CITY OF BURLINGAME

DEPARTMENT OF PUBLIC WORKS

NOTICE TO BIDDERS

INSTRUCTION TO BIDDERS

PROPOSAL AND AGREEMENT

SPECIAL PROVISIONS

FOR

POLICE STATION
EMERGENCY GENERATOR REPLACEMENT
CITY PROJECT NO. 84640

FOR USE IN CONNECTION WITH
STANDARD SPECIFICATIONS DATED 2010
AND STANDARD PLANS DATED 2010
OF THE CALIFORNIA DEPARTMENT OF TRANSPORTATION

KEVIN OKADA, P.E.
SR. CIVIL ENGINEER
RCE 65014
EXP. 6-30-19

BIDS WILL BE OPENED AT 2:00 P.M. ON March 14, 2019
IN CONFERENCE ROOM "A" AT BURLINGAME CITY HALL

INDEX

City Standard details are available upon request or found on the City webpage at:
http://www.burlingame.org/index.aspx?page=161
Burlingame.org/departments/engineering/city standard details.

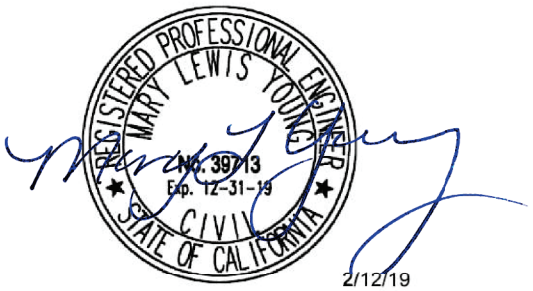
Emergency Generator Replacement

February 2019

The Technical Specifications contained herein have been prepared by or under the responsible charge of the following registered person(s).

Mary Lewis Young, C39713
West Yost Associates
2020 Research Park Drive, Suite 100
Davis, CA 95618

(530) 756-5905



2/12/19

Sharon M. Kimizuka, E15698
A T.E.E.M. Electrical Engineering
3841 N. Freeway Blvd #145
Sacramento, CA 95834

(916) 457-8144

2/12/19

The City of Burlingame

PUBLIC WORKS DEPARTMENT
(650) 558-7230

CITY HALL - 501 PRIMROSE ROAD
BURLINGAME, CALIFORNIA 94010-3997

CORPORATION YARD
(650) 558-7670

NOTICE TO BIDDERS

For the **POLICE STATION EMERGENCY GENERATOR PROJECT, CITY PROJECT NO. 84640,** sealed proposals will be received at the office of the City Clerk, City Hall, 501 Primrose Road, Burlingame, California, until 2:00 P.M., on Thursday March 14, 2019 sealed bids will be publicly opened and read at 2:00 P.M. on that date in City Hall Conference Room "A", in the City of Burlingame, San Mateo County, California.

Plans and Specifications covering the work may be obtained by prospective bidders upon application and a cash, check, or credit card non-refundable fee of $50.00, or $55.00 if contract documents are mailed (USPS only), at Public Works Engineering, 501 Primrose Road, Burlingame, CA 94010. Project documents (Read-Only) are available for viewing at *www.burlingame.org/departments/public_works* under Capital Improvement Projects.

The City of Burlingame intends to replace the emergency generator at the City's Police Station located at 1111 Trousdale Drive. The work consists of removal and disposal of the existing generator, purchase and installation of a new generator, and replacement of the automatic transfer switch.

Special Provisions, Specifications and Plans, including prevailing wage rates to be paid in compliance with Section 1773.2 of the California Labor Code and related provisions, may be inspected in the office of the City Engineer during normal working hours at City Hall, 501 Primrose Road, Burlingame, California, and are also available for review at the State of California Department of Industrial Relations' Web site.

A non-mandatory pre-bid meeting associated with this project will be held on Tuesday, March 5, 2019 at 10:00 A.M., at City Hall, 501 Primrose Road – Conference Room B, Burlingame, California.

The Contractor shall possess a Class A or Class C10 license prior to submitting a bid.

No contractors and subcontractor may be listed on the bid proposal for a public works project unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5 [with limited exceptions from this requirement for bid purposes only under Labor Code section 1771.5(a)].

All contractors and subcontractors will be required to furnish electronic certified payroll records directly to the Labor Commissioner (aka Division of Labor Standards Enforcement).

All work specified in this project, shall include the base bid and alternate bids (if shown in Proposal), and shall be completed within **60 of Working Days (WD) (Sixty working days)** from date of the Notice to Proceed.

Kevin Okada, P.E.
Senior Civil Engineer

DATE OF POSTING: 2/19/19

INSTRUCTIONS TO BIDDERS
POLICE STATION EMERGENCY GENERATOR PROJECT
CITY PROJECT NO. 84640

Proposals shall be submitted in accordance with the Special Provisions and these Instructions.

General Instructions

A. Bids shall be made upon the form provided, properly executed and with all items completed. All signatures shall be in longhand.

B. Bids shall not be unbalanced. Any apparent unbalancing of bids may be considered sufficient grounds for rejection of a proposal.

C. A proposal shall cover all items of the bidding schedule. Blank spaces in the bid shall be properly filled in, and the wording thereof must not be changed. Additions shall not be made to the items mentioned therein. Any unauthorized conditions, limitations or provisions attached to a proposal may cause its rejection. Alterations by erasures or interlineation shall be explained or noted in the bid over the signature of the bidder.

D. Late bids will be returned to the bidder unopened.

E. Each bid shall be addressed to the City Clerk of the City of Burlingame, and shall be delivered to the office of the City Clerk of the City of Burlingame, 501 Primrose Road, Burlingame, California 94010, on or before the day and time set for the opening of bids. The bid shall be enclosed in a sealed envelope bearing the title of the project, the name of the bidder, and the date and time of the opening. It is the sole responsibility of the bidder to ensure that the bid is received in proper time at the office of the City Clerk.

F. Cash deposits for Plans and Specifications will not be refunded.

Licensure

All bidders shall have the class of license(s) listed in the Notice Inviting Sealed Bids prior to submitting a bid.

Bidder's Bond

Each bid must be accompanied by cash, a certified or cashier's check, or a bidder's bond in the sum of not less than ten percent (10%) of the total aggregate of the bid, and such a check or bond shall be made payable to the City of Burlingame as set forth in Section 2 of the Special Provisions. If the successful bidder fails to file the bonds or to provide the insurance required by the Contract Documents, or refuses to enter into a contract within the specified time, it shall be liable for any difference by which the cost of procuring the work exceeds the amount of its bid and the bond or the amount of cash or check shall be available to offset such difference.

Examination of Plans, Specifications and Site Work

Before submitting a bid, each bidder shall carefully read the Specifications and all other Contract Documents. The bidder shall visit the site of the Project and shall fully inform itself as to all existing conditions and limitations under which the work is to be performed, and it shall include in its bid a sum to cover the cost of all items necessary to perform the work as set forth in the Contract Documents. No allowance of any kind whatsoever will be made to any bidder because of lack of such examination or knowledge. The submission of a bid shall be conclusive evidence that the bidder has made such an examination. *Bidders shall report any discrepancies in the field conditions or Contract Documents that they discover to the City before bids are opened.*

Competency of Bidder

Any bidder may be required to furnish evidence satisfactory to City that it and its proposed subcontractors have sufficient means and experience in the type of work called for to insure completion of the contract in a satisfactory manner.

Withdrawal of Bid

Any bidder may withdraw its bid, either personally or by a written request, at any time prior to the scheduled time for opening of bids.

Award or Rejection of Bids

The Contract, if awarded, will be awarded to the lowest responsible bidder subject to City's right to reject any or all bids and to waive informalities to the fullest extent provided by law in the bids.

Withdrawal of Bids after Opening

No bidder may withdraw its bid for a period of sixty (60) calendar days after the date set for the opening thereof, and the same shall be subject to acceptance by the City during this period.

Execution of Agreement

The successful bidder, as Contractor shall, within ten (10) calendar days after notice of award, execute and deliver to City one original and one counterpart of the Agreement, which is included in the Contract Documents.

Performance Bond, Labor and Materialpersons Bond, Deposit of Securities

At or prior to the delivery of the signed Agreement, Contractor shall deliver to the City a Faithful Performance Bond and a Contractor's Payment (Labor and Materials) Surety Bond, as are required by the Special Provisions. All bonds shall be in the general forms designated by City, and each shall be in an amount equal to one hundred percent (100%) of the contract price. All bonds shall be approved by the City Attorney before the successful bidder may proceed with the work. Failure or refusal to furnish bonds in the form satisfactory to the City Attorney shall subject the bidder to penalties for delay in commencement of the work or revocation of the award of contract.

Pursuant to Section 22300 of the California Public Contract Code, the Contractor will be permitted, at its request and sole expense, to substitute securities for any monies withheld by the City, as provided in the Special Provisions.

Insurance

At or prior to the delivery of the signed Contract Agreement, Contractor shall deliver to the City the policies of insurance and certificates and endorsements that are required by the Special Provisions. Failure or refusal to furnish insurance policies or certificates in the form satisfactory to the City Attorney shall subject the bidder to penalties for delay in commencement of the work or revocation of the Award of Contract. All policies,

endorsements, and certificates of insurance shall be approved by the City Attorney before the successful bidder may proceed with any work.

Interpretation of Drawings and Documents Prior to Bidding

If any potential bidder is in doubt as to the true meaning of any part of the Plans, Specifications, or other Contract Documents, or finds discrepancies in, or omissions from the Plans or Specifications, it may submit to the City Engineer a written request for an interpretation or correction thereof not later than five working days before the date bids will be opened. The person submitting the request will be responsible for its prompt delivery. Any interpretation or correction of the Contract Documents will be made only by addendum. Bidders shall confirm the existence of any and all addenda. The City will not be responsible for any other explanation or interpretation of the Contract Documents.

Addenda

Addenda issued during the time of bidding shall become a part of the documents furnished to bidders for the preparation of bids, shall be covered in the bids and shall be made a part of the Contract Documents. Each bid shall include specific acknowledgement in the space provided of receipt of all Addenda issued during the bidding period. Failure to do so may result in the bid being rejected and labeled as nonresponsive. Failure of any bidder to receive such Addenda shall not be grounds for non-compliance with the terms of the instructions. It is the responsibility of the Contractor to contact the City to determine the existence of any and all addenda.

Bidders Interested in More than One Bid

No person, firm or corporation shall be allowed to make or file or be interested in more than one bid for the same work, unless alternate bids are called for. A person, firm or corporation submitting a sub-proposal to a bidder, or who has quoted prices on materials to a bidder, is not thereby disqualified from submitting a sub-proposal or quoting prices to other bidders.

Special Notice

Bidders are required to inform themselves fully of the conditions relating to construction and labor under which the work will be or is now performed, and, so far as possible, the successful bidder must employ such methods and means in carrying out his/her work as will not cause any interruption or interference with any other Contractor.

List of Subcontractors

Bidders shall submit a list of their proposed subcontractors in compliance with Sections 4100-4113 of the Public Contract Code of the State of California. A form for this designation is furnished in the Contract Documents.

Additional Sureties

If at any time during the continuance of the contract the Sureties, or any of them, shall, in the opinion of City, be no longer responsible, the City shall have the right to require additional and sufficient Sureties which Contractor shall furnish to the satisfaction of City within ten (10) working days after notice.

Definition of Contract Documents

The term "Contract Documents" is defined in section 1.03 Definitions and Terms of the Special Provisions and in the AGREEMENT FOR PUBLIC IMPROVEMENT. The submission of any bid shall be deemed a thorough and complete understanding of all provisions of the Contract Documents.

Business License

All Contractors, whether they are general Contractors or subcontractors, who transact or carry on business in the City, shall acquire a Business License in conformance with the Burlingame Municipal Code.

Wages

Workers employed in the work must be paid at rates at least equal to the then current prevailing wage scale as determined by the State Director of the Department of Industrial Relations. A copy is on file in the City Department of Public Works, and is also available for review at the State of California Department of Industrial Relations' web site at www.dir.ca.gov/DLSR/PWD.

Pursuant to Labor Code Section 1770 *et. seq*, any Contractor who is awarded a public works project and intends to use a craft or classification not shown on the general prevailing wage determinations, may be required to pay the wage rate of that craft or classification most closely related to it as shown in the general determinations effective at the time of the calls for bids.

Unit Prices

Because unit prices are key elements of bid award and contract administration, in case of discrepancy between the unit price and the total set for a unit basis item, the unit price shall prevail. If, however, the unit price is omitted, ambiguous, unintelligible, or uncertain for any reason, or if it is the same amount as set forth in the "Total" column, then the amount set forth in the "Total" column for the item shall prevail and shall be divided by the estimated quantity to determine the unit price.

GENERAL

POLICE STATION EMERGENCY GENERATOR REPLACEMENT
CITY PROJECT NO. 84640

_____ ____, 20___

TO THE CITY OF BURLINGAME, CALIFORNIA:

Pursuant to the foregoing Notice to Contractors, the undersigned bidder herewith submits its proposal on the Bid Form, Designation of Subcontractors, and Statement of Experience Qualifications, Non-Collusion Declaration, and Statement under Public Contract Code Section 10285.1 attached hereto and made a part hereof, and binds itself on award by the City of Burlingame under this proposal to execute in accordance with such award, a contract, of which this Proposal and the Notice to Contractors, Instructions to Bidders, Special Provisions, Standard Specifications, and Plans and Specifications are hereby made a part of this Proposal and all provisions thereof are hereby accepted.

In submitting this proposal, the bidder has confirmed the existence of any and all addenda and accepts the changes to the contract included in all addenda.

The bidder further agrees that in case of its default in executing the Contract Documents, and providing the required bonds and insurance, the cash, check or Bidder's Bond, accompanying its proposal and the money payable thereon shall be and remain the property of the City of Burlingame, as provided in the Instructions to Bidders and the Special Provisions.

Company name: _____

_____
(Corporate Seal)

Signature _____

Address _____

Contractor's license number: _____

Contractor's telephone no. _____

Contractor's facsimile no. _____

If a corporation, organized under the laws of the state of: _____,

Nature of firm (corporation, partnership, etc.) and names of individual members of the firms, or names and titles of officers of the corporation:

Name _____ Title _____

Name _____ Title _____

Name _____ Title _____

Name _____ Title _____

DESIGNATION OF SUBCONTRACTORS

(Public Contract Code Sections 4100 *et seq.*)
TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID PROPOSAL
POLICE STATION EMERGENCY GENERATOR PROJECT
CITY PROJECT NO. 84640

As a bidder on the above-entitled project, the undersigned hereby designates the subcontractors that will perform work or labor or render services to the Contractor in or about the construction of the project in an amount in excess of one-half (1/2) of one percent (1%) of the Contractor's total bid or $10,000 whichever is greater.

The undersigned understands and agrees that should it fail to specify a subcontractor for any portion of the work as above stated, it agrees that the undersigned is fully qualified to perform that portion of the work itself, and that it shall perform that portion itself. Penalties for failure to comply with this provision are provided in the Subletting and Subcontracting Fair Practices Act commencing with Section 4100 of the Public Contract Code.

Pursuant to Public Contract Code Section 6109, Contractor shall not allow or permit any subcontractor that is ineligible to perform work on a public works project pursuant to Labor Code Section 1777.1 or 1777.7, to perform any work on this Project.

The undersigned agrees that it shall not, without written consent of the City Council, make any substitution, assignment or sublet to or of the following list of subcontractors which is made a part of this proposal and then only after compliance with the provisions of the Subletting and Subcontracting Fair Practices Act. [ATTACH ADDITIONAL PAGES IF NECESSARY]

LIST OF SUBCONTRACTORS

NAME OF SUBCONTRACTOR	ADDRESS OF SUBCONTRACTOR	STATE CONTRACTORS LICENSE #	DIR REGISTRATION #	WORK TO BE DONE BY SUBCONTRACTOR

NAME OF BIDDER: _____

Signature: _____

STATEMENT OF EXPERIENCE QUALIFICATIONS

TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID PROPOSAL
POLICE STATION EMERGENCY GENERATOR PROJECT
CITY PROJECT NO. 84640

The following statement as to experience qualifications of the bidder is submitted in conjunction with the Proposal, as a part thereof, and the truthfulness and accuracy of the information is guaranteed by the Bidder.

The bidder has been engaged in the contracting business, under the present business name, for a minimum of two years. Experience in work of a nature similar to that covered in the proposal extends over a period of two years with a minimum of five projects.

The bidder, as a contractor, has never failed to satisfactorily complete a contract awarded to it, except as follows:

_____

_____

The following contracts have been satisfactorily completed in the last three years for the persons, firm or authority indicated, and to whom reference is made:

YEAR	TYPE OF WORK PROJECT NAME	CONTRACT AMOUNT	LOCATION	FOR WHOM PERFORMED	CONTACT NAME AND PHONE NO.

The following is a list of plant and equipment owned by the bidder, which is definitely available for use on the proposed work as required:

QUANTITY	NAME, TYPE, CAPACITY	CONDITION	LOCATION

NAME OF BIDDER: _____

Signature: _____

NON-COLLUSION DECLARATION

(PUBLIC CONTRACT CODE SECTION 7106)
TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID PROPOSAL
POLICE STATION EMERGENCY GENERATOR PROJECT
CITY PROJECT NO. 84640

I, _____, declare under penalty of perjury that I am (sole owner, partner, president, etc.) 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 or 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.

I declare under penalty of perjury that the foregoing is true and correct and this was executed on the date shown below at _____.
(City, State)

Dated: _____

NAME OF BIDDER: _____

Signature _____

PUBLIC CONTRACT CODE SECTION 10285.1 STATEMENT

TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID
POLICE STATION EMERGENCY GENERATOR PROJECT
CITY PROJECT NO. 84640

In accordance with Public Contract Code Section 10285.1 (Stats. 1985, Ch. 376), the bidder hereby declares under penalty of perjury under the laws of the State of California that the bidder has_____, has not _____ been convicted within the preceding three years of any offenses referred to in that section, including any charge of fraud, bribery, collusion, conspiracy, or any other act in violation of any state or federal antitrust law in connection with the bidding upon, award of, or performance of, any public works contract, as defined in Public Contract Code Section 1101, with any public entity, as defined in Public Contract Code Section 1100, including the Regents of the University of California or the Trustees of the California State University. The term "bidder" is understood to include any partner, member, officer, director, responsible managing officer, or responsible managing employee thereof, as referred to in Section 10285.1.

[NOTE: THE BIDDER MUST PLACE A CHECK MARK AFTER "HAS" OR "HAS NOT" IN ONE OF THE BLANK SPACES ABOVE.]

The above Statement is part of the Proposal. Bidders are warned that making a false certification may subject the certifier to criminal prosecution.

I declare under penalty of perjury that the foregoing is true and correct and this was executed on the date shown below at _____.
(City, State)

Dated: _____

NAME OF BIDDER: _____

Signature _____

PUBLIC CONTRACT CODE SECTION 10162 QUESTIONNAIRE

TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID PROPOSAL

In accordance with Public Contract Code Section 10162, the Bidder shall complete, under penalty of perjury, the following questionnaire:

Has the bidder, any officer of the bidder, or any employee of the bidder who has a proprietary interest in the bidder, ever been disqualified, removed, or otherwise prevented from bidding on, or completing a federal, state, or local government project because of a violation of law or a safety regulation?

No_____ Yes_____

If the answer is yes, explain the circumstances below:

I declare under penalty of perjury that the foregoing is true and correct and this was executed on the date shown below at _____.
(City, State)

Dated: _____

NAME OF BIDDER: _____

Signature _____

Public Contract Code 10232 Statement

In accordance with Public Contract Code Section 10232, the Contractor, hereby states under penalty of perjury, that no more than one final unappealable finding of contempt of court by a federal court has been issued against the Contractor within the immediately preceding two year period because of the Contractor's failure to comply with an order of a federal court which orders the Contractor to comply with an order of the National Labor Relations Board.

Note: The above Statement and Questionnaire are part of the Proposal. Signing this Proposal on the signature portion thereof shall also constitute signature of this Statement and Questionnaire. Bidders are cautioned that making a false certification may subject the certifier to criminal prosecution.

I declare under penalty of perjury that the foregoing is true and correct and this was executed on the date shown below at _____.
(City, State)

Dated: _____

NAME OF BIDDER: _____

Signature _____

POLICE STATION
EMERGENCY GENERATOR REPLACEMENT
City Project No. 84640

BID SCHEDULE

Item No.	Description	Quantity	Unit	Unit Price	Item Price
1	Mobilization / Demobilization	LS	LS		
2	Remove Existing Generator including and not limited to transportation and disposal of generator and auxiliary apparatus; removing and disposing of existing exhaust piping; removing and disposing of all fuel in existing underground storage tank and abandoning tank in place; disconnecting, capping and abandoning existing fuel lines; and removing and disposing of existing building facilities associated with the existing generator.	LS	LS		
3	Purchase and Install new Generator. Including but not limited to housekeeping pad; design and installation of all anchorage and braces; exhaust piping; silencer; building and roof modifications; conduits and wiring; startup, testing and training; Bay Area Air Quality Management District permits to construct and operate; and all auxiliary apparatus and accessories required for a fully functional engine generator.	LS	LS		
4	Replace Automatic Transfer Switch including but not limited to all required conduits, wires and testing.	LS	LS		
5	Provide and Install temporary backup power during construction including but not limited to protable generator and all equipment and wiring.	LS	LS		
6	Remote Monitoring System including but not limited to installation, startup and testing of wireless network enabled monitor.	LS	LS		
	Total Base Bid for Items 1 - 6				**$**

The successful lowest responsible bidder will be determined on the basis of the lowest Total Base Bid amount.

BIDDING CONTRACTOR'S SIGNATURE _____

BIDDING CONTRACTOR'S NAME _____

CONTRACTOR'S LICENSE NO. _____ EXPIRATION DATE _____

CONTRACTOR'S ADDRESS _____

CONTRACTOR'S TELEPHONE NO. _____

DATE: _____

NOTES:

1. A proposal must include a total estimated amount together with an estimated amount for each item listed herein. Failure to do so may cause the proposal to be considered nonresponsive.

2. All quantities are estimated except where the unit is given as "LS".

3. Job prices shall cover all work complete and finished in accordance with the Contract Documents.

AGREEMENT FOR PUBLIC IMPROVEMENT

POLICE STATION EMERGENCY GENERATOR REPLACEMENT

CITY PROJECT NO. 84640

THIS AGREEMENT, made in duplicate and entered into in the City of Burlingame, County of San Mateo, State of California on _____, 2019 by and between the CITY OF BURLINGAME, a Municipal Corporation, hereinafter called "City", and _____, a [State of incorporation] [Corporation or other form of business], hereinafter called "Contractor."

WITNESSETH:

WHEREAS, City has taken appropriate proceedings to authorize construction of the public work and improvements herein provided for and to authorize execution of this Contract; and

WHEREAS, pursuant to State law and City requirements, a notice was duly published for bids for the contract for the improvement hereinafter described; and

WHEREAS, on _____, after notice duly given, the City Council of Burlingame awarded the contract for the construction of the improvements hereinafter described to Contractor, which the Council found to be the lowest responsive, responsible bidder for these improvements; and

WHEREAS, City and Contractor desire to enter into this Agreement for the construction of said improvements.

NOW, THEREFORE, IT IS AGREED by the parties hereto as follows:

1. Scope of work.

Contractor shall perform the work described in those Contract Documents entitled: EMERGENCY GENERATOR REPLACEMENT, CITY PROJECT NO. 84640.

2. The Contract Documents.

The complete contract between City and Contractor consists of the following documents: this Agreement; Notice Inviting Sealed Bids, attached hereto as Exhibit A; the accepted Bid Proposal, attached hereto as Exhibit B; the specifications, provisions, addenda, complete plans, profiles, and detailed drawings contained in the bid documents titled “Emergency Generator Replacement, City Project No. 84640” attached

as Exhibit C; the State of California Standard Specifications 2010, as promulgated by the California Department of Transportation; prevailing wage rates of the State of California applicable to this project by State law; and all bonds; which are collectively hereinafter referred to as the Contract Documents. All rights and obligations of City and Contractor are fully set forth and described in the Contract Documents, which are hereby incorporated as if fully set forth herein. All of the above described documents are intended to cooperate so that any work called for in one, and not mentioned in the other, or vice versa, is to be executed the same as if mentioned in all said documents.

3. Contract Price.

The City shall pay, and the Contractor shall accept, in full, payment of the work above agreed to be done, the sum of _____ dollars ($_____), called the "Contract Price". This price is determined by the lump sum and unit prices contained in Contractor's Bid. In the event authorized work is performed or materials furnished in addition to those set forth in Contractor's Bid and the Specifications, such work and materials will be paid for at the unit prices therein contained. Said amount shall be paid in progress payments as provided in the Contract Documents.

4. Termination

At any time and with or without cause, the City may suspend the work or any portion of the work for a period of not more than 90 consecutive calendar days by notice in writing to Contractor that will fix the date on which work will be resumed. Contractor will be granted an adjustment to the Contract Price or an extension of the Time for Completion, or both, directly attributable to any such suspension if Contractor makes a claim therefor was provided in the Contract Documents.

The occurrence of any one or more of the following events will justify termination of the contract by the City for cause: (1) Contractor's persistent failure to perform the work in accordance with the Contract Documents; (2) Contractor's disregard of Laws or Regulations of any public body having jurisdiction; (3) Contractor's disregard of the authority of the Engineer; or (4) Contractor's violation in any substantial way of any provision of the Contract Documents. In the case of any one or more of these events, the City, after giving Contractor and Contractor's sureties seven calendar days written notice of the intent to terminate Contractor's services, may initiate termination procedures under the provisions of the Performance Bond. Such termination will not affect any rights or remedies of City against Contractor then existing or that accrue

thereafter. Any retention or payment of moneys due Contractor will not release Contractor from liability. At the City's sole discretion, Contractor's services may not be terminated if Contractor begins, within seven calendar days of receipt of such notice of intent to terminate, to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 calendar days of such notice.

Upon seven calendar days written notice to Contractor, City may, without cause and without prejudice to any other right or remedy of City, terminate the Contract for City's convenience. In such case, Contractor will be paid for (1) work satisfactorily completed prior the effective date of such termination, (2) furnishing of labor, equipment, and materials in accordance with the Contract Documents in connection with uncompleted work, (3) reasonable expenses directly attributable to termination, and (4) fair and reasonable compensation for associated overhead and profit. No payment will be made on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

5. Provisions Cumulative.

The provisions of this Agreement are cumulative and in addition to and not in limitation of any other rights or remedies available to the City.

6. Notices.

All notices shall be in writing and delivered in person or transmitted by certified mail, postage prepaid.

Notices required to be given to the City shall be addressed as follows:

Mr. Kevin Okada
Senior Engineer
City of Burlingame
501 Primrose Road
Burlingame, California 94010

Notices required to be given to Contractor shall be addressed as follows:

Name
Company Name
Address

7. Interpretation

As used herein, any gender includes the other gender and the singular includes the plural and vice versa.

8. Waiver or Amendment.

No modification, waiver, mutual termination, or amendment of this Agreement is effective unless made in writing and signed by the City and the Contractor. One or more waivers of any term, condition, or other provision of this Agreement by either party shall not be construed as a waiver of a subsequent breach of the same or any other provision.

9. Controlling Law.

This Agreement is to be governed by and interpreted in accordance with the laws of the State of California.

10. Successors and Assignees.

This Agreement is to be binding on the heirs, successors, and assigns of the parties hereto but may not be assigned by either party without first obtaining the written consent of the other party.

11. Severability.

If any term or provision of this Agreement is deemed invalid, void, or unenforceable by any court of lawful jurisdiction, the remaining terms and provisions of the Agreement shall not be affected thereby and shall remain in full force and effect.

12. Indemnification.

Contractor shall indemnify, defend, and hold the City, its directors, officers, employees, agents, and volunteers harmless from and against any and all liability, claims, suits, actions, damages, and causes of action arising out of, pertaining or relating to the actual or alleged negligence, recklessness or willful misconduct of Contractor, its employees, subcontractors, or agents, or on account of the performance or character of the services, except for any such claim arising out of the sole negligence or willful misconduct of the City, its officers, employees, agents, or volunteers. It is understood that the duty of Contractor to indemnify and hold harmless includes the duty to defend as set forth in section 2778 of the California Civil Code. Notwithstanding the foregoing, for any design professional services, the duty to defend and indemnify City shall be limited to that allowed by state law. Acceptance of insurance certificates and endorsements required under this Agreement does not relieve Contractor from liability under this indemnification and hold harmless clause. This indemnification and hold

harmless clause shall apply whether or not such insurance policies shall have been determined to be applicable to any of such damages or claims for damages.

IN WITNESS WHEREOF, two identical counterparts of this Agreement, consisting of five pages, including this page, each of which counterparts shall for all purposes be deemed an original of this Agreement, have been duly executed by the parties hereinabove named on the day and year first hereinabove written.

CITY OF BURLINGAME,
a Municipal Corporation

"CONTRACTOR"

By _____
Lisa K. Goldman, City Manager

By _____
Print Name:
Company Name:

Approved as to form:

_____
Kathleen Kane, City Attorney

ATTEST:

_____
Meaghan Hassel-Shearer, City Clerk

CITY OF BURLINGAME

DEPARTMENT OF PUBLIC WORKS

SPECIAL PROVISIONS

FOR

POLICE STATION GENERATOR REPLACEMENT PROJECT
CITY PROJECT NO. 84640

GENERAL CONDITIONS

SECTION 1. DEFINITIONS AND TERMS

1.01 General

The following shall be added to Standard Specifications Section 1-1.01:

The work contemplated herein shall be done in accordance with these Specifications as defined in the Special Provisions Section 1.03, and the Municipal Code of the City of Burlingame, insofar as the same may apply and in accordance with the following Special Provisions.

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

1.02 Abbreviations

Abbreviations of the Standard Specifications shall be amended to include the following:

AIA	American Institute of Architects
APWA	American Public Works Association
ASA	American Standard Association
CSI	Construction Specifications Institute
IAMPO	International Association of Mechanical & Plumbing Officials
ICBO	International Conference of Building Officials
UBC	Uniform Building Code
UPC	Uniform Plumbing Code

1.03 Definitions and Terms

The definitions in Standard Specifications Section 1-1.07B are amended as follows:

As used herein, unless the context otherwise requires, the following terms have the following meanings:

Agency: The legal entity for which the work is being performed.

Authorized Laboratory: The laboratory authorized by the Engineer to test materials and work involved in the contract.

Contract Documents: The Contract Documents shall include the complete contract between City and Contractor, which shall consist of the following documents: the Agreement and Notice Inviting Sealed Bids; the accepted Bid Proposal; the specifications, provisions, addenda, complete plans, profiles, and detailed drawings contained in the bid documents entitled "Police Station Emergency Generator Project, City Project No. 84640"; the State of California Standard Specifications 2010, as promulgated by the California Department of Transportation; prevailing wage rates of the State of California applicable to this project by State law; and all bonds. All rights and obligations of City and Contractor are fully set forth and described in the Contract Documents, which are hereby incorporated as if fully set forth herein. All of the above described documents are intended to cooperate so that any work called for in one, and not mentioned in the other, or vice versa, is to be executed the same as if mentioned in all said documents. In case of any inconsistencies among the various documents, the Agreement shall prevail.

Contract Acceptance: The formal written contract acceptance of an entire contract by the City Council at a regularly scheduled meeting, recorded in the County of San Mateo Recorder's Office, titled "Notice of Completion," signed by an authorized official of the City of Burlingame, which has been completed in all respects in accordance with the plans and specifications and any modification thereof previously approved.

City: The City of Burlingame, State of California.

Department: The Department of Public Works of the City of Burlingame.

Director: The Director of Public Works of the City of Burlingame, California.

Engineer: The City Engineer of the City of Burlingame, State of California, acting either directly or through properly authorized agents, such agents acting within the scope of the particular duties entrusted to them.

Inspector: An inspector employed or retained by the City to perform inspection during construction of the work under the direction of the Director.

Legal Holiday: A holiday as specified in Section 5.04 of these Special Provisions.

Owner: The City of Burlingame, a political subdivision of the State of California.

Plans: Standard plans, revised standard plans and project plans.

1. **Project plans**: Drawings specific to the project, including authorized shop drawings.
2. **Standard plans:** *2010 California Department of Transportation Standard Plans, City of Burlingame Standard Details,* and any other local agency or district standard plans or details referenced in project plans.

The California Department of Transportation standard plans are available at:
http://www.dot.ca.gov/hq/esc/oe/construction_standards.html

The City of Burlingame Standard Details are available at: https://www.burlingame.org/departments/public_works/city_standard_details.php

Specifications: Standard specifications, and special provisions, as follows:

1. **Special Provisions:** Specifications specific to the project. These specifications are in a section titled *Special Provisions* of this bid book titled *Notice to Bidders/Proposal and Agreement/Special Provisions*.

2**. Standard Specifications:** Specifications standard to City construction projects. These specifications are in a book titled State of California Department of Transportation *Standard Specifications 2010* (Standard Specifications or SS). These standard specifications are available at:

www.dot.ca.gov/hq/esc/oe/construction_contract_standards/std_specs/2010_StdSpecs/2010_StdSpecs.pdf

Any reference therein to the State of California or a State agency, office or officer, acting under the Standard Specifications shall be interpreted to refer to the City or its corresponding agency, office or officer acting under this contract.

State: In references where context applies to "State" as the owner of the Project, the City of Burlingame.

Supplementary General Conditions: The part of the Contract Documents that makes additions, deletions, or revisions to these General Conditions.

Technical Specifications: Those portions of the Contract Documents consisting of the written technical descriptions of products and execution of the Work.

Work: The entire completed construction required to be furnished under the Contract Documents. Work is the result of performing services, furnishing labor, and furnishing and incorporating materials and equipment into the construction, all as required by the Contract Documents.

*** END OF SECTION ***

SECTION 2. BIDDING

2.01 General

The bidder's attention is directed to the provisions in Section 2, "Bidding," of the Standard Specifications and these Special Provisions for the requirements and conditions which it shall observe in the preparation of the proposal form and the submission of the bid.

The following Sections in the Standard Specifications are deleted:

2-1.15, "Disabled Veterans Business Enterprises".
2-1.18, "Small Business and Non-small Business Subcontracting Preferences".
2-1.27, "California Companies"

2.02 Subcontractor List

Standard Specifications Section 2-1.10, “Subcontractor List,” is replaced by the following:

2-1.10 SUBCONTRACTOR LIST

On the Subcontractor List form, list each subcontractor to perform work in an amount in excess of 1/2 of 1 percent of the total bid or $10,000, whichever is greater (Pub Cont Code § 4100 et seq.).

For each subcontractor listed, the Subcontractor List form must show:

1. Business name and the location of its place of business.
2. California contractor license number for a non-federal-aid contract.
3. Public works contractor registration number
4. Portion of work it will perform.

2.03 Proposal Pages

Standard Specifications Section 2-1.33, “Bid Document Completion” is amended to provide that the bid documents shall include the required proposal pages or copies thereof completed and signed, including Proposal to the City of Burlingame, Designation of Subcontractors, Experience Qualifications, Non-Collusion Declaration, Public Contract Code Compliance Statement and Questionnaire, and Bid Sheet in these Special Provisions.

2.04 Compliance Statement

The Contractor shall complete a statement indicating compliance with Public Works Contracts Code Section 10285.1 and Public Contract Code Section 10162 Questionnaire. These documents shall be completed and included in the Proposal.

2.05 Bidder's Security

Standard Specifications Section 2-1.34, “Bidder’s Security” is replaced with the following:

If Contractor’s bid is greater than $25,000, a Contractor shall submit bid with one of the following forms of bidder's security equal to at least 10 percent of the bid:

1. Cashier's check
2. Certified check
3. Signed bidder’s bond by an admitted surety insurer

A sample bid bond is provided at the end of this Section.

Bidders shall submit a cashier’s check, a certified check, or a bidder’s bond to the City before the bid opening time. The bidder's security shall be made payable to the City of Burlingame.

*** END OF SECTION ***

BIDDER'S BOND

KNOW ALL PERSONS BY THESE PRESENTS:

That we, as Principal, and _____ _____ as Surety, are held and firmly bound unto the City of Burlingame, a municipal corporation of the State of California (hereinafter called "City") in the penal sum of ten percent (10%) of the total aggregate amount of the bid of the Principal above named, submitted by said Principal to the City for the work described below, for the payment of which sum in lawful money of the United State, well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents. In no case shall the liability of the Surety hereunder exceed the sum of _____($_____) Dollars.

The condition of this obligation is such that a bid to the City for certain construction specifically described as follows, for which bids are to be opened on _____, _____, 20___, at ___:_____, has been submitted by Principal to City:

NOW THEREFORE, if the Principal is awarded the Contract and within the time and manner required under the Specifications, after the prescribed forms are presented to the Principal for signature, enters into a written contract, in the prescribed form, in accordance with the bid, and files two bonds with the City, one to guarantee faithful performance of the Contract and the other to guarantee payment for labor and materials as provided by law as well as files insurance certificates and equal employment opportunity documentation required under the bid, then this obligation shall be null and void; otherwise, it shall remain in full force.

In the event suit is brought upon said bond by City, and judgment is recovered, the Surety shall pay all costs incurred by City in such suit, including a reasonable attorney's fee to be fixed by the Court.

IN WITNESS WHEREOF, we have hereunto set our hands and seals on this day of _____, 20 ____.

_____(Seal)

_____(Seal)

_____(Seal)

_____(Seal)

_____(Seal)

_____

_____

NOTE: Attach notary acknowledgment for signatures of those executing for Principal and Surety

SECTION 3. AWARD AND EXECUTION OF CONTRACT

3.01 General

The bidder's attention is directed to the provisions of Standard Specifications Section 2, "Bidding," and Section 3 "Contract Award and Execution," , and to "Proposal Requirements and Conditions," of these Special Provisions for the requirements and conditions concerning award and execution of the contract, with the following clarifications, changes and additions.

The second paragraph of Standard Specifications Section 3-1.02A, “General,” is replaced with the following:

In the case of unit basis items, the amount set forth under the "Item Total" column shall be the product of the unit price bid and the estimated quantity for the item.
In case of discrepancy between the unit price and the total set forth for a unit basis item, the unit price shall prevail, except as provided in (a) or (b), as follows:

(a) If the amount set forth as a unit price is unreadable or otherwise unclear, or is omitted, or is the same as the amount as the entry in the item total column, then the amount set forth in the item total column for the item shall prevail and shall be divided by the estimated quantity for the item and the price thus obtained shall be the unit price;

(b) (Decimal Errors) If the product of the entered unit price and the estimated quantity is exactly off by a factor of ten, one hundred, etc., or one-tenth, or one-hundredth, etc. from the entered total, the discrepancy will be resolved by using the entered unit price or item total, whichever most closely approximates percentagewise the unit price or item total in the Agency's Engineer Estimate of cost.

If both the unit price and the item total are unreadable or otherwise unclear, or are omitted, the bid may be deemed irregular. Likewise if the item total for a lump sum item is unreadable or otherwise unclear, or is omitted, the bid may be deemed irregular unless the project being bid has only a single item and a clear, readable total bid is provided.

Symbols such as commas and dollar signs will be ignored and have no mathematical significance in establishing any unit price or item total or lump sums. Cents symbols also have no significance in establishing any unit price or item total because all figures are assumed to be expressed in dollars and/or decimal fractions of a dollar. Written unit prices, item totals and lump sums will be interpreted according to the number of digits and, if applicable, decimal placement. Bids on lump sum items shall be item totals only; if any unit price for a lump sum item is included in a bid and it differs from the item total, the items total shall prevail.

Standard Specifications Section 3-1.02B, “Tied Bids,” is replaced with:

3-1.02B Tied Bids

The Department breaks a tied bid with a coin toss.

Standard Specifications Sections 3-1.08, "Small Business Participation Report,” and 3-1.11, "Payee Data Record,” are deleted.

3.02 Award of Contract

To the fullest extent provided by law, the City reserves the right to waive any irregularities and/or informalities in any bid received.

The award of the contract, if it be awarded, will be to the lowest responsive and responsible bidder whose proposal complies with all the requirements prescribed. Such award, if made, will be made within forty-five (45) days after the opening of the proposals. If the lowest responsible bidder refuses or fails to execute the contract, the City may award the contract to the second lowest responsive and responsible bidder. Such award, if made, will be made within sixty (60) days after the opening of proposals. If the second lowest responsible bidder refuses or fails to execute the contract, the City may award the contract to the third lowest responsive and responsible bidder. Such award, if made, will be made within seventy-five (75) days after the opening of the proposals. The periods of time specified above within which the award of contract may be made shall be subject to extensions for such further periods as may be agreed upon in writing between the City and the bidder concerned.

All bids will be compared on the basis of the Engineer's Estimate of the quantities of work to be done.

3.03 Contract Bonds

Standard Specifications Section 3-1.05, “Contract Bonds (Pub Cont Code Sections 10221 and 10222),” is replaced with the following:

The surety or sureties on all bonds furnished must be approved by the City. Any modifications or alteration made in the plans or specifications shall not operate to release any surety from liability on any bond or bonds herein required to be given. All contract bonds shall be payable to the City of Burlingame and shall reference the project name and number.

All alterations, extensions of time, extra and additional work, and other changes authorized by these specifications or any part of the contract may be made without securing the consent of the surety or sureties on the contract bonds.

(a) Faithful Performance Bond

Contractor shall provide, at the time of the execution of the contract for the work, and at its own expense, a surety bond in an amount equal to at least one hundred percent (100%) of the contract price as security for the faithful performance of the contract.

(b) Contractor's Payment (Labor and Materials) Surety Bond
Contractor shall also provide, at the time of the execution of the contract for the work, and at its own expense, a separate surety bond in an amount equal to at least one hundred percent (100%) of the contract price as security for the payment of all persons performing labor and furnishing materials in connection with this contract; a sample is attached at the end of this section.

(c) Maintenance Bond
The Contractor shall furnish a Corporate Surety Maintenance Bond for faulty workmanship and materials in the amount of ten percent (10%) of the total contract cost. This bond shall be for the term of one year after completion and acceptance of the work and shall be delivered to the Engineer before acceptance of the contract.

3.04 Agreement Execution

The Contractor shall sign and return the contract agreement and furnish required bonds and insurance certificates within ten (10) working days after the date of the letter of Notice of Contract Award. If the insurance and bonds are not provided within this time period, the City may proceed to declare the bid bond forfeited and award the bid to another bidder.

3.05 Return of Proposal Guaranties

Bidders' attention is directed to Standard Specifications Section 3-1.19, "Bidders' Securities."

3.06 Insurance

BIDDERS' ATTENTION IS DIRECTED TO THE INSURANCE REQUIREMENTS BELOW AND IN STANDARD SPECIFICATIONS SECTIONS 3-1.07, "INSURANCE POLICIES," and 7-1.06, "INSURANCE."

IT IS HIGHLY RECOMMENDED THAT BIDDERS CONFER WITH THEIR RESPECTIVE INSURANCE CARRIERS OR BROKERS TO DETERMINE IN ADVANCE OF BID SUBMISSION THE AVAILABILITY OF INSURANCE CERTIFICATES AND ENDORSEMENTS AS PRESCRIBED AND PROVIDED HEREIN. IF AN APPARENT LOW BIDDER FAILS TO COMPLY STRICTLY WITH THE INSURANCE REQUIREMENTS, THAT BIDDER MAY BE DISQUALIFIED FROM AWARD OF THE CONTRACT OR THE AWARD MAY BE REVOKED AND SUFFER LOSS OF BID BOND.

Contractor shall procure and maintain for the duration of the Contract insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the work hereunder by the Contractor, Contractor's agents, representatives,

employees or subcontractors. The cost of such insurance shall be included in the Contractor's bid.

Standard Specifications Section 7-1.06, “Insurance,” is amended to include the following:

(a) Minimum Scope of Insurance

Coverage shall be at least as broad as:

(1) Insurance Services Office form number GL 0002 (Ed. 1/73) covering Comprehensive General Liability and Insurance Services Office form number GL 0404 covering Broad Form Comprehensive General Liability; or Insurance Services Office Commercial General Liability coverage ("occurrence" form GC 0001).

(2) Insurance Services Office form number CA 0001 (Ed. 1/78) covering Automobile Liability, code 1 "any auto" and endorsement CA 0025.

(3) Worker's Compensation insurance as required by the Labor Code of the State of California and Employers Liability insurance.

