall be in full accordance with the latest rules and regulations of the State Fire Marshal; the Safety Orders of the Division of Industrial Safety; the California Electric Code; the California Building Code; California Mechanical Code; the California Fire and Plumbing Codes; OSHA and other applicable State and local codes and laws. Nothing in these plans or specifications is to be construed to permit work not conforming to these Codes.

46. PAYMENT OF FEDERAL, STATE OR LOCAL TAXES

Any Federal, State or Local tax payable on articles furnished by the Contractor under the Contract shall be included in the Contract price and paid by the Contractor.

47. LIMITATIONS OF HOURS OF WORK

Eight (8) hours labor constitutes a legal day's work. The Contractor shall forfeit as a penalty $25.00 for each worker employed in the execution of the Contract by the Contractor for each calendar day which such worker is required or permitted to work more than eight (8) hours in one (1) calendar day and forty (40) hours in any one (1) calendar week in violation of the provisions of the California Labor Code, and in particular Sections 1810 and 1816. Work performed by employees of Contractors in excess of eight (8) hours

per day and forty (40) hours during any one (1) week, shall be permitted upon compensation for all hours worked in excess of eight (8) hours per day at not less than one and one-half (1 & 1/2) times the basic rate of pay, as provided in Section 1815.]

48. PAYMENT OF NOT LESS THAN THE GENERAL PREVAILING RATE OF PER DIEM WAGES

A. The Contractor shall pay his workers on all work included in this Contract not less than the general prevailing rate of per diem wages for legal holiday and overtime work in said locality. Such per diem wages shall not be less than the stipulated rates contained in a schedule thereof which has been ascertained and determined by the State Director of Industrial Relations to be the general prevailing rate of per diem wages for each craft or type of worker needed to execute this Contract.

B. The Contractor shall comply with Labor Code Section 1775. In accordance with Section 1775, the Contractor shall forfeit as a penalty twenty-five dollars ($25.00) for each calendar day or portion thereof, for each worker paid less than the stipulated prevailing rates for such work or craft in which such worker is employed for any work done under the Contract in violation of the provisions of the Labor Code in particular Labor Code Sections 1770 and 1780. In addition to said penalty, and pursuant to Section 1775, the difference between such stipulated prevailing wage rates and the amount paid to each worker for each calendar day or portion thereof for which each worker was paid less than the stipulated prevailing wage rate shall be paid to each worker by the Contractor.

49. LABOR CODE CLARIFICATION

It is to be understood that references to the California Labor Code shall mean the current Code or as may be amended during the period of the Contract.

50. NOTIFICATION OF READINESS FOR REQUIRED TESTS AND INSPECTIONS

The Contractor shall be responsible to notify all inspectors, testing agencies, and County representatives a minimum of seventy-two (72) hours before required tests and/or inspections.

51. RESPONSIBILITY FOR PROJECT SAFETY AND CONSTRUCTION TECHNIQUES

Specifically omitted from the services of the County are all design and construction review services relating to the Contractor's safety precautions or to means, methods, techniques, sequences, or procedures required for the Contractor to perform his work.

Omitted services include, but are not limited to, shoring, scaffolding, underpinning, temporary retainment of excavations and any erection methods and bracing.

52. RECORD DRAWINGS

A. The Contractor shall furnish one complete set of clean "Record" drawings to the County prior to project acceptance, showing clearly any changes made during construction. Record drawings shall be in accordance with Section 017839 Project Record Documents..

B. In addition to any changes, all mechanical, electrical and plumbing items concealed in the building and underground, actually installed and routed. Depth below surface to top of underground item shall be indicated.

C. All underground items shall be dimensioned from permanent reference points in a manner that they can be easily found in the field at a later time.

D. Each sheet of the "Record" drawings shall be identified with the following label to be signed by the Contractor:

These are record drawings which have been prepared or supervised by the undersigned.

_____

Contractor Date

E. The Contractor is solely responsible for the preparation, completeness, and accuracy of the "Record" drawings. The County and its representatives are not responsible to review the "Record" drawings.

53. OCCUPANCY OR USE BEFORE ACCEPTANCE OF COMPLETION

The County may occupy any building or portion thereof or use any improvement contemplated by the Contract prior to the completion of the entire work. A list of work to be completed and corrected by the Contractor, if any, shall be prepared and agreed to between the County and the Contractor before occupancy or use. Such occupancy or use shall not operate as an acceptance of any part of the work but shall start the guaranty-warranty period on the structure or portion thereof so occupied or improvement of equipment so used, provided, however, that such occupancy shall not start the guaranty-warranty period as to items appearing on the list of work to be completed and corrected. No such occupancy or use shall be deemed to have occurred unless and until the County has given the Contractor formal written notice of intention to so occupy or use, specifying the portion or portions of the structure, improvement or equipment which will be deemed so occupied or used.

54. COMPLIANCE WITH HANDICAPPED ACCESS LAWS

A. It is the County's intent for all features on these plans and specifications to conform to applicable regulations for the accommodations of physically handicapped persons in buildings and facilities used by the public, whether or not said plans and specifications so conform.

B. It shall be the responsibility of the manufacturers, suppliers and distributors to insure that all manufactured and fabricated products, devices and items they supply for this project conform to applicable regulations of Title 24 of the California Code of Regulations.

C. When shop drawings and/or manufacturers product literature, and other matters subject to handicapped regulations are submitted to County, the following shall be provided:

1. Statement that the item shown complies with the handicapped regulations of Title 24 of the California Code of Regulations.

2. Show all required dimensions, heights, clearances, and locations that must be followed when items are installed on project.

55. CONTRACT AMBIGUITY

This Contract shall be deemed to have been prepared jointly by the parties signing the Contract and if any inconsistencies or ambiguities exist, they shall not be interpreted or construed against any of the parties as the drafter.

56. FAIR EMPLOYMENT PRACTICES/NONDISCRIMINATION

The Contractor shall comply with Federal and State Fair Employment Practices provisions.

The Contractor, in connection with performance of work under this agreement, agrees to comply with the rules and regulations which deal with or relate to nondiscrimination set forth as follows:

A. During the performance of this Contract, the Contractor and its subcontractors shall not deny the Contract's benefits to any person on the basis of race, religious creed, color, national origin, ancestry, physical disability, mental disability, medical condition, marital status, sex or age, nor shall they discriminate unlawfully against any employee or applicant for employment because of race, religious creed, color, national origin, ancestry, physical disability, mental disability, medical condition, marital status, age, or sex. Contractor shall insure that the evaluation and treatment of employees and applicants for employment are free of such discrimination.

B. The Contractor shall comply with the provisions of the California Fair Employment and Housing Act (Gov. Code, sections 12900 *et seq*.), the regulations promulgated thereunder (2 Cal. Code of Regulations sections 7285.0 *et seq*.), and Government Code Sections 11135 - 11139.5).

C. The Contractor shall permit access by representatives of the Department of Fair Employment and Housing and the County upon reasonable notice at any time during the normal business hours, but in no case less than 24 hours notice, to view such of its books, records, accounts, other sources of information and its facilities as said Department or County shall require to ascertain compliance with this clause.

D. The Contractor and its subcontractors shall give written notice of their obligations under this clause to labor organizations with which they have a collective bargaining or other agreement.

E. The Contractor shall include the above nondiscrimination and compliance provisions in above subparagraphs A and B in all subcontracts to perform work under the Contract.

END OF SECTION

SECTION 008110

UNFORESEEN PHYSICAL CONDITIONS

PART I – GENERAL

1.1 SUMMARY

This Section includes special requirements for unforeseen hidden conditions, differing site conditions and underground facilities as required for California Public Works Contracts.

1.2 UNFORESEEN SITE CONDITIONS

A. Pursuant to Section 7104 of the California Public Contract Code, if any of the following conditions, hereinafter called hidden conditions, are encountered at the site, then Contractor shall promptly, before such conditions are disturbed and in no event later than three (3) days after discovery, notify County in writing using the "Hidden Conditions Report" attached to this Document:

1. Material that Contractor believes may be hazardous waste material, as defined in Section 25117 of the Health and Safety Code, that is required to be removed to a Class I, Class II, or a Class III disposal site in accordance with provisions of existing law.
2. Subsurface or latent physical conditions at the site or in the building differing materially from those represented in the Contract Documents.
3. Archaeological or historical artifacts or soils conditions identified with such artifacts as noted in the conditions of approval from the California Department of Parks and Recreation CEQA Document No. 11293 – Archaeological Review.
4. Unknown physical conditions at the site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents or conditions that could be observed by examination of the site and the Reference Documents.

B. Conditions that are not unforeseen, hidden, unknown or differing site and building conditions include but are not limited to, the following.

1. All that is indicated in or reasonably interpreted from the Contract Documents.
2. All that is indicated in or reasonably interpreted from the Reference Documents specified in Section 01010, “Summary of Work”.
3. All that could be seen on site and that could be observed.
4. Conditions that are materially similar or characteristically the same.
5. Conditions where the location of the building component is in the proximity where indicated in or reasonably interpreted from the

Contract Documents or Reference Documents.

C. County will promptly investigate the conditions reported which appear to be unforeseen conditions.

1. If County determines that the reported conditions are inherent in work of the character provided for in the Contract Documents or observed by examination of the site and Reference Documents, or that the condition is not hidden, unforeseen or materially different, Contractor shall execute the Work at no additional cost to County.
2. If County determines that the conditions are hidden or differing conditions and that they will materially cause a decrease or increase in Contractor's cost of any portion of the work, a Contract Modification will be issued for compensation of such portion of the work as provided in the General Conditions.
3. If County determines that the conditions are hidden or differing conditions and that they will materially affect the performance time, Contractor, upon submitting a written request, will be granted an extension of time subject to the provisions of the General Conditions.

    a. Time extensions or contract costs will not be granted for delays that could be or could have been avoided by Contractor redirecting his forces and equipment to perform other work on the Contract.

D. Should Contractor disagree with County's determination, Contractor shall submit a Request for Change (RFC) to County that the condition is not indicated in or reasonably interpreted from the Contract Documents, and that the condition is not similar in character to the material that could have been observed by examination of the site and Reference Drawings, but that the condition is materially different and the condition is unforeseen and unknown.

1. Contractor shall submit proof with written explanation, drawings, photographs, material and labor cost breakdowns, and other relevant data to show the condition.
2. County will review Contractor's submission and make a determination. Contractor shall not file for claim or RFC before County makes the determination.
3. In the event of continued disagreement, Contractor shall not be excused from any scheduled completion date provided for by the Contract, but shall proceed with all work to be performed under the Contract.
4. Contractor shall retain any and all rights provided either by the Contract or by law which pertain to the resolution of RFC and protests between the contracting parties.

1.3 REMOVAL, RELOCATION, OR PROTECTION OF EXISTING UTILITIES

A. In accordance with the provisions of Section 4215 of the California Government Code, County will assume the responsibility for the removal,

relocation, or protection of existing main or trunk-line utilities located on the site of the Contract work, if such utilities are not identified in the Contract Documents.

B. Contractor shall immediately notify County and the public utility in writing of such utility facilities it discovers while performing the work which are not identified in the Contract Documents.

1. Contractor shall negotiate with the owner of the utility, who shall have the sole discretion to perform repairs or relocation work or permit Contractor to do such repairs or relocation work at a reasonable price.

C. Contractor shall not be assessed liquidated damages for delay in Substantial Completion if the delay was caused by such existing utilities in direct conflict with the work and not shown on the Drawings.

D. Contractor will be compensated under the provisions of General Conditions Section 00700, Article 20 for extra work involving existing utilities not shown on the Drawings or included in the Specifications but in direct physical conflict with Contractor's operations.

1. This extra work shall include the following costs:

a. Locating, supporting, working around, and protecting or repairing damage not due to the failure of Contractor to exercise reasonable care.
b. Removing and relocating, as directed by County, existing main or trunk line utility facilities located on site but not indicated on the Drawings and Specifications with reasonable accuracy.
c. Equipment on the project necessarily idled during such work.

E. Contractor shall not be entitled to any adjustment in the Contract Sum or Time if the existence of such condition:

1. Could have been reasonably discovered or revealed as a result of any examination, investigation, exploration, test or study of the site and contiguous areas required by the Contract Documents to be conducted by or for Contractor prior to commencing such work, or
2. Could have been inferred from the presence of other visible facilities, such as buildings, meter and junction boxes, on or adjacent to the work site.

1.4 WORK STOPPAGES FOR HISTORICAL OR ARCHAEOLOGICAL FINDS

A. CONTRACTOR shall not be entitled to any adjustment in the Contract Sum for reasonable accommodations required to comply with the conditions of approval.

B. Work stoppages required and any special excavation requested by the Archaeological monitor will be compensated under the provisions of article 7 of the General Conditions.

PART 2 - PRODUCTS
NOT USED

PART 3 - EXECUTION
NOT USED

END OF SECTION

HIDDEN CONDITIONS REPORT (HCR)

Regional Behavioral Health Training Center - Flooring Project HCR No._____

Submitted By: _____ Date: _____

	Ctr to PM	PM to Arch	Arch to PM	PM to Ctr
Date Sent:	_____	_____	_____	
Date Received:	_____	_____	_____	

Type of Conditions Reported:

☐ Site Work ☐ Structural ☐ Architectural ☐ HVAC
☐ Plumbing ☐ Fire Protection ☐ Electrical ☐ Other

Location and Reference to Drawing: _____

Conditions Reported: _____

_____

_____

_____

_____

_____

_____

_____

Investigated By: _____ Firm: _____ Date: _____

☐ Check this box if the hidden condition reported is not hidden. Reply with location(s) where the information can be obtained.

Reply of Findings: _____

_____

_____

_____

_____

_____

By:_____ Firm:_____ Date:_____

The reply is a finding from the investigation. No change in the Contract Sum or Time is authorized. See Specifications Document 00811 for the timeliness of investigation.

00851

DRAWINGS INDEX

ELECTRICAL

E-001 ELECTRICAL LEGEND & ABBREVIATIONS
E-101 ELECTRICAL PLAN
E-501 ELECTRICAL DIAGRAMS

SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL

1.1 REQUIREMENTS of the drawings and general provisions of the Prime Construction Agreement and other sections of Division 1 apply to this section.

1.2 THIS SECTION sets forth general project scope, and general provisions regarding work to be performed by the Contractor.

1.3 THE WORK OF THIS CONTRACT consists of: Replacing the existing Uninterrupted Power Supply (UPS) system with new Owner furnished UPS. Project is located at 589 Low Gap Road, Ukiah, CA 95482.

WORK INCLUDED: Provide all documentation, labor, material, superintendence and administration as depicted in the drawings, as described in the project manual or as necessary for a complete and proper installation. Present to the Owner, at the close of construction, signed copies of all required permits indicating successful completion of all permit requirements.

1.4 APPLICABLE CODES AND REGULATIONS:

A. General Requirements: All materials and workmanship shall comply with the most recent edition of the California Code of Regulations (CCR), Title 24 (California Building Standards Code) with current State and local amendments. CCR, Title 24 consists of the following twelve parts:

Part 1 - California Building Standards Administrative Code
Part 2 - California Building Code
Part 3 - California Electrical Code
Part 4 - California Mechanical Code
Part 5 - California Plumbing Code
Part 6 - California Energy Code
Part 7 - (No longer published in Title 24. See Title 8, CCR)
Part 8 - California Historical Building Code
Part 9 - California Fire Code
Part 10 - California Existing Building Code
Part 11 - California Green Building Standards Code (CALGreen)
Part 12 - California Reference Standards Code

B. Energy Requirements: All materials and workmanship shall comply with the most recent editions of the California Code of Regulations, Title 24 (California Building Standards Code) with current State and local amendments and the most recent edition of the Building Energy Efficiency Standards published by the California Energy Commission.

C. Air Quality Requirements: All materials and workmanship shall comply with all current requirements of the Mendocino County Air Quality Management District. Provide all application materials, fees and documentation necessary to provide required notification and obtain all permits required by the Mendocino County Air Quality Management District. Obtain approval for all operations and present to the Owner, at the close of construction, signed copies of all required permits indicating successful completion of all permit requirements.

D. Recycling Requirements: This project is subject to the Mendocino County "Construction and Demolition Recycling and Reuse" Ordinance and the Department of Toxic Substances Control "Requirements for Generators of Treated Wood Waste." and the requirements of California Green Building Standards Code (CALGreen).

E. Other Requirements: All materials and workmanship shall comply with the most recent edition of any other codes or regulations adopted by governmental agencies having jurisdiction over any portion of the work.

1.5 PROJECT DATA:

A. Construction Type: The proposed facility shall conform to all requirements for Type V-B construction as set forth in the most current edition of the California Building Code in effect at the time of construction with current State and local amendments.

B. Occupancy Classification: The proposed facility shall conform to all requirements for Group B Occupancy as set forth in the most current edition of the California Building Code in effect at the time of construction with current State and local amendments.

1.6 WORK AREA AND USE OF PREMISES

A. The contractor shall have controlled access to the site. Contractor shall perform work such that access to the building is not restricted except by prior arrangement with the County. Pedestrian access to the building entrances and adjacent businesses shall be maintained during business hours. Work shall be adequately cordoned off to direct public from the street or parking lot, and direction shall be provided around the work area, to the building entrances.

B. The Contractor shall use every precaution to insure the protection of and prevent damage to existing facilities on or adjacent to the construction area. Damage to existing facilities due to construction activities shall be repaired by the Contractor at no additional cost to the Owner.

D. Bidders shall assume that they can use only the areas shown on Sheet E-101. Maintain the area clean and without damage to the surfaces or structures.

1.5 EXAMINATION

A. General: As stipulated in Document 001000 Instructions to Bidders, Contractor is responsible for inspection of the existing site conditions prior to bidding and shall include in the Contract any modifications of the Contract Documents proposed as a result of Contractor's inspection. Such modifications shall be included in the bid.

B. Persons performing work shall examine conditions that affect their work and shall report in writing to Contractor, with a copy to County, conditions detrimental to work.

1. Failure to examine and report makes the person responsible, at no increase in the Contract Sum, for corrections necessary for the proper installation of their work.

2. Commencement of Work constitutes acceptance of existing condition.

C. Field Verification: Contractor shall verify all existing conditions in the field prior to commencing the Work.

1.6 PERMITS FOR WORK

Contractor shall obtain and meet any building permit requirements from the County of Mendocino Building Department. Contractor is responsible for scheduling and passing all required building inspections and securing final acceptance. Building permit fees are waived by the County.

1.7 LISTING OF RELATED WORK

Listings of related work or sections in the various Sections are not necessarily complete listings. They are provided for information and convenience only and are intended to highlight related or similar work which is specified in other Sections. Related work listings and omissions from such listings are not intended to control Contractor in dividing the work among subcontractors or in establishing the extent of the work to be performed by any trade.

1.8 REQUEST FOR INFORMATION (RFI)

A. Requirement: It is Contractor's responsibility to review Contract Documents in advance of the work to be executed, and to request information so that County will have sufficient time to respond to Requests for Information prior to the start of actual construction of that part of the Work to which the RFI relates. Contractor shall be responsible for all delays, disruptions and other related impacts as a result of untimely RFI's submitted to County.

B. Contractor shall coordinate all requests for information to prevent duplication. Requests for information that are duplicative, uncoordinated with each other, or do not allow for a reasonable time for response will be returned to Contractor.

1. Contractor shall promptly notify County in writing of any discrepancies, and shall not proceed with the Work until such discrepancies have been resolved.

2. Failure to notify County shall not relieve Contractor of its responsibility for resulting damage and/or defect, and for the cost of any corrective work that may be required due to Contractor's failure to notify.

C. Contractor shall prioritize RFI's and request a response based on its most current and accepted CPM schedule.

D. Form:

1. When an interpretation or clarification of the Contract Documents is required from County, Contractor shall make the request on a form acceptable to the County.

2. Contractor shall limit the subject to one design discipline to expedite reply and attach supplementary information where necessary.

3. County will reply or give summary of reply on the same form and include supplementary information where necessary.

4. The completed form shall be the written record of each RFI.

F. Reply:

1. County will endeavor to reply to all RFI's promptly as work schedule of the consultants allows; generally no later than fifteen (15) days from the day received.

2. When an RFI involves a complex subject, extensive research or development, or substantial input from other governmental agency, County will inform Contractor and request additional time to prepare the reply. Contractor shall cooperate and agree to a reasonable time extension.

3. The reply shall be a clarification or an interpretation of the Contract Documents; the reply is not an authorization of change in the Contract Sum or Time.

4. Such written interpretation or clarification will be binding on Contractor and County. If County or Contractor believes that a written interpretation or clarification justifies an adjustment in the Contract Sum or Time, then County or Contractor may make a written request for change therefor as provided in the General Conditions, Article 20.

PART 2 - PRODUCTS (not applicable)

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PART 3 - EXECUTION (not applicable)

SECTION 01500

TEMPORARY FACILITIES & CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: Provide temporary facilities and controls needed for the Work including, but not necessarily limited to:
   1. Temporary utilities such as water, electricity, lighting and telephone;
   3. Sanitary facilities;
   4. Enclosures and temporary protection such as tarpaulins, barricades, and canopies;

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary conditions, and Sections in Division 1 of these Specifications.
   2. Except that equipment furnished by subcontractors shall comply with requirements of pertinent safe regulations, such equipment normally furnished by the individual trades in execution of their own portions of the Work are not part of this Section.
   3. Permanent installation and hookup of the various utility lines are described in other Sections.

