

**BID FOR
EASTERN PRATER WAY STORM DRAIN**

BID # 20/21-002

PWP # WA-2020-319

BIDS DUE NOT LATER THAN: 1:45 PM ON AUGUST 26, 2020

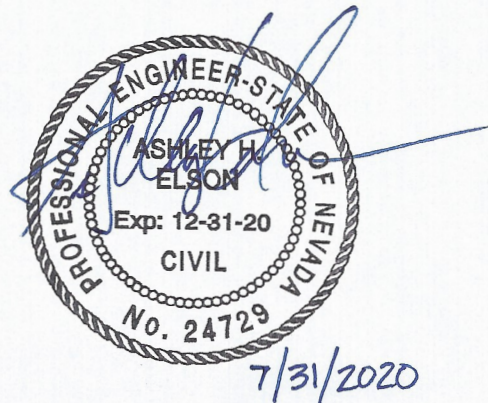
PUBLIC BID OPENING: 2:00 PM ON AUGUST 26, 2020

[NOTE: TIME BIDS ARE DUE IS DIFFERENT FROM BID OPENING TIME]



431 PRATER WAY
P.O. BOX 857
SPARKS, NV 89432-0857

Company Name: _____



**CITY OF SPARKS
NOTICE TO BIDDERS
EASTERN PRATER WAY STORM DRAIN
BID # 20/21-002 / PWP # WA-2020-319**

NOTICE IS HEREBY GIVEN that the City of Sparks, Nevada, will receive written sealed bids only, for the project listed above. Said bids must be in the hands of the Contracts and Risk Manager at 431 Prater Way, Sparks, Nevada, **NO LATER THAN 1:45 PM ON AUGUST 26, 2020**. Bids postmarked prior to, but not received until after this deadline will not be accepted. Vendor bid response submittals may not be sent to the City of Sparks via the Internet/e-mail and will not be entertained for award by the City of Sparks. The right is reserved to reject any Bid/Proposal or to accept the Bid/Proposal which is deemed by the City of Sparks to be in the best interest of the City of Sparks. The City of Sparks reserves the right to waive any irregularities and/or informalities in the bid process.

All Bids are to be marked clearly on the outside. Bids will be opened and publicly read at **2:00 PM ON AUGUST 26, 2020** at Sparks City Hall, 431 Prater Way Sparks, NV 89431. Due to social distancing concerns specific to the COVID-19 situation, the bid opening will be available to all interested parties via Zoom video/audio conferencing. Meeting # 899 8881 9148. Meeting Password: 671972

PROJECT DESCRIPTION: Construct 24-inch force main and pump station to include connection to existing storm drain and construction of high capacity drop inlets. Grind and overlay 2 inches of plantmix bituminous surface for identified areas.

PRE-BID MEETING: There will be a **NON-MANDATORY** pre-bid meeting held at 2:00PM on August 19, 2020. Due to social distancing concerns specific to the COVID-19 situation, the meeting will be available to all interested parties via Zoom video/audio conferencing. Meeting # 879 4810 4091. Meeting Password: 8ykds3

BONDING/LICENSING: A Bid Bond in the amount of 5% of bid amount is required. This bid bond will function as a penalty in the event the successful bidder fails to enter into a written contract with the City in accordance with the bid documents. Additionally, the City will be entitled to actual damages, if any. Prospective bidders will be required to have a current Contractor's License under the Nevada State Law for the type of work specified herein.

The work to be performed under this Contract shall be commenced by the successful Bidder after all executed Contract documents have been submitted, and after being notified to proceed by the City of Sparks.

Bid documents and specifications may be obtained from the City of Sparks website. Please visit <http://www.cityofsparks.us/bids> to obtain complete bid documents. There is no cost to use the system or obtain plans, but registration at the site is required. It is the responsibility of all potential bidders/responders to monitor the Purchasing Division's website for any changing information prior to submitting their bid/proposal. The City of Sparks will not be responsible for the timeliness or completeness of information provided by any 3rd party bid listing or re-selling service. For further information, contact the Purchasing Division at dmarran@cityofsparks.us or at (775) 353-2273. The individual responsible for coordinating this bid is: Dan Marran, CPPO, C.P.M. – Contracts and Risk Manager

Reno Gazette Journal Legal Notices Section
Publish Date: August 5, 2020
Proof of publication required

Bidder's Checklist

Bidders are instructed to complete and return the following forms in order for their bids to be complete. Failure to return the following items may result in your bid being declared “non-responsive.”

1. _____ Bid Item Schedule
2. _____ Bidder Information Sheets
3. _____ Subcontractor Information Form (5% list due with bid submittal)
4. _____ Acknowledgement and Execution Form
5. _____ Certification Regarding Debarment
6. _____ “Certificate of Eligibility” (Local Preference) - If bid exceeds \$250,000 and Contractor wishes to potentially apply their preference.
7. _____ Bid Bond
8. _____ Signed Bid Addenda (if applicable)

**CITY OF SPARKS
 BID ITEM SCHEDULE**

**BID TITLE: Eastern Prater Way Storm Drain
 BID #20/21-002
 PWP#WA-2020-319**

PRICES must be valid for 90 calendar days after the bid opening.

COMPLETION of this project is expected **PURSUANT TO CONTRACT DOCUMENTS.**

BIDDER acknowledges receipt of _____ Addenda.

| Bidder Name _____ | | | (signature) _____ | | |
|-------------------|----------|------|----------------------------------|-----------------|-------------|
| Item No. | Quantity | Unit | Description | Unit Price | Total Price |
| 1 | 1 | LS | Mobilization/Demobilization | \$ _____ /LS | \$ _____ |
| 2 | 1 | LS | Traffic Control | \$ _____ /LS | \$ _____ |
| 3 | 1 | LS | Dewatering | \$ _____ /LS | \$ _____ |
| 4 | 3 | LF | Install 12" SDR-35 PVC | \$ _____ /LF | \$ _____ |
| 5 | 2 | LF | Install 18" SDR-35 PVC | \$ _____ /LF | \$ _____ |
| 6 | 197 | LF | Install 24" C900PVC (DR 18) | \$ _____ /LF | \$ _____ |
| 7 | 2,994 | LF | Install 24" Force Main | \$ _____ /LF | \$ _____ |
| 8 | 11 | LF | Install 18" Class III RCP | \$ _____ /LF | \$ _____ |
| 9 | 58 | LF | Install 24" Class III RCP | \$ _____ /LF | \$ _____ |
| 10 | 249 | LF | Install 30" Class III RCP | \$ _____ /LF | \$ _____ |
| 11 | 239 | LF | Install 42" Class III RCP | \$ _____ /LF | \$ _____ |
| 12 | 84 | LF | Install 53"x34" Class III HERCP | \$ _____ /LF | \$ _____ |
| 13 | 3 | EA | Install 24" 11.25° Elbow Fitting | \$ _____ /EA | \$ _____ |
| 14 | 9 | EA | Install 24" 22.5° Elbow Fitting | \$ _____ /EA | \$ _____ |
| 15 | 9 | EA | Install 24" 45° Elbow Fitting | \$ _____ /EA | \$ _____ |

| | | | | | |
|----|-------|----|--|--------------|----------|
| 16 | 4 | EA | Install 4" Flush Valve Assembly | \$ _____ /EA | \$ _____ |
| 17 | 5 | EA | Install 1" Air Release Valve Assembly | \$ _____ /EA | \$ _____ |
| 18 | 3 | EA | Construct Concrete Collar | \$ _____ /EA | \$ _____ |
| 19 | 250 | LF | Remove Storm Drain Pipe | \$ _____ /LF | \$ _____ |
| 20 | 4 | EA | Construct High Capacity Curb Inlet (Double Grate) | \$ _____ /EA | \$ _____ |
| 21 | 2 | EA | Construct High Capacity Curb Inlet (Quadruple Grate) | \$ _____ /EA | \$ _____ |
| 22 | 4 | EA | Construct Type CM2 Drop Inlet (Single Unit Frame) | \$ _____ /EA | \$ _____ |
| 23 | 3 | EA | Construct NDOT Type 4 Storm Drain Manhole | \$ _____ /EA | \$ _____ |
| 24 | 5 | EA | Construct Type V Storm Drain Manhole | \$ _____ /EA | \$ _____ |
| 25 | 1 | LS | Pump Station Electrical and Instrumentation and Control Connections | \$ _____ /LS | \$ _____ |
| 26 | 1 | LS | Construct Pump Station | \$ _____ /LS | \$ _____ |
| 27 | 1 | LS | Construct Concrete Pad and Bollards | \$ _____ /LS | \$ _____ |
| 28 | 1 | LS | TMWA Water Line Replacement | \$ _____ /LS | \$ _____ |
| 29 | 1 | LS | TMWA Water Main Support and Slurry Backfill | \$ _____ /LS | \$ _____ |
| 30 | 625 | SF | Remove and Replace P.C.C. Sidewalk, Driveway Apron, or Valley Gutter | \$ _____ /SF | \$ _____ |
| 31 | 88 | LF | Remove and Replace P.C.C. Curb (Median) | \$ _____ /LF | \$ _____ |
| 32 | 420 | LF | Remove and Replace P.C.C. Curb and Gutter (Type 1, 1A, & Rolled) | \$ _____ /LF | \$ _____ |
| 33 | 112 | SF | Remove Existing and Construct Portland Cement Concrete Pedestrian Ramp | \$ _____ /SF | \$ _____ |
| 34 | 3,523 | LF | Permanent Bituminous Pavement Patching | \$ _____ /LF | \$ _____ |
| 35 | 9,975 | SY | 2" Grind and Overlay | \$ _____ /SY | \$ _____ |

