



A Tradition of Stewardship
A Commitment to Service

NAPA COUNTY
DEPARTMENT OF PUBLIC WORKS
1195 THIRD STREET, ROOM 101
NAPA, CALIFORNIA 94559

SPECIFICATIONS

FOR

650 Imperial Way HVAC Upgrade, PW 18-03

September 25, 2020

NOTICE TO CONTRACTORS

CONTRACT FOR CONSTRUCTION

PROPOSAL FORM

BONDS

**SPECIAL PROVISIONS – SECTION 'A'
SECTION 'B'
SECTION 'C'**

Contractor shall possess a Class B or C-20 license at the time of contract award.

Bid Opening Date: October 22, 2020



Approved _____
County Engineer RCE 633

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**NAPA COUNTY
STATE OF CALIFORNIA**

NOTICE TO CONTRACTORS

Proposals shall be submitted under sealed cover plainly marked as a proposal, and identifying the project to which the proposal relates and the date of the bid opening therefore. Proposals which are not properly marked will be rejected. Sealed proposals will be received at the office of the Clerk of the Board of Supervisors, Napa County Administration Building, 1195 Third Street, Room 310, Napa, California, until 11:30 A.M. on **October 22, 2020 (no bids will be accepted after 11:30 A.M.)** after which they will be opened and read under the social distancing protocol in enforcement at the time, for the construction in accordance with the Plans and Special provisions thereto, to which special reference is made as follows:

650 Imperial Way HVAC Upgrade Project, PW 18-03

Engineer Estimate: \$749,761

Bids are required for the entire work called for by the Plans and Specifications, and neither partial nor contingent bids will be considered.

Bidders are responsible for monitoring www.countyofnapa.org/1607/Current-Projects for addendums which may be issued up until 72 hours prior to bid opening. Complete sets of Contract Documents must be used in preparing Bids. The County does not assume responsibility for errors or misinterpretations resulting from the use of incomplete sets of Contract Documents.

Bid results of the three apparent low bidders with their subcontractor's list will be on the County's website www.countyofnapa.org/1607/Current-Projects by the day after the bids are publicly opened and read.

The Plans and Specifications may be seen at the Napa County Department of Public Works, 1195 Third Street, Room 101 Napa, California. Plans, Special Provisions (excluding State Standard Specifications and other documents included by reference), Proposal Forms and Contract Forms may be obtained at said office by prospective bidders to those licensed by the State of California for the type of work involved or may be found electronically at www.countyofnapa.org/1607/Current-Projects.

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

Pursuant to Sections 1770, et. seq., of the California Labor Code, the successful Bidder shall pay not less than the prevailing rate of per diem wages as determined by the Director of the California Department of Industrial Relations. Copies of such prevailing rate of per diem wages are on file at the Napa County Department of Public Works where copies will be made available to any interested party on request. These rate determinations may also be found on the State of California Department of Industrial Relations' website at: <http://www.dir.ca.gov/dlsr/DPreWageDetermination.htm>.

In accordance with Section 1773.2 of the Labor Code, copies of the applicable determinations of the Director of Public Works are on file at the Public Works Office and may be reviewed upon request, and in accordance Section 1774 of the Labor Code, the prevailing wage rates for classifications of labor to be employed in the work have been determined by the County and are included in the Special Provisions referred to above.

No bid will be considered unless it is made on a blank form furnished by the County Engineer of Napa County and is made in accordance with the provisions of the proposal requirements and conditions set forth under Section 2 of the 2018 Standard Specifications of the State California, Department of Transportation, except as modified in the above referred to Special Provisions.

The Contractor shall possess a Class B or C-20 license at the time of the Contract award. A bid guarantee in the amount of 10% of the total bid shall accompany the bid.

The successful bidder shall be required to furnish a Performance Bond in an amount equal to 100% of the contract price and a Labor and Material Bond in an amount equal to 100% of the contract price with good and sufficient surety.

Each bidder must be licensed as required by law.

PRE-BID MEETING: A mandatory on-site meeting for contractors is scheduled for October 7th, 2020, at 10:00 A.M. at 650 Imperial Way, Napa, CA 94559. If you plan to attend the pre-bid meeting, please contact Liang Chin Su at liang.su@countyofnapa.org by no later than 4 P.M. on October 6th.

All questions must be e-mailed, or mailed by **1:00 P.M. on October 14th, 2020** to Liang Chin Su at liang.su@countyofnapa.org, Napa County Public Works, 1195 Third St. Room 101, Napa, CA 94559.

The Board of Supervisors reserves the right to reject any or all bids. By order of the Board of Supervisors of the County of Napa, State of California made this September 25, 2020.

**NAPA COUNTY CLERK OF THE
BOARD OF SUPERVISORS**

NAPA COUNTY AGREEMENT NO. _____

CONTRACT FOR CONSTRUCTION

THIS AGREEMENT, made and concluded in triplicate this _____ day of _____, 2020, by and between the COUNTY OF NAPA, a political subdivision of the State of California, hereinafter referred to as “COUNTY”, and _____, hereinafter referred to as “CONTRACTOR”;

TERMS

ARTICLE I. In consideration of the payments and covenants hereinafter mentioned, to be made and performed by County, and under the conditions expressed in the two (2) bonds attached hereto, Contractor shall, at Contractor’s own cost and expense, do all the work and furnish all materials, except such as are specified herein to be furnished by County, necessary to construct and complete in a good, workmanlike and substantial manner and to the satisfaction of the Napa County Board of Supervisors that project known as **650 Imperial Way HVAC Upgrade. PW 18-03** which shall be constructed in the County of Napa, California, in accordance with the Plans and Specifications (“Plans”) entitled **650 Imperial Way HVAC Upgrade, PW 18-03** the Bid submitted by Contractor (“Bid Proposal”), the Special Provisions, and the May 2018 Standard Specifications of the State of California Department of Transportation (“Standard Specifications”). The Plans, Bid Proposal, Special Provisions, and Standard Specifications are hereby incorporated by reference as if set forth herein.

ARTICLE II. County hereby promises and agrees with Contractor to employ, and does hereby employ, Contractor to provide the materials and to do the work according to the terms and conditions herein contained for the prices hereinafter set forth, and hereby contracts to pay the same at the time, in the manner, and upon the conditions set forth herein, and both parties hereby agree, for themselves, their heirs, executors, administrators, successors and assigns, to full performance of the covenants contained herein.

ARTICLE III. It is further expressly agreed by and between the parties that if there is any conflict between the Bid Proposal of Contractor and any of the other terms of this Contract, then such other terms shall control and any such conflicting terms of the Bid Proposal shall not be deemed to have been accepted by County.

ARTICLE IV. Contractor agrees to receive and accept the following prices as full compensation for furnishing all materials and for doing all the work contemplated and embraced in this Contract; for all loss and damage, arising out of the nature of such work, from the action of the elements, or from any unforeseen difficulties or obstructions which may arise or be encountered in the prosecution of the work until its acceptance by the Board of

Supervisors of the County and for all risks of every description connected with the work; for all expenses incurred by or in consequence of the suspension or discontinuance of work; and for well and faithfully completing the work and the whole thereof in the manner and according to the Plans, Special Provisions, and Standard Specifications and the requirements of the Engineer under them, to wit:

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**650 Imperial Way HVAC Upgrade
PW 18-03**

ITEM NO.	DESCRIPTION	UNIT	QUANTITY	TOTAL
BASE BID				
1	Demolition	LS	1	
	Remove (E) HVAC Unit – Roof (AC-3)			
	Mechanical Demolition (Unit & Ductwork – VAV)			
	Equipment Controller demolition (AC-1, AC-2, AC-3, HU-1, HU-2, HU-3)			
	Demolition of (8) VAV Thermostats			
2	HVAC	LS	1	
	AC-3			
	Condensate Drain (RTU – Roof)			
	Roof Curb and Support			
	New AC-1, AC-2, AC-3, HU-1, HU-2, HU-3 DDC Controls			
	Diffusers and Grills			
	HVAC Ductwork			
	HVAC Duct Insulation			
	Fresh Air Ductwork			
	Start-Up			
	Air Balance			
	Title 24 Acceptance Forms			
Base Bid Total:				
TOTAL BASE BID (WRITTEN):				
			and	/100 DOLLARS
BID ALTERNATE				
1	Demolition	LS	1	
	Remove (E) Reznor Heating Unit - Roof			
	Mechanical Demolition (Unit & Ductwork – VAV)			
	Mechanical Demolition (Unit & Ductwork – By-Pass VAV Terminal)			
	Remove (E) Dual Duct – Hot Deck Ductwork			

2	HVAC	LS	1	
	HU-1			
	HU-2			
	HU-3			
	Roof Curb and Support			
	Air Balance (HU)			
	Start-Up			
Bid Alternate Total:				
TOTAL BID ALTERNATE (WRITTEN):				
and /100 DOLLARS				

IN WITNESS WHEREOF, this Contract has been approved by County and Contractor as of the date first set forth on page C-1 of this Contract.

NAPA COUNTY, a political subdivision of the State of California

By _____
 DIANE DILLON, Chair
 Board of Supervisors

“COUNTY”

By _____

By _____

“CONTRACTOR”

<p>APPROVED AS TO FORM Office of County Counsel</p> <p>By: _____ County Counsel</p> <p>Date: _____</p>	<p>APPROVED BY THE NAPA COUNTY BOARD OF SUPERVISORS</p> <p>Date: _____ Processed By: _____ Deputy Clerk of the Board</p>	<p>ATTEST: JOSE LUIS VALDEZ Clerk of the Board of Supervisors</p> <p>By: _____</p>
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NOTE: Signature of those executing for the Contractor must be acknowledged by Notary Public. If a corporation, this document must be signed by two corporate officers. The first signature must be either the Chairman of the Board, President, or any Vice President. The second signature must be the Secretary, an Assistant Secretary, the Chief Financial Officer, or any Assistant Treasurer. In the alternative, a single corporate signature is acceptable when accompanied by a corporate document demonstrating the legal authority of the signature to bind the company.

PROPOSAL FORM
(MAY BE DETACHED AND SUBMITTED ALONE)

**TO THE DIRECTOR OF PUBLIC WORKS
OF NAPA COUNTY
NAPA, CALIFORNIA**



FOR:

650 Imperial Way HVAC Upgrade

PW 18-03

NAME OF CONTRACTOR _____

BUSINESS ADDRESS _____

DIR LICENSE NUMBER _____

CONTRACTOR LICENSE NO. _____

Location: The work to be done and referred to herein is in Napa County, State of California, more particularly described as follows:

650 Imperial Way HVAC Upgrade

PW 18-03

The undersigned, as contractor, declares that the only person or parties interested in this proposal as principals are those named herein; that this proposal is made without collusion with any other person, firm or corporation; has visited the Site of Work as described in the Contract and has examined and familiarized him or herself with the existing conditions relating to the construction which will be performed, the annexed proposed form of contract, the Plans, Special Provisions and Standard Specifications; and he proposes, and agrees if this proposal is accepted, that he will contract with Napa County, in the form of the copy of the contract annexed hereto, to provide all necessary machinery, tools, apparatus and other means of construction, and to do all the work and furnish all the materials specified in the contract, in the manner and time therein prescribed, and according to the requirements of payment therefore the following item prices to wit:

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**650 Imperial Way HVAC Upgrade
PW 18-03**

ITEM NO.	DESCRIPTION	UNIT	QUANTITY	TOTAL
BASE BID				
1	Demolition	LS	1	
	Remove (E) HVAC Unit – Roof (AC-3)			
	Mechanical Demolition (Unit & Ductwork – VAV)			
	Equipment Controller demolition (AC-1, AC-2, AC-3, HU-1, HU-2, HU-3)			
	Demolition of (8) VAV Thermostats			
2	HVAC	LS	1	
	AC-3			
	Condensate Drain (RTU – Roof)			
	Roof Curb and Support			
	New AC-1, AC-2, AC-3, HU-1, HU-2, HU-3 DDC Controls			
	Diffusers and Grills			
	HVAC Ductwork			
	HVAC Duct Insulation			
	Fresh Air Ductwork			
	Start-Up			
	Air Balance			
	Title 24 Acceptance Forms			
Base Bid Total:				
TOTAL BASE BID (WRITTEN):				
				and /100 DOLLARS
BID ALTERNATE				
1	Demolition	LS	1	
	Remove (E) Reznor Heating Unit - Roof			
	Mechanical Demolition (Unit & Ductwork – VAV)			
	Mechanical Demolition (Unit & Ductwork – By-Pass VAV Terminal)			
	Remove (E) Dual Duct – Hot Deck Ductwork			
2	HVAC	LS	1	

	HU-1			
	HU-2			
	HU-3			
	Roof Curb and Support			
	Air Balance (HU)			
	Start-Up			
Bid Alternate Total:				
TOTAL BID ALTERNATE (WRITTEN):				
				and /100 DOLLARS

 *Authorized Signature Name Title

* If a corporation, this document must be signed by two corporate officers. The first signature must be either the Chairman of the Board, President, or any Vice President. The second signature must be the Secretary, an Assistant Secretary, the Chief Financial Officer, or any Assistant Treasurer. **In the alternative, a single corporate signature is acceptable when accompanied by a corporate document demonstrating the legal authority of the signature to bind the company.**

INSTRUCTIONS TO CONTRACTORS

The Bid and Determining Low Bidder.

Bids are required for the entire work. The amount of the bid for comparison purposes will be the Total Base Bid.

The contractor shall set forth for each item of work, in clearly legible figures, as item price and a total for the item in the respective spaces provided for this purpose. In the case of unit basis items, the amount set forth under the "Total" column shall be the extension of the item price bid on the basis of the estimated quantity for the item.

In case of a discrepancy between the item price and the total set forth for the item, the item price shall prevail, provided, however, if the amount set forth as an item price is ambiguous, unintelligible or uncertain for any cause, or is omitted, or in the case of unit basis items, is the same amount as the entry in the "Total" column, then the amount set forth in the "Total" column for the item shall prevail in accordance with the following:

- 1) As to lump sum items, the amount set forth in the "Total" column shall be the item price.
- 2) As to unit basis items, the amount set forth in the "Total" column shall be divided by the estimated quantity for the item and the price thus obtained shall be the item price.

In case of a discrepancy between the Total Lump Sum Bid and the calculated total of the amounts in the "Total" column for each line item determined after using the above procedures for resolving the discrepancies, the calculated total of the amounts set forth in the "Total" column for shall become the Total Lump Sum Bid and shall be used for comparison purposes in determining the lowest bid.

It is understood and agreed that the quantities of work under each item are approximate only, being given for a basis of comparison of proposal, and the right is reserved to the County to increase or decrease the amount of work under any item as may be required, in accordance with provisions set forth in the specifications for this project.

It is further understood and agreed that the total amount bid for the project does not constitute an agreement to pay a lump sum for the work unless it specifically so states.

If this proposal shall be accepted and the undersigned shall fail to contract as aforesaid and to give the two bonds in the sums to be determined as aforesaid, with surety satisfactory to the Director of Public Works within eight (8) days, not including Saturdays, Sundays and legal holidays, after the contractor has received notice from the County Engineer that the contract has been awarded to him, the Director of Public Works may, at its option, determine that the contractor has abandoned the contract, and thereupon this proposal, and the acceptance thereof shall be null and void, and the forfeiture of such security accompanying this proposal shall operate and the same shall be the property of Napa County.

Form of Bid.

- (1) To receive consideration, bids shall be made on the forms and in the manner set forth in the Notice to Contractors.

(2) Bids received after the date and time advertised for opening will be considered non-responsive and will be rejected.

(3) Each bid must be completed in ink, typewritten or computer generated, and all changes and/or erasures must be initialed in ink. Each bid must be signed in ink by an authorized representative of the firm.

(4) Contractors shall not change the bid form nor make additional stipulations on the bid form which are not consistent with the provisions of the specifications.

Taxes. Bid prices shall include all applicable federal, state, and local taxes.

Receipt of Bids. All bids must be received sealed in an envelope prior to the time specified in the Notice to Proposers or as amended expressly by an addendum. Late bids will not be opened and will not be considered under any circumstances.

Postponement of Opening. The County reserves the right to postpone the date and time for receiving and/or opening of proposals at any time prior to the date and time established in the Notice to Proposers.

Rejection of Proposals. The County reserves the right to reject any proposals which are incomplete, obscure, or irregular, any proposals which omit a bid on any one or more items for which bids are required; any proposals which omit unit prices if unit prices are required; any proposal in which unit prices are unbalanced in the opinion of the County; any proposals accompanied by insufficient or irregular proposal guaranty; and any proposals from contractors who have previously failed to perform properly or to complete contracts of any nature on time.

Relief of Contractors. Attention is directed to the provisions of Public Contract Code Section 5100, et seq., concerning relief of contractors, and in particular to the requirement therein that if a contractor claims a mistake was made in its bid, the contractor shall give the County written notice within five (5) calendar days after the opening of the bids of the alleged mistake, specifying in the notice, in detail, how the mistake occurred.

Bid Protest Procedures. All protesting bidders must pay a protest fee to Napa County Public Works before the protest is accepted in accordance with the Napa County Fee Policy adopted by the Board of Supervisors and last revised by Resolution 2019-70. The current Bid Protest Fee is \$903.88 as set forth in Part III Fees, Part 140 Public Works, Section 140.015 and Section 140.115(f). Any bid protest must be in writing and received by the County at 1195 Third Street, Napa, CA before 5:00 p.m. no later than five (5) working days following the occurrence giving rise to the protest (the "Bid Protest Deadline") shall be considered pursuant to the procedures set forth in Section 10 of the County Purchasing Manual and must comply with the provisions of that Section and those requirements set forth below:

(1) Only a contractor who has actually submitted a Bid Proposal is eligible to submit a bid protest against another contractor. Subcontractors are not eligible to submit bid protests. A contractor may not rely on the bid protest submitted by another contractor, but must timely pursue its own protest.

(2) The bid protest must contain a complete statement of the basis for the protest and all supporting documentation. Material submitted after the Bid Protest Deadline will not be considered. The protest must refer to the specific portion or portions of the Contract Documents upon which the protest is based. The protest must include the name, address and telephone number of the person representing the protesting contractor if different from the protesting contractor.

(3) The party filing the protest shall concurrently transmit a copy of the protest and all supporting documents by fax or by e-mail, by or before the Bid Protest Deadline, to the protested contractor and any other contractor who has a reasonable prospect of receiving an award depending upon the outcome of the protest.

(4) The protested contractor may submit a written response to the protest, provided the response is received by the County before 5:00 p.m., within two (2) working days after the Bid Protest Deadline or after receipt of the bid protest, whichever is sooner (the "Response Deadline"). The response must include all supporting documentation. Material submitted after the Response Deadline will not be considered. The response must include the name, address and telephone number of the person representing the protested contractor if different from the protested contractor.

(5) A copy of the protest and all supporting documents must also be transmitted by fax or by e-mail, by or before the Bid Protest Deadline, to the protested contractor and any other contractor who has a reasonable prospect of receiving an award depending upon the outcome of the protest.

(6) The procedure and time limits set forth in this section are mandatory and are the contractor's sole and exclusive remedy in the event of bid protest. The contractor's failure to comply with these procedures shall constitute a waiver of any right to further pursue a bid protest, including filing a Government Code Claim or initiation of legal proceedings.

It is the intention of the County to award a contract, if at all, to the lowest contractor who demonstrates the attributes of trustworthiness, as well as quality, fitness (including financial qualifications), capacity and experience to enable it to prosecute the work successfully and properly, and to complete the work within the time period named in the Contract Documents.

To determine responsibility, the County will weigh any evidence that the contractor has performed satisfactorily other contracts of like nature and magnitude, and comparable difficulty and rates of progress, to the Work. The County shall have sole discretion to determine what contracts are of like nature and magnitude, and comparable difficulty and rates of progress.

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NONCOLLUSION DECLARATION TO BE EXECUTED
BY CONTRACTOR AND SUBMITTED WITH BID

"I, _____, hereby declare as follows: that he or she is _____ of _____ the party making the foregoing bid that the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the contractor has not directly or indirectly induced or solicited any other contractor to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any contractor or anyone else to put in a sham bid, or that anyone shall refrain from bidding, that the contractor has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the contractor or any other contractor, or to fix any overhead, profit, or cost element of the bid price, or of that of any other contractor, or to secure any advantage against the public body awarding contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and, further, that the contractor 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 certify and declare under penalty of perjury that the foregoing is true and correct.

Executed on _____ at _____
(DATE) (PLACE)

SIGNATURE

Accompanying this proposal is a _____
[Insert the words "cashier's check", "certified check", or "contractor's bond" as the case may be.]
A personal check is not an acceptable form of security.]
in an equal amount to at least ten percent of total bid.

The names of all persons interested in the foregoing proposal as principals are as follows:

IMPORTANT NOTICE: If contractor or other interested person is a corporation, state legal name of corporation, also names of the president, secretary, treasurer and manager thereof; if a copartnership, state true name of firm, also names of all individual copartners comprising the firm; if contractor or other interested person is an individual, state first and last names in full.

Licensed in accordance with an act providing for the registration of Contractors License No. _____
Expiration Date _____ Classification _____

Signature of contractor

NOTE; if contractor is corporation, the legal name of the corporation shall be set forth above together with the signature of the officer or officer authorized to sign contracts on behalf of the corporation; if contractor is a co partnership, the true name of the firm shall be set forth above together with the signature of the partner or partners authorized to sign contracts in behalf of the co partnership; and if contractor is an individual, his signature shall be placed above. If signature is by an agent other than an officer of a corporation or a member of a partnership, a Power of Attorney must be on file with the County prior to opening bids or submitted with the bid; otherwise, the bid will be disregarded as irregular and unauthorized.

Business Address _____

Place of Residence _____

Dated _____, 2020 Phone _____

ADDENDUM ACKNOWLEDGEMENT

Contractor acknowledges receipt of the following addendums which are attached to the proposal:

Addendum No. _____ Date _____

Note: Bid Bonds to be on this form or on a form supplied by a licensed surety insurer

**CONTRACTORS BOND
NAPA COUNTY
STATE OF CALIFORNIA**

KNOW ALL PERSONS BY THESE PRESENTS,

That we _____

_____ as PRINCIPAL, and

_____ as SURETY,

are held and firmly bound unto NAPA COUNTY, hereinafter called the COUNTY, in the penal sum of TEN PERCENT (10%) OF THE TOTAL AMOUNT OF THE BID of the Principal above named, submitted by said Principal to the Napa County Board of Supervisor, for the work described below, for the payment of which sum in lawful money of the United States, 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 \$

THE CONDITION OF THIS OBLIGATION IS SUCH THAT WHEREAS the Principal has submitted the above mentioned bid to the Board of Supervisors of the County of Napa for the in Napa County, in accordance with the Specifications entitled **Mt. Veeder Road Bridge MPM 2.13, RDS 20-26** and the Standard Specifications of the State of California, Department of Transportation, dated, 2015, therefore, heretofore adopted by the Napa County Board of Supervisors.

NOW THEREFORE, if the aforesaid Principal is awarded the contract and within the time and manner required under the Specifications, after the prescribed forms are presented to him for signature, enter into a written contract, in the prescribed form, in accordance with the bid, and files and two bonds with the Clerk of the Board of Supervisors, one to guarantee faithful

performance and the other to guarantee payment for labor and materials, as required by law, then this obligation shall be null and void; otherwise, it shall be and remain in full force and virtue.

In the event suit is brought upon this bond by the Obligee and judgment is recovered, the surety shall pay all cost incurred by the obligee in such suit, including a reasonable attorney's fee to be fixed by the court.

SEALED with our seals and dated this ___ day of _____, _____.