(b) Minimum Limits of Insurance

Contractor shall maintain limits no less than:

(1) General Liability: $2,000,000 combined single limit per occurrence for bodily injury, personal injury and property damage. If Commercial General Liability Insurance or other form with a general aggregate limit is used, either the general aggregate limit shall apply separately to this Project/location or the general aggregate limit shall be twice the required occurrence limit.

(2) Automobile Liability: $1,000,000 combined single limit per accident for bodily injury and property damage.

(3) Workers' Compensation and Employers Liability: Worker's compensation limits as required by the Labor Code of the State of California and Employers Liability limits of $1,000,000 per accident.

(c) Deductibles and Self-insured Retentions

Any deductibles or self-insured retentions must be declared to and approved by the City. At the option of the City, either: the insurer shall reduce or eliminate such deductibles or self-insured retentions as respects the City, its officers, officials, employees and volunteers; or the Contractor shall procure a bond guaranteeing payment of losses and related investigations, claim administration, and defense expenses.

(d) Other Insurance Provision

The policies are to contain, or be endorsed to contain the following provision:

(1) General Liability and Automobile Liability Coverages

(A) The City of Burlingame, its officers, officials, employees and volunteers are to be covered as insureds as respects: liability arising out of activities performed by or on behalf of the Contractor, products and completed operations of the Contractor, premises owned, occupied or used by the Contractor, or automobiles owned, leased, hired or borrowed by the Contractor. The coverage shall contain no special limitations on the scope of protection afforded to the City of Burlingame, its officers, officials, employees, or volunteers. The endorsement providing this additional insured coverage shall be equal to or broader than ISO Form CG 20 10 11 85 and must cover joint negligence, completed operations, and the acts of subcontractors.

(B) The Contractor's insurance coverage shall be primary insurance as respects the City of Burlingame, its officers, officials, employees, and volunteers. Any insurance or self-insurance maintained by the City of Burlingame, its officers, officials, employees, or volunteers shall be excess of the Contractor's Insurance and shall not contribute with it.

(C) Any failure to comply with reporting provisions of the policies shall not affect coverage provided to the City of Burlingame, its officers, officials, employees, or volunteers.

(D) The Contractor's insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability.

(2) Workers' Compensation and Employers Liability Coverage

The insurer shall agree to waive all rights of subrogation against the City of Burlingame, its officers, officials, employees, or volunteers for losses arising from work performed by the Contractor for the City of Burlingame.

(3) All Coverages

Each insurance policy required by this clause shall be endorsed to state that coverage shall not be suspended, voided, canceled by either party, reduced in coverage or in limits except after thirty days prior written notice by certified mail, return receipt required, has been given to the City of Burlingame.

(e) Acceptability of Insurers

Insurance is to be placed with insurers with a Best's rating of no less than A-:VII and be authorized to conduct business with regard to the profferred lines of insurance in the State of California.

(f) Verification of Coverage

Contractor shall furnish the City with certificates of insurance and with original endorsements effecting coverage required by this clause. The certificates and endorsements for each insurance policy are to be signed by a person authorized by that insurer to bind coverage on its behalf. The certificates and endorsements are to be on forms approved by the City. All certificates and endorsements are to be received and approved by the City before work commences. The City reserves the right to require complete, certified copies of all required insurance policies, at any time.

(g) Subcontractors

Contractor shall include all subcontractors as insureds under its policies or shall furnish separate certificates and endorsements for each subcontractor. All coverages for subcontractors shall be subject to all of the requirements stated herein.

*** END OF SECTION ***

CONTRACTOR'S PAYMENT (LABOR AND MATERIALS) SURETY BOND
Sample

WHEREAS, the City Council of the City of Burlingame, State of California ("City") and _____, (hereinafter designated as "Principal") have entered into an agreement dated _____, and identified as _____("Agreement"), which is hereby referred to and made a part here of, whereby Principal agrees to install and complete certain designated public improvements; and

WHEREAS, under the terms of said agreement, Principal is required before entering upon the performance of the work to file a good and sufficient payment surety bond with City to secure the claims to which reference is made in Titles 1 and 3 (commencing with Section 8000) of Part 6 of Division 4 of the Civil Code of the State of California.

NOW, THEREFORE, Principal and _____, as Surety, incorporated under the laws of the State of _____, and duly authorized to transact business as an admitted surety, under the Laws of the State of California, are held and firmly bound unto City in the penal sum of _____ dollars ($_____), this amount being not less than one hundred percent of the total amount payable by the terms of the Agreement per Civil Code section 9554, for the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

The condition of this obligation is such that if Principal, Principal's subcontractors, heirs, executors, administrators, successors, or assigns shall fail to pay any of the persons, companies, or corporations, referred to in Section 9100 of the California Civil Code, as amended, with respect to any work of labor performed or materials supplied by any such persons, companies, or corporations, which work, labor, or materials are covered by the above-mentioned agreement and any amendments, changes, change order, additions, alterations, or modifications thereof, or any amounts due under the California Unemployment Insurance Code with respect to such work or labor, or for any amounts required to be deducted, withheld, and paid over to the Employment Development Department from the wages of employees of the Principal and its subcontractors pursuant to Section 13020 of the Unemployment Insurance Code, as amended, with respect to such work and labor, the Surety will pay for the same, in an amount not exceeding the sum herein above specified, and also, in case suit is brought upon this bond, the Surety will pay reasonable attorney's fees in an amount to be fixed by the court.

It is hereby expressly stipulated and agreed that this surety bond shall inure to the benefit of any and all persons, companies, and corporations entitled named in Section 9100 of the California Civil Code, as amended, so as to give a right of action to them or their assigns in any suit brought upon this surety bond.

The Surety hereby stipulates and agrees that no amendment, change, change order, addition, alteration, or modifications to the terms of the agreement of the work to be performed thereunder or the specifications accompanying the same, shall in any way affect its obligations on this surety

bond, and it does hereby waive notice of any such amendment, change, change order, addition, alteration, or modification to the terms of the agreement or to the work performed thereunder or to the specifications accompanying the same. Surety hereby waives the provisions of California Civil Code Sections 2845 and 2849.

IN WITNESS WHEREOF, this instrument has been duly executed by the Principal and Surety above named, on _____, 20___.

PRINCIPAL SURETY

By:_____ By:

_____
Address

NOTE: Attach notary acknowledgement for signatures of those executing for Principal and Surety

FAITHFUL PERFORMANCE BOND

Sample

WHEREAS, the City Council of the City of Burlingame, State of California, and _____ (herein designated as "Principal") have entered into an Agreement whereby Principal agrees to construct and complete certain designated public improvements, which said agreement, dated_____, 20_____, and identified as **PROJECT** # _____, is hereby referred to and made a part hereof: and

WHEREAS, said Principal is required under the terms of said Agreement to furnish a bond of the faithful performance of said Agreement.

NOW, THEREFORE, we, the Principal and _____, as Surety, are held and firmly bound unto the City of Burlingame (hereinafter called "City"), in the penal sum of _____dollars ($_____) lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, successors, executors and administrators, jointly and severally, formally by these presents.

The condition of this obligation is such that if the above bounded Principal, his/her or its heirs, executors, administrators, successors or assigns, shall in all things stand to and abide by, and well and truly keep and perform the covenants, conditions and provisions in the said Agreement and any alteration thereof made as therein provided, on his or their part, to be kept and performed at the time and in the manner therein specified, and in all respects according to their true intent and meaning, and shall indemnify and save harmless City, its offices, agents and employees, as therein stipulated, and this obligation shall become null and avoid; otherwise it shall be and remain in full force and effect.

Principal and Surety further agree that upon City's final acceptance of the work, ten percent (10 %) of this bond shall remain in effect to guarantees the repair and/or replacement of defective materials and/or workmanship, one years after City's final acceptance of the work.

As a part of the obligation secured hereby and in addition to the face amount specified therefor, there shall be included costs and reasonable expenses and fees, including reasonable attorney's fees, incurred by City in successfully enforcing such obligation, all to be taxed as costs and included in any judgment rendered.

The Surety hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the agreement or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligations on this bond, and it

does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the agreement or to the work or to the specifications.

IN WITNESS WHEREOF, this instrument has been duly executed by the Principal and Surety above named, on_____20_____.

PRINCIPAL	SURETY
By:_____	By:_____
_____	_____
Address	Address

NOTE: Attach notary acknowledgement for signatures of those executing for Principal and Surety.

SECTION 4. SCOPE OF WORK

4.01 General

Attention is directed to Standard Specifications Section 4, “Scope of Work,” and these Special Provisions.

4.02 Value Engineering

The last paragraph of Section Standard Specifications 4-1.07C, “Value Analysis Workshop.” is replaced with:

> The Contractor will be responsible for all workshop costs. The City will not reimburse Contractor for any associated costs with conducting a value analysis workshop.

Attention is directed to the provisions in Standard Specifications Sections 8-1.04, "Start of Job Site Activities," Section 8-1.05, "Time,” and Section 8-1.10, "Liquidated Damages," and these Special Provisions.

4.03 Increases of More than Twenty-Five Percent (25%) of Engineer’s Estimate

The last paragraph in Standard Specifications Section 9-1.06B, “Increases of More Than Twenty-Five Percent,” is amended to read as follows:

“When the compensation payable for the number of units of an item of work performed in excess of 125 percent of the Engineer’s Estimate, is less than $5,000 at the applicable contract unit price, the Engineer reserves the right to make no adjustment in said price if the Engineer so elects, except that an adjustment may be made if requested in writing by the Contractor.

It is the Contractor’s responsibility to continually analyze and apply the estimated quantities provided in the Contract and to use the knowledge gained from site visits, construction, and professional experience, to update the estimated quantities as the work progresses. If and when the Contractor reaches seventy-five percent (75%) of the estimated quantities of materials required for any portion of the work as specified in the Plans and Specifications and has any reasonable belief that the Contractor will be required to exceed those estimated quantities by more than ten percent (10%), the Contractor shall provide written notice to the Engineer of the possibility and the estimated quantities required to complete the work. If the Contractor fails to provide that written notice before delivering materials in excess of the originally estimated quantities, the Contractor shall not be entitled to any additional compensation or payment for the additional work or materials needed for the additional materials above one hundred and ten percent (110%), but nevertheless shall be required to complete the work.”

4.04 Changes Initiated by the City

The City reserves the right to change the scope of this contract to accommodate budget constraints. The City shall have full authority and discretion to determine the decrease or increase in quantities required as well as the sub-projects that will be altered, added, or deleted. The Contractor shall not be entitled to any additional compensation or adjustment in the unit prices bid because of the above-stated rights.

*** END OF SECTION ***

SECTION 5. CONTROL OF WORK

5.01 General

The control of the work shall be in conformance with Standard Specifications Section 5, “Control of Work,” , except as herein amended.

The following sections in the Standard Specifications are deleted:

Section 5-1.09, "Partnering”
Section 5-1.13C, "Disabled Veteran Business Enterprises"
Section 5-1.13D, "Non-Small Businesses"
Section 5-1.27E "Change Order Bills"
Section 5-1.43E "Alternative Dispute Resolution"

5.02 Coordination and Interpretation of Plans, Specifications and Special Provisions

Standard Specifications Section 5-1.02, “Contract Components,” is replaced with the following:

5-1.02 CONTRACT COMPONENTS

A component in one Contract part applies as if appearing in each. The parts are complementary and describe and provide for a complete work.

If a discrepancy exists:

1. The governing ranking of Contract parts in descending order is:
   - 1.0 Proposal, and Agreement
   - 1.1 Supplementary General Conditions of the Special Provisions
   - 1.2 General Conditions of the Special Provisions
   - 1.3 Technical Specifications of the Special Provisions
   - 1.4 Project plans
   - 1.5 City of Burlingame Standard Details
   - 1.6. Standard Specifications
   - 1.7 (State) Standard Plans
   - 1.8 Supplemental project information
2. Written numbers and notes on a drawing govern over graphics
3. A detail drawing governs over a general drawing
4. A specification in a section governs over a specification referenced by that section

In the event of a discrepancy between units shown on plans, in the special provisions and in the proposal, the units shown in the proposal shall govern.

If a discrepancy is found or confusion arises, submit an RFI.

5.03 Superintendence

Standard Specifications Section 5-1.16, “Representative,” is amended to include the following:

The Contractor's representative shall be available to personally talk to the Engineer within any eight (8) hour period when work is being performed on the project. A telephone number for such purpose shall be given to the Engineer at the start of the project.
The Contractor shall furnish to the Engineer the telephone number of a representative or answering service which will be responsible for responding to emergency calls (e.g., barricade replacement) from the Engineer during non-scheduled working hours.

If the Contractor fails to respond and correct the emergency condition within three (3) hours, and if, in the judgment of the Engineer, correction of the emergency condition should not be deferred until the next regularly scheduled working day, then the Engineer shall have the right to make appropriate arrangements to correct such emergency condition and charge the cost thereof to the Contractor.

5.04 Inspection

The following is added to Standard Specifications Section 5-1.01, "General:" :

The Contractor shall not perform any work during weekend days or City Holidays without the written permission of the Engineer. A fine of $5000 per violation will be deducted from the next progress payment should the Contractor perform unauthorized weekend or Holiday work.

The Contractor shall pay for all inspections required to be performed by City employees due to the scheduling of work by the Contractor between 5:00 P.M. and 8 A.M. on weekdays, and anytime on Saturdays, Sundays and City Holidays, and shall include travel time of the inspector.

City holidays are as follows:

*New Year's Day
*Martin Luther King's Birthday
*President's day
*Memorial Day
*Independence Day
*Labor Day
Columbus Day
*Veteran's Day
*Thanksgiving Day
Day After Thanksgiving
½ Day Christmas Eve
*Christmas Day
½ Day New Year's Eve

*Indicates holidays covered by "Construction Hours" restrictions of these Special Provisions Section 7.02.

Contact the City of Burlingame to determine the specific holiday dates for the current calendar year.

Holidays falling on Saturday or Sunday will be observed on Friday or Monday, respectively.

5.05 Payments to Subcontractors

The following is added to Standard Specifications Section 5-1.13A, ”General,” :

The Contractor shall comply with the provisions in Business and Professions Code Section 7108.5 concerning prompt payment to subcontractors.

The Contractor shall furnish a written statement showing all work to be subcontracted, giving the names and addresses of all subcontractors and a description of each portion of the work to be subcontracted. The Designation of Subcontractors statement shall be on the form furnished by the City as part of the Bid documents and shall be considered an integral part of those documents.

Pursuant to Public Contract Code Section 6109, no contractor or subcontractor that is ineligible under Labor Code Section 1777.1 or 1777.7 may bid or work on this project. Any contract entered into between the Contractor and such an ineligible subcontractor is void as a matter of law. A debarred subcontractor may not receive any public money for performing work as a subcontractor on this project, and any public money that may have been paid to a debarred subcontractor by the Contractor on the project shall be returned to the City. The Contractor shall be responsible for the payment of wages to workers of a debarred subcontractor who has been allowed to work on the project.

5.06 Permits

The Contractor shall obtain all permits, licenses, bonds, pay all charges and fees (including inspection fees); and other authorization required by all affected jurisdictions involved in this job, at its own expense, unless otherwise specified in Supplementary General Conditions of these Special Provisions. The City’s issuance of permits shall not relieve the Contractor of its responsibility as described in this section.

City permits, if required, shall have all fees waived, except for City business licenses. All subcontractors performing work within the limits of the City of Burlingame shall also obtain a City Business Licenses in accordance with these Special Provisions Section 5.07, “City Business License.”

Compliance with NPDES Permit. The Contractor shall comply with all requirements of the permit and shall not, directly or indirectly, cause a sanitary sewer overflow or prevent the City from complying with the requirements of the permit. Penalties imposed on the City as a result of any discharge violation caused by the actions of the Contractor, or its employees, or subcontractors shall be borne in full by the Contractor, including fines, legal fees, and other expenses to the City resulting directly or indirectly from such discharge violations. The City may recover such sums by deduction from the construction progress payments.

5.07 City Business License

The Contractor and all Subcontractors are required to have City business licenses in accordance with the Burlingame Municipal Code. Business license information is available at https://www.burlingame.org/departments/finance/business_license.php

5.08 Engineering Submittals

The following shall be added to Standard Specifications Section 5-1.23A, "General:"

Contractor's failure to make submittals in a timely manner will not be a basis for any time extensions and shall count against the Contractor's work days.

5.09 Project Appearance

The following shall be added to Standard Specifications Section 5-1.31, "Job Site Appearance:"

"PROJECT APPEARANCE. The Contractor shall maintain a neat appearance at the job site.

In any area visible to the public, the following shall apply: when practical, broken concrete and debris developed during the clearing and grubbing shall be disposed of concurrently with its removal. If stockpiling is necessary, the material shall be removed or disposed of weekly, unless otherwise granted by the City.

The Contractor shall furnish portable toilets for workmen and trash bins for all debris from structure construction. All debris shall be placed in trash bins daily. Forms or false work that are to be reused shall be stacked neatly concurrently with their removal. Forms and false work that are not to be reused shall be recycled concurrently with their removal.

5.10 Lines and Grades

Standard Specifications Section 5-1.26, "Construction Surveys," is replaced with the following:

Contractor shall perform all necessary construction surveys. Construction surveys shall be done in accordance with Chapter 12, "Construction Surveys," of the California Department of Transportation's *Survey Manual.*

All work shall be constructed to the lines and grades shown on the contract drawings. Unless authorized by the Engineer, any work done without construction survey line and grade will be done at the Contractor's risk.

5.11 Project Plans

Four (4) full-size sets of the project plans will be supplied to the successful bidder without charge. Additional sets will be supplied at the cost of reproduction.

5.12 Construction Area Lighting

The Contractor shall ensure that all working areas utilized during darkness are lighted to conform to the minimum illumination intensities established by California Division of Occupational Safety and Health Construction Safety Orders. In addition, the Contractor shall ensure that the lighting provides adequate safety to pedestrians in permitted portions of the construction area.

All lighting fixtures shall be mounted and directed in a manner precluding glare to approaching traffic.

5.13 Areas for Contractor's Use

The second and third paragraphs of Standard Specifications Section 5-1.32, "Areas of Use," are replaced with the following:

> If no City-owned or City-secured area is designated on the plans for the Contractor's use, the Contractor will be responsible to secure additional staging/stockpiling areas at Contractor's own expense in order to perform the work.
>
> The Contractor shall defend, indemnify, and hold the City harmless for any damage to or loss of materials or equipment in conformance with the indemnification requirements in the City's construction agreement.

5.14 Nonhighway Facilities

Standard Specifications Section 5-1.36D, "Nonhighway Facilities." is amended to include the following:

> Unless otherwise permitted by the Engineer, the Contractor shall conduct its operations in a manner which will permit continuous operation of all utility facilities. The Contractor shall contact Underground Services Alert (USA) at 811 or 800-642-2444 at least forty-eight (48) hours before excavation so that underground facilities may be marked in the field. Locations of existing utility mains and utility connections, if shown on the plans, are only approximate. The Engineer assumes no responsibility for accuracy or completeness of said data, which is offered solely for the convenience of the Contractor. If the Contractor finds that a known utility has not marked the job site with either locations or no facilities, Contractor shall be responsible for contacting the utility, or USA regarding the discrepancy before proceeding with work.
>
> Attention is directed to the possible existence of underground main or trunk line facilities not indicated on the plans or in the special provisions. The Contractor shall ascertain the exact location of underground main or trunk lines whose presence is indicated on the plans or in the special provisions, the location of their service laterals or other appurtenances and of existing service lateral or appurtenances of any other underground facilities which can be inferred from the presence of visible facilities such as buildings, meters and junction boxes prior to doing work that may damage any of such facilities or interfere with their service.

If the Contractor discovers underground main or trunk lines not indicated on the Plans or in the special provisions, it shall immediately give the Engineer and the Utility Company written notification of the existence of such facilities. Such mains or trunk lines shall be located and protected from damage as directed by the Engineer and the cost of such work will be paid for as extra work as provided in Section 4-1.05. Damage due to the Contractor's failure to exercise reasonable care shall be repaired at its cost and expense.

5.15 Acceptance of Contract

Standard Specifications Section 5-1.46, "Inspection and Contract Acceptance," is amended to include the following:

However, nothing in this Section 5-1.46 shall be construed to relieve the Contractor of full responsibility for correcting or replacing defective work or materials found at any time before the expiration of the one-year maintenance bond required under Section 3.03 of these Special Provisions.

5.16 Availability of Plans

Contractor shall maintain on the job site at a specific location an official set of Contract Documents, readily available at all times to the Engineer or Inspector.

*** END OF SECTION ***

SECTION 6. CONTROL OF MATERIALS

6.01 General

Attention is directed to Standard Specifications Section 6, "Control of Materials," and these Special Provisions.

6.02 City-Furnished Materials

City-furnished materials shall be furnished in conformance to Standard Specifications Section 6-1.02 and as described herein.

The City-furnished materials on this project, if any, are listed in Section 2, “Supplementary General Conditions,” of these Special Provisions.

The Contractor shall submit a written request to the Engineer for materials at least forty-eight (48) hours in advance of the date and time of their intended use. The request shall state the quantity and type of each material. Unless otherwise specifically provided in the Special Provisions, City-furnished materials will be stored at the City Corporation Yard at 1361 North Carolan Avenue, Burlingame. Materials will be available for pickup on weekdays, holidays excepted, from 8:00 a.m. to 9:00 a.m. and from 3:30 p.m. to 4:30 p.m.

All City-furnished materials that are not used on the project shall remain the property of the City and shall be returned to the City in as-furnished condition at the locations designated by the Engineer.

Any water use from fire hydrants shall be metered. A cash deposit shall be posted at the City Water Department Office at 501 Primrose Road, Burlingame, California, as assurance that the meter is returned in good condition. Meters shall be obtained from and returned to the Water Department Repair Shop at the City Corporation Yard at 1361 North Carolan Avenue, Burlingame, California. If the meter is returned in good condition, a refund shall be mailed to the Contractor. Contractor shall also pay for the amount of water used. Water drawn from the City-furnished meter shall only be used for this project.

Any damage to the meters while in the Contractor’s possession shall be its responsibility and deductions will be made from the deposit for repairs to the meters. Meters must be returned to the City within 10 working days after work is completed and payment made for water used prior to final payment.

6.03 Local Materials

The second paragraph of Standard Specifications Section 6-2.04, “Local Materials,” is replaced with the following:

> Testing of local materials to be used in the work for compliance with the specifications will be at the Contractor’s expense.

6.04 Buy America

Standard Specifications Section 6-2.05, “Buy America,” is deleted, unless this is a federally-funded contract.

6.05 Specific Brand or Trade Name and Substitution

Standard Specifications Section 6-3.02, “Specific Brand or Trade Name and Substitution,” is amended to include the following:

The City Engineer’s decision to accept substitution is final.

*** END OF SECTION ***

SECTION 7. LEGAL RELATIONS AND RESPONSIBILITY

7.01 General

This section shall conform to Standard Specifications Section 7, “Legal Relations and Responsibility to the Public,” with the following clarifications and amendments. The Contractor is responsible for protecting both its work and the public.

7.02 Construction Hours

Contractor shall not (including excavation and grading) work other than between the hours of 8:00 A.M. and 5:00 P.M. on weekdays (see Section 5.04 of these specifications), except in the case of urgent necessity in the interest of public health and safety, and then only with express permission of the Engineer. In the vicinity of any schools, the contractor shall not begin any operation until after 9:00 A.M. when school is in session.

7.03 Excavation Safety

Standard Specifications Section 7-1.02K(6)(b), “Excavation Safety,” is amended to include the following:

If required the Contractor shall submit a trenching and shoring plan signed and stamped by a license civil engineer or licensed geotechnical engineer for approval by the City. The plan shall include trenching and shoring support calculations.

Designate a competent person to be on site at all times while trench excavation work is being performed. The competent person shall be certified and make daily inspection in accordance with all OSHA requirements. A competent person means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them.

Additionally, the Contractor shall provide upon request by the Engineer calculations and details proving the adequacy of any proposed steel plate trench or excavation bridging to carry traffic loads.

The Contractor shall comply with Public Contract Code § 7104 while excavating.

7.04 Assignment of Antitrust Actions

The Contractor's attention is directed to Standard Specifications Section 7-1.02L(2), “Antitrust Claims.”

7.05 Highway Construction Equipment

Attention is directed to Standard Specifications Section 7-1.02O, "Vehicle Code."

7.06 Sound Control Requirements

Sound control shall conform to the provisions of Standard Specifications Section 14-8, "Noise and Vibration," and these special provisions.

The Contractor shall keep noise pollution due to construction activities as low as possible. In no case shall noise levels produced by the Contractor exceed either of the following maximums:

A. No individual piece of equipment shall produce a noise level exceeding 85dBA at a distance of 25 feet.

B. The noise level at any point outside of the property line or temporary construction area shall not exceed 85dBA. No equipment violating these standards will be allowed to operate.

In no case shall the Contractor's operations violate the noise ordinance (Municipal Code Chapter 10.40).

This noise level requirement shall apply to all equipment on the job or related to the job, including, but not limited to, trucks, transit mixers or transient equipment that may or may not be owned by the Contractor. The use of loud signals shall be avoided in favor of light warnings, except those required by safety laws for the protection of personnel.

7.07 Relations with Property Owners

The Contractor shall notify, in writing, property owners or residents at least forty eight (48) hours in advance of all work affecting access into and out of their property or place of business.

Forms for such notices will be provided to the Contractor at start of construction and shall be distributed to the property owners by the Contractor throughout the length of the Contract, whenever appropriate.

Concrete pouring shall be scheduled to re-open new and replace concrete driveways within seventy-two (72) hours after being closed.

Access to any place of business shall be maintained at all times and shall be coordinated with the business owner. Complete closure of any business access shall be only as approved in writing by the Engineer.

7.08 Public Convenience

Section 7-1.03 "Public Convenience" shall be amended by adding the following:

Attention is directed to Section 7 of the Standard Specifications regarding the fact that the Contractor is responsible for protecting both its work and the public.

The Contractor shall conduct his operations in a manner to minimize inconvenience to the homeowners, residents and the traveling public.

Closed driveways shall be re-opened for safe passage of vehicle and pedestrians by end of the each work shift.

Closed driveways during working hours shall be reopened temporarily as requested by property owners or residents to allow access to their driveways. The Contractor shall re-open the closed driveway within ten minutes (10) of such request.

Access to any place of business shall be maintained at all times and shall be coordinated with the business owner. Complete closure of any business access shall be only as approved in writing by the Engineer.

The Contractor shall conduct his operations in a manner to minimize inconveniences to property owners and residents and to avoid damage on private property. The Contractor shall maintain property owner and resident access to the homes at all times. The Contractor shall keep the work site on the private property in a tidy and neat manner. The Contractor shall remove all tools, equipment and material from the property at the end of each workday.

7.09 Indemnification

Contractor shall indemnify, defend, and hold the City, its directors, officers, employees, agents, and volunteers harmless from and against any and all liability, claims, suits, actions, damages, and causes of action arising out of, pertaining or relating to the actual or alleged negligence, recklessness or willful misconduct of Contractor, its employees, subcontractors, or agents, or on account of the performance or character of the services, except for any such claim arising out of the sole negligence or willful misconduct of the City, its officers, employees, agents, or volunteers. It is understood that the duty of Contractor to indemnify and hold harmless includes the duty to defend as set forth in section 2778 of the California Civil Code. Notwithstanding the foregoing, for any design professional services, the duty to defend and indemnify City shall be limited to that allowed by state law. Acceptance of insurance certificates and endorsements required under this Agreement does not relieve Contractor from liability under this indemnification and hold harmless clause. This indemnification and hold harmless clause shall apply whether or not such insurance policies shall have been determined to be applicable to any of such damages or claims for damages.

*** END OF SECTION ***

SECTION 8. PROSECUTION AND PROGRESS

8.01 General

Prosecution and progress shall conform to Standard Specifications Section 8, “Prosecution and Progress,” and these Special Provisions.

8.02 Progress Schedule

The work to be done shall be performed in stages to minimize the inconvenience to the public.

The Contractor shall develop and maintain the appropriate level critical path method schedule for this project in compliance with Standard Specifications Section 8-1.02, “Schedule.” In addition to the required schedule reports to be submitted to the City in accordance with Standard Specifications Section 8-1.02, “Schedule,” the Contractor shall maintain and furnish to the Engineer on a weekly basis a “three week look ahead” report detailing planned work for the following three weeks, highlighting critical path items of work.

8.03 Start of Job Site Activities

The Contractor shall sign and return the Contract Documents and furnish required bonds and insurance certificates within ten (10) working days after the date of the Notice of Contract Award. If the insurance and bonds are not provided within this time period, the City may declare the bid bond forfeited and award the bid to another bidder. Alternatively, the City may begin to count the elapsed time as “working days” under the Agreement.

The Contractor shall be able to begin work within fifteen (15) calendar days after receiving notice that the Contract has been approved by the City of Burlingame and shall diligently prosecute the same to completion before the expiration of the number of working days as set forth in the "Notice to Bidders." The "Notice to Proceed" shall indicate the "Beginning of Work" date to be used to determine the date of completion.

The “Notice to Proceed” will be given at the preconstruction meeting and will indicate the “Beginning of Work” date to be used to calculate the date of completion.

Even though the counting of working days may have begun, the Contractor shall not begin work before the preconstruction conference. The Contractor shall furnish all specified submittals to the Engineer at, or prior to, the preconstruction conference and shall obtain all specified approvals contained in the Standard Specifications and these Special Provisions prior to the beginning of job site activities.

8.04 Liquidated Damages

The Contractor’s attention is directed to the Supplementary General Conditions for Liquidated Damages.

8.05 Contractor’s Control Termination

The Contractor’s attention is directed to Standard Specifications Section 8-1.13, "Contractor’s Control Termination" and these Special Provisions.

If the Contractor's control of the work is terminated or it abandons the work and the contract work is completed in conformance with the provisions of Section 10255 of the Public Contract Code, any dispute concerning the amount to be paid to the City by the Contractor or its surety, under the provisions of Section 10258 of said Act, shall be subject to arbitration in accordance with the section of these special provisions entitled "Arbitration." The surety shall be bound by the arbitration award and is entitled to participate in such arbitration proceedings.

8.06 As-Built Data

The Contractor shall submit all information to the Engineer before project acceptance, including legible marked up plans of what was constructed, as required by the Engineer to verify as-built drawings for all permanent project work.

*** END OF SECTION ***

SECTION 9. MEASUREMENT AND PAYMENT

9.01 General

Measurement and payment shall be in conformance with these specifications in Section 9, "Payment," of the Standard Specifications and these Special Provisions.

Contractors' attention is directed to Standard Specifications Section 9-1.03, "Payment Scope," and as amended herein.

The fourth paragraph in Standard Specifications Section 9-1.03, "Payment Scope," is as follows:

> Full compensation for work specified in divisions I, II and X of the Standard Specifications, and in Sections 1 and 2 of these special provisions is included in the payment for the bid items unless:
>
> 1. Bid item for the work is shown on the Bid Item List.
> 2. Work is specified as change order work.

When an (F) is included after a bid item name on the Bid List, that bid item quantity is a final pay item.

The Contractor shall agree that the approximate quantities shown in the Bid Item List are solely for the purpose of comparing bids. The Contractor's compensation will be computed upon the basis of the actual quantities of work marked by the Engineer and completed, whether they be more or less than those shown in the Bid Item List.

Linear measurement shall be determined from measurements of bid items complete and in place. Unit counts will be made of the unit items complete and in place. Weight measurements will be based on weight receipts issued by a qualified weight master. Any other method of establishing the quantities not listed specifically herein, or defined in other portions of the contract provisions, shall be determined by referring to the applicable section of the Standard Specifications.

9.02 Payment Adjustments for Price Index Fluctuations

Standard specifications Section 9-1.07, "Payment for Adjustments for Price Index Fluctuations," is deleted, unless otherwise specified in the Supplementary Conditions.

9.03 Lump Sum Bid Item Progress Payments

The first paragraph of Standard Specification Section 9-1.16B, "Schedule of Values," isamended to include the following:

> If a schedule of values is not specified to be submitted or a payment breakdown is not provided in the payment clause of the applicable Standard Specifications or these Special Provisions, progress payments for lump sum bid items will be a percentage of the lump sum

bid item price based on the Engineer's determination of the amount of lump sum work already performed. At Contractors option, submit a lump sum breakdown that provides sufficient detail for the Engineer to determine the value of work performed. The Engineer may consider but not exclusively base the determination of progress payments on Contractors lump sum breakdown. The Engineer's determination of progress payments for lump sum bid items under the Contract will be final in accordance with Standard Specifications Section 5-1.03.

9.04 Materials On-Hand

Standard Specifications Section 9-1.16C, "Materials on Hand," is replaced by the following:

No partial payment will be made for any materials on hand which are furnished but not incorporated in the work.

9.05 Mobilization

Standard Specifications Section 9-1.16D, "Mobilization," is replaced with the following:

9-1.16D Mobilization

Public Contract Code Section 10104 defines "mobilization." The Contractor is eligible for partial payments for mobilization if the Contract includes a bid item for mobilization. The Department will make partial payments no less often than as specified under Public Contract Code Section 10264. If the Contract does not include a mobilization bid item, mobilization is included in the payment for the various bid items.

9.06 Retentions

Standard Specifications Section 9-1.16F, "Retentions," is replaced with the following:

9-1.16F Retentions

The City shall retain 5 percent of the estimated value of the work done and 5 percent of the value of materials so estimated to have been furnished and delivered and unused or furnished and stored as aforesaid as part security for Contractors fulfillment of the contract.

Pursuant to Public Contract Code Section 22300, the Contractor will be permitted, at its request and sole expense, to substitute securities for any monies withheld by the City to ensure performance under the contract. Said securities will be deposited either with the City or with the state or federally chartered bank as escrow agent. Securities eligible for this substitution are those listed in Government Code Section 16430 or bank or savings and loan certificate of deposit, interest-bearing demand deposit accounts, standby letters of credit, or any other mutually agreed to by Contractor and the City. The Contractor shall be the beneficial owner of any securities substituted for monies withheld and shall receive any interest thereon.

9.07 Progress Payments

On or before the first day of every month the Contractor and Engineer shall meet and prepare a written estimate of progress payments. From this amount, five percent (5%) will be deducted and, from the remaining ninety five percent (95%), there will be deducted any amounts due City from Contractor for supplies, materials, services, damages or otherwise deductible under the terms of the contract and the amount of all payments previously made to Contractor. The remainder will be paid by the City to the Contractor as a progress payment by the 20th day of the month. The remaining five percent (5%) thereof shall be paid to Contractor thirty-five (35) days after the recording of the Notice of Completion.

Pursuant to Public Contract Code Section 20104.50, the City will promptly process all requests for progress payments pursuant to this contract. As to any undisputed payments that are made more than thirty (30) days after receipt of an undisputed and properly submitted payment request from the Contractor, the City will pay interest equivalent to the legal rate set forth in Code of Civil Procedure Section 685.10.

9.08 Final Payment After Contract Acceptance

Standard Specifications Section 9-1.17D (1), "General" is amended to include the following:

Upon satisfactory completion of the entire work, the Engineer will recommend the acceptance of the work to the City Council. If the City Council accepts the completed work, it will cause a Notice of Completion to be recorded with the County Recorder.

Thirty-five days after the filing of the Notice of Completion, the Contractor will be entitled to the balance due for the completion and acceptance of the work, if certification is made by sworn written statement that all claims have been filed with the City based upon acts or omissions of the Contractor and that no liens or withhold notices have been filed against said work or the property on which the work was done.

9.09 Claim Resolution

Any claim by the contractor in connection with this project shall be resolved pursuant to Section 9204 of the Public Contract Code; the full text of which is as follows:

SECTION 1. Section 9204 is added to the Public Contract Code, to read:

(a) The Legislature finds and declares that it is in the best interests of the state and its citizens to ensure that all construction business performed on a public works project in the state that is complete and not in dispute is paid in full and in a timely manner.

(b) Notwithstanding any other law, including, but not limited to, Article 7.1 (commencing with Section 10240) of Chapter 1 of Part 2, Chapter 10 (commencing with Section 19100) of Part 2, and Article 1.5 (commencing with Section 20104) of Chapter 1 of Part 3, this section shall apply to any claim by a contractor in connection with a public works project.

(c) For purposes of this section:

(1) "Claim" means a separate demand by a contractor sent by registered mail or certified mail with return receipt requested, for one or more of the following:

(A) A time extension, including, without limitation, for relief from damages or penalties for delay assessed by a public entity under a contract for a public works project.

(B) Payment by the public entity of money or damages arising from work done by, or on behalf of, the contractor pursuant to the contract for a public works project and payment for which is not otherwise expressly provided or to which the claimant is not otherwise entitled.

(C) Payment of an amount that is disputed by the public entity.

(2) "Contractor" means any type of contractor within the meaning of Chapter 9 (commencing with Section 7000) of Division 3 of the Business and Professions Code who has entered into a direct contract with a public entity for a public works project.

(3)

(A) "Public entity" means, without limitation, except as provided in subparagraph (B), a state agency, department, office, division, bureau, board, or commission, the California State University, the University of California, a city, including a charter city, county, including a charter county, city and county, including a charter city and county, district, special district, public authority, political subdivision, public corporation, or nonprofit transit corporation wholly owned by a public agency and formed to carry out the purposes of the public agency.

(B) "Public entity" shall not include the following:

(i) The Department of Water Resources as to any project under the jurisdiction of that department.

(ii) The Department of Transportation as to any project under the jurisdiction of that department.

(iii) The Department of Parks and Recreation as to any project under the jurisdiction of that department.

(iv) The Department of Corrections and Rehabilitation with respect to any project under its jurisdiction pursuant to Chapter 11 (commencing with Section 7000) of Title 7 of Part 3 of the Penal Code.

(v) The Military Department as to any project under the jurisdiction of that department.

(vi) The Department of General Services as to all other projects.

(vii) The High-Speed Rail Authority.

(4) "Public works project" means the erection, construction, alteration, repair, or improvement of any public structure, building, road, or other public improvement of any kind.

(5) "Subcontractor" means any type of contractor within the meaning of Chapter 9 (commencing with Section 7000) of Division 3 of the Business and Professions Code who either is in direct contract with a contractor or is a lower tier subcontractor.

(d)

(1)

(A) Upon receipt of a claim pursuant to this section, the public entity to which the claim applies shall conduct a reasonable review of the claim and, within a period not to exceed 45 days, shall provide the claimant a written statement identifying what portion of the claim is disputed and what portion is undisputed. Upon receipt of a claim, a public entity and a contractor may, by mutual agreement, extend the time period provided in this subdivision.

(B) The claimant shall furnish reasonable documentation to support the claim.

(C) If the public entity needs approval from its governing body to provide the claimant a written statement identifying the disputed portion and the undisputed portion of the claim, and the governing body does not meet within the 45 days or within the mutually agreed to extension of time following receipt of a claim sent by registered mail or certified mail, return receipt requested, the public entity shall have up to three days following the next duly publicly noticed meeting of the governing body after the 45-day period, or extension, expires to provide the claimant a written statement identifying the disputed portion and the undisputed portion.

(D) Any payment due on an undisputed portion of the claim shall be processed and made within 60 days after the public entity issues its written statement. If the public entity fails to issue a written statement, paragraph (3) shall apply.

(2)

(A) If the claimant disputes the public entity's written response, or if the public entity fails to respond to a claim issued pursuant to this section within the time prescribed, the claimant may demand in writing an informal conference to meet and confer for settlement of the issues in dispute. Upon receipt of a demand in writing sent by registered mail or certified mail, return receipt requested, the public entity shall schedule a meet and confer conference within 30 days for settlement of the dispute.

(B) Within 10 business days following the conclusion of the meet and confer conference, if the claim or any portion of the claim remains in dispute, the public entity shall provide the claimant a written statement identifying the portion of the claim that remains in dispute and the portion that is undisputed. Any payment due on an undisputed portion of the claim shall be processed and made within 60 days after the public entity issues its written statement. Any disputed portion of the claim, as identified by the contractor in writing, shall be submitted to nonbinding mediation, with the public entity and the claimant sharing the associated costs equally. The public entity and claimant shall mutually agree to a mediator within 10 business days after the disputed portion of the claim has been identified in writing. If the parties cannot agree upon a mediator, each party shall select a mediator and those mediators shall select a qualified neutral third party to mediate with regard to the disputed portion of the claim. Each party shall bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator. If

mediation is unsuccessful, the parts of the claim remaining in dispute shall be subject to applicable procedures outside this section.

(C) For purposes of this section, mediation includes any nonbinding process, including, but not limited to, neutral evaluation or a dispute review board, in which an independent third party or board assists the parties in dispute resolution through negotiation or by issuance of an evaluation. Any mediation utilized shall conform to the timeframes in this section.

(D) Unless otherwise agreed to by the public entity and the contractor in writing, the mediation conducted pursuant to this section shall excuse any further obligation under Section 20104.4 to mediate after litigation has been commenced.

(E) This section does not preclude a public entity from requiring arbitration of disputes under private arbitration or the Public Works Contract Arbitration Program, if mediation under this section does not resolve the parties' dispute.

(3) Failure by the public entity to respond to a claim from a contractor within the time periods described in this subdivision or to otherwise meet the time requirements of this section shall result in the claim being deemed rejected in its entirety. A claim that is denied by reason of the public entity's failure to have responded to a claim, or its failure to otherwise meet the time requirements of this section, shall not constitute an adverse finding with regard to the merits of the claim or the responsibility or qualifications of the claimant.

(4) Amounts not paid in a timely manner as required by this section shall bear interest at 7 percent per annum.

(5) If a subcontractor or a lower tier subcontractor lacks legal standing to assert a claim against a public entity because privity of contract does not exist, the contractor may present to the public entity a claim on behalf of a subcontractor or lower tier subcontractor. A subcontractor may request in writing, either on his or her own behalf or on behalf of a lower tier subcontractor, that the contractor present a claim for work which was performed by the subcontractor or by a lower tier subcontractor on behalf of the subcontractor. The subcontractor requesting that the claim be presented to the public entity shall furnish reasonable documentation to support the claim. Within 45 days of receipt of this written request, the contractor shall notify the subcontractor in writing as to whether the contractor presented the claim to the public entity and, if the original contractor did not present the claim, provide the subcontractor with a statement of the reasons for not having done so.

(e) The text of this section or a summary of it shall be set forth in the plans or specifications for any public works project that may give rise to a claim under this section.

(f) A waiver of the rights granted by this section is void and contrary to public policy, provided, however, that (1) upon receipt of a claim, the parties may mutually agree to waive, in writing, mediation and proceed directly to the commencement of a civil action or binding arbitration, as applicable; and (2) a public entity may prescribe reasonable change order, claim, and dispute resolution procedures and requirements

in addition to the provisions of this section, so long as the contractual provisions do not conflict with or otherwise impair the timeframes and procedures set forth in this section.

(g) This section applies to contracts entered into on or after January 1, 2017.

(h) Nothing in this section shall impose liability upon a public entity that makes loans or grants available through a competitive application process, for the failure of an awardee to meet its contractual obligations.

(i) This section shall remain in effect only until January 1, 2020, and as of that date is repealed, unless a later enacted statute, that is enacted before January 1, 2020, deletes or extends that date.

9.10 Adjustment of Overhead Costs

Irrespective of the final payment to be made to the Contractor under this contract, there will be no adjustment of overhead costs.

9.11 Damages

Any provision in the Contract which limits the City's liability to an extension of time for delay for which the City is responsible and which delay is unreasonable under contemplation of the circumstances involved, and not within the parties', shall not be construed to preclude the recovery of damages by the Contractor or subcontractor. This section shall not be construed to void any provision in this Contract which requires notice of delays, provides for arbitration or other procedure for settlement, or provides for liquidated damages.

9.12 Compensation for General Conditions and Supplementary General Conditions

Compensation for doing any work under the General and Supplementary General Conditions shall be included in the various items of work, and no additional payment shall be made.