1.2 JOB SAFETY

A. Comply with all applicable laws and regulations pertaining to job safety, and be solely responsible for construction means, methods, techniques, sequences procedures and safety precautions and programs in connection with the Work. Owner or Architect will not be responsible for Contractor's failure to employ proper safety procedures.

B. All work, including the temporary construction, shall be in full accord with the latest orders, rules and regulations of the State of California Division of Industrial Safety and the California Occupational Safety and Health Act (CAL-OSHA).

C. The Contractor shall at all times so conduct his work as to cause the least possible obstruction and inconvenience and insure the protection of persons and property in the vicinity of the Work.

PART 2 - PRODUCTS

2.1 MISCELLANEOUS FACILITIES

A. Construction Aids: Hoists, ramps and ladders, enclosures, pumps, barriers, fences, barricades necessary to adequately move materials and equipment and to protect workmen and public.

B. All temporary construction to comply with requirements of state and local authorities.

2.2 PROTECTION OF INSTALLED WORK

A. Protect installed Work and provide special protection where specified in individual specification Sections.

B. Provide temporary and removable protection for installed Products. Control activity in immediate work areas to minimize damage.

C. Provide protective coverings at walls, projections, jambs, sills and soffits of openings.

D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

E. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

F. Prohibit traffic from landscaped areas.

PART 3 - EXECUTION

3.1 MAINTENANCE AND REMOVAL

A. Maintain temporary facilities and controls as long as needed for safe and proper completion of the Work.

B. Remove such temporary facilities and controls as rapidly as progress of the Work will permit or as directed by the Architect.

C. Remove temporary above grade or buried utilities, equipment, facilities, materials prior to Substantial Completion inspection.

E. Clean and repair damage caused by installation or use of temporary work.

F. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

END OF SECTION

SECTION 01640

PRODUCT HANDLING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: Products, including Owner furnished items scheduled for use in the Work by means including, but not necessarily limited to those described in this Section.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Additional procedures also may be prescribed in other Sections of these Specifications.

1.2 QUALITY ASSURANCE

Include within the Contractor's quality assurance program such procedures as are required to assure full protection of work and materials.

1.3 MANUFACTURERS' RECOMMENDATIONS

Except as otherwise approved by the County, determine and comply with manufacturers' recommendations on product handling, storage, and protection.

1.4 PACKING

A. Deliver products to the job site in their manufacturer's original container, with labels intact and legible.
   1. Maintain packaged materials with seals unbroken and labels intact until time of use.
   2. Promptly remove damaged material and unsuitable items from the job site, and promptly replace with material meeting the specified requirements, at no additional cost to the Owner.
   3. Immediately notify Owner of any damage to Owner Furnished – Contractor Installed (OFCI) items.

B. The County may reject as non-complying such material and products that do not bear identification satisfactory to the County as to manufacturer, grade, quality, and other pertinent information.

1.5 PROTECTION

A. Maintain finished surfaces clean, unmarred, and suitably protected until accepted by Owner.

1.6 REPAIRS AND REPLACEMENTS

A. In event of damage, promptly make replacements and repair to the approval of the County and at no additional cost to the Owner.

B. Additional time required to secure replacements and to make repairs will not be considered by the County to justify an extension of the Contract Time of Completion.

SECTION 01700

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: Closeout procedures, Final cleaning, Adjusting, Project record documents, Operation and maintenance data, Warranties, Spare parts and maintenance materials, Summary of closeout submittals to County.

1.2 CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for County's inspection.

B. Provide submittals to County that are required by governing or other authorities.

C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

D. Comply with procedures stated in the Conditions of the Contract Agreement and General Conditions for issuance of Certificate of Substantial Completion.

E. Should County consider that the Work' is incomplete or defective, he will promptly notify the Contract in writing, listing the incomplete or defective items. The Contractor shall then take immediate steps to remedy the stated deficiencies, and send a second written certification to County that the Work is complete.

F. Should County perform reinspections due to failure of the Work to comply with the claims of status of completion made by the Contractor:
1. Owner will compensate County for such additional services.
2. Owner will deduct the amount of such compensation from the final payment to the Contractor.

G. When the County finds that the Work is acceptable under the Contract Documents, he shall request the Contractor to make closeout submittals.

H. County will issue a final change order reflecting approved adjustments to Contract Sum not previously made by Change Order.

1.3 FINAL CLEANING

A. Remove waste and surplus materials, rubbish, and construction facilities from the site.

B. Execute final cleaning prior to final inspection.

C. Clean interior carpeted finished floors of stains and foreign substances, vacuum carpeted and soft surfaces.

D. Clean walls, windows, and sills affected by the work of the contract to a dust free condition.

1.4 OPERATION AND MAINTENANCE DATA

A. Compile data and 'related information appropriate for Owner's maintenance and operation of products furnished under the Contract.

B. Submit one copy of completed product data electronically.

C. Submit one copy of completed volumes in final form 15 days prior to final inspection. This copy will be returned after final inspection, with County comments. Revise content of documents as required prior to final submittal.

1.5 WARRANTIES

A. Provide two copies.

B. Submit prior to final Application for Payment.

1.6 FINAL PAYMENT

A. The 10% retention shall be held by the Owner until Forty (40) days after Final Acceptance. If no liens or encumbrances are filed and if all work is complete, the retention shall be paid the Contractor. Assessed liquidated damages shall be deducted from the retention.

B. Final payment to the Contractor will not be made until the Owner and County receive a signed-off final copy of the Building Permit, as applicable.

PART 2 PRODUCTS

(Not used)

PART 3 EXECUTION

(Not used)

SECTION 01710

CLEANING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: Throughout the construction period, maintain the buildings and site in a standard of cleanliness as described in this Section.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

   2. In addition to standards described in this Section, comply with requirements for cleaning as described in pertinent other Sections of these Specifications.

1.2 QUALITY ASSURANCE

A. Conduct daily inspection, and more often if necessary, to verify that requirements for cleanliness are being met.

B. In addition to the standards described in this Section, conduct cleaning and disposal operations to comply with pertinent requirements of governmental agencies having jurisdiction.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS AND EQUIPMENT

A. Provide required personnel, equipment, and materials needed to maintain the specified standard of cleanliness.
B. Provide covered containers for deposit of waste materials, debris and rubbish.
C. Locate containers for deposit of waste materials, debris and rubbish as directed by owner.

2.2 COMPATIBILITY

A. Use only those cleaning materials which will not create hazards to health or property and which will not damage surfaces.
B. Use only the cleaning materials, methods and equipment which are compatible with the surface being cleaned, as recommended by the manufacturer of the material to be cleaned.
C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 - EXECUTION

3.1 PROGRESS CLEANING

A. General:
1. Retain stored items in an orderly arrangement allowing maximum access, not impeding traffic or drainage, and providing required protection of materials.
2. Do not allow accumulation of scraps, debris, waste material, and other items not required for construction of this Work.
3. Provide adequate storage for all items awaiting removal from the job site, observing requirements for fire protection and protection of the ecology.

3.3 FINAL CLEANING

A. "Clean," for the purpose of this Article, and except as may be specifically provided otherwise, shall be interpreted as meaning the level of cleanliness generally provided by skilled cleaners using commercial quality building maintenance equipment and materials.

B. Prior to completion of the Work, remove from the job site all tools, surplus materials, equipment, scrap, debris, and waste. Conduct final progress cleaning as described in Article 3.1 above.

D. Schedule final cleaning as approved by the Construction Manager to enable the Owner to accept a completely clean finished installation.

E. Prior to final completion, or Owner occupancy, Contractor shall conduct an inspection of sight exposed surfaces in all construction areas, to verify that the entire Work is clean.

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SECTION 02080

CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: Construction waste shall be managed in conformance with the applicable codes and regulations listed below.

1.2 APPLICABLE CODES AND REGULATIONS:

A. General Requirements: See Specification Section 01010 - Summary of Work.

B. Recycling Requirements: This project is subject to the Mendocino County "Construction and Demolition Recycling and Reuse" Ordinance and the Department of Toxic Substances Control "Requirements for Generators of Treated Wood Waste."

C. This project is subject to the requirements of the most recent edition of the California Green Building Standards Code (CALGreen) with current State and Local amendments.

1.3 QUALITY ASSURANCE:

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

PART 2 - PRODUCTS

(No products are required in this Section.)

PART 3 - EXECUTION

3.1 SITE AND SURFACE CONDITIONS

A. Examine areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 CONSTRUCTION WASTE MANAGEMENT

A. By careful study of the Contract Documents, determine the location and extent of construction waste management to be performed.

B. In company with the Architect, visit the site and verify the extent and location of construction waste management required.

1. Carefully identify limits of selective demolition.
2. Mark interface surfaces as required to enable workmen to identify items to be managed according to the requirements of this section.

C. Prepare and follow an organized plan for construction waste management.

1. Establish a location on site for construction waste management tasks. Sort waste into required categories and stockpile materials until ready for disposal.
2. Develop an organized plan for construction waste management and fully inform all employees of the requirements and conditions.
3. Use means necessary to prevent dust, airborne debris and waterborne debris from becoming a nuisance to the public, to neighbors, workers and to other work being performed on or near the site.

D. Disposal of Materials

1. Completely remove items scheduled to be removed from site, leaving surfaces clean, solid, and ready to receive new materials specified elsewhere.
2. In all activities, comply with pertinent regulations of governmental agencies having jurisdiction.

3.3 SUBMITTALS:

A. Submit construction waste management plan, disposal confirmation and any other required documentation to governmental agencies having jurisdiction and County.

SECTION 260500

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Work included in this Section: "Provide" indicates all materials, labor, equipment, services, and incidentals necessary to install the Electrical Work indicated on the contract drawings and these specifications. Work includes, but is not limited to the following:

1. Branch circuit wiring, wiring devices and connections to all equipment requiring electrical service.
2. UPS system
3. Coordination with Vendor's associated with the construction of the project.
4. All necessary incidental work not specifically mentioned herein or shown on the drawings shall be provided for complete and functioning systems.

B. Work specified in Division 26, 27, 28:

1. Section 260519: 600-Volt Power Conductors and Cables
2. Section 260526: Grounding and Bonding for Electrical Systems
3. Section 260529: Hangers and Supports for Electrical Systems
4. Section 260533: Raceway and Boxes for Electrical Systems
5. Section 260553: Identification for Electrical Systems
6. Section 263353: Static Uninterruptible Power Supply

1.2 INCORPORATED DOCUMENTS

A. Requirements of the General Conditions, Supplementary Conditions, and Division 1 Sections apply to all work in this Section, unless modified herein.

B. Provide equipment and materials which conform to, and perform the installation thereof in accordance with the following codes and industry standards. The applicable version of each shall be that in effect as of the date of the Contract:

1. National Electrical Code, latest edition (NEC).
2. Uniform Building Code, latest edition (UBC)
3. Underwriters' Laboratories, Inc. (UL).
4. NFPA 101, Life Safety Code.
5. Titles 8, 19 and 24 of the California Code of Regulations (CCR).
6. American National Standards Institute (ANSI).
7. California State Fire Marshal (CSFM).
8. National Electrical Manufacturers' Association (NEMA).
9. Institute of Electrical and Electronics Engineers (IEEE).
    a. National Electrical Safety Code (NESC).
        i. Electrical Safety Orders.
        ii. Other applicable local codes and ordinances.

10. All local, State and Municipal Codes and Ordinances.

C. Where the authority-having-jurisdiction makes an interpretation or decision, as is their prerogative in accordance with the Code, such direction shall be considered a part of these Contract Documents as if contained herein. With respect to completing the intent of the Contract Documents, comply with any and all requirements of the authority-having-jurisdiction and utility company field inspectors, at no additional cost.

D. The above referenced codes and standards are considered to be absolute minimum requirements. The Drawings and Specifications shall take precedence over the above referenced codes and standards where materials or workmanship of higher quality or larger size is indicated. Nothing in these Drawings or Specifications shall be construed to allow work not conforming to the applicable codes and standards

1.3 CONDITIONS AT SITE

A. All bidders shall visit the project site and become familiar with the existing conditions prior to submission of bid. The act of submitting a bid shall indicate the Contractor to have familiarized themselves with all discernible conditions and has no exceptions to the existing conditions. There shall be no extra payment approved for work required due to existing conditions, whether specifically mentioned or not.

B. Lines of other services that are damaged as a result of this work shall promptly be repaired complete to the satisfaction of the Owner at no additional expense to the contract.

1.4 REVIEW OF CONTRACT DOCUMENTS

A. Examine all relevant Contract Documents including Drawings, Specifications, and Shop Drawings in order to become acquainted with the Work of other installers whose activities will adjoin or be affected by the Electrical Work.

1.5 PERMITS, LICENSES, AND FEES

A. Procure and pay licenses and fees that are required to carry out and complete the Electrical Work.

B. Pay utility company charges for normal or after hours shutdowns, service calls, repairs, and cable locating that are directly related to the installation of the Electrical Work.

1.6 SITE VERIFICATION OF INFORMATION

A. Visit the project site prior to submitting a bid and verify the condition, location and dimensions of buildings, equipment, and facilities. The act of submitting a bid shall indicate the Contractor to have familiarized themselves with all discernible conditions and has no exceptions to the

existing conditions. There shall be no extra payment approved for work required due to existing conditions, whether specifically mentioned or not.

B. Verify at the project site, the accuracy of information shown on the Drawings regarding existing equipment, materials, and facilities. This includes but is not limited to: size, type, rating, quality, age, and serviceability. No allowance will be made on behalf of the Contractor for extra expenses resulting from the failure to discover conditions affecting the Work.

C. Lines of other services that are damaged as a result of this work shall promptly be repaired complete to the satisfaction of the Owner at no additional expense to the contract.

1.7 WORKING SPACE

A. Maintain adequate work space around, and access to, electrical and mechanical equipment in strict accordance with the applicable Codes. Verify during the course of construction that sufficient space will be available for the installation equipment, fixtures, etc.

1.8 QUALITY ASSURANCE

A. Conformance:

1. The Contractor shall notify the Owner's Representative, prior to submission of bid, about any part of the design which fails to comply with abovementioned requirements.
2. If after contract is awarded, minor changes and additions are required by aforementioned authorities, even though such work is not shown on drawings or covered in the specifications, they shall be included at Contractor's expense.

B. Coordination:

1. The Contractor shall become familiar with the conditions at the job site, contract drawings and specifications and plan the installation of the electrical work to conform with the existing conditions and that shown and specified so as to provide the best possible assembly of the combined work of all trades.
2. The Contractor shall work out in advance all "tight" conditions, involving all trades and if found necessary, supplementary drawings shall be prepared by this Contractor, for the Owner's Representative approval before work proceeds in these areas. No additional costs will be considered for work which must be relocated due to conflicts with the work of other trades.

1.9 MATERIALS AND SUBSTITUTIONS

A. Materials shall be new, high quality, free from defects, of standard make, and of the brand or grade as shown on the Drawings or specified herein. Specific trade names are used in the Drawings and Specifications in order to establish the standard grade and characteristics of said items. This does not imply the right upon the part of the Contractor to use other materials or methods without the approval of the Architect.

B. Electrical materials and equipment shall bear the label of, or be listed by, the Underwriters' Laboratories (UL) wherever standards have been established and label service is regularly

furnished by that agency. Comply with the installation and application requirements of UL as documented in their published directories.

C. Unless specifically noted, equipment and systems shall be the product of a manufacturer who has been in the manufacture of, and has nationally distributed catalogs covering the ratings and specifications of, said equipment or systems, for a period of not less than five (5) years.

D. Maintain uniformity throughout the Project by making use of only one make or brand of material for each material used.

E. Substitutions of materials or methods will only be allowed if such items are approved in writing by the Architect as equal in quality and utility to the specified items. Submit a list of proposed substitutions within thirty (30) days of the award of the Contract. Include on the list the original manufacturer's name and model number, the proposed manufacturer's name and model number, catalog cut sheets, ratings, sizes, performance curves, shop drawings, and other data as may be required to demonstrate equality to the specified item.

F. The approval of a substitution does not authorize any deviation from the utility, size, function, or durability of the specified item unless specifically pointed out and requested in the proposed substitution list, and said deviation is approved in writing by the Architect. Responsibility of the Contractor for dimensional considerations or space conflicts is not relieved by the approval of a substitution.

G. If requested by the Architect, submit samples of materials and equipment for approval prior to installation.

H. Any and all additional costs incurred by the substitution of electrical material or equipment, or installation thereof, whether Owner's Representative, structural, plumbing, mechanical or electrical, shall be borne by the Contractor under this Section.

I. Burden of proof of equality of any substitution for a specified product is the responsibility of this Contractor.

J. Where required by Owner's Representative to ascertain equality of substitute product, Contractor may be requested to provide the specified item and the submitted substitution for comparison, at no additional cost to the Owner.

1.10 ELECTRICAL SUBMITTALS

A. See the General Conditions for conditions of submittal approval and general requirements for submission of shop drawings.

B. Submit electrical shop drawings and manufacturer's cut sheets for equipment and materials as noted in each Division 26 specification section. Bind the submittals as complete volumes according to classification of equipment such as power, lighting, fire alarm, etc. When possible, make all electrical submittals at the same time.

C. Submit shop drawings and supporting data as instruments of the Contractor. Stamp each item in the submittal documents with the Contractor's stamp, thereby stating that the equipment meets all requirements and conditions of the Drawings and Specifications. In particular, certify that the items shown on the shop drawings conform to the dimensional, environmental, and

space restrictions as pertains to all work under this Contract and the work of other parties in conjunction with this Project.

D. Provide a blank space on the title page of each submittal classification for the Architect's or Engineers approval stamp and comment field. The minimum size of such space shall be eight inches wide by five inches high.

E. Arrange panelboard submittals to show bussing, circuit numbering, and branch circuit protective devices similar the schedules on the Drawings. Show elevations of switchboards, motor control centers, and distribution centers indicating the layout of devices, meters, handles, etc. Provide device ratings, circuit numbers, and nameplate descriptions in table form. Include terminal strip mounting arrangements on elevations for terminal cabinets.

1.11 DRAWINGS AND SPECIFICATIONS

A. The data and information contained on the Drawings is as accurate as was reasonably possible at the time they were produced, but absolute accuracy is not guaranteed. Exact locations, distances, elevations, etc., will be dictated by the actual building and the conditions at the site.

B. The layout of electrical equipment, wiring, and accessories is shown in a diagrammatic fashion (not pictorially) in order to achieve clarity and legibility. Although the size and location of electrical equipment is drawn to scale wherever possible, refer to all data in the Contract Documents and field verify this information as the project progresses. Examine architectural, structural, mechanical, and other drawings to determine the exact location of conduits, outlets, fixtures, and equipment and to note any conditions which may affect the electrical work.

C. The Drawings and Specifications may be superseded by later detail drawings and specifications prepared by the Architect. Conform to such detail drawings, specifications, addenda, change orders, other reasonable changes as if they are contained herein. See the General Conditions for change order cost considerations.

D. Because the Electrical Drawings may be distorted for clarity of representation, it may be necessary to field verify the exact location of electrical outlets, lights, switches, etc. in order to conform to the architectural elements. The Architect reserves the right to make minor changes to the locations of equipment, devices, and wiring shown on the Drawings, at no additional cost, providing the changes are ordered before the rough-in of conduit, boxes, or related items is completed, and no extra material are required.

E. For dimensional and locational purposes, the Architectural Drawings take precedence over the Electrical Drawings. Determine the appropriate location of lighting fixtures, outlets, wall-mounted devices, etc. by studying the reflected ceiling plans, building sections, and interior elevations. Report conflicting conditions to the Architect before rough-in for adjustments to the locations.

F. Conduit quantities, sizes, termination points, and wiring are depicted on the Electrical Drawings. However, not all conduit bends or routing details are necessarily shown. Route conduit so as to conform to the structural conditions, avoid obstructing other trades, maintain space restrictions and keep circulation areas and access openings clear.

G. Thoroughly examine the Contract Documents prior to submitting a bid in order to determine electrical requirements which are not necessarily indicated on the Electrical Drawings. Include sufficient allowance in the bid sum to cover the costs of these other requirements.

H. Should the Contractor perceive that the Drawings and Specifications do not sufficiently define the intent of electrical work, contact the Architect for clarification or additional information. The absence of such contact will be considered as evidence of understanding, on the part of the Contractor, of the intended Electrical Work and the required installation thereof.

1.12 WORKMANSHIP

A. Constantly supervise the work personally or through an authorized and competent representative. Keep the same foreman or supervisor on the project from commencement through completion.

B. Perform the Electrical work using the highest caliber craftsman available. Workmanship shall be first class and of the best quality available to insure a long and trouble free service life. Allow only experienced and competent workmen on the job.

1.13 COOPERATION AND COORDINATION

A. Consult with the other installers and trades in coordinating the Work so as to avoid conflicts, omissions and delays. Cooperate with other contractors, third parties, and the Owner in order to expedite the project and provide for the proper execution of the building as a whole. Work performed without regard to other trades or the overall project scheme, may necessarily be required to be moved at the Contractor's expense.