| | | | | | |
|----|-------|----|--|--------------|-----------|
| 36 | 1 | LS | Protect and Adjust Utility Valve Boxes and Manholes to Finished Grade | \$ _____/LS | \$ _____ |
| 37 | 176 | LF | Preformed Thermoplastic Pavement Markings, 12" and 24" Stop Bar and Yield | \$ _____/LF | \$ _____ |
| 38 | 374 | LF | Preformed Thermoplastic Pavement Markings, 24" by 10' Long Crosswalk | \$ _____/LF | \$ _____ |
| 39 | 2 | EA | Preformed Thermoplastic Pavement Markings, Bike Symbol | \$ _____/EA | \$ _____ |
| 40 | 12 | LF | Preformed Thermoplastic Pavement Markings, Triangles | \$ _____/LF | \$ _____ |
| 41 | 11 | EA | Preformed Thermoplastic Pavement Markings, Arrow (Turn or Straight or Combination) | \$ _____/EA | \$ _____ |
| 42 | 511 | LF | Pavement Marking 4" Double Solid Yellow or White Paint | \$ _____/LF | \$ _____ |
| 43 | 1,724 | LF | Pavement Marking 4" Single Solid Yellow or White Paint | \$ _____/LF | \$ _____ |
| 44 | 3,192 | LF | Pavement Marking 4" Single Dashed Yellow or White Paint (10' Stripe 30' Gap) | \$ _____/LF | \$ _____ |
| 45 | 130 | LF | Pavement Marking 4" Single Dashed Yellow or White Paint (2.5' Stripe 3.5' Gap) | \$ _____/LF | \$ _____ |
| 46 | 1 | LS | Remove and Replace Loop Detectors | \$ _____/LS | \$ _____ |
| 47 | 1 | LS | Landscape Restoration (Contingent Item) | \$15,000/LS | \$15,000 |
| 48 | 250 | CY | Over Excavation of Unsuitable Material & Backfill (Contingent Item) | \$ _____/CY | \$ _____ |
| 49 | 25 | LF | Lateral Pipe Damage (Contingent Item) | \$ _____/LF | \$ _____ |
| 50 | 1 | LS | Force Account | \$400,000/LS | \$400,000 |

Total Price for Eastern Prater Way Storm Drain

\$ _____

(written total bid price)

\$ _____

Bidder Information

COMPANY INFORMATION:

| |
|---------------------------------------|
| Company Name: |
| Contact Name: |
| Address: |
| City: |
| State / Zip Code: |
| Telephone Number including area code: |
| Fax Number including area code: |
| E-mail: |

COMPANY BACKGROUND

- 1) Has your company ever failed to complete any contracts awarded to it? No ___ Yes ___ (If yes, please provide details.)

- 2) Has your company filed any arbitration request or law suits on contracts awarded within the last five years? No ___ Yes ___ (If yes, please provide details.)

- 3) Does your company now have any legal suits or arbitration claims pending or outstanding against it or any officers relating to the performance of a public contract? No ___ Yes ___ (If yes, please provide details.)

- 4) Does your company now employ any officers or principals who were with another firm when that company failed to complete a contract within the last five years? No ___ Yes ___ (If yes, please provide details.)

- 5) Has your company had a contract partially or completely terminated for default (cause) within the past five years? No ___ Yes ___ (If yes, please provide details.)

- 6) Has your company been found non-responsible on a government bid within the last five years? No ___ Yes ___ (If yes, please provide details.)

Bidder Information

CONTRACTOR LICENSE INFORMATION:

| |
|---|
| Nevada State Contractor's License Number (If Applicable): |
| License Classification(s): |
| Limitation(s) of License: |
| Date Issued: |
| Date of Expiration: |
| Name of Licensee: |
| City, State, Zip Code of Licensee: |
| Telephone Number of Licensee: |

BUSINESS LICENSING INFORMATION All vendors doing business within the City of Sparks are required to obtain and maintain a current business license from the City of Sparks prior to commencement of work (Sparks Municipal Code Section 5.08.020A). Vendor(s) awarded a contract resulting from this bid shall be required to obtain a current business license if they do not already hold one.

| |
|---|
| City of Sparks Business License Number: |
| Date Issued: |
| Date of Expiration: |
| Name of Licensee: |
| City, State, Zip Code of Licensee: |
| Telephone Number of Licensee: |
| Taxpayer Identification Number: |

Bidder Information

DISCLOSURE OF PRINCIPALS:

a) Individual and/or Partnership:

| |
|------------------------|
| Owner 1) Name: |
| Address: |
| City, State, Zip Code: |
| Telephone Number: |
| |
| Owner 2) Name: |
| Address: |
| City, State, Zip Code: |
| Telephone Number: |
| |
| Other 1) Title: |
| Name |
| |
| Other 2) Title: |
| Name: |

b) Corporation:

| |
|---|
| State in which Company is Incorporated: |
| Date Incorporated: |
| Name of Corporation: |
| Address |
| City, State, Zip Code: |
| Telephone Number: |
| President's Name: |
| Vice-President's Name: |
| Other 1) Name: |
| Title: |

SUBCONTRACTOR DETAIL
SUBCONTRACTORS EXCEEDING FIVE PERCENT OF BID AMOUNT

INSTRUCTIONS: Per NRS 338.141, Bidder submits the following names of First-Tier Subcontractors who will provide to Bidder labor or a portion of the Work or improvements for which Subcontractor will be paid an amount exceeding five percent (5%) of the Bid Price. The Bidder shall list the name of a Subcontractor for each portion of the Work, the value of which exceeds five percent (5%) of the Bid Price. **If Bidder will perform more than 5% of the Work, BIDDER SHALL ALSO LIST HIS NAME and description of the work that the prime contractor will perform in the space provided below.**

| | | |
|-----------------------|-----------------------------|------------------|
| Name of Subcontractor | Address | |
| Phone | Nevada Contractor License # | Limit of License |
| Description of Work: | | |
| Name of Subcontractor | Address | |
| Phone | Nevada Contractor License # | Limit of License |
| Description of Work: | | |
| Name of Subcontractor | Address | |
| Phone | Nevada Contractor License # | Limit of License |
| Description of Work: | | |
| Name of Subcontractor | Address | |
| Phone | Nevada Contractor License # | Limit of License |
| Description of Work: | | |
| Name of Subcontractor | Address | |
| Phone | Nevada Contractor License # | Limit of License |
| Description of Work: | | |
| Name of Subcontractor | Address | |
| Phone | Nevada Contractor License # | Limit of License |
| Description of Work: | | |

Bidder Name: _____

Authorized Signature: _____

SUBCONTRACTOR DETAIL
SUBCONTRACTORS EXCEEDING ONE PERCENT OF BID AMOUNT OR \$50,000

INSTRUCTIONS: In compliance with NRS 338.141, Bidder submits the following names of First-Tier Subcontractors who will provide to Bidder labor or a portion of the Work or improvements for which Subcontractor will be paid an amount exceeding one percent (1%) of the Bid or \$50,000, whichever is greater.

Since all Subcontractors listed on the Bidder's 5% Subcontractor Information Form are over 1% of the Bid amount, those Subcontractors shall automatically be deemed incorporated into this 1% Subcontractor Information form and need not be re-listed below.