Principal (contractor):

Surety:

By: _____

By: _____, Attorney in Fact

By: _____

Signatures for Principal and Surety must be acknowledged before a Notary Public

APPROVED AS TO FORM: THOMAS CAPRIOLA,
Napa County Counsel

By: _____

**NAPA COUNTY
PERFORMANCE BOND**

KNOW ALL PERSONS BY THESE PRESENTS THAT WE, _____,
whose address is _____ as Principal, and _____,
_____ , duly authorized under
the laws of the State of California to become sole surety on bonds and undertakings, as Surety, are jointly and severally held and
firmly bound unto NAPA COUNTY, a political subdivision of the State of California, as Oblige, in the full and just sum of
_____ **AND /100 DOLLARS**
lawful money of the United States of America, to be paid to the said Oblige, successors or assigns; for which payment, well and
truly to be made, we bind ourselves, our heirs, executors, successors, administrators and assigns, jointly and severally, firmly by
these presents.

THE CONDITION of the foregoing obligation is such that; whereas, the above bounden Principal has entered into a contract, or
is about to enter into a contract with the Oblige to do and perform the following work, to-wit: **650 Imperial Way HVAC
Upgrade, PW 18-03** as is more specifically set forth in said contract, to which contract reference is hereby made.

NOW, THEREFORE, if the said Principal shall well and truly do the said work, and fulfill each and every of the covenants,
conditions and requirements of the said contract in accordance with the plans and specifications, then the above obligation shall be
null and void, otherwise is shall remain in full force and effect.

THE SURETY does hereby consent to any and all alterations, modifications and revisions to the agreement secured by this bond
including but not limited to, any extension of time for performance or modifications in manner of performance which may be
agreed upon and between NAPA COUNTY as Oblige and the Principal, and the Surety does hereby waive notice of any
alterations, modifications, revisions, or extensions.

SEALED with our seals and dated this _____ day of _____, 2020.

Principal (contractor):

Surety:

By: _____

By: _____, Attorney in
Fact

By: _____

Signatures for Principal and Surety must be acknowledged before Notary Public

APPROVED AS TO FORM:
Napa County Counsel

By: _____
Thomas Capriola, Napa County Counsel

**NAPA COUNTY
LABOR AND MATERIAL BOND**

KNOW ALL PERSONS BY THESE PRESENTS THAT WE, _____, as Principal, and _____ duly authorized under the laws of the State of California to become sole surety on bonds and undertakings, as Surety, are held and firmly bound unto any and all materialmen, persons, companies or corporations furnishing materials, provisions, provender or other supplies used in, upon, for or about the performance of the work contracted to be executed or performed under the contract hereinafter mentioned, and all persons, companies or corporations renting or hiring teams, or implements or machinery, for or contributing to said work to be done, and all persons who performed work or labor upon the same, and whose claim has not been paid by the contractor, company or corporation, in the just and full sum of _____ **AND /100 DOLLARS** for the payment whereof, well and truly to be made, said Principal and Surety bind themselves, their heirs, administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION of the foregoing obligation is such that; whereas the above bounden principal has entered into a contract, or is about to enter into a contract with NAPA COUNTY, a political subdivision of the State of California, to do and perform the following work, to-wit: **650 Imperial Way HVAC Upgrade, PW 18-03.**

NOW THEREFORE, if the above bounden Principal, contractor, person, company or corporation, or his or its subcontractor fails to pay for any materials, provisions, provender, other supplies, or terms used in, upon for or about the performance of the work contracted to be done, or for any work or labor done thereon of any kind, or for amounts due under the Unemployment Insurance Act 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 or the subcontractors of the Principal pursuant to Section 13020 of the Unemployment Insurance Code with respect to the work and labor, then the Surety of this bond will pay the same, in an amount not exceeding the sum specified in this bond as well as a reasonable attorney's fee, which shall be fixed and awarded by the court to the prevailing party in said suit, said attorney's fee to be taxed as costs in said suit and to be included in the judgment therein rendered.

THE SURETY does hereby consent to any and all alterations, modifications and revisions to the contract above referred to, and work and labor under which is secured by this bond, including but not limited to, any extension of time for performance or modifications in manner of performance which may be agreed upon by and between NAPA COUNTY and the Principal, and the Surety does hereby waive notice of any alterations, modifications, revisions, or extensions.

THIS BOND is executed and filed to comply with the provisions of the act of Legislature of the State of California as designated in Civil Code 9550 et seq., inclusive, and all amendments thereto and shall inure to the benefit of any of the persons named in Civil Code section 9100 so as to give a right of action to those person or their assigns in any suit brought upon the bond.

SEALED with our seals and dated this _____ day of _____, 2020.

Principal (contractor):

Surety:

By: _____

By: _____, Attorney in Fact

By: _____

Signatures for Principal and Surety must be acknowledged before Notary Public

APPROVED AS TO FORM:
Napa County Counsel

By: _____

SPECIAL PROVISIONS- SECTION “A” GENERAL CONDITIONS

1. LOCATION

The project will be commenced at the following Napa county facility:

- 650 Imperial Way.

2. DESCRIPTION OF WORK

The work in general consists of, but is not limited to supplying all labor and materials to replace one existing HVAC rooftop unit with a larger unit as well as existing single duct variable air volume (VAV) boxes to dual duct boxes and associated ductwork as shown on the plans entitled “650 Imperial Way HVAC Systems Upgrade Project, PW 18-03” and these specifications.

3. DEFINITIONS AND TERMS

The following terms when used in these Special Provisions or in the Standard Specifications shall have the following meanings when used in this Contract:

Contractor. The person or entity described as "Contractor" in the preamble to this Contract.

County. Napa County, a political subdivision of the State of California.

Days. As used in these special provisions, days shall mean working days.

Department of Transportation. The Board of Supervisors of Napa County, State of California, acting by and through its Director of Public Works.

Department. The Napa County Department of Public Works.

Director of Transportation. The Napa County Public Works Director.

Engineer or County Engineer. The Napa County Public Works Director, acting either directly or through properly authorized agents, such agents acting within the scope of the particular duties entrusted to them.

Laboratory. The established laboratory of the Materials and Research licensed and certified by the Department of Transportation of the State of California or laboratories authorized by the Engineer to test materials and work involved in the contract.

Owner. Napa County.

State of California. Napa County.

Transportation Building, Napa County Administration Building, 1195 Third Street, Suite 101, Napa, California 94559.

State Highway Engineer. The Napa County Public Works Director, acting either directly or through properly authorized agents, such agents acting within the scope of the particular duties entrusted to them.

Standard Specifications. The 2018 edition of the Standard Specifications of the State of California, Department of Transportation. Any reference therein to the State of California or a State agency, office or officer shall be interpreted to refer to the County or its corresponding agency, office or officer acting under this contract.

4. CONTRACT DOCUMENTS

The Contract Documents shall include the Notice to Contractors, Proposal Form, bonds, these special provisions, the Standard Specifications of the State of California and the Standard Plans of the State of California, Department of Transportation, dated 2018 insofar as same may apply, and pertinent portions of other documents included by reference thereto in the Special Provisions or the Contract pages.

5. CONTRACTOR LICENSE

The Contractor must be properly licensed as a contractor from contract award through Contract acceptance (Public Contract Code § 10164).

6. DIFFERING SITE CONDITIONS

23 CFR 635.109 is made a part of this contract and incorporated herein by reference.

a. Contractor's Notification

Promptly notify the County's Engineer if you find either of the following conditions:

1. Physical conditions differing materially from either of the following:
 - Contract documents
 - Job site examination
2. Physical conditions of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in the work provided for in the Contract

Include details explaining the information you relied on and the material differences you discovered.

If you fail to promptly notify the Engineer, you waive the differing site condition claim for the period between your discovery of the differing site condition and your notification to the Engineer.

If you disturb the site after discovery and before the Engineer's investigation, you waive the differing site condition claim.

b. Engineer's Investigation and Decision (Standard Specifications 4-1.06C)

Upon your notification, the Engineer investigates job site conditions and:

1. Notifies you whether to resume affected work;
2. Decides whether the condition differs materially and is cause for an adjustment of time, payment, or both.

7. BEGINNING OF WORK, TIME OF COMPLETION AND LIQUIDATED DAMAGES

Attention is directed to all of the provisions of Section 8, "Prosecution and Progress," of the Standard Specifications and these Special Provisions.

The Contractor shall begin work within **five (5) calendar days** after receiving notice that the contract has been executed and approved by the County (Notice to Proceed).

This work shall be diligently prosecuted to completion before the expiration of **One Hundred and Thirty (130) WORKING DAYS** beginning the day of issuance of Notice to Proceed. Contractor shall maintain adequate work force and diligently prosecute work to completion.

Attention is directed to the provisions of Section 8-1.10, "Liquidated Damages," of the Standard Specifications and these Special Provisions. The Contractor shall pay to Napa County the sum of **THREE THOUSAND FIVE HUNDRED DOLLARS (\$3,500)** per day for each and every calendar day delay in finishing the work in excess of the number of working days prescribed above and any extension of time granted.

8. QUALITY ASSURANCE

The County uses a Quality Assurance Program (QAP) to ensure a material is produced to comply with the Contract.

You may examine the records and reports of tests the County performs if they are available at the job site.

Schedule work to allow time for QAP.

9. PROMPT PAYMENT OF FUNDS WITHHELD TO SUBCONTRACTORS

The County shall hold retainage from the prime contractor and shall make prompt and regular incremental acceptances of portions, as determined by the County, of the contract work, and pay retainage to the prime contractor based on these acceptances. The prime contractor, or subcontractor, shall return all monies withheld in retention from a subcontractor within 30 days after receiving payment for work satisfactorily completed and accepted including incremental acceptances of portions of the contract work by the County. Federal law (49 CFR26.29) requires that any delay or postponement of payment over 30 days may take place only for good cause and with the County's prior written approval. Any violation of this provision shall subject the violating prime contractor or subcontractor to the penalties, sanctions and other remedies specified in Section 7108.5 of the Business and Professions Code. These requirements shall not be construed to limit or impair any contractual, administrative, or judicial remedies otherwise available to the prime contractor or subcontractor in the event of a dispute involving late payment or nonpayment by the prime contractor, deficient subcontract performance, or noncompliance by a subcontractor.

10. SUBCONTRACTING

Attention is directed to Section 5-1.13, "Subcontracting," of the Standard Specifications.

11. PREVAILING WAGES

The Project is a "public works" as defined in the California Labor Code. The Contractor shall comply with all State prevailing wage requirements, including but not limited to, those set forth in Exhibit "A" at the end of these General Conditions, California Prevailing Wage Requirements.

12. CERTIFIED PAYROLL RECORDS

Special Attention is directed to the provisions of Section 7-1.02K(3), "Certified Payroll Records," of the Standard Specifications. A copy of all payrolls shall be submitted weekly to the Engineer. Payrolls shall contain the full name, address and social security number of each employee, his correct classification, rate of pay, daily and weekly number of hours worked, itemized deductions made and actual wages paid. They shall also indicate apprentices and ratio of apprentices to journeymen. The employee's address and social security number need only appear on the first payroll on which his name appears. The payroll shall be accompanied by a "Statement of Compliance" signed by the employer or his agent indicating that the payrolls are correct and complete and that the wage rates contained therein are not less than those required by the contract. The "Statement of Compliance" shall be on forms furnished by the Department or on any form with identical wording. The Contractor shall be responsible for the submission of copies of payrolls of all subcontractors. Failure to submit will delay processing of progress payments.

13. BIDDING REQUIREMENTS AND CONDITIONS

Attention is directed to Section 2, "Bidding," of the Standard Specifications and these Special Provisions.

- (a) Examination of Site. Each bidder shall have examined the site of the work before bidding so he shall have full knowledge of all facilities and difficulties affecting the work which may not be particularly described herein. No variation or allowance from the contract sum will be made because of lack of such examination or knowledge.
- (b) State Contract Act. The State Contract Act is not applicable to contracts involving political subdivisions of the State of California. Pre-qualification of bidders will not be required.
- (c) Joint Venture. If two or more Bidders desire to bid jointly on a single project or desire to combine their assets for so doing, they must file an affidavit of joint venture with the County Engineer, and such affidavit of joint venture will be valid only for the specific project for which it is filed. If such affidavit of joint venture is not filed as aforesaid and approved by the Engineer prior to the time for opening bids on the specific projects for which it is submitted, a joint bid submitted by the said Bidders will be disregarded.
- (d) Registered and Qualified – California Labor Code § 1771.1. A contractor or subcontractor shall not be qualified to bid on, be listed in a bid proposal, subject to the requirements of Section 4104 of the Public Contract Code, or engage in the performance of any contract for public work, as defined in this chapter, unless currently registered and qualified to perform

public work pursuant to Section 1725.5. It is not a violation of this section for an unregistered contractor to submit a bid that is authorized by Section 7029.1 of the Business and Professions Code or by Section 10164 or 20103.5 of the Public Contract Code, provided the contractor is registered to perform public work pursuant to Section 1725.5 at the time the contract is awarded.

14. CONTRACT AWARD AND EXECUTION (Bonds)

Attention is directed to Section 3, "Contract Award and Execution," of the Standard Specifications, contract bonds. In-lieu of the bonds specified under Section 3-1.05 of the Standard Specifications, the successful bidder shall furnish a faithful Performance Bond as required by Section 20129 of the Public Contract Code in an amount equal to one hundred percent (100%) of the contract price of the work contemplated and the laborer's and material man's payment bond as required by Section 8182 of the Civil Code in an amount equal to one hundred percent (100%) of the contract price of the work contemplated.

If the County awards the contract, the award is made to the lowest responsive and responsible contractor. Additional details are set forth in the proposal form. The contractor shall ensure that the bid is valid for 60 days from bid opening.

15. SCOPE OF WORK

Attention is directed to Section 4, "Scope of Work," of the Standard Specifications.

The intent of the plans and specifications is to cover the entire project ready for use when completed. The Contractor shall accomplish complete installation of facilities, and any other required items to make the unit complete. All units, facilities, etc., shall be in operating condition to the approval of the Engineer. The quantities and items listed in the proposal form and contract form are given as a basis for the comparison of bid and the Board of Supervisors does not, expressly or by implication, agree that the actual amount of work will correspond therewith, but reserves the right to increase or decrease the amount of any class or portion of the work, or to omit portions of the work as may be deemed necessary or expedient by the Engineer.

16. CHANGE ORDERS

(a) Limitations Where Contract Price Changes are Involved.

i. Overhead and Profit for the Contractor. The Contractor's overhead and profit on the cost of subcontracts shall be a sum not exceeding ten percent (10%) of such costs. The Contractor's overhead and profit on the costs of work performed by the Contractor shall be a sum not exceeding fifteen percent (15%) of such costs. Overhead and profit shall not be applied to the cost of taxes and insurance by Contractor or Subcontractors or to credits. No processing or similar fees may be charged by the Contractor in connection with the Modification.

ii. Bond Premiums. The actual rate of bond premiums as paid on the total cost (including taxes) will be allowed, but with no markup for profit and overhead.

iii. Taxes. State and city sales taxes should be indicated.

(b) Procedure. Attention is directed to Section 4-1.05 of the Standard Specifications.

(c) Authorized Representative / Limits. No Change Order shall be valid or binding against COUNTY unless such Change Order has been executed in writing by (1) COUNTY's Director of Public Works consistent with the authority granted to him by the Board of Supervisors pursuant to the limitations set forth under Napa County Resolution No. 2011-18 and Public Contract Code Section 20142, or (2) by the Board of Supervisors.

17. CONTROL OF THE WORK

Attention is directed to Section 5 of the Standard Specifications and these Special provisions. After contract approval, submit documents and direct questions in writing to the Engineer.

(a) 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 is found or confusion arises, request correction or clarification in writing. Any deviations from the approved Plans and Specifications shall be approved by the Engineer and all changes shall be by written permission only.

(b) Acceptance of Contract. Attention is directed to Section 5-1.46, "Final Inspection and Contract Acceptance," of the Standard Specifications and these Special provisions. Acceptance will consist of the execution and filing with the County Recorder of a Notice of Completion as defined in Civil Code Section 8182. Should it become necessary due to developed conditions to occupy any portion of the work before the contract is fully completed, such occupancy shall not constitute acceptance.

18. LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

Attention is directed to Section 7 of the Standard Specifications and these Special Provisions.

Comply with laws, regulations, orders, and decrees applicable to the project. Immediately report to the Engineer in writing any discrepancy or inconsistency between the contract and a law, regulation, order, and decree.

(a) Prevailing Wages. See Section 21 and 22 of these Special Provisions.

(b) Public Convenience and Public Safety.

Attention is directed to Section 7-1.03 and Section 7.1.04 of the Standard Specifications and these Special Provisions.

(1) Safety Devices. Furnishing and maintenance of safety devices shall be the responsibility of the Contractor at all times. The Contractor shall respond promptly to correct improper conditions or inoperative devices. Failure to inspect and maintain all necessary safety devices in proper operating condition when in use, or failure to respond promptly to notification of improperly operating equipment, will be sufficient cause for suspension of the contract until such defects are corrected or termination as otherwise provided in this Contract.

(2) Material Safety Data Sheets (MSDS) – The Contractor shall provide MSDS for each product used on site upon request by the Engineer.

(3) Safety Standards; Suspension of Contract for Unsafe Equipment. The Contractor shall comply with all the applicable provisions of the United States Department of Labor Occupational Safety and Health Act (OSHA), State of California Division of Industrial Safety, Title 8, Safety Orders (Cal-OSHA), the Federal Aviation Administration (FAA) and any other applicable codes and regulations. If, in the opinion of the Engineer, any operation or piece of equipment that is observed by the Engineer appears to be unsafe, the Engineer may immediately halt that portion of the work until the hazard is corrected to the satisfaction of the Engineer and no time extension or additional compensation shall be granted for the time lost due to said halting of the work.

(c) Hold Harmless/Indemnification. To the full extent permitted by law, Contractor shall hold harmless, defend at its own expense, and indemnify COUNTY and the officers, agents, employees and volunteers of County from any and all liability, claims, losses, damages or expenses, including reasonable attorney's fees, for personal injury (including death) or damage to property, arising from all acts or omissions to act of Contractor or its officers, agents, employees, volunteers, contractors and subcontractors in rendering services under this Agreement, excluding, however, such liability, claims, losses, damages or expenses arising from the sole negligence or willful acts of County or its officers, agents, employees or volunteers. Each party shall notify the other party immediately in writing of any claim or damage related to activities performed under this Agreement. The parties shall cooperate with each other in the investigation and disposition of any claim arising out of the activities under this Agreement, providing that nothing shall require either party to disclose any documents, records or communications that are protected under peer review privilege, attorney-client privilege, or attorney work product privilege.

(d) Insurance. Contractor shall obtain and maintain in full force and effect throughout the term of this Agreement, and thereafter as to matters occurring during the term of this Agreement, the following insurance coverage:

(1) Workers' Compensation insurance. To the extent required by law during the term of this Agreement, CONTRACTOR shall provide workers' compensation insurance for the performance of any of CONTRACTOR's duties under this Agreement, including but not limited to, coverage for workers' compensation and employer's liability and a waiver of subrogation against COUNTY and the Construction Management consultant, and shall provide COUNTY with certification of all such coverages upon request by COUNTY's Risk Manager.

(2) Liability insurance. CONTRACTOR shall obtain and maintain in full force and effect during the term of this Agreement the following liability insurance coverages, issued by a company admitted to do business in California and having an A.M. Best rating of A:VII or better or equivalent self-insurance:

(i) General Liability. Commercial general liability [CGL] insurance coverage (personal injury and property damage) of not less than FIVE MILLION DOLLARS (\$5,000,000) combined single limit per occurrence, covering liability or claims for any personal injury, including death, to any person and/or damage to the property of any person arising from the acts or omissions of CONTRACTOR or any officer, agent, or employee of CONTRACTOR under this Agreement. If the coverage includes an aggregate limit, the aggregate limit shall be no less than twice the

occurrence limit.

(ii) Comprehensive Automobile Liability Insurance. Comprehensive automobile liability insurance (Bodily Injury and Property Damage) on owned, hired, leased and non-owned vehicles used in conjunction with CONTRACTOR's business of not less than ONE MILLION DOLLARS (\$1,000,000) combined single limit per occurrence. If the coverage includes an aggregate limit, the aggregate limit shall be no less than twice the occurrence limit.

(3) Certificates. All insurance coverages referenced in (2), above, shall be evidenced by one or more certificates of coverage or, with the consent of COUNTY's Risk Manager demonstrated by other evidence of coverage acceptable to COUNTY's Risk Manager, which shall be filed by CONTRACTOR with the DEPARTMENT OF PUBLIC WORKS prior to commencement of performance of any of Contractor's duties; shall reference this Agreement by its COUNTY number or title and department; shall be kept current during the term of this Agreement; shall provide that COUNTY shall be given no less than thirty (30) days prior written notice of any non-renewal, cancellation, other termination, or material change, except that only ten (10) days prior written notice shall be required where the cause of non-renewal or cancellation is non-payment of premium; and shall provide that the inclusion of more than one insured shall not operate to impair the rights of one insured against another insured, the coverage afforded applying as though separate policies had been issued to each insured, but the inclusion of more than one insured shall not operate to increase the limits of the company's liability. For the commercial general liability insurance coverage referenced in (2)(i), and, where the vehicles area covered by a commercial policy rather than a personal policy, for the comprehensive automobile liability insurance coverage referenced in (2)(ii) CONTRACTOR shall also file with the evidence of coverage and endorsement from the insurance provider naming COUNTY, their officers employees, agents and volunteers as well as the STATE OF CALIFORNIA as additional insureds and waiving subrogation, and the certificate or other evidence of coverage shall provide that if the same policy applies to activities of CONTRACTOR not covered by this Agreement then the limits in the applicable certificate relating to the additional insured coverage of COUNTY shall pertain only to liability for activities of CONTRACTOR under this Agreement, and that the insurance provided is primary coverage to COUNTY with respect to any insurance or self-insurance programs maintained by COUNTY. The additional insured endorsements for the general liability coverage shall use Insurance Services Office (ISO) Form No. CG 20 09 11 85 or CG 20 10 11 85, or equivalent including (if used together) CG 2010 10 01 and CG 2037 10 01; but shall not use the following forms: CG 20 10 10 93 or 03 94. Upon request of COUNTY's Risk Manager, CONTRACTOR shall provide or arrange for the insured to provide within thirty (30) days of the request, certified copies of the actual insurance policies or relevant portions thereof.

(4) Deductibles/Retentions. Any deductibles or self-insured retentions shall be declared to, and be approved by, COUNTY's Risk Manager, which approval shall not be denied unless the COUNTY's Risk Manager determines that the deductibles or self-insured retentions are unreasonably large in relation to compensation payable under this Agreement and the risks of liability associated with the activities required of CONTRACTOR by this Agreement. At the option of and upon request by COUNTY's Risk Manager if the Risk Manager determines that such deductibles or retentions are unreasonably high, either the

insurer shall reduce or eliminate such deductibles or self-insurance retentions as respects COUNTY, its officers, employees, agents and volunteers or CONTRACTOR shall procure a bond guaranteeing payment of losses and related investigations, claims administration and defense expenses.

19. PROSECUTION AND PROGRESS

Attention is directed to Section 8, "Prosecution and Progress," of the Standard Specifications, and these Special Provisions.

(a) Preconstruction Meeting

Prior to the commencement of work at the site, a Preconstruction meeting will be held at a mutually agreed time and place which shall be attended by the Contractor, its Superintendent, and its subcontractors as appropriate.

The conference is required to familiarize all authorized persons involved with policies, regulations and procedures and to discuss construction operations and methods in order to avoid any misunderstanding or conflicts during construction.

Unless previously submitted to the Engineer, the Contractor shall bring to the preconstruction meeting six (6) copies each of the following:

1. Draft Construction Schedule.
2. Procurement schedule of major equipment and materials and items requiring long lead time.
3. Shop Drawing/Sample/submittal schedule.
4. Schedule of values (lump sum price breakdown) for progress payment purposes.
5. The Temporary Traffic Control Plan for Engineers review
6. Substitution Requests
7. Letter of Responsibility designating emergency contacts for the Contractor after business hours.