1.14 MANUFACTURER'S DIRECTIONS

A. Adhere to the manufacturer's directions regarding the proper installation and configuration of electrical equipment where those directions cover points not included in these Drawings and Specifications.

1.15 PROTECTION AND STORAGE

A. Use all means necessary to protect the materials of this Division before, during, and after installation and to protect the work and materials of all trades.

B. Deliver electrical materials to the site new, and in unbroken packages. Provide for the temporary storage of such materials, equipment, and construction tools in accordance with the General Conditions and in strict accordance with approved manufacturers' recommendations. Protect electrical equipment and materials during transit, storage and handling to prevent damage, soiling and deterioration.

C. During shipping storage and handling protect electrical materials from damage of any type including dust, water, over-spray, and temperature.

D. Avoid damage during construction to the work and materials of other trades as well as the electrical work and material. Repair or replace, at the Contractor's expense, defective or damaged items such that the entire Work is completed in a condition satisfactory to the Architect.

E. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner's Representative and at no additional cost to the Owner.

F. This Contractor shall personally, or through an authorized representative, check all materials upon receipt at jobsite for conformance with approved shop drawings and/or plans and specifications.

1.16 EXCAVATION, CUTTING, PATCHING, AND REPAIR

A. Perform excavation and backfill required for the installation of electrical sub-structures. Restore grounds, walkways, roadways, curbs, walls, and other existing underground facilities to their original condition.

B. Conform to the applicable requirements of Division 2, Earthwork for Utilities, in the selection, placement, and compaction of backfill material and finished surfaces.

C. Cut, core-drill, and demolish existing walls, floors, ceilings and other building surfaces as required for the installation of Electrical Work. Obtain the approval of the Architect prior to performing any operation which may affect any structural elements of the building.

D. Patch and repair wood, plaster, tile, or concrete surfaces which have been damaged by the installation of the Electrical Work so that the finished surface matches the surrounding conditions.

1.17 FLASHING, WATERPROOFING AND SEALING

A. In general, install in an approved watertight manner, Electrical Work which pierces exterior walls or waterproofing membranes. Flash and counter-flash roof and wall penetrations in a manner described in other applicable sections of this Specification and as approved by the Architect.

B. Fit conduits passing through finished walls with steel escutcheon plates of brass, chrome, or painted finish as directed by the Architect. Grout penetrations of floor slabs, concrete or masonry walls with an approved grout or silicone elastomeric caulk.

1.18 EARTHQUAKE RESISTANT INSTALLATION/FASTENING:

A. All electrical equipment and raceways shall be anchored to withstand forces generated by earthquake motions. As a minimum, equipment and equipment frames shall be designed to withstand a force of 25% of the weight of the equipment and frame acting at its center of gravity. Anchorage of the equipment and/or frame to the structure shall be for a force of 50% gravity also acting at the center of gravity.

B. For Main Switchboard and Automatic Transfer Switch, Generator, UPS, Battery Racks, PDU's, and Cable Tray, the above values shall be doubled. Design stresses in either case may be increased 1/3 over normal allowable stresses but never beyond yield.

1.19 CLEANING, ADJUSTING, AND TOUCH-UP

A. Remove on a daily basis electrical debris, scraps, packaging material and other rubbish. Dispose of such items off-site in an approved manner and debris. Maintain the site free from physical hazards at all times. See the General Conditions for additional requirements.

B. After installation, completely clean electrical equipment, fixtures, and materials of excess paint, over-spray, plaster, cement, insulating products, and other foreign matter. Leave the Electrical Work in a clean, finished, dry, level, like new condition.

C. Touch-up paint scratches and scuffs on electrical equipment and lighting fixtures with paint recommended by the manufacturer and matching the original item finish.

D. Make setting, adjustments, and programming in accordance with the manufactures' operating and installation instructions. Settings and program variables will be issued by the Architect prior to commissioning of the electrical system.

1.20 AS-BUILT DRAWINGS

A. Throughout the project, maintain accurate and current record documents. Show on the record drawings deviations from the Electrical Drawings, locations of underground conduits and pull-boxes, and concealed equipment which is not readily apparent. Dimension the record drawings using permanent, readily identified benchmarks such as column or wall lines.

B. At the completion of the project, present one clearly legible set of the record drawings to the Architect.

1.21 SCHEDULING/SEQUENCING

A. Place orders for all equipment in time to prevent any delay in construction schedule or completion of project. If any materials or equipment are not ordered in time, additional charges made by equipment manufacturers to complete their equipment in time to meet the construction schedule, together with any special handling charges, shall be borne by this Contractor.

B. The Contractor shall coordinate production and delivery schedule for all Owner-supplied equipment with the equipment suppliers to ensure that all Owner-supplied equipment is delivered to site in coordination with the construction schedule and in such a manner as to cause no delays in completion of the Contract as scheduled.

1.22 INSPECTIONS AND TESTING

A. Arrange for the inspection of the Work at various stages of completion by the Authority Having Jurisdiction, utility company representatives, and the Architect. Comply with all directions and

remedial measures issued thereby. Any objections to these orders on the part of the Contractor must be presented to the Architect in writing within forty eight (48) hours of the inspection report.

B. Coordinate the installation of the Work so that observation of all rough-in, concealed, or underground Work can take place by the Architect. Provide a minimum of seventy two (72) hours notice to the Architect prior to covering up the work. Uncover Work that has not been properly observed and make repairs to restore the Work and adjoining surfaces to their proper condition at no additional cost.

C. Perform tests of the electrical system during the course of the project and at project completion to ensure safe and proper function in accordance with the Contract Documents, manufacturers' recommendations, and applicable codes. Provide complete documentation of all test results to the Architect prior to project completion. Testing shall include, but not necessarily be limited to, the following:

1. Test for short circuits, open circuits, neutral leakage, and improper grounds on feeders and branch circuits. Perform this test with mains in disconnect from feeders, branch circuits closed, fixtures and devices permanently connected, lamps removed from sockets and wall switches closed.
2. Provide insulation resistance tests of all phase and neutral circuit conductors using a 500 Volt Megger for circuits of 240 Volt rating and below, and a 1000 Volt Megger for circuits of 277 volts and above. Minimum acceptable insulation resistance is one (1) megohm.
3. Perform a ground resistance test of each main grounding electrode system, ground rod, and supplemental grounding electrode. Utilize a calibrated, direct reading, earth ground test set and make the tests using the "Three-terminal, Fall-of-Potential" method. The maximum allowable earth ground resistance is 25 ohms.
4. Test for proper phase-to-phase and phase-to-neutral operating voltage on the main service and on each separately derived system. Perform this test at full load and at no load. With all circuits at full operating conditions, test the phase and neutral load currents using a clamp-on ammeter.
5. When series rated circuit breakers are used, provide a letter from the manufacturer of the equipment confirming that U.L. series rating exists for all protective devices. State the available fault current from the Utility Company and indicate that the overcurrent devices exceed the available fault current at the respective point of protection.
6. Seismic restraint calculations for equipment, by a Registered Structural Owner's Representative, per Paragraph 3.5 of this Section.
7. Tests as required by other sections of these Specifications.
8. Tests as prescribed by individual equipment manufacturers whether or not described in these Specifications.

D. At project completion, demonstrate to the Architect that the entire installation is complete, in proper operation condition and that the Contract has been properly and fully executed. Activate all circuits, lights, devices, and controls under full load and normal operating conditions. Identify faulty items and immediately replace or repair defective equipment, workmanship, and materials to like new condition and retest in the presence of the Architect.

E. At the completion of the Project, demonstrate to the Architect that the entire electrical system is free from short circuits and improper grounds, or upon request of the Architect anytime, make necessary tests under the observation of the Architect which will ensure that electrical equipment, materials and installation methods are as specified.

1.23 IDENTIFICATION

A. Each branch circuit of panelboards to have a permanently fixed number with one word directory, mounted under celluloid on inside of cabinet door, showing circuit numbers and typewritten description of equipment supplied by breakers, including location.

1. All existing panelboards touched shall be updated with new panel schedules.
2. All existing equipment on existing panel schedules shall be transferred to new panel schedules.

B. Provide label on all motors: "*Caution. Automatic equipment .May start at any time*."

C. Provide identification of all pull boxes, junction boxes, and conduit stub-ups on the project as outlined below:

1. For Power Feeders:
   a. Stencil cover with identifying circuit number.
   b. Lettering 1" high.
   c. Color of lettering black.
   d. Place lettering on cover in neat manner; run parallel to long sides of box.

2. For branch circuits, grounding, communication, signal, and control systems boxes and blank conduit stub-outs. Paint inside back of each j-box, front of each cover, and ends of each blank conduit stub-out with identifying system color as listed below:

System	Color
120/208 volt	Blue
Telephone/Data	Grey
Ground system	Green
Fire Alarm	Red

1.24 GUARANTEE

A. In accordance with Division 1 requirements.

1.25 PERMITS AND INSPECTIONS

A. This Contractor shall obtain and pay for all required permits and arrange for all inspections required.

B. Do not allow or cause any of the work to be covered or enclosed until it has been tested and/or inspected.

1.26 WARRANTIES, CERTIFICATES, AND OPERATING MANUALS

A. Properly fill out and deliver to the Owner, all warranties, guarantees, certificates, etc. for equipment and materials that are furnished and installed under this Section of the Work. The effective date on each item shall be the date of acceptance of the work by the Owner.

B. Deliver to the Owner, a minimum of two (2) copies of the manufacturers' operating and maintenance manuals for major items of equipment.

END OF SECTION

SECTION 260519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

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

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

1.4 QUALITY ASSURANCE

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

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Wire and Cable (600V)

a. American Wire Company
b. Belden
c. General Wire and Cable Corporation
d. Okonite Company
e. Rome Cable Corporation
f. Cerrowire
g. American Insulated Wire

h. AFC Cable Systems
i. Essex
j. Simplex Wire and Cable Company

2. Solderless Lugs and Grounding Connections

a. Burndy Engineering Company, Inc.
b. O.Z. Gedney Company, Inc.
c. Penn Union Electric Corporation
d. Thomas and Betts Company, Inc.

2.2 CONDUCTORS AND CABLES

A. Copper Conductors: Comply with NEMA WC 70.

B. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN and XHHW.

2.3 CONNECTORS AND SPLICES

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

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.

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

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

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

C. 600-volt class, insulation color coded, minimum No. 12 AWG for branch circuits, No. 14 AWG for control circuits.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

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

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

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

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

E. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

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

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

H. Insulation type:

1. Standard locations: #12 to #1 AWG: THWN for wet locations and THHN for dry locations. #1/0 through #4/0 AWG: XHHW (55 Mils). 250MCM and larger: XHHW (65 Mils). All wire sizes used shall be based on a 75 degree insulation rating, unless specifically used with 90 degree rated breakers and devices.
2. High temperature and non-standard locations: Provide wire type and insulation category suitable for area of use as defined in NEC table 310-13.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

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

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

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

D. Support cables according to Division 26 Sections "Hangers and Supports for Electrical Systems."

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

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

G. Install all wiring (low voltage and line voltage) in conduit unless noted otherwise in the drawings, but do not pull into conduit until plastering and taping have been completed and conduits and outlets have been thoroughly cleaned and swabbed as necessary to remove water and debris.

H. Approximately balance branch circuits about the neutral conductors in panels.

I. Connections to devices from "thru-feed" branch circuit conductors to be made with pigtails, with no interruption of the branch circuit conductors.

J. Neutral conductor identified by white outer braid, with different tracers of "EZ" numbering tags used where more than one neutral conductor is contained in a single raceway.

K. Neatly arrange and "marlin" wires in panels and distribution panelboards with "T and B Ty-rap" or approved equal plastic type strapping.

L. All wire and cable shall bear the Underwriters' Label, brought to the job in unbroken packages; wire color-coded as follows:

Voltage	Phasing	A	B	C	N
120/208	3PH-4W	Black	Red	Blue	White
208	3PH-3W	Black	Red	Blue	--

M. The equipment grounding conductor shall be insulated copper; where it is insulated, the insulation shall be colored green.

N. Label each wire of each electrical system in each pull box, junction box, outlet box, terminal cabinet, and panelboard in which it appears with "EZ" numbering tags indicating the connected circuit numbers.

3.4 INSTALLATION OF DICONNECTS, CONNECTORS, AND LUGS

A. Equipment Disconnects: All disconnects shall be located to allow proper code required clearance in each area. Locations shown on drawings are diagrammatic only. The contractor shall coordinate exact locations in the field (with other trades) prior to rough-in to insure proper clearances.

1. Motor Disconnect Switches and Safety Switches: General Electric Company Heavy Duty Type "THD", cover interlocked with operating handle so that cover cannot be opened with switch in closed position and switch cannot be closed with cover in open position. 240V or 480V rating, single or multi-pole as required or as noted on drawings, in Nema 1 enclosure indoors or Nema 3R enclosure outdoors unless otherwise noted. Provide dual element motor circuit fuses sized as recommended by equipment manufacturer (for final equipment actually installed).

2. Code required disconnects: Provide a local disconnect in addition to the branch circuit protection device for all equipment as required by code (whether shown or not). Disconnects shall consist of a motor rated switch (or disconnect) for all motor loads less than 3/4HP or other suitable disconnect sized to match branch circuit conductors and load current of equipment, with number of poles as required.

B. Lugs and Connectors: Thomas and Betts "lock-tite", for No. 4 and larger wire; "Scotchlock" fixed spring type with insulator for No. 6 and smaller wire.

1. All splices made up with wire nut connectors shall be solidly twisted together with electricians pliers before connector is installed to ensure a proper connection in the event of wire nut failure. No exceptions.
2. Connectors listed or labeled for "no wire twisting required" are not an acceptable substitute for actual wire twisting.
3. Utilize porcelain type connectors in all high temperature environments (above 105 degrees Celsius).

C. Splice Insulation: "Scotch" electrical tape with vinyl plastic backing or rubber tape with protective friction tape for interior work.

1. Provide watertight cast splices for all conductors in site pull boxes or wet locations.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Division 26 Section "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Section "Penetration Firestopping."

B. Fire stopping: 3M Fire Protection Products or equal.

1. Fire-rated and smoke barrier construction: Maintain barrier and structural floor fire and smoke resistance ratings including resistance to cold smoke at all penetrations, connections with other surfaces or types of construction, at separations required to permit building movement and sound vibration absorption, an at other construction gaps.
2. Systems or devices listed in the UL Fire Resistance Directory under categories XHCR and XHEZ may be used, providing that it conforms to the construction type, penetration type, annular space requirements and fire rating involved in each separate instance, and that the system be symmetrical for wall penetrations. Systems or devices must be asbestos free.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

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

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.

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

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

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

D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 260519

SECTION 260526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Grounding systems and equipment.

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 QUALITY ASSURANCE

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

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

PART 2 - PRODUCTS

2.1 CONDUCTORS

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

B. Bare Copper Conductors:

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

2.2 CONNECTORS

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

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

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

PART 3 - EXECUTION

3.1 APPLICATIONS

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

B. Underground Grounding Conductors: Install bare copper conductor, No. 4/0 AWG minimum. Bury at least 24 inches below grade.

C. Conductor Terminations and Connections:

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

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.
8. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.

B. Signal and Communication Equipment: In addition to grounding and bonding required by NFPA 70, provide a separate grounding system complying with requirements in TIA/ATIS J-STD-607-A.

1. For telephone, alarm, voice and data, and other communication equipment, 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.
2. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-4-by-12-inch grounding bus.
3. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.3 INSTALLATION

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

B. Install ground wires in rigid conduit.

C. All grounding electrode conductor connections "thermite" or "cad-weld" welded.

D. Use approved pressure type solderless connector or use fusion welding for all connections to and bonding of grounding electrode system. All connections shall be visible, readily accessible for testing purposes. Grounding electrode conductor between the grounding electrode and service equipment.

E. Terminate grounding conduits at equipment with ground bushing, with ground wire connected through bushing.

F. Other than for isolated ground receptacles, provide No. 12 stranded (green) THHN conductor from outlet box to ground screw of every receptacle.

G. Ground all isolated sections of metallic raceways.

H. Provide #12 minimum stranded (green) THHN conductor sized per NEC, or as noted, connected continuously throughout branch circuit for all circuits, bonded to panel ground bus, and to all electrical devices and equipment enclosures

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

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

3.4 LABELING

A. Comply with requirements in Division 26 Section "Requirements for Electrical Installations" The label or its text shall be green.

B. Install labels at the telecommunications bonding conductor and grounding equalizer and at the grounding electrode conductor where exposed.

1. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Make tests at ground rods before any conductors are connected.
4. Test system using the three-point fall of potential method only. Record results and submit to Architect for approval.

B. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
4. Power Distribution Units or Panelboards Serving Electronic Equipment: 3ohm(s).

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

END OF SECTION 260526

SECTION 260529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Hangers and supports for electrical equipment and systems.

1.2 PERFORMANCE REQUIREMENTS

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

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

1.3 ACTION SUBMITTALS

A. Product Data: For steel slotted support systems.

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

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

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.5 QUALITY ASSURANCE

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

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

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

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

a. Allied Tube & Conduit.
b. Cooper B-Line, Inc.; a division of Cooper Industries.
c. ERICO International Corporation.
d. GS Metals Corp.
e. Thomas & Betts Corporation.
f. Unistrut; Tyco International, Ltd.
g. Wesanco, Inc.
h. General Electric Company
i. Republic Steel Corporation

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

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

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

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

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

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

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

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

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

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

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

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

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

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

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

B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

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

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

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

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

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

3.2 SUPPORT INSTALLATION

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

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

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

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

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

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.

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

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

3.4 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touchup: Comply with requirements in Division 09 Section "Exterior Paints" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

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

END OF SECTION 260529

SECTION 260533

RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes conduit and tubing, surface and buried raceways, wireways, outlet boxes, pull boxes, junction boxes, hand holes and concrete manholes.

1.2 RELATED SECTIONS

A. Section 260500:Common Work Results for Electrical

B. Section 260519: 600-Volt Power Conductors and Cables

C. Section 260526: Grounding and Bonding for Electrical Systems

D. Section 260553: Identification for Electrical Systems

1.3 REFERENCES - CODES AND STANDARDS

A. ANSI C80.1 Rigid Steel Conduit, Zinc Coated.

B. ANSI C80.3 Electrical Metallic Tubing, Zinc Coated.

C. ANSI C80.6 American National Standard for Electrical Intermediate Metal Conduit.

D. ASTM A 48 Standard Specification for Grey Iron Castings.

E. NECA (National Electrical Contractor's Association) – "Standard of Installation."

F. NEMA FB 1 (National Electrical Manufacturers Association) – Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

G. NEMA OS 1 (National Electrical Manufacturers Association) – Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

H. NEMA OS 2 (National Electrical Manufacturers Association) – Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports.

I. NEMA RN 1 (National Electrical Manufacturers Association) – Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.

J. NEMA TC 2 – Electrical Polyvinyl Chloride (PVC) Conduit.

K. NEMA TC 3 (National Electrical Manufacturers Association) – PVC Fittings for Use with Rigid PVC Conduit and Tubing.

L. NEMA TC 6 - Non-Metallic Conduit.

M. NEMA 250 (National Electrical Manufacturers Association) – Enclosures for Electrical Equipment (1,000 Volts Maximum).

N. NFPA 70 National Electrical Code (NEC). Latest approved edition

O. UL 1 Flexible Metal Conduit

P. UL 6 Rigid Metal Conduit

Q. UL 514B Conduit, Tubing and Cable Fittings.

R. UL 651 Rigid Non-Metallic Conduit

S. UL 797 Electrical Metallic Tubing

T. UL 1242 Intermediate Metal Conduit

1.4 SYSTEM DESCRIPTION

A. Raceway, boxes and manholes located as indicated on drawings and at other locations required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Raceway, boxes and manholes are shown in approximate locations unless dimensioned. Provide raceway to complete wiring system.

B. Underground more than 5 feet (1,500 mm) outside foundation wall: Provide Schedule 40 non-metallic conduit.

C. Underground within 5 feet from foundation wall: Provide rigid steel or Schedule 40 non-metallic conduit.

D. In or Under Slab on Grade: Provide Schedule 40 non-metallic conduit encased in concrete. Provide Galvanized with tape wrap rigid steel factory bends greater than 22.5 degrees and for stub-ups through concrete slabs.

E. Outdoor Locations, Above Grade: Provide rigid steel conduit. Provide cast metal outlet, pull, and junction boxes.

F. In Slab above Grade: Provide galvanized rigid steel conduit. Provide cast or concrete-tight sheet metal boxes.

G. Exposed Dry Locations: Provide galvanized rigid steel conduit. Provide cast boxes.

H. Concealed Dry Locations: Provide electrical metallic tubing for sizes less than 2-inches. Provide galvanized rigid steel or intermediate steel conduit in sizes 2-inches or larger. Provide cast or sheet metal boxes.

I. Locations subject to Corrosive Atmosphere: Provide PVC coated, galvanized rigid steel or intermediate steel conduit. Provide PVC coated cast or sheet metal boxes.

J. Hazardous Locations (Per NEC Article 500): Galvanized rigid steel conduit. Cast iron boxes with threaded hubs for conduit entry. Conduit seals.