Information provided must be submitted within two (2) hours after the completion of the opening of the bids (Per NRS 338.141). Bidder shall enter "NONE" under "Name of Subcontractor" if not utilizing subcontractors exceeding this amount. This form must be complete in all respects. If, additional space is needed, attach a separate page. The bidder may elect to submit this information with the bid proposal and, in that case, the bidder will be considered as having submitted this information within the above two hours.

| | | |
|-----------------------|-----------------------------|------------------|
| Name of Subcontractor | Address | |
| Phone | Nevada Contractor License # | Limit of License |
| Description of Work: | | |
| Name of Subcontractor | Address | |
| Phone | Nevada Contractor License # | Limit of License |
| Description of Work: | | |
| Name of Subcontractor | Address | |
| Phone | Nevada Contractor License # | Limit of License |
| Description of Work: | | |
| Name of Subcontractor | Address | |
| Phone | Nevada Contractor License # | Limit of License |
| Description of Work: | | |

Bidder Name: _____ **Authorized Signature:** _____

CITY OF SPARKS ACKNOWLEDGMENT AND EXECUTION:

STATE OF _____)
) SS
County of _____)

_____(Name of Principal) being first duly sworn, deposes and says: That he/she is the Bidder, or authorized agent of the Bidder for whom the aforesaid described work is to be performed by; that he/she has read the Plans, Specifications, and related documents including but not limited to, any addenda issued and understands the terms, conditions, and requirements thereof; that if his/her bid is accepted that he/she agrees to furnish and deliver all materials except those specified to be furnished by the City of Sparks (Owner) and to do and perform all work for the **EASTERN PRATER WAY STORM DRAIN, Bid # 20/21-002**, together with incidental items necessary to complete the work to be constructed and/or services to be provided in accordance with the Specifications, Plans, and Contract Documents annexed hereto.

TO THE CONTRACTS AND RISK MANAGER OF THE CITY OF SPARKS:

The undersigned, as Bidder, declares that the only persons or parties interested in this proposal, as principals, are those named herein, the Bidder is fully informed respecting the preparation and contents of the attached Bid and of all pertinent circumstances respecting such Bid: that this proposal is made without collusion with any other person, firm or corporation; that he/she has carefully examined the location of the proposed work; the proposed form of Contract, the Contract Provisions, Plans, Specifications and Contract Documents incorporated therein referred to and made part thereof; that he/she proposes and agrees if this proposal is accepted, that he/she will contract with the City of Sparks in the form of the Contract prescribed, 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 and annexed Contract Provisions, Plans and Specifications, in the manner and time prescribed and according to the requirements of the Project Representative as therein set forth, it being understood and agreed that the quantities shown herein are approximate only and are subject to increase or decrease, and that he/she will accept, in full, payment therefore the indicated prices.

(Printed Name of Contractor/Bidder) Contractor/Bidder: _____
BY: _____
Firm: _____
Address: _____
City: _____
State / Zip Code: _____
Telephone Number: _____
Fax Number: _____
E-mail Address: _____
(Signature of Principal) Signature: _____
DATED this _____ day of _____, 2020.

State of Nevada)
) SS.
County of _____)

On this _____ day of _____, in the year 2020, before me,

_____/Notary Public, personally appeared _____ Personally known to me (or proved
to me on the basis of satisfactory evidence) to be the person whose name is subscribed to this instrument, and acknowledged that he (she) executed it. WITNESS my hand and official seal.

Notary's Signature: _____ My commission Expires: _____

**CERTIFICATION REGARDING DEBARMENT, SUSPENSION, AND OTHER
RESPONSIBILITY MATTERS
(This form to be signed and returned at the time of bid)**

The prospective bidder, _____ certifies to the best of its knowledge and belief that it and its principals:

- (a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
- (b) Have not within a three year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
- (c) Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph (b) of this certification; and
- (d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State, or local) terminated for cause or default.

I understand that a false statement on this certification may be grounds for rejection of this proposal or termination of the award. Any exceptions provided will not necessarily result in denial of award, but will be considered in determining bidder responsibility and whether or not the City will enter into contract with the party. For any exception noted, indicate on an attached sheet to whom it applies, initiating agency, and dates of action. Providing false information may result in criminal prosecution or administrative sanctions.

Typed Name & Title of Authorized Representative

Signature of Authorized Representative

Date

I am unable to certify to the above statement. My explanation is attached.

Signature _____ Date _____

Local Preference Affidavit

NEW Instructions: This form is required to receive a preference in bidding on projects exceeding \$250,000. This form must be submitted no later than two (2) hours following the opening of bids, only if the bidder wishes for their preferential status(established by their current Certificate of Eligibility) to be considered in the evaluation of bids. A copy of the bidder’s Certificate of Eligibility must be submitted at the time the contractor submits their bid.

I, _____, on behalf of the Contractor, _____, swear and affirm that in order to be in compliance with NRS 338.0117 and be eligible to receive a preference in bidding **EASTERN PRATER WAY STORM DRAIN (Bid #20/21-002)** certify that the following requirement will be adhered to, documented and attained on completion of the contract. Upon submission of this affidavit on behalf of _____, I recognize and accept that failure to comply with any requirements is a material breach of the contract and entitles the City to damages. In addition, the Contractor may lose their preference designation and/or lose their ability to bid on public works for a period of time, pursuant to NRS 338:

1. The Contractor shall ensure at least 50 percent of workers employed on the public work possess a Nevada driver’s license or identification card;
2. The Contractor shall ensure all vehicles used primarily for the public work will be registered and (where applicable) partially apportioned to Nevada;
3. The Contractor shall ensure payroll records related to this project are maintained and available within the State of Nevada.

These requirements are not applicable to Contractors who do not use the “Bidder’s Preference” eligibility certificate in their bid or do not receive an advantage in ranking of bids due to their preference status.

By: _____ Title: _____

Signature: _____ Date: _____

Signed and sworn to (or affirmed) before me on this _____ day of _____, 20____, by _____ (name of person making statement).

State of _____)
)ss.
County of _____)

_____ STAMP AND SEAL
Notary Signature

CITY OF SPARKS, NEVADA – 5% Bid Bond

KNOW ALL MEN BY THESE PRESENTS: That we the undersigned _____, as “Principal,” and _____, as “Surety,” are hereby held and firmly bound unto the City of Sparks, Nevada, as “Obligee,” in the penal sum of _____ dollars (\$_____) for the payment of which, well and truly to be made, the Principal and Surety bind themselves, their heirs, executors, and administrators, successors and assigns, jointly and severally, by this instrument. The condition of the obligation of this bid bond is as follows:

WHEREAS, NRS 332.105 authorizes local governments to require bid bonds to insure execution and proper performance of the Contract and the Bonding Company has an “A” or better rating with Moody’s or A.M. Best and T-Listed with the U.S. Treasury Department;

AND, WHEREAS, the Principal has submitted a bid for Bid # **20/21-002**, PWP # **WA-2020-319**, for the **EASTERN PRATER WAY STORM DRAIN**.

NOW, THEREFORE,

- (a) If said Bid shall be rejected; or
- (b) If said Bid shall be accepted and the Principal shall execute and deliver the contract in the bid documents (“Contract”) to Obligee in accordance with the terms of the bid documents, and give such bond or bonds as may be specified in the bid or contract documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or
- (c) If the Principal shall pay to the Obligee the full amount of the bid bond as a penalty irrespective of the Obligee’s actual damages in the event of the failure of the Principal to enter into such Contract and give such bond or bonds,

then, this obligation shall be null and void. Otherwise it shall remain in full force and effect, it being expressly understood and agreed that the liability of the Surety (but not of the Principal) for any and all claims hereunder shall, in no event, exceed the penal amount of the obligation as herein stated.

The Surety, for the consideration for which this bond was executed, hereby stipulates and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by any extension of the time within which the Obligee may accept such bid, and hereby waives notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and the Surety has caused their seal to be hereto affixed and these present to be signed by their proper officers.

Signed, Sealed and dated: _____

Principal
By: _____

Surety
By: _____

GENERAL CONDITIONS

General Conditions



GENERAL CONDITIONS

Please Read Carefully

These Provisions Are a Part of Your Bid and any Contract Awarded

Scope of Bid/Proposal: Bids/Proposals are hereby requested for **EASTERN PRATER WAY STORM DRAIN**, as per specifications herein.

The bidder agrees that:

- A. Bidder has carefully examined the specifications, and all provisions relating to the item(s) to be furnished or the work to be done; understands the meaning, intent, and requirements; and
- B. Bidder will enter into a written contract and furnish the item(s) or complete the work in the time specified, and in strict conformity with the City of Sparks specifications for the prices quoted.