(b) Progress Meetings

The Contractor shall schedule and hold regular on site progress meetings at least weekly and at other times as requested by Engineer. The Contractor, Engineer, Inspector, and all subcontractors active on the site shall be represented at each meeting. The Contractor or Engineer may at its discretion request attendance by the Contractor's suppliers, manufacturer's, and other subcontractors.

The County shall provide for keeping and distribution of the minutes. The purpose of the meetings will be to review the progress of the Work, maintain coordination of efforts, discuss changes in scheduling, and resolve other problems which may develop.

(c) Construction Schedule and Progress Schedule

The contractor, promptly after being awarded the contract or upon receiving notice of intent to award, shall prepare and submit a baseline construction schedule for the work. The baseline schedule shall not exceed the number of contract working days. The baseline schedule must

include the entire scope of work and demonstrate how the contractor plans to complete all work contemplated and shall provide for expeditious and practicable execution of the work.

The Contractor shall also incorporate all required permit conditions and other coordination into the schedule.

Progress schedules shall be updated and submitted on a weekly basis thereafter. The progress schedule shall be revised at appropriate intervals as required by the conditions of the work and project or when requested in writing by the Engineer. The Contractor shall perform the work in general accordance with the most recent schedules submitted to the Engineer.

(d) Schedule of Submittals

A schedule of submittals shall be provided to the Engineer at the preconstruction meeting. The Contractor shall keep the submittal schedule up to date and ensure that it coordinates with the construction schedule, with adequate time for the Engineer to review the submittals.

(e) Termination of Contract. Attention is directed Section 8-1.13 of the Standard Specifications and these Special provisions.

Whenever, in the opinion of the Board of Supervisors the said work is neglected by the Contractor, or the same is not prosecuted with the diligence and force specified, meant and intended in and by the terms of this contract, it shall be lawful for the Board of Supervisors to make a requisition upon the Contractor for such additional specific force or such additional specific material to be brought into the work under this contract or to remove improper material from the grounds, and its due and faithful fulfillment requires; of which action of the Board of Supervisors due notice in writing of not less than five days shall be served upon the Contractor or his agent having charge of the work; and if the Contractor fails to comply with such requisition within five days, it shall be lawful for the Board of Supervisors to employ upon such work the additional force or supply the materials as specifically required as aforesaid; and the amount paid for such additional force or material shall be charged against the Contractor and be deducted from his next or subsequent estimate and payment, or the same or any part thereof not so deducted may be recovered from the Contractor or his sureties.

Moreover, if the Contractor fails to comply with such requisition within five days, the Board of Supervisors may declare the contract terminated and may itself proceed to complete the work herein specified or may engage any other person or persons to do the same. Upon the completion of such work, the said Board of Supervisors through its proper office or officers shall cause a statement to be made of the default of the Contractor as aforesaid, and in completing the work itself or by any other person or persons. Should the amount in such statement be more than the amount would have been due the Contractor upon the completion of the work by him, the difference shall be paid by the Contractor to Napa County.

20. TERMINATION FOR CONVENIENCE OF THE COUNTY

Notwithstanding any other provision of this Agreement, County may, at any time, and without cause, terminate this Agreement in whole or in part, upon not less than seven (7) days' written notice to CONTRACTOR. Such termination shall be effected by delivery to Contractor of a

notice of termination specifying the effective date of the termination and the extent of the work to be terminated. Contractor shall immediately stop work in accordance with the notice and comply with any other direction as may be specified in the notice or as provided subsequently by County. County shall pay Contractor for the work completed prior to the effective date of the termination, and such payment shall be Contractor's sole remedy under this Agreement. Under no circumstances will Contractor be entitled to anticipatory or unearned profits, consequential damages, or other damages of any sort as a result of a termination or partial termination under this paragraph. Contractor shall insert in all subcontracts that the subcontractor shall stop work on the date of and to the extent specified in a notice of termination, and shall require subcontractors to insert the same condition in any lower tier subcontracts.

21. MEASUREMENT AND PAYMENT

Attention is directed to Section 9, "Payment," of the Standard Specifications and this Special Provisions.

Payment for the various items of the Bid Sheets, as further specified herein, shall include all compensation to be received by the Contractor for furnishing all tools, equipment, supplies, and manufactured articles, and for all labor, operations, and incidentals appurtenant to the items of work being described, as necessary to complete the various items of work as specified and shown on the Drawings, including all appurtenances thereto, and including all costs of compliance with the regulations of public agencies having jurisdiction, including Safety and Health Requirements of the California Division of Industrial Safety. No separate payment will be made for any item that is not specifically set forth in the Bid Sheet(s), and all costs therefor shall be included in the prices named in the Bid Sheet(s) for the various appurtenant items of work.

All pay line items will be paid for at the unit prices named in the Bid Sheet(s) for the respective items of work. The quantities of work or material stated as unit price items on the Bid Sheet(s) are supplied only to give an indication of the general scope of the Work; the County does not expressly nor by implication agree that the actual amount of work or material will correspond therewith, and reserves the right after award to increase or decrease the quantity of any unit price of any major item of work by an amount up to and including 25 percent of any major bid item, without a change in the unit price, and shall have the right to delete any bid item in its entirety, or to add additional bid items up to and including an aggregate total amount not to exceed 25 percent of the contract price.

Section 9-1.07 "Payment adjustments for price index fluctuations," is deleted.

(a) Force Account. Attention is directed Section 9-1.04 of the Standard Specifications and these Special Provisions.

Equipment rental rates shall be those rental rates applicable on contracts advertised by the State of California, Department of Transportation on the date of call for bids on this contract.

(b) Progress Payments. Attention is directed Section 9-1.16 of the Standard Specifications and these Special Provisions.

In lieu of Section 9-1.16 F Retentions, the County will retain 5 percent (5%) of the value of all work done and 5 percent (5%) of the value of the materials so estimated to have been furnished and delivered and unused or furnished and stored as aforesaid as part security for the fulfillment of the contract by the Contractor to the extent not inconsistent with Public Contract Code Section 20104.50; all such retentions being subject to the following statutory requirements:

Public Contract Code Section 7107. Retention proceeds; withholding disbursement

- (a) *This section is applicable with respect to all contracts entered into on or after January 1, 1993 relating to the construction of any public work of improvement.*
- (b) *The retention proceeds withheld from any payment by the public entity from the original contractor, or by the original contractor from any subcontractor, shall be subject to this section.*
- (c) *Within 60 days after the date of completion of the work of improvement, the retention withheld by the public entity shall be released. In the event of a dispute between the public entity and the original contractor, the public entity may withhold from the final payment an amount not to exceed 150 percent of the disputed amount. For purposes of this subdivision, "completion" means any of the following:*
 - (1) *The occupation, beneficial use, and enjoyment of a work of improvement, excluding any operation only for testing, startup, or commissioning, by the public agency, or its agent, accompanied by cessation of labor on the work of improvement.*
 - (2) *The acceptance by the public agency, or its agent, of the work of improvement.*
 - (3) *After the commencement of a work of improvement, a cessation of labor on the work of improvement for a continuous period of 100 days or more, due to factors beyond the control of the contractor.*
 - (4) *After the commencement of a work of improvement, a cessation of labor on the work of improvement for a continuous period of 30 days or more, if the public agency files for record a notice of cessation or a notice of completion.*
- (d) *Subject to subdivision (e), within 10 days from the time that all or any portion of the retention proceeds are received by the original contractor, the original contractor shall pay each of its subcontractors from whom retention has been withheld, each subcontractor's share of the retention received. However, if a retention payment received by the original contractor is specifically designated for a particular subcontractor, payment of the retention shall be made to the designated subcontractor, if the payment is consistent with the terms of the subcontract.*
- (e) *The original contractor may withhold from a subcontractor its portion of the retention proceeds if a bona fide dispute exists between the subcontractor and the original contractor. The amount withheld from the retention payment shall not exceed 150 percent of the estimated value of the disputed amount.*
- (f) *In the event that retention payments are not made within the time periods required by this section, the public entity or original contractor withholding the unpaid amounts shall be subject to a charge of 2 percent per month on the improperly withheld amount, in lieu of any interest otherwise due. Additionally, in any action for the collection of funds wrongfully withheld, the prevailing party shall be entitled to attorney's fees and costs.*

- (g) *If a state agency retains an amount greater than 125 percent of the estimated value of the work yet to be completed pursuant to Section 10261 of the Public Contract Code, the state agency shall distribute undisputed retention proceeds in accordance with subdivision (c). However, notwithstanding subdivision (c), if a state agency retains an amount equal to or less than 125 percent of the estimated value of the work yet to be completed, the state agency shall have 90 days in which to release undisputed retentions.*
- (h) *Any attempted waiver of the provisions of this section shall be void as against the public policy of this state.*

Public Contract Code Section 22300. Performance retentions; provision for substitute security; escrow agreement

- (a) *Provisions shall be included in any invitation for bid and in any contract documents to permit the substitution of securities for any moneys withheld by a public agency to ensure performance under a contract; however, substitution of securities provisions shall not be required in contracts in which there will be financing provided by the Farmers Home Administration of the United States Department of Agriculture pursuant to the Consolidated Farm and Rural Development Act (> 7 U.S.C. Sec. 1921 et seq.), and where federal regulations or policies, or both, do not allow the substitution of securities. At the request and expense of the contractor, securities equivalent to the amount withheld shall be deposited with the public agency, or with a state or federally chartered bank in this state as the escrow agent, who shall then pay those moneys to the contractor. Upon satisfactory completion of the contract, the securities shall be returned to the contractor.*
- (b) *Alternatively, the contractor may request and the owner shall make payment of retentions earned directly to the escrow agent at the expense of the contractor. At the expense of the contractor, the contractor may direct the investment of the payments into securities and the contractor shall receive the interest earned on the investments upon the same terms provided for in this section for securities deposited by the contractor. Upon satisfactory completion of the contract, the contractor shall receive from the escrow agent all securities, interest, and payments received by the escrow agent from the owner, pursuant to the terms of this section.*
- (c) *Securities eligible for investment under this section shall include those listed in > Section 16430 of the Government Code, bank or savings and loan certificates of deposit, interest-bearing demand deposit accounts, standby letters of credit, or any other security mutually agreed to by the contractor and the public agency. The contractor shall be the beneficial owner of any securities substituted for moneys withheld and shall receive any interest thereon. Failure to include these provisions in bid and contract documents shall void any provisions for performance retentions in a public agency contract. For purposes of this section, the term "public agency" shall include, but shall not be limited to, chartered cities.*
- (d) (1) *Any contractor who elects to receive interest on moneys withheld in retention by a public agency shall, at the request of any subcontractor, make that option available to the subcontractor regarding any moneys withheld in retention by the contractor from the subcontractor. If the contractor elects to receive interest on any moneys withheld in retention by a public agency, then the subcontractor shall receive the identical rate of interest received by the contractor on any retention moneys withheld from the subcontractor by the contractor, less any actual pro rata costs associated with*

administering and calculating that interest. In the event that the interest rate is a fluctuating rate, the rate for the subcontractor shall be determined by calculating the interest rate paid during the time that retentions were withheld from the subcontractor. If the contractor elects to substitute securities in lieu of retention, then, by mutual consent of the contractor and subcontractor, the subcontractor may substitute securities in exchange for the release of moneys held in retention by the contractor.

(2) This subdivision shall apply only to those subcontractors performing more than five percent of the contractor's total bid.

(3) No contractor shall require any subcontractor to waive any provision of this section.

(e) The Legislature hereby declares that the provisions of this section are of statewide concern and are necessary to encourage full participation by contractors and subcontractors in public contract procedures.

(f) The escrow agreement used hereunder shall be null, void, and unenforceable unless it is substantially similar to the following form:

**ESCROW AGREEMENT FOR
SECURITY DEPOSITS IN LIEU OF RETENTION**

This Escrow Agreement is

made and entered into by and between:

_____ whose address is _____
_____ hereinafter called "Owner,"
_____ whose address is _____
_____ hereinafter called " Contractor" and
_____ whose address is _____
_____ hereinafter called " Escrow Agent."

For the consideration hereinafter set forth, the Owner, Contractor, and Escrow Agent agree as follows:

(1) Pursuant to Section 22300 of the Public Contract Code of the State of California, Contractor has the option to deposit securities with Escrow Agent as a substitute for retention earnings required to be withheld by Owner pursuant to the Construction Contract entered into between the Owner and Contractor for _____ in the amount of _____ dated _____ (hereinafter referred to as the "Contract"). Alternatively, on written request of the Contractor, the Owner shall make payments of the retention earnings directly to the Escrow Agent. When the Contractor deposits the securities as a substitute for Contract earnings, the Escrow Agent shall notify the Owner within 10 days of the deposit. The market value of the securities at the time of the substitution shall be at least equal to the cash amount then required to be withheld as retention under the terms of the Contract between the Owner and Contractor. Securities shall be held in the name of _____, and shall designate the Contractor as the beneficial owner.

(2) The Owner shall make progress payments to the Contractor for those funds which otherwise would be withheld from progress payments pursuant to the Contract provisions, provided that the Escrow Agent holds securities in the form and amount specified above.

(3) When the Owner makes payment of retentions earned directly to the Escrow Agent, the Escrow Agent shall hold them for the benefit of the Contractor until the time that the escrow created under this contract is terminated. The Contractor may direct

the investment of the payments into securities. All terms and conditions of this agreement and the rights and responsibilities of the parties shall be equally applicable and binding when the Owner pays the Escrow Agent directly.

(4) Contractor shall be responsible for paying all fees for the expenses incurred by Escrow Agent in administering the Escrow Account and all expenses of the Owner. These expenses and payment terms shall be determined by the Owner, Contractor, and Escrow Agent.

(5) The interest earned on the securities or the money market accounts held in escrow and all interest earned on that interest shall be for the sole account of Contractor and shall be subject to withdrawal by Contractor at any time and from time to time without notice to the Owner.

(6) Contractor shall have the right to withdraw all or any part of the principal in the Escrow Account only by written notice to Escrow Agent accompanied by written authorization from the Owner to the Escrow Agent that Owner consents to the withdrawal of the amount sought to be withdrawn by Contractor.

(7) The Owner shall have a right to draw upon the securities in the event of default by the Contractor. Upon seven days' written notice to the Escrow Agent from the owner of the default, the Escrow Agent shall immediately convert the securities to cash and shall distribute the cash as instructed by the Owner.

(8) Upon receipt of written notification from the Owner certifying that the Contract is final and complete, and that the Contractor has complied with all requirements and procedures applicable to the Contract, Escrow Agent shall release to Contractor all securities and interest on deposit less escrow fees and charges of the Escrow Account. The escrow shall be closed immediately upon disbursement of all moneys and securities on deposit and payments of fees and charges.

(9) Escrow Agent shall rely on the written notifications from the Owner and the Contractor pursuant to Sections (5) to (8), inclusive, of this Agreement and the Owner and Contractor shall hold Escrow Agent harmless from Escrow Agent's release and disbursement of the securities and interest as set forth above.

(10) The names of the persons who are authorized to give written notice or to receive written notice on behalf of the Owner and on behalf of Contractor in connection with the foregoing, and exemplars of their respective signatures are as follows:

On behalf of Owner:

Title

Name

Signature

Address

On behalf of Contractor:

Title

Name

Signature

Address

On behalf of Escrow Agent:

Title

Name

Signature

Address

At the time the Escrow Account is opened, the Owner and Contractor shall deliver to the Escrow Agent a fully executed counterpart of this Agreement.

IN WITNESS WHEREOF, the parties have executed this Agreement by their proper officers on the date first set forth above.

“Owner”

“Contractor

Title
Title

Name

Signature

Title
Title

Name

Signature

Public Contract Code Section 20104.50 *Timely progress payments; legislative intent; interest; payment requests*

(a) (1) *It is the intent of the Legislature in enacting this section to require all local governments to pay their contractors on time so that these contractors can meet their own obligations. In requiring prompt payment by all local governments, the Legislature hereby finds and declares that the prompt payment of outstanding receipts is not merely a municipal affair, but is, instead, a matter of statewide concern.*

(2) *It is the intent of the Legislature in enacting this article to fully occupy the field of public policy relating to the prompt payment of local governments' outstanding receipts. The Legislature finds and declares that all government officials, including those in local government, must set a standard of prompt payment that any business in the private sector which may contract for services should look towards for guidance.*

(b) *Any local agency which fails to make any progress payment within 30 days after receipt of an undisputed and properly submitted payment request from a contractor on a construction contract shall pay interest to the contractor equivalent to the legal rate set forth in subdivision (a) of Section 685.010 of the Code of Civil Procedure.*

(c) *Upon receipt of a payment request, each local agency shall act in accordance with both of the following:*

(1) *Each payment request shall be reviewed by the local agency as soon as practicable after receipt for the purpose of determining that the payment request is a proper payment request.*

(2) *Any payment request determined not to be a proper payment request suitable for payment shall be returned to the contractor as soon as practicable, but not later than seven days, after receipt. A request returned pursuant to this paragraph shall be accompanied by a document setting forth in writing the reasons why the payment request is not proper.*

(d) *The number of days available to a local agency to make a payment without incurring interest pursuant to this section shall be reduced by the number of days by which a local agency exceeds the seven-day return requirement set forth in paragraph (2) of subdivision (c).*

(e) *For purposes of this article:*

(1) *A "local agency" includes, but is not limited to, a city, including a charter city, a county, and a city and county, and is any public entity subject to this part.*

(2) *A "progress payment" includes all payments due contractors, except that portion of the final payment designated by the contract as retention earnings.*

(3) *A payment request shall be considered properly executed if funds are available for payment of the payment request, and payment is not delayed due to an audit inquiry by the financial officer of the local agency.*

(f) *Each local agency shall require that this article, or summary thereof, be set forth in the terms of any contract subject to this article.*

(c) Claims. All claims under this contract shall be subject to the following statutory requirements:

Public Contract Code Section 9204 Claim resolution process for claim by contractor in connection with public works project.

(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.*

Public Contract Code Section 20104 Application of article; provisions included in plans and specifications

- (a) (1) This article applies to all public works claims of three hundred seventy-five thousand dollars (\$375,000) or less which arise between a contractor and a local agency.*
 - (2) This article shall not apply to any claims resulting from a contract between a contractor and a public agency when the public agency has elected to resolve any disputes pursuant to Article 7.1 (commencing with Section 10240) of Chapter 1 of Part 2.*
- (b) (1) "Public work" means "public works contract" as defined in Section 1101 but does not include any work or improvement contracted for by the state or the Regents of the University of California.*
 - (2) "Claim" means a separate demand by the contractor for (A) a time extension, (B) payment of money or damages arising from work done by, or on behalf of, the contractor pursuant to the contract for a public work and payment of which is not otherwise expressly provided for or the claimant is not otherwise entitled to, or (C) an amount the payment of which is disputed by the local agency.*
- (c) The provisions of this article or a summary thereof shall be set forth in the plans or specifications for any work which may give rise to a claim under this article.*
- (d) This article applies only to contracts entered into on or after January 1, 1991.*

Public Contract Code Section 20104.2 Claims; requirements, tort claims excluded

For any claim subject to this article, the following requirements apply:

- (a) The claim shall be in writing and include the documents necessary to substantiate the claim.*

Claims must be filed on or before the date of final payment. Nothing in this subdivision is intended to extend the time limit or supersede notice requirements otherwise provided by contract for the filing of claims.
- (b) (1) For claims of less than fifty thousand dollars (\$50,000), the local agency shall respond in writing to any written claim within 45 days of receipt of the claim or may request, in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses to the claim the local agency may have against the claimant.*
 - (2) If additional information is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of the local agency and the claimant.*
 - (3) The local agency's written response to the claim, as further documented, shall be submitted to the claimant within 15 days after receipt of the further documentation, or within a period of time no greater than that taken by the claimant in producing the additional information whichever is greater.*

- (c) (1) For claims of over fifty thousand dollars (\$50,000) and less than or equal to three hundred seventy-five thousand dollars (\$375,000), the local agency shall respond in writing to all written claim within 60 days of receipt of the claim, or may request in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses to the claim the local agency may have against the claimant.
- (2) If additional information is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of the local agency and the claimant.
- (3) The local agency's written response to the claim, as further documented, shall be submitted to the claimant within 30 days after receipt of the further documentation, or within a period of time no greater than that taken by the claimant in producing the additional information or requested documentation, whichever is greater.
- (d) If the claimant disputes the local agency's written response, or the local agency fails to respond within the time prescribed, the claimant may so notify the local agency, in writing, either within 15 days of receipt of the local agency's response or within 15 days of the local agency's failure to respond within the time prescribed, respectively, and demand an informal conference to meet and confer for settlement of the issues in dispute. Upon a demand, the local agency shall schedule a meet and confer conference within 30 days for settlement of the dispute.
- (e) Following the meet and confer conference, if the claim or any portion remains in dispute, the claimant may file a claim as provided in Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the Government Code. For purposes of those provisions, the running of the period of time within which a claim must be filed shall be tolled from the time the claimant submits his or her written claim pursuant to subdivision (a) until the time that claim is denied as a result of the meet and confer process, including any period of time utilized by the meet and confer process.
- (f) This article does not apply to tort claims and nothing in this article is intended nor shall be construed to change the time periods for filing tort claims or actions specified by Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the Government Code.

Public Contract Code Section 20104.4 Civil action procedures; mediation and arbitration: trial de novo: witness

The following procedures are established for all civil actions filed to resolve claims subject to this article:

- (a) Within 60 days, but no earlier than 30 days, following the filing or responsive pleadings, the court shall submit the matter to non-binding mediation unless waived by mutual stipulation of both parties. The process shall provide for the selection within 15 days by both parties of a disinterested third person as mediator, shall be commenced 30 days of the submittal, and shall be concluded within 15 days from the commencement of the mediation unless a time requirement is extended upon a good cause showing to the court or by stipulation of parties. If the parties fail to select a mediator within the 15-day period, any party may petition the court to appoint the mediator.
- (b) (1) If the matter remains in dispute, the case shall be submitted to judicial arbitration pursuant to Chapter 2.5 (commencing with Section 1141.10) of Title 3 of Part 3 of the Code of Civil Procedure, notwithstanding Section 1141.11 of that code. The Civil Discovery Act of (Article 3 (commencing with Section 2016) of Chapter 3 of Title 3

Part 4 of the Code of Civil Procedure) shall apply to any proceeding brought under this subdivision consistent with the rules pertaining to judicial arbitration.

(2) Notwithstanding any other provision of law, upon stipulation of parties, arbitrators appointed for purposes of this article shall be experienced in construction law, and, upon stipulation of the parties, mediators and arbitrators shall be paid necessary and reasonable hourly rates of pay not to exceed their customary rate, and such fees and expenses shall be paid equally by the parties, except in the case of arbitration where the arbitrator, for good cause, determines a different division. In no event shall these fees or expenses be paid by state or county funds.

(3) In addition to Chapter 2.5 (commencing with Section 1141.10) Title 3 of Part 3 of the Code of Civil Procedure, any party who receiving an arbitration award requests a trial de novo but does obtain a more favorable judgment shall, in addition to payment of costs and fees under that chapter, pay the attorney's fees of the other arising out of the trial de novo.

(c) The court may, upon request by any party, order any witnesses participate in the mediation or arbitration process.

Public Contract Code Section 20104.6 Payment of portion of claim which is undisputed; of interest on arbitration award or judgment

(a) No local agency shall fail to pay money as to any portion of a claim which is undisputed except as otherwise provided in the contract.

(b) In any suit filed under Section 20104.4, the local agency shall pay interest at the legal rate on any arbitration award or judgment. The interest shall begin to accrue on the date the suit is filed in a court of law.

(d) Final Payment. Payment will be made in accordance with the provisions of Section 9-1.17 of the Standard Specifications provided however that in no event will the final payment be made within 35 calendar days after the filing of Notice of Completion.