1.5 DESIGN REQUIREMENTS

A. Minimum Raceway Size: 3/4 inch (19 mm) unless otherwise specified.

1.6 SUBMITTALS

A. Manufacturer's Installation Instructions: Submit application conditions and limitations of use stipulated by product testing agency having jurisdiction. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

B. Submit detailed conduit routing plan, for review and approval, prior to installation as follows:

1. Exposed and/or concealed in building walls for conduits larger than 2-inch outside diameter.
2. All underground conduits (3/4-inch and larger) in duct bank; concealed in floor slabs, equipment pads and concrete slabs.

C. Product Data: Submit for the following:

1. Rigid Steel Conduit.
2. PVC Coated galvanized rigid steel conduit.
3. Intermediate steel conduit.
4. Electrical Metallic Tubing (EMT).
5. Flexible metal conduit.
6. Liquid tight flexible metal conduit.
7. Nonmetallic conduit.
8. Raceway fittings.
9. Conduit bodies.
10. Surface raceway.
11. Pull boxes, junction boxes and manholes.

D. Manufacturer's Installation Instructions:

1. Submit application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.
2. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.7 CLOSEOUT SUBMITTALS

A. Project Record Documents:

1. Record actual routing of conduits. Provide record (as-built) drawings marked in red to show actual routing of the underground raceway and cable when different from the original contract drawings. Prepare on new, clean set of contract drawings.
2. Record actual locations and mounting heights of outlet, pull boxes, junction boxes and manholes.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

B. Protect PVC and PVC-coated metallic conduit from sunlight.

PART 2 - PRODUCTS

2.1 CONDUIT

A. Galvanized Rigid Steel Conduit (GRSC or RGS), couplings and elbows shall be hot-dip galvanized, rigid mild steel in accordance with ANSI C80.1 and UL 6. The conduit interior and exterior surfaces shall have a continuous zinc coating with a transparent overcoat of enamel, lacquer, or zinc chromate. Conduit shall be formed with continuous welded seams with a uniform wall thickness, in minimum 10-foot lengths, with threaded ends.

B. Intermediate Metal Conduit (IMC). Raceway shall be hot-dipped galvanized mild steel in accordance with ANSI C80.6 and UL 1242 and shall bear the UL label. Conduit shall have same characteristics of rigid steel except for thinner wall.

C. Polyvinyl Chloride (PVC) coated galvanized rigid steel conduit and intermediate metal conduit shall be in accordance with NEMA RN 1. Coating shall be applied under controlled factory conditions. Prior to coating, conduit shall meet requirements of ANSI C80.1 and UL 6 or ANSI C80.6 and UL 1242 as appropriate. PVC coated conduits shall have ultra-violet (UV) inhibitor in the coating material.

D. Electrical Metallic Tubing (EMT). Electrical metallic tubing, including elbows and bends, shall be zinc coated, mild steel in accordance with the requirements of ANSI C80.3 and UL 797. The interior and exterior surfaces of the tubing shall have a continuous zinc coating. Conduit shall be formed with a continuous welded seam, with a uniform wall thickness, in minimum 10-foot lengths.

E. Flexible Metal Conduit shall be galvanized steel meeting the requirements of UL 1. Flexible aluminum conduit is not permitted.

F. Liquid-Tight Flexible Metal Conduit shall be plastic-jacketed, galvanized steel, "Sealtite" Type EF for general service areas or Type HC for high-temperature when used under raised floor or in air plenums. Conduit shall be UL listed.

G. Non-Metallic Conduit shall be as follows:

1. Schedule 40: Conduit shall be 90 degree Celsius, polyvinyl chloride in conformance with NEMA TC-2 and UL 651 requirements.
2. Spacers used in duct bank installations shall be high impact plastic, interlocking bases, and intermediate type spacers. Place spacers between 6 and 10 feet apart.

H. Rigid aluminum conduits and flexible aluminum or non-metallic conduits are not permitted on this project.

2.2 RACEWAY FITTINGS

A. Couplings and Thread Protectors. Each length of threaded conduit shall be provided complete from the manufacturer with a coupling on one end and a thread protector on the other. The thread protector shall have sufficient mechanical strength to protect the threads during normal handling and storage.

B. Metal Conduit Fittings shall conform to the requirements of UL 514B where this standard applies. Galvanized steel fittings shall be used with steel conduit. Threaded fittings shall engage a minimum of five threads made up wrench-tight and be compatible with conduit. EMT fittings shall be compression type, UL approved for rain tight applications and setscrew type with insulated throat for indoor applications.

C. Liquid-Tight Flexible Conduit Fittings shall be galvanized steel, T&B 53XX series insulated throat, and shall bear the UL label. Die-cast malleable fittings are not acceptable.

D. Liquid-Tight Flexible Metal Conduit Fittings shall be galvanized steel similar to T&B "Tite-Bite".

E. Non-Metallic Conduit Fittings shall be of same material and strength characteristics as the conduit and shall be solvent welded as recommended by manufacturer. End bells shall be plastic, high impact, tapered to fit. Where conduit transition from non-metallic to metallic is required, provide non-metallic female "terminal" adapter. Non-metallic "male" adapters are not acceptable.

F. Special Fittings. Conduit sealing, explosion proof, dust proof, and other types of special fittings shall be provided as required and shall be consistent with the area and equipment with which they are associated. Fittings installed outdoors or in damp locations shall be sealed and gasketed. Outdoor fittings shall be of heavy cast construction. Hazardous area fittings and conduit sealing shall conform to NEC requirements for the area classification.

G. Bushings shall be provided for the termination of all conduits not terminated in hubs, couplings or insulated throat connectors. Grounding type insulated bushings with insulating inserts in metal housings shall be provided for conduit 1-1/4 inches and larger. Standard bushings shall be galvanized steel or malleable iron in all sizes.

H. Locknuts. One interior and one exterior locknut shall be provided for all conduit terminations not provided with threaded hubs and couplings. Locknuts shall be designed to securely bond with the conduit to the box when tightened. Locknuts shall be so constructed that they will not be loosened by vibration.

I. Unions. Watertight conduit unions shall be Appleton or Crouse-Hinds Type UNF or UNY, or approved equal.

J. Raintight Conduit terminating hubs, where indicated on the drawings or required by these specifications, shall be Meyer's rigid conduit hubs, or approved equal.

2.3 CONDUIT BODIES

A. Aluminum conduit bodies shall be die-cast copper-free aluminum alloy A360. Aluminum conduit bodies shall be finished with powder-coated paint. Cover shall be die-cast or stamped aluminum or steel.}

B. Malleable iron conduit bodies shall be cast malleable iron with tensile strength meeting ASTM A 48, Class 30A requirements. Malleable conduit bodies shall be finished with an epoxy powder coating. Cover shall be malleable iron with captive screws.

C. All conduit bodies' entrances shall be machined NPT threads with a smooth, rounded, internal conduit stop bushing.

D. All conduit bodies shall be equipped with a sealed and gasketed cover. Cover shall be secured using stainless steel machine screws.

2.4 CONDUIT SUPPORTS

A. Conduit supports shall be furnished and installed in accordance with other section of these specifications. Conduits shall be supported so that fittings are accessible. Support systems shall be limited to electrical conduits only.

B. Hanger rods shall be 3/8-inch diameter galvanized threaded steel rods, minimum. Conduit racks over 18-inch wide, over one level, or supporting 2-inch RSC or larger, shall be 1/2-inch diameter rod minimum.

C. Conduit Clamps. Conduits in single runs or groups of two shall be supported by steel clamps and clamp backs. They shall be galvanized malleable iron or approved equal cast ferrous metal for steel conduit or tubing.

D. Support Channels. Supports for banks of three of more conduits shall be constructed of formed steel support channels (Unistrut, Kindorf, Superstrut, B-Line or approved equal) with associated conduit or tubing clips. Support channels shall be steel, hot-dip galvanized after fabrication with galvanized steel clips for steel conduit or tubing.

E. Wall Penetrations. All conduits, raceways, cables and sleeve penetrations through fire rated and hazardous location walls, shafts, floor, ceilings, etc., shall be sealed with a UL-approved fire stopping system, in accordance with specification Section 16060 – Basic Electrical Materials and Methods.

2.5 OUTLET BOXES AND SWITCH BOXES

A. Manufacturers: Firms regularly engaged in the manufacturing of electrical raceways of the types and capacities required, whose products have been in satisfactory use in similar service for not less than 3 years.

B. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, galvanized flat rolled sheet steel outlet wiring boxes of types, shapes and sizes, including box depths, to suit each respective location and installation; construct with stamped knockouts in back and sides, and with threaded screw holes with corrosion-resistant screws for securing box covers and wiring devices.

C. Outlet boxes used in wet outdoor locations, surface mounted shall be cast metal (FS or FD type) with mounting lugs and gasketed covers.

D. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported, per NEC requirements.

E. Outlet Box Accessories: Provide outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used and meeting requirements of individual wiring situations.

2.6 PULL BOXES, JUNCTION BOXES, HANDHOLES AND MANHOLES

A. Sheet Metal Boxes shall be NEMA OS 1, NEMA rating as indicated on drawings. Minimum 16 gauge galvanized steel construction with stainless steel hinged cover and neoprene gasket. Cover shall be secured to the body with a continuous, full length, piano type hinge and stainless steel pin on one side and captive screw on the other side. Door shall be equipped with padlock hasp with sealing hole provisions.

1. Provide #10-32 tapped hole provisions for optional ground lug kit.
2. Provide 0.375-16 collar studs for mounting optional panel.
3. Provide external mounting feet for secure wall mounting.
4. Finish: Wash and phosphate undercoat with ANSI 61 gray polyester power finish.

B. Surface-Mounted Cast Metal Box: NEMA 250, NEMA Type 3R or 4 as indicated, flat-flanged, surface- mounted junction box:

1. Material: Cast Iron.
2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

C. Concrete pull boxes, vaults and hand holes for power, lighting, controls and telecommunications shall be pre-cast concrete boxes, sized as indicated on the drawing or per NEC requirements. Pull boxes shall be equipped with a concrete cover for non traffic rated locations OR cast-in frame, galvanized steel, adjustable, high impact traffic cover (H-20 load rated), sump, lifting lugs, and conduit knock-outs. Knockout location and sizes shall be coordinated with the duct bank for each location. Cover shall be engraved with the words - – “POWER”, “LIGHTING”, “CONTROLS”, "COMM/DATA”, “TELEPHONE” or similar as applicable.

D. Concrete manholes and/or pull boxes for buried power (MH-P-xx) and control (MH-C-xx) conduits shall be either cast-in-place or pre-cast concrete vault.

1. Size, as indicated on the drawings or per NEC requirements.
2. Pull boxes, Vaults and Manholes shall be equipped with:

a. Galvanized steel covers for non-traffic rated locations and cast-in frame, galvanized steel, adjustable, high impact traffic cover (H-20 load rated) for traffic rated locations.
b. Sump, lifting lugs, conduit knock-outs, pick holes, bolt down holes in cover plate, and pull irons. Knockout location and sizes shall be coordinated with the duct bank for each location. HDG cable racks shall be provided as required to support the cables in the pull box. Cover shall be engraved with the words "POWER", "LIGHTING", or "CONTROLS" as applicable.

2.7 CLOSURE FOAM

A. All conduit, raceways, cables and sleeves penetrations through fire rated and hazardous location walls, shafts, floor, ceilings, etc., shall be sealed by closure foam as in Dow Corning #3-6548 silicone RTV, GE RTV 850 silicone foam, or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify outlet locations and routing and termination locations of raceway prior to rough in.

3.2 EXISTING WORK

A. Extend existing raceway and box installations using materials and methods compatible with existing electrical installations, or as specified.

B. Clean and repair existing raceway and boxes to remain or to be reinstalled.

3.3 INSTALLATION OF RACEWAYS

A. Routing

1. Install raceway and boxes in accordance with NECA "Standard of Installation."
2. Conduit routing shown on drawings is diagrammatic only. Contractor shall field route conduit and raceways between equipment and devices as required to obtain a complete wiring system.
3. Conduit shall not be exposed unless specifically mentioned on the drawings or accepted by the architect.
4. All exposed conduits shall be installed parallel or perpendicular to dominant surfaces with right-angle turns made of symmetrical bends or fittings.
5. Conduit shall not be installed on the outside face of exposed columns, but shall be routed on the web or on the inside of a flange of the column.
6. Except where prevented by the location of other work, a single conduit or a conduit group shall be centered on structural members.
7. Conduit shall be located at least 6 inches from hot water or steam pipes and from other hot surfaces

B. Moisture Pockets

1. Moisture pockets shall be eliminated from conduits. If water cannot drain to the natural opening in the conduit system, a hole shall be drilled in the bottom of a pull box or a "C-type" conduit fitting provided in the low point of the conduit run.

C. Couplings and Unions

1. Metal conduit shall be joined by threaded conduit couplings, with the conduit ends butted.
2. The use of running threads, Erickson type couplings, split couplings or similar unions are not permitted.

D. Conduit Bodies

1. Conduit bends shall meet the requirements of NEC, minimum bend radius of the cable installed or as indicated on the drawings, whichever is greater.
2. Conduits or tubing deformed or crushed in any way shall be removed from the job site.

E. Bends and Offsets

1. Changes in direction of conduits shall be made with fittings or bends.
2. Conduit bends shall meet the requirements of NEC, minimum bend radius of the cable installed or as indicated on the drawings, whichever is greater.
3. Bends shall be made using appropriate tools or mechanical equipment. The use of a pipe tee or vise for bending conduit or tubing will not be permitted.
4. For non-metallic conduit or plastic coated steel, approved factory bends and offsets shall be used.
5. Conduits or tubing deformed or crushed in any way shall be removed from the job site.
6. Install no more than the equivalent of three 90 degree bends between boxes or outlets

F. Cutting and Threading

1. The plane of all conduit ends shall be square with the centerline.
2. Where threads are required, they shall be cut and cleaned prior to conduit reaming.
3. The ends of all conduit and tubing shall be reamed to remove all rough edges and burrs.
4. Cutting oil shall be used in threading operations; the dies shall be kept sharp, and provisions shall be made for chip clearance.
5. Threads on conduits and fittings shall be lubricated with conducting and sealing compound.
6. All steel conduits shall be coated after threading with cold-galvanized zinc coating. The Contractor shall supply this protective material and shall apply it in the field prior to installing conduit or fittings.

G. All steel conduit, exposed to weather or in contact with earth, shall be re-galvanized after threading with "Galvanizing Powder M-321" as manufactured by the American Solder and Flux Company of Philadelphia, Pennsylvania; "Zincilate 810" as manufactured by Industrial Metal Protectives, Inc., of Dayton, Ohio; "Zinc Rich" coating as manufactured by ZRC Chemical Products Company, Quincy, Massachusetts; or approved equal. The Contractor shall supply this protective material and shall apply it in the field.

H. Connections to Boxes and Cabinets

1. Conduit shall be securely fastened to all boxes and cabinets.
2. Threads on metallic conduit shall project through the wall of the box to allow the bushing to butt against the end of the conduit.
3. The locknuts, both inside and outside, shall then be tightened sufficiently to bond the conduit securely to the box.
4. Locknuts on connectors shall be tightened securely to bond the connectors.

I. All conduits entering enclosures outdoors or in wet areas shall enter through Meyer's hubs, or approved equal, or threaded openings.

J. Cleaning

1. Precautions shall be taken to prevent the accumulation of water, dirt, or concrete in the conduit.
2. Conduit in which water or other foreign materials have been permitted to accumulate shall be thoroughly cleaned or, where such accumulation cannot be removed by methods acceptable to the Owner /Engineer, the conduit shall be replaced.
3. For conduits sizes 3 inches and larger, draw a flexible testing mandrel approximately 12 inches long with a diameter less than the inside diameter of the conduit through the conduit. After which, draw a stiff bristle brush through until conduit is clear of particles of foreign materials. For conduits less than 3 inches, draw a stiff bristle brush through until conduit is clear of particles and foreign material.

K. Empty Conduit

1. All conduits installed for future use shall have a polypropylene pull line with a minimum tensile strength of 200 lbs., Jet Line, Cat. No. 232, polyolefin, or approved equal. Pull line shall be secures at both ends to ensure future accessibility.

L. Rooftop Conduits

1. Provide redwood sleepers on waterproof mastic base for all conduit runs exposed on roofs.

M. Identification

1. All conduits shall be identified in accordance with other section of these specifications.

N. Grounding

1. All conduits shall be grounded in accordance with specification Section 16050 – Basic Electrical Materials and Methods.
2. A solid or stranded bare copper or green insulated copper solid or stranded ground wire shall be provided in all conduits and raceways.

O. Galvanized Rigid Steel Conduit

1. Galvanized rigid steel conduit shall be installed in areas exposed to weather, vehicle traffic, in hazardous classified areas, for penetrations through foundations, and 10 feet before transition from below grade to 8 feet above grade, unless otherwise noted on the drawings.

2. Steel conduit in contact with earth shall be protected by "Scotchwrap" 10 mil tape applied in double thickness using 50 percent lap turns to 6 inches above grade and 6 inches beyond transition.
3. Expansion joints shall be used where required.

P. Intermediate Steel Conduit

1. Intermediate steel conduit may be installed in lieu of galvanized rigid steel conduit in all above ground areas where rigid steel conduit is permitted, except for wires over 600-volts, unless otherwise specified.

Q. Polyvinyl Chloride (PVC) Coated Galvanized Rigid Steel Conduits and Intermediate Steel Conduit

1. PVC -coated, steel conduit and fittings shall be installed where highly corrosive conditions exist, indoors or outdoors.
2. The Contractor shall patch any damaged coating according to the manufacturer's instructions.

R. Electrical Metallic Tubing

1. Electrical metallic tubing shall be installed for all circuits, indoors above concrete slab, where not subject to conditions outlined for rigid galvanized steel conduits.

S. Rigid Aluminum Conduit

1. Not acceptable on this project.

T. Flexible Metal Conduit, Steel or Aluminum

1. Flexible conduit inserts not greater than 30 inches in length, shall be installed in all conduit runs, which are supported by both building steel and by structures subject to vibration or thermal expansion. This shall include locations where conduit supported by building steel enters or becomes supported by isolated structures on separate foundations.
2. Flexible conduit shall be installed in conduit runs, which cross expansion joints.
3. Special areas, such as plant office control rooms in which external noise is to be minimized, shall have flexible conduit in conduit runs where the runs cross from the main building framing to the control room or office framing.
4. Flexible conduit shall be installed adjacent to all equipment and devices, which move in relation to the supply conduit due to vibration, normal operation of the mechanism, or thermal expansion.
5. Conduit shall be connected to pressure switches, thermocouples, solenoids, and similar devices with flexible conduit. Flexible conduit shall be installed adjacent to the motor terminal housing for motors requiring 4-inch and smaller conduit.
6. Flexible metal conduit inserts not greater than 6 feet in length shall be installed for light fixture tap conductors.

U. Liquid-Tight Flexible Metal Conduit

1. Liquid-tight flexible metal conduit shall be used in place of regular flexible conduit for connections to motors and transformers, in areas exposed to weather, moisture or oil, and under raised floors.
2. Liquid-tight flexible metal conduit may be used in place of flexible metal conduit where not otherwise required.

V. Non-Metallic Conduit

1. Schedule 40 shall be used for all power, signal feeders and branch circuits, in earth or enclosed in concrete, unless otherwise noted on the drawings. Conduits must be buried in earth in accordance with the NEC.

W. Conduit Support

1. Fasten conduit supports to building structures and surfaces in accordance with Section 16050 – Basic Electrical Materials and Methods.
2. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
3. Do not use wire, ceiling support wires or perforated pipe straps to support conduit. Remove any temporary installation support wire.

X. Spacing of Supports

1. All conduit runs shall be rigidly supported, except where buried in concrete,.
2. Each conduit shall be supported within one (1) foot of junction boxes and fittings.
3. Spacers used in duct bank installations shall be placed no more than 6 to 10 feet apart.
4. Support spacing along conduit runs shall be as follows.

Conduit Size	Maximum Distance Between Supports
½ inch through 1-1/4 inch	5 feet
1-1/2 inch and larger	8 feet

Y. Ground and bond raceway and boxes in accordance with Section 16050 – Basic Electrical Materials and Methods.

3.4 CABINET AND BOX INSTALLATION

A. Install electrical boxes as shown on drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.

B. Locate boxes and conduit bodies so as to ensure ready accessibility of electrical wiring, maintain headroom and to present neat mechanical appearance.

C. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only. In inaccessible ceiling areas, install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

D. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices with each other.

E. Use flush mounting outlet boxes in finished areas.

1. Do not install flush mounting boxes back-to-back in walls.
2. Provide minimum 6-inch separation between adjacent boxes.
3. Provide minimum 24-inch separation in acoustic rated walls.
4. Use stamped steel bridges to fasten flush mounting outlet box between studs.
5. Secure flush mounting box to interior wall and partition studs.
6. Accurately position to allow for surface finish thickness.
7. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
8. Use adjustable steel channel fasteners for hung ceiling outlet box.

F. Support boxes independently of conduits.

G. Use code sized gang box where more than one device is mounted together. Do not use sectional box. Use code sized gang box with plaster ring for single device outlets.

H. Use cast outlet box in exterior locations where exposed to the weather and wet locations (interior or exterior).

I. Coordinate installation of electrical boxes and fittings with cable and raceway installation work. Provide knockout closures to cap unused knockout holes where blanks have been removed.