Note: Bidder is defined as any individual, partnership, or corporation submitting a bid, proposal, or quotation in response to a request for bid (RFB), request for proposal (RFP), request for information (RFI) or request for quotation (RFQ). A bidder may also be referred to as a bidder, contractor, supplier or vendor.

The use of the title "Bidder," "Vendor", "Contractor" or "Consultant" within this solicitation document and any resulting contract shall be deemed interchangeable and shall refer to the person or entity with whom the City of Sparks is soliciting and/or contracting for the service or product referenced within the bid document.

1. Prices:

All prices and notations must be in ink or typewritten. Mistakes may be crossed out and corrections typed or written with ink adjacent to the error. Bids shall indicate the unit price extended to indicate the total price for each item bid. Any difference between the unit price correctly extended and the total price shown for all items bid shall be resolved in favor of the unit prices. Bidders are encouraged to review all prices prior to bid submittal, as withdrawal or correction may not be permitted after the bid has been opened.

2. Firm Prices:

Prices on bid shall be firm prices not subject to escalation unless otherwise provided for in the specifications. In the event the specifications provide for escalation, the maximum limit shall be shown, or the bid shall not be considered. In the event of a decline in market price below a price bid, the City of Sparks shall receive the benefit of such decline.

3. Items Offered:

If the item offered by the bidder has a trade name, brand and/or catalog number, such shall be stated in the bid. If the bidder proposes to furnish an item of a manufacturer or vendor other than that mentioned on the face hereof, bidder must specify maker, brand, quality, catalog number, or other trade designation. Unless such is noted on the bid form, it will be deemed that the item offered is that designated even though the bid may state "or equal".

4. Brand Names:

Whenever reference to a specific brand name is made by the City, it is intended to describe a component that has been determined to best meet operational, performance, or reliability standards of the City, thereby incorporating these standards by reference within the specifications. These specifications are not meant to limit the vendor; they are guidelines to minimum qualifications. The bidder shall indicate their compliance or non-compliance for each line of the specification. Any deviations from the specifications or where submitted literature does not fully support the meaning of the specifications must be clearly cited in writing by the bidder.

General Conditions



An equivalent (“or equal”) may be offered by the bidder, subject to evaluation and acceptance by the City. It is the bidder’s responsibility to provide, at bidder’s expense, samples, test data, or other documentation the City may require to fully evaluate and determine acceptability of an offered substitute. The City reserves the sole right to reject a substituted component that will not meet or exceed City standards.

5. Samples:

Samples may be required for bid evaluation and testing purposes. Bidders shall agree to provide samples upon request and at no additional cost to the City.

6. Withdrawal of Bids:

Bids may be withdrawn by written or facsimile notice received prior to the exact hour and date specified for receipt of bid. A bid may also be withdrawn in person by a bidder, or bidder’s authorized representative, prior to the exact hour and date set for receipt of bids. Telephone withdrawals are not permitted.

7. Late Bids, Modifications, or Withdrawals:

Bids, modifications of bids, or bid withdrawals received after the exact time and date specified for receipt will not be considered.

8. Mistake in Bid:

- (a) If the bidder discovers a mistake in bid prior to the hour and date specified for receipt of bid, bidder may correct the mistake by withdrawing the bid in accordance with Item 7 above and resubmit prior to the stated bid deadline.
- (b) If within seventy-two hours of the bid closing and prior to the issuance of a purchase order or a contract, the apparent low bidder discovers a mistake in bid of a serious and significant nature, bidder may request consideration be given to withdrawing the bid. The mistake must be evident and provable. The right is reserved by the City to reject any and all requests for withdrawal of bids. The decision of the Purchasing Manager is final as regards acceptance or rejection of requests for withdrawal after closing of bids.
- (c) A mistake in bid cannot be considered once a purchase order or contract is issued.

9. Signature:

All bids shall be signed and the title and firm name indicated. A bid by a corporation shall be signed by an authorized officer, employee or agent with his or her title.

10. Exceptions:

A bidder deviating from specifications must specify any and all deviation(s). Failure to note said exceptions shall be interpreted to convey that the bidder shall propose to perform in the manner described and/or specified in this bid solicitation. If exception(s) are taken or alternatives offered, complete descriptions must be shown separately.

11. Confidential Information:

Any information deemed confidential or proprietary should be clearly identified by the bidder as such. It may then be protected and treated with confidentiality only to the extent permitted by state law. Otherwise the information shall be considered a public record. Information or data submitted with a bid will not be returned.

12. Quality:

Unless otherwise required in the specifications, all goods furnished shall be new and unused.



13. Litigation Warranty:

The bidder, by bidding, warrants that bidder is not currently involved in litigation or arbitration concerning the materials or bidder's performance concerning the same or similar material or service to be supplied pursuant to this contract of specification, and that no judgments or awards have been made against bidder on the basis of bidder's performance in supplying or installing the same or similar material or service, unless such fact is disclosed to the City in the bid. Disclosure may not disqualify the bidder. The City reserves the right to evaluate bids on the basis of the facts surrounding such litigation or arbitration and to require bidder to furnish the City with a surety bond executed by a surety company authorized to do business in the State of Nevada and approved by The City of Sparks in a sum equal to one hundred percent (100%) of the contract price conditional on the faithful performance by bidder of the contract in the event the bid is awarded to bidder, notwithstanding the litigation or arbitration.

14. Royalties, Licenses and Patents:

Unless otherwise specified, the bidder shall pay all royalties, license and patent fees. The bidder warrants that the materials to be supplied do not infringe any patent, trademark or copyright and further agrees to defend any and all suits, actions and claims for infringement that are brought against the City, and to defend, indemnify and hold harmless the City from all loss or damages, whether general, exemplary or punitive, as a result of any actual or claimed infringement asserted against the City, the bidder or those furnishing material to bidder pursuant to this contract.

15. Performance Standards:

Performance of work and acceptability of equipment or materials supplied pursuant to any contract or award shall be to the satisfaction and full discretion of the City.

16. Americans with Disabilities Act (ADA) Standards:

Bidders shall be required to comply with current ADA Standards in preparing their bids and executing work required under any contract resulting from this bid. Completed work must comply with current ADA Standards.

17. Warranties:

(a) Unless otherwise specified, all workmanship, material, labor or equipment provided under the contract shall be warranted by bidder and/or manufacturer for a minimum of twelve (12) months after acceptance by City. Greater warranty protection will be accepted. Lesser warranty protection must be indicated by bidder on the bid proposal as an exception.

(b) Bidder shall be considered primarily responsible to the City for all warranty service, parts and labor applicable to the goods or equipment provided by bidder under this bid or award, irrespective of whether bidder is an agent, broker, fabricator or manufacturer's dealer. Bidder shall be responsible for ensuring that warranty work is performed at a local agency or facility convenient to City and that services, parts and labor are available and provided to meet City's schedules and deadlines. If required and defined within the Scope of Work, the Bidder will post a performance bond after contract award to guarantee performance of these obligations. Bidder may establish a service contract with a local agency satisfactory to City to meet this obligation if bidder does not ordinarily provide warranty service.

18. Addenda:

The effect of all addenda to the bid documents shall be considered in the bid, and said addenda shall be made part of the bid documents and shall be returned with them. Before submitting a bid, each bidder shall ascertain

General Conditions



whether or not any addenda have been issued, and failure to acknowledge any such addenda may render the bid invalid and result in its rejection.

All potential bidders are responsible for monitoring the City website regarding the availability of new bid documents or addenda (where applicable). The City of Sparks will not be responsible for the results of any potential failures in automatic notification systems to potential bidders or plan holders with respect to these documents and will not adjust bid schedules or requirements due to any potential failures of those systems. It is the responsibility of all potential bidders/responders to monitor the Purchasing Division's website for any changing information prior to submitting their bid/proposal. The City of Sparks will not be responsible for the timeliness or completeness of information provided by any 3rd party bid listing or re-selling service.

19. Specifications to Prevail:

The detailed requirements of the Specifications, Scope of Work or Special Conditions shall supersede any conflicting reference in these General Conditions or the stated language on the City of Sparks Standard Purchase Order that are in conflict therewith.

20. Taxes:

The City is exempt from State, City and County Sales Taxes per NRS 372.325. The City will furnish Exemption Certificates for Federal Excise Tax when applicable. The successful bidder shall pay all taxes, levies, duties and assessments of every nature, which may be applicable to any work or materials under this Contract. The Contract Sum and any agreed variations thereof shall include all taxes imposed by law. The successful bidder shall make any and all payroll deductions required by law. The successful bidder herein indemnifies and holds the City harmless from any liability on account of any and all such taxes, levies, duties, assessments and deductions.