22. MISCELLANEOUS PROVISIONS

(a) Licenses and Permits. Any and all licenses and permits required shall be provided by the Contractor and he shall abide by any and all Federal, State and County laws and rules affecting the work and shall maintain all required protection for property, employees and the public and insurance in connection with same, for all of which he shall bear necessary expense.

(b) Building Laws, etc. The Contractor shall conform to and abide by all County and State Building, Labor, Sanitary and Electrical Codes, Ordinances, Laws, Rules and Regulations. Such laws and regulations shall be considered a part of this Exhibit "A" as if set forth herein in full and the work and materials shall be in accordance therewith.

(c) Guarantees. All work performed and equipment or material furnished shall be guaranteed for one (1) year from date of acceptance against any inherent or developed defects of materials or workmanship in manufacture or installations. All guarantees normally provided by manufactures of equipment or material installed under this project shall be furnished to County and shall remain in force for their normal life.

(d) Ownership of Plans and Specifications. All drawings, specifications and copies thereof provided to Contractor by the County shall remain the property of the County and they shall not be used by the Contractor or its subcontractors on other work.

(e) Addenda. Any addenda or notices issued during the time of bidding and forming a part of the documents provided to the Bidder for the preparation of the contractor's bid, shall be covered in the bid and shall be made a part of the contract. The Bidder shall acknowledge receipt of addenda in the space provided in the Proposal.

Should a bidder find apparent discrepancies in the drawings or documents, or should he be in doubts to their meaning, he should at once notify the County of Napa, Public Works Department, which will send a written instruction to all bidders. Napa County will not be responsible for oral instructions.

23. OWNER'S RIGHT TO DO WORK

Napa County as Owner reserves the right to let other contracts in connection with this work. The Contractor shall afford other contractors on the job site reasonable opportunity for introduction and storage of their materials and execution of their work and shall properly connect and coordinate his work with theirs.

If any part of the Contractor's work depends for proper execution or results upon work of any other Contractor, the Contractor shall inspect and promptly report to the Engineer any defects in such work that render it unsuitable for proper execution and results. His failure to so inspect and report shall constitute his acceptance of other Contractors' work as fit and proper for reception of his work, except as to defects which may develop in other Contractors' work after execution of his work.

To insure proper execution of his subsequent work, the Contractor shall measure and inspect work already in place and shall at once report to the Engineer any discrepancy between executed work and contract documents.

The Contractor shall ascertain to his own satisfaction the scope of the project and nature of any other contracts that have been or may be awarded by owner in prosecution of the project to the end that the Contractor may perform this contract in the light of such other contracts, if any. Nothing herein contained shall be interpreted as granting to the Contractor exclusive occupancy at the site of project. The Contractor shall not cause any unnecessary hindrance or delay to any other Contractors working on project. If simultaneous execution of any contract for the project is likely to cause interference with performance of some other contract or contracts, the owner shall decide which Contractor shall cease work temporarily and which Contractor then shall continue or whether work can be coordinated so that the Contractors may proceed simultaneously.

24. EQUAL OPPORTUNITY EMPLOYMENT

During the performance of the Contract, the Contractor shall comply with all applicable laws, ordinances, regulations, and codes, including but not limited to, the following:

(a) Non-Discrimination. During the performance of the work required by the Contract, the Contractor and its subcontractors shall not deny the benefits thereof to any person on the basis of sex, race, color, ancestry, religion or religious creed, national origin or ethnic group identification, sexual orientation, marital status, age (over 40), mental disability, physical disability or medical condition (including cancer, HIV and AIDS), nor shall they discriminate unlawfully against any employee or applicant for employment because of sex, race, color, ancestry, religion or religious creed, national origin or ethnic group identification, sexual orientation, marital status, age (over 40), mental disability, physical disability or medical condition (including cancer, HIV and AIDS), or use of family care leave. The Contractor shall ensure that the evaluation and treatment of employees and applicants for employment are free of such discrimination or harassment. In addition to the foregoing general obligations, the Contractor shall comply with the provisions of the Fair Employment and Housing Act (Government Code section 12900, et seq.), the regulations promulgated thereunder (Title 2, California Code of Regulations, section 7285.0, et seq.), the provisions of Article 9.5, Chapter 1, Part 1, Division 3, Title 2 of the Government Code (sections 11135-11139.5) and any state or local regulations adopted to implement any of the foregoing, as such statutes and regulations may be amended from time to time. To the extent this Contract subcontracts to the Contractor work required of the County by the State of California pursuant to agreement between the County and the State, the applicable regulations of the Fair Employment and Housing Commission implementing Government Code section 12990 (a) through (f), set forth in Chapter 5 of Division 4 of Title 2 of the California Code of regulations are expressly incorporated into this Agreement by reference and made a part hereof as if set forth in full, and the Contractor and any of its subcontractors shall give written notice of their obligations thereunder to labor organizations with which they have collective bargaining or other agreements.

(b) Documentation of Right to Work. The Contractor shall abide by the requirements of the Immigration and Control Reform Act pertaining to assuring that all newly-hired employees of the Contractor performing any of the work under the Contract have a legal right to work in the United States of America, that all required documentation of such right to work is inspected, and that INS Form 1-9 (as it may be amended from time to time) is completed and on file for each employee. The Contractor shall make the required documentation available upon request to the County for inspection.

(c) Inclusion in Subcontracts. To the extent any of the work to be performed by Contractor under the Contract is subcontracted to a third party, the Contractor shall include the provisions of (a) and (b), above, in all such subcontracts as obligations of the subcontractor.

25. COUNTY POLICIES ON WASTE, HARASSMENT, DRUG/ALCOHOL-FREE, VIOLENCE-FREE WORKPLACE.

Contractor hereby agrees to comply, and require its employees and subcontractors to comply, with the following policies, copies of which are on file with the Clerk of the Board of Supervisors and incorporated by reference herein. Contractor also agrees that it shall not engage in any activities, or permit its officers, agents and employees to do so, during the performance of any of the services required under this Agreement, which would interfere with compliance or induce violation of these policies by COUNTY employees or contractors.

- (a) Waste Source Reduction and Recycled Product Content Procurement Policy adopted by resolution of the Board of Supervisors on March 26, 1991.
- (b) County of Napa “Policy for Maintaining a Harassment and Discrimination Free Work Environment” revised effective June 20, 2017.
- (c) County of Napa Drug and Alcohol Policy adopted by resolution of the Board of Supervisors on June 25, 1991 and subsequently revised effective May 1, 2009.
- (e) Napa County Workplace Violence Policy, adopted by the BOS effective May 23, 1995 and subsequently revised effective November 2, 2004, which is located in Napa County Policy Manual Part I, Section 37U.

26. REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR.

Before starting each portion of the work, the Contractor shall carefully study and compare the Contract Documents relative to that portion of the work, shall take field measurements of any existing conditions related to that portion of the work and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating construction by the contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, any errors, inconsistencies, or omissions discovered by the contractor shall be reported promptly to the Engineer as a request for information in such form as the Engineer may require.

Any design errors or omissions noted by the Contractor during this review shall be reported promptly to the Engineer, but it is recognized that the Contractor’s review is made in the Contractor’s capacity as a contractor and not as a licensed design professional unless otherwise specifically provided in the Contract Documents. The Contractor is not required to ascertain that the contract Documents are in accordance with applicable laws, statutes, ordinances, building codes, and rules and regulations, but any nonconformity discovered by or made known to the contractor shall be reported promptly to the Engineer.

27. SUPERVISION AND CONSTRUCTION PROCEDURES

(a) Supervision and Direction of Work. The Contractor shall supervise and direct the work, using the contractor’s best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the work under the contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Engineer and shall not proceed with that portion of the work without further written instructions from the Engineer. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any resulting loss or damage.

(b) Responsibility of Work. The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, subcontractors, and their agents and employees, and other persons or entities performing portions of the work for or on behalf of the Contractor or any of its subcontractors.

(c) Subsequent Work. The Contractor shall be responsible for inspection of portions of work already performed to determine that such portions are in proper condition to receive subsequent work.

(d) Superintendent. The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing. Other communications shall be similarly confirmed on written request in each case.

28. AUDITS/ACCOUNTING/RECORDS

The Contractor shall maintain financial accounts, documents, and records (collectively, "records") relating to this agreement, in accordance with the guidelines of "Generally Accepted Accounting Principles" ("GAAP") published by the American Institute of Certified Public Accountants. The records shall include, without limitation, evidence sufficient to reflect properly the amount, receipt, deposit, and disbursement of all funds related to the construction of the project, and the use, management, operation and maintenance of the real property. Time and effort reports are also required. The Contractor shall maintain adequate supporting records in a manner that permits tracing from the request for disbursement forms to the accounting records and to the supporting documentation.

Additionally, the County or its agents may review, obtain, and copy all records relating to performance of the agreement. The grantee shall provide the County or their agents with any relevant information requested and shall permit the County or their agents access to the Contractor's premises upon reasonable notice, during normal business hours, to interview employees and inspect and copy books, records, accounts, and other material that may be relevant to a matter under investigation for the purpose of determining compliance with this agreement and any applicable laws and regulations.

The Contractor shall retain the required records for a minimum of three years following the later of final disbursement by the County, and the final year to which the particular records pertain. The records shall be subject to examination and audit by the County and the Bureau of State Audits during the retention periods.

If the Contractor retains any subcontractors to accomplish any of the work of this agreement, the Contractor shall first enter into an agreement with each subcontractor requiring the subcontractor to meet the terms of this section and to make the terms applicable to all subcontractors.

29. INTERPRETATION; VENUE.

(a) Interpretation. The headings used herein are for reference only. The terms of the Agreement are set out in the text under the headings. This Agreement shall be governed by the laws of the State of California without regard to the choice of law or conflicts.

(b) Venue. This Agreement is made in Napa County, California. The venue for any legal action in state court filed by either party to this Agreement for the purpose of interpreting or enforcing any provision of this Agreement shall be in the Superior Court of California, County of Napa, a unified court. The venue for any legal action in federal court filed by either party to this Agreement for the purpose of interpreting or enforcing any provision of this Agreement lying within the jurisdiction of the federal courts shall be the Northern District of California. The appropriate venue for arbitration, mediation or similar legal proceedings under this Agreement shall be Napa County, California; however, nothing in this sentence shall obligate either party to submit to mediation or arbitration any dispute arising under this Agreement.

30. FORCE MAJEURE

In the event the work is delayed due to causes which are outside the control of both parties and their subcontractors, consultants and employees, and could not be avoided by the exercise of due care, which may include, but is not limited to, delays by regulating agencies, wars, floods, adverse weather conditions, labor disputes, unusual delay in transportation, epidemics abroad, earthquakes, fires, terrorism, the COVID-19 pandemic or other incidence of disease or illness that reaches outbreak, epidemic and/or pandemic proportions or otherwise affects the area in which the Project is located and the Contractor's labor or supply chain, unusual delay in deliveries, riots, civil commotion or other unavoidable casualties, and other acts of God, both parties will be entitled to an extension in their time for performance equivalent to the length of delay. Neither party will be entitled to compensation from the other for *force majeure* events.

31. COVID-19

Some or all of the work will be performed during a state of emergency due to the COVID-19 pandemic. Minimizing the risk of transmission among workers is essential. Contractor shall take reasonable efforts to follow these guidelines to increase hygiene on the jobsite:

- (a) Add sanitary facilities (toilet and hand washing stations with soap and hand sanitizer provided). Workers should both wash their hands with soap for twenty seconds and use hand sanitizer often.
- (b) Perform deep cleaning on jobsites including disinfecting handrails, doorknobs, equipment handles and tools on an accelerated basis.
- (c) Instead of having group safety meetings, and to keep the suggested social distance, hold smaller individual safety meetings at the jobsite maintaining social distancing guidelines.
- (d) Keep separation of at least 6 feet as feasible while on the job and always during rest and break periods and lunches; there should not be any group gatherings.
- (e) Ask workers to consider bringing a lunch made at home and stay away from congested lunch trucks and coffee shops. Ask workers to try and go directly from work to home and vice versa with as little contact with the general public as

possible.

- (f) Ensure workers wear and utilize all safety equipment available on the jobsite. Contractors should provide all protective equipment as available.
- (g) Instruct sick workers to stay at home.
- (h) Remind workers not shake hands when greeting others.
- (i) Remind workers not to touch their eyes, nose, or mouth with unwashed hands.

Exhibit “A”

CALIFORNIA PREVAILING WAGE REQUIREMENTS

Pursuant to California Labor Code sections 1720 and 1771, construction, alteration, demolition, installation, repair and maintenance work performed under this Agreement is subject to State prevailing wage laws. State prevailing wage laws require certain provisions be included in all contracts for public works. The Contractor and any subcontractors shall comply with State prevailing wage laws including, but not limited to, the requirements listed below.

1. Compliance with Prevailing Wage Requirements. Pursuant to sections 1720 through 1861 of the California Labor Code, the Contractor and all subcontractors shall ensure that all workers who perform work under this Agreement are paid not less than the prevailing rate of per diem wages as determined by the Director of the California Department of Industrial Relations (DIR). This includes work performed during the design, site assessment, feasibility study, and other preconstruction phases of construction including, but not limited to, inspection and land surveying work, regardless of whether any further construction work is conducted, and work performed during the post-construction phases of construction, including, but not limited to, all cleanup work at the jobsite.

1.1. Copies of such prevailing rate of per diem wages are on file at the Napa County Public Works Department and are available for inspection to any interested party on request. Copies of the prevailing rate of per diem wages also may be found at <http://www.dir.ca.gov/OPRL/DPreWageDetermination.htm>. The Contractor and all subcontractors shall post a copy of the prevailing rate of per diem wages determination at each job site and shall make them available to any interested party upon request.

1.2. The wage rates determined by the DIR refer to expiration dates. If the published wage rate does not refer to a predetermined wage rate to be paid after the expiration date, then the published rate of wage shall be in effect for the life of this Agreement. If the published wage rate refers to a predetermined wage rate to become effective upon expiration of the published wage rate and the predetermined wage rate is on file with the DIR, such predetermined wage rate shall become effective on the date following the expiration date and shall apply to this Agreement in the same manner as if it had been published in said publication. If the predetermined wage rate refers to one or more additional expiration dates with additional predetermined wage rates, which expiration dates occur during the life of this Agreement, each successive predetermined wage rate shall apply to this Agreement on the date following the expiration date of the previous wage rate. If the last of such predetermined wage rates expires during the life of this Agreement, such wage rate shall apply to the balance of the Agreement.

2. Penalties for Violations. The Contractor and all subcontractors shall comply with California Labor Code section 1775 in the event a worker is paid less than the prevailing wage rate for the work or craft in which the worker is employed. This shall be in addition to any other applicable penalties allowed under California Labor Code sections 1720 through 1861.

3. Payroll Records. The Contractor and all subcontractors shall comply with California Labor Code section 1776, which generally requires keeping accurate payroll records, verifying and certifying payroll records, and making them available for inspection. The Contractor shall require its subcontractors to also comply with section 1776. The Contractor and all subcontractors shall furnish records specified in California Labor Code section 1776 on a monthly basis, both to the County and directly to the Labor

Commissioner in the manner required by California Labor Code section 1771.4. The Contractor shall ensure its subcontractors prepare and submit payroll records to the County and the DIR as required by this section.

3.1. If the Contractor or a subcontractor is exempt from the DIR registration requirement pursuant to section 9.4 below, then the Contractor or such subcontractor is not required to furnish payroll records directly to the Labor Commissioner but shall retain the records for at least three years after completion of the work, pursuant to California Labor Code section 1771.4(a)(4).

3.2. The County may require the Contractor and its subcontractors to prepare and submit records specified in section 1776 to the County and the Labor Commissioner on a weekly basis, at no additional cost to the County.

4. Apprentices. The Contractor and all subcontractors shall comply with California Labor Code sections 1777.5, 1777.6 and 1777.7 concerning the employment and wages of apprentices. The Contractor is responsible for compliance with this section for all apprenticeable occupations pursuant to California Labor Code section 1777.5(n).

5. Working Hours. The Contractor and all subcontractors shall comply with California Labor Code sections 1810 through 1815, including but not limited to: (i) restrict working hours on public works contracts to eight hours a day and forty hours a week, unless all hours worked in excess of 8 hours per day are compensated at not less than 1½ times the basic rate of pay; and (ii) specify penalties to be imposed on contractors and subcontractors of \$25 per worker per day for each day the worker works more than 8 hours per day and 40 hours per week in violation of California Labor Code sections 1810 through 1815.

6. Required Provisions for Subcontracts. The Contractor shall include, at a minimum, a copy of the following provisions in any contract they enter into with a subcontractor: California Labor Code sections 1771, 1771.1, 1775, 1776, 1777.5, 1810, 1813, 1815, 1860 and 1861.

7. Labor Code Section 1861 Certification. In accordance with California Labor Code section 3700, the Contractor is required to secure the payment of compensation of its employees. By signing the Agreement, to which this is an exhibit, the Contractor certifies that:

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

8. Compliance Monitoring and Enforcement. This project is subject to compliance monitoring and enforcement by the DIR. The County must withhold contract payments from the Contractor as directed by the DIR, pursuant to California Labor Code section 1727.

9. Contractor and Subcontractor Registration Requirements. The Contractor and all subcontractors shall not be qualified to bid on, be listed in a bid or proposal, subject to the requirements of section 4104 of the California Public Contract Code, or engage in the performance of any contract for public work, unless currently registered and qualified to perform public work pursuant to California Labor Code section 1725.5. It is not a violation of this section for an unregistered contractor to submit a bid that is authorized by section 7029.1 of the California Business and Professions code or by sections 10164 or 20103.5 of the California Public Contract Code, provided the Contractor is registered to perform public work pursuant to section 1725.5 at the time the contract is awarded.

9.1. A Contractor's inadvertent error in listing a subcontractor who is not registered pursuant to California Labor Code section 1725.5 in response to a solicitation shall not be grounds for filing a protest or grounds for considering the bid or proposal non-responsive provided that any of the following apply: (1) the subcontractor is registered prior to the proposal due date; (2) within twenty-four hours after the proposal due date, the subcontractor is registered and has paid the penalty registration fee specified in California Labor Code section 1725.5; or (3) the subcontractor is replaced by another registered subcontractor pursuant to California Public Contract Code section 4107.

9.2. By submitting a bid or proposal to the County, the Contractor is certifying that he or she has verified that all subcontractors used on this project are registered with the DIR in compliance with California Labor Code sections 1771.1 and 1725.5, and the Contractor shall provide proof of registration for themselves and all listed subcontractors to the County at the time of the bid or proposal due date or upon request.

9.3. The County may ask the Contractor for the most current list of subcontractors (regardless of tier), along with their DIR registration numbers, utilized on this project at any time during performance of this Agreement, and the Contractor shall provide the list within ten (10) working days of the County's request.

9.4. This section shall not apply to work performed on a public works project of twenty-five thousand dollars (\$25,000) or less when the project is for construction, alteration, demolition, installation, or repair work or to work performed on a public works project of fifteen thousand dollars (\$15,000) or less when the project is for maintenance work, pursuant to California Labor Code sections 1725.5(f) and 1771.1(n).

10. Stop Order. Where a contractor or subcontractor engages in the performance of any public work contract without having been registered in violation of California Labor Code sections 1725.5 or 1771.1, the Labor Commissioner must issue and serve a stop order prohibiting the use of the unregistered contractor or subcontractor on ALL public works until the unregistered contractor or subcontractor is registered. Failure to observe a stop order is a misdemeanor.

SPECIAL PROVISIONS - SECTION 'B'
GENERAL REQUIREMENTS

1. GENERAL REQUIREMENTS

(a) LAYOUT OF WORK – The Contractor shall lay out the work as directed by the Engineer in the field.

(b) MATERIAL SAFETY DATA SHEETS (MSDS) – The Contractor shall provide MSDS for each product used on site.

(c) DAMAGES – The Contractor shall be responsible for any damages to existing facilities, utilities and roads due to causes attributable to the work, and all such damaged facilities, utilities and roads shall be repaired when directed by the Engineer and as required to place them in as good as condition as existed before commencement of the work.

(d) PUBLIC SAFETY –The Contractor shall at all times conduct his work in accordance with Construction Safety Orders of the Division of Industrial Safety, State of California, to insure the least possible obstruction to traffic and inconvenience to the general public, and adequate protection of persons and property in the vicinity of the work.

No access way shall be closed to the public without first obtaining permission from the Engineer.

The Contractor shall furnish, erect and maintain all lights, signs, barricades and barriers necessary to give adequate warning to the public at all times and shall provide such guards as may be necessary to prevent accidents and avoid damage and injury.

Should the Contractor fail to provide public safety as specified or if, in the opinion of the Engineer, the warning devices furnished by the Contractor are not adequate, the County may place any warning lights or barricades or take any necessary action to protect or warn the public of any dangerous condition connected with the Contractor's operations and the Contractor shall be liable to the County for all costs incurred plus 100%.

Nothing in this section shall be construed to impose tort liability on the County or Engineer. Full compensation for conforming to the requirements of this section shall be considered as included in the contract prices paid for the various contract items of work and no additional compensation will be allowed.

(e) COOPERATION – The Contractor shall cooperate with the occupants of the existing facilities adjacent to the project and coordinate the work in such a manner as to minimize the disruption to the existing facilities.

Full compensation for conforming to the requirements of this section shall be considered as included in the contract prices paid for the various contract items of work and no additional compensation will be allowed.

(f) SCHEDULE OF WORK – The Contractor shall not obstruct the access to any other driveway within the project area for greater than 15 minutes.

(g) SAFETY – The Contractor shall comply with all the applicable provisions of the United States Department of Labor Occupational Safety and Health Act (OSHA), State of California Division of Industrial Safety, Title 8, Safety Orders (Cal-OSHA) and any other applicable codes and regulations.

If, in the opinion of the Engineer, any operation or piece of equipment that is observed by the Engineer appears to be unsafe, the Engineer may immediately halt that portion of the work until the hazard is corrected to the satisfaction of the Engineer and no time extension or additional compensation shall be granted for the time lost due to said halting of the work.

(h) PRE-CONSTRUCTION CONFERENCE – Prior to the commencement of any work of any kind, the Contractor, or his authorized agent or representative shall attend a pre-construction conference with representatives of the Napa County Engineer. The conference is required to familiarize all authorized persons involved with policies, regulations and procedures and to discuss construction operations and methods in order to avoid any misunderstanding or conflicts during construction.

(i) DISPOSITION OF REMOVED MATERIALS – Attention is directed to section, the Contractor shall be responsible for the disposal of all surplus excavation materials off the site. The Contractor shall not dispose of any materials from demolition or removal by sale, gift or in any manner whatsoever, to the general public at the site. Disposal operations shall comply with all applicable laws and ordinances and must be approved by the Engineer.

(j) CLEAN UP – Clean up shall be performed to prevent accidents to personnel, protect all work in place, and to effect completion of the project in an orderly manner. Excess debris shall be removed from the work area immediately so as not to clutter the existing facilities. Access to all other properties within the project area shall be unobstructed and passable between the hours of 7:00 p.m. and 7:00 a.m. weekdays, on weekends and holidays, and whenever work is not actively in progress.

(k) EQUIPMENT – Standard construction equipment shall be used and shall be maintained in a safe and satisfactory condition at all times and in compliance with the latest provisions of the CAL/OSHA regulations. All trucks and other heavy equipment shall be well maintained and in proper working order and in compliance with all applicable laws and regulations.

(l) WORKING HOURS REQUIREMENTS – Normal work week shall be Monday through Friday 7:00 a.m. to 7:00 p.m. unless otherwise approved by the Engineer.

(m) SCOPE – Contractor shall take into account all costs associated with the improvements as discussed in the technical specifications, when preparing the bid and shall take into account the working hour restrictions.