J. Avoid using round boxes where conduit must enter box through side of box, which would result in difficult and insecure connections where fastened with a locknut or bushing on rounded surface.

K. Fasten boxes rigidly to substrate or structural surfaces to which they are being mounted, or solidly embed electrical boxes in concrete or masonry as appropriate.

L. Except as prevented by the location of other work, all junction boxes and outlet boxes shall be centered on structures.

M. Conduit openings in boxes shall be made with a hole saw or shall be punched.

N. Cabinets and boxes shall be rigidly mounted.

1. Mounting on concrete shall be secured by self-drilling anchors.
2. Mounting on steel shall be by drilled and tapped screw holes, or by special support channels welded to the steel, or by both.
3. Cabinets shall be leveled and fastened to the mounting surface with not less than ¼-inch air space between the enclosure and mounting surface.
4. All mounting holes in the enclosure shall be used.

O. Large Pull Boxes - Boxes larger than 100 cubic inches in volume or 12 inches in any dimension.

1. Interior Dry Locations - Use hinged enclosure.
2. Other Locations - Use surface mounted box of appropriate location classification.

3.5 ANCHORS

A. Where supports for raceways, boxes, and cabinets are mounted on concrete surfaces, they shall be fastened with self-drilling tubular expansion shell anchors with externally split expansion shells, single-cone expanders, and annular break-off grooved chucking cones. Anchors shall be Phillips "Red Head" or approved equal.

3.6 PULL BOX AND VAULT INSTALLATION

A. Openings or “knockouts” in precast concrete vaults shall be located as shown on the drawings and shall be sized sufficiently to permit passage of the largest dimension of pipe and/or flange.

B. Upon completion of installation, all voids or openings in the vault walls around pipes shall be filled with 3,000 psi non-shrink grout.

C. After the structure and all appurtenances are in place and approved, backfill shall be placed to the original ground line or to the limits designated on the plans.

D. All joints between precast concrete vault sections shall be made watertight. The plastic joint sealing compound shall be installed according to the manufacturer's recommendations to provide a watertight joint which remains impermeable throughout the design life of the structure. The outside of the entire structure shall be coated with an approved water proofing material.

E. Access doors shall be built up such that the hatch is flush with the surrounding surface unless otherwise specified on the drawings or by the District. The Contractor is responsible for placing the cover at the proper elevation where paving is to be installed and shall make all necessary adjustments so that the cover meets these requirements.

F. Ladders shall be installed using Type 316 stainless steel capsule anchors.

G. Ladders shall be attached a minimum of 3 places to the vault wall.

H. Ladder shall be centered under access door opening.

3.7 ADJUSTING

A. Install knockout closures in unused openings in boxes.

3.8 CLEANING

A. Clean interior of boxes to remove dust, debris, and other material.

B. Clean exposed surfaces and restore manufacturer’s finish.

END OF SECTION

SECTION 260553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. The extent of the electrical systems and equipment requiring identification is shown on the drawings, and the extent of identification required is specified herein and in individual sections of work requiring identification. The types of electrical identification specified in this section include the following:

1. Exposed conduit color banding.
2. Cable/conductor identification.
3. Operational instructions and warnings.
4. Equipment/system identification signs.

1.2 REFERENCES - CODES AND STANDARDS

A. ANSI Z535.1 - Safety Color Code

B. APWA ULCC - Uniform Color Code for Buried Utilities.

C. NFPA 70 National Electrical Code (NEC). Latest approved edition.

1.3 SYSTEM DESCRIPTION

A. Label the following electrical equipment with nameplates which clearly identify each item, the function or use of the item, and the circuit identification of the feed to the item:

1. Distribution Panelboards, Power and Lighting Panels, Local Control Panels, Terminal Cabinets and all electrical equipment enclosure shall be identified using laminated plastic nameplates. The equipment number, voltage rating, current rating, number of phases, connection type, short circuit interrupting rating, and circuit number shall be shown
2. All underground raceway or cable shall be marked with buried warning tape along its entire length.
3. All exposed raceway longer than 10 feet in length shall be identified.
4. Panelboard Directories: Furnish all panelboards with a complete typewritten directory mounted in the inner door under a clear plastic cover set in a metal frame.

B. Branch circuits and devices:

1. Label all individual receptacle outlets and light switches at their faceplate to indicate the panelboard of origin and branch circuit number, as shown on drawings. Label modular furniture feeds at the power pole drop in a visible and consistent location. Labels shall

be self adhesive, thermal machine printed type such as Brothers, Panduit, or T&B and shall be clear plastic with black lettering.

2. All branch circuits in outlet boxes shall be identified with circuit number using wrap-around labels (T&B, BRADY or 3M).
3. As an alternative to separate nameplates, device plates may be engraved directly with lettering filled with black enamel.

1.4 SUBMITTALS

A. Catalog data for nameplates, labels, and markers.

B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation and installation of product.

1.5 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70 – National Electrical Code.

B. Furnish products listed and classified by Underwriters' Laboratories, Inc. (UL), Electrical Testing Laboratories, Inc. (ETL), or other recognized, approved testing and listing agencies as suitable for the purpose specified and shown.

PART 2 - PRODUCTS

2.1 NAMEPLATES AND LABELS

A. Nameplates

1. Engraved three-layer laminated plastic, white letters on black background for normal power and white letters on red background for emergency power. Communications and control cabinets shall be labeled with white letters on green background.
2. Locations

    a. Each electrical distribution and control equipment enclosure.
    b. Communication cabinets.

3. Letter Size

    a. Use 1/8-inch letters for identifying individual equipment and loads.
    b. Use ¼-inch letters for identifying grouped equipment, loads, panelboards, and transfer switches.
    c. Use ½-inch letters for identifying the main switchboard, motor control centers, transformers and large distribution switchboards.

B. Labels

1. Embossed adhesive tape, with 3/16-inch white letters on colored background to match color scheme of plastic laminate labels in 2.1.1. Use only for identification of individual wall switches and receptacles, control device stations, and multi-outlet devices.
2. Thickness

    a. 1/16-inch for units up to 20 square inches or 8-inch length; 1/8-inch for larger units.

2.2 WIRE MARKERS

A. Manufacturers

1. Brady
2. Thomas & Betts
3. 3-M Co.

B. Description: Cloth, tape, split sleeve, or tubing type wire markers, self-adhesive.

C. Locations: Each conductor at panelboard gutters, pull boxes, outlet and junction boxes, control panels, motor controllers and starters, and each load connection.

D. Legend

1. Power and Lighting Circuits: Branch circuit or feeder feed from.
2. Control Circuits: Control wire number indicated on shop drawings.
3. Neutral Conductors: Clearly indicate the branch circuit or feeder number the neutral serves. In multi-wire circuits where the neutral is shared, mark the neutral with the circuit number of the "A" phase.

2.3 CONDUIT MARKERS

A. Provide manufacturer's standard preprinted, flexible or semi-rigid, permanent, plastic-sheet conduit markers, minimum of 3 mils thick and 1-1/2-inch wide extending 360 degrees around conduits; designed for self-adhesive attachment to conduit. Except as otherwise indicated, provide lettering that indicates the voltage of the conductor(s) in the conduit. Provide 8-inch minimum length for 2-inch and smaller conduit, 12-inch minimum length for larger conduit.

B. Location: Furnish markers for each conduit longer than 10 feet.

C. Spacing: 20 feet on center.

D. Color: Unless otherwise indicated or required by governing regulation, provide orange markers with black letters.

1. Fire Alarm System: Red w/black letters.
2. Telephone System: Green w/yellow letters.
3. Data/Communication. System: White w/black letters.

E. Legend:

1. 208 Volt System: Normal 208/120-volts.
2. Fire Alarm System: Fire alarm.
3. Telephone System: Telephone.
4. Data/Communication System: Data/communications.

2.4 FASTENERS

A. Secure all labels and nameplates with self-tapping stainless steel screws. Use contact type permanent adhesive where screws cannot or should not penetrate the substrate.

2.5 LETTERING AND GRAPHICS

A. Coordinate names, abbreviations and other designations used in the electrical identification work, with the corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of the electrical systems and equipment.

2.6 UNDERGROUND WARNING TAPE

A. Three-inch minimum width, 5 mil thickness, foil bonded polyethylene tape, detectable type, with suitable continuous warning legend describing buried electrical lines. Tape color shall conform to APWA uniform color code using ANSI Z535.1 safety colors. Text shall be black, 2-inch minimum letters.

B. Identify underground conduits using underground warning tape. Install one tape per trench at 3 inches below finished grade.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive nameplates and labels.

B. Coordination: Where identification is to be applied to surfaces that require finish, install identification after completion of painting.

C. Regulations: Comply with governing regulations and the requests of governing authorities for the identification of electrical work.

3.2 APPLICATION

A. Install nameplate and label parallel to equipment lines.

B. Secure nameplate to equipment front using screws, rivets, or adhesive.

C. Secure nameplate to outside moveable surface of door on panelboard.

D. Conduit Identification:

1. Where electrical conduit is exposed in spaces with exposed mechanical piping, which is identified by a color-coded method, apply color-coded identification on the electrical conduit in a manner similar to the piping identification. Except as otherwise indicated, use orange as the coded color for conduit.
2. Paint red band or provide red tape on each fire alarm conduit longer than 10 feet, minimum 20 feet on center.

E. Cable/Conductor Identification:

1. Apply cable/conductor identification on each cable and conductor in each box/enclosure/cabinet where the wires of more than one circuit or communication/signal system are present, except where another form of identification (such as color-coded conductors) is provided.
2. Match identification with marking system used in panelboards, shop drawings, contract documents, and similar previously established identification for project electrical work.

F. Operational Identification and Warnings

1. Wherever reasonably required to ensure safe and efficient operation and maintenance of the electrical systems, and electrically connected mechanical systems and general systems and equipment, including the prevention of misuse of electrical facilities by unauthorized personnel, install self-adhesive plastic signs or similar equivalent identification, instruction or warnings on switches, outlets and other controls, devices and covers of electrical enclosures. Where detailed instructions or explanations are needed, provide plasticized tags with clearly written messages adequate for the intended purposes.

G. Equipment/System Identification Signs

1. Install an engraved plastic-laminate sign on each major unit of electrical equipment in the building; including the central or master unit of each electrical system and the communication/signal systems, unless the unit is specified with its own self-explanatory identification or signal system.
2. Except as otherwise indicated or specified, provide single line of test, ½-inch high lettering on 1-1/2-inch high sign (2-inch high where two lines are required), white lettering in black field.
3. Provide text matching terminology and numbering of the contract documents and shop drawings.

H. Install signs at locations indicated or, where not otherwise indicated, at location for best convenience of viewing without interference with operation and maintenance of equipment. Secure to substrata with fasteners, except use adhesive where fasteners should not or cannot penetrate the substrata.

END OF SECTION

SECTION 263353

STATIC UNINTERRUPTIBLE POWER SUPPLY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Three-phase, on-line, double-conversion, static-type, UPS units with the following features:

    a. Surge suppression.
    b. Rectifier-charger.
    c. Inverter.
    d. Controls and indications.
    e. Static bypass transfer switch.
    f. Maintenance bypass/isolation panel.
    g. Output distribution section.
    h. Output isolation transformers.
    i. Remote status and alarm panels.
    j. Remote monitoring provisions.
    k. Battery and battery disconnect device.
    l. Battery monitoring.
2. Refer to project plans for Owner furnished items

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GTO: Gate turn-off thyristor.

C. IGBT: Isolated gate bipolar transistor.

D. LCD: Liquid-crystal display.

E. LED: Light-emitting diode.

F. NiCd: Nickel cadmium.

G. PC: Personal computer.

H. SPD: Surge protection device.

I. THD: Total harmonic distortion.

J. UPS: Uninterruptible power supply.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of UPS.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for UPS.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For UPS.

1. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Show access, workspace, and clearance requirements; details of control panels; and battery arrangement.
3. Include diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For UPS equipment, from manufacturer.

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

B. Product Certificates: For each product, from manufacturer.

C. Factory Test Reports: Comply with specified requirements.

D. Product Test Reports: Indicate test results compared with specified performance requirements, and provide justification and resolution of differences if values do not agree.

E. Field quality-control reports.

F. Sample Warranties: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

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

1.7 WARRANTY

A. Special Battery Warranties: Manufacturer and Installer agree to repair or replace UPS system storage batteries that fail in materials or workmanship within specified warranty period.

1. Warranted Cycle Life for Valve-Regulated, Lead-Calcium Batteries: Equal to or greater than that represented in manufacturer's published table, but not less than the following, based on annual average battery temperature of 77 deg F (25 deg C):
2. Warranted Cycle Life for Premium Valve-Regulated, Lead-Calcium Batteries: Equal to or greater than that represented in manufacturer's published table, but not less than the following, based on annual average battery temperature of 77 deg F (25 deg C):
3. Warranted Cycle Life for Flooded Batteries: Equal to or greater than that represented in manufacturer's published table, but not less than the following, based on annual average battery temperature of 77 deg F (25 deg C):

B. Special UPS Warranties: Specified form in which manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within special warranty period.

1. Special Warranty Period: **Two** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 OPERATIONAL REQUIREMENTS

A. Automatic operation includes the following:

1. Double Conversion, Standard Efficiency:

a. Normal Conditions: Load is supplied with power flowing from the normal power input terminals, through the rectifier-charger and inverter, with the battery connected in parallel with the rectifier-charger output.
b. Abnormal Supply Conditions: If normal supply deviates from specified and adjustable voltage, voltage waveform, or frequency limits, the battery supplies energy to maintain constant, regulated inverter power output to the load without switching or disturbance.
c. Power Failure: If normal power fails, energy supplied by the battery through the inverter continues supply-regulated power to the load without switching or disturbance.

2. Double Conversion, Line Interactive:

a. Normal Conditions: Load is supplied with power flowing from the normal power input terminals, with the rectifier-charger and inverter turned off and the battery disconnected.
b. Abnormal Supply Conditions: If normal supply deviates from specified and adjustable voltage, voltage waveform, or frequency limits, the rectifier-charger and inverter turn on and the battery supplies energy to provide constant, regulated inverter power output to the load with minimum of 98 percent UPS system efficiency.

c. Power Failure: If normal power fails, there is a maximum 4-microsecond delay while the rectifier-charger and inverter turn on and the battery supplies energy to re-establish constant, regulated power output to the load.

3. Double Conversion, IGBT:

a. Normal Conditions: Load is supplied with power flowing from the normal power input terminals, through the rectifier-charger and inverter, with the battery connected in parallel with the rectifier-charger output. High-efficiency carrier stored trench IGBT, in both rectifier-charger and inverter circuits, provides a minimum of 97 percent efficiency for the UPS system at full load and a minimum of 94 percent efficiency at 50 percent load.
b. Abnormal Supply Conditions: If normal supply deviates from specified and adjustable voltage, voltage waveform, or frequency limits, the battery supplies energy to provide constant, regulated inverter power output to the load.
c. Power Failure: If normal power fails, the rectifier-charger and inverter use energy from the battery to supply constant, regulated power output to the load without switching or disturbance.

4. When power is restored at the normal supply terminals of the system, controls shall automatically synchronize the inverter with the external source before transferring the load. The rectifier-charger shall supply power to the load through the inverter and simultaneously recharge the battery.
5. If the battery becomes discharged and normal supply is available, the rectifier-charger shall charge the battery. The rectifier-charger shall automatically shift to float-charge mode on reaching full charge.
6. If any element of the UPS system fails and power is available at the normal supply terminals of the system, the static bypass transfer switch shall switch the load to the normal ac supply circuit without disturbance or interruption.
7. The output power converters shall produce up to 300 percent of rated full-load current for short-circuit clearing. The inverter shall sustain steady-state overload conditions of up to 200 percent of rated full-load current for 60 seconds in normal operation.
8. The inverter shall be capable of sustaining 150 percent of system capacity for 30 seconds while powered from the battery.
9. Should overloads persist past the time limitations, the automatic static transfer switch shall switch the load to the bypass output of the UPS. When the fault has cleared, the static bypass transfer switch shall return the load to the UPS system.
10. If the battery is disconnected, the UPS shall supply power to the load from the normal supply with no degradation of its regulation of voltage and frequency of the output bus.

B. Manual operation includes the following:

1. Turning the inverter off causes the static bypass transfer switch to transfer the load directly to the normal ac supply circuit without disturbance or interruption.
2. Turning the inverter on causes the static bypass transfer switch to transfer the load to the inverter.

C. Maintenance Bypass/Isolation Switch Operation: Switch is interlocked so it cannot be operated unless the static bypass transfer switch is in the bypass mode. Device provides manual selection among the three conditions described below without interrupting supply to the load during switching:

1. Full Isolation: Load is supplied, bypassing the UPS. Normal UPS ac input circuit, static bypass transfer switch, and UPS load terminals are completely disconnected from external circuits.
2. Maintenance Bypass: Load is supplied, bypassing the UPS. UPS ac supply terminals are energized to permit operational checking, but system load terminals are isolated from the load.
3. Normal: Normal UPS ac supply terminals are energized and the load is supplied through the static bypass transfer switch and the UPS rectifier-charger and inverter, or the battery and the inverter.

D. Environmental Conditions: The UPS shall be capable of operating continuously in the following environmental conditions without mechanical or electrical damage or degradation of operating capability, except battery performance:

1. Ambient Temperature for Electronic Components: 32 to 104 deg F (0 to 40 deg C).
2. Ambient Temperature for Battery: 41 to 95 deg F (5 to 35 deg C).
3. Relative Humidity: Zero to 95 percent, noncondensing.
4. Altitude: Sea level to 2000 feet (1220 m).

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: UPS shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

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

B. UL Compliance: Listed and labeled by an NRTL to comply with UL 1778.

C. NFPA Compliance: UPS components shall be listed and labeled by an NRTL as suitable for installation in computer rooms according to NFPA 75.

D. The UPS shall perform as specified in this article while supplying rated full-load current, composed of any combination of linear and nonlinear load, up to 100 percent nonlinear load with a maximum load crest factor of 3.0, under the following conditions or combinations of the following conditions:

1. Inverter is switched to battery source.
2. Steady-state ac input voltage deviates up to plus or minus 15 percent from nominal voltage.
3. Steady-state input frequency deviates up to plus or minus 5 percent from nominal frequency.
4. THD of input voltage is 15 percent or more with a minimum crest factor of 3.0, and the largest single harmonic component is a minimum of 5 percent of the fundamental value.
5. Load is 30 percent unbalanced continuously.

E. Minimum Duration of Supply: If battery is sole energy source supplying rated full-load UPS current at 80 percent power factor, duration of supply is **2 hours**.

F. Input Voltage Tolerance: System steady-state and transient output performance remains within specified tolerances when steady-state ac input voltage varies plus 10 percent and minus 15 percent from nominal voltage.

G. Overall UPS Efficiency: Equal to or greater than 91 percent at 100 percent load.

H. AC Output-Voltage Regulation for Loads 100 Percent resistive.

I. AC Output-Voltage Regulation for Loads 100 Percent Balanced: +\-1% static, +\-5% dynamic.

J. Maximum Harmonic Content of Output-Voltage Waveform: 5 percent rms total and 3 percent rms for any single harmonic, for 100 percent rated nonlinear load current with a load crest factor of 3.0.

K. Maximum Harmonic Content of Output-Voltage Waveform: 5 percent rms total and 3 percent rms for any single harmonic, for rated full load with THD up to 50 percent, with a load crest factor of 3.0.

L. Minimum Overload Capacity of UPS at Rated Voltage: 125 percent of rated full load for 10 minutes, 200 percent for 60 seconds in normal operation, and 150 percent for 30 seconds in battery operating mode.

M. Maximum Output-Voltage Transient Excursions from Rated Value: For the following instantaneous load changes, stated as percentages of rated full UPS load, voltage shall remain within stated percentages of rated value and recover to, and remain within, plus or minus 2 percent of that value within 50 ms:

1. 50 Percent: Plus or minus 3 percent.
2. 100 Percent: Plus or minus 5 percent.
3. Loss of AC Input Power: Plus or minus 1 percent.
4. Restoration of AC Input Power: Plus or minus 1 percent.

N. Input Power Factor: A minimum of [**0.90**] [**0.95**] lagging when supply voltage and current are at nominal rated values and the UPS is supplying rated full-load current without additional filters.

O. Output Power Factor Rating: Loads with power factor of 0.9 leading to 0.8 lagging shall not require derating of the UPS. For loads with power factors outside this range, derate the UPS output as follows:

1. Derate the UPS a maximum of 5 percent for 0.7 PF lagging.
2. Derate the UPS a maximum of 10 percent for 0.6 PF lagging.
3. Derate the UPS a maximum of 15 percent for 0.5 PF lagging.
4. Derate the UPS a maximum of 20 percent for a range of 0.4 to 0.1 PF lagging.

P. EMI Emissions: Comply with FCC rules and regulations and with 47 CFR 15 for Class A equipment.

2.3 UPS SYSTEMS

A. Description: Double conversions Technology Self-contained compact tower type, battery backup device and accessories that provides three-phase electrical power in the event of failure or sag in the normal power system.

B. Electronic Equipment: Solid-state devices using hermetically sealed, semiconductor elements. Devices include rectifier-charger, inverter, static bypass transfer switch, and system controls.