*** END OF SECTION ***

SUPPLEMENTARY GENERAL CONDITIONS

The General Conditions and Standard Conditions are hereby amended as follows:

1. Section 6.02 of the General Conditions is amended by adding the following:

   "The City-furnished materials for this project are:

   - NONE"

2. Section 8.04 of the General Conditions is amended by adding the following:

   "Contractor's failure to achieve substantial completion of the work described in the Contract Documents will cause the City to incur losses of types and in amounts which are impossible to compute and ascertain with certainty. The Contractor shall pay to the City of Burlingame liquidated damages in the amount of $1000.00 per day for each day and every calendar days' delay in finishing the work in excess of the number of days referred to in these specifications. The amount may be assessed and recovered by the City as against Contractor and its Surety. Such liquidated damages are intended to represent estimated actual damages and are not intended as a penalty, and Contractor shall pay them to the City, without limiting City's any of the City's rights as provided in the Contract Documents."

*** END OF SECTION ***

SPECIAL INSPECTION AND TESTING AGREEMENT
CITY OF BURLINGAME

To permit applicants of projects requiring special inspection and/or testing per Section 1704 of the 2013 California Building Code.

BEFORE A PERMIT CAN BE ISSUED: The owner, or the engineer of record acting as the owner's agent, shall complete two (2) copies of this agreement and the attached structural tests and inspections schedule including the required acknowledgments. A preconstruction conference with the parties involved may be required to review the special inspection requirements and procedures.

APPROVAL OF SPECIAL INSPECTORS: Each special inspector shall be approved by the Building Division prior to performing any duties. Each special inspector shall submit his/her qualifications to the Building Division and is subject to a personal interview for prequalification. Special inspectors shall display approved identification, as stipulated by the Building Division, when performing the function of a special inspector.

Special inspection and testing shall meet the minimum requirements of CBC Section 1704. The following conditions are also applicable:

A. Duties and Responsibilities of the Special Inspector

1. Observe work

The special inspector shall observe the work for conformance with the Building Department approved (stamped) design drawings and specifications and applicable workmanship provisions of the C.B.C. Architect/engineer-reviewed shop drawings and/or placing drawings may be used only as an aid to inspection. Special inspections are to be performed on a continuous basis, meaning that the special inspector is on site in the general area at all times observing the work requiring special inspection. Periodic inspections, if any, must have prior approval by the Building Department based on a separate written plan reviewed and approved by the Building Department and the project engineer or architect.

2. Report Nonconforming Items

The special inspector shall bring nonconforming items to the immediate attention of the contractor and note all such items in the daily report. If any item is not resolved in a timely manner or is about to be incorporated in the work, the special inspector shall immediately notify the Building Department by telephone or in person, notify the engineer or architect, and post a discrepancy notice.

3. Furnish Daily Reports

On request, each special inspector shall complete and sign both the special inspection record and the daily report form for each day's inspections to remain at the jobsite with the contractor for review by the Building Division's inspector.

4. Furnish Weekly Reports

The special inspector or inspection agency shall furnish weekly reports of tests and inspections directly to the Building Division, project engineer or architect, and others as designated.

These reports must include the following:
a. Description of daily inspections and tests made with applicable locations;
b. Listing of all nonconforming items;
c. Reports on how nonconforming items were resolved or unresolved, as applicable; and
d. Itemized changes authorized by the architect, engineer and Building Division if not included in nonconformance items.

5. Furnish Final Report

The special inspector or inspection agency shall submit a final signed report to the Building Division stating that all items requiring special inspection and testing were fulfilled and reported and, to the best of his/her knowledge, in conformance with the approved design drawings, specifications, approved change orders and the applicable workmanship provisions of the C.B.C. Items not in conformance, unresolved items or any discrepancies in inspection coverage (i.e., missed inspections, periodic inspections when continuous was required, etc.) shall be specifically itemized in this report.

B. Contractor Responsibilities

1. Notify the Special Inspector
   The contractor is responsible for notifying the special inspector or agency regarding individual inspections for items listed on the attached schedule and as noted on the Building Division approved plan. Adequate notice shall be provided so that the special inspector has time to become familiar with the project.

2. Provide Access to Approved Plans
   The contractor is responsible for providing the special inspector access to approved plans at the jobsite.

3. Retain Special Inspection Records
   The contractor is also responsible for retaining at the jobsite all special inspection records submitted by the special inspector, and providing these records for review by the Building Division's inspector upon request.

C. Building Division Responsibilities

1. Approve Special Inspection
   The Building Division shall approve all special inspectors and special inspection requirements.

2. Monitor Special Inspection
   Work requiring special inspection and the performance of special inspectors shall be monitored by the Building Division's inspector. His/her approval must be obtained prior to placement of concrete or other similar activities in addition to that of the special inspector.

3. Issue Certificate of Occupancy
   The Building Division may issue a Certificate of Occupancy after all special inspection reports and the final report have been submitted and accepted.

ACKNOWLEDGEMENTS

I have read and agree to comply with the terms and conditions of this agreement

Owner's name: _____

Owner's signature_____ Date:_____

Contractor's name: _____

Contractor's Signature_____ Date:_____

Special Inspector or Inspection Agency's name: _____

Special Inspector's signature:_____ Date:_____

Project Engineer/Architect' name:_____

Project Engineer/Architect's signature:_____ Date:_____

ACCEPTED FOR THE BUILDING DIVISION
Print Name: _____

Accepted and signed by:_____ Date:_____

SECTION 01110

SUMMARY OF WORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. General description of the Project and the Work to be performed by the Contractor.

1.02 WORK COVERED BY CONTRACT

A. The Work covered under this Contract will be performed at the site of the City of Burlingame's Police Station, 1111 Trousdale Drive. The project location is indicated on the Drawings.

B. The Work to be performed by the Contractor generally includes:

1. Furnishing labor, superintendence, materials, power, water, tools, equipment and services required by the Contract Documents or required to complete the Work.

2. Coordinating work of all trades.

3. Furnishing and installing miscellaneous items incidental to or necessary for completion of the Work, whether these items are specifically indicated in the Contract Documents or not.

C. The Work consists of construction of the following items:

1. Mobilization/demobilization

2. Temporary backup power system

3. Remove and dispose of existing generator and auxiliary apparatus

4. Remove fuel from underground storage tank, disconnect and plug fuel lines

5. Housekeeping pad

6. New generator, exhaust silencer and piping, ducting, conduits and appurtenances

7. Automatic transfer switch

8. Remote monitoring system

1.03 OTHER CONTRACTS

A. The Owner may be undertaking other projects at the plant site simultaneously with the Work to be completed under this project. Coordination with the contractors undertaking related work or un-related work within the plant is the responsibility of the Contractor.

1.04 SPECIFICATION LANGUAGE

A. Specifications may be written in the imperative mood and streamlined form in accordance with practices and principals of the Construction Specifications Institute.

B. Imperative language is directed to the Contractor unless specifically noted otherwise.

C. The words "shall be" are included by inference where a colon (:) is used within sentences or phrases.

1.05 REGULATORY REQUIREMENTS

A. Comply with Federal, State, and local laws, regulations, codes, and ordinance applicable to the work.

B. References in the Contract Documents to local codes shall mean those of City of Burlingame.

C. Other standards and codes that apply to the work are designated in the Specifications.

1.06 ACCESS BY GOVERNMENT OFFICIALS

A. Authorized representatives of governmental agencies shall at all times have access to the work area. Provide proper facilities for access and inspection.

1.07 PROTECTION OF PUBLIC AND PRIVATE PROPERTY

A. Construction will encounter numerous existing features of various types, such as fences, drain culverts, irrigation facilities, curbs, asphalt pavement, buildings, utility poles, guy wires and other surface structures. Protect existing features of this nature and all features affected by construction operations shall be restored to their original condition.

B. Contractor shall be responsible for all damage to existing facilities regardless of location or character, that may be caused by transporting equipment, materials, or workers to or from the work or any part or site thereof, whether by Contractor or Contractor's subcontractors or suppliers.

C. Keep fire hydrants and water control valves free from obstruction and available for use at all times.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01140

WORK SEQUENCE AND CONSTRAINTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Schedule requirements, construction constraints, and a suggested Work sequence for specific elements of the Project.

1.02 GENERAL SEQUENCING REQUIREMENTS

A. The sequencing requirements and construction constraints described are critical elements of the Work and are presented to underscore the importance of proper management, planning, scheduling, coordination, and execution of the Work.

B. Sequencing requirements and construction constraints have been defined in this Section for only certain structures, facilities, and elements of the Work. All work, whether or not addressed in this Section, shall be governed by applicable specified requirements. If additional shutdown constraints are necessary to allow implementation of Contractor's construction procedures and schedule, the Engineer will establish such constraints.

C. Contractor's Construction Schedule:

1. Clearly illustrate the proposed sequence of construction.

2. Conform to the sequencing requirements and limitations specified in this Section where specified.

3. Modify or adapt the suggested sequencing as necessary to complete the project provided all environmental and service continuity requirements are met.

1.03 OPERATIONAL CONTINUITY

A. The City of Burlingame owns and operates the police station facilities. The Work under this project will interface with these existing facilities.

B. Do not interrupt functions necessary to maintain operation of these facilities except as approved by the Engineer through review of the Contractor's Site Access Plan and as specified herein.

C. Coordinate the Work to minimize interference and interruption of the normal operation of the Owner's existing facilities through proper planning and by making temporary connections.

D. Provide temporary backup power during construction. Police Station cannot be without backup power for longer than 30 minutes.

1.04 ACCESS

A. The existing facility where Contractor's work is to be done will be occupied by the Owner throughout the construction period. Access to the site by the Owner's personnel is required for daily operations and administration. Additionally, regular traffic into and out of the site is to be expected.

B. Provide necessary access to the Owner's personnel as required to safely and efficiently operate/maintain the facilities.

C. Site security gates remain closed at all times. Contact office using gate at intercom to open gate.

D. All personnel must sign in at the office and receive a visitor's pass each day.

E. Contractor shall not block access to sally port located on southwest side of building for more than 14 days.

F. Contractor shall not block entry to the existing underground parking garage.

1.05 SITE ACCESS PLAN

A. Prepare and submit a detailed Site Access Plan that describes the measures that will be implemented to provide access to police station, sally port, parking area, underground garage and all points of ingress/egress and how the work will be undertaken to minimize obstructions and inconvenience to police and the general public. Submit the Site Access Plan to the Engineer for review; work at the site shall not be started until the Engineer has approved the Site Access Plan.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 WORK COORDINATION

A. Schedule and coordinate the overall Work and construction operations, including the work of subcontractors and the timely provision of products and supplies.

B. Perform Work in an orderly and logical sequence. Individual specification Sections may identify specific requirements that are related to Work sequence. These types of constraints are not repeated in this Section but shall be followed by the Contractor.

3.02 WORK CONSTRAINTS

A. Work Hours

1. Except as otherwise required for the safety or protection of persons and except as otherwise stated in the Contract Documents, Work may only be performed Monday through Friday during the hours of 7:00 am and 6:00 pm. Contractor will not perform Work on a Sunday or any legal holiday defined by the City of Burlingame without written consent from the Owner.

2. Legal holidays are defined as:

   a. New Year's Day on January 1.

   b. Memorial Day on the last Monday in May.

   c. Independence Day on July 4.

   d. Labor Day on the first Monday in September.

   e. Thanksgiving Day on the fourth Thursday in November.

   f. Christmas Day on December 25.

   g. When a holiday falls on Sunday, the following Monday is recognized as the legal holiday. When a holiday falls on a Saturday, the preceding Friday is recognized as the legal holiday.

END OF SECTION

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SECTION 01330

SUBMITTALS

PART 1 - GENERAL

1.01 SUMMARY

A. Requirements for the submittal of information that will enable determination of whether the Contractor's proposed materials, equipment or methods of work are in general conformance to the design concept and in compliance with the Contract Documents.

B. Furnish drawings, specifications, descriptive data, certificates, samples, test results, methods, schedules, manufacturer's installation instructions and other information as indicated.

1.02 CONTRACTOR'S RESPONSIBILITIES

A. Contractor shall be responsible for the accuracy and completeness of the information contained in each submittal and shall assure that the materials and equipment incorporated into the Work, or the methods of performing the Work shall be as described in the accepted submittals.

B. Verify that all features of all products conform to the specified requirements. Submittal documents shall be clearly edited to indicate only those items, models, or series of equipment that are being submitted for review. Extraneous materials shall be crossed out or otherwise obliterated.

C. Coordinate submittals among subcontractors and suppliers. Ensure that there is no conflict with other submittals and notify the Engineer in each case where his submittal may affect the work of another contractor or the Owner, including those submittals complying with unit responsibility requirements specified in applicable technical sections.

D. Coordinate submittals with the Work so that work will not be delayed. Coordinate and schedule different categories of submittals, so that one will not be delayed for lack of coordination with another. No extension of time will be allowed because of failure to properly schedule submittals.

E. Do not proceed with work related to a submittal until the submittal process is complete and the submittal has received a response "No Exceptions Taken" or "Make Corrections Noted."

F. Certify on each submittal document that the Contractor has reviewed the submittal, verified field conditions, and complied with the contract documents.

1. Include a copy of the specification section with addendum updates, all referenced and applicable sections, and each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements.

a. Use check marks (✓) to denote full compliance with a paragraph as a whole.

b. If deviations from the specifications are indicated and, therefore requested by the Contractor, underline each deviation and denote by a number in the margin to the right of the identified paragraph.

c. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications.

d. Include a detailed, written justification for each deviation.

2. Failure to comply with this paragraph is sufficient cause to reject the entire submittal.

1.03 REVIEW COSTS

A. The Owner's cost for review of submittals for the same proposed materials, equipment or work will be apportioned as follows:

1. The cost of review of the initial submittal and the first revised submittal will be borne by the Owner.

2. The cost to review all additional revised submittals after the first revised submittal will be charged to the Contractor. The cost of review shall include, without limitation, administrative, design and engineering activities directly related to review of submittals.

1.04 SUBMITTAL INDEX

A. Within 30 days of the Notice to proceed, submit a list, by specification section, of all submittals to be submitted.

B. Update and resubmit the submittal index on a monthly basis, where additional submittals are identified, or as necessary

1.05 CATEGORIES OF SUBMITTALS

A. General

1. Submittals fall into two general categories;

a. Submittals for review and comment require action by the Engineer.

b. Submittals that are primarily for information only do not require Engineer's approval.

B. Submittals for Review and Comment

1. Transmit submittals for review and comment to the Engineer. The Engineer will review the submittal for compliance with the Contract requirements and will provide written comments regarding acceptability.

C. Submittals for Information Only

1. Where specified, furnish submittals to the Engineer for information only. The Engineer may, at the Engineer's option, review and comment on any product data.

2. Incomplete or inadequate product data will be returned to the Contractor for resubmittal.

1.06 TRANSMITTAL PROCEDURE

A. General

1. Transmit submittals regarding material and equipment under cover of a Shop Drawing/Transmittal Form. Contractor may provide transmittal form or request a copy of the form from the Owner.

2. Use a separate form for each specific item, class of material, equipment, and items specified in separate, discrete sections, for which the submittal is required.

3. Identify submittal documents common to more than one piece of equipment with all the appropriate equipment numbers.

4. Make submittals for various items with a single form when the items taken together constitute a manufacturer's package or are so functionally related that expediency indicates checking or review of the group or package as a whole.

5. Assign a unique sequential number on the transmittal form accompanying each item submitted.

a. Use the following format for original submittal numbers: "XXX"; where "XXX" is the sequential number assigned by the Contractor.

b. Use the following format for resubmittals: "XXX-Y"; where "XXX" is the originally assigned submittal number and "Y" is a sequential letter assigned for resubmittals, i.e., A, B, or C being the 1st, 2nd, and 3rd resubmittals, respectively. Submittal 25B, for example, is the second resubmittal of submittal 25.

B. Electronic Submittals

1. Electronic submittals are preferred except as otherwise indicated.

2. Prepare electronic submittals and Shop Drawings in electronic (*.pdf) format including half-sized and full-sized drawings, catalog information and other required submittal information.

3. Break down submittals that are larger than 10 megabytes into smaller sections, using logical division points to create sections.

4. Electronically bookmark electronic submittals greater than 30 pages in length by major submittal section to facilitate ease of navigation.

C. Paper copy submittals are an acceptable alternative to electronic submittals if the Contractor demonstrates, to the satisfaction of the Engineer, that electronic submittals presents a hardship.

D. Deviation from Contract

1. If the Contractor proposes to provide material, equipment, or method of work that deviates from the project manual, so indicate under "Proposed Deviations" on the transmittal form accompanying the submittal copies.

E. Submittal Completeness

1. Submittals that do not have all the information required to be submitted, including deviations, are not acceptable and will be returned without review.

1.07 SUBMITTAL CONTENT

A. Prepare submittals in compliance with individual Specification Sections and as indicated herein.

B. Shop Drawings:

1. Develop project-specific, scaled drawings to fully identify materials and products that will be provided and their relationship to other products that will be furnished and installed.

2. Do not utilize reproductions of the Contract Documents as the basis for the submittal.

3. Identify products, assemblies, equipment and systems.

4. Provide equipment identification numbers or tag numbers, wiring diagrams, and setting diagrams.

5. Identify critical dimensions.

C. Product Data:

1. Provide information necessary to demonstrate conformance with the specified requirements. Include performance curves, specifications, and wiring diagrams.

2. Product data may consist of manufacturer’s standard catalog information and data sheets, marked to indicate the specific products that will be provided.

3. Provide supplemental information as necessary to fully demonstrate how products will be modified from the manufacture’s standard products to meet the specification requirements.

D. Manufacturer’s Instructions: Written or published information that establishes the manufacturer’s recommendations, guidelines and procedures for handling and installation of products, equipment and assemblies.

E. Samples: Mount, display or package samples in a manner that will facilitate review and establish workmanship and quality of materials.

1.08 SUBMITTAL REQUIREMENTS

A. When the Contract Documents require a submittal, submit the specified information as follows:

1. Submittals for Review and Comment:

a. Electronic Submittal: Submit one electronic (*.pdf) submittal.

b. Paper Copy Submittal: If paper copy submittals are acceptable to the Engineer, submit four (4) copies of all submitted information plus one reproducible original for review unless otherwise specified.

2. Submittals for Information Only:

a. Electronic Submittal: Submit one electronic (*.pdf) submittal.

b. Paper Copy Submittal: If paper copy submittals are acceptable to the Engineer, submit four (4) copies of all submittal information for review, unless otherwise specified.

1.09 REVIEW PROCEDURE

A. General

1. The Engineer will review submittals within the processing time identified in paragraph “Processing Time” and return:

a. Electronic Submittal – a signed submittal response document, in (*.pdf) format.

b. Paper Copy Submittal – Two marked up copies of the submitted copies. The reproducible original will be retained by the Engineer.

B. Submittals for Review and Comment

1. The returned submittal will indicate one of the following actions:

a. "NO EXCEPTIONS TAKEN" – The material, equipment or work method complies with the project manual.

b. "MAKE CORRECTIONS NOTED" – Limited corrections are required.

1) Provide a corrected copy where:

a) The information is to be included in the O&M data.

b) If requested by the Engineer.

c. "AMEND AND RESUBMIT" – The submittal is insufficient or contains incorrect data.

d. "REJECTED – SEE REMARKS" – The material, equipment, or work method does not comply with the project manual. Submittals with deviations that have not been identified clearly may be rejected.

2. For submittals marked "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED.

a. The Contractor may begin implementing the work method or incorporating the material and equipment covered by the submittal in accordance with any noted corrections.

3. For submittals marked "AMEND AND RESUBMIT" or "REJECTED – SEE REMARKS"

a. Contractor shall provide a typed letter responding to each of the Engineer's review comments with each resubmittal.

b. Except at its own risk, the Contractor shall not undertake the work covered by such submittals until a new submittal is submitted and returned marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED."

C. Submittals for Information Only

1. The returned submittal will indicate ACCEPTED FOR RECORD" if the submittal is complete and adequate.

2. Engineer may return comments on information submittals to identify concerns with what was submitted, in such case, Contractor shall address concerns in writing and return a revised submittal.

1.10 PROCESSING TIME

A. Prepare submittals and transmit to Engineer for review in sufficient time to allow Engineer's review; manufacture, fabrication or assembly of materials and systems; and shipping of material to the site in time for installation in accordance with the Contractor's schedule.

B. Engineer's time for review will begin upon receipt of a complete and comprehensive submittal containing all required information.

C. Engineer will review submitted information and transmit a response to Contractor within 15 days after receipt, subject to the following:

1. In some instances, review times for specific submittals may be modified by the individual specification Section.

2. Resubmittals will be subject to the same review time.

D. No adjustment of Contract Time or Contract Price will be allowed due to delays in the progress of the Work that are caused by rejected submittals and subsequent resubmittals.

1.11 EFFECT OF REVIEW OF CONTRACTOR'S SUBMITTALS

A. The purpose of submittals is to demonstrate how Contractor intends to conform to the Contract Documents and design concepts. Engineer is entitled to rely upon the accuracy and completeness of designs, calculations, or certifications made by licensed professionals whether or not a stamp or seal is required by the Contract Documents.

B. The review procedure is based on the Contractor's guarantee that all features and characteristics not requiring submittals conform to the contract documents.

C. Review of contract drawings, methods of work, or information regarding materials or equipment the Contractor proposes to provide, does not relieve the Contractor of its responsibility for

1. Fulfilling the requirements of the Contract,

2. Proper operation of the equipment,

3. Correction of defective work

D. Reviews shall not be regarded as an assumption of risk or liability by the Engineer or the Owner.

E. A mark of "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED" means that the Owner has no objection to the Contractor, upon its own responsibility, using the plan or method of work proposed, or providing the materials or equipment proposed.

F. The Engineer's review of shop drawings, samples, or test procedures will be only for conformance with design concepts and for compliance with information given in Contract Documents. The Engineer's review does not extend to:

1. Accuracy of dimensions, quantities, or performance of equipment and systems designed by Contractor.

2. Contractor's means, methods, techniques, sequences, or procedures except when specified, indicated on the Drawings, or required by Contract Documents.

3. Safety precautions or programs related to safety which shall remain the sole responsibility of the Contractor.

G. Review of a separate item does not indicate approval of the assembly in which the item functions.

1.12 SUBSTITUTIONS OR “OR EQUAL” ITEMS

A. Named or Sole Source Times

1. Whenever materials or equipment are specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the naming of the item is intended to establish the type, function, and quality required.

2. Unless the name designated a “sole source” and/or is followed by words indicating that no substitution is permitted, materials, or equipment of other Suppliers may be accepted by Engineer if sufficient information is submitted by Contractor to allow Engineer to determine that the material or equipment proposed is equivalent or equal to that named.

B. Initiating Substitution Request

1. To propose to furnish or use a substitute item of material or equipment, Contractor shall use the Proposed "Or Equal" Substitution Submittal Transmittal Form.

2. Submit the Substitution Submittal form to Engineer for acceptance, certifying that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, be similar and of equal substance to that specified and be suited to the same use as that specified.

3. State that the evaluation and acceptance of the proposed substitute will not prejudice Contractor's achievement of Substantial Completion on time, whether acceptance of the substitute for use in the Work will require:

   a. A change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for Work on the Project) to adapt the design to the proposed substitute.

   b. Incorporation or use of the substitute in connection with the Work is subject to payment of any license fee or royalty.

4. Identify all variations of the proposed substitution from that specified

5. Identify available maintenance, repair, and replacement service

6. Provide an itemized estimate of all costs that will result directly or indirectly from acceptance of such substitute, including costs of redesign and claims of other contractors affected by the resulting change

7. The Owner or Engineer may require Contractor to furnish at Contractor's expense additional data about the proposed substitute.

8. If a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Contract Documents, Contractor may propose to furnish or utilize a substitute means, method, sequence, technique or procedure of construction. Submit sufficient information to allow Engineer to determine that the proposed substitution is equivalent to that indicated or required by the Contract Documents.

C. Review Procedure

1. The procedure for review of substitutions by Engineer will be similar to that provided in this Section.

2. Requests for substitutions may only be submitted by the Contractor.

3. All requests for substitution shall be submitted within thirty (30) calendar days after the date of Notice to Proceed unless the Owner has agreed in writing to a later submittal date and the Contractor agrees to comply with all conditions of the Owner for the late submittal.

4. The Owner's agreement to a later submittal date shall not be construed as favorable review or acceptance of the proposed "or equal" substitution.

5. The Engineer will respond to all requests for substitutions within thirty (30) days following receipt of an acceptable substitution submittal, unless the Engineer notifies the Contractor within fourteen (14) days after receipt of the proposed "or equal" substitution submittal that more time is needed to complete a thorough review.

6. The Engineer and Owner will be the sole judge of acceptability, and no proposed "or equal" substitution item or service will be ordered, installed or utilized without Engineer's prior written acceptance that will be evidenced by either a Change Order or an accepted Shop Drawing.

7. As a condition of acceptance, the Owner may require Contractor to furnish, at Contractor's expense, a special performance guarantee or other surety with respect to a proposed "or equal" substitution item or service.

D. Modification due to Substitutions

1. All costs for redesign required by the implementation of the proposed substitute shall be borne by the Contractor.

2. All costs associated with incorporating a substitution into the project shall be borne by the Contractor.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01610

SEISMIC ANCHORAGE AND BRACING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Requirements for seismic anchorage and bracing for equipment, tanks and nonstructural components.

1.02 REFERENCED SECTIONS

A. The following Sections are referenced in this Section

1. Section 01330 – Submittals
2. Section 05501 – Anchor Bolts and Anchoring Devices

1.03 AREAS OF DESIGN RESPONSIBILITY

A. The Contractor shall be responsible for designing all seismic attachments, braces, and anchors to the structure for electrical equipment included in the Work that weigh more than 20 pounds.

B. Equipment manufacturers may provide standard design calculations and details for their specific pieces of equipment as part of the submittal for that equipment. Project-specific design calculations and details need not be produced unless the manufacture does not already have standard designs already prepared.

1.04 REFERENCES

A. The following is a list of standards which may be referenced in this section.

1. International Code Council (ICC) as modified by California Title 24.
   a. 2016 California Building Code (CBC)
   b. Evaluation Service (ICC-ES) Reports and Legacy Reports
2. American Society of Civil Engineers (ASCE): ASCE 7, Minimum Design Loads for Building and Other Structures.

1.05 SUBMITTALS

A. Comply with Section 01330.

B. Seismic Anchorage and Bracing Calculations

1. Submit manufacturer's engineered seismic hardware data and installation requirements.
2. Provide calculations for seismic attachments, braces and anchorages clearly showing the criteria used for the design. Calculations for anchorage of components assigned a component importance factor of 1.5 in accordance

with ASCE 7, Chapter 13 shall be sealed by a registered California Professional Engineer.

C. Shop Drawings: Show details of seismic attachment assemblies including connection hardware, bracing, and anchor bolts.

1.06 DESIGN AND PERFORMANCE REQUIREMENTS

A. In accordance with CBC Section 1621, tanks, mechanical and electrical components, and other elements of the Work that are permanently attached to structures shall be designed and constructed to transfer the component seismic forces specified in ASCE 7, Chapter 13 to the structure.

B. Seismic attachments, braces, and anchorages shall be designed in accordance with the provisions of the California Building Code and the following site-specific seismic criteria, unless noted otherwise on the Drawings.

1. Site-Specific Spectral Response Coefficients

a. Short Period Mapped Maximum Considered Earthquake, 5 Percent Damped: Ss = 2.111g

b. 1 Second Period Mapped Maximum Considered Earthquake, 5 Percent Damped: S1 = 0.876g

c. Short Period Design Spectral Response Acceleration, 5 percent Damped: SDS = 1.408g

d. 1 Second Period Design Spectral Response Acceleration, 5 percent Damped: SD1 = 0.992g

2. Site Class: F

3. Seismic Design Category: F, unless noted otherwise

4. Seismic Use Group: IV, unless noted otherwise

5. Component Importance Factor, Ip:

a. Mechanical and Electrical Equipment: Use 1.5

b. Tanks and Tank Anchorage: Use 1.5

c. Components that contain hazardous materials: Use 1.5

d. Components that are required for life safety: Use 1.5

e. Components that must remain functional after an earthquake, such as fire protection sprinkler systems: Use 1.5

6. Do not use more than 60 percent of the weight of tanks and mechanical and electrical equipment for designing anchors for resisting overturning due to seismic forces.

7. Do not use friction to resist sliding due to seismic forces.

C. In accordance with ASCE 7, the following are exempt from the requirements of this Section:

1. Mechanical and electrical components with a Component Importance Factor of = 1.0 that weigh 400 pounds or less, are mounted 4 feet or less above the adjacent finished floor elevation, and are provided with flexible connections between the components and any associated ductwork, piping, or conduit.

2. Mechanical and electrical components with a Component Importance Factor of = 1.0 that weigh 20 pounds or less, are mounted at any height, and are provided with flexible connections to attached ductwork, piping, and conduit.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Attachments and supports transferring seismic loads to the structure shall be constructed of materials and products suitable for the application and designed and constructed in accordance with the design criteria shown on the Drawings and nationally recognized standards.

B. Powder driven fasteners and sleeve anchors shall not be used for seismic attachments and anchorages where resistance to tension loads is required.

C. Anchor Bolts: In accordance with Section 05501.

PART 3 - EXECUTION

3.01 GENERAL

A. Design seismic anchorage systems to provide restraint in all directions, for each component or system so anchored.

B. Tall and narrow equipment such as motor control centers and electrical control panels shall be anchored at the base and within 12 inches from the top of the equipment.

C. Mechanical and electrical components shall not be attached to more than one element of a building structure at a single restraint location where such elements may respond differently during a seismic event. Such attachments shall also not be made across building expansion and contraction joints.

D. Seismic attachments and braces shall be provided and installed by the Contractor in accordance with the size and number of braces determined by the design calculations prepared by the Contractor.

E. Anchor bolts and concrete and masonry anchors for the anchorage of equipment shall be provided and installed by the Contractor in accordance with the bolt sizing, minimum embedment, and spacing requirements determined by the calculations prepared by the Contractor.

END OF SECTION

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SECTION 02221

DEMOLITION, SALVAGE AND ABANDONMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Demolition, salvage and abandonment of existing facilities.

1.02 REFERENCED SECTIONS

A. The following Section is referenced in this Section

1. Section 01330 – Submittals

1.03 SUBMITTALS

A. Comply with Section 01330.

B. Description of removal procedures for careful removal of materials and equipment and the protection of facilities which are to remain undisturbed.

C. Time schedule for demolition work. Show demolition in relation to new construction, including any temporary facilities.

1.04 EXISTING CONDITIONS

A. Prior to the submittal of Bids, Contractor shall visit the site and inspect all facilities to become familiar with existing conditions and utilities.

1.05 REGULATORY REQUIREMENTS

A. Dispose of debris in accordance with the requirements of jurisdictional agencies.

B. Comply with applicable air quality control regulations.

C. Obtain necessary permits for building demolition, transportation of debris to disposal site(s) and dust control.

D. Erect appropriate safety devices to protect the general public, Owner's operations personnel, and workers from the hazards of demolition activities.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 GENERAL

A. The Drawings identify the major equipment and facilities to be demolished, salvaged or abandoned. Auxiliary utilities such as water, air, drainage, lubrication oil, electrical wiring, controls, and instrumentation are not necessarily shown. Remove

auxiliary utilities, as well as equipment and pipe supports and associated instrumentation devices pertaining to piping or equipment designated to be removed.

3.02 PROTECTION OF EXISTING FACILITIES

A. Before beginning any demolition work, carefully survey the existing work and examine the Contract Documents to determine the extent of the Work.

B. Take precautions to prevent damage to facilities which are to remain in place, and be responsible for any damages to these facilities resulting from this work. Repair or replace damages to such work to return the facilities to its pre-existing condition at no additional cost to the Owner.

3.03 DEMOLITION

A. Demolish equipment in an orderly and safe manner.

3.04 DISPOSAL OF DEMOLISHED MATERIALS

A. Concrete, site debris, rubbish, and other materials resulting from demolition operations, as well as mechanical and electrical equipment designated to be demolished, shall be the property of the Contractor and shall be legally disposed of at the Contractor's expense.

3.05 CLEANING

A. During and upon completion of the demolition operations, promptly remove unused tools and equipment, surplus materials, rubbish, debris, and dust and leave work areas in a clean condition.

B. Do not sweep, grade, or flush surplus materials, rubbish, or debris into storm drains.

END OF SECTION

SECTION 05501

ANCHOR BOLTS AND ANCHORING DEVICES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Anchor bolts, concrete anchors, adhesive anchors, and other anchoring devices.

1.02 REFERENCED SECTIONS

A. The following Section is referenced in this Section

1. Section 01330 – Submittals

1.03 SUBMITTALS

A. Comply with Section 01330.

B. Product Data: Manufacturer's data for nuts, bolts, concrete anchors, chemical anchors and other fasteners.

C. Catalog data and ICBO reports for each type of anchor bolt.

1.04 QUALITY ASSURANCE

A. For applications that require special inspection in accordance with building codes, coordinate the progress of the Work with the required inspection activities.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Unless otherwise specified or indicated on the Drawings, materials of construction for anchoring devices shall conform to the following:

1. Anchor bolts and other anchoring devices, nuts and washers installed indoors: Type 304 stainless steel.

2.02 CAST-IN-PLACE ANCHOR BOLTS

A. Locations

1. Use cast-in-place anchor bolts:

a. In locations indicated on the Drawings.

b. To anchor engine-driven equipment and equipment with motors 3 horsepower and larger.

2.03 CONCRETE ANCHORS

A. Concrete Anchors: Drilled in place wedge-type anchors with threaded stud body, stainless steel expansion clip, nut and washer.

B. Materials: Type 304 or Type 316 stainless steel, depending upon installed location.

C. Code Compliance: Test in accordance with, and comply with requirements of, ASTM E488 and ICC-ES AC193.

D. Manufacturers: One of the following or equal:

1. Hilti Kwik Bolt 3.

2. ITW Redhead, Trubolt Wedge Anchor.

3. Powers Fasteners, Power-Stud SD4 or SD6.

4. Wej-It Corporation, Ankr-Tite Wedge Anchors.

2.04 ADHESIVE ANCHORS

A. Applications: Use for bonding threaded rods and concrete reinforcing bars to hardened concrete and grouted cement masonry. Do not use in overhead applications, in chlorine gas environments, or where anchor may be exposed to machine oil or diesel oil.

B. Code Compliance: Test in accordance with, and comply with requirements of, ASTM E488 and ICC-ES AC58.

C. Materials

1. Epoxy Adhesive: Two component, injectable epoxy adhesive.

2. Concrete Reinforcing Bars: Grade 60.

3. Threaded Rods: Type 304 stainless steel all-thread rod conforming to ASTM F593.

D. Manufacturers: One of the following or equal:

1. Hilti HVA Adhesive Anchor System.

2. ITW Redhead G5 Adhesive Anchoring System.

3. Powers Fasteners PE1000+ Epoxy Anchoring System.

PART 3 - EXECUTION

3.01 GENERAL ANCHORING REQUIREMENTS

A. Use equipment shop drawings, anchorage layout drawings, and anchor bolt layout templates to accurately position anchor bolts.

B. Install anchor bolts, concrete anchors and other anchoring devices with at least 2 threads projecting beyond the nut, but no more than 1/2-inch projecting beyond the nut.

C. Prior to installing nuts, coat threads of stainless steel bolts with material to prevent galling of threads.

1. Manufacturers: One of the following or equal:

a. Never Seez Compound Corporation, Never-Seez.

b. Oil Research, Inc., WLR No. 111.

D. Tighten nuts on anchor bolts, concrete anchors and other anchoring devices to the "snug-tight" condition, defined as tightness attained by a few impacts of an impact wrench or the full effort of a man using an ordinary wrench.

3.02 CONCRETE ANCHORS AND ADHESIVE ANCHORS

A. Cast-in-place anchor bolts may be used in place of concrete anchors and adhesive anchors at Contractor's option.

B. Installation

1. Drill holes using concrete drill bits and impact type drill motors. Hole diameter shall be in accordance with the manufacturer's recommendations.

2. Clean drilled hole using compressed air to dislodge and remove drilling dust.

3. Accurately locate concrete anchors and set anchors with axis perpendicular to surfaces from which they will project.

4. Do not disturb adhesive anchors until cure time has elapsed.

5. Unless otherwise indicated on the Drawings or as required by structural calculations prepared by the equipment supplier, comply with minimum embedment lengths identified in the following table.

Minimum Embedment Lengths for Concrete and Adhesive Anchors

Diameter of Anchor or Bar, inches	Embedment Length for Concrete Anchors, inches(1)
1/4	1-3/4
3/8	1-7/8
1/2	2-1/4
5/8	2-3/4
3/4	3-1/4
(1) Use large size if so indicated elsewhere	

END OF SECTION

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SECTION 16010

ELECTRICAL

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall install, ready for use, the electrical and instrumentation system as specified herein and shown on the Contract drawings. This document describes the function and operation of the system and particular components, but does not necessarily describe all necessary devices. All components and devices shall be furnished and installed as necessary/required to provide a complete operable and reliable system for accomplishing the functions and meeting the performance set forth hereinafter.

B. Furnish all required labor, materials, project equipment, tools, construction equipment, safety equipment, transportation, test equipment, incidentals, and services to provide a complete and operational electrical & instrumentation system as shown on the E&I - Series Drawings, included in these Specifications, or required for fully operating facility.

C. Examine the specification and Drawings for mechanical equipment and provide all circuit breakers, switches, pushbuttons and appurtenances which are not specified to be with the mechanical equipment. Erect all electrical equipment not definitely stated to be erected by others, furnish and install conduit, wire and cable and make connections required to place all equipment in complete operation.

D. It is recommended that the Electrical Contractor attend the job walk for the site and shall have accomplished the following:

1. Thoroughly examine existing conditions before submitting his bid proposal to perform any work. He shall compare site conditions with data given on the plans or in these Specifications. No allowance shall be made for any additional costs incurred by the Contractor due to his failure to have examined the site or to have failed to report any discrepancies to the Owner prior to bid.

2. It is the Contractor's responsibility to be fully familiar with the existing utility locations, conditions and local requirements and regulations.

3. Verify all measurements and conditions and shall be responsible for the correctness of same. No extra compensation will be allowed because of differences between Work shown on the Drawings and measurements at the site.

E. Any major deviations in location and conduit routing that the Contractor makes without the express written review or direction of the Engineer, shall be considered to have been made at the Contractor's sole responsibility. Such deviations made by the Contractor shall be reflected on the Contractor supplied "Record Drawings." The Owner will reimburse the Engineer and the Owner will then deduct an amount equal to said reimbursement from the Contractor's contract for all engineering, drafting, and clerical expenses associated with updating the Record Drawings due to any major unauthorized changes.

F. The major areas in the scope of work shown on E&I - Series Contract Drawings which includes the furnishing and installation:

1. Standby Diesel Generator including modifying existing hardware for monitoring generator, and other miscellaneous device.
2. Automatic Transfer Switch.
3. Remote low fuel level alarm monitoring system.
4. Demo existing generator, ATS, fuel monitoring system.
5. Instrumentation and other miscellaneous devices. This includes all wiring and cables.
6. Provide all necessary conduits, junction boxes, grounding system, field interconnection wiring, hardware, fittings, and devices to connect the designated equipment and wiring.
7. Installation of primary devices, equipment and instruments are not completely detailed on Contract Drawing plan sheets. Use Device Indexes and Contract Drawings installation details for installation and mounting requirements.
8. All necessary miscellaneous shut off, sample, and calibration valves to sensors.
9. Trenching, back filling, compaction and resurfacing to match existing surfaces for each underground conduit route.
10. Grounding system and equipment grounding.
11. Concrete pads and supports for electrical and instrumentation equipment
12. Remove and dispose of all excess dirt, paving, concrete, and other materials from site work.
13. Coordination for connection of utility services.

G. Existing site is limited in space. It is the Contractor's responsibility to provide an electrical and instrumentation package to fit in the allocated space.

H. Provide all necessary hardware, conduit, wiring, fittings, and devices to connect the electrical equipment provided under other Sections.

I. All electrical equipment and materials, including installation and testing, shall conform to the applicable codes and standards listed in this and other Sections. All electrical work shall conform with the National Electric Code (NEC) 2017 issue. Nothing on the Drawings or in the Specifications shall be construed to permit work or materials not conforming to these codes and standards.

J. The following specifications incorporate specific equipment and devices that are standards of the Owner because of their serviceability, because of the local availability of labor, parts and materials, or because of the ability of the Owner to umbrella the equipment under existing maintenance contracts; however, favorable alternatives proposed in writing will be considered by the Owner.

1.02 CODES AND STANDARDS

A. All electrical/instrumentation equipment and materials, including installation and testing, shall conform to the following applicable codes and standards:

1.	ANSI	-	American National Standards Institute, Inc.
2.	EIA	-	Electronics Industries Association.
3.	ETL	-	Electrical Testing Laboratories.
4.	FM	-	Factory Mutual.
5.	GO128	-	General Order No. 128, Rules for Construction of Underground Electrical Supply and Communication Systems, Public Utilities Commission of the State of California.
6.	IEEE	-	Institute of Electrical and Electronics Engineers.
7.	ICEA	-	Insulated Power Cable Engineers' Association.
8.	ISA	-	International Society of Automation (ISA) Standards (formerly Instrument Society of America.
9.	NEC	-	National Electrical Code, 2017 Edition.
10.	NEMA	-	National Electrical Manufacturers Association.
11.	NETA	-	Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems, International Electrical Testing Association.
12.	NESC	-	National Electrical Safety Code.
13.	NFPA	-	National Fire Protection Agency & NFPA820
14.	OSHA	-	Occupational Safety and Health Act Standards.
15.	UL	-	Underwriter's Laboratories, Inc.

B. The revisions of these codes and standards in effect on the date of issuance of the Contract Documents shall apply.

C. Codes and standards referenced shall be considered minimum acceptable work.

D. In instances where two or more codes are at variance, the most restrictive requirements shall apply.

E. Nothing on the Drawings or in the Specifications shall be construed to permit work or materials not conforming to the preceding codes and standards.

F. All work shall also be performed in accordance with the Owner, State, County or Owner standards, and local Utility codes.

G. The Contractor shall furnish without extra charge any additional material and labor which may be required for compliance with these codes and standards, even though the work is not explicitly mentioned in the Specifications or shown on the Contract E- Series Drawings.

H. Amperage listed on the single-line Drawings for motors are per NEC Table 430.250 and may not necessarily match that of the equipment supplied. It is the electrical system supplier and Contractor's responsibility to furnish equipment sized for the motors supplied for this project at no additional cost.

I. All electrical work shall conform with the National Electric Code (NEC) 2017 issue and the latest NFPA 70E. Nothing on the Drawings or in the Specifications shall be construed to permit work or materials not conforming to these codes and standards.

1.03 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Provide electrical system that interfaces to work performed under other Mechanical and Equipment plans.

B. The following is part of Division XI:

1. Section 16210 – Diesel Generator
2. Section 16605 – Electrical Systems Analysis.

1.04 ELECTRICAL CONTRACTOR QUALIFICATIONS

A. It is the intent of this Section that the complete responsibility for management and installation of the electrical and instrumentation required for this project be by a qualified Electrical Contractor. This responsibility includes, but not limited to, supervision and coordination of work performed by all suppliers of Division XI

B. Uncertified electricians shall not perform electrical work for which certification is required per Labor Code Section 3099. Electricians shall be required to carry proof of certification on their person at all times. Electricians found on the jobsite without proof of certification will be asked to leave, prohibited from working on-site until proof of certification has been provided and may be reported to the Contractors State License Board (CSLB).

C. Contractor shall submit the proposed Electrical Subcontractor and System Supplier with bid documents that will be used on this project.

D. If the Contractor, Electrical Subcontractor, and System Supplier listed in bid documents are deemed not qualified by Owner, they will have their bid rejected at the Owner's sole discretion and the next qualified bidder selected.

E. The Electrical Subcontractor shall meet the following minimum qualifications:

1. Has a current C-10 Electrical Subcontractor's License.
2. Has regularly engaged in similar electrical contracting for the Municipal Water Industry.
3. Has successfully performed work of similar or greater complexity on at least two previous projects under one company name and under the present company name.
4. Has all persons performing work as electricians certified by the California Apprenticeship Council per California Labor Code Section 3099.
5. Has been actively engaged in the type of electrical and instrumentation work specified in this Section for a minimum of two years.

F. Bid package shall include a list of five (5) completed projects of similar size and nature for water treatment plants the Electrical Contractor has completed:

1. Provide completion dates of projects.
2. References of Owner Representative in charge of project, including contact name and telephone number.