SPECIAL PROVISIONS - SECTION 'C'
TECHNICAL SPECIFICATIONS



A Tradition of Stewardship
A Commitment to Service

Napa County Building Department

Department of Public Works

**650 Imperial Way
HVAC Upgrade**

**650 Imperial Way
Napa, CA 94585**

BID SET

SPECIFICATIONS

MK2 Engineers
5030 Business Center Drive
Fairfield, CA 94534

September 24, 2020



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SUBMITTAL LIST SUMMARY



SECTION 22 10 05
PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe, pipe fittings, specialties, and connections for piping systems.
 - 1. Sanitary sewer.
 - 2. Flanges, unions, and couplings.
 - 3. Pipe hangers and supports.

1.02 REFERENCE STANDARDS

- A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300 2016.
- B. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV 2016.
- C. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV 2017.
- D. ASME B31.1 - Power Piping 2020.
- E. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2020.
- F. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- G. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service 2019.
- H. ASTM B32 - Standard Specification for Solder Metal 2008 (Reapproved 2014).
- I. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes 2020.
- J. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube 2016.
- K. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings 2016.
- L. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018.
- M. NSF 61 - Drinking Water System Components - Health Effects 2019.
- N. NSF 372 - Drinking Water System Components - Lead Content 2016.



1.03 SUBMITTALS

- A. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 SANITARY SEWER PIPING, ABOVE GRADE

- A. Copper Pipe: ASTM B42.
 - 1. Fittings: ASME B16.23, cast copper, or ASME B16.29, wrought copper.
 - 2. Joints: ASTM B32, alloy Sn50 solder.

2.03 NATURAL GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
 - 1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
 - 2. Joints: Threaded or welded to ASME B31.1.

2.04 FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 Inches (80 mm) and Under:
 - 1. Ferrous Pipe: Class 150 malleable iron threaded unions.

2.05 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
 - 1. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:
 - a. Bases: High-density polypropylene.
 - b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
 - c. Steel Components: Stainless steel or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
 - d. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion-resistant material.
 - e. Height: Provide minimum clearance of 6 inches (150 mm) under pipe to top of roofing.



PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

3.03 APPLICATION

- A. Install unions downstream of valves and at equipment or apparatus connections.

3.04 TOLERANCES

- A. Drainage Piping: Establish invert elevations within 1/2 inch (10 mm) vertically of location indicated and slope to drain at minimum of 1/4 inch per foot (1:50) slope.

END OF SECTION



SECTION 23 05 13
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 GENERAL

- 1.01 SECTION INCLUDES
- A. General construction and requirements.
 - B. Applications.
 - C. Three phase electric motors.
- 1.02 REFERENCE STANDARDS
- A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings 2015.
 - B. IEEE 112 - IEEE Standard Test Procedure for Polyphase Induction Motors and Generators 2017.
 - C. NEMA MG 1 - Motors and Generators 2018.
 - D. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- 1.03 SUBMITTALS
- A. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.
 - B. Test Reports: Indicate test results verifying nominal efficiency and power factor for three phase motors larger than 1/2 horsepower.
 - C. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.
 - D. Operation Data: Include instructions for safe operating procedures.
 - E. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.
- 1.04 DELIVERY, STORAGE, AND HANDLING
- A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.
- 1.05 WARRANTY
- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.



- B. Provide five year manufacturer warranty for motors larger than 20 horsepower.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Baldor Electric Company/ABB Group; [____]: www.baldor.com/#sle.
- B. Leeson Electric Corporation; [____]: www.leeson.com/#sle.
- C. Regal-Beloit Corporation (Century); [____]: www.centuryelectricmotor.com/#sle.

2.02 GENERAL CONSTRUCTION AND REQUIREMENTS

- A. Electrical Service:
 - 1. Motors Larger than 1/2 Horsepower: 208 volts, three phase, 60 Hz.
- B. Nominal Efficiency:
 - 1. Open Motor with Two Poles: 82.5.
 - 2. Open Motor with Four Poles: 82.5.
 - 3. Open Motor with Six Poles: 50.0.
 - 4. Enclosed Motor with Two Poles: 75.5.
 - 5. Enclosed Motor with Four Poles: 82.5.
 - 6. Enclosed Motor with Six Poles: 50.0.
- C. Construction:
 - 1. Open drip-proof type except where specifically noted otherwise.
 - 2. Design for continuous operation in 104 degrees F (40 degrees C) environment.
 - 3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
- D. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.
- E. Wiring Terminations:
 - 1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
 - 2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.03 APPLICATIONS

- A. Motors located in exterior locations, air cooled condensers, humidifiers, direct drive axial fans, and roll filters: Totally enclosed type.

2.04 THREE PHASE POWER - SQUIRREL CAGE MOTORS

- A. Starting Torque: Between 1 and 1-1/2 times full load torque.
- B. Starting Current: Six times full load current.



- C. Power Output, Locked Rotor Torque, Breakdown or Pull Out Torque: NEMA Design B characteristics.
- D. Design, Construction, Testing, and Performance: Comply with NEMA MG 1 for Design B motors.
- E. Insulation System: NEMA Class B or better.
- F. Testing Procedure: In accordance with IEEE 112. Load test motors to determine free from electrical or mechanical defects in compliance with performance data.
- G. Motor Frames: NEMA Standard T-Frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.
- H. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum ABMA STD 9, L-10 life of 20,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.
- C. Check line voltage and phase and ensure agreement with nameplate.

END OF SECTION



SECTION 23 05 29
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Support and attachment components for equipment, piping, and other HVAC/hydronic work.

1.02 RELATED REQUIREMENTS

- A. Section 23 05 48 - Vibration and Seismic Controls for HVAC.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2019.
- D. MFMA-4 - Metal Framing Standards Publication 2004.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
 - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
 - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
 - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 5. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00.



1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.
- B. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
 - 1. Application of protective inserts, saddles, and shields at pipe hangers for each type of insulation and hanger.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
 - 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
 - 3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of [_____]. Include consideration for vibration, equipment operation, and shock loads where applicable.
 - 4. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
 - 5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
 - 1. Comply with MFMA-4.
- C. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
 - 1. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2 inch (13 mm) diameter.
- D. Anchors and Fasteners:
 - 1. Manufacturers - Mechanical Anchors:
 - a. Hilti, Inc: www.us.hilti.com/#sle.



- b. Powers Fasteners, Inc: www.powers.com/#sle.
 - c. Simpson Strong-Tie Company Inc: www.strongtie.com/#sle.
2. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
 3. Steel: Use beam clamps, machine bolts, or welded threaded studs.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
- C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- F. Equipment Support and Attachment:
 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- G. Secure fasteners according to manufacturer's recommended torque settings.
- H. Remove temporary supports.

END OF SECTION



SECTION 23 05 48
VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Vibration isolation requirements.
- B. Seismic control requirements.
- C. Vibration-isolated equipment support bases.
- D. Vibration isolators.
- E. Vibration-isolated and/or seismically engineered roof curbs.

1.02 DEFINITIONS

- A. HVAC Component: Where referenced in this section in regards to seismic controls, applies to any portion of the HVAC system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., ductwork, piping).
- B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

1.03 REFERENCE STANDARDS

- A. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications Most Recent Edition Cited by Referring Code or Reference Standard.

1.04 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
 - 1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.
 - 2. Seismic Controls: Include seismic load capacities.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.



PART 2 PRODUCTS

2.01 VIBRATION ISOLATION REQUIREMENTS

- A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing HVAC equipment and/or HVAC connections to vibration-isolated equipment.
- B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:
- C. General Requirements:
 - 1. Select vibration isolators to provide required static deflection.
 - 2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.

2.02 VIBRATION ISOLATORS

- A. General Requirements:
 - 1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.
 - 2. Spring Elements for Spring Isolators:
 - a. Color code or otherwise identify springs to indicate load capacity.
 - b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.
 - c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
 - d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.
 - e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
 - f. Selected to function without undue stress or overloading.
- B. Vibration Isolators for Nonseismic Applications:
 - 1. Resilient Material Isolator Pads:
 - a. Description: Single or multiple layer pads utilizing elastomeric (e.g., neoprene, rubber) isolator material.
 - b. Pad Thickness: As required for specified minimum static deflection; minimum 0.25 inch (6 mm) thickness.
 - c. Multiple Layer Pads: Provide bonded, galvanized sheet metal separation plate between each layer.
 - 2. Resilient Material Isolator Hangers, Nonseismic:
 - a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing elastomeric (e.g., neoprene, rubber) isolator material for the lower hanger rod connection.
 - 3. Spring Isolator Hangers, Nonseismic:
 - a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection.
 - b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.



PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- C. Secure fasteners according to manufacturer's recommended torque settings.
- D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.
- E. Vibration Isolation Systems:
 - 1. Spring Isolators:
 - a. Position equipment at operating height; provide temporary blocking as required.
 - b. Lift equipment free of isolators prior to lateral repositioning to avoid damage to isolators.
 - c. Level equipment by adjusting isolators gradually in sequence to raise equipment uniformly such that excessive weight or stress is not placed on any single isolator.
 - 2. Isolator Hangers:
 - a. Use precompressed isolator hangers where required to facilitate installation and prevent damage to equipment utility connection provisions.
 - b. Locate isolator hangers at top of hanger rods in accordance with manufacturer's instructions.
 - 3. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.
 - 4. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
 - 5. Adjust isolators to be free of isolation short circuits during normal operation.
 - 6. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect vibration isolation and/or seismic control components for damage and defects.
- C. Vibration Isolation Systems:
 - 1. Verify isolator static deflections.
 - 2. Verify required clearance beneath vibration-isolated equipment support bases.



3. Verify vibration isolation performance during normal operation; investigate sources of isolation short circuits.
- D. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

END OF SECTION



SECTION 23 05 53
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.

1.02 REFERENCE STANDARDS

- A. ASTM D709 - Standard Specification for Laminated Thermosetting Materials 2017.

1.03 SUBMITTALS

- A. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

- A. Air Handling Units: Nameplates.
- B. Air Terminal Units: Nameplates.

2.02 NAMEPLATES

- A. Letter Color: White.
- B. Letter Height: 1/2 inch (13 mm).
- C. Background Color: Black.
- D. Plastic: Comply with ASTM D709.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

END OF SECTION



SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.
- B. Measurement of final operating condition of HVAC systems.

1.02 REFERENCE STANDARDS

- A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition 2016.
- B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems 2008 (Reaffirmed 2017).
- C. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing 2002.

1.03 SUBMITTALS

- A. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
 - 1. Include at least the following in the plan:
 - a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
 - b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
 - c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
 - d. Final test report forms to be used.
 - e. Procedures for formal deficiency reports, including scope, frequency and distribution.
- B. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
 - 1. Revise TAB plan to reflect actual procedures and submit as part of final report.
 - 2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
 - 3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
 - 4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
 - 5. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.
 - 6. Include the following on the title page of each report:
 - a. Name of Testing, Adjusting, and Balancing Agency.



- b. Address of Testing, Adjusting, and Balancing Agency.
- c. Telephone number of Testing, Adjusting, and Balancing Agency.
- d. Project name.
- e. Project location.
- f. Project Engineer.
- g. Project Contractor.
- h. Project altitude.
- i. Report date.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Perform total system balance in accordance with one of the following:
 - 1. AABC (NSTSB), AABC National Standards for Total System Balance.
 - 2. SMACNA (TAB).
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. TAB Agency Qualifications:
 - 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
 - 2. Certified by one of the following:
 - a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
 - b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
 - c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.
- D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 - 1. Systems are started and operating in a safe and normal condition.
 - 2. Temperature control systems are installed complete and operable.
 - 3. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - 4. Duct systems are clean of debris.
 - 5. Fans are rotating correctly.
 - 6. Air outlets are installed and connected.
 - 7. Duct system leakage is minimized.



- B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.
- C. Beginning of work means acceptance of existing conditions.

3.03 PREPARATION

- A. Hold a pre-balancing meeting at least one week prior to starting TAB work.
 - 1. Require attendance by all installers whose work will be tested, adjusted, or balanced.
- B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect to facilitate spot checks during testing.

3.04 ADJUSTMENT TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.05 RECORDING AND ADJUSTING

- A. Field Logs: Maintain written logs including:
 - 1. Running log of events and issues.
 - 2. Discrepancies, deficient or uncompleted work by others.
 - 3. Contract interpretation requests.
 - 4. Lists of completed tests.
- B. Ensure recorded data represents actual measured or observed conditions.
- C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- D. Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.
- E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.06 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.



- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

3.07 SCOPE

- A. Test, adjust, and balance the following:
 - 1. Packaged Roof Top Heating/Cooling Units.
 - 2. Air Terminal Units.
 - 3. Air Inlets and Outlets.

3.08 MINIMUM DATA TO BE REPORTED

- A. Electric Motors:
 - 1. Manufacturer.
 - 2. Model/Frame.
 - 3. HP/BHP.
 - 4. Phase, voltage, amperage; nameplate, actual, no load.
 - 5. RPM.
 - 6. Service factor.
 - 7. Starter size, rating, heater elements.
 - 8. Sheave Make/Size/Bore.
- B. Air Moving Equipment:
 - 1. Location.
 - 2. Manufacturer.
 - 3. Model number.
 - 4. Serial number.
 - 5. Arrangement/Class/Discharge.
 - 6. Air flow, specified and actual.
 - 7. Return air flow, specified and actual.
 - 8. Outside air flow, specified and actual.
 - 9. Total static pressure (total external), specified and actual.
 - 10. Inlet pressure.



11. Discharge pressure.
12. Sheave Make/Size/Bore.
13. Number of Belts/Make/Size.
14. Fan RPM.

C. Return Air/Outside Air:

1. Identification/location.
2. Design air flow.
3. Actual air flow.
4. Design return air flow.
5. Actual return air flow.
6. Design outside air flow.
7. Actual outside air flow.
8. Return air temperature.
9. Outside air temperature.
10. Required mixed air temperature.
11. Actual mixed air temperature.
12. Design outside/return air ratio.
13. Actual outside/return air ratio.

D. Duct Leak Tests:

1. Description of ductwork under test.
2. Duct design operating pressure.
3. Duct design test static pressure.
4. Duct capacity, air flow.
5. Maximum allowable leakage duct capacity times leak factor.
6. Test apparatus:
 - a. Blower.
 - b. Orifice, tube size.
 - c. Orifice size.
 - d. Calibrated.
7. Test static pressure.
8. Test orifice differential pressure.
9. Leakage.

E. Terminal Unit Data:

1. Manufacturer.
2. Type, constant, variable, single, dual duct.
3. Identification/number.
4. Location.
5. Model number.
6. Size.
7. Minimum static pressure.
8. Minimum design air flow.
9. Maximum design air flow.
10. Maximum actual air flow.
11. Inlet static pressure.

F. Air Distribution Tests:

1. Air terminal number.



2. Room number/location.
3. Terminal type.
4. Terminal size.
5. Area factor.
6. Design velocity.
7. Design air flow.
8. Test (final) velocity.
9. Test (final) air flow.
10. Percent of design air flow.

END OF SECTION



SECTION 23 07 13
DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Duct insulation.
- B. Duct liner.
- C. Insulation jackets.

1.02 REFERENCE STANDARDS

- A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.
- B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.
- C. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus 2017.
- D. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form 2020.
- E. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications 2013 (Reapproved 2019).
- F. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation 2020.
- G. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material) 2019.
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.
- I. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi 2015.
- J. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.



1.04 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, FLEXIBLE

- A. Manufacturer:
 - 1. CertainTeed Corporation: www.certainteed.com/#sle.
 - 2. Johns Manville: www.jm.com/#sle.
 - 3. Owens Corning Corporation: www.ocbuildingspec.com/#sle.
- B. Insulation: ASTM C553; flexible, noncombustible blanket.
 - 1. K (Ksi) value: 0.36 at 75 degrees F (0.052 at 24 degrees C), when tested in accordance with ASTM C518.
 - 2. Maximum Service Temperature: 1200 degrees F (649 degrees C).
 - 3. Maximum Water Vapor Absorption: 5.0 percent by weight.
- C. Indoor Vapor Barrier Mastic:
 - 1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

2.03 JACKETS

- A. Aluminum Jacket: ASTM B209 (ASTM B209M).
 - 1. Thickness: 0.016 inch (0.40 mm) sheet.
 - 2. Finish: Smooth.
 - 3. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
 - 4. Fittings: 0.016 inch (0.4 mm) thick die shaped fitting covers with factory attached protective liner.
 - 5. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.015 inch (0.38 mm) thick aluminum.

2.04 DUCT LINER

- A. Manufacturers:
 - 1. CertainTeed Corporation: www.certainteed.com/#sle.
 - 2. Johns Manville: www.jm.com/#sle.
 - 3. Owens Corning Corporation: www.ocbuildingspec.com/#sle.
- B. Note: Choose the liner type - Elastomeric Foam or Glass Fiber.



- C. Elastomeric Foam Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1, in sheet form.
 - 1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
 - 2. Maximum Service Temperature: 180 degrees F (82 degrees C).
 - 3. Fungal Resistance: No growth when tested according to ASTM G21.
 - 4. Apparent Thermal Conductivity: Maximum of 0.28 at 75 degrees F (0.045 at 24 degrees C).
 - 5. Minimum Noise Reduction Coefficients:
 - a. 1/2 inch (13 mm) Thickness: 0.30.
 - b. 1-1/2 inches (40 mm) Thickness: 0.50.
 - c. 2 inch (50 mm) Thickness: 0.60.
 - 6. Erosion Resistance: Does not show evidence of breaking away, flaking off, or delamination at velocities of 10,000 fpm (50.8 m/s) per ASTM C1071.
 - 7. Connection: Waterproof vapor barrier adhesive.
- D. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation. Comply with ASTM C916.
- E. Liner Fasteners: Galvanized steel, self-adhesive pad with integral head.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Test ductwork for design pressure prior to applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. External Duct Insulation Application:
 - 1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
 - 2. Secure insulation without vapor barrier with staples, tape, or wires.
 - 3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
 - 4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
 - 5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

END OF SECTION



SECTION 23 09 13
INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Thermostats:
 - 1. Electric room thermostats.

1.02 SUBMITTALS

- A. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

PART 2 PRODUCTS

2.01 EQUIPMENT - GENERAL

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.02 THERMOSTATS

- A. Electric Room Thermostats:
 - 1. Service: Cooling and heating.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that systems are ready to receive work.
- C. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check and verify location of thermostats with plans and room details before installation. Locate 48 inches (1200 mm) above floor. Align with lighting switches. Refer to Section 26 27 26.

END OF SECTION



SECTION 23 09 23
DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. System description.
- B. Operator interface.
- C. Power supplies and line filtering.
- D. System software.
- E. Controller software.

1.02 RELATED REQUIREMENTS

- A. Section 23 09 13 - Instrumentation and Control Devices for HVAC.
- B. Section 23 09 93 - Sequence of Operations for HVAC Controls.

1.03 REFERENCE STANDARDS

- A. ASHRAE Std 135 - A Data Communication Protocol for Building Automation and Control Networks 2016.
- B. MIL-STD-810 - Environmental Engineering Considerations and Laboratory Tests 2019h.

1.04 SUBMITTALS

- A. Product Data: Provide data for each system component and software module.
- B. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.05 WARRANTY

- A. Provide five year manufacturer's warranty for field programmable micro-processor based units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Siemens AG, Building Technologies Division: www.siemens.com/#sle.



2.02 SYSTEM DESCRIPTION

- A. Automatic temperature control field monitoring and control system using field programmable micro-processor based units.
- B. Base system on distributed system of fully intelligent, stand-alone controllers, operating in a multi-tasking, multi-user environment on token passing network, with central and remote hardware, software, and interconnecting wire and conduit.
- C. Include computer software and hardware, operator input/output devices, control units, local area networks (LAN), sensors, control devices, actuators.
- D. Controls for variable air volume terminals, radiation, reheat coils, unit heaters, fan coils, and the like when directly connected to the control units. Individual terminal unit control is specified in Section 23 09 13.
- E. Provide control systems consisting of thermostats, control valves, dampers and operators, indicating devices, interface equipment and other apparatus and accessories required to operate mechanical systems, and to perform functions specified.
- F. Include installation and calibration, supervision, adjustments, and fine tuning necessary for complete and fully operational system.

2.03 OPERATOR INTERFACE

- A. PC Based Work Station:
 - 1. Connected to server for full access to all system information.
- B. Workstation, controllers, and control backbone to communicate using BACnet protocol and addressing.
- C. BACnet protocol to comply with ASHRAE Std 135.

2.04 CONTROLLERS

- A. Building Controllers:
 - 1. General:
 - a. Manage global strategies by one or more, independent, standalone, microprocessor based controllers.
 - b. Provide sufficient memory to support controller's operating system, database, and programming requirements.
 - c. Share data between networked controllers.
 - d. Controller operating system manages input and output communication signals allowing distributed controllers to share real and virtual object information and allowing for central monitoring and alarms.
 - e. Utilize real-time clock for scheduling.
 - f. Continuously check processor status and memory circuits for abnormal operation.
 - g. Controller to assume predetermined failure mode and generate alarm notification upon detection of abnormal operation.
 - h. Communication with other network devices to be based on assigned protocol.
 - 2. Communication:



- a. Controller to reside on a BACnet network using ISO 8802-3 (ETHERNET) Data Link/Physical layer protocol.
 - b. Perform routing when connected to a network of custom application and application specific controllers.
 - c. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.
3. Anticipated Environmental Ambient Conditions:
 - a. Outdoors and/or in Wet Ambient Conditions:
 - 1) Mount within waterproof enclosures.
 - 2) Rated for operation at 40 to 150 degrees F (4 to 65 degrees C).
 - b. Conditioned Space:
 - 1) Mount within dustproof enclosures.
 - 2) Rated for operation at 32 to 120 degrees F (0 to 50 degrees C).
 4. Provisions for Serviceability:
 - a. Diagnostic LEDs for power, communication, and processor.
 - b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.
 5. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.
 6. Power and Noise Immunity:
 - a. Maintain operation at 90 to 110 percent of nominal voltage rating.
 - b. Perform orderly shutdown below 80 percent of nominal voltage.
 - c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W. at 3 feet (1 m).
- B. Input/Output Interface:
1. Hardwired inputs and outputs tie into the DDC system through building, custom application, or application specific controllers.
 2. All Input/Output Points:
 - a. Protect controller from damage resulting from any point short-circuiting or grounding and from voltage up to 24 volts of any duration.
 - b. Provide universal type for building and custom application controllers where input or output is software designated as either binary or analog type with appropriate properties.
 3. Binary Inputs:
 - a. Allow monitoring of On/Off signals from remote devices.
 - b. Provide wetting current of 12 mA minimum, compatible with commonly available control devices and protected against the effects of contact bounce and noise.
 - c. Sense dry contact closure with power provided only by the controller.
 4. Pulse Accumulation Input Objects: Comply with all requirements of binary input objects and accept up to 10 pulses per second.
 5. Analog Inputs:
 - a. Allow for monitoring of low voltage 0 to 10 VDC, 4 to 20 mA current, or resistance signals (thermistor, RTD).
 - b. Compatible with and field configurable to commonly available sensing devices.
 6. Binary Outputs:
 - a. Used for On/Off operation or a pulsed low-voltage signal for pulse width modulation control.
 - b. Outputs provided with three position (On/Off/Auto) override switches.



- c. Status lights for building and custom application controllers to be selectable for normally open or normally closed operation.
- 7. Analog Outputs:
 - a. Monitoring signal provides a 0 to 10 VDC or a 4 to 20 mA output signal for end device control.
 - b. Provide status lights and two position (AUTO/MANUAL) switch for building and custom application controllers with manually adjustable potentiometer for manual override on building and custom application controllers.
 - c. Drift to not exceed 0.4 percent of range per year.
- 8. Tri State Outputs:
 - a. Coordinate two binary outputs to control three point, floating type, electronic actuators without feedback.
 - b. Limit the use of three point, floating devices to the following zone and terminal unit control applications:
 - c. Control algorithms run the zone actuator to one end of its stroke once every 24 hours for verification of operator tracking.
- 9. System Object Capacity:
 - a. System size to be expandable to twice the number of input output objects required by providing additional controllers, including associated devices and wiring.
 - b. Hardware additions or software revisions for the installed operator interfaces are not to be required for future, system expansions.