C. Enclosures: Comply with NEMA 250, Type 1, unless otherwise indicated.

D. Configuration: Multicabinet modular style units.

E. Control Assemblies: Mount on modular plug-ins, readily accessible for maintenance.

F. Maintainability Features: Mount rectifier-charger and inverter sections and the static bypass transfer switch on modular plug-ins, readily accessible for maintenance.

G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

H. Capacity Upgrade Capability: Arrange wiring, controls, and modular component plug-in provisions to permit future **25** percent increase in UPS capacity.

I. Seismic-Restraint Design: UPS assemblies, subassemblies, and components (and fastenings and supports, mounting, and anchorage devices for them) shall be designed and fabricated to withstand static and seismic forces.

J. UPS Cabinet Ventilation: Redundant fans or blowers draw in ambient air near the bottom of cabinet and discharge it near the top rear.

K. Output Circuit Neutral Bus, Conductor, and Terminal Ampacity: Rated phase current times a multiple of 1.73, minimum.

2.4 SURGE SUPPRESSION

A. Protect internal UPS components from surges that enter at each ac power input connection including main disconnect switch, static bypass transfer switch, and maintenance bypass/isolation switch. Protect rectifier-charger, inverter, controls, and output components.

1. Use factory-installed surge suppressors tested according to IEEE C62.41.1 and IEEE C62.41.2.

2.5 RECTIFIER-CHARGER

A. Description: Voltage source converter rectifier, verify with Eaton.

B. Capacity: Adequate to supply the inverter during rated full output load conditions and simultaneously recharge the battery from fully discharged condition to 95 percent of full charge within 10 times the rated discharge time for duration of supply under battery power at full load.

C. Output Ripple: Limited by output filtration to less than 0.5 percent of rated current, peak to peak.

D. Control Circuits: Immune to frequency variations within rated frequency ranges of normal and emergency power sources.

1. Response Time: Field adjustable for maximum compatibility with local generator-set power source.

E. Battery Float-Charging Conditions: Comply with battery manufacturer's written instructions for battery terminal voltage and charging current required for maximum battery life. The battery charger shall be matched to the battery type supplied.

F. NiCd Battery Charger: Sense full charge by measuring the rate of temperature increase. Battery charging shall be terminated when the rate of temperature rise reaches 1.8 deg F (1 deg C) per minute. If the battery reaches 140 deg F (60 deg C) prior to reaching this rate of temperature rise, charging shall terminate. Chargers that determine full charge by voltage measurement to sense a 10-mV drop per cell when reaching full charge are also acceptable.

2.6 CONTROLS AND INDICATIONS

A. Description: Group displays, indications, and basic system controls on a common control panel on front of UPS enclosure.

B. Minimum displays, indicating devices, and controls include those in lists below. Provide sensors, transducers, terminals, relays, and wiring required to support listed items. Alarms include audible signals and visual displays.

C. Indications: Labeled LED

1. Quantitative indications shall include the following:

a. Input voltage, each phase, line to line.
b. Input current, each phase, line to line.
c. Bypass input voltage, each phase, line to line.
d. Bypass input frequency.
e. System output voltage, each phase, line to line.
f. System output current, each phase.
g. System output frequency.
h. DC bus voltage.
i. Battery current and direction (charge/discharge).
j. Elapsed time discharging battery.

2. Basic status condition indications shall include the following:

a. Normal operation.
b. Load-on bypass.
c. Load-on battery.
d. Inverter off.
e. Alarm condition.

3. Alarm indications shall include the following:

    a. Bypass ac input overvoltage or undervoltage.
    b. Bypass ac input overfrequency or underfrequency.
    c. Bypass ac input and inverter out of synchronization.
    d. Bypass ac input wrong-phase rotation.
    e. Bypass ac input single-phase condition.
    f. Bypass ac input filter fuse blown.
    g. Internal frequency standard in use.
    h. Battery system alarm.
    i. Control power failure.
    j. Fan failure.
    k. UPS overload.
    l. Battery-charging control faulty.
    m. Input overvoltage or undervoltage.
    n. Input transformer overtemperature.
    o. Input circuit breaker tripped.
    p. Input wrong-phase rotation.
    q. Input single-phase condition.
    r. Approaching end of battery operation.
    s. Battery undervoltage shutdown.
    t. Maximum battery voltage.
    u. Inverter fuse blown.
    v. Inverter transformer overtemperature.
    w. Inverter overtemperature.
    x. Static bypass transfer switch overtemperature.
    y. Inverter power supply fault.
    z. Inverter transistors out of saturation.
    aa. Identification of faulty inverter section/leg.
    bb. Inverter output overvoltage or undervoltage.
    cc. UPS overload shutdown.
    dd. Inverter current sensor fault.
    ee. Inverter output contactor open.
    ff. Inverter current limit.

4. Controls shall include the following:

    a. Inverter on-off.
    b. UPS start.
    c. Battery test.
    d. Alarm silence/reset.
    e. Output-voltage adjustment.

D. Dry-form "C" contacts shall be available for remote indication of the following conditions:

1. UPS on battery.
2. UPS on-line.
3. UPS load-on bypass.
4. UPS in alarm condition.
5. UPS off (maintenance bypass closed).

E. Emergency Power off Switch: Capable of local operation and operation by means of activation by external dry contacts.

2.7 STATIC BYPASS TRANSFER SWITCH

A. Description: Solid-state switching device providing uninterrupted transfer with a contactor or electrically operated circuit breaker to automatically provide electrical isolation for the switch.

B. Switch Rating: Continuous duty at the rated full-load UPS current, minimum.

C. Input SPD: **80** kA.

2.8 MAINTENANCE BYPASS/ISOLATION SWITCH

A. Description: Manually operated switch or arrangement of switching devices with mechanically actuated contact mechanism arranged to route the flow of power to the load around the rectifier-charger, inverter, and static bypass transfer switch.

1. Switch shall be electrically and mechanically interlocked to prevent interrupting power to the load when switching to bypass mode.
2. Switch shall electrically isolate other UPS components to permit safe servicing.
3. Switch shall electrically isolate the rectifier-charger, inverter, and static bypass transfer switch from the load, but shall allow primary power to the UPS for testing.

B. Comply with NEMA PB 2 and UL 891.

C. Switch Rating: Continuous duty at rated full-load UPS current.

D. Mounting Provisions: **Separate wall- or floor-mounted unit**].

E. Key interlock with key that is released only when the rectifier-charger and inverter are bypassed by the static bypass transfer switch. Key shall be required to unlock maintenance bypass/isolation switch before switching from open (normal) position to closed position. Lock shall be designed specifically for mechanical and electrical component interlocking.

2.9 REMOTE MONITORING

A. Description: Communication module in unit control panel provides capability for remote monitoring of status, parameters, and alarms specified in "Controls and Indications" Article. The remote computer and the connecting signal wiring are not included in this Section. Include the following features:

1. Connectors and network interface units for data transmission via RS-485, Ethernet, or web-based link.
2. Software designed for control and monitoring of UPS functions and to provide on-screen explanations, interpretations, diagnosis, action guidance, and instructions for use of monitoring indications and development of meaningful reports. Permit storage and analysis of power-line transient records. Designs for Windows applications, software, and computer are not included in this Section.

3. Software and Hardware: Compatible with that specified in Section 260913 "Electrical Power Monitoring and Control."

2.10 BATTERY

A. Description: Valve-regulated, recombinant, lead-calcium units, factory assembled in an isolated compartment of UPS cabinet, complete with battery disconnect switch.

1. Arrange for drawout removal of battery assembly from cabinet for testing and inspecting.
2. and inspecting.

B. Seismic-Restraint Design: Battery racks, cabinets, assemblies, subassemblies, and components (and fastenings and supports, mounting, and anchorage devices for them) shall be designed and fabricated to withstand static and seismic forces.

2.11 BASIC BATTERY MONITORING

A. Description: Continuous, real-time capture of battery performance data.

B. <Double click here to find, evaluate, and insert list of manufacturers and products.>

C. Battery Ground-Fault Detector: Initiates alarm when resistance to ground of positive or negative bus of battery is less than 5000 ohms.

D. Battery compartment high-temperature detector initiates an alarm when smoke or a temperature greater than 167 deg F (75 deg C) occurs within the compartment.

E. Battery compartment smoke/high-temperature detector initiates an alarm when smoke or a temperature greater than 167 deg F (75 deg C) occurs within the compartment.

F. Annunciation of Alarms: At UPS control panel and remotely.

2.12 ADDITIONAL BATTERY MONITORING

A. Monitoring features and components shall include the following:

1. Factory-wired sensing leads to cell and battery terminals and cell temperature sensors.
2. Connections for data transmission via RS-485 link, [**and**] [**network interface and**] external signal wiring to [**computer**] [**electrical power monitoring and control equipment**]. External signal wiring and computer are not specified in this Section.
3. USB ports for printer and accessories.
4. PC-based software designed to store and analyze battery data, compile reports on individual-cell parameters and total battery performance trends, and provide data for scheduling and prioritizing battery maintenance.

B. Performance: Automatically measure and electronically record the following parameters on a routine schedule and during battery discharge events. During discharge events, record measurements timed to nearest second; including measurements of the following parameters:

1. Total battery voltage and ambient temperature.
2. Individual-cell voltage, impedance, and temperature, and string current. During battery-discharging events such as utility outages, measures battery and cell voltages, battery string current and records values versus time to nearest second.
3. Individual-cell electrolyte levels.

2.13 BATTERY-CYCLE WARRANTY MONITORING

A. Description: Electronic device, acceptable to battery manufacturer as a basis for warranty action, for monitoring of charge-discharge cycle history of batteries covered by cycle-life warranties.

B. Performance: Automatically measure and record each discharge event, classify it according to duration category and total discharges according to warranty criteria, and display remaining warranted battery life on front panel display.

C. Additional monitoring functions and features shall include the following:

1. Measuring and Recording: Total voltage at battery terminal. Initiate an alarm for excursions outside the proper float-voltage level.
2. Monitoring: Ambient temperature at battery; initiate an alarm if temperature deviates from normally acceptable range.
3. Keypad on Device Front Panel: Provide access to monitored data using front panel display.
4. Alarm Contacts: Arrange to initiate remote alarm for battery discharge events abnormal battery voltage or temperature.
5. Memory: Store recorded data in nonvolatile electronic memory.
6. Ethernet Port: Permits downloading of data to a PC.

2.14 SOURCE QUALITY CONTROL

A. Factory test complete UPS system before shipment. Use actual batteries that are part of final installation. Include the following:

1. Test and demonstration of all functions, controls, indicators, sensors, and protective devices.
2. Full-load test.
3. Transient-load response test.
4. Overload test.
5. Power failure test.

B. Observation of Test: Give 14 days' advance notice of tests and provide opportunity for Owner's representative to observe tests at Owner's choice.

C. Report test results. Include the following data:

1. Description of input source and output loads used. Describe actions required to simulate source load variation and various operating conditions and malfunctions.

2. List of indications, parameter values, and system responses considered satisfactory for each test action. Include tabulation of actual observations during test.
3. List of instruments and equipment used in factory tests.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for conditions affecting performance of the UPS.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Verify installation conditions are representative of the conditions used in the coordination studies for the electrical system. Provide fuse protection according to Section 262813 "Fuses" if required for coordination with UPS overcurrent protective device requirements.

3.2 INSTALLATION

A. Comply with NECA 1.

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

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

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

D. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

E. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and NFPA 70.

F. Connections: Interconnect system components. Make connections to supply and load circuits according to manufacturer's wiring diagrams unless otherwise indicated. Apply oxide inhibitor on battery terminals.

3.3 GROUNDING

A. Separately Derived Systems: If not part of a listed power supply for a data-processing room, comply with NFPA 70 requirements for connecting to grounding electrodes and for bonding to

metallic piping near isolation transformer. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Separately Derived Systems: If part of a listed power supply for a data-processing room, comply with manufacturer's written instructions that include grounding requirements in excess of NFPA 70 requirements for connecting to grounding electrodes and for bonding to metallic piping near isolation transformer. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

1. Identify each battery cell individually.

3.5 BATTERY EQUALIZATION

A. Equalize charging of battery cells according to manufacturer's written instructions. Record individual-cell voltages.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Contractor shall be present for Manufacturer's field testing.

C. Tests and Inspections:

1. Inspect interiors of enclosures, including the following:

    a. Inspect anchorage, alignment, grounding, and required clearances.
    b. Component type and labeling verification.
    c. Ratings of installed components.

2. Test electrical and mechanical interlock systems for correct operation and sequencing.
3. Inspect bolted electrical connections for high resistance using one or more of the following methods:

    a. Use of low-resistance ohmmeter according to Section 7.22.2.2 of NETA ATS.
    b. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer's published data or Table 100.12 of NETA ATS.
    c. Perform thermographic survey according to Section 9 of NETA ATS.

4. Test static transfer from inverter to bypass and back. Use normal load, if possible.
5. Test dc undervoltage trip level on inverter input breaker. Set according to manufacturer's published data.
6. Verify synchronizing indicators for static switch and bypass switches.

7. Test automatic transfer switches.
   a. Verify settings and operation of control devices.
   b. Calibrate and set all relays and timers according to Section 7.9 of NETA ATS.
   c. Verify phase rotation, phasing, and synchronized operation as required by the application.
   d. Perform automatic transfer tests.

      1) Simulate loss of normal power.
      2) Return to normal power.
      3) Simulate loss of emergency power.
      4) Simulate all forms of single-phase conditions.

   e. Verify correct operation and timing of the following functions:

      1) Normal source voltage-sensing and frequency-sensing relays.
      2) Time delay on transfer.
      3) Alternative source voltage-sensing and frequency-sensing relays.
      4) Automatic transfer operation.
      5) Interlocks and limit switch function.
      6) Time delay and retransfer on normal power restoration.

8. Test direct current system's batteries.

   a. Verify adequacy of battery support racks, mounting, anchorage, alignment, grounding, and clearances.
   b. Inspect spill containment installation. Measure charger float and equalizing voltage levels. Adjust to battery manufacturer's recommended settings.
   c. Verify all charger functions and alarms.
   d. Measure each cell voltage and total battery voltage with charger energized and in float mode of operation.
   e. Perform a load test according to manufacturer's published data or IEEE 450.
   f. Measure charger float and equalizing voltage levels. Adjust to battery manufacturer's recommended settings.
   g. Test values.

      1) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
      2) Charger float and equalize voltage levels shall be according to battery manufacturer's published data.
      3) The results of charger functions and alarms shall be according to manufacturer's published data.
      4) Cell voltages shall be within 0.05 V of each other or according to manufacturer's published data.

5) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
6) Cell internal ohmic values (resistance, impedance, or conductance) shall not vary by more than 25 percent between identical cells that are in a fully charged state.
7) Results of load tests shall be according to manufacturer's published data or IEEE 450.

9. Test communication of status and alarms to remote monitoring equipment.

F. Seismic-restraint tests and inspections shall include the following:

1. Inspect type, size, quantity, arrangement, and proper installation of mounting or anchorage devices.

G. The UPS system will be considered defective if it does not pass tests and inspections.

H. Record of Tests and Inspections: Maintain and submit documentation of tests and inspections, including references to manufacturers' written instructions and other test and inspection criteria. Include results of tests, inspections, and retests.

I. Prepare test and inspection reports.

J. Coordination with Specified UPS Monitoring Functions: Obtain printouts of built-in monitoring functions specified for the UPS and its components in this Section that are simultaneously recorded with portable instruments in this article.

1. Provide the temporary use of an appropriate PC and printer equipped with required connections and software for recording and printing if such units are not available on-site.
2. Coordinate printouts with recordings for monitoring performed according to this article, and resolve and report any anomalies in and discrepancies between the two sets of records.

K. Monitoring and Testing Assistance by Contractor:

1. Open UPS and electrical distribution and load equipment and wiring enclosures to make monitoring and testing points accessible for temporary monitoring probe and sensor placement and removal as requested.
2. Observe monitoring and testing operations; ensure that UPS and distribution and load equipment warranties are not compromised.
3. Perform switching and control of various UPS units, electrical distribution systems, and load components as directed by power quality specialist. Specialist shall design this portion of monitoring and testing operations to expose the UPS to various operating environments, conditions, and events while response is observed, electrical parameters are monitored, and system and equipment deficiencies are identified.
4. Make repairs and adjustments to the UPS and to electrical distribution system and load components, and retest and repeat monitoring as needed to verify validity of results and correction of deficiencies.

5. Engage the services of the UPS manufacturer's factory-authorized service representative periodically during performance testing operations for repairs, adjustments, and consultations.

L. Documentation: Record test point and sensor locations, instrument settings, and circuit and load conditions for each monitoring summary and power disturbance recording. Coordinate simultaneous recordings made on UPS input and load circuits.

END OF SECTION 263353

Product Brochure

10-30 kVA

Eaton 9355 UPS

Scalable. Compact. Flexible.

Powering Business Worldwide

Agility, scalability and space efficiency – with greater standard runtime

The Eaton 9355 is a mid-size, three-phase uninterruptible power system (UPS) that delivers superior power protection for the ever-expanding loads in today's space-constrained data centers.

The double-conversion topology of the 9355 means that it protects IT infrastructure from all of the most common power problems to give data center managers greater peace of mind. The 9355 also offers an industry-leading combination of flexibility, scalability and power density—all in an innovative, high-efficiency package.

The 9355's sleek, end-of-row tower design is available in 10 kVA and 20 kVA configurations, upgradeable to 15 kVA and 30 kVA, respectively, and offers the smallest footprint of any comparable UPS. Standard internal batteries often eliminate the need for costly and space-consuming external battery cabinets.

An on-board power distribution module gives data center managers additional flexibility by helping to preserve valuable rack space and making the rack-based environment truly plug and play. This module can be configured for hardwired output or with a variety of output receptacles, reducing site preparation and installation expenses.

Up to four 9355 UPSs can be paralleled for either redundancy or extra capacity using Eaton's patented Powerware Hot Sync paralleling technology. Powerware Hot Sync also enables wireless paralleling in the event of a communications failure, providing the industry's only truly redundant paralleling solution.

The 9355's space-efficient design and outstanding performance and reliability make it perfect for corporate, telecom, healthcare, banking, industrial and retail applications. Combined with Eaton's world-class warranty and service plans, expert technical support, and broad selection of options—and backed by 40 years of R&D excellence—the 9355 is the ideal power protection solution for small data centers.

Product snapshot

Power rating:	10, 15, 20 and 30 kVA at 0.9 power factor (three phase)
Form factor:	Small-footprint tower, black
Topology:	Double conversion
Battery backup:	Up to 22 minutes typical, extendable up to three hours
Input voltage:	208V/120V or 220V/127V
Output voltage:	208V/120V or 220V/127V 480V: 120V/208V or 600V: 120/208 with input isolation transformer (at 60 Hz only)
Frequency:	50/60 Hz auto-sensing
Dimensions:	10 and 15 kVA two-high configuration: 32.2" H x 12" W x 32.5" D 10 and 15 kVA three-high configuration: 47.8" H x 12" W x 32.5" D 20 and 30 kVA: 66" H x 20" W x 34" D

Eaton 9355 UPS Features and benefits

- Compact tower form factor offers up to 75 percent smaller footprint and 13 percent more power capacity than comparable UPSs for industry-leading power density
- All-in-one design with internal batteries and integrated power distribution module with maintenance bypass switch delivers a complete power protection solution in one box for simplified installation
- Double-conversion topology provides complete power protection, isolating valuable IT equipment from all nine of the most common power problems
- High 0.9 output power factor for more real power in less space
- Internal batteries on all standard configurations support up to 350 percent more runtime than comparable UPSs
- Scalable 10 kVA and 20 kVA configurations can be upgraded to provide 50 percent more power without additional hardware
- On-board, plug-and-play power distribution module allows for hardwired output or 15 different output receptacle options, enhancing flexibility and reducing installation costs
- Patented Powerware Hot Sync paralleling technology enables paralleling of up to four 9355 UPSs for additional capacity or redundancy
- Microprocessor-controlled ABM technology with innovative three-stage charging technique extends the useful life of UPS batteries and optimizes battery recharge time
- Power management software suite includes applications for remote UPS monitoring, management and shutdown to help ensure system and data integrity

10 kVA *15 kVA* *20 kVA* *30 kVA*

Premium power protection

With the 9355 UPS, data center managers can safely eliminate the effects of electrical line disturbances and guard the integrity of their systems and equipment. The 9355 is a true double-conversion, three-phase system that can be used to prevent loss of valuable electronic information and minimize equipment downtime.

- The 9355 continually monitors incoming electrical power and removes the surges, spikes, sags, and other irregularities that are inherent in commercial utility power
- Working with a building's electrical system, the 9355 supplies the clean, consistent power required by sensitive electronic equipment for reliable operation
- During brownouts, blackouts, and other power interruptions, internal batteries provide emergency power to safeguard operation

Self-diagnosis

The 9355 constantly monitors its own operation —such as voltage, temperature and function of internal components—and sends an alarm or takes action if it detects a potential problem.

Self-correction

If it senses a problem, the 9355 instantly transfers the power path to a bypass source with zero interruption in power. When the alarm condition passes, the 9355 automatically reverts from bypass to normal power.