1.05 SYSTEM SUPPLIER QUALIFICATIONS

A. General:

1. It is the intent of this Section that complete responsibility in the supplying of the MCC, and other equipment required for this project be supplied by one System Supplier. This responsibility includes, but not limited to, all work necessary to select, furnish, program, supervise installation, calibrate, and place into operation all transmitters, instruments, controllers, alarm equipment, monitoring equipment, and accessories as specified herein.
2. The system supplier shall have an on staff project engineer with prior experience on similar sized projects. This project engineer shall coordinate the technical aspects of this project and prepare the submittals and drawings. The system supplier project engineer shall attend all coordination meetings and be on-site when requested by the Owner's Engineer.

B. Pre-Qualified System Suppliers

1. The Suppliers listed below have been determined to meet minimum qualifications specified in this Section and are pre-qualified by the Owner for providing supplier bids as system suppliers on the project.
   a. Tesco (phone 916 395-8800)

b. Krug-Bixby-Long Associates (KBL) (phone 510 887-1117)

c. Primex Controls (formerly MCC Control Systems &Meyer Control Corporation), (phone 707 449-0341)

d. Technical Systems, Inc. (phone 707 678-1111)

C. Non-Pre-Qualified System Suppliers

1. System Suppliers not pre-qualified by the Owner shall submit the information listed herein at least 14 calendar days prior to bid date, and if approved by the Owner, will be listed in a Contract addendum prior to bid.

a. Company history.

b. List of five (5) completed projects of similar size and nature for water treatment plants.

c. Provide completion dates of projects.

d. References of Owner Representative in charge of project, including contact name and telephone number.

e. List of projects in progress.

f. Description of scope of projects.

g. Dollar amount of projects.

h. References of Owner Representative in charge of project, including contact name and telephone number.

i. Complete 2017 Year End Financial statement prepared by a Certified Accountant or complete 2017 Company Tax Returns listing assets and liabilities.

2. Additional information for clarification as requested by the Owner in writing shall be provided by the System Supplier asking for the qualification or qualification will automatically be denied.

3. System Supplier providing financial statements lacking detail or stating that detailed financial records are proprietary will be disqualified as a qualified System Supplier and is grounds alone for disqualification.

4. Any qualification package deemed incomplete or lacking sufficient information to determine qualification will result in System Supplier not being qualified.

5. No reason will be released on why a System Supplier was not qualified.

1.06 CONTRACT DOCUMENTS

A. The Contract drawings and specifications are intended to be descriptive of the type of electrical system to be provided; any error, omission, or minor details missing in either shall not relieve the Contractor from the obligations there under to install in correct detail any and all materials necessary for a complete operational system, at no additional cost.

B. The Contract drawings are generally diagrammatic; exact locations of electrical products shall be verified in the field with the Engineer. Except where special details on drawings are used to illustrate the method of installation of a particular piece or type of equipment or materials, the requirements or descriptions in this Section shall take precedence in the event of conflict.

C. The Contract Electrical elementary, elevation and one-line diagrams are the basis of the electrical system to be provided and are for reference only. It is the Contractor's responsibility to adjust and make minor revisions to the diagrams as necessary for operational system at no additional cost to the Owner. Additional isolators, relays, wiring, terminal blocks, and appurtenances, shall be provided for an operation system at no additional cost to the Owner.

D. Location at facilities of new equipment, inserts, anchors, panels, pull boxes, conduits, stub-ups, and fittings for the electrical system are to be determined by the Contractor and Engineer at time of installation. Contractor shall make minor adjustments to locations of electrical equipment required by existing conditions and coordination with other trades at no additional cost.

E. The Conduit and Wire Routing Schedule, wire fill, and number of conduits are based on the best information available.

1. It is the Contractor's responsibility to modify the conduit schedule based upon Shop Drawings for the actual equipment. Such modifications in conduit sizes and numbers of conductors shall be at no additional cost to the Owner, if such changes are the direct result of the equipment selected by the Contractor.

2. A copy of the Conduit and Wire Routing Schedule and Electrical plans showing conduit routing shall be updated weekly by the Contractor. Progress payments will be withheld if during monthly checks it is found that the Contractor fails to maintain the Conduit Schedule updates.

F. Electrical & instrumentation, conduit & wire lengths shown on Contract Drawings are approximate. The Contractor is responsible for determining actual lengths for bidding and installation purposes. Contractor is to be made aware that equipment may be installed in the lower levels of the building and instrumentation manufacturer's cable length depends on conduit routing.

G. The Contractor shall examine the architectural, mechanical, structural, electrical and instrumentation equipment provided under other Sections of this Contract in order to determine the exact routing and final terminations for all conduits and cables. The exact locations and routing of cables and conduits shall be governed by structural conditions, physical interferences, and the physical location of wire terminations on equipment. Conduits shall be stubbed up as near as possible to equipment.

H. All equipment shall be installed and located so that it can be readily accessed for operation and maintenance. The Engineer reserves the right to require minor changes in location of equipment, without incurring any additional costs.

I. Provide means to furnish equipment and accessories, do the installation, complete connections, submit documentation, perform start-up, and be responsible for the warranty.

J. Where conduits are shown as "home runs" on the Contract drawings or stated to be furnished, but not explicitly shown as part of the scope of work; the Contractor shall provide all fittings, boxes, wiring, etc., as required for completion of the raceway system in compliance with the NEC and the applicable specifications in this Section.

K. No changes from the Contract drawings or specifications shall be made without written approval of the Engineer. Should there be a need to deviate from the Contract documents, submit written details and reasons for all changes to the Engineer for favorable review within 30 days after award of Contract.

L. When existing conduits are to be used, it is the Electrical Contractor's responsibility to verify conduit size and routing. This includes all potholing or other location methods. Existing conductors and conduits damaged by Contractor during construction shall be repaired or replaced at no cost to Owner.

M. The resolution of conflicting interpretation of the Contract documents shall be as determined by the Engineer.

N. The Contractor shall coordinate with other Suppliers on the project for a complete and operable system.

O. It is the System Supplier's responsibility for obtaining instrumentation transmitter configuration software, manuals, USB drives and disks necessary for the Contractor to program and configure the instrumentation transmitters.

P. The Electrical Contractor shall maintain a separate set of neatly and accurately marked set of Record Documents, consisting of spreadsheets, specifications and full size blue-line Electrical (E-Series) and Instrumentation (I-Series) Contract Drawings.

1. These documents are to be used specifically for recording the as built locations and layout of all electrical and instrumentation equipment, routing of raceways, junction and pull boxes, and other diagram or document changes.

2. These Record documents shall be kept up-to-date during the progress of the job, with all "change orders", submittal modifications, and construction changes shown and stamped with "As-Built" at end of job.

3. These Record documents shall not be used for daily construction use and shall not contain any mark-ups that are unrelated to as-built corrections.

4. The following lists the record documents shall be as-built by Electrical Contractor:

    a. E-Series Drawings.

    b. Panelboard schedules.

    c. Conduit and Wire Routing Schedule.

    d. Lighting Schedule.

    e. Duct banks and their routing with offset measurement and indicate changes in depth. Duct bank elevations shall not be drawn or penciled in by hand. Provide CAD drawings of duct banks.

5. The following lists the record documents that shall be as-built by System Supplier to be maintained by Electrical Contractor:

    a. I-Series Drawings

    b. Instrumentation Index.

6. Record documents shall be kept current weekly with all "change orders," submittal modifications, and construction changes shown. Record Documents shall be subject to the inspection by the Engineer at all times, progress payments or portions thereof may be withheld if Record Documents are not accurate or current.

7. When documents are changed, they shall be marked with erasable colored pencils using the following coloring scheme:

    a. Additions - red

    b. Deletions - green

    c. Comments - blue

    d. Dimensions - black

8. Show the following on the Electrical (E-Series) Record Contract Drawings by dimension from readily obtained base lines:

    a. Exact location, type and function of electrical and instrumentation equipment and devices.

    b. Precise routing and locations of underground conduits, pullboxes, junction boxes, and appurtenances that make-up the raceway system.

    c. Show the dimensions, location and routing of electrical work, which will become permanently concealed.

    d. Show complete routing and sizing of any significant revisions to the systems shown.

9. Prior to acceptance of the work, the Contractor shall deliver to the Engineer one set of record full size drawings neatly marked accurately showing the information required above.

1.07 COORDINATION

A. The Contractor shall coordinate the electrical work with the other trades, code authorities, utilities, and the Engineer; with due regard to their work, towards promotion of a rapid completion of the project. If any cooperative work must be altered due to lack of proper supervision of such, or failure to make proper provisions, then the Contractor shall bear expense of such changes as necessary to be made in the work of others.

B. Manufacturer's directions and instructions shall be followed in all cases where such is not shown on the Contract Drawings or herein specified.

C. Power utility coordination:

1. The Contractor shall field verify the locations for the underground primary and secondary conduit runs, pull boxes, and transformer pad with utility representative prior to installation.

2. Provide all the equipment and materials not provided by the power utility company for permanent service at the locations shown on the Contract Drawings. All work shall meet the requirements of the serving power utility companies.

3. Coordinate all work with the serving power utility, Pacific Gas & Electric (PG&E) for the work shown on Contract Drawings. The Contractor shall obtain the required inspections.

   a. Submit to the power utility the proposed metering details including, but not limited to, proposed meter enclosure, meter socket and service entrance drawing details. Provide a written statement from the utility that shows approval of the proposed metering.

   b. All work associated with material and installation for the utility power service not paid by the utility shall be borne by the Contractor.

   c. Contractor shall be responsible for obtaining utility engineered drawings.

   d. The Contractor shall provide and install all material, conduits, wiring, pull ropes, pole risers, pull boxes, transformer pads, bollards, and other work specified and shown on PG&E engineered drawings for new power service.

   e. Conflicts between the Contract drawings and the utility engineered drawings shall be brought to the attention of the Engineer. Contractor shall meet all utility requirements at no additional cost to the Owner.

   f. All fees and charges for the utility power service hook-up will be paid by the Owner.

D. The electrical and instrumentation modifications and additions are to be made at facilities that need to remain powered at all times. The Contractor shall schedule all the required work with the Owner, including each shutdown period. Each shutdown shall be implemented to minimize disruption of the existing operations. Shutdowns may be required outside of normal working hours when necessary. The work to be provided under this Contract shall not disrupt any of the existing operations without prior approval.

1. The Contractor shall limit all scheduled shutdown periods to less than 20 minutes and only with prior approval of the Owner.

2. Carry out scheduled shut downs only after the time, date, and sequence of work proposed to be accomplished during shutdown has been favorably reviewed by the Owner. Submit shutdown schedule and plans at least 10 working days in advance of when the scheduled shutdown is to occur.

3. Contractor shall make provisions for portable generators and automatic transfer switches when facilities will be without power.

4. The Owner reserves the right to delay, change, or modify any shutdown at any time, at no additional cost to the Owner, when the risk of such a shutdown would jeopardize the operation of system.

5. Contractor is advised that during change out of existing MCCs, meter/main, pumps, demolition of existing conduits, installation of new conduits, etc., Contractor is responsible to keep equipment running for all necessary station operation. The Contractor shall install temporary generators, motor controls, panelboards, power panelboards, wiring, etc. to keep all facility equipment powered and automatic controls functional.

E. Contractor shall be responsible for obtaining utility Engineered Drawings for service conductor conduits, pull boxes, wire size requirements, pull rope requirements, etc. Conflicts between the Contract Drawings and the utility engineered drawings shall be brought to the attention of the Engineer.

F. The Contractor shall cease work at any particular point, temporarily, and transfer his operations to such portions of work as directed, when in the judgment of the Owner it is necessary to do so.

G. Prior to commencing construction, the General Contractor shall arrange a conference with the General Contractor, Electrical Contractor, System Supplier, Resident Engineer & Owner as well as all equipment and system suppliers vital to the current phase of work. During the meeting, the equipment supplier shall verify types, sizes, locations, installation requirements, controls and diagrams of all equipment furnished. The Equipment and System Suppliers shall, in writing, inform the Engineer that all phases of coordination of this equipment have been covered and if there are any unusual conditions, they shall be enumerated at this time.

H. It is the responsibility of the Contractor to make all equipment approval arrangements and scheduling with the power utility company connected with this project. Schedule within 30 days after award of contract all service installations and connections with the power and telephone utility. Lack of effort by the Contractor to properly schedule Utility service will not be considered valid justification for delays in project completion and no extension in contract time will be given.

1.08 SUBMITTAL AND DRAWING REQUIREMENTS

A. General:

1. Submit shop documents and drawings for approval in accordance with this subsection and Section 01330.

2. Electrical submittals shall be submitted for favorable review by the Owner or Engineer per this subsection. They shall be complete giving all details of connections, wiring, instruments, enclosures, materials and dimensions. Standard sales literature will not be acceptable.

3. A copy of the appropriate Section Specification Sections, with addendum updates included and with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements.

   a. Check marks (√) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated and, therefore, requested by the Contractor, each deviation shall be underlined and denoted by a unique number in the margin to the right of the identified paragraph. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the Specifications.

   b. The submittal shall be accompanied by a detailed, written justification for each numbered item explaining variance or non-compliance with specifications.

   c. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no review.

4. The Contractor shall coordinate submittals and required meetings with the work, and panel fabrication so that project will not be delayed. This coordination shall include scheduling the different categories of submittal, so that one will not be delayed for lack of coordination with another.

5. No material or equipment shall be allowed at the job site until the submittal for such items has been reviewed by the Engineer and marked "No Exceptions Taken" or "Make Corrections Noted."

6. The equipment specifications have prepared on the basis of the equipment first named in the Specifications. The Supplier shall note that the second

named equipment, if given, is considered acceptable and equal equipment, but in some cases additional design, options, or modifications may be required, at no additional cost, to meet Specifications.

7. The decision of the Engineer governs what is acceptable as a substitution. If the Engineer considers it necessary, tests to determine equality of the proposed substitution shall be made, at the Contractor's expense, by an unbiased laboratory that is satisfactory to the Engineer.

8. The Contractor shall cease work at any particular point, temporarily, and transfer his operations to such portions of work as directed, when in the judgment of the Engineer it is necessary to do so.

9. No submittal documents shall be labeled as proprietary. Labeling documents as proprietary will be sufficient cause for rejection of entire submittal. The Owner reserves the right to copy or duplicate any and all portions of the documents provided for the project including copyrighted documents as desired.

10. Identify all submittals by submittal number on letter of transmittal. Submittals shall be numbered consecutively and resubmittals shall have a letter suffix. For example:

    a. 1st submittal: 1.

    b. 1st resubmittal: 1A.

    c. 2nd resubmittal: 1B, etc.

B. The electrical submittals shall include but not be limited to data sheets and drawings for each product together with the technical bulletin or brochure. No FAX copies of documents are allowed. Color copies shall be provided when black and white copies do not show adequate clarity. The electrical submittals shall include:

1. Product (item) name used herein and on the Contract Drawings.

2. The manufacturer's model or other designation.

3. Tag name/number per the P&ID drawings, schedules, and indexes.

4. Index Binder Tab Dividers.

5. Detailed electrical one line, elementary control diagrams and interconnection diagrams showing all wiring requirements for each system.

6. Complete documentation with full description of operation.

7. Complete catalog cuts with full description of equipment. General sales literature will not be acceptable. The part or model number with options to be provided shall be clearly identified. Where more than one item or catalog number appears on a catalog cut, the specific item(s) or catalog numbers(s) proposed shall be clearly identified.

8. Location of assembly at which it is installed.

9. Input-output characteristics.

10. Range, size, and graduations as required.

11. Physical size with dimensions and mounting details. System Supplier submit a letter listing all instrumentation pipe sizes, pipe connections, flange types, and ANSI ratings signed by Contractor and System Supplier to certify coordination for proper installation prior to flow elements being purchased.

12. Enclosure fabrication and color.

13. Enclosure layout and elevation drawings to scale.

14. Quantity and quality requirements for electric power.

15. Materials of construction of components.

16. Nameplate schedule.

17. Interconnection diagrams.

18. Failure to provide submittals with heavy duty permanent plastic labeled index tabs may be grounds for immediate rejection without review.

19. Bill of Materials: A complete Bill of Materials list shall be provided at the inside of the front cover. The Contractor shall provide Bill of Material for electrical components formatted as shown in Appendix "A". A separate set of Material Listing forms shall be provided for the MCC, spare parts, and another listing all field equipment. Generic names or part numbers used by a distributor or Systems House are not acceptable; originating manufacturer's name and part number shall be listed.

20. A separate instrument data sheet shall be provided for each instrument per ISA S20 standards or approved equal. Data sheets shall be printed on blue or pink paper. Provide an index with proper identification and cross-referencing of each data sheet.

21. Submit USB electronic copies of all submitted drawing in AutoCAD format.

22. For each resubmittal, provide a copy of submittal comments and a separate letter, on Company letterhead, identifying how each submittal comment has been addressed in the resubmittal.

23. Electronic PDF version of submittals shall be provided with table of contents, regardless of hard copy format of submittal. PDF shall be "bookmarked" at each index, subtab, copy of appropriate check-marked Specification Section, bill of materials, copy of submittal comments (for resubmittals), Contractor's response to submittal comments (for resubmittals), drawings, etc. Failure to bookmark PDF may be grounds for immediate rejection without review. Bookmarks shall not be out of order; the English description shall match that listed in the Submittal's Table of Contents.

24. Electronic submissions of submittals may be provided for submittals less than 40 pages and without drawings. Submittals equal to or over 40 pages or those that contain drawings shall be provided in a hardcopy format. Drawings shall be printed at 11 inches by 17 inches. Hardcopy submittals shall be provided in binders as specified herein. The Owner reserves the right to reject submittals that fail to be organized as described herein.

C. All drawings shall be generated with a computer utilizing the AutoCAD 2010 or later drafting package. Standard preprinted drawings simply marked to indicate applicability to the Contract will not be acceptable. Drawings shall be prepared in a professional manner and shall have borders and a title block identifying the project, system, drawing number, drawing title, AutoCAD file name, project engineer, date, revisions, and type of drawing. Drawings shall be no smaller than 11" x 17" and printed with a laser jet printer or plotted in ink on vellum. The lettering shall be legible and no smaller than 0.075 inch in height. Diagrams shall carry a uniform and coordinated set of wire colors, wire numbers, and terminal block numbers. A Drawing Index shall be provided that lists each Drawing title and drawing number. Each Drawing title and number shall be unique. The index shall not include drawings listed as "This Page Intentionally Left Blank". The shop drawings shall include:

1. Electrical one or three line diagrams detailing all devices associated with the power distribution system. The following applicable information or data shall be shown on the one- or three- line diagram: location, size and amperage rating of bus; size and amperage rating of wire or cable; breaker ratings, number of poles, and frame sizes; generator; automatic transfer switch; utility metering; voltage; amperage; number of wires and phases; fault interrupt ratings; ground size and connections; neutral size and connections; power fail and other protective devices; fuse size and type; panelboard; starters; contactor size and overload range; motor full load amperage of submitted motor and horsepower; rating for miscellaneous loads; etc. Submit equipment motor voltage, phase and full load amps provided for this project for verification of accuracy of submitted one line drawings.

2. Elementary diagrams shall be provided for all relay logic, power supplies, and other wiring. All elementary diagrams shall be drawn in JIC EMP/EGP format and standards similar to those shown on the E-series elementary diagrams showing ladder rung numbers and coil and contact cross referencing numbers.

3. Enclosure and Elevation layout diagrams shall be provided to show all deadfront, front panel and backpan devices drawn to scale. Show fabrication methods and details; including material of construction, paint color, support and latching mechanisms, fans and ventilation system, and conduit entrance areas.

4. Interconnection diagrams shall show for each piece of equipment all wiring between all devices, panels, cabinets, terminal boxes, control equipment,

motor control centers and any other devices and equipment. An interconnection diagram shall be furnished for each electrical and instrumentation system, even if one was not shown explicitly on the Contract Drawings. Interconnection diagrams shall be prepared for all conduits listed in the Conduit and Wire Routing Schedule. Each interconnection diagram shall show the following as a minimum:

a. Interconnect drawings shall be prepared for all equipment by the System Supplier.

b. The diagrams shall be utilized by the electrician during all phases of installation and connection of all conductors to ensure coordination of equipment interconnect.

c. The diagrams shall show wiring as field labeled at the end of the project when as-builts are submitted.

d. Each wire labeling code as actually installed shall be shown. The wiring labeling code for each end of the same wire must be identical.

e. All devices and equipment labeling codes shall be shown.

f. All Interconnection wires listed in the Conduit and Wire Routing Schedule for each conduit shall be shown only on one interconnect drawing. Interconnection diagrams shall be of the continuous line type with identified lines. Diagrams of the wireless or wire schedule type are not acceptable. Bundled wires shall be shown as a single line with the direction of entry/exit of individual wires clearly shown.

g. All terminations points on the diagram shall be shown with the actual equipment identification terminal number or letter. This identification of terminations includes terminal blocks, junction boxes, all devices, computer I/O points, etc. "??" in lieu of terminal number is unacceptable.

h. Diagrams shall include raceway numbers, raceway size, raceway type, cable numbers, wire color code, and wire numbers.

i. Each wire size, and cable size and color code shall be shown. Each conduit with the conduit label and conduit size and wire fill shall be shown. Wire and cable routing through conduits, wireways, manholes, handholes, junction boxes, terminal boxes and other electrical enclosures shall be shown with the appropriate equipment labels. All spare wires, cable, and termination points shall be shown. Cable shields shall be shown.

j. Labeling codes for terminal blocks, terminals, wires, cables, panels, cabinets, instruments, devices, and equipment shall be shown. Place "øA", "øB", and "øC" label next to each breaker to identify phase connected to.

k. Schematic symbols shall be used for field devices, showing electrical contacts. Signal and DC circuit polarities shall be shown.

l. The diagrams shall show all other Contract and Supplier drawing numbers, for reference, that are associated with each device that is interconnected. Attached to each interconnect, a copy of all the support documents used in preparing interconnects shall be submitted. This includes current issues of panel schematics, elementary diagrams, panelboard schedules, conduit schedules, one-line diagrams, connection diagrams, terminal block diagrams, submittals, contract drawings, vendor drawings and all other data used to develop the interconnection diagram as noted in the "Reference Documents" corner of Interconnect Drawings.

m. Interconnects shall include list of all applicable reference drawings, request for clarifications, field instructions and change orders. All deletions and additions of equipment, wire and cables shall be clearly shown.

n. Field wiring shall not start before the Interconnection Drawing has been submitted by the Contractor and approved by the Owner.

o. Do not show the same wires or jumpers, or panel wiring on both the connection and interconnection diagrams. All jumper, shielding, and grounding termination details not shown on the connection diagrams shall be shown on the interconnection diagrams.

p. Interconnection diagrams shall be submitted and approved by Owner for each electrical and instrumentation system. The Contractor shall not pull in any wires into conduits that do not have approved interconnects. If the Contractor pulls in wire without Owner approval of associated Interconnect Drawings, the Contractor will not be reimbursed for labor for re-pulling in wires even if there was an error in wire fill or sizing. Also, if the Contractor pulls in wire without Owner approval of associated Interconnect Drawings, then all progress payments related to field wiring for that particular area of work will be withheld until approved Interconnect Drawings are in use.

q. All interconnection diagrams shall be prepared by a System Supplier under the supervision of or by a State of California Registered Electrical Engineer and shall bear that Engineer's professional stamp and signature for all Interconnection Drawings submitted for approval including as-builts and those used in the field installation.

r. Example format of Interconnection diagram is shown on Contract "E" Series Drawings or may be obtained from the Engineer.

s. Interconnect drawings submitted with wiring of a single conduit run separated onto multiple interconnect drawings will be rejected without review. A single conduit run with wiring shown on separate interconnect drawings will be allowed only after written approval is given by the Engineer for each conduit run prior to submitting the associated interconnect drawings.

t. Only field wiring between MCC, Panelboards, Control Panels, and other electrical and instrumentation devices or equipment shall be shown on interconnection drawings. No internal panel wiring shall be shown on interconnect drawings except jumper or other wiring to be installed in field by Electrical Contractor.

u. Interconnect Drawings along with the corresponding support documents shall be submitted in a separate submittal package. Interconnect drawings submitted with non-interconnect drawing packages will be rejected.

v. Interconnect drawings shall be prepared for all equipment by the System Supplier with the exception of the Telephone System and Security Alarm System which may be produce their own interconnect drawings.

w. Provide a notes section on each interconnect drawing. In the note section, list any variances from the Contract conduit schedule necessary for completing the interconnections. Change orders regarding wire fill, conduit schedule and errors in plans regarding conduits and wires will not be processed until interconnect drawings have been received for such work.

x. The field electrician shall mark-up all interconnection diagrams during installation to show accurate as-built wiring, conduits runs, terminations, etc. If interconnection drawings are not properly as-built, the Electrical Contractor will have cost deducted from the Contract for the Owner to field verify and prepare as-built interconnection drawings amount. The amount of the deduction shall be determined on a time and material basis. The cost of such work shall be $120.00 per hour plus expenses.

y. The System Supplier shall be responsible to collect all information necessary to complete each interconnection drawing. This includes making field trips to collect all terminal connection data for new and existing, MCCs, switchboards, panelboards, instruments, equipment and electrical panels.

z. An index of drawings shall be provided with each Interconnection submittal listing the unique drawing number and the description of the interconnect drawing (e.g. Drawing 4321-IC1004 Pump 1004 Interconnect Drawing).

aa. Provide conduit and interconnect drawing cross reference indexes. Interconnect Conduit Index shall list all conduits listed in the Conduit & Wire Routing schedule and its associated Interconnection Drawing number. An Interconnection Drawing Index shall list all Interconnection drawings and the conduits shown on that specific drawing. These two indexes shall be at the front of all interconnection drawing submittals.

bb. Interconnection submittals that contain more than two motor control panels/centers shall have heavy duty dividers with permanent plastic labeled index tabs separating each group of drawings.

5. Submit full size drawing of all nameplates and tags, as specified herein, to be used on project. The Engineer has the right to adjust nameplate engraving titles during submittals at no additional cost to the Owner. Submittal to include the following:

   a. Dimensions of nameplate.

   b. Exact lettering and font for each nameplate.

   c. Color of nameplate.

   d. Color of lettering.

   e. Materials of construction.

   f. Method and materials for attachment.

   g. Drawing showing location of nameplates on each panel and enclosure.

6. Copying contract drawings and providing them as submittals will be considered unresponsive and the submittal will be rejected without review.

D. Each submittal shall be bound in a three ring binder, which is sized such that when all material is inserted the binder is not over 3/4 full. Binder construction shall allow easy removal of any page without complete manual disassembly; spiral ring type binders are not acceptable.

1. Each binder shall be appropriately labeled on the outside spine & front cover with the project name, contract number, equipment supplier's name, specification section(s), and major material contained therein.

2. An index shall be provided at the inside of the front cover. This index shall itemize the contents of each tab and subtab section. Also list the project name, contract number and equipment supplier's name, address, phone number, and contact person on the index page.

3. Field equipment shop documents, panel equipment shop documents, drawings, and bill of materials shall be grouped under separate tabs. Catalog cuts shall be ordered in the same sequence as their corresponding Contract specification subsection.

4. All copies shall be clear and legible. Data sheets shall be provided for each instrument, with an index and proper identification and cross-referencing.

5. Exceptions to the Contract specifications or drawings shall be clearly defined by the equipment supplier.

   a. Data shall contain sufficient details so a proper evaluation may be made by the Engineer. Contractor shall provide separate letter (located in the front of the submittal) detailing specific exceptions to the Contract Specifications or Drawings.

b. Exceptions that are noted in the marked-up Drawings or Specifications, but not listed on the Exceptions/Clarifications letter, will be considered as non-responsive and not accepted as changes to the Contract Documents.

6. Request for information (RFIs) shall not be included in submittals. RFIs supplied with submittals will not be answered. RFIs shall be submitted following proper channels.

7. Resubmittals shall be provided with a copy of the previous submittal comments and a separate letter, on company letterhead, identifying how each submittal comment has been addressed in the resubmittal.

8. Drawings shall be submitted in a separate hole-punched binder that covers the entire 11" x 17" length of the Drawing:

   a. Shop Drawings with less than 20 sheets total in the submittal, may be provided in an 11½-inch by 17½-inch reinforced folder.

   b. All Interconnection Drawings or Shop Drawings of 20 sheets or more shall be provided in separate heavy duty three-ring binder to allow drawings to be easily removed. Binder shall be Cardinal D-Ring Easy Open Ledger Binder with locking D-Rings or approved equal.

   c. Failure to provide drawing submittal in correct binder format may be grounds for immediate rejection without review.

   d. Each drawing title block shall contain the English description name for drawing contents (i.e. Lift Pump No. 1 Interconnect Drawing) and drawing number. All pages and drawings in the submittal shall be numbered sequentially (with no number skipped) in lower right hand corner.

   e. Drawings that are "C" or "D" size shall be folded, with the title block visible and placed in reinforced clear plastic pockets.

E. Shop documents and drawings shall be submitted for all devices and components in the electrical system. The Contractor is notified that this is a "Fast Track" project and all electrical & instrumentation drawings shall be submitted in a timely manner as not to delay completion of the project.

1.09 SUPERVISION

A. The Contractor shall schedule all activities, manage all technical aspects of the project and attend all project meetings associated with this Section.

B. The Contractor shall supervise all work in this Section, including the electrical system general construction work, from the beginning to completion and final acceptance.

C. The Contractor shall supervise and coordinate all work in this Section to insure that each phase of the project, submittal, delivery, installation, and acceptance testing, etc., is completed within the allowable scheduled time frames.

D. The Contractor shall be responsible for obtaining, preparing, completing, and furnishing all paper work for this Section, which shall include transmittals, submittal, forms, documents, manuals, instructions, and procedures.

1.10 INSPECTIONS

A. All work or materials covered by the Contract documents shall be subject to inspection at any and all times by the Owner. If any material does not conform to the Contract documents, or does not have an "No Exceptions Taken" or "Make correction Noted" submittal status; then the Contractor shall, within three days after being notified by the Owner, remove the unacceptable material from the premises; and if said material has been installed, the entire expense of removing and replacing same, including any cutting and patching that may be necessary, shall be borne by the Contractor.

B. The Contractor shall give the Owner 10 working days' notice of the dates and time for inspection. Date of inspection shall be as agreed upon by both the Contractor and Owner.

C. Work shall not be closed in or covered over before inspection and approval by the Owner. All costs associated with uncovering and making repairs where non-inspected work has been performed shall be borne by the Contractor.

D. The Contractor shall cooperate with the Owner and provide assistance for the inspection of the electrical system under this Contract. The Electrical Contractor shall remove covers, provide access, operate equipment, and perform other reasonable work which, in the opinion of the Engineer, will be necessary to determine the quality and adequacy of the work.

E. Before request for final inspection is made, the Contractor shall submit to the Owner in writing, a statement that the Contractor has made his own thorough inspection of the entire project enumerating punch list items not complete and that the installation and testing is complete and in conformance with the requirements of this Section.

F. The Owner may arrange for a facility inspection by Cal-OSHA Consultation Service at any time. The Contractor shall make the necessary corrections to bring all work in conformance with Cal-OSHA requirements, all at no additional cost to the Owner.

G. Contractor will be Responsible for any Additional Cost for Overtime, Weekend Overtime or Differential Time, Expenses for Inspection of Defective Work that has to be re-inspected.

1.11 JOB CONDITIONS

A. The Contractor shall make all arrangements and pay the costs thereof for temporary services required during construction of the project, such as temporary electrical power and telephone service. Upon completion of the project, remove all temporary services, equipment, material and wiring from each site as the property of the Contractor.

B. The Contractor shall provide adequate protection for all equipment and materials during shipment, storage and construction. Equipment and materials shall be completely covered with two layers of plastic and set on cribbing six inches above grade so that they are protected from weather, wind, dust, water, or construction operations. Equipment shall not be stored outdoors without the approval of the Owner. Where equipment is stored or installed in moist areas, such as unheated buildings, provide an acceptable means to prevent moisture damage, such as a uniformly distributed heat source to prevent condensation.

C. The elevation of the project site is shown on Contract Civil Drawings. All equipment shall be derated, as recommended by the manufacturer or in accordance with ANSI C37.30.

D. The normal outdoor, not in direct sunlight, ambient temperature range of the job site will vary between 0 to 110 degrees Fahrenheit. All equipment shall be rated to operate in these temperature ranges or provisions for adequate heating and cooling shall be installed, at no additional cost to Owner.

E. The jobsite is prone to vandalism and theft. Contractor shall be responsible for securing all materials and equipment against theft and vandalism for the duration of the project.

F. Contractor & Subcontractors shall utilize temporary services during construction of the project. No Contractors shall utilize building power, receptacles, etc. during construction.

1.12 MEASUREMENT AND PAYMENT

A. No measurement will be made. Full compensation for conforming to these requirements, including all the labor, materials, tools, equipment, incidentals and for doing all the work involved in this section necessary for completion of the work, as shown on the Contract Plans, as specified in the Standard Specifications, these special provisions and as directed by the Engineer, shall be considered as included in the prices paid for the various contract items of work involved and no additional compensation will be allowed.

1.13 CHANGE ORDER PRICING

A. All change order pricing by Contractor or System Supplier shall be broken out into the following minimum categories:

1. Labor per hour listed per discipline, i.e. Engineer, Drafter, Estimator, Programmer, Secretarial, etc.
2. Materials and equipment itemized per component and quantity.
3. Rentals, travel, per Diem, etc.
4. Tax.
5. Shipping.
6. Overhead and profit.

B. Lump sum change order pricing is not acceptable.

C. If Contractor or System Supplier refuse to provide a change order with broken out pricing, the Engineer reserves the right to obtain independent estimates from other Contractors or System Suppliers. The Contractor or System Supplier who refused to provide the change order with broken out pricing, will be charged for the preparation of the independent estimates.

PART 2 - MATERIALS

2.01 QUALITY

A. It is the intent of the Contract specifications and drawings to secure the highest quality in all materials and equipment in order to facilitate operation and maintenance of the facility. All equipment and materials shall be new and the products of reputable suppliers having adequate experience in the manufacture of these particular items. For uniformity, only one manufacturer will be accepted for each type of product.

B. All equipment shall be designed for the service intended and shall be of rugged construction, of ample strength for all stresses which may occur during fabrication, transportation, erection, and continuous or intermittent operation. All equipment shall be adequately stayed and braced and anchored and shall be installed in a neat and workmanlike manner. Appearance and safety, as well as utility, shall be given consideration in the design of details. All components and devices installed shall be standard items of industrial grade, unless otherwise noted, and shall be of sturdy and durable construction suitable for long, trouble free service. Light duty, fragile and competitive grade devices of doubtful durability shall not be used.

C. Products that are specified by manufacturer, trade name or catalog number established a standard of quality and do not prohibit the use of equal products of other manufacturers provided they are favorably reviewed by the Engineer prior to installation.

D. Underwriters Laboratories (UL) listing is required for all substituted equipment when such a listing is available for the first named equipment.

E. When required by the Contract specifications or requested by the Engineer, the Contractor shall submit equipment or material samples for test or evaluation. The samples shall be furnished with information as to their source and prepared in such quantities and sizes as may be required for proper examination and tests, with all freight and charges prepaid. All samples shall be submitted before shipment of the equipment or material to the job site and in ample time to permit the making of proper tests, analyses, examinations, rejections, and resubmissions before incorporated into the work.

F. All equipment shall be designed and constructed so that in the event of a power interruption, the equipment specified hereunder shall resume normal operation without manual resetting or operator interaction when power is restored.

G. Signal transmission from remote or field electric and electronic devices shall be 4-20 mA, sourced by a 24 VDC loop supply from the panel that is to receive the signal. Nonstandard transmission methods such as impulse duration, pulse rate, and voltage regulated will not be permitted except where specifically noted.

H. Outputs of equipment that are not of the standard signals as outlined, shall have the output immediately raised and/or converted to compatible standard signals for remote transmission.

I. It is the System Supplier's responsibility to visit jobsite to collect and document existing conditions and equipment device part numbers in order for all similar called out new equipment to match existing.

2.02 NAMEPLATES AND TAGS

A. EQUIPMENT EXTERIOR NAMEPLATES: Nameplate material shall be rigid laminated black phenolic with beveled edges and white lettering, except for caution, warning, and danger nameplates the color shall be red with white lettering. The size of the nameplate shall be as shown on the Drawings. No letters are allowed smaller than 3/16". All phenolic nameplates located outdoors shall be UV resistant. Securely fasten nameplates in place using two 316 stainless steel screws if the nameplate is not an integral part of the device. Epoxy cement or glued on nameplates will not be acceptable.

1. Each major piece of electrical equipment shall have a manufacturer's nameplate showing the Contract specified name and number designation, the manufacturer's name, model designation, part number, serial number, and pertinent ratings such as voltage, amperage, # of phases, range, calibration, etc.

2. For each device with a specific identity (pushbutton, indicator, field control station, disconnect switches, etc.) mounted on the exterior or deadfront of a piece of equipment, provide a nameplate with the inscription as shown in the Contract Documents. Where no inscription is indicated in the Contract Documents, furnish nameplates with an appropriate inscription providing the name and number of device.

3. For all receptacles and switches, provide a faceplate engraved or stamped with the panelboard and circuit number it is fed from. Also, include on faceplate or on a separate nameplate for each light switch identification use such as "OUTSIDE BUILDING LIGHTS", "PERIMETER LIGHTS", "MCC ROOM", etc.

4. All field instruments and devices shall be labeled with designation shown on P&ID diagrams.

5. All transformers and panelboards shall have nameplates with ½" high letters and be engraved with designations as shown on one-line Drawings.

6. All safety and disconnect switches shall have nameplates with ½" high letters and be engraved with designations as shown on one-line drawings.

7. Underground Pull Box and Vault Cover Identification: Engrave or bead weld pull box covers with minimum 1/4"thickness and 1/2" letters and

covers shall be engraved with designations as shown on Contract drawings or as directed by Owner.

8. Aboveground Pull Box Cover Identification: 316 stainless steel screws attached stamped 316 stainless steel plate nameplates with 1/2" letters and be engraved with designations as shown on Contract drawings or as directed by Owner.

9. Provide engraved nameplate at service entrance equipment (red with white lettering) indicating type and location of standby generator per NEC 702.7 (A).

10. Provide engraved nameplate at service entrance equipment per NEC 702.7(B)

11. METERING – Service Equipment Label: Per NEC 110.24 (A) Service equipment shall be legibly marked in field with the maximum available fault current. Field marking shall include date the fault current calculation was performed and be weather & UV rated. Service equipment shall not be hand labeled.

B. EQUIPMENT INTERIOR NAMEPLATES: Nameplate material shall be clear plastic with black machine printed lettering as produced by a KROY or similar machine; except caution, warning, and danger nameplates shall have red lettering.

1. The size of the nameplate tape shall be no smaller than ½" in height with 3/8" lettering unless otherwise approved by the Engineer. Securely fasten nameplates in place on a clean surface using the adhesion of the tape. Add additional clear adhesive to hold the nameplate securely in place when necessary.

2. For each device with a specific identity (relay, module, power supply, fuse, terminal block, etc.) mounted in the interior of a piece of equipment provide a nameplate located above the device with the inscription as shown in the Contract Documents. Where no inscription is indicated in the Contract documents, furnish nameplates with an appropriate inscription providing the name and number of device used on the Submittal Drawings. Stamp the nameplates with the inscriptions as approved by the Engineer in the submittal.

3. Nameplates shall not be attached to wireway covers or to removable devices.

C. EQUIPMENT TAGS: The Contractor shall attach a tag to the equipment (including instruments) with the same inscriptions as specified above in paragraph A. The tag shall be made from 316 stainless steel material and the size of the nameplate shall be no smaller than 3/8"h x 2"w with 3/16" machine printed or engraved lettering unless otherwise approved by the Engineer. Securely fasten tags in place using 316 stainless steel 0.048 inch diameter wire of the type normally used for this purpose (catalog cut sheet shall be submitted). Stainless steel wire shall be crimp connected. Twisting ends together is not acceptable.

D. Engrave or machine print the tags with inscriptions as approved by the Engineer in the nameplate submittal.

E. Provide temporary labels for all instruments and devices immediately when installed. Temporary labels shall be provided with ½" letters minimum and labeled with P&ID tag number.

2.03 WIRE

A. This Section applies to all wires or conductors used internal for all electrical equipment or external for field wiring. All wires shall be properly fused or protected by a breaker at the amperage rating allowed by the NEC.

B. Material: Wire shall be new, plainly marked with UL label, gauge, voltage, type of insulation, and manufacturer's name. All wire shall conform to the following:

1. Conductors shall be copper, with a minimum of 97% conductivity.
2. Wire shall be Class B stranded. Solid wire conductor prohibited.
3. ASTM B8, soft drawn copper, maximum 12 months old.
4. Insulation of all conductors and cables shall be rated 600 volt.
5. Insulation type for all conductors shall be moisture and heat resistant thermoplastic NEC Type XHHW-, rated 90 °C in dry locations and 75 °C in wet locations, or approved equal.
6. Field wire minimum AWG sizes
    a. #12 for wires used for individual conductor circuits 480 volt and above. #12 for wires used for individual conductor circuits 100 volt and above, except for PLC I/O which may be #14 AWG.
    b. #14 for wires used for individual conductor circuits below 100 volt.
7. Non-field or panel wire minimum AWG sizes if properly protected by fuse or breaker:
    a. #14 for wires used for individual conductor circuits 100 volt and above.
    b. #18 for wires used for individual conductor circuits below 100 volt and above if properly protected by fuse or breaker.
8. Instrument Wiring
    a. Field: Instrument cables shall have 600V tray cable rated insulation and 100% individual shielded twisted pair #16 conductors with drain wire. Single twisted shielded pair (T.S.P.R.) Cables shall be Belden, Manhattan, or approved equal.
    b. Non-Field: Instrument cables shall have 300V rated insulation and 100% individual shielded twisted pair #18 conductors with drain wire. Single twisted shielded pair (T.S.P.R.) cables shall be Belden, Manhattan, or approved equal.

c. General: Instrument cables shall have 600V rated insulation and 100% individual shielded twisted pair #16 conductors with drain wire. Single twisted shielded pair (T.S.PR.) cables shall be Belden, or approved equal.

C. Wire Marking

1. Wire Identification: All wire terminations including field interconnect as well as wiring interior MCC cubicles, switchboard, panels, equipment, junction panels and boxes shall be identified with machine printed labels. Hand lettered labels are not acceptable and shall be replaced at the Contractor's expense. The wire identification code for all field interconnect and panel interior wiring, shall be similar to the designations shown on the Contract example drawings.

2. Wire Labels: The labels shall be machine printed with indelible ink, heat shrink type capable of accepting a minimum of 23 machine printed characters per sleeve label by Brady "Bradysleeve" or equal. Labeling shall be neatly installed for visibility and shall be clearly legible. Each wire and conductor shall be labeled with wire label as shown on approved loop, elementary and interconnect Drawings. Labels shall not be wrap around or Snap-On type.

3. Where there is insufficient space for labels on locally interconnected neutral wires such as jumpers between adjacent auxiliary relay coil neutral terminals, these labels may be omitted. "Locally" is defined as wires no longer than 8".

4. Wire labels for lighting and receptacles shall be installed and consist of the panelboard and circuit number (i.e., Panelboard "LP100", circuit breaker #3 would have wire label line "LP100-L3" and neutral "LP100-N3").

5. All spare wires shall be labeled with equipment number followed by X1, X2, etc. (i.e. P11001-X1 for first spare wire).

6. All control and signal wiring terminations shall have the correct wire label applied prior to making connection.

D. Special Purpose Wiring

1. Manufacturer Supplied Cables (MNFR CBL): Cables and wiring for special systems shall be provided by the manufacturer with the equipment and installed per the manufacturer's recommendations.

2. CAT 6 communication cable in underground (UG) conduit shall meet the following requirements:

a. TIA/EIA-568-B Category 6E Specifications.

b. #24 AWG solid bare copper conductor, 4 or 25 pair shielded twisted pair per "Conduit & Wire Routing Schedule".

c. Rated for direct burial application.

d. Insulation: Solid Polyolefin, 600V rated.

e. Filling compound: 80°C extended thermoplastic rubber.

f. Outer Jacket: Black, water and UV resistant polyethylene.

g. Electrically continuous aluminum shield.