2.05 POWER SUPPLIES AND LINE FILTERING

- A. Power Supplies:
 - 1. Provide UL listed control transformers with Class 2 current limiting type or over-current protection in both primary and secondary circuits for Class 2 service as required by the NEC.
 - 2. Limit connected loads to 80 percent of rated capacity.
 - 3. Match DC power supply to current output and voltage requirements.
 - 4. Unit to be full wave rectifier type with output ripple of 5.0 mV maximum peak to peak.
 - 5. Regulation to be 1 percent combined line and load with 100 microsecond response time for 50 percent load changes.
 - 6. Provide over-voltage and over-current protection to withstand a 150 percent current overload for 3 seconds minimum without trip-out or failure.
 - 7. Operational Ambient Conditions: 32 to 120 degrees F (0 to 50 degrees C).
 - 8. EM/RF meets FCC Class B and VDE 0871 for Class B and MIL-STD-810 for shock and vibration.
 - 9. Line voltage units UL recognized and CSA approved.
- B. Power Line Filtering:
 - 1. Provide external or internal transient voltage and surge suppression component for all workstations and controllers.
 - 2. Minimum surge protection attributes:
 - a. Dielectric strength of 1000 volts minimum.
 - b. Response time of 10 nanoseconds or less.
 - c. Transverse mode noise attenuation of 65 dB or greater.
 - d. Common mode noise attenuation of 150 dB or greater at 40 to 100 Hz.



2.06 LOCAL AREA NETWORK (LAN)

- A. Provide communication between control units over local area network (LAN).
- B. LAN Capacity: Not less than 60 stations or nodes.
- C. Break in Communication Path: Alarm and automatically initiate LAN reconfiguration.
- D. LAN Data Speed: Minimum 19.2 Kb.
- E. Communication Techniques: Allow interface into network by multiple operation stations and by auto-answer/auto-dial modems. Support communication over telephone lines utilizing modems.
- F. Transmission Median: Fiber optic or single pair of solid 24 gauge twisted, shielded copper cable.
- G. Network Support: Time for global point to be received by any station, shall be less than 3 seconds. Provide automatic reconfiguration if any station is added or lost. If transmission cable is cut, reconfigure two sections with no disruption to system's operation, without operator intervention.

2.07 SYSTEM SOFTWARE

- A. Operating System:
 - 1. Concurrent, multi-tasking capability.
 - a. Common Software Applications Supported: Microsoft Excel.
 - b. Acceptable Operating Systems: [_____].
 - 2. System Graphics:
 - a. Allow up to 10 graphic screens, simultaneously displayed for comparison and monitoring of system status.
 - b. Animation displayed by shifting image files based on object status.
 - c. Provide method for operator with password to perform the following:
 - 1) Move between, change size, and change location of graphic displays.
 - 2) Modify on-line.
 - 3) Add, delete, or change dynamic objects consisting of:
 - a) Analog and binary values.
 - b) Dynamic text.
 - c) Static text.
 - d) Animation files.
 - 3. Custom Graphics Generation Package:
 - a. Create, modify, and save graphic files and visio format graphics in PCX formats.
 - b. HTML graphics to support web browser compatible formats.
 - c. Capture or convert graphics from AutoCAD.
 - 4. Standard HVAC Graphics Library:
 - a. HVAC Equipment:
 - 1) Air Handlers.
 - 2) Terminal HVAC Units.
 - b. Ancillary Equipment:
 - 1) Ductwork.



B. Workstation System Applications:

1. Automatic System Database Save and Restore Functions:
 - a. Current database copy of each Building Controller is automatically stored on hard disk.
 - b. Automatic update occurs upon change in any system panel.
 - c. In the event of database loss in any system panel, the first workstation to detect the loss automatically restores the database for that panel unless disabled by the operator.
2. Manual System Database Save and Restore Functions by Operator with Password Clearance:
 - a. Save database from any system panel.
 - b. Clear a panel database.
 - c. Initiate a download of a specified database to any system panel.
3. Software provided allows system configuration and future changes or additions by operators under proper password protection.
4. On-line Help:
 - a. Context-sensitive system assists operator in operation and editing.
 - b. Available for all applications.
 - c. Relevant screen data provided for particular screen display.
 - d. Additional help available via hypertext.
5. Security:
 - a. Operator log-on requires user name and password to view, edit, add, or delete data.
 - b. System security selectable for each operator.
 - c. System supervisor sets passwords and security levels for all other operators.
 - d. Operator passwords to restrict functions accessible to viewing and/or changing system applications, editor, and object.
 - e. Automatic, operator log-off results from keyboard or mouse inactivity during user-adjustable, time period.
 - f. All system security data stored in encrypted format.
6. System Diagnostics:
 - a. Operations Automatically Monitored:
 - 1) Workstations.
 - 2) Printers.
 - 3) Modems.
 - 4) Network connections.
 - 5) Building management panels.
 - 6) Controllers.
 - b. Device failure is annunciated to the operator.
7. Alarm Processing:
 - a. All system objects are configurable to "alarm in" and "alarm out" of normal state.
 - b. Configurable Objects:
 - 1) Alarm limits.
 - 2) Alarm limit differentials.
 - 3) States.
 - 4) Reactions for each object.
8. Alarm Messages:
 - a. Descriptor: English language.
 - b. Recognizable Features:



- 1) Source.
 - 2) Location.
 - 3) Nature.
9. Configurable Alarm Reactions by Workstation and Time of Day:
- a. Logging.
 - b. Printing.
 - c. Starting programs.
 - d. Displaying messages.
 - e. Dialing out to remote locations.
 - f. Paging.
 - g. Providing audible annunciation.
 - h. Displaying specific system graphics.
10. Custom Trend Logs:
- a. Definable for any data object in the system including interval, start time, and stop time.
 - b. Trend Data:
 - 1) Sampled and stored on the building controller panel.
 - 2) Archivable on hard disk.
 - 3) Retrievable for use in reports, spreadsheets and standard database programs.
 - 4) Archival on LAN accessible storage media including hard disk, tape, Raid array drive, and virtual cloud environment.
 - 5) Protected and encrypted format to prevent manipulation, or editing of historical data and event logs.
11. Alarm and Event Log:
- a. View all system alarms and change of states from any system location.
 - b. Events listed chronologically.
 - c. Operator with proper security acknowledges and clears alarms.
 - d. Alarms not cleared by operator are archived to the workstation hard disk.
12. Object, Property Status and Control:
- a. Provide a method to view, edit if applicable, the status of any object and property in the system.
 - b. Status Available by the Following Methods:
 - 1) Menu.
 - 2) Graphics.
 - 3) Custom Programs.
13. Reports and Logs:
- a. Reporting Package:
 - 1) Allows operator to select, modify, or create reports.
 - 2) Definable as to data content, format, interval, and date.
 - 3) Archivable to hard disk.
 - b. Real-time logs available by type or status such as alarm, lockout, normal, etc.
 - c. Stored on hard disk and readily accessible by standard software applications, including spreadsheets and word processing.
 - d. Set to be printed on operator command or specific time(s).
14. Reports:
- a. Standard:
 - 1) Objects with current values.
 - 2) Current alarms not locked out.



- 3) Disabled and overridden objects, points and SNVTs.
 - 4) Objects in manual or automatic alarm lockout.
 - 5) Objects in alarm lockout currently in alarm.
 - 6) Logs:
 - a) Alarm History.
 - b) System messages.
 - c) System events.
 - d) Trends.
 - b. Custom:
 - 1) Daily.
 - 2) Weekly.
 - 3) Monthly.
 - 4) Annual.
 - 5) Time and date stamped.
 - 6) Title.
 - 7) Facility name.
 - c. Tenant Override:
 - 1) Monthly report showing total, requested, after-hours HVAC and lighting services on a daily basis for each tenant.
 - 2) Annual report showing override usage on a monthly basis.
 - d. Electrical, Fuel, and Weather:
 - 1) Electrical Meter(s):
 - a) Monthly showing daily electrical consumption and peak electrical demand with time and date stamp for each meter.
 - b) Annual summary showing monthly electrical consumption and peak demand with time and date stamp for each meter.
 - 2) Fuel Meter(s):
 - a) Monthly showing daily natural gas consumption for each meter.
 - b) Annual summary showing monthly consumption for each meter.
 - 3) Weather:
 - a) Monthly showing minimum, maximum, average outdoor air temperature and heating/cooling degree-days for the month.
- C. Workstation Applications Editors:
1. Provide editing software for each system application at PC workstation.
 2. Downloaded application is executed at controller panel.
 3. Full screen editor for each application allows operator to view and change:
 - a. Configuration.
 - b. Name.
 - c. Control parameters.
 - d. Set-points.
 4. Scheduling:
 - a. Monthly calendar indicates schedules, holidays, and exceptions.
 - b. Allows several related objects to be scheduled and copied to other objects or dates.
 - c. Start and stop times adjustable from master schedule.
 5. Custom Application Programming:
 - a. Create, modify, debug, edit, compile, and download custom application programming during operation and without disruption of all other system applications.



- b. Programming Features:
- 1) English oriented language, based on BASIC, FORTRAN, C, or PASCAL syntax allowing for free form programming.
 - 2) Alternative language graphically based using appropriate function blocks suitable for all required functions and amenable to customizing or compounding.
 - 3) Insert, add, modify, and delete custom programming code that incorporates word processing features such as cut/paste and find/replace.
 - 4) Allows the development of independently, executing, program modules designed to enable and disable other modules.
 - 5) Debugging/simulation capability that displays intermediate values and/or results including syntax/execution error messages.
 - 6) Support for conditional statements (IF/THEN/ELSE/ELSE-F) using compound Boolean (AND, OR, and NOT) and/or relations (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.
 - 7) Support for floating-point arithmetic utilizing plus, minus, divide, times, square root operators; including absolute value; minimum/maximum value from a list of values for mathematical functions.
 - 8) Language consisting of resettable, predefined, variables representing time of day, day of the week, month of the year, date; and elapsed time in seconds, minutes, hours, and days where the variable values can be used in IF/THEN comparisons, calculations, programming statement logic, etc.
 - 9) Language having predefined variables representing status and results of the system software enables, disables, and changes the set points of the controller software.

2.08 CONTROLLER SOFTWARE

- A. All applications reside and operate in the system controllers and editing of all applications occurs at the operator workstation.
- B. System Security:
1. User access secured via user passwords and user names.
 2. Passwords restrict user to the objects, applications, and system functions as assigned by the system manager.
 3. User Log On/Log Off attempts are recorded.
 4. Automatic Log Off occurs following the last keystroke after a user defined delay time.
- C. Object or Object Group Scheduling:
1. Weekly Schedules Based on Separate, Daily Schedules:
 - a. Include start, stop, optimal stop, and night economizer.
 - b. 10 events maximum per schedule.
 - c. Start/stop times adjustable for each group object.
- D. Provide standard application for equipment coordination and grouping based on function and location to be used for scheduling and other applications.
- E. Alarms:
1. Binary object is set to alarm based on the operator specified state.
 2. Analog object to have high/low alarm limits.
 3. All alarming is capable of being automatically and manually disabled.



- 4. Alarm Reporting:
 - a. Operator determines action to be taken for alarm event.
 - b. Alarms to be routed to appropriate workstation.
 - c. Reporting Options:

- F. Maintenance Management: System monitors equipment status and generates maintenance messages based upon user-designated run-time limits.

- G. Sequencing: Application software based upon specified sequences of operation in Section 23 09 93.

- H. PID Control Characteristics:
 - 1. Direct or reverse action.
 - 2. Anti-windup.
 - 3. Calculated, time-varying, analog value, positions an output or stages a series of outputs.
 - 4. User selectable controlled variable, set-point, and PED gains.

- I. Staggered Start Application:
 - 1. Prevents all controlled equipment from simultaneously restarting after power outage.
 - 2. Order of equipment startup is user selectable.

- J. Energy Calculations:
 - 1. Accumulated instantaneous power or flow rates are converted to energy use data.
 - 2. Algorithm calculates a rolling average and allows window of time to be user specified in minute intervals.
 - 3. Algorithm calculates a fixed window average with a digital input signal from a utility meter defining the start of the window period that in turn synchronizes the fixed-window average with that used by the power company.

- K. Anti-Short Cycling:
 - 1. All binary output objects protected from short-cycling.
 - 2. Allows minimum on-time and off-time to be selected.

- L. On-Off Control with Differential:
 - 1. Algorithm allows binary output to be cycled based on a controlled variable and set-point.
 - 2. Algorithm to be direct-acting or reverse-acting incorporating an adjustable differential.

- M. Run-Time Totalization:
 - 1. Totalize run-times for all binary input objects.
 - 2. Provides operator with capability to assign high run-time alarm.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.

3.02 INSTALLATION

- A. Install control units and other hardware in position on permanent walls where not subject to excessive vibration.



- B. Install software in control units and in operator work station. Implement all features of programs to specified requirements and appropriate to sequence of operation. Refer to Section 23 09 93.

3.03 MANUFACTURER'S FIELD SERVICES

- A. Start and commission systems. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation.
- B. Provide service engineer to instruct Owner's representative in operation of systems plant and equipment for 3 day period.

3.04 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate complete and operating system to Owner.

END OF SECTION



SECTION 23 09 93
SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other sections.
- B. Sequence of operation for:
 - 1. Air terminal units.
 - 2. Central fan systems.

1.02 SUBMITTALS

- A. Sequence of Operation Documentation: Submit written sequence of operation for entire HVAC system and each piece of equipment.
 - 1. Include initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.
 - 2. For packaged controlled equipment, include manufacturer's furnished sequence of operation amplified as required to describe the relationship between the packaged controls and the control system, indicating which points are adjustable control points and which points are only monitored.
 - 3. Include schedules, if known.
- B. Control System Diagrams: Submit graphic schematic of the control system showing each control component and each component controlled, monitored, or enabled.
 - 1. Label with settings, adjustable range of control and limits.
 - 2. Include flow diagrams for each control system, graphically depicting control logic.
 - 3. Include the system and component layout of all equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.
 - 4. Include draft copies of graphic displays indicating mechanical system components, control system components, and controlled function status and value.
 - 5. Include all monitoring, control and virtual points specified in elsewhere.
 - 6. Include a key to all abbreviations.
- C. Points List: Submit list of all control points indicating at least the following for each point.
 - 1. Name of controlled system.
 - 2. Point abbreviation.
 - 3. Point description; such as dry bulb temperature, airflow, etc.
 - 4. Display unit.
 - 5. Control point or setpoint (Yes / No); i.e. a point that controls equipment and can have its setpoint changed.



6. Monitoring point (Yes / No); i.e. a point that does not control or contribute to the control of equipment but is used for operation, maintenance, or performance verification.
7. Intermediate point (Yes / No); i.e. a point whose value is used to make a calculation which then controls equipment, such as space temperatures that are averaged to a virtual point to control reset.
8. Calculated point (Yes / No); i.e. a “virtual” point generated from calculations of other point values.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 AIR TERMINAL UNITS

A. Dual-Duct:

1. As the space temperature rises above the cooling set-point, the primary airflow is modulated from the cooling minimum airflow to the cooling maximum airflow.
2. As the space temperature falls below the heating set-point, the secondary airflow is modulated from the heating minimum airflow to the heating maximum airflow.
3. Between the heating and cooling set-points, both the primary airflow and secondary airflow are modulated to maintain dual mixing minimum.

3.02 CENTRAL FAN SYSTEMS

A. Time Schedule: Start and stop supply and return fans. Determine fan status through auxiliary contactors in motor starter. If fan fails to start as commanded, signal alarm.

B. Safety Devices:

1. Freeze Protection: Stop fans and close outside air dampers if temperature before supply fan is below 37 degrees F (3 degrees C); signal alarm.
2. High Temperature Protection: Stop fans and close outside dampers if temperature in return air is above 300 degrees F (150 degrees C); signal alarm.
3. Smoke Detector: Stop fans, close outside dampers, and close smoke dampers if smoke is detected; signal alarm.

C. Outside Air Damper: When supply fan is running, open outside air damper to minimum position. Prevent supply fan starting until outside air damper is open and position is verified.

D. Outside, Return, and Relief Dampers:

1. When supply fan is not running, outside and relief dampers are closed and return damper is open.
2. When supply fan is running, dampers are controlled and operate with outside and relief dampers opening, and return damper closing.
3. For cooling and outside air temperatures below 55 degrees F (12 degrees C), modulate dampers to maintain mixed air temperature of 55 degrees F (12 degrees C) or higher.
4. For cooling and outside air temperatures above 55 degrees F (12 degrees C) compare return and outside air temperatures. If return air temperature is lower, drive outside damper to minimum, close relief damper, and open return damper.
5. For outside air temperatures above 79 degrees F (26 degrees C), drive outside damper to minimum, close relief damper, and open return damper.



E. Dual Duct System:

1. Control hot deck temperature in accordance with outdoor reset schedule by operating rooftop heating units.

END OF SECTION



SECTION 23 31 00
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal ductwork.
- B. Nonmetal ductwork.

1.02 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.
- D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2018.
- E. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2005 (Revised 2009).

1.03 SUBMITTALS

- A. Product Data: Provide data for duct materials.

PART 2 PRODUCTS

2.01 DUCT ASSEMBLIES

- A. Regulatory Requirements: Construct ductwork to comply with NFPA 90A standards.
- B. Ducts: Galvanized steel, unless otherwise indicated.
- C. Low Pressure Supply (Heating Systems): 1/2 inch wg (125 Pa) pressure class, galvanized steel.
- D. Low Pressure Supply (System with Cooling Coils): 1/2 inch wg (125 Pa) pressure class, galvanized steel.
- E. Return and Relief: 1/2 inch wg (125 Pa) pressure class, galvanized steel.



2.02 MATERIALS

- A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.
- B. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
 - 1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
 - 2. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
- C. Gasket Tape: Provide butyl rubber gasket tape for a flexible seal between transfer duct connector (TDC), transverse duct flange (TDF), applied flange connections, and angle rings connections.
- D. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.03 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.
- B. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.
- C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- D. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).

2.04 MANUFACTURED DUCTWORK AND FITTINGS

- A. Round Ducts: Round lockseam duct with galvanized steel outer wall.
 - 1. Manufacture in accordance with SMACNA (DCS).
- B. Flexible Ducts: Black polymer film supported by helically wound spring steel wire.
 - 1. UL labeled.
 - 2. Insulation: Fiberglass insulation with polyethylene vapor barrier film.
 - 3. Pressure Rating: 4 inches wg (1000 Pa) positive and 0.5 inches wg (175 Pa) negative.
 - 4. Maximum Velocity: 4000 fpm (20.3 m/sec).
 - 5. Temperature Range: Minus 20 degrees F to 175 degrees F (Minus 28 degrees C to 79 degrees C).

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA (DCS).



- B. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- C. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- D. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

END OF SECTION



SECTION 23 36 00
AIR TERMINAL UNITS

PART 1 GENERAL

- 1.01 SECTION INCLUDES
- A. Dual-duct units.
- 1.02 RELATED REQUIREMENTS
- A. Section 23 05 48 - Vibration and Seismic Controls for HVAC.
 - B. Section 23 09 93 - Sequence of Operations for HVAC Controls.
 - C. Section 23 31 00 - HVAC Ducts and Casings.
- 1.03 REFERENCE STANDARDS
- A. AHRI 880 (I-P) - Performance Rating of Air Terminals 2017.
 - B. ASTM A492 - Standard Specification for Stainless Steel Rope Wire 1995 (Reapproved 2019).
 - C. ASTM A603 - Standard Specification for Metallic-Coated Steel Structural Wire Rope 2019.
 - D. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems 2008.
- 1.04 SUBMITTALS
- A. Product Data: Provide data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings that indicate air flow, static pressure, and NC designation. Include electrical characteristics and connection requirements.
 - B. Manufacturer's Installation Instructions: Indicate support and hanging details, installation instructions, recommendations, and service clearances required.
 - C. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists. Include directions for resetting constant-volume regulators.
 - D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- 1.05 WARRANTY
- A. Provide five year manufacturer warranty for air terminal units.



PART 2 PRODUCTS

2.01 DUAL-DUCT UNITS

- A. Manufacturers:
1. Price Industries, Inc; [____]: www.priceindustries.com/#sle.
 2. Trane, a brand of Ingersoll Rand; [____]: www.trane.com/#sle.
- B. Basis of Design: Titus.
1. Variable-Volume, Compact, Mixing Dual-Duct Unit: DDS, (direct digital controls).
- C. General:
1. Factory-assembled, AHRI 880 (I-P) rated, variable air volume control terminal with damper assembly, flow sensor, externally mounted volume controller, duct collars, and all required features.
 2. Control box bearing identification, including but not necessarily limited to nominal cfm, maximum and minimum factory-set airflow limits.
- D. Unit Casing:
1. Minimum 22 gauge, 0.0299 inch (0.76 mm) galvanized steel.
 2. Air Inlet Collars: Provide round, suitable for standard flexible duct sizes.
 3. Unit Discharge: Rectangular, with slip-and-drive connections.
 4. Acceptable Liners:
- E. Damper Assembly:
1. Heavy-gauge, galvanized steel or extruded aluminum construction with solid shaft rotating in bearings.
 2. Provide indicator on damper shaft or alternative method for indicating damper position over full range of 90 degrees.
 3. Incorporate low leak damper blades for tight airflow shutoff.
- F. Controls:
1. DDC (Direct-Digital Controls):
 - a. Include a factory-installed, unit-mounted, direct-digital controller.
 - b. Damper Actuator: 24 volt, powered open and closed.
 - c. Provide multi-point array with velocity sensors in hot-deck and cold-deck air inlet and outlet.
 - d. Terminal Unit Controller: Pressure-independent, variable air volume controller with electronic airflow transducers, factory-calibrated to minimum and maximum air volumes.
 - 1) Operating Modes: Occupied and unoccupied.
 - 2) Proportional and integral control of room temperature.
 - 3) Remote temperature or airflow set-point reset.
 - 4) Monitoring and adjusting capability with portable terminal.
 - e. Room Sensor:
 - 1) Wall-mounted, compatible with temperature controls specified.
 - 2) Provide with temperature set-point adjustment and access connection for portable operator terminal.
 2. Control Sequence:
 - a. Cold air damper modulates to maintain space temperature.



- b. Hot air damper modulates to maintain constant CFM.
- c. See Section 23 09 93.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that conditions are suitable for installation.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install the inlets of air terminal units and air flow sensors a minimum of four duct diameters from elbows, transitions, and duct takeoffs.
- C. See drawings for the size(s) and duct location(s) of the air terminal units.
- D. Provide ceiling access doors or locate units above easily removable ceiling components.
- E. Support units individually from structure with wire rope complying with ASTM A492 and ASTM A603 in accordance with SMACNA (SRM). See Section 23 0548.
- F. Do not support from ductwork.
- G. Connect to ductwork in accordance with Section 23 31 00.

END OF SECTION



SECTION 23 74 13
PACKAGED OUTDOOR CENTRAL-STATION AIR-HANDLING UNITS

PART 1 GENERAL

- 1.01 SECTION INCLUDES
- A. Packaged roof top unit.
 - B. Unit controls.
 - C. Roof mounting curb and base.
 - D. Maintenance service.
- 1.02 RELATED REQUIREMENTS
- A. Section 23 05 48 - Vibration and Seismic Controls for HVAC.
 - B. Section 23 09 13 - Instrumentation and Control Devices for HVAC: Control components, time clocks.
 - C. Section 23 09 13 - Instrumentation and Control Devices for HVAC: Installation of thermostats and other controls components.
- 1.03 SUBMITTALS
- A. Product Data: Provide capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.
 - B. Manufacturer's Instructions: Indicate assembly, support details, connection requirements, and include start-up instructions.
 - C. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
 - D. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.
 - E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Filters: One set for each unit.
- 1.04 QUALITY ASSURANCE
- A. Unit shall be rated in accordance with AHRI (Air-Conditioning, Heating, and Refrigeration Institute) Standard 340/360, latest edition.
 - B. Unit shall be designed to conform to ANSI (American National Standards Institute)/ASHRAE 15, ASHRAE 62, and UL (Underwriters Laboratories) Standard 1995.