The 9355 UPS features a four-button graphical LCD that provides useful information such as load status, events, measurements and settings.

Advanced battery management

The 9355 UPS offers innovative technologies to maximize the health and service life of its internal and external batteries:

- ABM technology uses a unique three-stage charging technique that significantly extends battery service life and optimizes recharge time when compared to traditional trickle charging
- Temperature-compensated charging monitors battery temperature and adjusts the charge rate accordingly, which properly charges the battery and greatly extends battery life
- An integrated battery management system tests and monitors battery health and remaining lifetime, providing user notification to guide preventive maintenance

Eaton's UPS batteries are field replaceable. One person, working alone, can easily replace a battery without disrupting data center operations or power to protected equipment.

Green power performance

The 9355 delivers a robust combination of low input current distortion and high power factor for maximum efficiency. Operating at greater than 90 percent efficiency across all load ranges, the 9355 helps to reduce utility costs, extend battery runtimes and produce cooler operating conditions.

In addition, Eaton's use of sustainable materials and highly efficient manufacturing technology results in dramatic savings in carbon footprint as compared to competitive UPS products.

Maximum runtime, minimum footprint

The 9355 UPS provides industry-leading power density and a 75 percent footprint reduction versus comparable UPS solutions. All standard 9355 configurations incorporate internal batteries to provide up to 350 percent more runtime and offer 13 percent more capacity at equivalent VA ratings. Extended runtime allows the 9355 to power this extra capacity nearly four times longer without additional hardware, eliminating the need for costly and space-consuming external battery cabinets.

Standard 10 kVA and 20 kVA capacity models can also be upgraded to 15 kVA and 30 kVA, respectively, providing 50 percent more power with no additional hardware and no increase in footprint.

The 9355's small footprint requires only three to six square feet of floor space, enabling easy data center space-planning and preserving valuable raised-floor real estate.

Industry-leading scalability and redundancy

Today's critical applications require redundancy for ultimate reliability—and the 9355 delivers. Eaton's innovative Hot Sync technology and optional maintenance bypass parallel tie cabinet work together with the 9355 to provide an advanced, cost-effective UPS paralleling system.

The patented Hot Sync technology enables system load sharing, allowing any UPS module in the system to serve as a backup for any other module. Hot Sync's wireless paralleling capability also ensures system stability in the event of a communications failure.

Using a wall-mounted maintenance bypass parallel tie cabinet, data center managers can easily parallel up to four 9355 UPSs for either redundancy or capacity. UPSs can be quickly added to the pre-installed parallel tie cabinet and brought online in minutes, and individual UPSs can be isolated and swapped out for maintenance—significantly reducing installation and maintenance expenses.

Most other paralleling systems on the market use a top-down configuration in which the master fails when any subsidiary module fails. With Eaton's unique approach, each UPS is independent, yet synchronized with the others to prevent any single point of failure and help eliminate costly downtime.

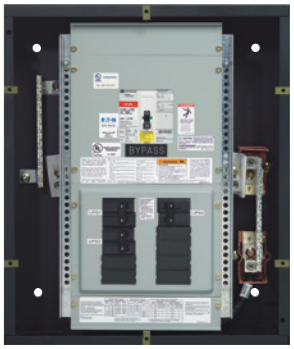
Additional paralleling benefits include:

- Scalability, from 10 to 120 kVA using one parallel tie cabinet
- N+3, N+2 or N+1 redundancy, from 10 to 90 kVA in a compact footprint—often in a smaller footprint than a single large UPS
- Redundant battery systems, with each parallel UPS containing its own internal batteries

Up to four 9355 UPSs can be paralleled for capacity or redundancy—often in a smaller footprint than a single large UPS

Parallel tie cabinet

Front



Rear

10 and 15 kVA Configurations

At 15 kVA, the 9355 occupies

70% less footprint

than competitor C

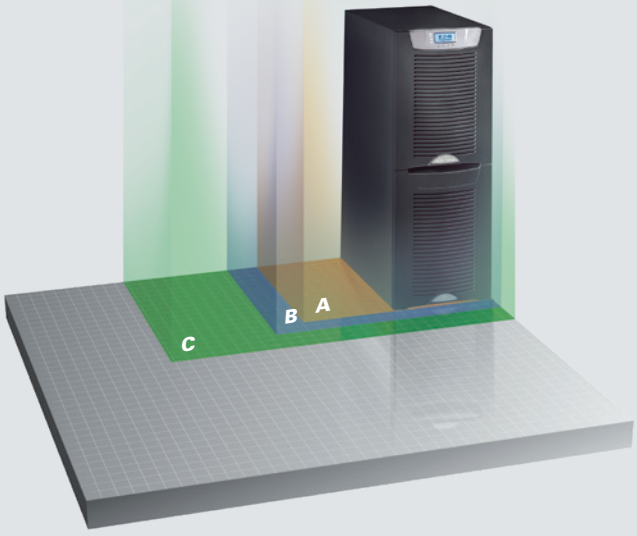
20 and 30 kVA Configurations

At 20 kVA, the 9355 occupies

48% less footprint

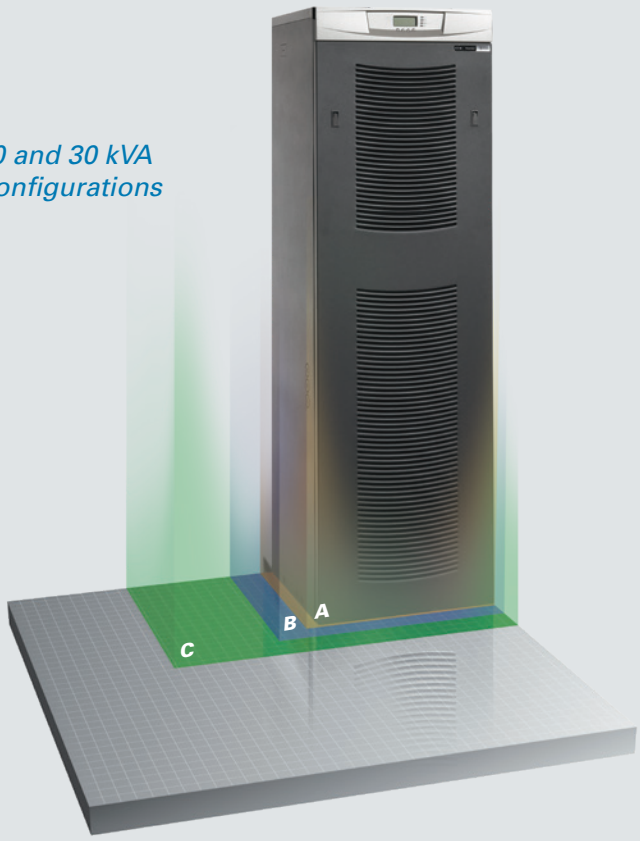
and delivers over three times the battery runtime

10 and 15 kVA Configurations



	Dimensions (inches)			Footprint (square inches)	Battery Runtime (minutes)	
	W	D	H		10 kVA	15 kVA
9355	**12**	**34**	**32**	**408**	**9**	**5**
Competitor A	21	33	59	693	5	5
Competitor B	24	36	82	864	5	5
Competitor C	33	40	63	1320	5	5

20 and 30 kVA Configurations



	Dimensions (inches)			Footprint (square inches)	Battery Runtime (minutes)	
	W	D	H		20 kVA	30 kVA
9355	**20**	**34**	**66**	**680**	**18**	**11**
Competitor A	21	33	59	693	5	5
Competitor B	24	36	82	864	5	5
Competitor C	33	40	63	1320	5	5

Flexible, integrated power distribution

An on-board power distribution module (PDM) gives the 9355 the flexibility necessary to adapt to the diverse and continually changing data center environment. This integrated PDM allows data center managers to preserve valuable rack space and reduce heat by feeding nine to 100 kW of rack servers from one 9355 UPS.

The PDM can be configured to feature a user-selectable mix of NEMA and IEC output receptacles, helping to reduce site preparation and installation costs. These high-density, high-amperage receptacles support blade servers, network switches and other power-hungry IT equipment.

The PDM's circuits are clearly labeled to simplify load balancing while branch circuit breakers provide branch circuit protection and on/off operation for groups of receptacles. Other features include a maintenance bypass switch that allows the data center manager to service the 9355 without shutting down the connected loads to increase availability, reduce mean time to repair and maintenance costs, and lower total cost of ownership.

Simplified rack-based power distribution options

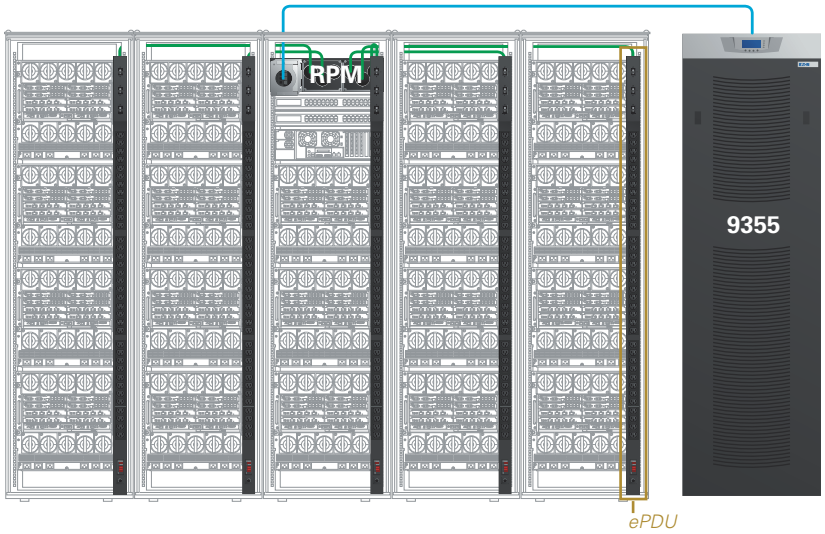
The 9355's on-board power distribution module is compatible with Eaton's optional rack power modules (RPM) and enclosure power distribution units, providing maximum flexibility in distributing power throughout the facility or data center. The RPM and ePDU enable primary power distribution from the 9355 to secondary power distribution devices or directly to IT equipment, for organized power distribution with fewer cables to manage and fewer distribution points to monitor.

Both solutions deliver power to loads of various voltages and can be configured to include user-selectable combinations of NEMA, IEC and hardwired inputs, and NEMA and IEC output receptacles.

ePDUs are available in space-saving 0U-vertical and 1U-horizontal configurations making the ePDU ideal for high-density rack environments.

ePDUs allow users to meter, monitor, switch, sequence and manage branches or individual outlets.

Eaton RPMs and ePDUs simplify power distribution by reducing the number of cables to manage and distribution points to monitor



ePDUs

Rack power module (front and rear view)

Integrated power distribution module

Options & service

Additional 9355 options

Options cabinets

For maximum flexibility, Eaton offers four options cabinet models for the following applications:

- Options cabinet with a maintenance bypass switch (MBS) that provides wrap-around bypass for UPS maintenance or service without shutting down the load
- Options cabinet with both MBS and input isolation transformer that allows operation from a 208V, 480V, or 600V 60-Hz source (input transformer in single-feed systems or bypass transformer in dual-feed systems)
- Options cabinet for dual-feed systems that provides a second input from a 208V, 480V, or 600V 60-Hz source
- Options cabinet with an output isolation transformer for 480V loads

Wall-mount maintenance bypass panels

Eaton offers a comprehensive line of optional wall-mounted maintenance bypass panels compatible with the 9355 UPS. The wall-mounted bypass panel is used to bypass the UPS during maintenance or servicing, providing wrap-around bypass for UPS service without shutting down the load. And for more flexible power distribution, these maintenance bypass panels can be equipped with surge protection and provisions for 36 poles of distribution utilizing Eaton's Cutler-Hammer breakers.

Proven warranty and support services

Customers consistently rank Eaton services number one in quality. Eaton's comprehensive, world-class service solutions are designed to improve costs, uptime, reliability, power quality and safety. And with 240 customer service engineers in North America and 1,200 international authorized service providers, Eaton has more service personnel than any other UPS manufacturer.

The standard factory warranty covers:

- System warranty: One year parts / 90 days labor
- Battery warranty: Two years parts / 90 days labor

Extensive service options for enhanced reliability

For support beyond the warranty period, Eaton offers enhanced service options including onsite startup, corrective and preventive maintenance, battery solutions, training, remote monitoring and factory spare parts and upgrades. Customizable three-phase UPS services packages allow customers to select the plan that provides the right combination of system uptime, convenience and value.

Service Plans

Eaton 9355 UPS Service Plans	PowerTrust Value	ProActive	PowerTrust	PowerTrust Preferred	Flex Contracts
Parts and Labor for Electronics	●	●	●	●	
Parts and Labor for Batteries	○	○	○	○	
5x8 On-Site Corrective Maintenance	●				
7x24 On-Site Corrective Maintenance		●	●	●	
Next Business Day Response	●				Custom
Eight-Hour Response		●	●	●	Service
Four-Hour Response		○	○	○	Contracts
Two-Hour Response		○	○	○	
5x8 UPS Preventive Maintenance Visit	One per year	○	One per year		
7x24 UPS Preventive Maintenance Visit	○	One per year	○	Two per year	
Battery Preventive Maintenance Visit	○	○	One per year	Two per year	
eNotify Remote Monitoring Service	●	●	●	●	
Discounted Spare Parts Kit, T&M, and Upgrades		30%	30%	30%	

● Included feature

○ Optional

Enhanced communication capabilities

The 9355 UPS is equipped with a variety of standard communications features for network connectivity and remote management applications, including:

- RS-232 serial port
- Two X-Slot communication bays
- Relay output contacts
- Two programmable signal inputs
- Remote emergency power-off (REPO)

Easy network connectivity and monitoring

ConnectUPS-X card

The ConnectUPS-X Web/SNMP X-Slot card connects the 9355 directly to an Ethernet network and the Internet and enables graceful shutdown of multiple computers over the network. The ConnectUPS-X Web/SNMP also features a three-port switching hub.

Modbus card

The Modbus card is an X-Slot device that allows continuous, real-time monitoring of the 9355 through a Building Management System (BMS) or industrial automation system.

Relay interface cards

The relay interface card for the X-Slot enables remote UPS shutdown and provides isolated dry contact Form-C relay outputs for utility failure, low battery, UPS alarm/OK, and on bypass.

Environmental Monitoring Probe

The environmental monitoring probe (EMP) works with the 9355 and ConnectUPS-X card to remotely monitor ambient temperature and relative humidity of the remote environment. The EMP can also be configured to provide status of two additional contact devices such as smoke detectors or open-door sensors.

Power Xpert Gateway Series cards

Power Xpert Gateway Series X-Slot cards provide Web-enabled, real-time monitoring of UPSs, PDUs and RPPs through standard onboard Web pages, Power Xpert software or third-party software.

Power Xpert meters

Power Xpert meters combine state-of-the-art technology with next-generation power diagnostics, data trending and performance benchmarking with a twist-and-click LCD display.

Centralized control and visibility

The 9355 UPS is shipped with the Eaton Software Suite CD. The software suite includes the following applications, as well as a user-friendly wizard to guide users through software selection and installation:

- LanSafe power management software
- PowerVision UPS performance analysis and monitoring software (30-day trial version)
- NetWatch network monitoring software

eNotify Remote Monitoring

Eaton's eNotify Remote Monitoring Service provides 24x7 real-time monitoring of the 9355 and battery systems and alerts both service technicians and the customer when a problem is detected. Proactive monitoring enables technical experts to respond immediately to more than 40 alarm conditions and, in many cases, resolve issues remotely with minimal or no downtime. Additional eNotify benefits include:

- One-way outbound status and event e-mails for security and reliability
- Fast diagnosis and notification of critical alarms
- Monthly customer reports including power event logs and overall UPS and battery health summaries

ConnectUPS-X Web/ SNMP X-Slot card

Power Xpert Gateway Card 2000

Modbus card

Relay Interface cards

Enviromental Monitoring Probe

LanSafe

Foreseer

PowerVision

Model selection guide (10 and 15 kVA)

Power Rating (kVA/kW)[1]	Description	Input/Output Voltage	Part Number[2]	Base Runtime	Dimensions (HxWxD, in.)	Weight (lb.)[3]
10 / 9	2-high w/32 battery	208/208	KA1011100000010	8	32.2x12.0x33.5	373.0
10 / 9	3-high w/64 battery	208/208	KA1012100000010	22	47.8x12.0x33.5	609.0
10 / 9	2-high w/32 battery	220/220[4]	KA1011200000010	8	32.2x12.0x33.5	373.0
10 / 9	3-high w/64 battery	220/220[4]	KA1012200000010	22	47.8x12.0x33.5	609.0
10 / 9	3-high w/32 battery and input isolation transformer	480/208	KA1013400000010	8	47.8x12.0x33.5	577.0
10 / 9	3-high w/32 battery and input isolation transformer	600/208	KA1013600000010	8	47.8x12.0x33.5	577.0
15 / 13.5	2-high w/32 battery	208/208	KA1511100000010	4	32.2x12.0x33.5	373.0
15 / 13.5	3-high w/64 battery	208/208	KA1512100000010	13	47.8x12.0x33.5	609.0
15 / 13.5	2-high w/32 battery	220/220[4]	KA1511200000010	4	32.2x12.0x33.5	373.0
15 / 13.5	3-high w/64 battery	220/220[4]	KA1512200000010	13	47.8x12.0x33.5	609.0
15 / 13.5	3-high w/32 battery and input isolation transformer	480/208	KA1513400000010	4	47.8x12.0x33.5	577.0
15 / 13.5	3-high w/32 battery and input isolation transformer	600/208	KA1513600000010	4	47.8x12.0x33.5	577.0

1. 50/60 Hz auto-sensing.
2. An input neutral is required for all configurations unless the input isolation transformer is used. For parallel systems, change the fifth configure-to-order (CTO) digit to a 2 and include parallel tie cabinet.
3. Add 47 lb. for two-high configurations or 50 lb. for three-high configurations to determine shipping weight.
4. 220V units are wye connected 220/127V input and 220/127V output, three-phase, four-wire plus ground.

Model selection guide (20 and 30 kVA)

Power Rating (kVA/kW)[1]	Input/Output Voltage	Feed	UPS Part Number[2]	Options Cabinet(s)	Base Runtime[3]	Dimensions (HxWxD, in.)	Weight (lb.)[4]
20 / 18	208/208	Single	KB2013100000010	None	18	66.0 x 20.0 x 34.1	1160.0
20 / 18	208/208	Single[6]	KB2013100000010	KBT001100000010[5]	18	66.0 x 40.0 x 34.1	1695.0
20 / 18	208/208	Dual[6]	KB2013100000010	KBT001100000010 KBT002100000010[5]	18	66.0 x 60.0 x 34.1	2230.0
20 / 18	220/220[7]	Single	KB2013200000010	None	18	66.0 x 20.0 x 34.1	1160.0
20 / 18	480/208	Single	KB2013100000010	KBT001200000010[5]	18	66.0 x 40.0 x 34.1	1695.0
20 / 18	480/208	Dual	KB2013100000010	KBT002200000010 KBT001200000010[5]	18	66.0 x 60.0 x 34.1	2230.0
20 / 18	600/208	Single	KB2013100000010	KBT001300000010	18	66.0 x 40.0 x 34.1	1695.0
20 / 18	600/208	Dual	KB2013100000010	KBT001300000010[5] KBT002300000010	18	66.0 x 60.0 x 34.1	2230.0
20 / 18	480/480	Single	KB2013100000010	KBT001200000010[5] KBT003200000010	18	66.0 x 60.0 x 34.1	2230.0
30 / 27	208/208	Single	KB3013100000010	None	11	66.0 x 20.0 x 34.1	1160.0
30 / 27	208/208	Single[6]	KB3013100000010	KBT001100000010[5]	11	66.0 x 40.0 x 34.1	1695.0
30 / 27	208/208	Dual[6]	KB3013100000010	KBT001100000010[5] KBT002100000010	11	66.0 x 60.0 x 34.1	2230.0
30 / 27	220/220[7]	Single	KB3013200000010	None	11	66.0 x 20.0 x 34.1	1160.0
30 / 27	480/208	Single	KB3013100000010	KBT001200000010[5]	11	66.0 x 40.0 x 34.1	1695.0
30 / 27	480/208	Dual	KB3013100000010	KBT001200000010[5] KBT002200000010	11	66.0 x 60.0 x 34.1	2230.0
30 / 27	600/208	Single	KB3013100000010	KBT001300000010	11	66.0 x 40.0 x 34.1	1695.0
30 / 27	600/208	Dual	KB3013100000010	KBT001300000010[5] KBT002300000010	11	66.0 x 60.0 x 34.1	2230.0
30 / 27	480/480	Dual	KB3013100000010	KBT001200000010[5] KBT003200000010	11	66.0 x 60.0 x 34.1	2230.0

1. 50/60 Hz auto-sensing.
2. An input neutral is required for all configurations unless the input isolation transformer is used. For parallel systems, change the fifth CTO digit to a 2 and include parallel tie cabinet.
3. All models include internal batteries.
4. Add 50 lb. to determine shipping weight.
5. Contains on-board maintenance bypass.
6. With isolation transformer.
7. 220V units are wye connected 220/127V input and 220/127V output, three-phase, four-wire plus ground.