3. Indoor CAT 6 communication cable meet the following requirements:

a. TIA/EIA-568-C.2 Category 6 100 MHz specifications.

b. #24 AWG solid bare copper conductor, 4 twisted pairs.

c. Polyolefin insulation.

d. Shielded bulk cable.

e. PVC jacket.

f. Nominal Impedance: 100 ohms.

g. Nominal capacitance: 15 pf/ft. maximum.

h. UL listed.

i. Non-plenum usage rated when routed in conduit.

j. Plenum usage rated when routed in plenum spaces.

k. Cable shall be rated for water.

4. Generator Lead Cables: Generator lead cable have very flexible Class K (30 AWG) stranding with PVC insulation and jacket. Cable shall be rated for 600 volt, 90 deg C. and be oil and gas resistant. Cable shall be Carol Diesel Locomotive Cable or approved equal.

E. Color Code

1. Color code of all wire shall conform with the following table.

WIRES COLOR CODE TABLE

Description	Phase/Code Letter	Field Wire or Tape Color	Non-Field Wire Color
480 V, 3 Phase	A	Brown	Brown
	B	Orange	Orange
	C	Yellow	Yellow
240 V or	A	Black	–
208 V, 3P	B	Red (Orange if high leg)	–
	C	Blue	–
240 / 120 V, 1 P	L1	Black	Black
	L2	Red	–
12 V Positive	12P	Dark Blue	Dark Blue
12 V Negative	12N	Black/Red Stripe	Black/Red Stripe
24 V Positive	24P	Pink	Pink
24 V Negative	24N	Black Stripe	Black Stripe

Description	Phase/Code Letter	Field Wire or Tape Color	Non-Field Wire Color
AC Control		Violet	Red (Yellow for Foreign Circuits)
DC Control		Light Blue	Light Blue
Neutral	N	White	White
Ground	G	Green	Green
Shielded Pair	+	White (Clear)	White (Clear)
	–	Black	Black

2. No other colors shall be used without prior approval of the Owner.

3. The same color shall be connected to the same phase throughout the panel.

4. All wires shall be properly fused or protected by a breaker at the amperage rating allowed by the NEC.

5. Neutral used for AC Control shall be white.

6. Phase color insulation shall be provided for complete length of #8 wire or smaller, colored phase tape is not allowed on #8 and smaller wire.

2.04 TERMINAL BLOCKS & FUSES

A. Control Panel Terminal Blocks:

1. General

a. Terminal blocks to be clamp type, 6mm spacing, 600 volt, minimum rating of 30 amps, and mounted on DIN rail, Phoenix Contact to match Owner Standard. DIN rail shall be same type as used for the relays. Install an extra DIN rail on each type of terminal strip with 20% spare terminals for future additions.

b. Provide terminal blocks with "follower" plates that compress the wires and have wire guide tangs for ease of maintenance. Terminal blocks that compress the wires with direct screw compression are unacceptable. All power, control and instrument wires entering and leaving a compartment shall terminate on terminal blocks with wire numbers on terminals and on both ends of the wires.

c. Terminal Tags and Markers: Each terminal strip shall have a unique identifying alphanumeric code at one end. Numbers shall be assigned to all blocks except grounding blocks. Fuse blocks shall be assigned unique tag numbers such as FU1, FU2. No two fuses shall be assigned the same tag number. Terminal blocks are to be labeled to match the wire landed.

d. Terminal blocks shall be physically separated into groups by the level of signal and voltage served. Power and control wiring above 100 volts shall have a separate group of terminal blocks from

terminal blocks for wiring below 100 volts, intermixing of these two types of wiring on the same group of terminal blocks is not allowed.

e. Provide a ground terminal or connection point for each grounding conductor.

f. Provide a separate terminal block for every two neutral terminations or as coordinated with the interconnect diagrams.

2. Power Termination Blocks shall be rated for 600V main power connection. The power termination blocks shall be rated to accept Copper or Aluminum cable rated as shown on Contract one-line diagrams. The power termination block shall be capable of being mounted anywhere in a termination box. Each termination block shall be provided with lug shield to prevent contact with power connections. The power termination blocks shall be Connectron or approved equal.

B. Fuses

1. Fuses used in circuits 200 VAC and above shall be time-delay type FNQ or approved equal, 13/32" x 1-1/2", and have an interrupting rating of 42,000 AIC at 500 VAC. Fuse holders shall be of the barrier type and rated 600 VAC.

2. Fuses used in 120 VAC shall be time-delay type MDL or approved equal, 1/4" x 1-1/4", and have a rating of 250 VAC. Fuse-holders shall be of the terminal block type.

3. Fuses used in signal and 24 VDC circuits shall be fast acting type GMA or approved equal, 5 mm x 20 mm/1/4" x 1-1/4", and have an rating of 250 VAC. Fuse-holders shall be of the terminal block type.

4. Fuses shall be sized in conformance with the NEC.

2.05 COMPONENTS

A. Switches and Pushbuttons

1. Switches and pushbuttons for general purpose applications shall be water and oil tight as defined by NEMA 4X, corrosion resistant as defined by NEMA ICS 6-110.58, U.L. listed, standard 30 mm diameter, with round plastic clamp ring. Switches shall be Allen-Bradley 800H, or approved equal.

2. Switches and pushbuttons shall have contacts rated 10 amperes continuous and 600 VAC.

3. Manufacturer's standard size legend plates shall be provided and engraved to specify each switch and pushbutton function. The legend plate color shall be black.

4. Selector switch handles and pushbutton caps shall be black.

5. Selector switches for hand-off-auto (HOA) applications shall have the hand position to the left, off in center, and auto in the right position.

6. Potentiometer be 10kohm, manual single turn potentiometer.

7. On/Off selector switches shall have the "ON" position to the right.

8. Lockout stop shall be a pushbutton with red cap and pad locking assembly for pushbutton.

B. Relays and Timers

1. GENERAL: Relays and timers shall be provided with N.O. or N.C. contacts as shown on the Contract drawings. All spare contacts shown shall be provided. Contacts shall be rated 10 amps minimum at 120 VAC, 60 Hz unless otherwise stated. Supply power or coil voltage shall be 120 VAC unless shown otherwise on the Contract drawings. Relays and timers shall be designed for continuous duty. All relays shall be U.L. listed. The following is a summary of abbreviations associated with relays and timers:

CR	–	Control relay
TR	–	Timing relay
PFR	–	power fail relay
TDOE	–	Time delay on energization
TDOD	–	Time delay on de-energization

2. Control relays (CR) shall be plug-in type with indicating lights and clear see-through sealed or enclosed housing to exclude dust. Sockets for plug-in relays shall be standard industrial blade type with barrier pressure screw terminals. Provide IDEC Type RR, to match existing. Two form-C contacts (minimum) shall be provided on each relay.

3. Time delay relays (TR) on energization or de-energization shall be solid state plug-in relays with a timer adjustable over the range 1 second to 3 minutes unless other ranges are indicated or required. Provide LED timer energized indicator lamp. Sockets for plug-in timers shall be standard industrial type with barriered pressure screw terminals. Time delay relays shall be IDEC GTS to match Owner standards.

C. Circuit Breakers

1. Circuit breakers shall be of the indicating type, providing ON, OFF and TRIPPED positions of the operating handle. Circuit breakers shall be quick-make, quick-break, with a thermal-magnetic (TM) action or Motor Circuit Protectors (MCP) as shown on One-Line Diagrams. Circuit breakers feeding Soft Starters or VFDs shall have true adjustable long, short and instantaneous trip units.

2. Main Circuit breakers shall be the bolted on type. The use of tandem or dual circuit breakers in a normal single-pole space to provide the number of poles or spaces specified are not acceptable. All multiple-pole circuit breakers shall be designed so that an overload on one pole automatically causes all

poles to open. Main Circuit breakers and motor circuit protectors shall be manufactured by Eaton, G.E., ITE, or approved equal.

3. Each 480 volt or 240V circuit breaker shall have a minimum interrupting capacity of 35,000 amperes. Each 120 volt breaker shall be rated for a minimum 10,000 amperes interrupting capacity. Breakers shall be sized as shown on Drawings and as necessary for the supplied equipment.

4. Fused disconnects shall not be used in place of breakers.

5. Breakers shall be sized and have a minimum interrupting capacity as shown on Drawings and as required for the supplied equipment.

6. All breakers shall be supplied with the correct sized copper only lugs for wire sizes as listed in "Conduit & Wire Routing Schedule". Provide larger frame breaker or lug adapters as necessary when connecting to the listed oversized wire.

2.06 CONDUIT, RACEWAYS, AND WIREWAYS

A. General: Conduit, raceways, wireways, wiring methods, materials and installation shall meet all requirements of the NEC, be UL labeled for the application, and meet the minimum following specifications:

1. All wiring shall be installed in conduits, raceways, or wireways when interconnecting equipment and devices.

2. The Contractor shall use special conduit, raceways, wireways, construction methods, and materials as shown on the Contract drawings; which shall take precedence over any general methods and materials specified in this Section.

3. The minimum size conduit shall be ¾-inch unless indicated otherwise on the Drawings or for special connections to equipment.

4. Conduit stubs for future use shall be capped with coupling, nipple, plug, and cap and each end identified with conduit labels.

5. Conduits to be abandoned that protrude above graded shall be cut flush and filled with grout

6. Conduits shall not be filled to more than 50% of their total cross – sectional area.

7. Conduits entering enclosures shall be fitted with insulated grounding bushing; O-Z "HBLG", Appleton "GIB", or approved equal. All grounding bushings shall be tied to the grounding system with properly sized bonding conductors per the NEC code.

8. Conduit drains shall be installed with GRS-PVC condulets-T with Stainless Steel Universal Conduit Drain, Appleton ECDB38 or approved equal. Install in conduit locations where condensation may form.

B. Conduit Marking

1. All conduits listed in the "Conduit and Wire Routing Schedule" shall have conduit tags at both ends of each conduit segment. This includes all conduits in pullboxes and vaults.

2. Tag material shall be rigid laminated red phenolic with white lettering. The size of the tag shall be 2" diameter. No letters are allowed smaller than 7/16". Tags shall be heat and UV resistant, stainproof, electrically non-conductive and non-corroding. Securely fasten tags in place using 316 stainless steel 0.048 inch diameter wire of the type normally used for this purpose (catalog cut sheet shall be submitted). Stainless steel wire shall be crimp connected. Twisting ends together is not acceptable. Engrave the tags, on both sides, with the conduit number as listed in the Conduit and Wire Routing Schedule on the Contract "E"-series Drawings. Labeling shall be neatly installed for visibility and shall be clearly legible. Conduit tags shall be Brady Custom B-1, or approved equal.

3. Prior to encasement, concealment, backfilling of conduits, temporary conduit labels shall be provided at each end of conduit. Temporary conduit labels shall have ½-inch (minimum) lettering at all transition points. After encasement and concealment temporary conduit labels shall be placed at each exposed end.

C. Galvanized Rigid Steel Conduit (GRS)

1. Rigid steel conduit, couplings, bends and nipples shall be in accordance with ANSI C80.1 and UL-6.

2. Hotdip galvanized inside and outside after fabrication and then coated with a zinc bichromate finish.

3. Minimum trade size – three-quarters inch (¾") unless otherwise shown on Contract Drawings.

4. Conduits entering enclosures shall be fitted with insulated grounding bushing; O-Z "HBLG", Appleton "GIB", or approved equal. All grounding bushings shall be tied to the grounding system with properly sized bonding conductors per the NEC code.

5. Galvanized rigid steel factory elbows for indoor 90 degree transitions.

6. EMT or IMC is not considered an equivalent to GRS.

7. GRS conduit is allowed only when specifically called out in the "Conduit and Wire Routing Schedule".

D. Galvanized Rigid Steel Conduit – PVC Coated (GRS-PVC)

1. Standard weight, galvanized conduit with a 40-mil thick polyvinylchloride coating bonded to both the outside and urethane interior coating. Conduit shall be hot-dip galvanized conforming to NEMA RN 1. GRS-PVC conduit to be Robroy Plasti-bond Red, Perma-Cote, or approved equal.

2. Provide PVC coated galvanized rigid steel factory elbows for 90 degree transitions.

3. Fittings shall be hot dipped galvanized steel or galvanized cast ferrous metal with a PVC 40 mils thick coating. Provide threaded-type fittings, couplings, and connectors; set-screw type and compression-type are not acceptable. Fittings shall be Robroy Liquitite coated fittings or approved equal.

4. All junction boxes shall be galvanized with exterior surfaces PVC coated to 40 mils thickness except where 316 stainless steel boxes are called out.

5. Conduits entering enclosures shall be fitted with insulated grounding bushing; O-Z "HBLG", Appleton "GIB", or approved equal. All grounding bushings shall be tied to the grounding system with properly sized bonding conductors per the NEC code.

6. Support channel and pipe straps shall be PVC coated. Exposed metal/nuts, all-thread rod shall be 316 stainless steel.

7. PVC coating patching material shall be as provided by the manufacturer.

8. PVC coated Aluminum conduit is not acceptable.

E. Liquid Tight Flexible Metal Conduit (FLEX)

1. Minimum trade size one-half inch (1/2").

2. All flex conduits shall be metallic with water tight outer jackets.

3. Connectors:

a. NON-NEMA 12 AREA: PVC coated metallic with insulated bushings.

b. NEMA 12 AREA: Metallic with insulated bushings.

4. Final connections to vibrating equipment such as motors and fans shall be made with flexible conduits.

5. Flexible conduit lengths shall not be greater than 36 inches.

6. Flexible metallic conduit shall not be considered as a ground conductor, install a separate wire for equipment bonding.

7. Flexible conduit shall only be installed in exposed or accessible locations.

8. Flexible conduits shall be used for conduit coupling to all vibrating and shifting equipment.

2.07 AUTOMATIC TRANSFER SWITCH

A. Switch unit:

1. The transfer switch unit shall be electrically operated and mechanically held. The electrical operator shall be a single solenoid mechanism,

momentarily energized to minimize power consumption and heat generation.

2. ATS types utilizing components of molded-case circuit breakers, contactors, or parts thereof, are not acceptable.

3. The switch shall be true double-throw with inherently interlocked construction. The switch shall be mechanically interlocked to ensure only one of two possible positions, normal or emergency.

4. Wide contact gaps shall be provided to ensure positive isolation of the normal and emergency power sources.

5. The switch shall be rated to withstand symmetrical short circuit current at the ATS terminals in combination with normal or emergency feeder breakers rated equal to or greater than RMS symmetrical amperes shown on Contract Drawings.

6. The switch shall be fully rated at amperage as shown on Contract Drawing, when mounted in switchboard/pedestal, for switching all types of loads, including induction motors, at the specified amperage and voltage.

7. Switches that are not rated for continuous duty, repetitive switching of all types of loads or transfer between two active power sources, are not acceptable.

8. The main power contacts shall have silver alloy construction with wiping action and shall be protected by arc chutes or arcing contacts.

9. The main contact design shall allow repeated making and breaking of full load current, in a combination of motor and other loads, without damage to the main contacts.

10. All main power contacts and auxiliary contacts shall be mechanically attached to a common actuator shaft.

11. The operating transfer time shall be adjustable time delayed open transition type with intentional load disconnect position for an adjustable period of time when transferring from Source 1 to Source 2 or from Source 2 to Source 1.

12. Silver plated copper shall be used in the construction of the bus work.

13. Inspection of all contacts (movable and stationary) linkages and moving parts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors.

14. All switch and relay contacts, coils, mechanical linkages, and control elements shall be serviceable or removable from the front of the mounted switch and accessory assembly without removal of the switch or assembly from the compartment and without disconnection of the power cables or control wiring.

15. The switch shall have a manual operating handle for maintenance purposes.

16. Screw type solderless terminals or lugs shall be provided for connecting all external line & load power cables and control wiring. All connections shall be accessible from the front without removal of internal components.

17. A terminal strip shall be provided for terminating all control wiring. Number all terminals with machine printed lettering matching the wire number of the terminated wire.

18. All control wiring shall have permanent identification at each point of connection. Wire identification shall be by machine printed numbered wiring sleeves. Electrically common wires shall have the same wire number. Electrically different wiring shall have unique wire numbers.

19. Control wiring shall be neatly bundled and secured in place by plastic cable ties. Wiring shall be protected with plastic spiral wrap where it is subject to mechanical damage or crosses over to a hinged door.

20. The switch assembly shall be in an enclosure as shown on Contract E-Series Drawings.

21. The automatic transfer switch shall be Kohler KCS-D, solid neutral, with options to meet specified requirements, or approved equal.

22. Provide copper lugs including grounding lugs of quantity and size for conductors listed in the Conduit and Wire Routing Schedule.

B. ATS control panel:

1. A control panel shall be provided to direct the operation of the transfer switch. The modules sensing and logic shall be a controlled by a built-in microprocessor. Control panels that do not utilize microprocessor electronics to control the operation of the switch are not acceptable.

2. The transfer switch control panel shall be mounted separately from the transfer switch and shall be supplied with a quick disconnect plug for ease of maintenance.

3. The control panel shall meet or exceed the voltage surge withstand capability in accordance with IEEE Standard 472-1974 (ANSI C37.90a) and the withstand voltage test in accordance with the proposed NEMA Standard ICS1-109.21.

4. The under-voltage of each phase of the normal source shall be monitored, with pickup adjustable from 85% to 100% of nominal and the dropout adjustable from 75% to 98% of pickup setting, both in increments of 1%. These adjustments shall be factory set at 85% dropout, and 90% pickup.

5. The voltage of each phase of the emergency source shall be monitored, with pickup adjustable from 85% to 100% of nominal. This adjustment shall be factory set at 95% pickup.

6. Frequency sensing of the emergency source shall be provided, with pickup adjustable from 90% to 100% of nominal. This adjustment shall be factory set at 97% pickup.

7. The control panel shall include the following field adjustable time delays:

    a. Time delay to override momentary normal source outages, adjustable from 0 to 5 minutes. This adjustment shall be field set to place emergency generator on-line in 10 seconds.

    b. Transfer to emergency time delay for controlled timing of load transfer to emergency, adjustable from 0 to 5 minutes. This adjustment shall be field set to place emergency generator on-line in 2 seconds.

    c. Emergency source failure time delay to ignore momentary transients during initial generator set loading, adjustable from 0 to 6 seconds. Set at 2 seconds.

    d. Retransfer to normal time delay, adjustable 0 to 60 minutes. This adjustment shall be factory set at 5 minutes. The time delay is automatically bypassed if the emergency source fails and normal source is acceptable.

    e. Delayed transition time delay for setting the dead time when all power is removed from the load side of ATS, adjustable 0 to 5 minutes. Set at 5 seconds.

    f. Generator exercise timer:

        1) Timer provided for operator adjustment of day of week, time of day and run duration for exercising the generator under operating loads by activating the automatic transfer switch. This timer shall be field set by the Contractor with date and time as specified by Owner. Timer shall be mounted on the ATS outer deadfront door. Timer shall be able to be disabled.

8. Two auxiliary contacts shall be provided. One that closes when the switch is in the normal position and one that closes when the switch is in the emergency position. These auxiliary contacts shall be rated 1 amp at 120 volts.

9. Circuitry shall be provided to allow for connection of a remote contact to inhibit transfer to emergency source and/or retransfer to normal source, ignoring the associated timing relays.

10. All adjustments shall be fully field adjustable without the use of tools, meters, power supplies, or special test equipment.

11. Each adjustment resolution shall be settable within minimum increments of 1%.

12. Repetitive accuracy of timer, voltage and frequency settings over a temperature range of -20 degrees Celsius to 70 degrees Celsius shall be within +/-2%.

13. The control panel shall be arranged such that adjustments to time delay settings can be safely made without personal exposure to live parts.

14. The control panel and power terminals shall be completely covered to protect against accidental contact, foreign matter, and tampering.

15. Provide the following displays on the controller display unit with keypad:

    a. Event log to display 99 logged events with the time and date of the event, event type and event reason.

    b. Total number of ATS transfers.

    c. Number of ATS transfers caused by power source failures.

    d. Total number of days ATS has been in operation.

    e. Total number of hours that the normal and emergency sources have been available.

    f. Each phase voltage and amperage.

16. The wire harness for connection of the control panel to the transfer switch shall have sufficient length to reach between the mounting locations shown on the design Drawings.

17. Provide Kohler MPAC 1500 automatic controller or approved equal.

2.08 GROUNDING SYSTEM

A. The utility service entrance switchboard ground bus shall be tied to a building ground rod as per Contract E-Series Drawings.

B. The main ground bonding wire from the ground shall extend up into the utility service entrance for the visible connection with a UL approved "ground clamp" attached to the ground bus. The main ground bonding wires shall be a 2/0 copper.

C. The ground rod shall consist of not less than 10 continuous feet of ¾-inch copper coated electroplated high grade carbon steel. The ground rod shall be an Eritech 613400, NEHRING type NCC, Weater 348, or approved equal.

D. Ground clamps shall be bolt-on type as manufactured by ILSCO type AGC, O-Z Gedney Type GRC, Burndy Type GAR or GP, or approved equal.

E. All ground rod, pipe, and steel plate and buried bond connections shall be made by welding process equal to Cadweld.

F. Provide a 13 inch diameter, 9-inch nominal throat, concrete ground rod box, minimum 12 inches deep, with a cast iron traffic cover embossed or engraved "GROUND."

G. Ground buses shall be provided in all electrical enclosures. Each ground bus shall be sized as shown on the Contract drawings or specified herein. The ground bus shall be adequately sized for the connection of all grounding conductors required

per NEC. Screw type lugs shall be provided on all ground busses for connection of grounding conductors.

H. Each ground bus shall be copper. Screw type fasteners shall be provided on all ground busses for connection of grounding conductors. Ground bus shall be a Challenger GB series, ILSCO D-167 series, or approved equal.

I. Attachment of the grounding conductor to equipment or enclosures shall be by connectors specifically provided for grounding. Mounting, support, or bracing bolts shall not be used as an attachment point for ground conductors.

J. All raceway systems, supports, enclosures, panels, and equipment housings shall be permanently and effectively grounded.

K. One side of the secondary on all transformers shall be grounded.

L. The system neutral (grounded conductor) shall be connected to the system's grounding conductor at only a single point in the system. This connection shall be made by a removable bonding jumper sized in accordance with the applicable provisions of the National Electrical Code if the size is not shown on the Drawings. The grounding of the system neutral shall be in the enclosure that houses the service entrance main over-current protection.

M. The system neutral conductor and all equipment and devices required to be grounded by the National Electrical Code shall be grounded in a manner that satisfies the requirements of the National Code.

N. Grounding conductors shall be sized as shown on the Plans or in accordance with NEC Table 250.122, whichever is larger.

O. Grounding and bonding wires shall be installed on all conduits with grounding bushings, expansion joints and for continuity of raceways transitions. Bonding wires at endpoints shall be connected to enclosure ground bus or equipment grounding lug.

P. Conduit grounding bushings shall be installed on all metallic conduits. Conduit grounding bushings shall be set screw locking type electra-galvanized malleable iron with insulation collar and shall be provided with a feed through compression lug for securing the ground bonding wire. Ground bonding wire shall be bare wire and shall be sized per NEC.

Q. All receptacles shall have their grounding contact connected to a grounding conductor.

R. Branch circuit grounding conductors for receptacles, or other electrical loads shall be arranged such that the removal of a lighting fixture, receptacle, or other load does not interrupt the ground continuity to any other part of the circuit.

S. Negative side of all VDC power supplies shall be grounded.

2.09 ELECTRICAL ENCLOSURES AND BOXES

A. Enclosures and boxes to be wall mounted, minimum 14 gauge, type 316 stainless steel with seams continuously welded & ground smooth, and fast access door latches. A copper ground bus shall be provided in the enclosure. Outer door shall have provisions for locking enclosure with standard padlock. Provide white backpan in box.

B. Provide accessories consisting of breaker to disconnect incoming power, heater, fan, removable metal louvers, and thermostats, where shown on Contract drawings.

C. Provide larger enclosure as required to accommodate the supplied equipment at no additional cost to the Owner

D. Provide metal data pocket within each enclosure and box to hold as-built drawings.

E. All panel doors shall be installed with ground straps.

F. Enclosure shall be Hoffman, Circle AW or approved equal.

2.10 REMOTE NOTIFICATION SYSTEM

A. Provide a wireless remote I/O with 120VAC power supply and router for monitoring generator fuel tank low level. Dry contact sensor shall send text message or email as configured to notify recipient of alarm status. Provide all components and cables for a complete and operable system. Coordinate with Owner for connection to existing WiFi network, messages, and contact list.

B. Remote Dry contact sensor monitoring unit shall be Spot-Protect Switchspot, King Pigeon GSM, or approved equal.

C. Enclosures and boxes to be generator mounted, plastic, with fast access door latches. A copper ground bus shall be provided in the enclosure. Outer door shall have provisions for locking enclosure with standard padlock. Provide white backpan in box. Enclosure shall be Hoffman, Rittal or approved equal.

PART 3 - MATERIALS

3.01 ELECTRICAL WORKMANSHIP

A. All work in this Section shall conform to the codes and standards outlined herein.

B. The Electrical Contractor shall employ personnel that are skilled and experienced in the installation and connection of all elements, equipment, devices, instruments, accessories, and assemblies. All installation labor shall be performed by qualified personnel who have had experience on similar projects. Provide first class workmanship for all installations.

C. Ensure that all equipment and materials fit properly in their installations.

D. Perform any required work to correct improper installations at no additional expense to the Owner.

E. The Engineer reserves the right to halt any work that is found to be substandard or being installed by unqualified personnel.

3.02 ELECTRICAL CONSTRUCTION METHODS, GENERAL

A. All wiring shall be neatly bundled and laced with plastic tie-wraps, anchored in place by round-head 316 stainless screw attached retainer. Where space is available, such as in electrical cabinets, all wiring shall be run in slotted plastic wireways or channels with dust covers. Wireways or channels shall be sized such that the wire fill does not exceed 50%. Wires carrying 100 volts and above shall be physically separated from lower voltage wiring by using separate bundles or wireways with sufficient distance to minimize the introduction of noise, crossing only at 90 degree angles. Tie-wraps shall be T & B TY-RAP's, or approved equal.

B. Where wiring crosses hinged surfaces, provide a "U" shaped hinge loop protected by plastic spiral wrap. The hinge loop shall be of sufficient length to permit opening and closing the door without stressing any of the terminations or connections.

C. All devices shall be permanently labeled and secured in accordance with subsections labeled "NAMEPLATES AND TAGS".

D. All field wires and panel wires have wire markers as specified in the "WIRE" subsection.

E. All components associated with a particular compartment's or enclosure's function shall be mounted in that compartment or enclosure.

F. Spacing and clearance of components shall be in accordance with UL, JIC, and NEC standards.

G. Wires shall not be spliced except where shown. Devices with pigtails, except lighting fixtures, shall be connected at terminal blocks. Equipment delivered with spliced wires shall be rejected and the Contractor required to replace all such wiring, at no additional cost to the Owner.

H. No wires shall be spliced without prior approval by the Engineer.

I. Where splices are allowed or approved by the Engineer they shall conform with the following:

1. Splices of #10 and smaller, including fixture taps, shall be made with see-thru nylon self-insulated twist on wire joints; T & B "Piggys", Ideal "Wing Nut", or approved equal.

2. Splices of #8 and larger shall be double crimped splices, or approved equal, insulated with hear shrink tubing, or approved equal.

3. Splices in underground pullboxes shall be insulated and moisture sealed with 3M "Scotchcast" cast resin splice kits and shall have a date marking for shelf life. Do not use splice kits with a date marking for shelf life that has expired.

4. Wire splicing devices shall be sized according to manufacturer's recommendations.

5. Tape on splices shall not be allowed.

6. Splices for motor leads shall be made with T&B MSC series splice kit, or approved equal.

J. Tapes shall conform to the requirements of UL 510 and be rated: 105 degrees C, 600V, flame retardant, hot and cold weather resistant. Vinyl plastic electrical tape shall be 7 mil black. Phase tape shall be 7 mil vinyl plastic, color coded as specified. Electrical insulation putty shall be rubber based, elastic putty in tape form. Varnished cambric shall not be used.

K. Connections to terminals shall be as follows:

1. Use connector or socket type terminals furnished with component.

2. Connections to binding post screw, stud or bolt use:

   a. For #10 and smaller wire, T & B "Sta-Kon", Buchanan "Termend" or approved equal, self-insulated locking forked tongue lug.

   b. For #8 to #4/0 wire, T & B "Locktite", Burndy QA or approved equal lug of shape best suited.

3. Use ratchet type crimping tool which does not release until proper crimp pressure has been applied.

4. Connections to terminals shall be as follows:

   a. Use connector or socket type terminals furnished with component.

b. Connections to binding post screw, stud, or bolt use:

1) For #10 and smaller wire, T & B "Sta-Kon", Buchanan "Termend", or approved equal, self-insulated locking forked tongue lug.

2) For #8 to #4/0 wire, T & B "Locktite", Burndy QA, or approved equal, lug of shape best suited.

c. Use ratchet type crimping tool which does not release until proper crimp pressure has been applied.

d. Connections for all terminals shall be made with insulation stripped per manufacturer's instructions.

L. Equipment shall be wired and piped by the manufacturer or supplier. Major field modifications or changes are not allowed without the written "change order" authority by the Engineer. When field changes are made, the components, materials, wiring, labeling, and construction methods shall be identical to that of the original supplied equipment. Contractor's cost to replace or rework the equipment to match original manufacturer or supplier methods shall be done at no additional cost to the Owner.

M. Mating fittings, bulkhead fittings, plugs, lugs, connectors, etc. required to field interface to the equipment and panels shall be provided by the supplier when the equipment is delivered.

N. All electrical and instrumentation factory as-built drawings associated with the equipment shall be provided with the equipment when it is delivered to the job site. Drawings for each piece of equipment shall be placed in clear plastic packets of sufficient strength that will not tear or stretch from drawing removal and insertion.

3.03 ELECTRICAL EQUIPMENT FABRICATION, GENERAL

A. Panel cutouts for devices (i.e. indicating lights, switches) shall be cut, punched, or drilled and smoothly finished with rounded edges. Exposed metal from cutouts that are made after the final paint finish has been applied shall be touched up with a matching paint prior to installing device. Do not paint nameplates, labels, tags, switches, receptacles, conductors, etc.

B. All doors shall be fully gasketed with non-shrinkable, water and flame resistant material.

C. Bolts and screws for mounting devices on doors shall be as specified by the manufacturer, otherwise they shall have a 316 stainless steel flush head which blends into the device or door surface. No bolt or screw holding nuts shall be used on the external surface of the door.

D. No fastening devices shall project through the outer surfaces of equipment.

E. Each component within the equipment shall be securely mounted on an interior subpanel or backpan and arranged for easy servicing, such that all adjustments and component removal can be accomplished without removing or disturbing other components. Mounting bolts and screws shall be front located for easy access and removal without special tools. Access behind the sub panel or backpan shall not be required for removing any component.

F. HARNESS: Where space is available, all wiring shall be run in slotted plastic wire ways or channels with dust covers. If space is not available for wireways, then all wiring shall be neatly bundled and laced with plastic tie-wraps, anchored in place by 316 stainless steel screw attached retainer. Wire ways or channels shall be sized such that the wire fill does not exceed 50%. Tie-wraps shall be T&B TY-RAP, or approved equal.

G. HINGE LOOPS: Where wiring crosses hinged surfaces, provide a "U" shaped hinge loop protected by clear nylon spiral wrap. The hinge loop shall be of sufficient length to permit opening and closing the door without stressing any of the terminations or connections. Spiral wrap shall be Graybar T25N, or approved equal.

H. RETAINERS: Wire ways, retainers, and other devices shall be screw mounted with round-head 316 stainless steel screws or mechanically mounted by push-in or snap-in attachments. Glue or sticky back attachment of any type or style shall not be used. Retainers shall be T&B TC series, or approved equal.

I. ROUTING: Wires shall be routed in slotted plastic wire-ways with snap covers.

1. Wires carrying 120 VAC shall be separated as much as possible from other low voltage wires and signal cables, and shall be routed only in ducts for 120 VAC. If the power wiring has to cross the signal wiring, the crossing shall be as close to a right angle as possible.

2. Ducts for 24 VDC wiring shall be used for all other wires and cables. Routing of 120 VAC in combined ducts is not allowed without prior written approval of the Owner.

3. Wires and cable shall be routed along the shortest route between termination points, excepting routes which would result in routing 120 VAC and other wires and cables in the same duct. Wires and cables shall have sufficient length to allow slack and to avoid any strain or tension in the wire or cable.

4. Wires and cables shall be placed in the ducts in a straight, neat and organized fashion and shall not be kinked, tangled or twisted together. Additional wire ducting shall be provided for use by the electrical subcontractor for routing field wires to their landing points in the each electrical and instrumentation panel.

5. Wiring not routed in duct work shall be neatly bundled, treed, and laced with plastic ties. Wiring across door hinges shall be carefully made up and

supported to avoid straining and chafing of the conductors or from putting any strain on their terminals.

J. TERMINATIONS: Single wire and cable conductors shall be terminated according to the requirements of the terminal device. All terminations must be made at terminals or terminal blocks. Use of spring or buttsplice connectors are not allowed.

1. Provide 2" minimum separation between wireway and terminal blocks. Installation of wireways too close to terminal blocks will be required to be completely reworked to the satisfaction of the Owner.

2. For captive screw pressure plate type terminals, the insulation shall be removed from the last 0.25 inches of the conductor. The conductors shall be inserted under the pressure plate to full length of the bare portion of the conductor and the pressure plate tightened without excess force. No more than two conductors shall be installed in a single terminal. All strands of the conductor shall be captured under the pressure plate.

3. Terminal blocks and same equipment type termination wiring shall have all wiring terminated with appropriate sized ferrules with insulation collars. Ferrule crimping (full ratcheting) tool with proper sized jigs shall be used per manufacturer's recommendations.

4. For screw terminals, appropriately sized locking forked spade lugs shall be used. Lugs shall be crimp on type that form gas tight connections. All crimping shall be done using a calibrated crimping tool made specifically for the lug type and size being crimped.

5. On shielded cables, the drain wire shall be covered with insulating tubing along its full bare length between the cable jacket and the terminal lug or terminal pressure plate.

6. For screwless terminals, wire shall be stripped back and inserted per the manufacturer's instructions. When stripping insulation from conductors, do not score or otherwise damage conductor.

7. Heat shrink shall be placed on ends of shielded cable to cover foil.

8. Additional condulets with terminal blocks shall be supplied for wire termination to devices with leads instead of terminals. (i.e., solenoid valves, level probe, etc.).

9. Terminate all status, control, and analog I/O wiring on terminal blocks, including spares. Provide additional relay, DIN rails, terminal blocks and side panels as required.

K. A ground bus shall be provided in each enclosure or cabinet. It shall have provisions for connecting a minimum of ten grounding conductors. Screw type lugs shall be provided for connection of grounding conductors. All grounding conductors shall be sized as shown on plans or in accordance with NEC Table 250.122, whichever is larger. All metal panel doors shall be installed with ground straps, including all MCC bucket doors.

L. Minimum wire bending space at terminals and minimum width of wiring gutters shall comply with NEC Tables 373.6(A) & (B).

M. Wire sizes shall not be installed smaller than those shown in NEC Article 310 for each circuit amperage rating.

N. Future device and component mounting space shall be provided on the door, backpan, and subpanel where detailed on the Drawings. Where no detail is shown, provide a minimum of 15 percent usable future space.

O. Doors shall swing freely a minimum of 90º and close with proper alignment.

P. Provide larger motor termination boxes as required to accommodate conduit and wires.

3.04 DELIVERY

A. Contractor shall inspect each electrical and instrumentation item delivered to the jobsite.

B. Contractor shall unpack each item for inspection within two (2) days of arrival.

C. Complete written inventory shall be produced by Contractor and submitted to Owner within (2) days after arrival on jobsite for record keeping prior to any payment for the item.

D. All panels and enclosures be delivered with as-built drawings in clear plastic packets within each panel and enclosure.

3.05 DAMAGED PRODUCTS

A. Damage products will not be accepted. All damaged products shall be replaced with new products at no additional cost to the Owner.

3.06 FASTENERS & LUGS

A. Fasteners for securing equipment shall be 316 stainless steel. The fastener size shall match equipment mounting holes. Layout to maintain headroom, neat mechanical appearance, and to support equipment loads required.

B. All wire & cable lugs shall be copper; aluminum or aluminum alloy lugs shall not be used. The Electrical Contractor shall supply all lugs to match the quantity & size of wire listed in the conduit & wire routing schedule.

C. Anchor Methods:

1. Hollow Masonry: Sleeve type anchors.

2. Solid Masonry: Sleeve type anchors or epoxy anchors bolts.

3. Metal Surfaces: Machine screws, bolts, or welded studs.

4. Concrete Surfaces: Wedge or expansion 316 stainless steel anchors.

5. Structural Steel: Right angle, parallel and edge type rigid metal clamps. Do not weld or drill structural steel.

D. Equipment Mounting:

1. The Electrical Contractor shall be responsible for furnishing and setting all anchor bolts required to install his equipment.

2. Electrical equipment shall be unistrut "stand off" mounted a minimum of ½ - inch from the wall in a manner so that the rear of the equipment is freely exposed to air circulation. Unistrut material shall be 316 stainless steel in NEMA 4X areas and galvanized in non-NEMA 4X areas unless called out specifically in details.

3. All equipment enclosures shall be of the NEMA classification noted on the electrical plan Drawings for the area in which the device will be mounted.

4. Reinforced concrete pad with 316 stainless steel anchor bolts shall be provided for each electrical freestanding equipment.

E. Dissimilar metals such as aluminum, stainless steel, steel, galvanized steel between enclosures, devices, etc. and mounting surfaces shall be isolated from each other using insulated tape or nonmetal spacers. Tape and spacers used shall be specifically manufactured for this application.

3.07 INSTALLATION, GENERAL

A. System

1. Install all products per manufacturer's recommendations and the Drawings.

2. Contract Drawings are intended to show the basic functional requirements of the electrical system and instrumentation system and do not relieve the Contractor from the responsibility to provide a complete and functioning system.

3. Keep a copy of the manufacturer's installation instructions on the jobsite available for review at all times prior to and during the installation of the associated equipment.

B. Provide all necessary hardware, conduit, terminal blocks, wiring, fittings, and devices to connect the electrical equipment provided under other Sections. The following shall be done by the Contractor at no additional cost to the Owner:

1. Provide additional devices, wiring, terminal block, conduits, relays, signal converters, isolators, boosters, and other miscellaneous devices as required to complete interfaces of the electrical and instrumentation system.

2. Changing normally open contacts to normally closed contacts or vice versa.

3. Adding additional relays to provide more contacts as necessary.

4. Installing additional terminal blocks to land wires.

C. All programmable devices, shall be programmed, set-up and tested by the Contractor prior to start of witness testing. This includes instrumentation. Programming and set-up parameters shall be adjusted or changed as directed by the Owner or Engineer during start-up and throughout the warranty period, at no additional cost to the Owner. Coordinate with the Owner and setup all alarm, process, time delays and operation setpoints.

D. Coordinate with the Owner and setup all alarm, process, and operation setpoints.

E. Panels and Enclosures

1. Install panels and enclosures at the location shown on the Plans or approved by the Engineer.

2. Install level and plumb.

3. Clearance about electrical equipment shall meet the minimum requirements of NEC 110.66.

4. Box supports shall be located and oriented as directed in field by Owner.

5. Seal all enclosure openings, including bottom edge of all pad mounted enclosures to prevent entrance of insects, rodents, dirt, debris, etc.

6. All conduits entering outdoor panels and enclosures shall use watertight hubs. These hubs shall be located on sides or bottom only. Top entry of outdoor panels or enclosures is not allowed unless specifically shown on plans.

7. Additional condulets with terminal blocks shall be supplied for wire termination to devices with leads instead of terminals. (i.e. solenoid valves, level probe, etc.)

8. Terminate all status, control, and analog I/O wiring on terminal blocks, including spares. Provide additional relay, DIN rails, terminal blocks and side panels as required.

9. All panels and enclosures be delivered with as-built drawings in clear plastic packets within each panel and enclosure.

10. Provide larger motor termination boxes as required to accommodate conduit and wires.

F. Conduits and Ducts

1. Care shall be exercised to avoid interference with the work of other trades. This work shall be planned and coordinated with the other trades to prevent such interference. Pipes shall have precedence over conduits for space

requirements. Exposed conduits shall be neatly arranged with runs perpendicular or level and parallel to walls. Bends shall be concentric.

2. Exposed conduits runs shall not be run directly on the ground. Secure conduits to 316 stainless steel unistrut.

3. Install conduit free from dents and bruises.

4. All conduits shall be labeled with conduit tags on all ends; at junction boxes, pull boxes, enclosures, stub-outs, or other terminations. All spare conduits shall be labeled.

5. A maximum of three equivalent 90 degree elbows are allowed in any continuous runs. Install pull boxes where required to limit bends in conduit runs to not more than 270 degrees or where pulling tension would exceed the maximum allowable for the cable.

6. Route all above grade outdoor conduits or conduits in rated areas parallel or perpendicular to structure lines and/or piping.

7. Conduits installed outdoor or in NEMA 4X rated areas above grade shall be braced in place with 316 stainless steel Unistrut stanchions or PVC coated clamps with backplates.

8. Duct-taping conduits together is not acceptable. Conduits, installed into concrete pads, shall be installed with a minimum of 2" distance between conduits to allow installation of bushings.

9. Conduit entrances: Seal each conduit entrance from below grade into the panels, and other electrical enclosures with plugging compound sealant to prevent the entrance of insects and rodents.

10. Special "Soft–Jaw" type pipe clamps shall be used to prevent damage to PVC-coated conduits while field threading, cutting to length, and coupling sections.

11. Conduits shall be painted to match the color of surface attached to as directed by Owner.

12. Prior to encasement, concealment, backfilling of conduits, temporary conduit labels shall be provided at each end of conduit. Temporary conduit labels shall have ½-inch (minimum) lettering at all transition points. After encasement and concealment temporary conduit labels shall be placed at each exposed end.

13. All spares shall be mandrel and have pull ropes installed.

14. Conduits shall be painted to match the color of surface attached to as directed by Owner.

15. All existing conduits that are reused shall have a mandrel or conduit piston pulled through the entire conduit run to prove the length contains no blockages or obstructions. Mandrelling shall be witness by the Owner.

16. Install new conduit tags for reused conduits at all transition boxes and endpoints. Conduit & Wire Routing Schedule shall be updated as these modifications take place.

G. Conduit and Wire Routing Schedule

1. Conduit material, wire size, and quantity listed in schedule take precedence over Division 16 Specifications.

2. All of the entries for each line in the conduit schedule apply to each conduit when multiple quantity of conduits multiple quantity of conduits (quantity of which are indicated by number entered in conduit no. column in schedule) are listed in the schedule.

3. Wire sizes listed are in AWG or Kcmil and are copper conductors.

4. Extra wire was intentionally placed in the "Conduit & Wire Routing Schedule" which shall be labeled on both ends with a unique wire label.

5. Contractor to supply and install all conduits and wiring as shown on Utility Engineered Design drawings. Utility primary and secondary conduit and wiring shown in "Conduit and Wire Routing Schedule" is for bid purposes only. A credit or add-on will be provided by Contractor based on the actual work performed by Contractor for the Utility service.

6. All control and signal wiring terminations shall have the correct wire label applied prior to making connection.

7. Conduit entries listed as "GRS-PVC" in the Conduit & Wire Routing Schedule are to be "Galvanized Rigid Conduits with PVC coating" the entire length.

8. Vertical offsets and sloping of conduits are not detailed on plans, the Electrical Contractor shall include in his bid the price for the complete conduit run utilizing the civil & mechanical plans to measure vertical & slope distances.

9. Exposed conduits runs shall not be run directly on the ground or roof. Secure conduits to stainless steel unistrut.

10. Duct-taping conduits together is not acceptable. Conduits, installed into concrete pads, shall be installed with a minimum of 2" distance between conduits to allow installation of bushings.

11. Seals

a. Seal around all conduits, wires, and cables penetrating between panels, walls, ceilings, and floors in all buildings with a fire stop material. Seal shall be made at both ends of the conduit with a fire stop putty. Seal shall have a minimum two hour rating. Fire stop sealing shall be International Protective Coatings Flamesafe, or approved equal.

b. Seal around conduits entering outside to inside structures and around bottom of free standing enclosures to maintain watertight integrity of structure.

c. Place conduit seal inside each underground conduit riser into panels and enclosures to prevent entrance of insects and rodents.

d. Seal conduits entering any electrical instrument and install conduit drains as necessary to prevent corrosion from water condensation.

e. Conduit entrances: Seal each conduit entrance from below grade into the MCC and other electrical enclosures with plugging compound sealant to prevent the entrance of insects and rodents. Conduits between the enclosures shall be sealed with plugging compound sealant on each end. Plugging compound sealant shall be PRC-DeSoto (formerly Courtaulds) Aerospace Semco PR-868 or approved equal.