21. Prevailing Wages:

Bidder is responsible for complying with all applicable local, State and Federal wage laws, whether or not specifically cited in this bid document.

Per NRS Sections 338.020 through 338.090, certain projects defined as "public works" require the payment of the prevailing wage as determined by the Labor Commissioner. Generally speaking, projects/contracts for construction of a public work valued at less than \$100,000 are exempt from the prevailing wage requirement (NRS 338.080). Bidder shall be fully aware of the prevailing wage requirements of the State of Nevada as detailed in NRS Chapter 338 and price their bid response accordingly. Further information concerning Prevailing Wage rates can be found at:
http://labor.nv.gov/PrevailingWage/Public_Works/Prevailing_Wages/

Federal "Davis Bacon" wages may be applicable if the funding for the project includes Federal funds. These requirements are detailed in the "Special Conditions – Federal Requirements" section that will be included in this bid document when such conditions apply. Contractor shall compare the applicable wage rate for each classification used on the project and pay the higher of the two rates (Nevada State Prevailing Wage or Davis Bacon Wage) in each case.

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22. Apprenticeship Utilization Act (This Section IS IS NOT Applicable to this bid):

Senate Bill 207 (Apprenticeship Utilization Act) passed during the 2019 Legislative Session added sections 338.0116 and 338.01165 to the NRS. These new provisions apply to bids for public works where the value exceeds \$100,000.00. In passing SB 207, The Legislature hereby finds and declares that: (1) A skilled workforce in construction is essential to the economic well-being of the State; (2) Apprenticeship programs are a proven method of training a skilled workforce in construction; and (3) Requiring the use of apprentices on the construction of public works will ensure the availability of a skilled workforce in construction in the future for this State

A contractor or subcontractor engaged in **horizontal construction** who employs a worker on a public work pursuant to NRS 338.040 shall use one or more apprentices for at least 3 percent of the total hours of labor worked for each apprenticed craft or type of work to be performed on the public work for which more than three workers are employed.

“Horizontal Construction” means the construction of any fixed work, including any irrigation, drainage, water supply, flood control, harbor, railroad, highway, tunnel, airport or airway, sewer, sewage disposal plant or water treatment facility and any ancillary vertical components thereof, bridge, inland waterway, pipeline for the transmission of petroleum or any other liquid or gaseous substance, pier, and work incidental thereto. The term does not include vertical construction, the construction of any terminal or other building of an airport or airway, or the construction of any other building.

A contractor or subcontractor engaged in **vertical construction** who employs a worker on a public work pursuant to NRS 338.040 shall use one or more apprentices for at least 10 percent of the total hours of labor worked for each apprenticed craft or type of work to be performed on the public work for which more than three workers are employed.

“Vertical Construction” means the construction or remodeling of any building, structure or other improvement that is predominantly vertical, including, without limitation, a building, structure or improvement for the support, shelter and enclosure of persons, animals, chattels or movable property of any kind, and any improvement appurtenant thereto.

A Public Body/Awarding Body, upon the request of a contractor or subcontractor, **MAY** submit a request for a modification or waiver of the percentage of hours of labor of one or more apprentices prior to (1) the bid advertisement; (2) the bid opening; or (3) the award of the contract if, “Good Cause” exists. The Labor Commissioner may also grant a modification or waiver from the requirements of NRS 338.01165 after work on the public work has commenced.

More information regarding these requirements and forms associated with this act may be found in the section following these General Conditions, labeled “Apprenticeship Requirements.”

23. Conflict of Interest:

No City employee or elected or appointed member of City government, or member of the employee’s immediate family, may participate directly or indirectly in the procurement process pertaining to this bid if they:

- (a) Have a financial interest or other personal interest that is incompatible with the proper discharge of their official duties in the public interest or would tend to impair their independence, judgment or action in the performance of their official duties.

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- (b) Are negotiating for or have an arrangement concerning prospective employment with bidder. The bidder warrants to the best of his knowledge that the submission of the bid will not create such conflict of interest. In the event such a conflict occurs, the bidder is to report it immediately to the Purchasing Manager. For breach or violation of this warranty, the City shall have the right to annul this contract without liability at its discretion, and bidder may be subject to damages and/or debarment or suspension.

24. Disqualification of Bidder:

Any one or more of the following may be considered as sufficient for the disqualification of a prospective Bidder and the rejection of the Bid:

- (a) The Bidder is not responsive or responsible.
- (b) The quality of services, materials, equipment or labor offered does not conform to the approved plans and specifications.
- (c) There is evidence of collusion among prospective Bidders (Participants in such collusion will receive no recognition as Bidders).
- (d) The Bidder lacks the correct contractor's license classification required for the defined scope of work.
- (e) Lack of competency, understanding of the scope of work, adequate machinery, plant and/or equipment as revealed in routine due diligence associated with bid evaluation.
- (f) Unsatisfactory performance record as shown by past work for the City of Sparks, judged from the standpoint of workmanship, progress, and quality of services/goods provided.
- (g) Uncompleted work which, in the judgment of the City of Sparks, might hinder or prevent the prompt completion of additional work, if awarded.
- (h) Failure to pay or satisfactorily settle all bills due for labor and/or material on any contract(s).
- (i) Failure to comply with any requirements of the City of Sparks.
- (j) Failure to list, as required, all subcontractors who will be employed by the Bidder.
- (k) Any other reason determined, in good faith, to be in the best interest of the City of Sparks.

25. Gratuities:

The City may rescind the right of the bidder to proceed under this agreement if it is found that gratuities in the form of entertainment, gifts, cash or otherwise are offered or given by the bidder, or any agent or representative of the bidder, to any officer or employee of the City with the intent of influencing award of this agreement or securing favorable treatment with respect to performance of this agreement.

26. Bidder's Security (This Section IS IS NOT Applicable to this bid):

A bid deposit in an amount equal to at least 5% of the bid may be required as a bid security by the City. The bid security may only be in cash, a cashier's or certified check made payable to the City of Sparks, or a bid bond. If the bid security is a bond, it shall be executed by a surety insurer authorized to issue surety bonds in the State of Nevada. All Bonding Companies must have an "A" rating or better with Moody's or A.M. Best Company, and be included on the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bond and as Acceptable Reinsuring Companies" as published in circular 570 (as amended) by the audit staff, Bureau of Accounts, U.S. Treasury Department. (In other words, the company is T-listed.) The bid security must be executed by the bidder and enclosed with the bid proposal in the sealed bid envelope.

27. Performance and Payment Bonds:

Per NRS 339.025, before any contract, except one subject to the provisions of chapter 408 of NRS, exceeding \$100,000 for any project for the new construction, repair or reconstruction of any public building or other public work or public improvement of any contracting body is awarded to any contractor, he shall furnish to the contracting body the following bonds which become binding upon the award of the contract to the contractor

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(All Bonding Companies must have an “A” rating or better with Moody’s or A.M. Best Company, and be included on the current list of “Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bond and as Acceptable Reinsuring Companies” as published in circular 570 (as amended) by the audit staff, Bureau of Accounts, U.S. Treasury Department. (In other words, the company is T-listed.):

Performance Bond (This Section IS IS NOT Applicable to this bid):

The Contractor awarded this bid will be required to furnish the City with a surety bond conditioned upon the faithful performance of the contract. This may take the form of a bond executed by a surety company authorized to do business in the State of Nevada and approved by the City of Sparks. The bond shall be in a sum equal to one hundred percent (100%) of the amount of the contract price. Such bond shall be forfeited to the City in the event that bidder receiving the contract shall fail or refuse to fulfill the requirements and all terms and conditions of the contract.

Payment Bond (This Section IS IS NOT Applicable to this bid):

The Contractor awarded this bid will be required to furnish the City with a payment bond. This may take the form of a bond executed by a surety company authorized to do business in the State of Nevada and approved by the City of Sparks. The bond shall be in a sum equal to one hundred percent (100%) of the amount of the contract price. The bond must be solely for the protection of claimants supplying labor or materials to the contractor to whom the contract was awarded, or to any of his subcontractors, in the prosecution of the work provided for in such contract.

28. Indemnification:

To the fullest extent permitted by law, upon award, Contractor shall hold harmless, indemnify, defend and protect City, its affiliates, officers, agents, employees, volunteers, successors and assigns (“Indemnified Parties”), and each of them from and against any and all claims, demands, causes of action, damages, costs, expenses, actual attorney’s fees, losses or liabilities, in law or in equity, of every kind and nature whatsoever (“Claims”) arising out of or related to any act or omission of Contractor, its employees, agents, representatives, or Subcontractors in any way related to the performance of work under this Agreement by Contractor, or to work performed by others under the direction or supervision of Contractor, including but not limited to:

1. Personal injury, including but not limited to bodily injury, emotional injury, sickness or disease, or death to persons;
2. Damage to property of anyone, including loss of use thereof;
3. Penalties from violation of any law or regulation caused by Contractor’s action or inaction;
4. Failure of Contractor to comply with the Insurance requirements established under this Agreement;
5. Any violation by Contractor of any law or regulation in any way related to the occupational safety and health of employees.