Battery backup times (in minutes)

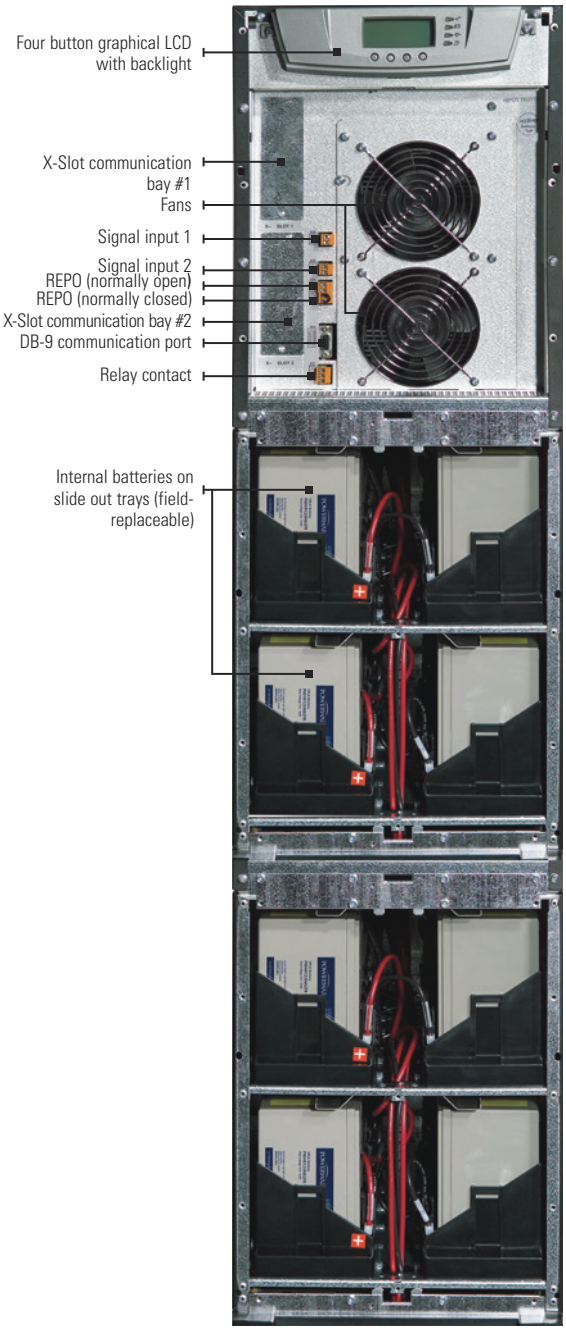
10-15 kVA backup times

VA	Watt	UPS + Internal 32 Battery	(1) EBM 64	(2) EBM 64	(3) EBM 64	(4) EBM 64	UPS + Internal 64 Battery	(1) EBM 96	(2) EBM 96	(3) EBM 96
15000	13500	5	23	43	65	89	13	43	77	113
14500	13050	5	24	45	68	93	14	45	81	119
14000	12600	5	25	47	72	97	15	47	84	125
13500	12150	6	26	49	75	102	16	49	88	130
13000	11700	6	28	52	78	106	17	52	92	136
12500	11250	6	29	54	82	111	18	54	96	142
12000	10800	7	30	57	86	116	19	57	101	149
11500	10350	7	32	59	90	122	19	59	106	156
11000	9900	7	33	62	94	129	20	62	111	164
10500	9450	8	35	66	100	136	21	66	117	174
10000	9000	8	37	70	106	144	23	70	124	184
9500	8550	9	40	74	112	153	24	74	132	196
9000	8100	10	42	79	120	163	26	79	141	209
8500	7650	11	46	85	129	175	28	85	152	225
8000	7200	12	49	92	139	189	30	92	164	242
7500	6750	13	53	100	151	205	32	100	178	263
7000	6300	15	58	109	164	224	35	109	194	286
6500	5850	16	64	119	180	245	39	119	212	314
6000	5400	18	70	131	198	270	43	131	234	346
5500	4950	20	78	145	220	300	47	145	259	383
5000	4500	22	87	162	245	334	53	162	289	428
4500	4050	25	97	182	276	376	59	182	325	-
4000	3600	29	110	207	313	426	67	207	369	-
3500	3150	33	127	238	359	-	77	238	423	-
3000	2700	38	148	277	418	-	90	277	-	-
2500	2250	46	176	329	-	-	107	329	-	-

20-30 kVA backup times

VA	Watt	UPS + Internal 1 Battery	Internal Battery + EBC - 36	Internal Battery + (1) EBC - 72	Internal Battery + (2) EBC-72
30000	27000	11	31	56	89
29000	26100	11	33	58	90
28000	25200	12	35	60	93
27000	24300	12	38	62	95
26000	23400	13	40	65	98
25000	22500	14	43	68	101
24000	21600	14	46	71	103
23000	20700	15	48	74	106
22000	19800	16	51	76	109
21000	18900	17	53	79	111
20000	18000	18	56	82	114
19000	17100	19	58	85	117
18000	16200	20	62	88	120
17000	15300	22	66	92	130
16000	14400	24	71	96	142
15000	13500	26	75	101	154
14000	12600	28	79	105	166
13000	11700	31	84	110	178
12000	10800	35	88	114	201
11000	9900	38	94	119	256
10000	9000	42	101	134	251
7500	6750	58	117	188	347
5000	4500	90	188	294	543

Note: Backup times are approximate and may vary with equipment, configuration, battery age, temperature, etc.



Front view of three-high module with cover off

Technical Specifications for 10 and 15 kVA[1]

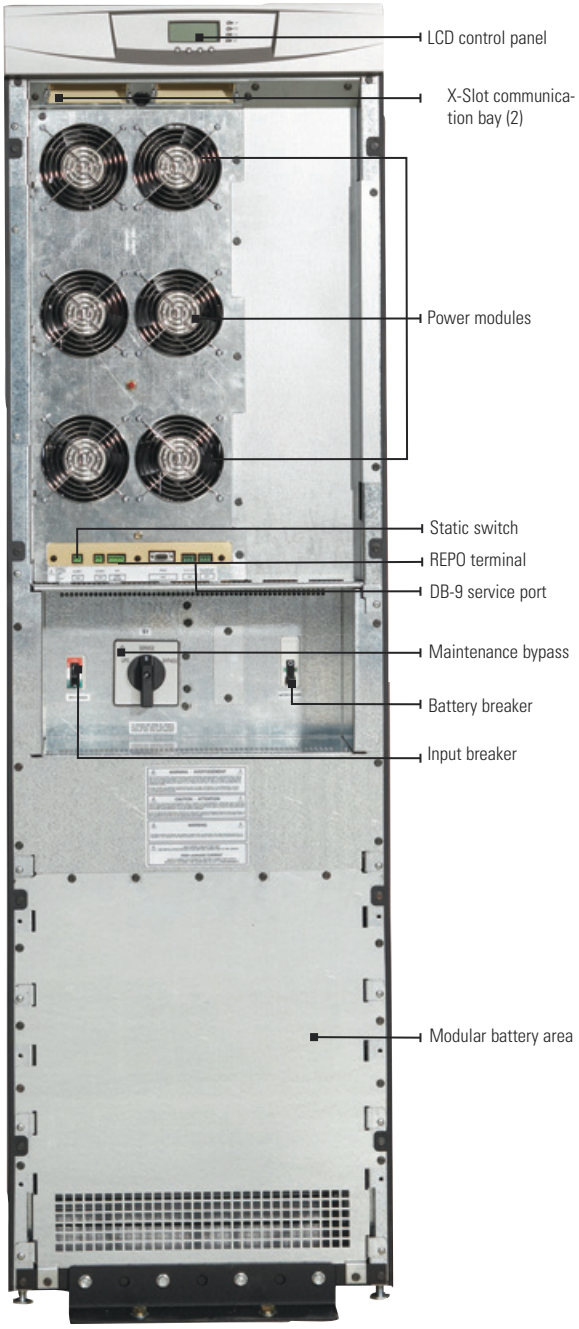
Power	
Ratings (kVA/Watts)	10 kVA/9 kW and 15 kVA/13.5 kW at 0.9 power factor
Topology	Double conversion
Electrical input	
Nominal input voltage	208V/120V or 220V/127V three-phase 400V models also available
Input voltage range	-15%, +10% from nominal at 100% load without depleting battery
Operating frequency	50/60 Hz (45 to 65 Hz)
Input power factor	>0.99 typical, >0.96 frequency converter
Input current distortion	5% THD
Electrical output	
Nominal output voltage	208/120, 220/127 Vac
Output voltage regulation	±1% static; ±5% dynamic at 100% resistive load change, <1 ms response time
Efficiency	91%, typical
Heat dissipation (BTU/hr)	*10 kVA models:* 3,798 @ 208V and 220V input 6,294 @ 480V and 600V (with input isolation transformer) *15 kVA models:* 5,122 @ 208V and 220V input 8,134 @ 480V and 600V (with input isolation transformer)
Battery	
Battery type	9 Ah, sealed, lead-acid, maintenance-free
Battery runtime	See battery backup time chart
Battery replacement	Field-replaceable
Charger	Default is 3.4A per battery string. Charger current is configurable from 0.5A to 25A per string with an overall maximum of 34A (limited by input current)
Start-on-battery	Allows start of UPS without utility input
General	
Diagnostics	Full system self-test at startup
UPS bypass	Automatic on overload or UPS failure
Parallel for redundancy	Yes, using Powerware Hot Sync technology and capacity
Dimensions and weights	See model selection table
Overload (normal operation)	150% for 5 sec / 125% for 1 min (online), 110% for 10 min
Communications	
LCD display	Graphical LCD with blue backlight
LEDs	(4) LEDs for notice and alarm
Audible alarms	Yes
Communication ports	(1) RS-232, (1) relay contact, (1) REPO, (2) environmental input
Communication slots	(2) X-Slot communication bays
Power management software	Bundled Software Suite CD
Environmental	
Operating temperature	50–104°F (10–40°C), 45°C with 7.5% derating; Optimal battery performance: 77°F (25°C)
Storage temperature	32–77°F (0–25°C); Recommended battery storage: 59–77°F (15–25°C)
Relative humidity	0–95%, non-condensing
Audible noise	< 56 dBA at 1 meter (noiseless room) typical
Altitude	9,843 ft. (3000m) without derating
Certifications	
Safety certifications	UL1778 5th Edition, CSA C22.2 No. 107.3-14, NOM-NYCE
EMC compliance	47 CFR Part 15/ICES-003 Class A
Quality	ISO 9001:2015, ISO 14001:2004
Surge	ANSI C62.41 Category B3, IEC 61000-4-5
Markings	cULus, NOM-NYCE

1. Due to continuous product improvements, program specifications are subject to change without notice.

Technical Specifications for 20 and 30 kVA[1]

Power	
Ratings	20 kVA/18 kW and 30 kVA/27 kW at 0.9 power factor
Topology	Double conversion
Electrical input	
Nominal input voltage	208V/120V, 220V/127V +10, -15% 480V/277V, 600V (480+600 with transformer) 400V models also available
Operating frequency	50/60 Hz (45 to 65 Hz)
Input power factor	0.99 typical
Input current distortion	<5% THD
Electrical output	
Nominal output voltage	208/120, 220/120 Vac
	480/227 with output transformer
Output voltage regulation	±1% static; ±4% dynamic with 100% step load recovery within 1 ms response time
Efficiency	91%, typical
Heat dissipation (BTU/hr)	*20 kVA models* 6,762 @ 208V and 220V input 10,450 @ 480V and 600V (with input isolation transformer) *30 kVA models:* 9,220 @ 208V and 220V input 13,831 @ 480V and 600V (with input isolation transformer)
Battery	
Battery type	9 Ah, sealed, lead-acid, maintenance-free
Battery runtime	See battery backup time chart
Battery replacement	Field-replaceable
Charger	Default is 8A
General	
Diagnostics	Full system self-test at startup
UPS bypass	Automatic on overload or UPS failure
Parallel for redundancy	Yes, using Powerware Hot Sync technology for redundancy and capacity
Dimensions and weights	See model selection table
Overload	150% for 5 sec / 125% for 1 min (online), 110% for 10 min
Communications	
LCD display	Graphical LCD with blue backlight
LEDs	(4) LEDs for notice and alarm
Audible alarms	Yes
Communication ports	(1) RS-232, (1) relay contact, (1) REPO, (2) environmental input
Communication slot	(2) X-Slot communication bays
Power management software	Bundled Software Suite CD
Environmental	
Operating temperature	50–104°F (10–40°C), 45°C with 7.5% derating; Optimal battery performance: 77°F (25°C)
Storage temperature	32–77°F (0–25°C); Recommended battery storage: 59–77°F (15–25°C)
Relative humidity	0–95%, non-condensing
Audible noise	< 58 dBA at 1 meter depending on load
Altitude	<3000m
Certifications	
Safety certifications	IEC 62040-1-1, IEC 60950, EN 62040-1-1, UL 1778, NOM-0190SCP8-1993
EMC compliance	EN 50091-2 Class A
Quality	ISO 9001: 2000 and ISO 14001:1996
Markings	UL, cUL, NOM-NYCE

1. Due to continuous product improvements, program specifications are subject to change without notice.



20/30 kVA UPS

Power Distribution Module with Mechanical Bypass Switch
(10 and 15 kVA Models)

NEMA Output Receptacle(s)[1] Quantity	Breaker	Voltage (V)	Receptacle Code[2]	Phase(s)	Enter "Receptacle Code" into CTO Digits #
(1) L15-30R	30A	208	2	3	9, 10 or 11 only
(1) L21-20R	20A	208/120	3	3	9, 10 or 11 only
(1) L21-30R	30A	208/120	4	3	9, 10 or 11 only
(2) 5-15R	15A	120	A	1	9,10,11,12
(2) 5-20R UL	20A	120	B	1	9,10,11,12
(2) 6-15R	15A	208	D	2	9,10,11,12
(2) 6-20R	20A	208	E	2	9,10,11,12
(2) L5-15R	15A	120	F	1	9,10,11,12
(1) L5-20R*	20A	120	G	1	9,10,11,12
(1) L5-30R*	30A	120	H	1	9,10,11,12
(2) L6-15R	15A	208	I	2	9,10,11,12
(1) L6-20R*	20A	208	J	2	9,10,11,12
(1) L6-30R*	30A	208	K	2	9,10,11,12
(1) L14-20R*	20A	120/208	L	2	9,10,11,12
(1) L14-30R*	30A	120/208	M	2	9,10,11,12
Blank Panel	N/A	N/A	X	N/A	9,10,11,12
(2) IEC 320 C13 (120V)	20A	120	N	1	9,10,11,12
(2) IEC 320 C19 (120V)	20A	120	P	1	9,10,11,12

1. The combined quantities of LOCKING receptacles (denoted by *) must not exceed four per unit.1. Arrange receptacle codes in numerical-alphabetical order in digits 9 through 12 of the CTO number. Example 1: A PDM with an L21-20, an L14-30, and Qty 2 IEC320-C19 would have digits 9 through 12 of the CTO arranged as "3MPP". Example 2: A PDM with a 5-15R, and an L6-30 and an L14-30 would have digits 9 through 12 of the CTO arranged as "AKMX". Please be sure utilize the "X" designation for any of the four total slots not populated.

Options (10 and 15 kVA)

Description	Part Number	Input/Output Voltage (V)	Dimensions (H x W x D, inches)	Weight (lb)
Two-high line and match battery module (64 batteries)	103004192-5501	N/A	32.2 x 12 x 30.2	480
Three-high line and match battery module (96 batteries)	103004193-5501	N/A	47.8 x 12 x 30.2	710
Wall-mount parallel tie cabinet (2-Breaker MBP)[1, 3]	124100020-001	N/A	36 x 20 x 5.8	68
Wall-mount Remote EPO Switch	103002939	N/A	4.5 x 4.5 x 4.5	3
Zone 4 Seismic Mounting Kit	103004194-5501	N/A	-	-
Remote monitor display panel[2]	103002687-001	N/A	4.9 x 5.9 x 1.6	3
Spare parts kit	106711169	N/A	N/A	N/A
10 to15 kVA upgrade	103004657	N/A	N/A	N/A
Upgrade to a parallel UPS module three-breaker maintenance bypass panels	UP08N-PAR1	N/A	N/A	N/A
100A Bus, 200A Neutral, & 60A MBP, MIB, MIS[3]	124100027-001	208/208	48 x 20 x 5.8	120
With integral 120 KA TVSS (100A Bus, 200A Neutral, and 60A MBP, MIB, MIS)[3]	124100027-002	208/208	60 x 20 x 5.8	120
With 36-pole distribution provisions (Cutler-Hammer GHB 65 kAIC, or GBHW 22 kAIC and BAB 10 kAIC only)[3]	124100027-003	208/208	72 x 20 x 5.8	210
With 36-pole distribution provisions and integrated TVSS (Cutler-Hammer GHB 65 kAIC, GBHW 22 kAIC and BAB 10 kAIC only)[3]	124100027-004	208/208	90 x 20 x 5.8	225

1. 208V/208V input/output voltage. 225A bus, 200A neutral, (1) 225A MBP and (4) 80A MIS.
2. Requires Industrial Relay and Display Card. See X-Slot Connectivity
3. Add 40 lb. for shipping weight of panels and 50 lb. for panels with panelboard provisions.

Options (20 and 30 kVA)

Description	Part Number	Input/Output Voltage (V)	Dimensions (H x W x D, inches)	Weight (lb)
Two-string line and match battery cabinet (36 batteries)	103005183	N/A	66.0 x 20.0 x 34.1	1105
Four-string line and match battery cabinet (72 batteries)	103004868	N/A	66.0 x 20.0 x 34.1	2060
Option cabinet containing maintenance bypass (no transformer)	KBT000000000010	208/208	67.0 x 20.0 x 34.1	205
Wall-mount parallel tie cabinet (two-breaker MBP)[1, 3]	124100026-001	208/208	48.0 x 20.0 x 5.8	150
Remote monitor display panel[2]	103002687-001	N/A	N/A	N/A
Remote EPO switch (wall mounted)	103002939	N/A	N/A	N/A
Zone 4 seismic kit	103004896	N/A	N/A	N/A
Spare parts kit	106711170	N/A	N/A	N/A
20 to 30 kVA upgrade	103004901	N/A	N/A	N/A
Upgrade to a parallel UPS module	UP08N-PAR	N/A	N/A	N/A
Three-breaker maintenance bypass panels				
225A Bus, 200A Neutral and 125A MBP, 110A MIB, 110A MIS)[3]	124100028-001	208/208	48.0 x 20.0 x 5.8	120
With integral 120 KA TVSS (100A Bus, 200A Neutral and 60A MBP, MIB, MIS)[3]	124100028-002	208/208	60.0 x 20.0 x 5.8	120
With 36-pole distribution provisions (Cutler-Hammer GHB 65 kAIC, or GBHW 22 kAIC and BAB 10 kAIC only)[3]	124100028-003	208/208	72.0 x 20.0 x 5.8	210
With 36-pole distribution provisions and integrated TVSS (Cutler-Hammer GHB 65 kAIC, GBHW 22 kAIC and BAB 10 kAIC only)[3]	124100028-004	208/208	90.0 x 20.0 x 5.8	225

1. 400A Bus, 200A Neutral, (1) 350A MBP and (4) 110A MIS.
2. Requires Industrial Relay and Display Card. See X-Slot Connectivity Options table.
3. Add 40 lb. for shipping weight of panels and 50 lb. for panels with panelboard provisions.

Options cabinet

X-Slot Connectivity Options

Description[1]	Value for CTO Digit 8	Part Number (if ordered separately)
None (No Pre-installed X-Slot card)	0	–
ConnectUPS-X Web/SNMP/xHub Card	3	116750221-001
Modem Card	7	05146288-5501
Modbus Card	4	103005425-5591
Relay Card (AS/400 compatible)	5	1018460
Industrial Relay and Display Card[2]	6	103003055
CAN Bridge Parallel Card	N/A	103004336

1. The UPS has two X-Slots. One card can be factory installed while the second X-Slot card can be purchased separately.
2. 5A @ 250V. Provides (4) form-C relay contacts for integrating UPS alarms into security and alarm systems. Also provides signal information for the Remote Monitor Display Panel (part number 103002687-001).

RPM Configurations for 9355

Part Number	Input Cable	Receptacle 1	Receptacle 2	Metering
Y03100011100000	Hardwired Input	L21-20 (2)	L21-20 (2)	Local Power Meter
Y03100022100000	Hardwired Input	L21-30 (2)	L21-30 (2)	Local Power Meter
Y03100055100000	Hardwired Input	L6-30 (3)	L6-30 (3)	Local Power Meter
Y03100047100000	Hardwired Input	L6-20 (3)	5-20 (6)	Local Power Meter
Y03100017100000	Hardwired Input	L21-20 (2)	5-20 (6)	Local Power Meter
Y031000FF100000	Hardwired Input	L15-30 (2)	L15-30 (2)	Local Power Meter
Y301000BB100000	Hardwired Input	IEC320-C19 (6)	IEC320-C19 (6)	Local Power Meter

Wall-mount maintenance bypass panel

Learn more at
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Printed in USA
Publication No. 9355FXA / GG
July 2019

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