H. Excavation and Back Filling

1. The Electrical Contractor shall provide the excavation for equipment foundations, and trenches for conduits or buried cables.

2. Underground conduits outside of structures shall have a minimum cover of 24 inches except for utility conduits depth shall be as required by the governing utility requirements. Back filling shall be done only after conduits have been inspected.

3. Trenches for all underground utility lines shall be excavated to the required depths.

4. Repave any area that was paved prior to excavation. Backfill and surface all areas as shown on the Drawings or where not shown to the original condition that was present prior to the excavation.

5. Contractor shall uncover any uninspected covered conduit trenches, at no additional cost to Owner, to verify proper installation.

6. Excavation and back fill conduit trenches shall conform to the requirements of the Earthwork Section of these Specifications, unless modified on plans, and to other entities as required. Backfill shall consist of 3/4 inch class 2 aggregate base material, unless otherwise noted.

7. At all times during the installation of the electrical distribution system, the Contractor shall provide barricades, fences, guard rails, etc., to safeguard all personnel, including small children, from excavated trenches.

I. Wiring, Grounding, and Shielding

1. It is important to observe good grounding and shielding practices in the generally noisy environment in this application. The shield of shielded cables shall be terminated to ground at one end only (source end), the shield at the other end (receive end) shall be encased in an insulated material to isolate it from ground.

2. Special cables shall be provided when required by manufacturer or necessary to correct noise or distortion interference at no additional cost to Owner.

3. Field wiring shall not begin until interconnection drawings have been submitted by the Contractor and approved by the Engineer.

J. Cutting and Patching: The Contractor shall do all cutting and patching required to install his work. Any cutting which may impair the structure shall require prior approval by the Engineer. Cutting and patching shall be done only by skilled labor of the respective trades. All surfaces shall be restored to their original condition after cutting and patching. Paint patched surfaces to match the original color.

K. Housekeeping Pads:

1. Concrete housekeeping pads are required for all free standing electrical equipment. Housekeeping pads shall be 3-1/2" inches above surrounding finished floor or grade unless otherwise shown and shall be 4 inches (minimum) larger in width on all sides of equipment. The depth of housekeeping pads shall be 18 inches (minimum).

2. Housekeeping pads shall be installed for future units as shown on the Contract Drawings.

3. Housekeeping pad shall be Class "A" concrete with rebar crossway network. The minimum size rebar allowed is #3. Concrete shall be precisely leveled so that equipment set in place will not require shimming.

L. Cleaning and Touch Up

1. Prior to startup and at completion of the work prior to final acceptance, all parts of the installation, including all equipment, exposed conduit, devices, and fittings shall be cleaned and given touch up by Contractor as follows:

   a. Remove all grease and metal cuttings.

   b. Any discoloration or other damage to parts of the building, the finish, or the furnishings, shall be repaired.

   c. Thoroughly clean any of his exposed work requiring same.

   d. Vacuum and clean the inside of all MCC and electrical and instrumentation enclosures.

   e. Clean all above and below ground pull boxes, junction boxes, and vaults from all foreign debris prior to final acceptance.

   f. Paint all scratched or blemished surfaces with the necessary coats of quick drying paint to match adjacent color, texture, and thickness. This shall include all prime painted electrical equipment, including enclosures, panels, poles, boxes, devices, etc.

   g. Remove all decals and lettering from both sides of support plates.

   h. Repair damage to factory finishes with repair products recommended by Manufacturer.

i. Repair damage to PVC or paint finishes with matching touchup coating recommended by Manufacturer.

3.08 ELECTRICAL TESTING

A. General Requirements

1. It is the intent of these tests to assure that all equipment is operational within industry and manufacturer's tolerances and is installed in accordance with design plans and specifications.

2. All equipment setup and assembled by the Contractor shall be in accordance with the design plans and Drawings and the manufacturer's recommendations and instructions and shall operate to the Engineer's satisfaction.

   a. Follow all manufacturer's instructions for handling, receiving, installation, and pre-check requirements prior to energization.

   b. After energization, follow manufacturer's instructions for programming, set-up and calibration of equipment.

   c. The Contractor shall be responsible for, and shall correct by repair or replacement, at his own expense, equipment which, in the opinion of the Engineer, has been caused by faulty mechanical or electrical assembly by the Contractor.

   d. Necessary tests to demonstrate that the electrical and mechanical operation of the equipment is satisfactory and meets the requirements of these Specifications shall be made by the Contractor at no additional cost to the Owner.

3. The testing shall not be started until the manufacturer has completed fabrication, wiring, setup, and programming; performed satisfactory checks and adjustments; factory testing sheets approved by Owner; and can demonstrate the system is complete and operational.

4. The first Pre-Energization tests shall be performed to determine the suitability for energization and shall be completed with all power turned off and complete prior to the start of any of the Post-Energization Tests. The Electrical Contractor shall have qualified personnel on the job site for all Pre-Energization and Post-Energization tests.

5. Testing Sheets and Procedures:

   a. The supplier shall submit for approval, the proposed factory & field testing sheets at least two weeks prior to the start of the tests. Each testing sheet shall have a title giving the type of test and entry spaces for the name of the person who performed the test, name of the person who witnessed the test, and the date.

   b. Separate test procedures in separate binders shall be submitted for approval for the Factory and Field Tests. Testing shall not commence until the test procedures have been reviewed and

approved by the Owner. Tests forms shall be similar to those shown on Appendix "A".

6. All tests shall be witnessed by the Engineer and/or Owner personnel. The test forms shall be completed by the testing person for field checkout, testing, and calibration of all equipment and instruments.

   a. All filled in test forms shall be given to the Engineer and/or Owner the day of the test. Fill in two sets of test forms if Contractor wants to keep a copy.

   b. All tests shall be documented in writing by the supplier and signed by the Engineer as satisfactory completed. The supplier shall keep a detailed log of all tests that failed or did not meet specifications, including date of occurrence and correction.

   c. Completed forms with proper signatures and dates shall be included and become a component of the Operations and Maintenance Manual for each of the respective systems.

   d. The Contractor shall notify the Owner and the Engineer of the Supplier's readiness to begin all factory and field tests in writing (a minimum of ten working days prior to start), and shall schedule system checkout on dates agreed to by the Owner and the Engineer in order that the testing be scheduled and witnessed.

   e. The Contractor shall fill in & submit for approval the "Scheduled Test Request Form" located in Appendix "A" for each requested inspection, factory and field test.

B. FAILURE TO MEET TEST:

1. Any system material or workmanship which is found defective on the basis of acceptance tests shall be reported to the Engineer. The Contractor shall replace the defective material or equipment and have tests repeated until test proves satisfactory to the Engineer without additional cost to the Owner.

2. If the results of any of tests are unacceptable to the Engineer, the Contractor shall make corrections and perform the tests again until they are acceptable to the Engineer; these additional tests shall be done at no additional cost to the Owner.

3. If testing, installation or configuration work performed is deemed inadequate by Owner or Engineer, then the Contractor shall provide a qualified technician to meet these requirements. No extension of Contract time will be allowed.

C. SAFETY

1. Testing shall conform to the respective manufacturer's recommendations. All manufacturer's safety precautions shall be followed.

2. The procedures stated herein are guidelines for the intended tests, the Contractor shall be responsible to modify these tests to fit the particular

application and ensure personnel safety. Absolutely no tests shall be performed that endanger personal safety.

3. The Contractor shall have two or more personnel present at all tests.

4. Two non-licensed portable radios are to be made available by the Contractor for the testing organization to conduct tests.

5. California Electrical Safety Orders (ESO) and Occupational Safety and Health Act (OSHA): The Contractor is cautioned that testing and equipment shall comply with ESO and OSHA as to safety, clearances, padlocks and barriers around electrical equipment energized during testing.

6. Field inspections and pre-energization tests shall be completed prior to applying power to equipment.

D. Electrical Field Tests

1. The Contractor shall engage and pay for the services of an approved qualified testing company for the purpose of performing inspections and tests as herein specified. The testing company shall provide all material, equipment, labor and technical supervision to perform such tests and inspections. The Electrical Contractor shall be present on site for all field tests.

2. Prior to start of any field testing, the Field Test Procedures, Interconnection Drawings and Preliminary Operation and Maintenance Manuals shall have been submitted by the Contractor and approved by the Engineer. Also, prior to start of field testing of equipment, correct machine printed wire labels shall be in place on all wires associated with that equipment.

3. The Electrical Contractor shall complete and submit "Schedule Test Request Form" as illustrated in Appendix "A" for each electrical field test.

4. The Electrical Contractor shall be at the jobsite to assist with all Electrical Field Tests.

5. Pre-Energization Tests: These tests shall be completed prior to applying power to any equipment.

   a. Inspections:

      1) Visual and mechanical inspections:

         a) Inspect for physical damage, proper anchorage and grounding.

         b) Compare equipment nameplate data with design plans and starter schedule.

         c) Compare overload setting with motor full load current for proper size.

      2) Performed NETA acceptance testing for each piece of equipment.

3) The Testing Company shall compile, by visual inspection a record of all motor nameplate data, the following minimum data shall be neatly tabulated in spreadsheet form and submitted to Owner:

a) Manufacturer

b) Part and model number

c) Equipment driven

d) Motor horsepower

e) Nameplate amperes, volts and phase

f) Service factor

g) Temperature ratings

h) Overload catalog number

i) Overload current range and setting

j) Circuit breaker rating

k) Circuit breaker trip setting, for magnetic only circuit breakers.

4) The Contractor shall fill in, for each piece of equipment, Test Form TF4 located in Appendix "A".

b. Torque Connections:

1) All electrical, mechanical and structural threaded connections inside equipment shall be tightened in the field after all wiring connections have been completed. Every worker tightening screwed or bolted connections shall be required to have and utilize a torque screwdriver/wrench at all times. Torque connections to the value recommended by the equipment manufacturer. If they are not available, use NEC Annex I for torque values as guidelines.

c. Wire Insulation & Continuity Tests:

1) All devices that are not rated to withstand the 1000V megger potential shall be disconnected prior to the megger tests.

2) Megger insulation resistances of all 600 volt insulated conductors using a 1000V megger for 10 seconds. Make tests with circuits installed in conduit and isolated from source and load. Each field conductor shall be meggered conductor to conductor and conductor to ground. These tests shall be made on cable after installation with all splices made up and terminators installed but not connected to the equipment.

3) Each megger reading shall not be less than 10 Meg-ohms resistive. Corrective action shall be taken if values are recorded less than 10 Meg-ohms. Values of different phases of conductors in the same conduit run showing substantially

different Meg-ohm values, even if showing above 10 Meg-ohms shall be replaced.

4) Each instrumentation conductor twisted shielded pair shall have the conductor and shield continuity measured with an ohmmeter. Conductors with high ohm values, that do not match similar lengths of conductors the same size, shall be replaced at no additional cost to the Owner.

5) The Contractor shall fill in test forms Power and Control Conductor Test Form TF1 and Instrumentation Conductor Test Form TF2 located in Appendix "A".

d. Grounding System Tests:

1) Visual and Mechanical Inspection:

a) Verify ground system is in compliance with Drawings and Specifications.

2) Electrical Tests:

a) Before backfilling trenches, and placement of sidewalks, landscape and paving, measure the resistance of each electrode to ground using a ground resistance tester. Perform the test not less than two days after the most recent rainfall and in the afternoon after any ground condensation (dew) has evaporated.

b) After all individual ground electrode readings have been made, interconnect as required and measure the system's ground resistance.

c) The grounding test shall be in conformance with IEEE Standard 81.

d) The current reference rod shall be driven at least 100 feet from the system under test.

e) Measurements shall be made at 10 feet intervals beginning 25 feet from the test electrode and ending 75 feet from it in a direct line between the system being tested and the test electrode.

f) Point-to-Point: Perform point-to-point tests to determine the resistance between the main grounding system and all major electrical equipment frames, system neutral, and/or derived neutral points.

3) Test Values:

a) The resistance between the main grounding electrode and equipment ground shall be no greater than five ohms per IEEE Standard 142.

b) Investigate point-to-point resistance values that exceed 0.5 ohms.

c) The Contractor shall fill in Grounding System Test Form TF3 located in Section 16010 Appendix "A".

d) Plots of ground resistance shall be made and submitted to the Engineer for approval.

e. Panelboard Tests

1) Visual and Mechanical Inspection:

a) Inspect for physical damage, proper anchorage and grounding.

b) Compare equipment nameplate data with design plans and panelboard schedules.

c) Compare breaker legend for accuracy.

d) Check torque of bolted connections.

2) The Contractor shall fill in Panelboard Test Form TF5 located in Appendix "A".

f. Breaker Test:

1) All breakers shall be checked for proper mounting, conductor size, and feeder designation. Operate circuit breaker to ensure smooth operation. Inspect case for cracks or other defects. Check tightness of connection with torque wrench in accordance with manufacturer's recommendations.

2) All MCPs and breakers 100 amps and above shall be tested. Time current characteristic tests shall be performed bypassing three hundred percent (300%) rated current through each pole separately. Trip amps and time shall be measured. Instantaneous pickup current shall be determined by run up or pulse method. Clearing times should be within four (4) cycles or less. All trip times shall fall within NETA Table values. Instantaneous pickup current levels should be within 20% of manufacturer's published values.

3) Contact and Insulation Resistance: Contact resistance shall be measured and be compared to adjacent poles and similar breaker. Deviations of more than 50% shall be reported to Engineer. Insulation resistance shall be measured and shall not be less than 50 megohms.

4) At end of test the all breakers trip settings shall be set by Contractor to values listed in protective device coordination study to properly protect equipment.

5) The Contractor shall fill in mcc Device Test Form TF8 and Breaker Test Form TF9 located in Appendix "A".

6. Post Energization Tests

a. Panels and Enclosure Tests:

1) During these tests, test all local and remote control operations and interlocks.

2) Electrical Tests:

a) Perform operational tests by initiating control devices to affect proper operation.

b) The Contractor shall fill in Operational Device Checks and Tests Form TF6.

b. Phase Rotation Tests:

1) Check connections to all equipment for proper phase relationship. During this test, disconnect all devices which could be damaged by the application of voltage or reversed phase sequence. Three phase equipment shall be tested for the phase sequence "ABC" front to back, left to right, and top to bottom.

2) All three phase motors shall be tested for proper phase rotation. Revise wire color codes to indicate correct phase color if wires are swapped.

3) The Contractor shall fill in Phase Rotation Test Form TF7 located in Appendix "A".

c. Motor Testing:

1) Record the amperage draw on all phases of each motor operating under full load. Ensure that these values do not exceed the motor nameplate full load amperage.

2) Record the voltage between all phases of each motor operating under full load. If the voltage balance is not within plus or minus 5 percent of nominal, request the Utility power company or other responsible party to correct the problem.

3) Record the Ohm's on phase to phase with low Ohms tester.

4) The Contractor shall compile, by visual inspection of equipment installed for each motor, the following data in neatly tabulated form and be placed in the O&M manual:

a) Equipment driven.

b) Motor horsepower.

c) Nameplate amperes.

d) Service factor.

e) Temperature rating.

f) Overload catalog number.

g) Overload current range and setting.

h) Circuit breaker rating.

i) Circuit breaker trip setting, for magnetic only circuit breakers.

5) The Contractor shall fill in Motor Test Form TF10, located in Appendix "A."

6) Additional motor testing requirements per Division XI.

d. Instrumentation Tests

1) The Contractor shall provide a minimum of two (2) hours of field acceptance testing for each instrument. If any instrument has not been fully tested during its allotted time, the Contractor shall provide additional hours for finishing testing of the instrument, to be paid by the Contractor.

2) The overall accuracy of each instrument loop shall be checked to ensure that it is within acceptable tolerance.

a) As a minimum, all the tests indicated/specified on the test form TF14 in Appendix "A" shall be performed by the Contractor for each of the instruments listed in Appendix "B" Device Index.

3) Test equipment used for testing shall be of suitable quality so as not to mask performance deficiencies. All test equipment shall be traceable to National Bureau of Standards and have been calibrated within six months of test date.

4) Testing shall be accomplished using simulated inputs only with prior written approval of the Owner.

5) Calibration stickers shall be supplied for all equipment and instruments. Calibration stickers shall list the following information:

a) Tag number.

b) Calibrated by who (name), firm, city and telephone number.

c) Date calibrated.

d) Calibration range.

e) Comments.

e. Control System Tests: The following tests shall be performed for all MCCs and for the control panels listed in Section 16010 Appendix "B", including all non-Division 16 Control Panels

1) Component Tests:

a) Measure insulation resistance of starter phase to phase and phase to ground with the starter contacts closed and the protective device open. Test voltage and minimum acceptable values shall conform to NETA Section 3 "Test Values." Measure insulation

resistance of each control circuit with respect to ground.

b) Motor overload units shall be tested by injecting primary current through overload unit and monitoring trip time.

c) Test the motor circuit protectors and thermal breakers as specified herein.

2) Control Tests:

a) Remove motor overload heaters from each motor starter or disconnect pump/motor coupling. In case the motor overload heaters are fed by current transformers, the motor conductors shall be removed and insulated away from the load lugs of the motor starter.

b) Verify the pump control circuits are wired and operate as shown on the elementary diagrams. Check the indicator lights, alarm lights, local & remote selector switches, alarm contacts, power fail relays, overloads, etc., for proper operation.

c) Reinstall all heaters and all wiring removed for this test.

f. Trial Operations: The entire electrical installation shall be either tested or trial operated to verify Contract compliance. That is, controls, heaters, fans, light switches, convenience receptacles, lights, etc. shall be trial operated. Contractor shall conduct trial operations in the presence of the Engineer and Operations and Maintenance personnel.

E. Operational Testing:

1. After all the previous tests in this subsection 3.07 and 3.08 are complete, the Contractor shall conduct operational testing.

2. The Contractor shall demonstrate operation of each part of the control and instrumentation system to the satisfaction of the Owner and/or Engineer. Tests shall be repeated by the Contractor at no additional cost to the Owner and at the discretion of the Owner and/or Engineer to resolve whether the system has been demonstrated that it will operate under all modes of operations and varying conditions.

3. For the operational testing the new equipment shall be activated to automatically run for 5 days, 24 hours per day, Monday through Friday. During this five day period the Owner will run the different combinations of the monitoring options. If equipment failure occurs during the 5 days of operational testing, the Contractor shall repair or replace the defective equipment and shall begin another 5 day operational test, Monday through

Friday. This shall be continued until the new equipment functions acceptably for 5 consecutive days.

4. The Electrical Contractor, testing firm and System Supplier shall re-visit the jobsite as often as necessary until all field tests, start-up and operation tests are completed and approved.

3.09 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals covering instruction and maintenance on each type of equipment shall be furnished prior to completion of the project.

B. These instructions shall provide the following as a minimum:

1. Each set bound in a three ring binder and organized as specified herein. Binder shall be sized such that when all material is inserted the binder is not over 3/4 full

2. "As Constructed" set of submittal shop documents, data sheets, and drawings (with all field changes included) for all items in the electrical system.

3. A complete list of items supplied, including serial numbers, ranges, options, and other pertinent data necessary for ordering replacement parts.

4. Full technical specifications on each item.

5. Instrument data sheets for all instruments supplied on the project, clearly identifying the instrument tagname, range, part number, serial number, size, etc.

6. Detailed service, maintenance and operation instructions for each item supplied. Schematic diagrams of all electronic devices shall be included. A complete parts lists with stock numbers shall be provided on the components that make up the assembly.

7. Special maintenance requirements particular to this system shall be clearly defined, along with special calibration and test procedures.

8. Safety precautions and procedures.

9. Record of the following:

   a. Each motor nameplate data including manufacturer, full part number, size, voltage, amps, service factor, bearings, etc.

   b. Each breaker and overload heater element including manufacturer, full part number, size, setting etc.

   c. Spread sheet listing all setpoints and programmable parameters entered for this project for VFD, UPS, HIM, etc.

10. No photo copies are allowed of standard published manuals available from manufacturers. All of the manuals shall be originals, not copies.

11. Include all completed and signed test data and forms from factory and field testing.

12. Warranty certificate with start dates, duration and contact information.

13. Troubleshooting instructions.

14. Record of all settings or parameters for all programmable devices.

C. At the end of the project these manuals shall be updated to show "as-built or as-installed" conditions.

D. Provide to the Owner four (4) sets of USB drives on lanyards and two sets of DVDs (DVDs shall contain all documents in both PDF format and unlocked AutoCAD - DWG format, version 2010 or later):

1. As-built Contract electrical and instrumentation drawings prepared for this project.

2. As-built set of all required Drawings for the project.

3. Electronic PDF version of O&M manual. Version format shall follow the hard copy submittal of the O&M, including index, equipment record sheet, warranty information, theory of operation, maintenance instruction, etc. PDF shall be "bookmarked" at each index, subtab, transmittal letter, equipment record sheet, warranty information, theory of operation, maintenance instruction, etc. Failure to bookmark PDF may be grounds for immediate rejection without review. Bookmarks shall be descriptive of actual document, tab, etc. Bookmarks shall not be out of order; the English description shall match that listed in the Submittal's Table of Contents.

4. These disks shall be the property of the Owner, for its use on this and future projects.

5. Label drives with site name using clear plastic with black machine printed lettering as produced by a KROY or similar machine. The size of the nameplate tape shall be with 3/8-inch lettering unless otherwise approved by the Engineer. Securely fasten nameplates in place on the USB drive using the adhesion of the tape.

3.10 TRAINING

A. All training sessions shall be held on dates and times agreeable to Owner. A total of 5 or less Owner personnel shall be trained.

B. After "Operation Testing" has started the Contractor shall provide a period of not less than 8 hours training for instruction of operation and maintenance personnel in the use of all the new electrical and instrumentation systems. The Contractor shall make necessary arrangements with manufacturer's representative. Provide product literature and application guides for user's reference during instruction.

C. Training to include instruction on the use, operation, calibration, programming, and maintenance of the field devices and remote monitoring system.

D. Acceptable Operation and Maintenance Manuals shall be on site and available when training sessions are implemented.

E. See the following sections for additional training requirements:

1. Section 16605 – Electrical System Analysis.

3.11 SPARE PARTS

A. The Contractor shall supply all spare parts prior to start of field tests. All parts shall be sealed in plastic bags and delivered to each site in a heavy duty plastic storage bag. Bag shall be clearly labeled on the outside with part name and number and the corresponding equipment tagname.

B. The Contractor shall make available any replacement parts that are not manufacturer's normal stock items for immediate service and repair of all the instrumentation equipment throughout the warranty period.

C. The following spare parts shall be provided to the Owner as part of this Contract for each site:

1. Five (5) fuses for each type of fuse.
2. Twenty (20) lamps for each type of light.
3. Two (2) relays for each type of control, power fail and time delay relay.

D. See other Division 16 sections for additional spare parts to be provided.

3.12 WARRANTY

A. The Contractor shall warrant all electrical and instrumentation equipment including software programming for a period of one (1) year from date of final acceptance. Standard published warranties of equipment which exceed the preceding specified length of time shall be honored by the manufacturer or supplier.

B. The Contractor shall provide all labor and material to troubleshoot, replace, or repair any hardware or software that fails or operates improperly during the warranty period, at no additional cost to the Owner.

C. The System Supplier shall have a staff of experienced personnel available to provide service on 2 working days' notice during the warranty period. Such personnel shall be capable of fully testing and diagnosing the hardware and software and implementing corrective measures.

D. If the System Supplier "fails to respond" in 2 working days, the Owner at its option will proceed to have the warranty work completed by other resources; the total cost (direct and indirect) for these other resources shall be reimbursed in full by the Contractor.

1. "Fail to respond" shall be defined as: The Contractor has not shown a good faith effort and has not expended adequate resources to correct the problem.

2. The use of other resources, as stated above, shall not change or relieve the Contractor from fulfilling the remainder of the warranty requirements.

E. The Contractor shall warrant all electrical and instrumentation equipment for a period of one (1) year from date of final acceptance. Standard published warranties of equipment which exceed the preceding specified length of time shall be honored by the manufacturer or supplier.

F. Prior to "final acceptance", the Contractor shall furnish to the Engineer a listing of warranty information for all manufacturers of materials, instruments, and equipment used on the project. The listing shall include the following:

1. Manufacturer's name, service contact person, phone number, and address.

2. Material and equipment description, equipment number, part number, serial number, and model number.

3. Manufacturer's warranty expiration date.

G. The Contractor shall provide all labor and material to troubleshoot, program, replace, or repair any hardware or software that fails or operates unpredictably during the warranty period, at no additional cost to the Owner.

H. Each time the Supplier's repair person responds to a system malfunction during the warranty period, he or she must contact the designated Owner maintenance supervisor for scheduling of the work, access to the jobsite, and permission to make repairs. Operation of facilities necessary to test equipment shall only be performed by or under the direction Owner staff. Owner reserves the right at its sole discretion to deny operations requested by the Supplier. A written description of all warranty work performed shall be documented on a field service report to be given to Owner prior to the repair person leaving job site. This field service report shall detail and clearly state problem, corrective actions taken, additional work that needs to be done, data, repair person name and company.

3.13 FINAL ACCEPTANCE

A. Final acceptance will be given by the Owner after the equipment has passed the "operational testing" trial period, each deficiency has been corrected, final documentation has been provided, and all the requirements of design documents have been fulfilled.

B. At the end of the project, following the completion of the field tests, and prior to final acceptance, the Supplier shall:

1. Remove all temporary services, equipment, material, and wiring from the site.

2. Verify Service equipment has been legibly marked in field with the maximum available fault current per NEC 110.24 (A). Field marking shall include date the fault current calculation was performed and be weather & UV rated. Service equipment shall not be hand labeled

3. Two sets of all keys for locks supplied on this project. Submit each key with matching duplicate. Wire all keys for each lock securely together. Tag and plainly mark with lock number or equipment identification, and indicate physical location, such as panel or switch number.

4. Verify that as-installed drawings, in reinforced clear plastic pockets, have been placed in all new or modified panels.

5. Resubmit all Electrical System Analysis studies with all calculations rerun, data and graphs updated to reflect as-left conditions. Provide new Arc Flash labels to reflect as-constructed equipment and as-left circuit breaker settings.

6. Provide the following to the Owner:

   a. Listing of warranty information.

   b. Two (2) Electrical Systems Analysis DVDs of as-built set of studies, reports, settings, etc. and source files per Section 16605.

   c. Each "operation and maintenance" manual shall be modified or supplemented by the Supplier to reflect all field changes and as-built conditions.

   d. Full size record drawings neatly marked accurately showing the information required herein

   e. Two (2) disk copies of all final documentation to reflect as-built conditions.

   f. Four (4) USB drives and two (2) DVDs with copies of all final documentation to reflect as-built conditions.

APPENDIX "A"

ELECTRICAL & INSTRUMENTATION FORMS

Index of Forms:

Bill of Material

Schedule Test Request Form

TF1 Power and Control Conductor Test Form

TF2 Instrumentation Conductor Test Form

TF3 Grounding System Test Form

TF4 Visual and Mechanical Inspection Form

TF5 Panelboard Test Form

TF6 Operational Device Checks and Tests Form

TF7 Phase Rotation Test Form

TF9 Breaker Device Test Form

TF14 Instrument Data Sheet and Calibration Record

BILL OF MATERIAL

PROJECT: _____ **DATE** ___/___/___

LOCATION: _____ **PAGE** _____

SPECIFICATION SECTION	QTY	DESCRIPTION	MFG.	PART NUMBER	TAG No.

SCHEDULED TEST REQUEST FORM

COMPANY PERFORMING TEST: _____
TESTING PERSONNEL : _____ _____
PHONE NUMBER OF COMPANY: _____
TEST PROCEDURE SUBMITTAL: _____ APPROVED : ___/___/___
SCHEDULED TEST DATE : _____ DATE : ___/___/___

TIME	DESCRIPTION OF TEST
8:00	
9:00	
10:00	
11:00	
12:00	
13:00	
14:00	
15:00	
16:00	

NOTES:

TESTED BY : _____ DATE : ____/____/____
WITNESSED BY: _____

POWER AND CONTROL CONDUCTOR TEST FORM

TEST FORM (TF1)

EQUIPMENT

NAME : _____ LOCATION : _____

CONDUCTOR NUMBER	INSULATION TESTS					
	PHASE TO GROUND			PHASE TO PHASE		
	A	B	C	AB	BC	CA

NOTES:

Record insulation test values in meg-ohms.

TESTED BY : _____ DATE : ____/____/____

WITNESSED BY: _____

INSTRUMENTATION CONDUCTOR TEST FORM

TEST FORM (TF2)

EQUIPMENT

NAME : _____ LOCATION : _____

CONDUCTOR PAIR NUMBER	CONTINUITY TESTS		INSULATION TESTS		
	CONDUCTOR TO CONDUCTOR	CONDUCTOR TO SHIELD	CONDUCTOR TO CONDUCTOR	CONDUCTORS TO GROUND*	SHIELD TO GROUND

NOTES:

Record continuity test values in ohms.

record insulation test values in meg-ohms.

* With both conductors tied together

TESTED BY : _____ DATE : ____/____/____

WITNESSED BY: _____

GROUNDING SYSTEM TEST FORM

TEST FORM (TF3)

FALL IN POTENTIAL TEST

MAIN GROUND LOCATION	APPLIED VOLTAGE V	MEASURED POINT 1 VOLTAGE	MEASURED POINT 2 VOLTAGE	MEASURED POINT 3 VOLTAGE	CALCULATED RESISTANCE OHMS

TWO POINTS TESTS

EQUIPMENT NAME	EQUIPMENT #	CIRCUIT #	APPLIED CURRENT	MEASURED VOLTAGE	CALCULATED RESISTANCE OHMS

NOTES:

TESTED BY : _____ DATE : ____/____/____

WITNESSED BY: _____

VISUAL AND MECHANICAL INSPECTION FORM

TEST FORM (TF4)

EQUIPMENT

NAME : _____ LOCATION : _____

NAMEPLATE DATA

MFGR. :	_____	SERIES # :	_____
MODEL # :	_____	U.L. # :	_____
VOLTAGE :	_____	PHASE :	_____
AMPERAGE :	_____	SERVICE :	_____
BUS TYPE :	_____	BUS BRACING:	_____
VERT. BUS :	_____	HORZ. BUS :	_____
GND. BUS :	_____	NEU. BUS :	_____
ENCLOSURE :	_____		_____
	_____		_____

INSPECTION CHECK LIST

ENTER: A-ACCEPTABLE R-NEEDS REPAIR OR REPLACEMENT NA-NOT APPLICABLE

TIGHTEN ALL BOLTS AND SCREWS	_____
TIGHTEN ALL WIRING AND BUS CONNECTIONS	_____
VERIFY ALL BREAKERS AND FUSES HAVE PROPER RATING	_____
CHECK BUS BRACING AND CLEARANCE	_____
CHECK MAIN GROUNDING CONNECTION AND SIZE	_____
INSPECT GROUND BUS BONDING	_____
CHECK EQUIPMENT GROUNDS	_____
CHECK CONDUIT GROUNDS AND BUSHINGS	_____
INSPECT NEUTRAL BUS AND CONNECTIONS	_____
CHECK HEATERS AND THERMOSTATS	_____
CHECK VENTILATION AND FILTERS	_____
CHECK FOR BROKEN OR DAMAGED DEVICES	_____
CHECK DOOR AND PANEL ALIGNMENT	_____
INSPECT ANCHORAGE	_____
CHECK FOR PROPER CLEARANCES AND WORKING SPACE	_____
REMOVE ALL DIRT AND DUST ACCUMULATION	_____
INSPECT ALL PAINT SURFACES	_____
CHECK FOR PROPER WIRE COLOR CODES	_____
INSPECT ALL WIRING FOR WIRE LABELS	_____
CHECK FOR PROPER WIRE TERMINATIONS	_____
CHECK FOR PROPER WIRE SIZES	_____
INSPECT ALL DEVICES FOR NAMEPLATES	_____
CHECK IF DRAWINGS MATCH EQUIPMENT	_____
CHECK ACCURACY OF OPERATION & MAINTENANCE	_____
	_____

TESTED BY : _____ DATE : ____/____/____

WITNESSED BY: _____

PANEL-BOARD TEST FORM

TEST FORM (TF5)

PANEL NAME: _____ LOCATION : _____

NAMEPLATE DATA

MFGR. :	_____	SERIES # :	_____
MODEL # :	_____	U.L. # :	_____
VOLTAGE :	_____	PHASE :	_____
AMPERAGE :	_____	SERVICE :	_____
BUS TYPE :	_____	BUS BRACING:	_____
VERT. BUS :	_____	HORZ. BUS :	_____
GND. BUS :	_____	NEU. BUS :	_____
ENCLOSURE :	_____	MAIN BKR :	_____

INSULATION RESISTANCE TESTS - MEGOHMS					
A-GND	B-GND	C-GND			

INSPECTION CHECK LIST

ENTER: A-ACCEPTABLE R-NEEDS REPAIR OR REPLACEMENT NA-NOT APPLICABLE

TIGHTEN ALL BOLTS AND SCREWS	_____
TIGHTEN ALL WIRING AND BUS CONNECTIONS	_____
VERIFY ALL BREAKERS AND FUSES HAVE PROPER RATING	_____
CHECK BUS BRACING AND CLEARANCE	_____
CHECK MAIN GROUNDING CONNECTION AND SIZE	_____
INSPECT GROUND BUS BONDING	_____
CHECK EQUIPMENT GROUNDS	_____
CHECK CONDUIT GROUNDS AND BUSHINGS	_____
INSPECT NEUTRAL BUS AND CONNECTIONS	_____
CHECK FOR BROKEN OR DAMAGED DEVICES	_____
CHECK DOOR AND PANEL ALIGNMENT	_____
INSPECT ANCHORAGE	_____
CHECK FOR PROPER CLEARANCES AND WORKING SPACE	_____
REMOVE ALL DIRT AND DUST ACCUMULATION	_____
INSPECT ALL PAINT SURFACES	_____
CHECK FOR PROPER WIRE COLOR CODES	_____
INSPECT ALL WIRING FOR WIRE LABELS	_____
CHECK FOR PROPER WIRE TERMINATIONS	_____
CHECK FOR PROPER WIRE SIZES	_____
INSPECT ALL DEVICES FOR PROPER LEGEND NAMEPLATES	_____
	_____

CALIBRATION TEST EQUIPMENT PART NO.	DATE CALIBRATED:

TESTED BY : _____ DATE : ____/____/____

WITNESSED BY: _____

OPERATIONAL DEVICE CHECKS AND TESTS FORM

TEST FORM (TF6)

NAME : _____ LOCATION : _____

CUB. #	EQUIPMENT NAME	EQUIP #	LOCAL SITE DEVICE CHECKS AND TESTS							REMOTE SITE DEVICE CHECKS & TESTS		
			SELECTOR SWITCH	INDICATOR LIGHTS	PUSHBUTTON & LOS	METERING & INDICATORS	OVERLOAD RESET	INTERLOCKS & CONTROL	ALARM & STATUS	SELECTOR SWITCH	INDICATOR LIGHTS	PUSHBUTTON & LOS

TESTED BY : _____ DATE : ____/____/____

WITNESSED BY : _____

NOTES:

PHASE ROTATION TEST FORM

TEST FORM (TF7)

EQUIPMENT NAME	EQUIPMENT #	CIRCUIT #	PHYSICAL PHASE LOCATION	PHASE COLOR CODE	MEASURED PHASE ROTATION

NOTES:
Use phase tester to verify all circuits and equipment have a clockwise A-B-C phase rotation.
Physical phase locations: Left to Right - LR or Top to Bottom - TB
Phase color codes: Brown, Orange, & Yellow -BOY
Black, Red, & Blue -BkRBe

TESTED BY : _____ DATE : ____/____/____
WITNESSED BY: _____

BREAKER DEVICE TEST FORM

TEST FORM (TF9)

FEEDER : _____ LOCATION : _____
EQUIP NAME: _____ EQUIP # : _____
EQUIP H.P. : _____ EQUIP KVA : _____

MFGR. : _____ PART # : _____ FRAME # : _____
VOLTAGE : _____ INTERRUPT RATING : _____ CHARACTER CURVE: _____

CONTACT RESISTANCE TESTS - OHMS INSULATION RESISTANCE TESTS - MEGOHMS

PHASE A	PHASE B	PHASE C	A-GND	B-GND	C-GND

MFGR TRIP TIME @300% MIN : _____ BREAKER RATING / RANGE: _____
MFGR TRIP TIME @300% MAX: _____ FINAL BREAKER SETTING : _____
MFGR INST. PICKUP APMS:

TEST-CURRENT TESTS TRIP TIME IN SECONDS @ 300% AMPS			INSTANTANEOUS TRIP TEST - AMPS		
PHASE A	PHASE B	PHASE C	PHASE A	PHASE B	PHASE C

ADDITIONAL TESTS AND SETTING AS APPLICABLE

	PICKUP		DELAY-TIME		
FUNCTION	RANGE	SETTING	RANGE	SETTING	
LONG TIME					
SHORT TIME					
GROUND FLT.					

NOTES:

TESTED BY : _____ DATE : ____/____/____
WITNESSED BY: _____

INSTRUMENTATION DATA SHEET AND CALIBRATION RECORD TEST FORM (TF14)

Component Description	Manufacturer	Location
	Name	Site
Component Tag Name	Model	Equip
	Serial #	

	Range	Unit
Indicator Range		
Input Range		
Output Range		

General Notes

1) Attach Calibration Curves for dp Flowmeters

2) Include mounting elevations for level Instruments

3) All entries within solid box to be typed in prior to start of test

Designed Calibration			Measured Calibration		
Input Signal	Output	Eng. Value	Input	Output	Comments

Notes

Tested by (Print Name) Witnessed by (Print Name)

Signature Signature

Date / / Date / /

END OF SECTION

SECTION 16210

DIESEL GENERATOR

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. These specifications describe the minimum requirements for a skid- mounted, standby-duty, three-phase, turbocharged with aftercooler engine driven electric generator powered from Diesel fuel. A larger generator shall be supplied when necessary to meet the requirements of this section. Section 16210 Appendix "B" contains the "Generator Data Form" which lists the minimum sizing for the generator and accessories. The Contractor shall fill in form with proposed values and include this form with the generator submittal.

B. The engine generator shall include a diesel engine, control and instrument panel, batteries, battery charger, brushless alternator, excitor, voltage regulator, generator main breaker, sub-base fuel tank, fuel pump radiator, blower fan, exhaust silencer, vibration isolator, weatherproof housing and accessories as stated herein.

C. The major areas in the scope of work include providing for and installation of complete standby power systems:

1. Standby Generator system. Coordinate location of generator breakers and control panel so they are installed facing the generator room double doors.

2. Sub-base fuel tank.

3. A 120-VAC powered battery charger mounted to the generator skid.

4. Steel reinforced concrete pad, adequately sized to support the diesel generator being supplied.

5. Intake/exhaust air sound attenuating system and ducts.

6. Fuel tank with fuel tank rupture containment basin.

7. Miscellaneous conduits, junction boxes, field interconnection wiring, and associated hardware.

8. Trenching, back filling, compaction, and paving of each underground conduit route and fuel line piping.

9. All piping associated with connecting fuel system.

10. All fuel transfer pumps associated with the fuel system.

D. The engine generator shall be provided as described in the following Specification.

E. All auxiliary apparatus and accessories shall be provided, at no additional cost to the Owner, as required for a fully functional engine generator.

F. The engine generator shall be delivered as a skid mounted unit, piped and wired for operation.

G. Provide the field installation, startup, testing and training for the engine generator and associated equipment as part of this scope of work.

H. All equipment shall be new, of current production by a U.S. firm which manufactures and/or assembles the components of the engine generator as a matched unit so that there is one-source responsibility for warranty, parts, and service through a manufacturer's local representative.

I. The manufacturer's local representative shall be an authorized distributor who maintains a stock of spare parts for the supplied engine generator and has a service facility with factory-trained service personnel. The manufacturer's local representative shall be located within a radius of 100 miles of the Owner.

J. The Contractor shall:

1. Thoroughly examine conditions before submitting his bid proposal to perform any work. He shall compare site conditions with data given on the Drawings and in these Specifications. No allowance shall be made for any additional costs incurred by the Contractor due to his failure to have examined the site or to have failed to report any discrepancies to the Owner.

2. Verify all measurements and conditions and shall be responsible for the correctness of same. No extra compensation will be allowed because of differences between work described in these specifications and measurements at the site.

3. Coordinate with the other trades the exact location for the engine generator, above ground fuel tank, etc. and routing of piping, cable and conduits.

K. The engine generator shall meet all local Bay Area Air Quality Management District (BAAQMD), 415 749-4900, and Environmental Protection Agency (EPA) requirements. Unit shall utilize and operate with Best Available Control Technology (BACT) guidelines 3-7. Provide all information, fill out forms (both Authority to Construct and Permit to Operate), and obtain approval from the BAAQMD.

L. The diesel engine and generator shall be as manufactured by one of the following combinations of engine and generator manufacturer:

	ENGINE	**GENERATOR**
1.	Caterpillar	Caterpillar
2.	Detroit Diesel	Kohler

3. Cummins Onan

4. Detroit Diesel MTU

M. Unit shall meet all current Local, State and Federal emission requirements at time of installation.

N. Install steel reinforced concrete pads, each adequately sized to support the diesel generator, and generator switchgear being supplied.

O. Coordinate with Electrical Contractor to provide and install larger lugs as required for power and control wires at no additional expense to Owner.

1.02 SPECIFICATIONS

A. The bidder shall examine carefully the specifications. 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 materials to be furnished, and as to the requirements of these specifications and the contract. After the signing of the Contract, no consideration will be given to any claims of misunderstanding of the work to be done, or of any provisions of the specifications and contract documents.

B. All equipment/options are to be factory installed. If the equipment/options are not available factory installed, dealer installed equipment/accessories may be acceptable. The Contractor is to specify those items which will be dealer installed in the submitted show drawing submittals.

C. Only new models in current production, that meet the requirements of these specifications and which are cataloged by the manufacturer and for which manufacturer's published literature and printed specifications are currently available, will be considered. Special options may be included only when recommended by the manufacturer of the unit approved by the Owner.

D. The Contractors price shall include tax, licenses, freight, delivery expenses, fuel, installation of all components and other miscellaneous charges.

1.03 QUALIFICATION

A. Bids will be considered only on equipment represented by a reliable California firm carrying an adequate supply of repair parts in the State.

B. The Supplier shall have represented both the engine and generator manufacturers for at least three years prior to the bid award.

C. By entering into this contract, the Contractor shall guarantee the availability of service for this standby power system by the Contractor during the warranty period.

1.04 SUBMITTALS

A. Submit shop documents and drawings for approval in accordance with this subsection and as specified in Section 16010. All non-relevant items not provided for on this project shall be crossed-off on all documents and drawings.

B. Submit a single data sheet summarizing the following, as well as all details and catalog cuts for:

1. Engine:

    a. Make and model

    b. Number of cylinders and cylinder arrangement

    c. Bore, Inches

    d. Stroke, Inches

    e. Compression ratio

    f. Piston displacement, Cubic Inches

    g. Piston speed, Feet per Minute, at rated RPM

    h. HP at rated KW output

    i. Rated RPM

    j. Number and type of bearings

    k. Fuel type and consumption at full load

    l. Cylinder head material

    m. Crankshaft material

    n. Valves material

    o. Governor type

    p. Block heaters – verify voltage and size to Contact Drawings

2. Generator:

    a. Make and type

    b. Generator full load electrical rating, KVA, KW, Voltage, Amperage, Hz, # of Phases, # of Wires, Power Factor

    c. Peak motor starting, KVA

    d. Number of leads

    e. Number and type of bearings

f. Voltage regulator type

g. Exciter type

h. Generator winding insulation class and temperature rise

i. Generator transient (x'd) and subtransient (x’d) reactance in per unit

j. Frequency regulation, %, from no-load to full load

k. Frequency regulation, %, at steady state full load

l. Ambient temperature range

m. Voltage regulation from no load to full load

3. Electrical:

a. Control and instrument panel

b. Batteries and battery charger

c. Standby system three-line diagrams which include the generator equipment.

d. Standby system interconnection diagrams for all generator wiring. Standard internal connection diagrams for each piece of equipment shall only be accepted when modified to indicate corresponding wire and cable numbers on drawings for external pieces of equipment.