In determining the nature of the claim against City, the incident underlying the claim shall determine the nature of the claim, notwithstanding the form of the allegations against City.

If City’s personnel are involved in defending such actions, Contractor shall reimburse City for the time and costs spent by such personnel at the rate charged City for such services by private professionals.

In cases of professional service agreements, requiring professional liability coverage:

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If the insurer by which a Consultant is insured against professional liability does not so defend the City and applicable agents and/or staff, and the Consultant is adjudicated to be liable by a trier of fact, the City shall be entitled to reasonable attorney’s fees and costs to be paid to the City by the Consultant in an amount which is proportionate to the liability of the of the Consultant.

Nothing in this contract shall be interpreted to waive nor does the City, by entering into this contract, waive any of the provisions found in Chapter 41 of the Nevada Revised Statutes.

29. Insurance:

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

The City may, unless otherwise required by law, waive or reduce the insurance requirements itemized here, at the discretion of the city’s Contracts and Risk Manager.

Should work be required on City premises or within the public right-of-way, upon award of the contract, the bidder shall provide proof of insurance for the types of coverage, limits of insurance and other terms specified herein, prior to initiation of any services under City, Bid, Proposal or Contract. Coverage shall be from a company authorized to transact business in the State of Nevada and the City of Sparks and shall meet the following minimum specifications:

Contractor shall at its own expense carry and maintain at all times the following insurance coverage and limits of insurance no less than the following or the amount customarily carried by Contractor or any of its subcontractors, whichever is greater. Contractor shall also cause each subcontractor employed by Contractor to purchase and maintain insurance of the type specified herein. All insurers must have AM Best rating not less than A-VII, and be acceptable to the City. Contractor shall furnish copies of certificates of insurance evidencing coverage for itself and for each subcontractor. Failure to maintain the required insurance may result in termination of this contract at City’s option. If Contractor fails to maintain the insurance as set forth herein, City shall have the right, but not the obligation, to purchase said insurance at Contractor’s expense.

Contractor shall provide proof of insurance for the lines of coverage, limits of insurance and other terms specified below prior to initiation of any services. Coverage shall be from a company authorized to transact business in the State of Nevada and the City of Sparks. Contractor and any of its subcontractors shall carry and maintain coverage and limits no less than the following or the amount customarily carried by Contractor or any of its subcontractors, whichever is greater.

| Applicable to this Contract | Insurance Type | Minimum Limit | Insurance Certificate | Additional Insured | Waiver of Subrogation |
|------------------------------------|---|----------------------|------------------------------|---------------------------|------------------------------|
| Yes | General Liability/Umbrella (Excess) Liability | \$2,000,000 | ✓ | ✓ | ✓ |

General Conditions



| | | | | | |
|------------|---------------------------|-------------|---|-----|-----|
| Yes | Automobile Liability | \$1,000,000 | ✓ | ✓ | |
| Yes | Workers' Compensation | Statutory | ✓ | N/A | ✓ |
| Yes | Employer's Liability | \$1,000,000 | ✓ | N/A | |
| No | Professional Liability | \$1,000,000 | ✓ | N/A | N/A |
| No | Pollution Legal Liability | \$1,000,000 | ✓ | N/A | N/A |

Commercial General Liability

Contractor shall carry and maintain Commercial General Liability (CGL) and, if necessary to meet required limits of insurance, commercial umbrella/excess liability insurance with a total limit of not less than the limits specified herein.

For contracts that are for the construction or improvement of public facilities, the Contractor shall obtain and maintain products and completed operations liability coverage through the statute of repose after completion of the project. Continuing commercial umbrella coverage, if any, shall include liability coverage for damage to the insured's completed work equivalent to that provided under ISO form CG 00 01.

There shall be no endorsement or modification of the CGL limiting the scope of coverage for liability arising from pollution, explosion, collapse, underground property damage, or damage to the named insured's work unless Subcontractor carries and maintains separate policies providing such coverage and provides Contractor evidence of insurance confirming the coverage.

Minimum Limits of Insurance

\$2,000,000 Each Occurrence Limit for bodily injury and property damage

\$2,000,000 General Aggregate Limit

\$2,000,000 Products and Completed Operations Aggregate Limit

\$10,000 Medical Expense Limit

If Commercial General Liability Insurance or other form with a general aggregate limit is used, it shall be revised to apply separately to this PROJECT or LOCATION.

Coverage Form

Coverage shall be at least as broad as the unmodified Insurance Services Office (ISO) Commercial General Liability (CGL) "Occurrence" form CG 00 01 04/13 or substitute form providing equivalent coverage and shall cover liability arising from premises, operations, independent contractors, products-completed operations, personal and advertising injury, and liability assumed under an insured contract (including the tort liability of another assumed in a business contract).

Additional Insured

City, its officers, agents, employees, and volunteers are to be included as insureds using the applicable ISO additional insured endorsement(s) or substitute forms providing equivalent coverage, in respects to damages and defense arising from: activities performed by or on behalf of Contractor, including the insured's general supervision of Contractor; products and completed operations of Contractor; premises owned, occupied, or used by Contractor. The coverage shall contain no special limitations on the scope of protection afforded to City, its

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officers, employees, or volunteers. Additional insured status for City shall apply until the expiration of time within which a claimant can bring suit per applicable state law.

Primary and Non-Contributory

Contractor's insurance coverage shall apply as primary insurance with respect to any other insurance or self-insurance programs afforded to City, its officers, agents, employees, and volunteers. There shall be no endorsement or modification of the CGL to make it excess over other available insurance; alternatively, if the CGL states that it is excess or pro rata, the policy shall be endorsed to be primary with respect to the additional insured. Any insurance or self-insurance maintained by City, its officers, employees, or volunteers shall be excess of Contractor's insurance and shall not contribute with it in any way.

Waiver of Subrogation

Contractor waives all rights against City and its agents, officers, directors and employees for recovery of damages to the extent these damages are covered by the commercial general liability or commercial umbrella liability insurance maintained pursuant to this agreement. Insurer shall endorse CGL policy as required to waive subrogation against the City with respect to any loss paid under the policy.

Endorsements

Policy forms or endorsements are required confirming coverage for all required additional insureds. The forms or endorsements for CGL shall be at least as broad as the unmodified ISO additional insured endorsement CGO 20 10 07/04 and CG 20 37 07/04 or substitute forms providing additional insured coverage for products and completed operations.

A waiver of subrogation in favor of City shall be endorsed to the policy using an unmodified Waiver of Transfer of Rights of Recovery of Others to Us ISO CG 24 04 05 09, or a substitute form providing equivalent coverage.

Electronic Data Liability

If any underground work will be performed, Contractor shall maintain electronic data liability insurance applicable to the Project and insuring against liability arising out of the loss of, loss of use of, damage to, corruption of, inability to access, or inability to manipulate electronic data. This coverage shall be maintained with a limit of liability of not less than \$1,000,000 and provide coverage at least as broad as electronic data liability coverage form CG 04 37 (or substitute form providing equivalent coverage).

Railroad Protective Liability

For any construction or demolition work within fifty (50) feet of a railroad, Contractor shall maintain Railroad Protective Liability insurance on behalf of and in the name of the railroad, as named insured, with a limit of \$6,000,000 per occurrence or higher limit if required by the railroad. Contractor shall also ensure that any exclusions pertaining to the indemnification of a railroad are removed from its CGL policy or that ISO form CG 24 17 (Contractual Liability-Railroads Endorsements) is included in the coverage.

Business Automobile Liability

Minimum Limits of Insurance

\$1,000,000 Combined Single Limit per accident for bodily injury and property damage or the limit customarily carried by Contractor, whichever is greater. No aggregate limit may apply. Coverage may be combined with Excess/Umbrella Liability coverage to meet the required limit.

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Coverage Form

Coverage shall be at least as broad as the unmodified Insurance Services Office (ISO) Business Automobile Coverage form CA 00 01 10/13, CA 00 25 10/13, CA 00 20 10/13 or substitute form providing equivalent coverage. Such insurance shall cover liability arising out of any auto (including owned, hired, and non-owned autos).