- C. Roof curb shall be designed to NRCA (National Roofing Contractors Association) criteria per Bulletin B-1986.
- D. Insulation and adhesive shall meet NFPA (National Fire Protection Association) 90A requirements for flame spread and smoke generation.
- E. The management system governing the manufacture of this product is ISO (International Organization for Standardization) 9001:2008 certified.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect units from physical damage by storing off site until roof mounting curbs are in place, ready for immediate installation of units.
- B. Unit shall be stored and handled per manufacturer's recommendations. All exposed coils shall have protective shipping covers.

1.06 WARRANTY

- A. Provide a five year warranty to include coverage for refrigeration compressors.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Carrier, a part of UTC Building and Industrial Systems, a unit of United Technologies Corp: www.carrier.com/#sle.
- B. Trane, a brand of Ingersoll Rand: www.trane.com/#sle.
- C. York International Corporation/Johnson Controls Inc: www.johnsoncontrols.com/#sle.

2.02 PERFORMANCE REQUIREMENTS

- A. See Mechanical Schedule.

2.03 MANUFACTURED UNITS

- A. General: Roof mounted units having electric refrigeration.
- B. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan, controls, air filters, refrigerant cooling coil and compressor, condenser coil and condenser fan.
- C. Electrical Characteristics:
 - 1. 208 volts, three phase, 60 Hz.
- D. Disconnect Switch: Factory mount disconnect switch in control panel.



2.04 FABRICATION

A. Unit Cabinet:

1. Constructed of galvanized steel, bonderized and precoated with a baked enamel finish.
 - a. Top cover shall be 18-gage sheet metal with 0.75-in. thick, 1.5-lb density, fiberglass insulation.
 - b. Access panels and doors shall be 20-gage sheet metal with 0.5-in. thick, 1.5-lb density, fiberglass insulation.
 - c. Corner and center posts shall be 16-gage galvanized steel.
 - d. Basepans in the heating and return air sections shall be 16-gage galvanized steel.
 - e. Basepans in the condenser section shall be 16-gage galvanized steel.
 - f. Compressor rail shall be 12-gage galvanized steel.
 - g. Condensate pan shall be 16-gage aluminized steel.
 - h. Air baffles shall be 18-gage galvanized steel with 0.5-in. thick, 1.5-lb density, fiberglass insulation.
 - i. Base rail shall be 14-gage galvanized steel.
 - j. Fan deck (indoor and outdoor section) shall be 16-gage galvanized steel.
2. Unit casing shall be capable of withstanding 500-hour salt spray exposure per ASTM (American Society for Testing and Materials) B117 (scribed specimen).
3. Sides shall have person-sized insulated hinged access doors for easy access to the control box and other areas requiring servicing. Each door shall seal against a rubber gasket to help prevent air and water leakage and be equipped to permit ease and safety during servicing.
4. Interior cabinet surfaces shall be sheet metal lined or insulated with flexible fire-retardant material, coated on the air side.
5. Unit shall have a factory-installed sloped condensate drain connection made from an aluminized steel or optional stainless steel.
6. Equipped with lifting lugs to facilitate overhead rigging.
7. Filters shall be accessible through a hinged access panel without requiring any special tools.

B. Indoor Evaporator Fans:

1. Double-width/double-inlet, centrifugal, belt driven, forward-curved type with single outlet discharge.
2. Fan shaft bearings shall be of the pillow-block type with positive locking collar and lubrication provisions.
3. Statically and dynamically balanced.
4. Evaporator fan shaft bearings shall have a life of 200,000 hours at design operating conditions in accordance with ANSI B3.15.
5. Solid fan shaft construction for size 020-050 units and two-piece solid fan shaft construction on the size 060 unit.

C. Condenser Fans:

1. Fans shall be direct-driven propeller type only, with corrosion-resistant blades riveted to corrosion resistant steel supports for all size 020-050 units and the size 060 unit with optional condenser coil. Size 060 units with the microchannel condenser coil shall have a direct driven, 9-blade airfoil cross section, reinforced polymer construction, and shrouded-axial type fans with inherent corrosion resistance.
2. Fans discharge air vertically upward and are protected by PVC coated steel wire safety guards.



3. Statically and dynamically balanced.

D. Air Filters:

1. 2 inch (50 mm) thick glass fiber disposable media in metal frames.

E. Roof Mounting Curb: 14 inches (350 mm) high galvanized steel, channel frame with gaskets, nailer strips.

2.05 EVAPORATOR COIL

A. Provide copper tube aluminum fin coil assembly with galvanized drain pan and connection.

B. Evaporator coil shall have aluminum plate fins mechanically bonded to seamless internally grooved copper tubes with all joints brazed.

C. Coils shall be leak tested at 150 psig and pressure tested at 650 psig.

D. Provide capillary tubes or thermostatic expansion valves for units of 6 tons (21 kw) capacity and less, and thermostatic expansion valves and alternate row circuiting for units 7.5 tons (26 kw) cooling capacity and larger.

2.06 COMPRESSOR

A. Provide hermetic compressors, 3600 rpm maximum, resiliently mounted with positive lubrication, crankcase heater, high and low pressure safety controls, motor overload protection, short cycle protection with minimum on and off timers, suction and discharge service valves and gauge ports, and filter drier.

B. Factory rubber-in-shear mounted for vibration isolation.

C. Reverse rotation protection capability.

D. Crankcase heaters shall only be activated during compressor off mode.

2.07 CONDENSER COIL

A. Provide copper tube aluminum fin coil assembly with subcooling rows and coil guard.

B. Provide direct drive propeller fans, resiliently mounted with fan guard, motor overload protection, wired to operate with compressor. Provide high efficiency fan motors.

2.08 Refrigerant Components:

A. Unit shall be equipped with dual refrigerant circuits, each containing:

1. Solid core filter drier.
2. Thermostatic expansion valve.
3. Fusible plug.



PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that roof is ready to receive work and opening dimensions are as indicated on shop drawings.
- B. Verify that proper power supply is available.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Mount units on factory built roof mounting curb providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level.

3.03 SYSTEM STARTUP

- A. Prepare and start equipment. Adjust for proper operation.

3.04 CLOSEOUT ACTIVITIES

- A. Demonstrate operation to Owner's maintenance personnel.

3.05 MAINTENANCE

- A. Provide service and maintenance of packaged roof top units for one year year from Date of Substantial Completion.
- B. Provide routine maintenance service with a two month interval as maximum time period between calls.
- C. Include maintenance items as outlined in manufacturer's operating and maintenance data, including minimum of six filter replacements, minimum of one fan belt replacement, and controls check-out, adjustments, and recalibration.
- D. After each service call, submit copy of service call work order or report that includes description of work performed.

END OF SECTION



SECTION 260519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.

1.03 DEFINITIONS

- A. VFC: Variable frequency controller.

1.04 ACTION SUBMITTALS

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

1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Field quality-control reports.

1.06 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

PART 2 PRODUCTS

2.01 CONDUCTORS AND CABLES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Alcan Products Corporation; Alcan Cable Division.
 - 2. Alpha Wire.
 - 3. Belden Inc.
 - 4. Encore Wire Corporation.
 - 5. General Cable Technologies Corporation.



6. Southwire Incorporated.
- B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.
 - C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THW-2, Type THHN-2-THWN-2.
 - D. VFC Cable:
 1. Comply with UL 1277, UL 1685, and NFPA 70 for Type TC-ER cable.
 2. Type TC-ER with oversized crosslinked polyethylene insulation, and sunlight- and oil-resistant outer PVC jacket.
 3. Comply with UL requirements for cables in Classes I and II, Division 2 hazardous location applications.

2.02 CONNECTORS AND SPLICES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 1. AFC Cable Systems, Inc.
 2. Gardner Bender.
 3. Hubbell Power Systems, Inc.
 4. Ideal Industries, Inc.
 5. IlSCO; a branch of Bardes Corporation.
 6. NSi Industries LLC.
 7. O-Z/Gedney; a brand of the EGS Electrical Group.
 8. 3M; Electrical Markets Division.
 9. Tyco Electronics.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.03 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70, 2014 Edition.

PART 3 EXECUTION

3.01 CONDUCTOR MATERIAL APPLICATIONS



- A. Feeders: Copper Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger, except VFC cable, which shall be extra flexible stranded.

3.02 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN-2-THWN-2, single conductors in raceway, Type XHHW-2, single conductors in raceway.
- B. Exposed Feeders: Type THHN-2-THWN-2, single conductors in raceway, Type XHHW-2, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN-2-THWN-2, single conductors in raceway, .
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway, Type XHHW-2, single conductors in raceway
- E. Exposed Branch Circuits, Including in Crawlspace: Type THHN-2-THWN-2, single conductors in raceway,
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-2-THWN-2, single conductors in raceway
- G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway, Type XHHW-2, single conductors in raceway
- H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
- I. VFC Output Circuits: Type XHHW-2 in metal conduit.

3.03 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.



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

3.04 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
 - 1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.05 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.06 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

3.07 FIRESTOPPING

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

3.08 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
 - 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in conductors No. 3



AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.

- a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
 - b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
- D. Test and Inspection Reports: Prepare a written report to record the following:
1. Procedures used.
 2. Results that comply with requirements.
 3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- E. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION



SECTION 260529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.

1.03 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

1.04 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.05 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel slotted support systems.
 - 2. Nonmetallic slotted support systems.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
 - 1. Trapeze hangers. Include Product Data for components.



2. Steel slotted channel systems. Include Product Data for components.
3. Nonmetallic slotted channel systems. Include Product Data for components.
4. Equipment supports.

1.06 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.07 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70, 2014 Edition.

1.08 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 077200 "Roof Accessories."

PART 2 PRODUCTS

2.01 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Atkore International.
 - g. Wesanco, Inc.
 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.



4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 5. Channel Dimensions: Selected for applicable load criteria.
- B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- (14-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c., in at least 1 surface.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.
 - c. Fabco Plastics Wholesale Limited.
 - d. Seasafe, Inc.
 2. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
 3. Fitting and Accessory Materials: Same as channels and angles.
 4. Rated Strength: Selected to suit applicable load criteria.
- C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- D. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Hilti, Inc.
 2. ITW Ramset/Red Head; Illinois Tool Works, Inc.



3. MKT Fastening, LLC.
 4. Simpson Strong-Tie Co., Inc.
2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Cooper B-Line, Inc.
 2. Empire Tool and Manufacturing Co., Inc.
 3. Hilti, Inc.
 4. ITW Ramset/Red Head; Illinois Tool Works, Inc.
 5. MKT Fastening, LLC.
 3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
 6. Toggle Bolts: All-steel springhead type.
 7. Hanger Rods: Threaded steel.

2.02 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 EXECUTION

3.01 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.



- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with two-bolt conduit clamps
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports .

3.02 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
 - 6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
 - 7. To Light Steel: Sheet metal screws.
 - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.



3.03 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- B. Field Welding: Comply with AWS D1.1/D1.1M.

3.04 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than **4 inches (100 mm)** larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi (20.7-MPa) 28-day compressive-strength concrete.
- C. Anchor equipment to concrete base.
 - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.05 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION



SECTION 260533
RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Metal conduits, tubing, and fittings.
 - 2. Nonmetal conduits, tubing, and fittings.
 - 3. Metal wireways and auxiliary gutters.
 - 4. Nonmetal wireways and auxiliary gutters.
 - 5. Surface raceways.
 - 6. Boxes, enclosures, and cabinets.
 - 7. Handholes and boxes for exterior underground cabling.

1.03 DEFINITIONS

- A. ARC: Aluminum rigid conduit.
- B. GRC: Galvanized rigid steel conduit.
- C. IMC: Intermediate metal conduit.

1.04 ACTION SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.05 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
 - 1. Structural members in paths of conduit groups with common supports.
 - 2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.



- B. Qualification Data: For professional engineer.
- C. Seismic Qualification Certificates: For enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
 - 4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.
- D. Source quality-control reports.

PART 2 PRODUCTS

2.01 METAL CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following, but are not limited to, the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Allied Tube & Conduit.
 - 3. Anamet Electrical, Inc.
 - 4. Electri-Flex Company.
 - 5. O-Z/Gedney.
 - 6. Picoma Industries.
 - 7. Republic Conduit.
 - 8. Robroy Industries.
 - 9. Southwire Company.
 - 10. Thomas & Betts Corporation.
 - 11. Western Tube and Conduit Corporation.
 - 12. Wheatland Tube Company.
- B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. GRC: Comply with ANSI C80.1 and UL 6.



- D. ARC: Comply with ANSI C80.5 and UL 6A.
- E. IMC: Comply with ANSI C80.6 and UL 1242.
- F. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit] [IMC
 - 1. Comply with NEMA RN 1.
 - 2. Coating Thickness: 0.040 inch (1 mm), minimum.
- G. EMT: Comply with ANSI C80.3 and UL 797.
- H. FMC: Comply with UL 1; zinc-coated steel or aluminum.
- I. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- J. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
 - 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
 - 2. Fittings for EMT:
 - a. Material: Steel or die cast.
 - b. Type: Setscrew or compression.
 - 3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
 - 4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.
- K. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.02 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following but are not limited to, the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Anamet Electrical, Inc.
 - 3. Arnco Corporation.
 - 4. CANTEX Inc.
 - 5. CertainTeed Corporation.
 - 6. Condux International, Inc.



7. Electri-Flex Company.
 8. Kraloy.
 9. Lamson & Sessions; Carlon Electrical Products.
 10. Niedax-Kleinhuis USA, Inc.
 11. RACO; Hubbell.
 12. Thomas & Betts Corporation.
- B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. ENT: Comply with NEMA TC 13 and UL 1653.
- D. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- E. LFNC: Comply with UL 1660.
- F. Rigid HDPE: Comply with UL 651A.
- G. Continuous HDPE: Comply with UL 651B.
- H. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D 3485.
- I. RTRC: Comply with UL 1684A and NEMA TC 14.
- J. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
- K. Fittings for LFNC: Comply with UL 514B.
- L. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- M. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.03 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following, but are not limited to, the following:
1. Cooper B-Line, Inc.
 2. Hoffman.
 3. Mono-Systems, Inc.



- 4. Square D.
- B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.
 - 1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireway Covers: Hinged type unless otherwise indicated.
- E. Finish: Manufacturer's standard enamel finish.

2.04 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following but are not limited to, the following:
 - 1. Allied Moulded Products, Inc.
 - 2. Hoffman.
 - 3. Lamson & Sessions; Carlon Electrical Products.
 - 4. Niedax-Kleinhuis USA, Inc.
- B. Listing and Labeling: Nonmetallic wireways and auxiliary gutters shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Description: Fiberglass polyester, extruded and fabricated to required size and shape, without holes or knockouts. Cover shall be gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections shall be flanged and have stainless-steel screws and oil-resistant gaskets.
- D. Description: PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.
- E. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.
- F. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- G. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."



2.05 SURFACE RACEWAYS

- A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following, but are not limited to, the following:
 - a. Mono-Systems, Inc.
 - b. Panduit Corp.
 - c. Wiremold / Legrand.
- C. Surface Nonmetallic Raceways: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC with texture and color selected by Architect from [manufacturer's standard] [custom] colors. Product shall comply with UL 94 V-0 requirements for self-extinguishing characteristics.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following include, but are not limited to, the following:
 - a. Hubbell Incorporated.
 - b. Mono-Systems, Inc.
 - c. Panduit Corp.
 - d. Wiremold / Legrand.
- D. Tele-Power Poles:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following, but are not limited to, the following:
 - a. Mono-Systems, Inc.
 - b. Panduit Corp.
 - c. Wiremold / Legrand.
 - 2. Material: Galvanized steel with ivory baked-enamel finish.
 - 3. Fittings and Accessories: Dividers, end caps, covers, cutouts, wiring harnesses, devices, mounting materials, and other fittings shall match and mate with tele-power pole as required for complete system.

2.06 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following, but are not limited to, the following:



1. Adalet.
 2. Cooper Technologies Company; Cooper Crouse-Hinds.
 3. EGS/Appleton Electric.
 4. Erickson Electrical Equipment Company.
 5. FSR Inc.
 6. Hoffman.
 7. Hubbell Incorporated.
 8. Kraloy.
 9. Milbank Manufacturing Co.
 10. Mono-Systems, Inc.
 11. O-Z/Gedney.
 12. RACO; Hubbell.
 13. Robroy Industries.
 14. Spring City Electrical Manufacturing Company.
 15. Stahlin Non-Metallic Enclosures.
 16. Thomas & Betts Corporation.
 17. Wiremold / Legrand.
- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy aluminum, Type FD, with gasketed cover.
- E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- F. Metal Floor Boxes:
1. Material: Cast metal or sheet metal.
 2. Type: Fully adjustable.
 3. Shape: Rectangular.
 4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.



- G. Nonmetallic Floor Boxes: Nonadjustable, round or rectangular.
 - 1. Listing and Labeling: Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- H. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.
- I. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb (32 kg).
 - 1. Listing and Labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- J. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- K. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum galvanized, cast iron with gasketed cover.
- L. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- M. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).
- N. Gangable boxes are allowed.
- O. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Nonmetallic Enclosures: Fiberglass.
 - 3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- P. Cabinets:
 - 1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 - 2. Hinged door in front cover with flush latch and concealed hinge.
 - 3. Key latch to match panelboards.
 - 4. Metal barriers to separate wiring of different systems and voltage.
 - 5. Accessory feet where required for freestanding equipment.
 - 6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.



2.07 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. General Requirements for Handholes and Boxes:
1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
 2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Armorcast Products Company.
 - b. Carson Industries LLC.
 - c. NewBasis.
 - d. Oldcastle Precast, Inc.
 - e. Quazite: Hubbell Power System, Inc.
 - f. Synertech Moulded Products.
 2. Standard: Comply with SCTE 77.
 3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
 4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
 5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 6. Cover Legend: Molded lettering, "ELECTRIC." .
 7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
 8. Handholes 12 Inches Wide by 24 Inches Long (300 mm Wide by 600 mm Long) and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.
- C. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers of polymer concrete reinforced concrete. cast iron, hot-dip galvanized-steel diamond plate or fiberglass.
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:



- a. Armorcast Products Company.
 - b. Carson Industries LLC.
 - c. NewBasis.
 - d. Nordic Fiberglass, Inc.
 - e. Oldcastle Precast, Inc; Christy Concrete Products.
 - f. Quazite: Hubbell Power System, Inc; Hubbell Power Systems.
 - g. Synertech Moulded Products.
2. Standard: Comply with SCTE 77.
 3. Color of Frame and Cover: Gray.
 4. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
 5. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
 6. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 7. Cover Legend: Molded lettering, "ELECTRIC."
 8. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
 9. Handholes 12 Inches Wide by 24 Inches Long (300 mm Wide by 600 mm Long) and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.08 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

- A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
 1. Tests of materials shall be performed by an independent testing agency.
 2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
 3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

PART 3 EXECUTION

3.01 RACEWAY APPLICATION



- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed Conduit: GRC, IMC , Type EPC-40-PVC.
 2. Concealed Conduit, Aboveground: GRC IMC EMT.
 3. Underground Conduit: RNC, Type EPC-40-PVC Type EPC-80-PVC, direct buried concrete encased.
 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC LFNC.
 5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R
- B. Indoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed, Not Subject to Physical Damage: EMT ENT or RNC.
 2. Exposed, Not Subject to Severe Physical Damage: EMT RNC identified for such use.
 3. Exposed and Subject to Severe Physical Damage: GRC IMC. Raceway locations include the following:
 - a. Loading dock.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - c. Mechanical rooms.
 - d. Gymnasiums.
 4. Concealed in Ceilings and Interior Walls and Partitions: EMT ENT or [RNC, Type EPC-40-PVC.
 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
 6. Damp or Wet Locations: GRC IMC.
 7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel nonmetallic in damp or wet locations.
- C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting



manufacturer and apply in thickness and number of coats recommended by manufacturer.

3. EMT: Use setscrew or compression, cast-metal fittings. Comply with NEMA FB 2.10.
 4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.
 - F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
 - G. Install surface raceways only where indicated on Drawings.
 - H. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C)

3.02 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- E. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- H. Support conduit within 12 inches (300 mm) of enclosures to which attached.
- I. Raceways Embedded in Slabs:
 1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m) intervals.



2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 3. Arrange raceways to keep a minimum of 1 inch (25 mm) of concrete cover in all directions.
 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
 5. Change from ENT to RNC, Type EPC-40-PVC, GRC or IMC before rising above floor.
- J. Stub-ups to Above Recessed Ceilings:
1. Use EMT, IMC, or RMC for raceways.
 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- M. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- N. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- O. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- P. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
- Q. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- S. Surface Raceways:
1. Install surface raceway with a minimum 2-inch (50-mm) radius control at bend points.



2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
- T. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
- U. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 2. Where an underground service raceway enters a building or structure.
 3. Where otherwise required by NFPA 70.
- V. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- W. Expansion-Joint Fittings:
1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C) and that has straight-run length that exceeds 25 feet (7.6 m). Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F (55 deg C) and that has straight-run length that exceeds 100 feet (30 m).
 2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
 - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
 - d. Attics: 135 deg F (75 deg C) temperature change.
 3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.00078 inch per foot of length of straight run per deg F (0.0115 mm per meter of length of straight run per deg C) of temperature change for metal conduits.



4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
 5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- X. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
1. Use LFMC in damp or wet locations subject to severe physical damage.
 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- Y. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- Z. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
- AA. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- BB. Locate boxes so that cover or plate will not span different building finishes.
- CC. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- DD. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- EE. Set metal floor boxes level and flush with finished floor surface.
- FF. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.
- 3.03 INSTALLATION OF UNDERGROUND CONDUIT
- A. Direct-Buried Conduit:
1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches (150 mm) in nominal diameter.
 2. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After



placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."

3. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete for a minimum of 12 inches (300 mm) on each side of the coupling.
 - b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
5. Warning Planks: Bury warning planks approximately 12 inches (300 mm) above direct-buried conduits but a minimum of 6 inches (150 mm) below grade. Align planks along centerline of conduit.
6. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.04 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.
- D. Install handholes with bottom below frost line, below grade.
- E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.
- F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.05 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS



- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

3.06 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.07 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION



SECTION 260544

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.



2. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and with no side larger than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
 - b. For sleeve cross-section rectangle perimeter 50 inches (1270 mm) or more and one or more sides larger than 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 1. Manufacturers:
 - a. Advance Products & Systems
 - b. CALPICO
 - c. Metraflex
 - d. Pipeline Seal & Insulator
 - e. Proco Products
 2. Sealing Elements: EPDM, Nitrile (Buna N) rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 3. Pressure Plates: Carbon steel, Plastic, Stainless steel.
 4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, Stainless steel of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

- A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.
 1. Manufacturers:
 - a. HOLDRITE

2.4 GROUT

- A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.



2.5 SILICONE SEALANTS

- A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
 - 2.
- B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
 - 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
 - a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
 - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
 - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 3. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
 - 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
 - 5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level. Install sleeves during erection of floors.
- D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
 - 1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.



- E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel, cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
- B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 260544



SECTION 262726
WIRING DEVICES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
 - 2. Twist-locking receptacles.
 - 3. Receptacles with integral surge-suppression units.
 - 4. Isolated-ground receptacles.
 - 5. Weather-resistant receptacles.
 - 6. Communications outlets.

1.03 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- D. RFI: Radio-frequency interference.
- E. TVSS: Transient voltage surge suppressor.
- F. UTP: Unshielded twisted pair.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
 - 2. Cord and Plug Sets: Match equipment requirements.