4. Accessories:

a. Exhaust silencer, stack, and piping system. Wrap exhaust silencer as required by code

b. Fuel tank and piping system

c. Vibration isolation system

d. Water cooling system

e. Paint Finish.

C. Submit electrical schematics and wiring diagrams for:

1. Generator control panel

2. Battery charging system

3. Main generator

4. Voltage regulator

5. Governing system

6. Auxiliary electrical devices

7. Generator Main Breaker

8. Fuel system pipe heat trace or leak detection as required in other Divisions

D. Submit dimension drawings for:

1. Engine generator side, front, and top.

2. Generator skid construction and size, anchor details.

3. Fuel tank and containment basin. Design fuel exhaust system to meet local Codes.

4. Exhaust muffler and air intake baffle.

5. Conduit stub-up areas under generator frame, and fuel tank.

E. Submit reports, calculations, and curves in one three-ring binder for:

1. Engine horsepower curves. These curves shall show the manufacturer's approval of the engine rating for standby application per the specifications stated herein.

2. Engine generator fuel consumption curves.

3. The Contractor shall submit seismic calculations for the proposed construction of the bolt tie-down to concrete pad to anchor the engine generator, and fuel tank.

4. Calculations showing that the unit meets the specified noise and emission requirements.

5. Generator load report showing that the unit shall start the loads as specified in this section. Submit typed statement that the generator has been sized to operate the specified loads. Submit calculations and back-up to show the generator is properly sized.

6. Sound level data showing that the complete generator package meets the sound attenuating requirements stated herein.

7. Provide fuel tank pressure testing as required by the local jurisdiction.

F. Descriptive literature shall be provided that describes the engine generator and all accessories. This literature shall provide sufficient detail to determine that the engine generator has all the accessories, options, features, and characteristics specified herein. Items that are not provided shall be neatly lined out.

G. The Contractor shall include in writing as part of the submittal details any proposed departures from the design documents and the reasons therefore. Incorporate no such departures into the work without prior written approval of the Owner. The approval of departures which substantially deviate from the design documents shall be evidenced by a "change order" directive by the Owner. Any cost differential associated with this change order must be negotiated with the Owner to amend the scope of work to reflect the costs or savings.

H. A copy of this specification section, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check marks (✓) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated and, therefore, requested by the Contractor, each deviation shall be underlined and denoted by a unique number in the margin to the right of the identified paragraph. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the Specifications. The submittal shall be accompanied by a detailed, written justification for each numbered item explaining variance or non-compliance with specifications. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no review.

I. The Contractor shall note that the named generator equipment, if given, is considered acceptable, but in some cases additional design, options, or modifications may be required, at no additional cost to the Owner, to meet Specifications.

J. The decision of the Owner stipulates what is acceptable as an approved equal. If the Owner considers it necessary, tests to determine equality of the proposed substitution shall be made, at the Contractor's expense, by an unbiased laboratory satisfactory to the Owner. Equality will be judged on the basis of the following:

1. Conformance with description or performance required.

2. Equal in quality.

3. Comparable in operation and maintenance.

4. Equal in longevity and service under conditions of climate and usage for given application.

5. Conformance with space allocations.

6. Comparable in appearance and artistic effect.

7. Compatible with mechanical and electrical construction of related work without necessitating changes in detail.

K. No material or equipment shall be allowed to be delivered to the Owner until the submittal for such items has been reviewed by the Owner and approved.

L. Each submittal shall be bound in a three ring binder, which is sized such that when all material is inserted the binder is not over ¾ full. Binder construction shall allow easy removal of any page without complete manual disassembly; spiral ring type binders are not acceptable. Each binder shall be appropriately labeled on the outside with the project name, job number, equipment Contractor's name, specification section(s), and major material contained therein. An index shall be provided at the front of all sections which itemizes the contents of each tab and subtab section and lists the project name, job number and equipment's Contractor's name, address, phone number, and contact person. Drawings that are "C" or "D" size shall be folded with the title block visible and placed in clear plastic pockets. Faxed documents shall not be used in any manuals.

M. Submit complete and specific information with regard to equipment representatives and service facilities.

N. The generator manufacturer (representative is not acceptable) shall submit and provide the following letters in the manufacturer's letterhead prior to shipment of generator from the factory:

1. Letter certifying that the manufacturer has reviewed the connected loads power and certifies that the generator to be provided shall start the loads, in any combination or sequence, without generator voltage dropping below any of the connected equipment ratings.

2. Letter shall state that the generator to be supplied was verified to be compatible, without any adverse effects with other major equipment to be supplied for this project. This letter shall state the name and manufacturer of primary pumps, automatic transfer switch and motor control center and contain proof of verification of compatibility.

1.05 MEASUREMENT AND PAYMENT

A. The Contractor's bid shall include tax, licenses, freight, delivery expenses, fuel and other miscellaneous charges.

B. Payment shall be per the following schedule:

1. 80% upon delivery and inventory of major components of standby power system and fuel tank.

2. An additional 10% on approval of "operation and maintenance" manuals specified herein.

3. Balance of 10% upon final acceptance specified herein.

PART 2 - PRODUCTS

2.01 QUALITY

A. It is the intent of these design documents to secure an engine generator of the latest commercial design that has been prototype tested, factory built, production tested, site tested, as a total unit together with all accessories.

B. All materials, components, and parts supplied shall be highest grade, unused, new, and in current production.

C. Provide all of the features, options, and accessories specified herein.

D. All rotating parts shall be guarded against accidental contact.

E. Generator shall be rated for use with reduced voltage starters.

2.02 RATING

A. The engine generator shall have a minimum continuous standby rating as listed in Section 16210 Appendix "B". Standby rated shall means that generator starts within 60 seconds upon being called to operate at continuous uninterrupted operation for the total duration of a power outage. Rating of the engine generator shall be based on operation when equipped with all necessary operating accessories such as radiator, fan, air cleaners, lubricating oil pump, governor, exhaust silencer, etc.

B. The engine horsepower rating shall be a minimum HP/KW listed in Section 16210 Appendix "B".

C. No derating from the ratings specified shall occur for ambient temperatures below 122°F or installation elevation below 500 feet.

D. The engine generator will be installed at approximately 164 feet above sea level. The engine generator shall operate successfully at ambient temperatures between 20°F and 115°F.

E. The engine/generator shall accept 100% of the nameplate KW rating in one step, in compliance with NFPA 110, Paragraph 5-13.2.6.

F. The engine generator shall be capable of successfully providing three-phase, 60 hertz power to start and continuously run loads listed on Contract Drawings. The maximum step voltage dip shall be as listed in Appendix B, below rated voltage as measured line to line at the generator terminals, during start of pump.

2.03 ENGINE

A. The engine shall be an electronic ignition engine type, four cycle, with vertical inline or V-type cylinders, turbocharged with aftercooler.

1. The engine shall utilize only #2 diesel fuel.

2. Piston displacement shall be the minimum cubic inches listed in Section 16210 Appendix "B".

3. The engine shall be of direct injection design i.e., pre-combustion chambers shall not be incorporated in the cylinder heads. Glow plugs shall not be used for engine starting

4. The engine shall deliver the minimum HP listed in Section 16210 Appendix "B".

5. The engine shall have sufficient power to produce the specified ratings when operating with all accessories including exhaust, fuel, cooling, and battery charging systems, etc.

B. The engine shall be equipped with:

1. Engine driven or electric fuel transfer pump, fuel filters, electric fuel shutoff valve, flexible fuel line, and secondary fuel pressure regulator. The fuel transfer pump shall be capable of lifting the fuel from the above-ground fuel tank. The fuel filters shall be replaceable and conveniently located for servicing.

2. Electrical governor; consisting of a magnetic pickup speed sensor, adjustable electronic control, and an electrical actuator mounted integrally with the fuel pump. The governor shall provide automatic engine generator set frequency regulation adjustable from isochronous to 5% droop. Governors using external throttle linkages are not acceptable.

3. Positive engagement solenoid shift-starting VDC starter rated for amps cranking current as listed in Section 16210, Appendix "B".

4. Battery charging alternator with a minimum ampere output as listed in Section 16210 Appendix "B".

5. Positive displacement, full pressure lubrication oil pump, cartridge oil filters, dipstick, and oil drain. The oil pump shall be capable of supplying adequate lubricating oil under pressure to the main bearings, crankshaft bearings, pistons, piston pins, timing gears, camshaft bearings, and valve rocker mechanism. The cartridge oil filters shall be full flow type, conveniently located for servicing. Filters shall be equipped with a spring loaded bypass valve to insure oil circulation if filters are clogged. Provide isolation valve and piping to exterior of generator frame for oil change maintenance.

6. Dry type replaceable air cleaner elements. The dry-type air cleaner shall be equipped with a self-cleaning dust and water evacuator and a vacuum restriction gauge to indicate maximum allowable restriction of the air cleaner system according to the engine manufacturer's recommendations. The air cleaner elements shall be conveniently located for servicing.

7. Unit mounted radiator, water pump, and thermostat. The engine cooling system shall be filled with a solution of 50/50 ethylene glycol/water antifreeze or equivalent as recommended by the manufacturer. Provide expansion tank in clear view from outside generator enclosure maintenance door.

8. Removable type cylinder liners.

9. Replaceable insert main bearings.

10. Block heater sizing and voltage, listed in Section 16210 Appendix "B" for "hot" start of engine. If Generator supplier provides block heater other than that listed, Contractor shall provide any and all other equipment necessary (i.e. transformer, additional conduit with wiring, circuit breakers, etc.) to meet specifications at no additional cost to Owner.

2.04 GENERATOR

A. The generator alternator shall be brushless, with skewed stator with 2/3 pitch windings and amortisseur rotor windings skewed for smooth voltage waveform. The generator shall have the following features:

1. Self-ventilated cooling.

2. Drip-proof housing construction.

3. 130° C alternator temperature rating.

4. Voltage regulation under load from no load to full load within +/- 0.5%.

5. Random voltage variation for constant loads, from no load to 100% load shall not exceed +/-0.5% of its mean value.

6. Frequency variation shall be isochronous under varying loads from no load to 100% load.

7. Random frequency variation shall not exceed +/- 0.25% of its mean value from no load to full load.

8. The insulation material shall meet the NEMA standard (MG1-22.40 and 16.40) for class H and be vacuum impregnated with epoxy varnish to be fungus resistant per MIL I-24092.

9. The excitation system shall be of brushless construction controlled by a solid state voltage regulator with adjustable volts-per-hertz operation capable of maintaining voltage within +/- 2% at any constant load from 0 to 100% of rating. The regulator shall be sealed from the environment and isolated from the load to prevent tracking when connected to SCR (Soft Starter) or Diode (VFD) loads.

10. Semi-flexible disc direct coupling to engine flywheel.

11. Maintenance free bearings.

12. Radio interference suppression to meet the BS.800 and VDE Class G and N standards.

13. Telephone interference factor of less than 50 per NEMA MG1-22.43.

14. AC voltage waveform total harmonic distortion of less than 5% total from no load to full load. Any individual harmonic shall have less than 3% THD.

B. On starting each listed load, by method shown on Contract Drawings, the instantaneous voltage dip shall not exceed equipment ratings and shall recover to +/- 2% of rated voltage within one second.

C. The generator shall be capable of sustaining at least 250% of rated current for at least 10 seconds under a 3 phase symmetrical short by inherent design or by the addition of an optional current boost system.

D. The generator shall be capable of providing a minimum of KVA for motor starting and KW for continuous operation as listed in Section 16210 Appendix "B".

2.05 CONTROLLER AND INSTRUMENT PANEL

A. Provide a generator-set mounted controller and instrument panel installed. The panel mounting shall be vibration isolated from the rest of the engine / generator set.

B. The controller unit shall be of all solid state construction, except for relays used as alarm followers to provided dry contacts or in switching high current circuits. The controller shall utilize a microprocessor for logic control. All printed circuit boards shall be conformably coated and moisture proof. Circuitry shall be of plug-in design for quick replacement. The controller shall be equipped to accept a plug-in device capable of allowing maintenance personnel to test controller performance without operating the engine. The controller shall be capable of operation from –40° C to 85° C.

C. The controller shall include:

1. Fused DC control circuits.

2. Complete two-wire start/stop control which shall operate on closure of a contact from a remotely located automatic transfer switch.

3. Engine starter control for:

a. Speed sensing and a second independent starter motor disengagement systems to protect against the starter engaging with a moving flywheel. Battery charging alternator voltage will not be acceptable for this purpose.

b. Starting system designed for restarting in event of a false engine start, by permitting the engine to completely stop rotating before reengaging the starter.

c. Cranking cycler with 15 second ON and OFF cranking periods or as recommended by the manufacturer. Cranking shall cease upon engine starting and running. Two means of cranking termination shall be provided, on as a backup to the other. Failure to start after three cranking cycles shall shut down and lockout the engine, and visually indicate an over-crank shutdown on the indicator panel. Over-crank protection designed to open the cranking circuit after 75 seconds if the engine fails to start or as recommended by the manufacturer.

4. Circuitry and sensing devices for emergency shutdown of the engine on any occurrence of the following conditions:

a. High coolant temperature.

b. Low oil pressure.

c. Over speed.

d. Over-crank.

e. Low coolant level.

f. Remote manual stop station.

g. Shutdown shall be initially inhibited for a time delay period as necessary to allow the engine start for shutdown conditions 1, 2, and 5 or as recommended by the manufacturer.

5. Remote Monitoring:

a. A dry contact, normally open, which closes when the generator is running shall be provided and brought out to terminals for remote from the unit status monitoring.

b. A dry contact, normally closed, which opens on generator fail shall be provided and brought out to terminals for remote from the unit status monitoring.

c. A dry contact, normally open, which closes when there is low fuel in the fuel tank shall be provided and brought out to terminals for remote from the unit status monitoring.

6. Engine cool down timer factory set at five (5) minutes to permit unloaded running of the generator set after transfer of the load to normal.

7. Three position (RUN-STOP-REMOTE) selector switch with two complete sets of spare normally open contacts for the "RUN" and "REMOTE" positions. In the RUN position the engine shall start and run regardless of the position of the remote starting contact. In the REMOTE position, the engine shall start when contacts in the remote control circuit close and stop five minutes after those contacts open. In the STOP position the engine shall not start even though the remote start contact closes. This position shall also provide for immediate engine shutdown in case of emergency. Reset of any fault lamp shall also be accomplished by putting the switch to the off position.

8. Emergency Stop maintained pushbutton located at maximum 5 feet above grade.

D. The instrument panel shall meet NFPA-110 Controller Accessories Requirements and shall include the following (digital display may be provided in place of analog instruments) Units shall read in US units (degree F, PSI, etc.):

1. Indicating lights to signal:

a. System ready indication (green)

b. Pre-warning for low oil pressure (yellow)

c. Pre-warning for high coolant temperature (yellow)

d. Low oil pressure shutdown (red)

e. High coolant temperature shutdown (red)

f. Over-crank shutdown (red)

g. Over-speed shutdown (red)

h. RUN-STOP-REMOTE switch in STOP position indication (flashing red)

i. Low coolant temperature (yellow)

j. Low battery voltage (red)

k. Low fuel tank level (red)

l. Alarms lights shall latch-in on occurrence of an alarm until manually reset by an operator. A test button shall be provided for testing the operation of all the lights listed above. A follower dry contact

(normally open which closes on an abnormal condition) shall be provided and brought out to terminals for remote from the unit status indication of a common trouble alarm which is activated on the occurrence of any alarm.

2. Alarm horn. A silencer switch shall be provided which allows/prevents the horn from sounding on alarms.

3. Voltmeter, 3½-inch, +/- 2% full scale accuracy.

4. Ammeter, 3½-inch, +/- 2% full scale accuracy.

5. Means to indicate whether dual range meters are on high or low scales.

6. Voltmeter/ammeter phase selector switch.

7. Direct reading pointer-type frequency meter, 3½-inch, +/- 2% full scale accuracy, 45 to 65 Hz scale.

8. Coolant temperature gauge, 2-inch DC meter, +/- 2% full scale accuracy.

9. Oil pressure gauge, 2-inch DC meter, +/- 2% full scale accuracy.

10. Battery voltage gauge, 2-inch DC meter, +/- 2% full scale accuracy.

11. Engine running time meter.

12. Voltage adjust rheostat, +/- 5% range.

13. Panel light shall be provided to illuminate all gauges, meters, and controls on the instrument panel. Graphical display (with 9 lines of data) in place of gauges and meters is acceptable.

2.06 ACCESSORIES

A. The following engine generator accessories shall be provided and installed:

1. Exhaust Silencers: Critical type silencers including flexible stainless steel exhaust piping and fittings properly sized and installed according to the manufacturer's recommendation. The silencer shall be coated with a high temperature aluminum carbo-zinc #11 coating system for temperature and rust resistance. Gasproof, seamless, stainless steel, flexible exhaust connector(s) ending in pipe thread or SAE flange shall be used. Silencers shall be Maxim M41-10, or approved equal. Support for exhaust silencer is not to be carried by the exhaust manifold.

2. Exhaust Stack Pipe

   a. Description

      1) The system will be comprised of a flexible coupling at turbocharger, piping to connect flexible coupling to silencers, piping to carry gases through a rain cap. The silencer, stack, and exhaust piping shall be sized to insure that measured exhaust back pressure does not exceed the manufacturer's minimum or maximum limitation.

   b. Materials:

      1) Contractor to furnish black steel extra strong weight discharge pipe conforming to ASTM A53 grade A or ASTM A120 for engine exhaust system.

      2) Flexible metal connections for junctions between turbocharger, piping and silencer. Spring loaded galvanized rain cap at end of exhaust pipe.

   c. Rain cap shall be stainless steel with adjustable counter weights.

   d. Indoor units shall have exhaust system insulated as follows:

      1) The exhaust piping shall be covered with a 0.029-inch thick aluminum shield, secured to the insulation with stainless steel "Expando Bands" or an approved equal, spaced at 12 inches on centers, maximum.

      2) Insulation on bends and fittings shall be covered with 0.093-inch thick shield.

      3) Flexible joints shall be left exposed.

3. Screenings – Provide screenings on intake and exhaust system to prevent rodent intrusion into generator. Generator supplier is responsible for examining all Contract drawings for falling debris prior to submitting on vertical intake or exhaust systems.

4. Fuel tank piping shall vent outdoors 12 feet (minimum) above grade, 5 feet (minimum) away from property line and 2 feet away from building opening to meet Code.

5. Vibration isolation dampeners between the engine-generator and steel mounting skid. The engine-generator isolation shall be steel compression spring-type; seismic rated with earthquake restraints in both lateral and vertical directions. In addition, snubbers shall limit and cushion extreme excursions due to shocks encountered when the engine-generator is in transit. These snubbers may be in separate devices. Built-in dampeners are acceptable.

6. Batteries: Battery rack with tie down clamps, battery cables, and volt batteries all mounted to the engine/generator skid. The batteries shall be capable of delivering the cold-cranking amps required at zero degrees Fahrenheit per SAE Standard J-537. The batteries shall be sized to provide a minimum of cold-cranking amps at VDC listed in Section 16210 Appendix "B".

7. Battery Charger: A current limiting minimum ampere, at VDC as listed in Section 16210 Appendix "B", completely solid state battery charger to automatically recharge the starting batteries. The charger shall be a float and equalize type. The complete charger unit shall be U.L. listed. The charger shall be a stand-alone unit to be located within the engine/generator housing. The charger shall be operational through an ambient temperature range of –40°F to 140°F. It shall include the following features:

   a. Fused AC input and DC output overload and short circuit protection.

   b. DC ammeter and voltmeter, 5% full scale accuracy, to indicate battery charging rate.

   c. "Power on" lamp to indicate when the charger is powered.

   d. Reverse polarity protection to prevent the charger from operating if improperly connected.

   e. Charger circuitry protection from line or load voltage transients.

   f. Charger temperature compensation. The charger shall provide temperature compensation of -2 mv/°C per cell over the ambient temperature of –40°C up to 60°C. This shall automatically adjust the "float" and "equalize" voltage settings to prevent the batteries from overcharging at high temperature and under charging at low ambient temperatures.

   g. DC voltage regulation +/- 1% from no load to full load and over AC input line variations of +/- 10%.

   h. Automatic "high rate" constant current charge circuit with automatic switchover to a lower "equalize" constant voltage charging rate and finally to a "float" charging rate. When the batteries have lost charge and AC power is applied to the charger input, the charger shall operate in the "high rate" constant current mode until the batteries voltage rises to the preset "equalize" level. At the preset "equalize" level, the charger shall switch to the "equalize" constant voltage mode until the current required to maintain this voltage drops to 50% of the charger's high rate current. The charger shall now switch to the lower constant voltage "float" mode (fully charged batteries). The charger shall continue to operate in this mode until AC input

power is lost or the current required to maintain the batteries at float voltage setting exceeds a preset amperage.

i. Current limiting circuitry shall be provided to prevent damage to the charger from being overloaded at low battery voltage such as occurs during short circuit conditions or during engine starter cranking.

j. Low battery voltage contact connected to the instrument panel light.

k. Provide "Battery Charge Fail" dry contact to be connected to PLC.

l. The battery charger shall be powered from 120 VAC.

8. Dimensions and foot prints of generator shown on Contract Drawings were developed based on best available information. It is the Contractor's responsibility to obtain site plans (including building accesses if necessary) of the location for each generator to ensure the supplied generator is appropriate for the location. Contractor is responsible for providing adequate generator pad and any associated installation costs regardless of the footprint of the supplied generators.

9. A resettable line current sensing safeguard circuit breaker with inverse time versus current response shall be provided mounted to the engine/generator unit. This breaker shall have adjustable long time, short time, instantaneous and ground fault settings to allow selective tripping of downstream fuses or circuit breakers under a fault condition. This breaker shall protect the generator from damage that could occur due to the generator's own high current capability. This breaker shall not automatically reset preventing restoration of voltage if maintenance is being performed. Provide ground fault sensor on the generator neutral and indicate warning. The breaker size shall be three-pole with interrupt KAIC and amps rating (maximum size listed in Section 16210 Appendix "B") to match the rating of the wiring and automatic transfer switch.

10. Sub-base Fuel Tank:

a. Fuel tanks shall be sized with a minimum capacity of gallons listed in Appendix "B".

b. Fuel tank shall be provided with the following features:

1) Steel double contained. Containment chamber shall be sized to hold the primary tank fuel capacity in event of a leak

2) Emergency vent as required by NFPA 30.

3) Lockable fill cap.

4) 3" diameter mechanical fuel tank level gauge – marked at 85% percent of tank capacity.

5) Leak, Low and high fuel level switches, explosion proof. All switches shall be wired to Generator Control Panel for alarming.

6) Fuel oil supply and return connections with shutoff valves.

7) Tank shall be furnished with Zone 4 seismic restraints. Contractor shall furnish calculations as specified herein.

8) U.L. listed overfill/spill container having a capacity of not less than 5 gallons shall be provided for the tank fill connection. Spill container shall be noncombustible and shall be fixed to the tank and equipped with a manual drain valve that drains into the primary tank.

c. Provide fuel venting system as required by NFPA 30. Fuel tank piping shall vent outdoors 12 feet (minimum) above grade, 5 feet (minimum) away from property line and 2 feet away from building opening to meet Code.

d. The fuel tank shall not be filled in excess of 90 percent of its capacity. An overfill prevention system shall be provided for the tank. During tank filling operation, the system shall:

1) Provide an independent means of notifying the person filling the tank that the fluid level has reached 85 percent of tank capacity by providing a tank level gage marked at 85 percent of tank capacity.

2) Visual and audible operator notification when the quantity of liquid in the tank reaches 90 percent of tank capacity by high level switch.

3) Automatically shut off the flow of fuel to the tank when the quantity of liquid in the tank reaches 90 percent of tank capacity. For rigid hose fuel-delivery systems, an approved means shall be provided to empty the fill hose into the tank after the automatic shutoff device is activated.

e. A permanent sign shall be provided at the fill point for the tank documenting the filling procedure and the tank calibration chart. The filling procedure shall require the person filling the tank to determine the gallonage required to fill it to 90 percent of capacity before commencing the fill operation.

f. Fuel tank shall have visible hazard identification sign and placard identifying the material in the tank in compliance with NFPA 704.

11. Screenings – Provide screenings on intake and exhaust system to prevent rodent intrusion into generator. Generator supplier is responsible for examining all Contract drawings for falling debris prior to submitting on vertical intake or exhaust systems.

PART 3 - EXECUTION

3.01 GENERAL

A. The engine generator shall not be delivered to the job site until the certified factory test report as specified under testing has been reviewed and accepted by the Owner. Missing or non-reviewed certified factory test report shall be sufficient cause for the unit to be rejected.

B. The Owner reserves the right at any time to reject any equipment that is not in conformance with design specifications.

C. Rejected equipment shall be immediately removed from the delivery jobsite by the Contractor.

3.02 CONSTRUCTION METHODS

A. The construction methods specified herein shall be followed by the manufacturer of the engine generator. If the manufacturer fails to comply then the Contractor shall pay all costs required to make the changes to the equipment to conform with these construction methods.

B. Screw type solderless terminals or lugs shall be provided for connecting all external line and load power cables, control and instrument wiring. All connections shall be accessible from the front without removal of internal components.

C. A terminal strip shall be provided for terminating all control and instrument wiring. Number all terminals with machine printed lettering matching the wire number of the terminated wire.

D. All control and instrument wiring shall have permanent identification at each point of connection. Wire identification shall be by machine printed numbered wiring sleeves. Electrically common wires shall have the same wire number. Electrically different wiring shall have unique wire numbers.

E. Control and instrument wiring shall be neatly bundled and secured in place by plastic cable ties. Wiring shall be protected with plastic spiral wrap where it is subject to mechanical damage or crosses over to a hinged door.

F. Each instrument panel mounted device shall be identified with engraved 2-color black Bakelite nameplates. The legends shall clearly identify each device function, avoiding the use of abbreviations. All nameplates shall be secured with stainless steel screws.

G. Workmanship: The equipment and any accessories shall be a product of good workmanship and shall be free from any defects that will affect their appearance or serviceability.

3.03 FACTORY INSPECTION AND TESTS

A. Factory Inspection: Prior to delivery to the Owner, the Contractor shall notify and give the Owner the opportunity to inspect and witness factory test of the completed engine generator assembly at the supplier's location. A written notice shall be given

to the Owner 7 days prior to the date for the factory test. Owner costs to attend factory inspection and test will be paid by the Owner, if the Owner elects to attend. The engine generator shall not be shipped from the supplier to the Owner without acceptance of factory test report and written authorization from the Owner.

B. Factory Tests: The engine generator to be supplied shall be tested by the manufacturer prior to shipment. All tests shall be made with all accessories installed. The factory tests shall be made under varying loads for a minimum of four hours total. The factory testing shall include the following tests:

1. Single step load pickup.

2. Transient and steady state governing.

3. Safety shutdown device testing.

4. Voltage regulation.

5. Rated power.

6. Maximum power.

C. A public notary certified typewritten factory test report shall be provided which lists the factory tests performed, results of the each test, name and phone number of person who performed the tests, date(s) of when tests were performed, serial and part number of equipment tested, all adjustment or setting values, and failures encountered and repairs made during testing. The factory test report shall be submitted to the Owner for review and approval prior to shipment of any equipment. A Factory Generator Test Report as shown on sheet TFG1 in Section 16210 Appendix "A" shall be completed by Contractor and submitted to the Owner for review and approval prior to shipment of any generator equipment.

3.04 INSTALLATION

A. Battery Mounting: Mount batteries on steel battery rack attached to generator skid in a clean, dry location protected from falling hazards, but accessible to permit ease of inspection of electrolyte level. Provide and install a 2-pole padlockable-knife or keyed switch adjacent to batteries that will disconnect both the positive and negative leads of the batteries that feed all the generator circuits.

B. Install condensation drain in exhaust piping and weather hood at end of exhaust for each engine generator.

C. Equip all fuel lines with manual and automatic shutoff valves.

D. Base: Mount engine, generator and radiator on a common structural steel sub-base capable of maintaining unit alignment suitable for mounting unit on a concrete foundation. Equip with vibration isolators between generator set and sub-base.

E. Mount generator breaker, battery charger, batteries, heater and control panel to generator set unit.

F. Ground generator neutral to ground per generator manufacturer's instructions.

3.05 FIELD TESTS

A. The Contractor shall take all precautions necessary to ensure the safety of all personnel during the tests. Absolutely no tests shall be run that could potentially cause injury or jeopardize personnel safety.

B. Submit test procedures per Section 16010 "Electrical" for approval two (2) weeks (minimum) prior to start of field tests.

C. Fuel System Testing prior to being placed in service – Fuel tank and associated piping shall be field tested prior to being placed in service if required by local jurisdiction or code. Provide Initial Testing and Tightness Testing per NFPA 30.

D. The initial setup of the engine generator shall be performed by a factory-trained service person of the manufacturer's local representative. The factory-trained service person shall furnish and fill the engine fuel, lubricants, and cooling system. The factory-trained service person shall make all preliminary tests and checks required before engine start-up the day prior to witness field testing.

E. The Contractor shall be responsible and pay the costs for the necessary fuel to fill each diesel generator tank prior to the start of the field tests. This fuel shall be No. 2. Diesel fuel with a fuel conditioner, FirePrep 1000 (available from Pacific Detroit Diesel Allison Inc.) or as recommended by the manufacturer. Contractor shall fill each generator fuel tank after all tests have been accepted at no additional cost to the Owner. Contractor shall fill all fuel tanks prior to final acceptance.

F. The Contractor shall pay for a factory-trained service representative to perform one (1) 8-hour day of field tests, beginning at 8:00 a.m. any weekday, except Monday or Friday.

G. Each failure mode, alarm, and control function shall be demonstrated by the Contractor's factory-trained service representative prior to performing any other field load tests.

H. The Contractor shall fill the fuel tank to capacity prior to start of field tests and prior to final acceptance.

I. The following Generator Field Checklist shall be filled out by the generator manufacturer and given to the Owner at the end of the field tests.

J. Each item on the Generator Field Test Checklist sheet shall be marked with a check (√) or "N/A" (not-applicable).

CHECKLIST

The Following (minimum) Installation Checks Must Be Made by Service Representative Before Start-Up in addition to those recommended by Generator Manufacturer:

NOTE

This form is to be used as a general guide, follow the manual supplied with generator along with reference to any applicable codes or standards. Ultimate compliance must be with applicable generator manual and codes and standards.

___ 1. Equipment installed in dedicated room?

___ 2. Battery-powered emergency lighting installed in equipment room?

___ 3. Adequate clearance on all sides to allow ease of maintenance?

___ 4. Proper construction and leveling of mounting bases?

___ 5. Adequate heating for equipment room?

___ 6. Adequate incoming and outgoing air (louver motors adjusted and of proper voltage)?

___ 7. Radiator duct flange properly sized and connected?

___ 8. Cooling system properly filled?

___ 9. Proper level of specified oil in crankcase?

___ 10. Adequate/dedicated fuel supply?

___ 11. Flexible sections installed in cooling water lines?

___ 12. Manually-operable fuel and cooling water valves installed, allowing manual operation of, or bypass of solenoid valves, when used?

___ 13. Flexible fuel lines installed between engine and fuel piping?

___ 14. Fuel tanks and piping installed in accordance with applicable codes and standards?

___ 15. Adequate fuel transfer tank pump lift and pump motor properly wired?

___ 16. Proper size exhaust line and flexible connector(s)? Flexible connector(s) should not be bent.

___ 17. Exhaust line condensate trap with drain installed?

___ 18. Exhaust line installed with proper downward outgoing incline?

___ 19. Proper-specified muffler installed with hangers and mounts tight?

___ 20. Exhaust line free of excessive bends and restrictions? Back pressure under specified limit?

___ 21. Exhaust line protected from entry by rain, snow, and animals?

___ 22. Approved heat-isolating thimble(s) installed at points where exhaust line passes through combustible wall(s) or partition(s)?

___ 23. Exhaust system termination located to prevent entry of exhaust gases into structures?

___ 24. Battery(ies) of proper size and voltage?

___ 25. Battery(ies) filled with electrolyte and properly connected to charger?

___ 26. Battery charger AC circuit properly connected and charger operational?

___ 27. Battery(ies) properly mounted with adequate ventilation?

___ 28. Starting cables of proper length and gauge?

___ 29. Battery isolation disconnect knife switch installed?

___ 30. Starting cables properly connected to battery(ies)?

___ 31. Generator load conductors of proper ampacity, and properly connected to circuit breakers, and/or emergency side of transfer switch?

___ 32. Load conductors, engine start leads, battery and heater power source leads installed in separate conduits?

___ 33. Nameplate voltage and frequency of both generator set and transfer switch matching normal/utility source ratings?

___ 34. Transfer switch AC conductors properly connected (Normal to NL1, NL2, NL3; Emergency to EL1, EL2, EL3; Load to LL1, LL2, LL3)?

___ 35. Transfer switch switching mechanism free from binding? NOTE: Disconnect all AC sources, and operate manually to check.

___ 36. All other wiring, including customer added options, connected properly?

___ 37. Equipment room clean with all material not related to Generator Supply System operation removed?

___ 38. Earthquake rated anchoring adequate for equipment and support systems?

Tested by: _____ Witnessed by: _____

Date of Test: _____

K. Each engine generator shall be tested with load bank supplied by Generator supplier under full load for four (4) continuous hours. The factory-trained service person shall be responsible for running the engine generator during these load tests. Any defects or failures discovered during these tests shall be corrected or adjusted by the factory-trained service person. The engine generator load test shall be restarted after each repair or adjustment that required shutdown of the engine generator as many times as necessary until the complete engine generator runs under full load without shutdown or failure for four (4) continuous hours.

1. Portable load bank shall be set-up the day before the start of the generator load bank testing.

2. A resistive load shall be applied for the full-load test. The load bank is to provide a load equal to 100 percent of the generator nameplate kW. Unity power factor is acceptable for on-site testing, provided that rated load tests at rated power factor have been performed by the manufacturer of the generator at factory test prior to shipment.

3. The full-load test shall be initiated immediately upon reaching rated rpm, pick up percent of nameplate kW rating on one step, less applicable derating factors for site conditions.

4. Record the data listed on Field Generator Report Test Form TFG2 in Section 16210 Appendix "A" at first load acceptance and every 15 minutes thereafter until the completion of the four hour test period.

3.06 TRAINING

A. The local representative's factory-trained service person shall instruct the Owner's personnel in the proper operating and maintenance procedures for all components of the engine generator. This instruction shall be given for a minimum length of six (6) hours and on a date acceptable to the Owner's schedule. Two hours of the training shall cover "operation" and four hours of the training shall cover "maintenance". Training shall not be given until the Owner has received and approved the operation and maintenance manuals and field generator tests have been completed.

3.07 SPARE PARTS

A. The Contractor shall supply sufficient spare parts to support the engine generator throughout the warranty period.

B. The following spare parts shall be provided to the Owner for each generator:

1. 12 each of each type and size of fuse.

2. 24 spare lamps for each type.

C. Spare parts shall be packaged for safe shipping and storage and clearly labeled on the outside with part name and number.

3.08 OPERATION AND MAINTENANCE MANUALS

A. Prior to the delivery of the equipment, the Contractor shall submit six (6) sets of "operation and maintenance" (O & M) manuals for approval. O&M manuals shall be per this subsection.

B. At least one of these sets of O & M manuals shall be made up of "original" (no copies or reproductions) documents.

C. Manufacturers' or Contractors' standard brochures or manuals shall be edited to reflect only that model or series of equipment installed on this project, including any modifications. All extraneous material shall be crossed out or otherwise removed in a manner acceptable to the Owner. All text, tables, graphs, and drawings shall be clear and legible. Black and white copies of color originals are not acceptable. Color originals or true color copies of these originals shall be provided in each set.

D. All information required herein shall be provided even though it may be considered proprietary. If any of the information herein is considered proprietary, the Owner will enter into a proprietary agreement with the Contractor. This agreement will stipulate that all such information will be kept confidential by the Owner and the Owner will use the information only for its internal use and will not reproduce any proprietary information for distribution.

E. O & M manuals shall contain the following:

1. All submittal documentation required under this section with all corrections and changes made to reflect final as-built conditions.

2. Operation, maintenance, troubleshooting, instruction, calibration, user, and other manuals available for "equipment" from the manufacturer. Subtab and index the different manuals for easy location.

3. These manuals shall include or be amended to include the following:

   a. An itemized list of all data provided.

   b. Name and location of the manufacturer, the manufacturer's nearest distributor and spare parts warehouse.

   c. Recommended installation, adjustment, modes of operation, startup, calibration, and troubleshooting procedures.

   d. Warnings and cautions to prevent equipment damage and to insure personnel safety.

   e. Complete internal wiring, component layout, connection, and schematic diagrams. All "proprietary" diagrams shall be included.

f. Complete parts lists, by generic title and identification number, cross-referenced to component layout diagram.

g. Disassembly and assembly instructions.

h. Recommended preventive maintenance procedures and schedule.

i. Recommended lubrication and an estimated quantity for a year duration.

j. Recommended spare parts list, including the unit price of each. The Contractor shall provide an availability policy listing the location of where spare parts are stocked and the delivery time for each of the recommended spare parts.

k. All test data and test forms completed for this project.

F. Electronic PDF version of O&M manual. Version format shall follow the hard copy submittal of the O&M, including index, equipment record sheet, warranty information, theory of operation, maintenance instruction, etc. PDF shall "bookmarked" to at each index and subtab listed in O&M.

1. These files shall be the property of the Owner, for its use on this and future projects.

2. Label drives with site name using clear plastic with black machine printed lettering as produced by a KROY or similar machine. The size of the nameplate tape shall be with 3/8-inch lettering unless otherwise approved by the Engineer. Securely fasten nameplates in place on the USB drive using the adhesion of the tape.

3.09 WARRANTY

A. The Contractor shall have a staff of experienced personnel available to provide service on two (2) working days' notice during the warranty period. Such personnel shall be capable of fully testing and diagnosing the equipment delivered; and of implementing corrective measures.

B. If the Contractor fails to respond in two (2) working days, the Owner at its option will proceed to have the warranty work completed by other resources; the total cost for these other resources shall be reimbursed in full by the Contractor. The use of other resources, as stated above, shall not change or relieve the Contractor from fulfilling the remainder of the warranty requirements.

C. Prior to final acceptance, the Contractor shall furnish to the Owner a listing of warranty information for all manufacturers of materials and equipment supplied under the scope of work covered in these design documents. The listing shall include the following:

1. Manufacturer's name, service contact person, phone number, and address.

2. Material and equipment description, equipment number, part number, serial number, and model number.

3. Warranty expiration date.

D. Hardware Support:

1. The Contractor shall warrant all equipment for a period of one (1) year from date of final acceptance. Standard published warranties of equipment which exceed the preceding specified length of time shall be honored by the manufacturer.

2. The Contractor shall provide all labor and material to replace or repair any hardware that fails during the warranty period, at no additional cost to the Owner.

3. Free technical phone support on equipment for a period of one year. Support shall be provided directly from the manufacturer. Phone support shall be available between 8 a.m. and 5 p.m. California time, Monday through Friday.

E. Each time the Contractor's repair person responds to a system malfunction during the warranty period, he or she must contact the designated Owner maintenance supervisor for scheduling of the work, access to the jobsite, and permission to make repairs. Operation of facilities necessary to test equipment shall only be performed by or under the direction Owner staff. The Owner reserves the right at its sole discretion to deny operations requested by the Contractor.

3.10 FINAL ACCEPTANCE

A. Final acceptance will be given by the Owner after the equipment has been field tested satisfactorily, each deficiency has been corrected, documentation has been provided, and all the requirements of this Specification Section have been fulfilled.

B. At the end of the project, following the completion of the field tests, and prior to final acceptance, the Contractor shall provide the following to the Owner:

1. Each "operation and maintenance" manual shall be modified or supplemented by the Contractor to reflect all field changes and as-built conditions. Reports of the factory and field tests are to be inserted into O&M manuals by Contractor.

2. Manufacturer’s field representative shall furnish a letter of compliance for the engine generator stating that the generator:

a. Has been properly installed and lubricated.

b. Is in accurate alignment and all leaks fixed.

c. Has been operated satisfactorily under full-load conditions and all tests have been completed.

d. Personnel trained in all operations.

e. Electrical system is completely corrected and properly functioning.

f. Ready for Owner's usage as a standby generator.

g. Generator unit cleaned, touchup painted, and two sets of keys for all locks turned over to Owner.

h. Punch list items have been corrected.

SECTION 16210

APPENDIX "A"

GENERATOR TEST FORMS

Index:

FACTORY GENERATOR TEST REPORT

TEST FORM 1 (TFG1)

JOB # _____	ENG MODEL: _____ S/N: _____
SERIAL# _____	GEN MODEL: _____ S/N: _____
MODEL # _____	VOLT REG MODEL: _____ S/N: _____
KW: _____ KVA: _____ Hz: _____	ELECT GOV CONT P/N: _____ S/N: _____
VOLTS: _____ PH: _____	ELECT GOV ACT P/N: _____ S/N: _____
AC CONNECT: _____	CONTROL MODULE/SPEED SWITCH #: _____

PRELOAD CHECKS

		CKD	N/A	
____ CRANK CUT-OUT				
____ OVERSPEED SET 67HZ	___ LIGHT	___	___	GENERATOR RUN LIGHT
____ HI WATER TEMP SHUTDOWN	___ LIGHT	___	___	PANEL LIGHT
____ LO OIL PRESSURE SHUTDOWN	___ LIGHT	___	___	LAMP TEST SWITCH
OIL PRESSURE SHUTDOWN DELAY @ ____ SEC		___	___	ALARM HORN & SILENCE SW.
CRANK @ ___ CYCLES ON ___ SEC, OFF ___ SEC		___	___	SWITCH NOT IN AUTO LIGHT
MAG P/U VOLTS: _____ DC VOLTS: _____		___	___	EMERGENCY STOP PB
VOLTAGE CHECKS		___	___	PRE LOW OIL PRESSURE LIGHT
L1 TO L2: _____	L1 TO N: _____	___	___	PRE HIGH WATER TEMP LIGHT
L2 TO L3: _____	L2 TO N: _____	___	___	LOW COOLANT LEVEL CONTACT
L3 TO L1: _____	L3 TO N: _____	___	___	LOW FUEL LEVEL CONTACT
VOLT ADJUST MIN @ _____	MAX @ _____	___	___	TACH CALIBRATE
		___	___	BLOCK HEATER
1 STEP LOAD PICK-UP _____ AMPS @ ____ PF		___	___	REMOTE START CONTACTS
		___	___	LOW COOLANT TEMP

LOAD TEST @ 1.0 POWER FACTOR

TIME HRS	% LOAD	VOLTS ø B	AMPS ø B	HZ	KW	AMB °F	WATER °F	OIL PSI	ENGR HRS
WARM UP	0								
0.1	25								
0.1	50								
0.2	75								
0.2	100								
0.2	100								
0.2	MAX								

COMMENTS:

TESTED BY : _____ PHONE: _____ DATE : ____/____/____

CERTIFIED BY : _____ PHONE: _____ DATE : ____/____/____

FIELD GENERATOR TEST REPORT

TEST FORM 2 (TFG2)

JOB NAME: CUSTOMER:

SITE ADDRESS: ADDRESS:

CITY, STATE ZIP: CITY, STATE ZIP:

GENERATOR MODEL: SPEC: GENERATOR SERIAL NO.:

ENGINE MAKE: MODEL: ENGINE SERIAL NO:

KW/KVA RATING: VOLTS: Hz: PHASE: WIRE:

COLD START TEST

START TIME	TIME			OPERATING SPEED VOLT.			OVERSHOOT VOLT.			OVERSHOOT FREQ.
	DELAY START	CRANKING	FULL SPEED	L1	L2	L3	L1	L2	L3	HZ

STEADY STATE TEST

TIME	VOLTAGE			AMPS				KILOWATTS, CYCLES PRESSURE					TEMPERATURE			BATT.
	L1	L2	L3	L1	L2	L3	% LOAD	KW	HZ	RPM	P.F.	OIL	WATER	OIL	AMBIENT	CHRG.