Pollution liability coverage at least as broad as that provided under the ISO pollution liability—broadened coverage for covered autos endorsement (CA 99 48) shall be provided, and the Motor Carrier Act endorsement (MCS 90) shall be attached for all contracts involving transportation of “hazardous material” as this term is defined by applicable law, including, but not limited to, waste, asbestos, fungi, bacteria and mold.

Additional Insured

City, its officers, agents, employees, and volunteers are to be included as insureds with respect to damages and defense arising from the ownership, maintenance or use of automobiles owned, leased, hired, or borrowed by the Contractor. The coverage shall contain no special limitations on the scope of protection afforded to City, its officers, employees, or volunteers. Additional insured status for City shall apply until the expiration of time within which a claimant can bring suit per applicable state law.

Endorsements

A policy endorsement is required listing all required additional insureds. The endorsement for Business Automobile Liability shall be at least as broad as the unmodified ISO CA 20 48 10/13 or a substitute form confirming City’s insured status for Liability Coverage under the Who Is An Insured Provision contained in Section II of the coverage form ISO CA 00 01 10/13.

Waiver of Subrogation.

Contractor waives all rights against City, its officers, agents, employees, and volunteers for recovery of damages to the extent these damages are covered by the commercial general liability or commercial umbrella liability insurance maintained pursuant to this agreement. Contractor’s insurer shall endorse policy to waive subrogation against City with respect to any loss paid under the policy.

Workers’ Compensation and Employer’s Liability

Contractor shall carry and maintain workers’ compensation and employer’s liability insurance meeting the statutory requirements of the State of Nevada, including but not limited to NRS 616B.627 and NRS 617.210 or provide proof that compliance with the provisions of Nevada Revised Statutes Chapters 616A-D and all other related chapters is not required. It is understood and agreed that there shall be no coverage provided for Contractor or any Subcontractor of the Contractor by the City. Contractor agrees, as a precondition to the performance of any work under this Agreement and as a precondition to any obligation of the City to make any payment under this Agreement to provide City with a certificate issued by an insurer in accordance with NRS 616B.627 and with a certificate of an insurer showing coverage pursuant to NRS 617.210.

It is further understood and agreed by and between City and Contractor that Contractor shall procure, pay for and maintain the above-mentioned coverage at Contractor's sole cost and expense.

Should Contractor be self-funded for workers’ compensation and employer’s liability insurance, Contractor shall so notify City in writing prior to the signing of this Contract. City reserves the right to approve said retentions, and may request additional documentation, financial or otherwise, for review prior to the signing of this Contract.

General Conditions



Upon completion of the project, Contractor shall, if requested by City, provide a Final Certificate for itself and each Subcontractor showing that Contractor and each Subcontractor had maintained the required Workers Compensation and Employer’s Liability by paying all premiums due throughout the entire course of the project.

Nevada law allows the following to reject workers’ compensation coverage if they do not use employees or subcontractors in the performance of work under the contract:

- Sole proprietors (NRS 616B.627 and NRS 617.210)
- Unpaid officers of quasi-public, private or nonprofit corporations (NRS 616B.624 and NRS 617.207)
- Unpaid managers of limited liability companies (NRS 616B.624 and NRS 617.207)
- An officer or manager of a corporation or limited liability company who owns the corporation or company (NRS 616B.624 and NRS617.207)

If a contractor has rejected workers’ compensation coverage under applicable Nevada law, the contractor must indicate the basis for the rejection of coverage and complete, sign and have notarized an Affidavit of Rejection of Coverage. The Affidavit must be completed, signed and notarized prior to performance of any work.

Minimum Limits of Insurance

| | |
|------------------------|--|
| Workers’ Compensation: | Statutory Limits |
| Employer’s Liability: | \$1,000,000 Bodily Injury by Accident – Each Accident |
| | \$1,000,000 Bodily Injury by Disease – Each Employee |
| | \$1,000,000 Bodily Injury by Disease – Policy Limit |

Coverage Form

Coverage shall be at least as broad as the unmodified National Council on Compensation Insurance (NCCI) Workers Compensation and Employer’s Liability coverage form WC 00 00 07/11 or substitute form providing equivalent coverage.

OTHER INSURANCE COVERAGES (IF APPLICABLE)

Professional Liability Insurance (if Applicable) \$1,000,000 each claim limits of liability or whatever limit is customarily carried by the Contractor, whichever is greater, for design, design-build or any type of professional services. If coverage is required on a claims-made or claims-made and reported basis, any applicable retroactive or pending & prior litigation dates must precede the effective date of this contract. Continuous coverage shall be maintained, or an extended reporting period shall be obtained for a period of at least three (3) years following completion of the project.

Contractors Pollution Liability Insurance (If Applicable)- \$1,000,000 per occurrence and \$2,000,000 aggregate or whatever amount is acceptable to the City for any exposure to “hazardous materials” as this term is defined in applicable law, including but not limited to waste, asbestos, fungi, bacterial or mold.

Coverage shall apply to bodily injury; property damage, including loss of use of damaged property or of property that has not been physically injured; cleanup costs; and defense, including costs and expenses incurred in the investigation, defense, or settlement of claims.

City shall be included as an insured under Contractor’s pollution liability insurance.

General Conditions



If coverage is required on a claims-made or claims-made and reported basis, any applicable retroactive or pending & prior litigation dates must precede the effective date of this contract. Continuous coverage shall be maintained, or an extended reporting period shall be obtained for a period of at least three (3) years following completion of the project.

If the scope of services as defined in this contract includes the disposal of any hazardous materials from the job site, Contractor must furnish to City evidence of pollution liability insurance maintained by the disposal site operator for losses arising from the insured facility accepting waste under this contract. Coverage certified to the City under this section must be maintained in minimum amounts of \$1,000,000 per loss, with an annual aggregate of at least \$2,000,000.

Lower tier sub-subcontractors, Truckers, Suppliers: Evidence confirming lower tier subcontractors, truckers and suppliers are maintaining valid insurance prior to beginning work on the project to meet the requirements set forth herein on Subcontractor, including but not limited to all additional insured requirements of Subcontractor.

ALL COVERAGES

Coverage shall not be suspended, voided, canceled, or non-renewed by either CONTRACTOR or by the insurer, reduced in coverage or in limits except after thirty (30) days' prior written notice has been given to CITY except for ten (10) days' notice for nonpayment of premium.

DEDUCTIBLES AND RETENTIONS

Any deductibles or self-insured retentions that exceed \$100,000.00 per occurrence or claim must be declared to and approved by the City's Contracts and Risk Manager and prior to signing this Contract. City is entitled to request and receive additional documentation, financial or otherwise, prior to giving its approval of the deductibles and self-insured retentions. Any changes to the deductibles or self-insured retentions made during the term of this Contract or during the term of any policy must be approved by City's Contracts and Purchasing Manager prior to the change taking effect. Contractor is responsible for any losses within deductibles or self-insured retentions.

OTHER INSURANCE PROVISIONS

Should City and Contractor agree that higher coverage limits are needed warranting a project policy, project coverage shall be purchased and the premium for limits exceeding the above amount may be borne by City. City retains the option to purchase project insurance through Contractor's insurer or its own source.

Any failure to comply with reporting provisions of the policies shall not affect coverage provided to City, its officers, agents, employees, or volunteers.

ACCEPTABILITY OF INSURERS

Insurance is to be placed with insurers with a Best's rating of no less than A-VII and acceptable to the City. City, with the approval of the Risk Manager, may accept coverage with carriers having lower Best's ratings upon review of financial information concerning Contractor and insurance carrier. City reserves the right to require that Contractor's insurer be a licensed and admitted insurer in the State of Nevada, or meet any applicable state and federal laws and regulations for non-admitted insurance placement.

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VERIFICATION OF COVERAGE

Contractor shall furnish City with certificates of insurance and with original endorsements affecting coverage required by this contract. The certificates and endorsements for each insurance policy are to be signed by a person authorized by that insurer to bind coverage on its behalf.