1.05 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.
- C. Samples: One for each type of device and wall plate specified, in each color specified.



1.06 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.07 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

1.08 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. TVSS Receptacles: One for every 10 of each type installed, but no fewer than two of each type.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 - 1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
 - 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
 - 3. Leviton Mfg. Company Inc. (Leviton).
 - 4. Pass & Seymour/Legrand (Pass & Seymour).
- B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.02 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70, 2014 Edition.
- C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
 - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
 - 2. Devices shall comply with the requirements in this Section.

2.03 STRAIGHT-BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.



1. Products: Subject to compliance with requirements, provide the following but are not limited to, the following:
 - a. Cooper; 5351 (single), CR5362 (duplex).
 - b. Hubbell; HBL5351 (single), HBL5352 (duplex).
 - c. Leviton; 5891 (single), 5352 (duplex).
 - d. Pass & Seymour; 5361 (single), 5362 (duplex).
- B. Isolated-Ground, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
 1. Products: Subject to compliance with requirements, provide the following, but are not limited to, the following:
 - a. Cooper; IG5362RN.
 - b. Hubbell; IG5362.
 - c. Leviton; 5362-IG.
 - d. Pass & Seymour; IG5362.
 2. Description: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.04 GFCI RECEPTACLES

- A. General Description:
 1. Straight blade, feed-through type.
 2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
 3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
 1. Products: Subject to compliance with requirements, provide the following but are not limited to, the following:
 - a. Cooper; VGF20.
 - b. Hubbell; GFR5352L.
 - c. Pass & Seymour; 2095.
 - d. Leviton; 7590.



2.05 TVSS RECEPTACLES

- A. General Description: Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 1449, and FS W-C-596, with integral TVSS in line to ground, line to neutral, and neutral to ground.
1. TVSS Components: Multiple metal-oxide varistors; with a nominal clamp-level rating of 400 V and minimum single transient pulse energy dissipation of 240 J, according to IEEE C62.41.2 and IEEE C62.45.
 2. Active TVSS Indication: Visual and audible, with light visible in face of device to indicate device is "active" or "no longer in service."
- B. Duplex TVSS Convenience Receptacles:
1. Products: Subject to compliance with requirements, provide the following, but are not limited to, the following:
 - a. Cooper; 5362BLS.
 - b. Hubbell; HBL5362SA.
 - c. Leviton; 5380.
 - d. Pass & Seymour; 5362BLSP.
 - e.
 2. Description: Straight blade, 125 V, 20 A; NEMA WD 6 Configuration 5-20R.
- C. Isolated-Ground, Duplex Convenience Receptacles:
1. Products: Subject to compliance with requirements, provide one of the following but not limited to:
 - a. Cooper; IG5362BLS.
 - b. Hubbell; IG5362SA.
 - c. Leviton; 5380-IG.
 - d. Pass & Seymour; IG5362BLSP.
 2. Description:
 - a. Straight blade, 125 V, 20 A; NEMA WD 6 Configuration 5-20R.
 - b. Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.06 TWIST-LOCKING RECEPTACLES

- A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.



1. Products: Subject to compliance with requirements, provide the following, but are not limited to, the following:
 - a. Cooper; CWL520R.
 - b. Hubbell; HBL2310.
 - c. Leviton; 2310.
 - d. Pass & Seymour; L520-R.
- B. Isolated-Ground, Single Convenience Receptacles, 125 V, 20 A:
 1. Products: Subject to compliance with requirements, provide the following, but are not limited to, the following:
 - a. Cooper; IGL520R.
 - b. Hubbell; IG2310.
 - c. Leviton; 2310-IG.
 - d. Pass & Seymour; IG4700.
 2. Description:
 - a. Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.
 - b. Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
 1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 4. Install wiring devices after all wall preparation, including painting, is complete.



C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:



1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.
 2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.
- F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and re-mount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- G. Dimmers:
1. Install dimmers within terms of their listing.
 2. Verify that dimmers used for fan speed control are listed for that application.
 3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.
- H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
- I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.
- 3.02 GFCI RECEPTACLES
- A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.
- 3.03 IDENTIFICATION
- A. Comply with Section 260553 "Identification for Electrical Systems."
- B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.
- 3.04 FIELD QUALITY CONTROL
- A. Perform the following tests and inspections:
1. In healthcare facilities, prepare reports that comply with recommendations in NFPA 99, 2015 Edition.
 2. Test Instruments: Use instruments that comply with UL 1436.
 3. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- B. Tests for Convenience Receptacles:
1. Line Voltage: Acceptable range is 105 to 132 V.



2. Percent Voltage Drop under 15-A Load: A value of 3 percent or higher is unacceptable.
 3. Ground Impedance: Values of up to 2 ohms are acceptable.
 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 5. Using the test plug, verify that the device and its outlet box are securely mounted.
 6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- C. Wiring device will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION



SECTION 262816

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Receptacle switches.
4. Shunt trip switches.
5. Molded-case circuit breakers (MCCBs).
6. Molded-case switches.
7. Enclosures.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in **PDF and** electronic format.

B. Shop Drawings: For enclosed switches and circuit breakers.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include wiring diagrams for power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.

C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.



1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Accredited by NETA.
 - 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

1.6 WARRANTY

- A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: **One** year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to **ASCE/SEI 7**.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified **and the unit will be fully operational after the seismic event.**"

2.2 GENERAL REQUIREMENTS

- A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- D. Comply with NFPA 70.

2.3 FUSIBLE SWITCHES

- A. Manufacturers:
 - 1. ABB
 - 2. Eaton
 - 3. General Electric
 - 4. Siemens Industry
 - 5. Square D/Schneider Electric



- B. Type HD, Heavy Duty:
1. **Single, Double** throw.
 2. **Three, six** pole.
 3. **240, 600-V** ac.
 4. **1200 A and smaller, 200 A and smaller.**
 5. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate **indicated** fuses.
 6. Lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 3. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
 4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
 5. Service-Rated Switches: Labeled for use as service equipment.

2.4 NONFUSIBLE SWITCHES

- A. Manufacturers:
1. Eaton
 2. General Electric
 3. Siemens Industry
 4. Square D/Schneider Electric
- B. Type GD, General Duty, Three Pole, Single Throw, 240-V ac, 600 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.
- C. Type HD, Heavy Duty, Three Pole, Single Throw, **600-V** ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- D. Type HD, Heavy Duty, Six Pole, Single Throw, **240, 600-V** ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- E. Type HD, Heavy Duty, Three Pole, Double Throw, **240, 600-V** ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- F. Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.



2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
5. Service-Rated Switches: Labeled for use as service equipment.

2.5 RECEPTACLE SWITCHES

- A. Manufacturers:
 1. Eaton
 2. General Electric
 3. Siemens Industry
 4. Square D/Schneider Electric
- B. Type HD, Heavy-Duty, Three Pole, Single-Throw Fusible Switch: **240, 600-V ac**, [30] [60] [100] <Insert amperage> A; UL 98 and NEMA KS 1; horsepower rated, with clips or bolt pads to accommodate **indicated** fuses; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- C. Type HD, Heavy-Duty, Three Pole, Single-Throw Nonfusible Switch: **240, 600-V ac**, [30] [60] [100] <Insert amperage> A; UL 98 and NEMA KS 1; horsepower rated, lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- D. Interlocking Linkage: Provided between the receptacle and switch mechanism to prevent inserting or removing plug while switch is in the on position, inserting any plug other than specified, and turning switch on if an incorrect plug is inserted or correct plug has not been fully inserted into the receptacle.
- E. Receptacle: Polarized, three-phase, four-wire receptacle (fourth wire connected to enclosure ground lug).
- F. Accessories:
 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 3. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
 4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
 5. Auxiliary Contact Kit: **One, Two** NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open. Contact rating - [24-V ac] [120-V ac] [208-V ac] [240-V ac] [6-V dc] [12-V dc] [24-V dc].
 6. Hookstick Handle: Allows use of a hookstick to operate the handle.
 7. Lugs: **Mechanical, Compression** type, suitable for number, size, and conductor material.
 8. Service-Rated Switches: Labeled for use as service equipment.



2.6 SHUNT TRIP SWITCHES

- A. Manufacturers:
1. Bussmann
 2. Littelfuse
 3. Mersen USA
- B. General Requirements: Comply with **ASME A17.1**, UL 50, and UL 98, with Class J fuse block and 200-kA interrupting and short-circuit current rating.
- C. Type HD, Heavy-Duty, Three Pole, Single-Throw Fusible Switch: **240-V ac, 30, 60 or 100 A**; UL 98 and NEMA KS 1; integral shunt trip mechanism; horsepower rated, with clips or bolt pads to accommodate **indicated** fuses; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- D. Type HD, Heavy-Duty, Three Pole, Single-Throw Nonfusible Switch: **240-V ac, 30, 60 or 100A**; UL 98 and NEMA KS 1; integral shunt trip mechanism; horsepower rated, lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- E. Control Circuit: 120-V ac; obtained from **integral control power transformer, with primary and secondary fuses**, with a control power **transformer** of enough capacity to operate shunt trip, pilot, indicating and control devices.
- F. Accessories:
1. Oiltight key switch for key-to-test function.
 2. Oiltight **green** ON pilot light.
 3. Isolated neutral lug; **100** percent rating.
 4. Mechanically interlocked auxiliary contacts that change state when switch is opened and closed.
 5. Three-pole, double-throw, fire-safety and alarm relay; **120-V ac** coil voltage.
 6. Three-pole, double-throw, fire-alarm voltage monitoring relay complying with NFPA 72.
 7. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 8. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
 9. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
 10. Service-Rated Switches: Labeled for use as service equipment.

2.7 MOLDED-CASE CIRCUIT BREAKERS

- A. Manufacturers:
1. Eaton
 2. General Electric
 3. NOARK Electric North America
 4. Siemens Industry
 5. Square D/Schneider Electric
- B. Circuit breakers shall be constructed using glass-reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.



- C. Circuit breakers shall have a toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. The circuit-breaker handle shall be over center, be trip free, and reside in a tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon shall be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit-breaker tripping mechanism for maintenance and testing purposes.
- D. The maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearly marked on face of circuit breaker. Circuit breakers shall be **100 percent rated or series rated as indicated on the Drawings. Circuit breaker/circuit breaker or Fuse/circuit breaker** combinations for series connected interrupting ratings shall be listed by UL as recognized component combinations. Any series rated combination used shall be marked on the end-use equipment along with the statement "Caution - Series Rated System. _____ Amps Available. Identical Replacement Component Required."
- E. MCCBs shall be equipped with a device for locking in the isolated position.
- F. Lugs shall be suitable for **140 deg F (60 deg C) rated wire on 125-A circuit breakers and below, [167 deg F (75 deg C) rated wire or 194 deg F (90 deg C) rated wire, sized according to the 167 deg F (75 deg C) temperature rating in NFPA 70.**
- G. Standards: Comply with UL 489 with interrupting capacity to comply with available fault currents.
- H. Thermal-Magnetic Circuit Breakers: Inverse time-current thermal element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- I. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
- J. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
1. Long- and short-time pickup levels.
 2. Long- and short-time time adjustments.
 3. Ground-fault pickup level, time delay, and I-squared t response.
- K. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.
- L. Features and Accessories:
1. Standard frame sizes, trip ratings, and number of poles.
 2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
 3. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.



4. Auxiliary Contacts: **One SPDT switch** with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
5. Alarm Switch: One **NO, NC** contact that operates only when circuit breaker has tripped.

2.8 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
- B. Enclosure Finish: The enclosure shall be **finished with gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (NEMA 250 Type 1), gray baked enamel paint, electrodeposited on cleaned, phosphatized galvanized steel (NEMA 250 Types 3R, 12), a brush finish on Type 304 stainless steel (NEMA 250 Type 4-4X stainless steel), copper-free cast aluminum alloy (NEMA 250 Types 7, 9).**
- C. Conduit Entry: NEMA 250 Types 4, 4X, and 12 enclosures shall contain no knockouts. NEMA 250 Types 7 and 9 enclosures shall be provided with threaded conduit openings in both endwalls.
- D. Operating Mechanism: The circuit-breaker operating handle shall be **externally operable with the operating mechanism being an integral part of the box, not the cover, directly operable through the front cover of the enclosure (NEMA 250 Type 1), directly operable through the dead front trim of the enclosure (NEMA 250 Type 3R), externally operable with the operating mechanism being an integral part of the cover (NEMA 250 Types 7, 9).** The cover interlock mechanism shall have an externally operated override. The override shall not permanently disable the interlock mechanism, which shall return to the locked position once the override is released. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.
- E. Enclosures designated as NEMA 250 Type 4, 4X stainless steel, 12, or 12K shall have a dual cover interlock mechanism to prevent unintentional opening of the enclosure cover when the circuit breaker is ON and to prevent turning the circuit breaker ON when the enclosure cover is open.
- F. NEMA 250 Type 7/9 enclosures shall be furnished with a breather and drain kit to allow their use in outdoor and wet location applications.

PART 3 - EXECUTION

3.1 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

- A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.
 1. Indoor, Dry and Clean Locations: NEMA 250, **Type 1.**
 2. Outdoor Locations: NEMA 250, **Type 3R, Type 4X.**
 3. **Kitchen, Wash-Down** Areas: NEMA 250, **Type 4Xstainless steel .**
 4. Other Wet or Damp, Indoor Locations: NEMA 250, **Type 4.**



5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
6. Hazardous Areas Indicated on Drawings: NEMA 250, **Type 7, Type 9 with cover attached by Type 316 stainless steel bolts.**

3.2 INSTALLATION

- A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
 1. Notify **Owner** no fewer than **seven** days in advance of proposed interruption of electric service.
 2. Indicate method of providing temporary electric service.
 3. Do not proceed with interruption of electric service without **Owner's** written permission.
 4. Comply with NFPA 70E.
- B. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- C. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- D. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- E. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- F. Install fuses in fusible devices.
- G. Comply with NFPA 70 and NECA 1.
- H. Set field-adjustable circuit-breaker trip ranges **to values indicated on the Drawings.**

3.3 IDENTIFICATION

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.



- C. Perform tests and inspections **with the assistance of a factory-authorized service representative.**
- D. Tests and Inspections for Switches:
1. Visual and Mechanical Inspection:
 - a. Inspect physical and mechanical condition.
 - b. Inspect anchorage, alignment, grounding, and clearances.
 - c. Verify that the unit is clean.
 - d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
 - e. Verify that fuse sizes and types match the Specifications and Drawings.
 - f. Verify that each fuse has adequate mechanical support and contact integrity.
 - g. Inspect bolted electrical connections for high resistance using one of the two following methods:
 - 1) Use a low-resistance ohmmeter.
 - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
 - a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
 - h. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on the Drawings.
 - i. Verify correct phase barrier installation.
 - j. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.
 2. Electrical Tests:
 - a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
 - b. Measure contact resistance across each switchblade fuseholder. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
 - c. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of



insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.

- d. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
- e. Perform ground fault test according to NETA ATS 7.14 "Ground Fault Protection Systems, Low-Voltage."

E. Tests and Inspections for Molded Case Circuit Breakers:

1. Visual and Mechanical Inspection:

- a. Verify that equipment nameplate data are as described in the Specifications and shown on the Drawings.
- b. Inspect physical and mechanical condition.
- c. Inspect anchorage, alignment, grounding, and clearances.
- d. Verify that the unit is clean.
- e. Operate the circuit breaker to ensure smooth operation.
- f. Inspect bolted electrical connections for high resistance using one of the two following methods:
 - 1) Use a low-resistance ohmmeter.
 - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
 - a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
- g. Inspect operating mechanism, contacts, and chutes in unsealed units.
- h. Perform adjustments for final protective device settings in accordance with the coordination study.

2. Electrical Tests:

- a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
- b. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with circuit breaker closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.



- c. Perform a contact/pole resistance test. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
 - d. Perform insulation resistance tests on all control wiring with respect to ground. Applied potential shall be 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable. Test duration shall be one minute. For units with solid state components, follow manufacturer's recommendation. Insulation resistance values shall be no less than two megohms.
 - e. Determine the following by primary current injection:
 - 1) Long-time pickup and delay. Pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
 - 2) Short-time pickup and delay. Short-time pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
 - 3) Ground-fault pickup and time delay. Ground-fault pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
 - 4) Instantaneous pickup. Instantaneous pickup values shall be as specified and within manufacturer's published tolerances.
 - f. Test functionality of the trip unit by means of primary current injection. Pickup values and trip characteristics shall be as specified and within manufacturer's published tolerances.
 - g. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of the shunt trip and close coils shall be as indicated by manufacturer.
 - h. Verify correct operation of auxiliary features such as trip and pickup indicators; zone interlocking; electrical close and trip operation; trip-free, anti-pump function; and trip unit battery condition. Reset all trip logs and indicators. Investigate units that do not function as designed.
 - i. Verify operation of charging mechanism. Investigate units that do not function as designed.
3. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- F. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- G. Prepare test and inspection reports.
1. Test procedures used.
 2. Include identification of each enclosed switch and circuit breaker tested and describe test results.
 3. List deficiencies detected, remedial action taken, and observations after remedial action.

Bid Set



END OF SECTION 262816



SUBMITTAL LIST SUMMARY

DIVISION 22 - PLUMBING

22 10 05 Plumbing Piping

1. SUBMITTALS

- A. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

23 05 13 Common Motor Requirements for HVAC Equipment

1. SUBMITTALS

- A. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.
- B. Test Reports: Indicate test results verifying nominal efficiency and power factor for three phase motors larger than 1/2 horsepower.
- C. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.
- D. Operation Data: Include instructions for safe operating procedures.
- E. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

23 05 29 Hangers and Supports for HVAC Piping and Equipment

1. SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.
- B. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
 - i. Application of protective inserts, saddles, and shields at pipe hangers for each type of insulation and hanger.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

23 05 48 Vibration and Seismic Controls for HVAC

1. SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.



- i. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.
- ii. Seismic Controls: Include seismic load capacities.

23 05 53 Identification for HVAC Piping and Equipment

1. SUBMITTALS

- A. Product Data: Provide manufacturers catalog literature for each product required.

23 05 93 Testing, Adjusting, and Balancing for HVAC

1. SUBMITTALS

- A. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
 - i. Include at least the following in the plan:
 - 1. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
 - 2. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
 - 3. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
 - 4. Final test report forms to be used.
 - 5. Procedures for formal deficiency reports, including scope, frequency and distribution.
- B. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
 - i. Revise TAB plan to reflect actual procedures and submit as part of final report.
 - ii. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
 - iii. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
 - iv. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
 - v. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.
 - vi. Include the following on the title page of each report:
 - 1. Name of Testing, Adjusting, and Balancing Agency.
 - 2. Address of Testing, Adjusting, and Balancing Agency.
 - 3. Telephone number of Testing, Adjusting, and Balancing Agency.



4. Project name.
5. Project location.
6. Project Engineer.
7. Project Contractor.
8. Project altitude.
9. Report date.

23 07 13 Duct Insulation

1. SUBMITTALS

- A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

23 09 13 Instrumentation and Control Devices for HVAC

1. SUBMITTALS

- A. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

23 09 23 Direct-Digital Control System for HVAC

1. SUBMITTALS

- A. Product Data: Provide data for each system component and software module.
- B. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner s name and registered with manufacturer.

23 09 93 Sequence of Operations for HVAC Controls

1. SUBMITTALS

- A. Sequence of Operation Documentation: Submit written sequence of operation for entire HVAC system and each piece of equipment.
 - i. Include initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.
 - ii. For packaged controlled equipment, include manufacturer's furnished sequence of operation amplified as required to describe the relationship between the packaged controls and the control system, indicating which points are adjustable control points and which points are only monitored.
 - iii. Include schedules, if known.
- B. Control System Diagrams: Submit graphic schematic of the control system showing each control component and each component controlled, monitored, or enabled.
 - i. Label with settings, adjustable range of control and limits.
 - ii. Include flow diagrams for each control system, graphically depicting control logic.



- iii. Include the system and component layout of all equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.
- iv. Include draft copies of graphic displays indicating mechanical system components, control system components, and controlled function status and value.
- v. Include all monitoring, control and virtual points specified in elsewhere.
- vi. Include a key to all abbreviations.
- C. Points List: Submit list of all control points indicating at least the following for each point.
 - i. Name of controlled system.
 - ii. Point abbreviation.
 - iii. Point description; such as dry bulb temperature, airflow, etc.
 - iv. Display unit.
 - v. Control point or setpoint (Yes / No); i.e. a point that controls equipment and can have its setpoint changed.
 - vi. Monitoring point (Yes / No); i.e. a point that does not control or contribute to the control of equipment but is used for operation, maintenance, or performance verification.
 - vii. Intermediate point (Yes / No); i.e. a point whose value is used to make a calculation which then controls equipment, such as space temperatures that are averaged to a virtual point to control reset.
 - viii. Calculated point (Yes / No); i.e. a "virtual" point generated from calculations of other point values.

23 31 00 HVAC Ducts and Casings

1. SUBMITTALS

- A. Product Data: Provide data for duct materials.

23 36 00 Air Terminal Units

1. SUBMITTALS

- A. Product Data: Provide data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings that indicate air flow, static pressure, and NC designation. Include electrical characteristics and connection requirements.
- B. Manufacturer's Installation Instructions: Indicate support and hanging details, installation instructions, recommendations, and service clearances required.
- C. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists. Include directions for resetting constant-volume regulators.
- D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

23 74 13 Packaged Outdoor Central-Station Air-Handling Units



1. SUBMITTALS

- A. Product Data: Provide capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.
- B. Manufacturer's Instructions: Indicate assembly, support details, connection requirements, and include start-up instructions.
- C. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
- D. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - i. Extra Filters: One set for each unit.

DIVISION 26 - ELECTRICAL

26 05 19 Low-Voltage Electrical Power Conductors and Cables

1. ACTION SUBMITTALS

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

2. INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Field quality-control reports.

26 05 29 Hangers and Supports For Electrical Systems

1. ACTION SUBMITTALS

- A. Product Data: For the following:
 - i. Steel slotted support systems.
 - ii. Nonmetallic slotted support systems.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
 - i. Trapeze hangers. Include Product Data for components.
 - ii. Steel slotted channel systems. Include Product Data for components.
 - iii. Nonmetallic slotted channel systems. Include Product Data for components.
 - iv. Equipment supports.

2. INFORMATIONAL SUBMITTALS

- A. Welding certificates.

26 05 33 Raceways and Boxes for Electrical Systems

1. ACTION SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.



2. INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
 - i. Structural members in paths of conduit groups with common supports.
 - ii. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.
- B. Qualification Data: For professional engineer.
- C. Seismic Qualification Certificates: For enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.
 - i. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - ii. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - iii. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
 - iv. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.
- D. Source quality-control reports.

26 05 44 Sleeves and Sleeve Seals for Electrical Raceways and Cabling

1. ACTION SUBMITTALS

- a. Product Data: For each type of product.

26 27 26 Wiring Devices

1. ACTION SUBMITTALS

- o Product Data: For each type of product.
- o Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- o Samples: One for each type of device and wall plate specified, in each color specified.

2. INFORMATIONAL SUBMITTALS

- o Field quality-control reports.

3. CLOSEOUT SUBMITTALS

- o Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

4. MAINTENANCE MATERIAL SUBMITTALS

- o Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
- o TVSS Receptacles: One for every 10 of each type installed, but no fewer than two of each type.

26 28 16 Enclosed Switches and Circuit Breakers



1. ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF and electronic format.

B. Shop Drawings: For enclosed switches and circuit breakers.

1. Include plans, elevations, sections, details, and attachments to other work.

2. Include wiring diagrams for power, signal, and control wiring.

2. INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.

C. Field quality-control reports.

3. CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

SMOKE DETECTOR

1. ACTION SUBMITTALS

A. Product Data: For smoke detectors.

B. Submit a permit to the County Fire Department for approval.