TESTED BY: _____ DATE : ____/____/____

WITNESSED BY: _____

NOTES:

SECTION 16210

APPENDIX "B"

DIESEL GENERATOR DATA FORM

GENERATOR DATA FORM

Description	Specification Minimum	Submitted Value	Units
GENERATOR			
Generator Continuous Output Power	80		KW
	100		KVA
Amperage	278		AMPS
Three Phase Voltage	208		VAC
Power Frequency	60		Hz
Motor Starting (max. 35% voltage dip)	270		KVA
Maximum Step Voltage Dip	20		%
BREAKERS & LOAD BANK			
Generator Main Breaker Rating	400		Amps
Generator Main Breaker Type	TM		-
Generator Main Breaker Interrupt Rating	65		KAIC
ENGINE			
Horsepower at Rated RPM	145		HP
Rated RPM	1800		RPM
HP Rating	1.81		HP/KW
Displacement	276		Cubic In.
Fuel Type	No. 2 Diesel		-
Engine Type	Turbo		-
ENGINE ELECTRICAL SYSTEM			
Starter/Battery/Voltage	24		VDC
Cold Cranking Current	640		A
Alternator Output	45		A
Battery Charger Output	10		A
ENGINE BLOCK HEATER			
Size	1500		W
Phase	1		ø
Voltage	120		VAC
FUEL TANK			
Capacity (Minimum)	74		Gallons
Fuel Tank Type	Sub-Base		-
Fuel Consumption at 50% Load	4.1		Gal/Hr
Runtime at 50% Load	18.0		Hr
ENCLOSURE			
Type	Open		-
Maximum Sound Level	77		dB

END OF SECTION

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SECTION 16605

ELECTRICAL SYSTEM ANALYSIS

PART 1 - GENERAL

1.01 SUBMITTALS

A. Provide the following submittals, per Section 16605, for the entire electrical power system including the 208/120V distribution system:

1. Short Circuit Study.
2. Protective Device Coordination Study.
3. Arc Flash Study.

B. Electrical System Studies shall be prepared, stamped and signed by a professional Electrical Engineer registered in the State of California and in accordance with IEEE 242, IEEE 399 ANSI/IEEE C37.13 and IEEE 519.

C. Exceptions / Clarifications

1. Itemize all exceptions and clarifications to the Contract Documents in a letter (located in the front of the submittal) on company letterhead.
2. Exceptions that are noted in the study, but not listed on the Exceptions/Clarifications letter, will be considered as non-responsive and not accepted as changes to the Contract Documents.
3. All exceptions taken from the Drawings and specifications shall be documented with justifications. When noting the exception, list which Drawings or which Specification Subsection number the exception is taken.
4. Clarification requests shall list which Drawing or Specification Subsection number the clarification is required for.

D. Provide two (2) DVDs at the completion of the project. One DVD will contain the as-built set of studies, reports, settings, etc. The other DVD will contain the original source format of input data used for the PC based computer software, including all SKM files used to create the studies. Provide all setup information used for the computer based study and report.

E. For each resubmittal, provide a copy of submittal comments and a separate letter, on Company letterhead, identifying how each submittal comment has been addressed in the resubmittal.

F. When submittals are provided in PDF format, utilize the "Bookmark" feature of the Adobe Acrobat and clearly bookmark locations in the report to locations identified in the Report's Table of Contents. Bookmarks shall not be out of order; the English description shall match that listed in the Report's Table of Contents.

1.02 SEQUENCING AND SCHEDULING

A. It is the responsibility of those performing the electrical system analysis to collect and field verify all data. This includes verifying existing electrical distribution and obtaining all data from the Utility Company, Generator supplier and vendors necessary for completing the requested studies. Utilize proposed load data for the Studies obtained from submittals, Utility Company, Generator manufacturers, field verifications, etc.

B. A complete Protective Device Coordination Study shall be submitted within 60 days after approval of Short Circuit Study.

C. At the completion of the project, all studies shall be resubmitted with all calculations rerun, data and graphs updated to reflect as-left conditions. Provide new Arc Flash labels to reflect as-constructed equipment and as-left circuit breaker settings.

D. When previous electrical system analysis studies are available and provided to the Contractor, it is the Contractor's responsibility to verify the accuracy of the data used and to update it to match existing conditions.

PART 2 - MATERIALS

2.01 GENERAL

A. Equipment and component titles and numbers used in the Studies shall be identical to the equipment and component titles and numbers shown on the Drawings.

B. Perform Studies using PC based computer software. State program name and version (e.g. version 2.1) in report.

C. Perform complete fault calculations for Utility and generator sources. Equipment shall not be grouped as a single large load; they shall be treated as individual loads. When generators are incorporated into the system, develop two separate networks: one with utility only (no generator attached) and one with generator only (no utility attached)

D. Complete protective device coordination study listing all device settings shall be utilized during start-up of electrical equipment.

E. Provide unique page numbers for every sheet in all Studies. Unique page numbers to be manually placed by Study Company after printout if study report doesn't assign page numbers.

F. One line diagrams

1. Shall be readable on 11" x 17" paper. One line diagrams shall be redrawn in AutoCAD on multiple sheets if necessary or as requested by Owner.
2. Buses and branches shall have descriptive names matching one line diagram or existing system (i.e. not Bus-0084).
3. Automatic transfer switches (ATSs), Main Switchboards (MSBs), shall not have multiple node buses.
4. Primary and secondary for transformers, Variable Frequency Drives (VFDs), etc. shall be changed to node buses.

G. Multiple scenarios for the short circuit and arc flash reports shall be provided.

1. Maximum available fault current from utility transformer:
   a. One Study with all motor contribution.
   b. One Study with no motor contribution.
2. Minimum available fault current from utility transformer:
   a. One Study with all motor contribution.
   b. One Study with no motor contribution.

3. Nominal available fault current from utility transformer: (if only nominal fault current is provided by the Utility and not maximum/minimum available fault current)
    a. One Study with all motor contribution.
    b. One Study with no motor contribution.
4. Generator (when shown)
    a. One Study with all motor contribution.
    b. One Study with no motor contribution.
5. Do not combine networks when multiple sites are modeled.
6. All studies shall be repeated with the arc flash reduction switch enabled (where applicable).

2.02 SHORT CIRCUIT STUDY

A. Include the following in the short circuit study:
    1. Cable impedances based on copper conductors.
    2. Bus impedances based on copper bus bars.
    3. Transformer impedances based on tolerances specified in ANSI C57.12.00.
    4. Source date (i.e. cable lengths, sizes, and quantity, for all runs in study, listing of bus loads, etc.).
    5. Utility data:
        a. Size of Utility transformer.
        b. Impedance of Utility transformer.
        c. Primary voltage of Utility transformer.
        d. Fault information on primary side of Utility transformer:
            1) Three phase bolted fault.
            2) X/R ratio (positive sequence).
            3) Line to ground fault.
            4) X/R ratio (zero sequence).
        e. Protective relays (type & settings).
    6. Voltage drop and current flow at each node and load in system.

B. Calculate Short Circuit interrupting duties for an assumed three-phase bolted fault and line-to-ground fault at each of the following locations:
    1. Power transformer’s primary
    2. Main Switchboard.
    3. All Motor Control Centers (MCCs).
    4. All panelboards.

5. All 480V, 3-phase motor and equipment loads.
6. All 3-phase transformer secondaries.
7. All 240/208V equipment.

C. Verify:

1. Equipment and protective devices are applied within their ratings.
2. Adequacy of switchboard, panelboard and MCC bus bars to withstand Short Circuit stresses.
3. Adequacy of transformer windings to withstand Short Circuit stresses and over-current.
4. Cable sizes for ability to withstand normal and fault load currents.

D. Provide the following in the Short Circuit study report:

1. Calculation methods and assumptions.
2. Input data.
3. Short circuit data.
    a. Impedances.
    b. X to R ratios.
    c. Asymmetry factors.
    d. Motor contributions.
    e. Short Circuit kVA.
    f. Symmetrical and asymmetrical line-to-line and line-to-ground fault currents.
    g. Device evaluation including rating of equipment.
    h. Bus evaluation including rating of equipment.
    i. Source data, from Electric Utility Company. Include copy of correspondence with Utility Company indicating values used.
    j. Source data from Generator Supplier (where applicable). Include copy of Generator provided values used.
4. Tabulations of calculated quantities.
5. Results, conclusions, and recommendations.
6. One line diagrams of distribution system.
7. Impedance diagram showing the resistances and reactances for all cables of the distribution system.

2.03 PROTECTIVE DEVICE COORDINATION STUDY

A. Provide Protective Device Coordination drawings for each section of distribution system that includes the following:

1. Graphically diagram displaying coordination time-current curves on conventional log-log curve sheets. Each time-current curve shall have a unique identifier label. This identifier shall be used in the tabulated settings spreadsheet and on the associated one-line diagram.

2. Time-current curves shall include the following curves (minimum):

   a. Utility relays (phase & ground) and high voltage switchgear relays (phase and ground).

   b. All upstream protective devices and breakers.

   c. All mechanical overloads.

   d. All MCP breaker and associated motor or equipment load. Duplicates of the same sized protective device and motor size may be omitted (i.e., when there are 3 pumps for same application).

   e. All transformers and associated primary and secondary protection.

   f. Unique identifier for each protective device.

   g. Provide separate TCC for phase and ground curves.

   h. TCC for Ground curves shall include the transformer magnetizing inrush currents for all transformers downstream of the circuit breaker. Ground shall clear the inrush currents.

3. One-line diagram that applies to specific portion of distribution system associated with time-current curves. One-line diagram shall include the following:

   a. Location of each device.

   b. Power and voltage ratings, primary and secondary transformers amperages.

   c. All significant circuit elements such as transformers, cables, breakers, fuses, relays, etc. with their corresponding amperage ratings.

   d. Tag of each branch and node (shall be the same tags used in short circuit study).

   e. Mechanical overload and contactor.

   f. English description, equipment name, HP, and full load amp rating of motors and other 3 phase loads.

   g. Terminate device characteristic curves at a point reflecting maximum fault current to which device is exposed as calculated in short circuit study.

4. Time current curves shall be provided for all protective devices with adjustable settings.

B. Characteristics plotted on time current curves shall include:

1. Protective current relays.
2. Fuses including manufacturer's minimum melts, total clearing, tolerance, and damage bands.
3. Circuit breaker trip devices, including manufacturer's tolerance bands.
4. Transformer full-load currents at 100% and 600%.
5. Motor and equipment full load currents. Motors fed from VFDs and Soft Starters shall have their starting curves adjusted according to inrush currents on the TCC. Motors on TCC shall show the DC offset for VFD and Soft Starter fed pumps.
6. Transformer magnetizing inrush currents.
7. Transformer damage curves.
8. ANSI transformer withstand parameters.
9. Fault currents.
10. Ground fault protective device settings.
11. Other electronic protective devices.

C. Provide the following recommended settings in spreadsheet format in the Protective Device Coordination study report:

1. Relay settings including CT values.
2. Circuit Breakers adjustments:
    a. Long Delay Pickup and Time.
    b. Short Time Pickup and Time.
    c. Instantaneous Pickup and Time.
    d. Ground Pickup and Time.
3. Programmable settings for all electronic devices. Settings for non-current relay settings shall also be provided.
4. Settings shall be given both in amps and seconds as well as the corresponding physical setting (i.e. 30A and setting B on MCP) for device.
5. Identify protective device associated with each curve by manufacturer type, function and part number.

2.04 ARC FLASH HAZARD STUDY

A. General:

1. Arc flash boundary and incident energy shall be calculated using a PC computer program at all significant locations in the electrical network,

including switchgears, switchboards, MCCs, transformers, and other major equipment where work could be performed on energized equipment.

2. Arc flash computation shall include both line and load side of main breaker calculations, where necessary.

3. Document method of calculation.

4. Do not include the motor contribution of motors fed by VFDs in the arc flash hazard study.

B. Safe working distances shall be specified for calculated fault locations based upon the calculated arc flash boundary considering an incident energy of 1.2 cal/cm2.

C. Study shall include the following:

1. All significant locations in 480 volt, 240 volt and 208 volt systems fed from transformers equal to or greater than 125 kVA.

2. Incident energy and flash protection boundary calculations in spreadsheet format in the Arc Flash Hazard study report.

3. Provide the following incident energy and flash protection boundary calculations in spreadsheet format in the Arc Flash Hazard study report (values shall be calculated for all electrical equipment in the power distribution system):

a. Arcing fault magnitude

b. Device clearing time

c. Duration of arc

d. Boundary for:

1) Arc flash limited shock approach

2) Limited shock approach

3) Restricted shock approach

e. Working distance

f. Incident energy at 18 inches (in cal/sq.-cm)

g. Recommendations for arc flash energy reduction for each location having more than 8 cal/sq.-cm. Provide preliminary cost estimate for implementing recommendations.

h. Provide separate spreadsheets for all scenarios listed in subsection 2.01.G. Do not combine the spreadsheet values nor only provide the worst case scenario. Clearly list on each spreadsheet the English description of the Scenario presented.

4. Provide recommendations for the Personal Protective Equipment (PPE) that the Owner should maintain on site for the level of hazard.

5. Provide recommendations for safety label design that should be posted on electrical equipment.

2.05 STUDY REPORTS

A. Written reports submitted for approval shall contain:

1. Scope of Studies performed.
2. Explanation of bus and branch numbering system.
3. Report calculations, tabulations and spreadsheets.
4. Selected equipment deficiencies.
5. Results of Studies.
6. Comments, recommendations or suggestions regarding:
   a. Changes and additions to equipment rating and/or characteristics.
   b. Circuit protective devices improperly rated for overload or fault conditions.
   c. Arc Flash protective equipment and safety labels.
7. Tabulation spreadsheet for all protective device settings with the following column entries (minimum):

Device Code	Description	MFR	Type	Plug Trip	Frame	KAIC	Long Time		Short Time		Inst	Ground	
							Amps	Time	Amps	Time	Amps	Amps	Time

8. Stamped, signed and dated by Electrical Engineer registered in the State of California who performed the analysis.

B. Reports are to be updated to reflect as-built conditions and placed in O&M manual, per Section 16010 requirements.

PART 3 - EXECUTION

3.01 GENERAL

A. Make minor modifications to equipment settings as required to accomplish conformance with the Short Circuit and Arc Flash Studies.

B. Notify Engineer in writing of any required major equipment modifications.

3.02 FIELD TESTS

A. Provide field testing of protective equipment.

B. Adjust relay and protective device settings according to values established by Coordination Study.

3.03 ARC FLASH WARNING LABELS

A. All Arc Flash warning labels shall meet NEC requirements, OSHA standards and NFPA recommendations.

B. Provide and install 4 in. x 6 in. thermal transfer type labels of high adhesion polyester for each work location analyzed and as required by the NEC for flash protection on power distribution equipment.

C. Each label shall have an orange header with the wording, "WARNING, ARC FLASH HAZARD," and shall include the following machine printed information:

1. Location Designation
2. Nominal system voltage
3. Arc Flash boundary
4. Available incident energy and working distance (in inches)
5. Minimum arc rating of clothing
6. Site specific level of PPE
7. Engineering report number, revision number and issue date
8. Company preparing report and contact phone number.

D. Labels shall not be hand labeled.

E. For all areas, Contractor shall post the following:

1. Working distances
2. Shock hazard voltage

3. Shock Approach Boundaries:

   a. Limited

   b. Restricted

F. Provide Arc Flash labels for the each of the following pieces of equipment:

1. 480V and applicable 208V panelboards
2. MCCs
3. Switchboard
4. Switchgears
5. Control Panels
6. All electrical equipment with an incident energy level greater than 1.2 Cal/cm2.
7. Where Switchgear, Switchboard, MCC, Panelboard, Distribution Panel, etc. feed multiple circuit breakers from the enclosure, provide separate line and load side Arc Flash Labels for the Main Circuit Breaker.
8. Provide separate labels at each circuit breaker that has arc flash reduction switches indicating the appropriate values when the switch is enabled.

G. Labels shall be submitted for approval. No labels shall be installed without prior approval by Owner or Owner representative.

3.04 ARC FLASH TRAINING

A. The Supplier shall train Owner personnel of the potential arc flash hazards associated with working on energized equipment (minimum of 4 hours). Maintenance procedures shall be in accordance with the requirements of NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces and shall be provided in the equipment manuals.

END OF SECTION

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VE SOLUTIONS

PROJECT: Burlingame Police Genset Replacement Project No.: 18053

DATE: 1/11/2019 BY: B. Friederichs rev:

Code: 2016 CBC

Geotechnical Properties:

$p_b := 1500\ psf$ CBC minimum

Seismic Parameters:

$S_{DS} := 1.75$

$I_p := 1.5$ Risk Category IV

Gen Set Slab & Anchorage:

$W_g := 2600\ lbf$ genset

$W_t := 1300\ lbf$ tank full

$a_p := 1.0$

$R_p := 2.5$

$\Omega_0 := 2.5$

$z := 0\ ft$

$h := 9\ ft$

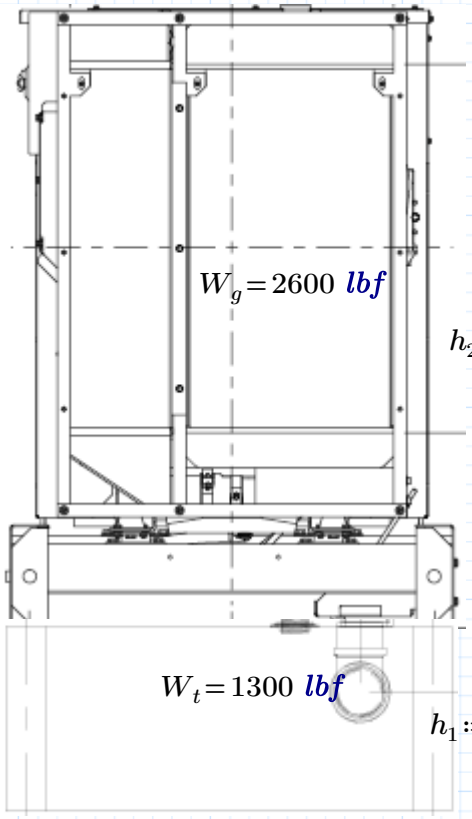
$$F_p := \frac{0.4 \cdot S_{DS} \cdot a_p \cdot \left(1 + 2 \cdot \frac{z}{h}\right) \cdot I_p}{R_p} = 0.42$$

$F_{p\_max} := 1.6 \cdot S_{DS} \cdot I_p = 4.2$

$F_{p\_min} := 0.3 \cdot S_{DS} \cdot I_p = 0.79$

$F_p := \max\left(min\left(F_p, F_{p\_max}\right), F_{p\_min}\right) = 0.79$

$W_p := W_g + W_t = 3900\ lbf$



650 University Ave, Suite 110, Sacramento, CA 95825 916-505-0519 fax 916-514-9102 email: bradf@vesolutions.net

(E) Slab Check:

$V := F_p \cdot W_p = 3071.25\ lbf$

$OTM := F_p \cdot \left(W_g \cdot \left(h_1 + h_2\right) + W_t \cdot h_1\right) = 6.65\ kip \cdot ft$

$h_{eq} := \frac{OTM}{V} = 26\ in$ equivalent cg height

(E) 5" slab with #4 @ 18" cc okay-See Enercalc

Genset Attachment:

$n := 4$ # of anchors

$OTM = 6.65\ kip \cdot ft$

$RM := \left(0.9 - 0.2 \cdot S_{DS}\right) \cdot W_p \cdot \frac{b}{2} = 2.77\ kip \cdot ft$

$T := \frac{2 \cdot \left(\Omega_0 \cdot OTM - RM\right)}{n \cdot b} = 2.68\ kip$

$V := \frac{\Omega_0 \cdot V}{n} = 1.92\ kip$

5/8" dia.x 3-1/8" embedment Hilti HIT-HY 200 + HAS-V-36-See Hilti calc for anchorage

Silencer Support:

$W_1 := 125\ lbf$ silencer mass

$W_2 := 6\ ft \cdot 15\ plf = 90\ lbf$ exhaust pipe

$W_3 := 6\ ft \cdot 15\ plf = 90\ lbf$ pipe thru roof

$n_s := 2$ # of supports

$$W_p := \frac{W_1 + W_2 + W_3}{n_s} = 152.5\ lbf$$

$a_p := 2.5$

$R_p := 9$

$\Omega_0 := 2.5$

$z := 9\ ft$

$h := 9\ ft$

$$F_p := \frac{0.4 \cdot S_{DS} \cdot a_p \cdot \left(1 + 2 \cdot \frac{z}{h}\right) \cdot I_p}{R_p} = 0.88$$

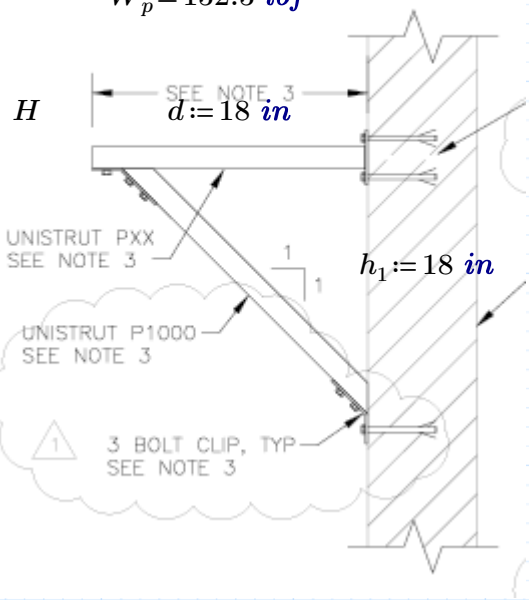
$F_{p\_max} := 1.6 \cdot S_{DS} \cdot I_p = 4.2$

$F_{p\_min} := 0.3 \cdot S_{DS} \cdot I_p = 0.79$

$F_p := \max\left(min\left(F_p, F_{p\_max}\right), F_{p\_min}\right) = 0.88$

$F_p := F_p \cdot W_p = 133.44\ lbf$

$W_p = 152.5\ lbf$



top conn:

@ service loads

$P_s := 0.7 \cdot \Omega_0 \cdot F_p = 233.52\ lbf$

$$V_s := \frac{W_p}{2} = 76.25\ lbf$$

calculation is for one anchor, instead of two which is conservative

$P_t := 724\ lbf$

$V_t := 1853\ lbf$

$DCR := \left(\frac{P_s}{P_t}\right)^{\frac{5}{3}} + \left(\frac{V_s}{V_t}\right)^{\frac{5}{3}} = 0.16$ 1/2" dia x 3-1/2" emb Hilti KB3-okay

bot conn:

@ service loads

$V_s := \frac{W_p}{2} = 76.25\ lbf$

$V_t := 1853\ lbf$

$DCR := \frac{V_s}{V_t} = 0.04$

1/2" dia x 3-1/2" emb Hilti KB3-okay

www.hilti.us

Profis Anchor 2.8.0

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Address:		Sub-Project I Pos. No.:	18053
Phone I Fax:	|	Date:	1/23/2019
E-Mail:			

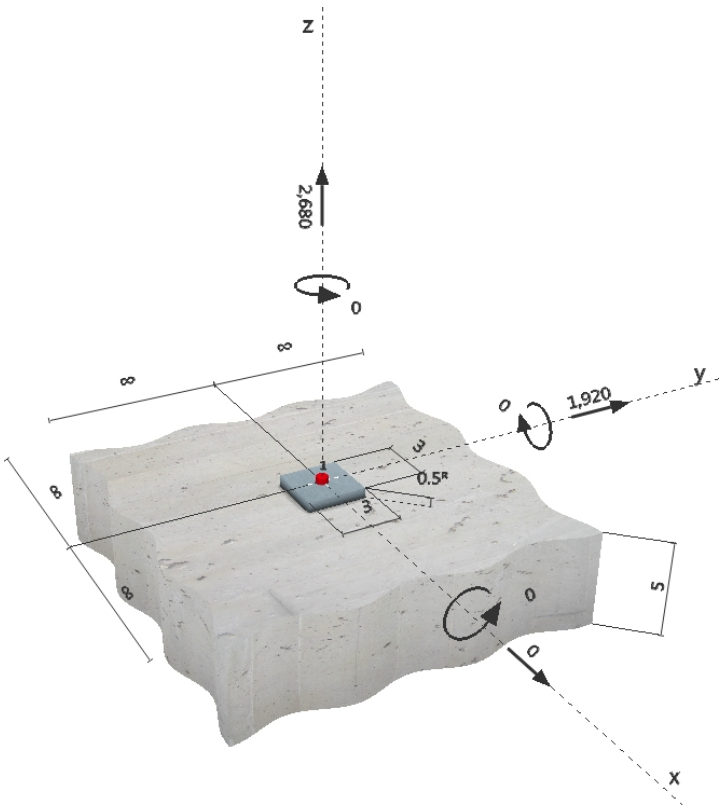
Specifier's comments: Genset Anchorage

1 Input data

Anchor type and diameter:	**HIT-HY 200 + HAS-E B7 5/8**
Effective embedment depth:	$h_{ef,act}$ = 3.500 in. ($h_{ef,limit}$ = - in.)
Material:	ASTM A 193 Grade B7
Evaluation Service Report:	ESR-3187
Issued I Valid:	3/1/2018 | 3/1/2020
Proof:	Design method ACI 318-11 / Chem
Stand-off installation:	e_b = 0.000 in. (no stand-off); t = 0.500 in.
Anchor plate:	l_x x l_y x t = 3.000 in. x 3.000 in. x 0.500 in.; (Recommended plate thickness: not calculated
Profile:	no profile
Base material:	cracked concrete, 3000, f_c' = 3,000 psi; h = 5.000 in., Temp. short/long: 32/32 °F
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: condition B, shear: condition B; no supplemental splitting reinforcement present edge reinforcement: none or < No. 4 bar
Seismic loads (cat. C, D, E, or F)	Tension load: yes (D.3.3.4.3 (d)) Shear load: yes (D.3.3.5.3 (a))

[R] - The anchor calculation is based on a rigid baseplate assumption.

Geometry [in.] & Loading [lb, in.lb]



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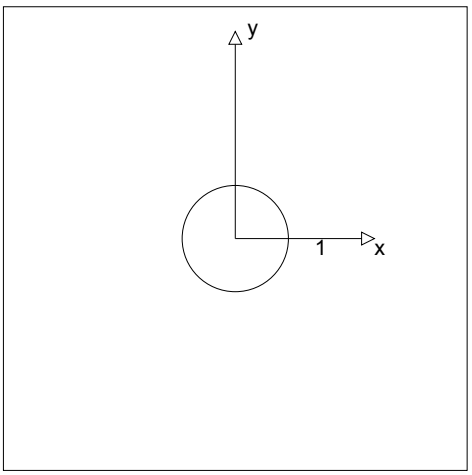
2 Load case/Resulting anchor forces



Load case: Design loads

Anchor reactions [lb]

Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	2,680	1,920	0	1,920

max. concrete compressive strain:	- [‰]
max. concrete compressive stress:	- [psi]
resulting tension force in (x/y)=(0.000/0.000):	2,680 [lb]
resulting compression force in (x/y)=(0.000/0.000):	0 [lb]

Anchor forces are calculated based on the assumption of a rigid baseplate.

3 Tension load

	Load N_{ua} [lb]	Capacity ϕN_n [lb]	Utilization $\beta_N = N_{ua}/\phi N_n$	Status
Steel Strength*	2,680	21,187	13	OK
Bond Strength**	2,680	3,992	68	OK
Sustained Tension Load Bond Strength*	N/A	N/A	N/A	N/A
Concrete Breakout Strength**	2,680	2,972	91	OK

* anchor having the highest loading **anchor group (anchors in tension)

3.1 Steel Strength

N_{sa} = ESR value	refer to ICC-ES ESR-3187
$\phi N_{sa} \geq N_{ua}$	ACI 318-11 Table D.4.1.1

Variables

$A_{se,N}$ [in.^{2}]	f_{uta} [psi]
0.23	125,000

Calculations

N_{sa} [lb]
28,250

Results

N_{sa} [lb]	ϕ steel	ϕN_{sa} [lb]	N_{ua} [lb]
28,250	0.750	21,187	2,680

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3.2 Bond Strength

$N_a = \left(\frac{A_{Na}}{A_{Na0}}\right) \psi_{ed,Na} \psi_{cp,Na} N_{ba}$ ACI 318-11 Eq. (D-18)

$\phi N_a \geq N_{ua}$ ACI 318-11 Table D.4.1.1

A_{Na} = see ACI 318-11, Part D.5.5.1, Fig. RD.5.5.1(b)

$A_{Na0} = (2 c_{Na})^2$ ACI 318-11 Eq. (D-20)

$c_{Na} = 10 d_a \sqrt{\frac{\tau_{uncr}}{1100}}$ ACI 318-11 Eq. (D-21)

$\psi_{ec,Na} = \left(\frac{1}{1 + \frac{e'_N}{c_{Na}}}\right) \leq 1.0$ ACI 318-11 Eq. (D-23)

$\psi_{ed,Na} = 0.7 + 0.3 \left(\frac{c_{a,min}}{c_{Na}}\right) \leq 1.0$ ACI 318-11 Eq. (D-25)

$\psi_{cp,Na} = MAX\left(\frac{c_{a,min}}{c_{ac}}, \frac{c_{Na}}{c_{ac}}\right) \leq 1.0$ ACI 318-11 Eq. (D-27)

$N_{ba} = \lambda_a \cdot \tau_{k,c} \cdot \alpha_{N,seis} \cdot \pi \cdot d_a \cdot h_{ef}$ ACI 318-11 Eq. (D-22)

Variables

$\tau_{k,c,uncr}$ [psi]	d_a [in.]	h_{ef} [in.]	$c_{a,min}$ [in.]	$\tau_{k,c}$ [psi]
2,261	0.625	3.500	∞	1,192

$e_{c1,N}$ [in.]	$e_{c2,N}$ [in.]	c_{ac} [in.]	λ_a	$\alpha_{N,seis}$
0.000	0.000	7.579	1.000	1.000

Calculations

c_{Na} [in.]	A_{Na} [in.^{2}]	A_{Na0} [in.^{2}]	$\psi_{ed,Na}$
8.920	318.25	318.25	1.000

$\psi_{ec1,Na}$	$\psi_{ec2,Na}$	$\psi_{cp,Na}$	N_{ba} [lb]
1.000	1.000	1.000	8,188

Results

N_a [lb]	ϕ_{bond}	$\phi_{seismic}$	$\phi_{nonductile}$	ϕN_a [lb]	N_{ua} [lb]
8,188	0.650	0.750	1.000	3,992	2,680

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3.3 Concrete Breakout Strength

$N_{cb} = \left(\frac{A_{Nc}}{A_{Nc0}}\right) \psi_{ed,N} \psi_{c,N} \psi_{cp,N} N_b$ ACI 318-11 Eq. (D-3)

$\phi N_{cb} \geq N_{ua}$ ACI 318-11 Table D.4.1.1

A_{Nc} see ACI 318-11, Part D.5.2.1, Fig. RD.5.2.1(b)

$A_{Nc0} = 9 h_{ef}^2$ ACI 318-11 Eq. (D-5)

$\psi_{ec,N} = \left(\frac{1}{1 + \frac{2 e'_N}{3 h_{ef}}}\right) \leq 1.0$ ACI 318-11 Eq. (D-8)

$\psi_{ed,N} = 0.7 + 0.3 \left(\frac{c_{a,min}}{1.5 h_{ef}}\right) \leq 1.0$ ACI 318-11 Eq. (D-10)

$\psi_{cp,N} = MAX\left(\frac{c_{a,min}}{c_{ac}}, \frac{1.5 h_{ef}}{c_{ac}}\right) \leq 1.0$ ACI 318-11 Eq. (D-12)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ ACI 318-11 Eq. (D-6)

Variables

h_{ef} [in.]	$e_{c1,N}$ [in.]	$e_{c2,N}$ [in.]	$c_{a,min}$ [in.]	$\psi_{c,N}$
3.500	0.000	0.000	∞	1.000

c_{ac} [in.]	k_c	λ_a	f'_c [psi]
7.579	17	1.000	3,000

Calculations

A_{Nc} [in.^{2}]	A_{Nc0} [in.^{2}]	$\psi_{ec1,N}$	$\psi_{ec2,N}$	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [lb]
110.25	110.25	1.000	1.000	1.000	1.000	6,097

Results

N_{cb} [lb]	$\phi_{concrete}$	$\phi_{seismic}$	$\phi_{nonductile}$	ϕN_{cb} [lb]	N_{ua} [lb]
6,097	0.650	0.750	1.000	2,972	2,680

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4 Shear load

	Load V_{ua} [lb]	Capacity ϕV_n [lb]	Utilization $\beta_V = V_{ua}/\phi V_n$	Status
Steel Strength*	1,920	7,712	25	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout Strength (Concrete Breakout Strength controls)**	1,920	8,536	23	OK
Concrete edge failure in direction **	N/A	N/A	N/A	N/A

* anchor having the highest loading **anchor group (relevant anchors)

4.1 Steel Strength

$V_{sa} = \alpha_{V,seis} (0.6\ A_{se,V}\ f_{uta})$ refer to ICC-ES ESR-3187

$\phi\ V_{steel} \geq V_{ua}$ ACI 318-11 Table D.4.1.1

Variables

$A_{se,V}$ [in.^{2}]	f_{uta} [psi]	$\alpha_{V,seis}$	$(0.6\ A_{se,V}\ f_{uta})$ [lb]
0.23	125,000	0.700	16,950

Calculations

$V_{sa,eq}$ [lb]
11,865

Results

$V_{sa,eq}$ [lb]	ϕ steel	$\phi\ V_{sa}$ [lb]	V_{ua} [lb]
11,865	0.650	7,712	1,920

4.2 Pryout Strength (Concrete Breakout Strength controls)

$V_{cp} = k_{cp} \left[\left(\frac{A_{Nc}}{A_{Nc0}} \right) \psi_{ed,N}\ \psi_{c,N}\ \psi_{cp,N}\ N_b \right]$ ACI 318-11 Eq. (D-40)

$\phi\ V_{cp} \geq V_{ua}$ ACI 318-11 Table D.4.1.1

A_{Nc} see ACI 318-11, Part D.5.2.1, Fig. RD.5.2.1(b)

$A_{Nc0} = 9\ h_{ef}^2$ ACI 318-11 Eq. (D-5)

$\psi_{ec,N} = \left(\frac{1}{1 + \frac{2\ e'_N}{3\ h_{ef}}} \right) \leq 1.0$ ACI 318-11 Eq. (D-8)

$\psi_{ed,N} = 0.7 + 0.3 \left(\frac{c_{a,min}}{1.5 h_{ef}} \right) \leq 1.0$ ACI 318-11 Eq. (D-10)

$\psi_{cp,N} = \text{MAX} \left(\frac{c_{a,min}}{c_{ac}}, \frac{1.5 h_{ef}}{c_{ac}} \right) \leq 1.0$ ACI 318-11 Eq. (D-12)

$N_b = k_c\ \lambda_a \sqrt{f'_c}\ h_{ef}^{1.5}$ ACI 318-11 Eq. (D-6)

Variables

k_{cp}	h_{ef} [in.]	$e_{c1,N}$ [in.]	$e_{c2,N}$ [in.]	$c_{a,min}$ [in.]
2	3.500	0.000	0.000	∞

$\psi_{c,N}$	c_{ac} [in.]	k_c	λ_a	f'_c [psi]
1.000	7.579	17	1.000	3,000

Calculations

A_{Nc} [in.^{2}]	A_{Nc0} [in.^{2}]	$\psi_{ec1,N}$	$\psi_{ec2,N}$	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [lb]
110.25	110.25	1.000	1.000	1.000	1.000	6,097

Results

V_{cp} [lb]	ϕ concrete	ϕ seismic	ϕ nonductile	$\phi\ V_{cp}$ [lb]	V_{ua} [lb]
12,194	0.700	1.000	1.000	8,536	1,920

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5 Combined tension and shear loads

β_N	β_V	ζ	Utilization $\beta_{N,V}$ [%]	Status
0.902	0.249	5/3	95	OK

$\beta_{NV} = \beta_N^{\zeta} + \beta_V^{\zeta} <= 1$

6 Warnings

- The anchor design methods in PROFIS Anchor require rigid anchor plates per current regulations (ETAG 001/Annex C, EOTA TR029, etc.). This means load re-distribution on the anchors due to elastic deformations of the anchor plate are not considered - the anchor plate is assumed to be sufficiently stiff, in order not to be deformed when subjected to the design loading. PROFIS Anchor calculates the minimum required anchor plate thickness with FEM to limit the stress of the anchor plate based on the assumptions explained above. The proof if the rigid base plate assumption is valid is not carried out by PROFIS Anchor. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- Condition A applies when supplementary reinforcement is used. The Φ factor is increased for non-steel Design Strengths except Pullout Strength and Pryout strength. Condition B applies when supplementary reinforcement is not used and for Pullout Strength and Pryout Strength. Refer to your local standard.
- Design Strengths of adhesive anchor systems are influenced by the cleaning method. Refer to the INSTRUCTIONS FOR USE given in the Evaluation Service Report for cleaning and installation instructions
- Checking the transfer of loads into the base material and the shear resistance are required in accordance with ACI 318 or the relevant standard!
- An anchor design approach for structures assigned to Seismic Design Category C, D, E or F is given in ACI 318-11 Appendix D, Part D.3.3.4.3 (a) that requires the governing design strength of an anchor or group of anchors be limited by ductile steel failure. If this is NOT the case, the connection design (tension) shall satisfy the provisions of Part D.3.3.4.3 (b), Part D.3.3.4.3 (c), or Part D.3.3.4.3 (d). The connection design (shear) shall satisfy the provisions of Part D.3.3.5.3 (a), Part D.3.3.5.3 (b), or Part D.3.3.5.3 (c).
- Part D.3.3.4.3 (b) / part D.3.3.5.3 (a) require the attachment the anchors are connecting to the structure be designed to undergo ductile yielding at a load level corresponding to anchor forces no greater than the controlling design strength. Part D.3.3.4.3 (c) / part D.3.3.5.3 (b) waive the ductility requirements and require the anchors to be designed for the maximum tension / shear that can be transmitted to the anchors by a non-yielding attachment. Part D.3.3.4.3 (d) / part D.3.3.5.3 (c) waive the ductility requirements and require the design strength of the anchors to equal or exceed the maximum tension / shear obtained from design load combinations that include E, with E increased by ω_0.
- Installation of Hilti adhesive anchor systems shall be performed by personnel trained to install Hilti adhesive anchors. Reference ACI 318-11, Part D.9.1

Fastening meets the design criteria!

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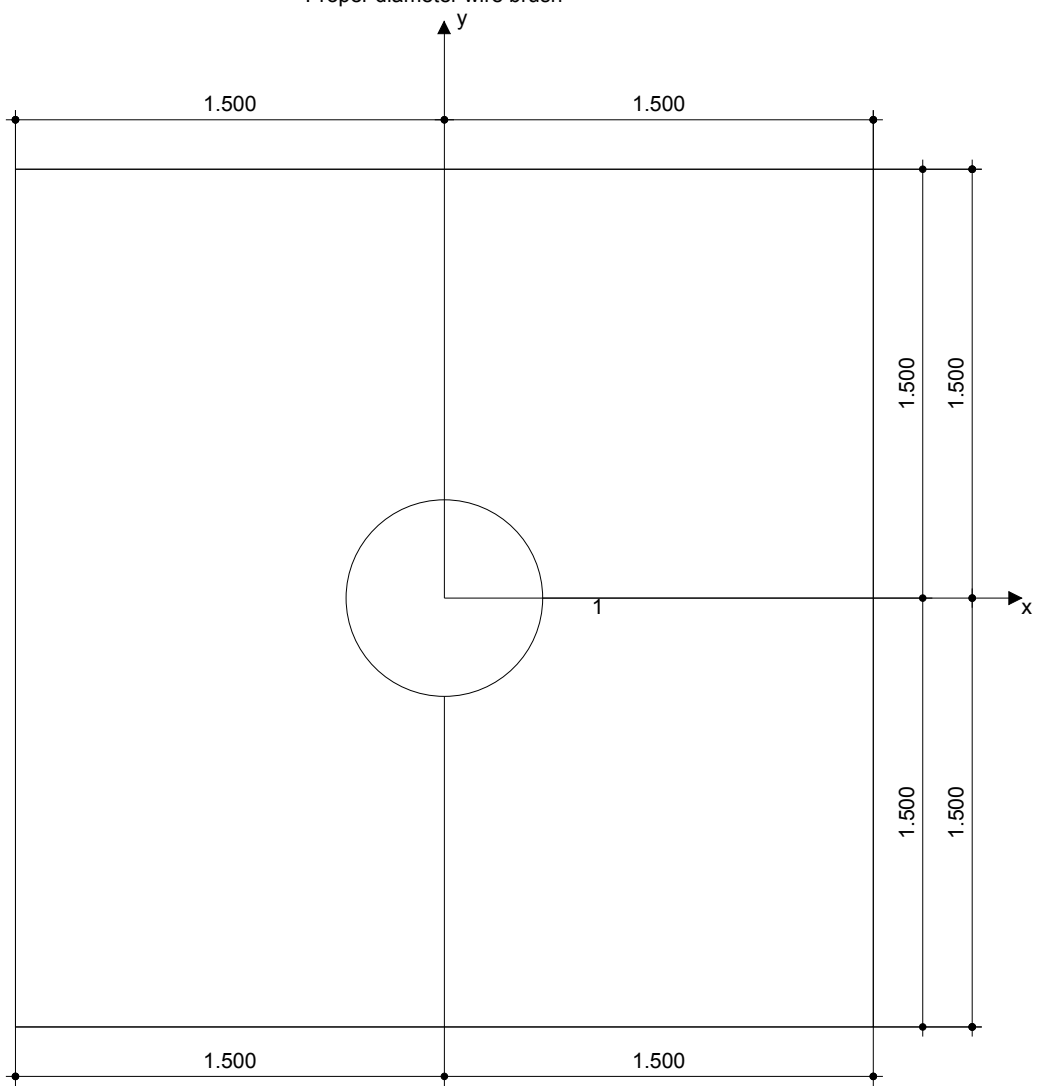
7 Installation data

Anchor plate, steel: -
Profile: no profile
Hole diameter in the fixture: d_f = 0.688 in.
Plate thickness (input): 0.500 in.
Recommended plate thickness: not calculated
Drilling method: Hammer drilled
Anchor type and diameter: HIT-HY 200 + HAS-E B7 5/8
Installation torque: 720.001 in.lb
Hole diameter in the base material: 0.750 in.
Hole depth in the base material: 3.500 in.
Minimum thickness of the base material: 5.000 in.
Cleaning: Compressed air cleaning of the drilled hole according to instructions for use is required

7.1 Recommended accessories

Drilling	Cleaning	Setting
• Suitable Rotary Hammer • Properly sized drill bit	• Compressed air with required accessories to blow from the bottom of the hole • Proper diameter wire brush	• Dispenser including cassette and mixer • Torque wrench



Coordinates Anchor in.

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	0.000	0.000	-	-	-	-

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8 Remarks; Your Cooperation Duties

- Any and all information and data contained in the Software concern solely the use of Hilti products and are based on the principles, formulas and security regulations in accordance with Hilti's technical directions and operating, mounting and assembly instructions, etc., that must be strictly complied with by the user. All figures contained therein are average figures, and therefore use-specific tests are to be conducted prior to using the relevant Hilti product. The results of the calculations carried out by means of the Software are based essentially on the data you put in. Therefore, you bear the sole responsibility for the absence of errors, the completeness and the relevance of the data to be put in by you. Moreover, you bear sole responsibility for having the results of the calculation checked and cleared by an expert, particularly with regard to compliance with applicable norms and permits, prior to using them for your specific facility. The Software serves only as an aid to interpret norms and permits without any guarantee as to the absence of errors, the correctness and the relevance of the results or suitability for a specific application.
- You must take all necessary and reasonable steps to prevent or limit damage caused by the Software. In particular, you must arrange for the regular backup of programs and data and, if applicable, carry out the updates of the Software offered by Hilti on a regular basis. If you do not use the AutoUpdate function of the Software, you must ensure that you are using the current and thus up-to-date version of the Software in each case by carrying out manual updates via the Hilti Website. Hilti will not be liable for consequences, such as the recovery of lost or damaged data or programs, arising from a culpable breach of duty by you.