Prior to the start of any Work, Contractor must provide the following documents to City of Sparks, Attention: Purchasing Division, P.O. Box 857, Sparks, NV 89432-0857:

- A. Certificate of Insurance.** Contractor must provide a Certificate of Insurance form to the City of Sparks to evidence the insurance policies and coverage required of Contractor.
- B. Additional Insured Endorsements.** An original Additional Insured Endorsement, signed by an authorized insurance company representative, must be submitted to the City of Sparks, by attachment to the Certificate of Insurance, to evidence the endorsement of the City of Sparks as additional insured.
- C. Policy Cancellation Endorsement.** Except for ten (10) days' notice for non-payment of premium, each insurance policy shall be endorsed to specify that without thirty (30) days prior written notice to the City of Sparks, the policy shall not be suspended, voided, cancelled or non-renewed, and shall provide that notices required by this paragraph shall be sent by certified mailed to the address specified above. A copy of this signed endorsement must be attached to the Certificate of Insurance. If endorsements are not available, Contractor shall be responsible to provide prior written notice to City as soon as practicable upon receipt of any notice of cancellation, non-renewal, reduction in required limits or other material change in the insurance required under this Agreement.
- D. Bonds (as Applicable).** Bonds as required and/or defined in the original bid documents.

All certificates and endorsements are to be addressed to the City of Sparks, Purchasing Division and be received and approved by City before work commences. The City reserves the right to require complete certified copies of all required insurance policies at any time.

SUBCONTRACTORS

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

MISCELLANEOUS CONDITIONS

1. Contractor shall be responsible for and remedy all damage or loss to any property, including property of City, caused in whole or in part by Contractor, any Subcontractor, or anyone employed, directed, or supervised by Contractor.
2. Nothing herein contained shall be construed as limiting in any way the extent to which Contractor may be held responsible for payment of damages to persons or property resulting from its operations or the operations of any Subcontractors under it, and such coverage and limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to City in this contract.
3. In addition to any other remedies City may have if Contractor fails to provide or maintain any insurance policies or policy endorsements to the extent and within the time herein required, City may, at its sole option:

General Conditions



- a. Purchase such insurance to cover any risk for which City may be liable through the operations of Contractor under this Agreement and deduct or retain the amount of the premiums for such insurance from any sums due under the Agreement;
 - b. Order Contractor to stop work under this Agreement and/or withhold any payments which become due Contractor here under until Contractor demonstrates compliance with the requirements hereof; or,
 - c. Terminate the Agreement.
4. If Contractor's liability policies do not contain the standard ISO separation of insureds condition, or a substantially similar clause, they shall be endorsed to provide cross-liability coverage.

30. Safety Program:

Upon award, the Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the work. The Contractor shall take all necessary precautions for the safety of, and shall provide all necessary protection to prevent damage, injury, or loss to:

1. All employees on the work site and all other persons who may be affected thereby.
2. All the work, materials, and equipment to be incorporated therein, whether in storage on or off the site.
3. Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

Contractor shall comply with all applicable laws, ordinances, rules, regulations, and others of any public authority having jurisdiction for the safety of persons or property or to protect them from damage, injury, or loss. He shall erect and maintain, as required by existing conditions and progress on the work, all necessary safeguards for safety and protection, including posting danger signs, other warnings against hazards, promulgating safety regulations, and notifying owners and users of adjacent utilities. Contractor shall comply with OSHA'S Hazard Communication Standards.

Contractor shall designate a responsible member of its organization at the site whose duty shall be the prevention of accidents. This person shall be Contractor's superintendent unless otherwise designated in writing by Contractor to the Owner and the Engineer.

31. Award of Contract:

- (a) Bids/Proposals will be analyzed and award will be made to the lowest, responsive and responsible bidder whose bid conforms to the solicitation and whose bid is considered to be most advantageous to the City, price and other factors considered. Factors to be considered may include, but are not limited to: bidder's past performance, total unit cost, economic cost analysis, life cycle costs, warranty and quality, maintenance cost, durability, the operational requirements of the City and any other factors which will result in the optimum economic benefit to the City.
- (b) The City reserves the right to reject any item or items, to waive informalities, technical defects and minor irregularities in bids/proposals received; and to select the bid(s) or proposal(s) deemed most advantageous to the City. Should the City elect to waive a right it will not constitute an automatic waiver of that right in the future nor will it impact any other right or remedy. The City may consider bids/proposals submitted on an "all or nothing" basis if the bid/proposal is clearly designated as such.
- (c) The City reserves the right to award one or more contracts on the bids/proposals submitted, either by award of all items to one bidder or by award of separate items or groups of items to various bidders as the interests of the City may require, unless the bidder clearly specifies otherwise in his bid.

General Conditions



- (d) Upon acceptance by the City of Sparks, the solicitation, bid, proposal, or price quotation and issuance of a purchase order issued to the successful bidder shall be deemed to result in a binding contract incorporating those terms and these General Conditions without further action required by either party. Items are to be furnished as described in the bid and in strict conformity with all instructions, conditions, specifications, and provisions in the complete contract, as defined by this clause or any related integrated agreement.

32. Request for Proposal (RFP) Submittals:

In the case of Request for Proposals (RFP's), it should be noted that the documents submitted by prospective bidders are competitive sealed proposals and not competitive sealed bids. When proposals are opened, prices and other information will not be made public until the proposal is awarded. There shall be no disclosure of any bidder's information to competing bidders prior to the award of the proposal.

By their nature, proposals will include a number of variables that will vary based on the complexity of the product or service addressed within the proposal. Therefore, the evaluation of RFP's and the recommendation for award will not be based on price alone. Selection criteria will be better defined for each scope of work in the Special Conditions section of this bid.

Upon award of the contract, the executed contract and proposals will become public information. Accordingly, each proposal should be submitted on the vendor's most favorable terms from a price and technical standpoint.

33. Bidder Preference Law (This Section IS IS NOT Applicable to this bid):

This project will be bid and awarded under the Provisions(s) of NRS 338.147, which restricts preference given to certain contractors on Public Works Projects. The NRS cited in this section is meant to be a reference only. Each bidder shall acquaint himself with the latest provisions of NRS 338.147.

If the Contract for any Public Works Construction Project is expected to cost \$250,000 or more, then all Contractors wishing to receive benefit of their preference status in the evaluation of bids must submit a copy of their Certificate of Bidder Preference issued by the State Contractor's Board. (Call 775-688-1141 or 775-486-1100 to obtain certification information from the State Contractors Board). Contractors who do not submit a preference certificate at the time of their bid are presumed to have wished not to exercise the benefit of their preference, or do not possess the certificate of eligibility.

To the extent Contractor has sought, qualified and receives a bidding preference on this project, pursuant to Nevada Revised Statutes Chapter 338, Contractor acknowledges and agrees that the following requirements will be adhered to, documented and attained for the duration of the Project:

1. At least 50 percent of the workers employed on the Project (including subcontractors) hold a valid driver's license or identification card issued by the Nevada Department of Motor Vehicles;
2. All vehicles used primarily for the public work will be (a) registered and (where applicable) partially apportioned to Nevada; or (b) registered in Nevada; and
3. The Contractor shall maintain and make available for inspection within Nevada all payroll records related to the Project.

Contractor recognizes and accepts that failure to comply with any requirements herein shall be a material breach of the contract and entitle the City of Sparks to liquidated damages in the amount set by statute. In addition, the

General Conditions



Contractor recognizes and accepts that failure to comply with any requirements herein may lose its certification for a preference in bidding and/or its ability to bid on any contracts for public works pursuant to NRS Chapter 338.

To the extent Contractor has sought, qualified and receives a bidding preference, and this project has a value of over \$250,000 pursuant to Nevada Revised Statutes Chapter 338, each contract between the contractor, applicant or design-build team and a subcontractor must provide for the apportionment of liquidated damages assessed pursuant to this section if a person other than the Contractor was responsible for the breach of a contract for a public work caused by a failure to comply with a requirement of Items 1-3 within this section. The apportionment of liquidated damages must be in proportion to the responsibility of each party for the breach.

This section shall not be applicable for projects in which some or all of the funding comes from Federal sources.

34. Tie Bids:

Should identical low, responsive and responsible bids be received from two bidders, the City of Sparks Purchasing Manager shall notify all parties involved in the tie and may at his option utilize a coin-flip to determine the low bidder who shall be recommended for award. Or;

Should there be three or more low, responsive and responsible tie bids the Purchasing Manager shall exercise the following tie breaking method, unless another alternative is apparent and prudent: The City of Sparks Purchasing Manager shall set a mutually agreed upon time where, in his office, he shall shuffle a new deck of playing cards and have each bidder's representative cut the cards. The tie bidder who cuts the highest card (with Ace high) shall be recommended for bid award.

35. Appeals/Protests – Bids Only (Not Applicable to Request for Proposals):

A person who submits a bid on a contract may, after the bids are opened and within 5 business days after the date the "Recommendation to Award" is issued by the City, unless otherwise stated in the Special Conditions, file a notice of protest regarding the awarding of the contract. The City's "Recommendation to Award" will be dated and posted on the City's public website within the area where bid notices and bid re-caps are posted (Currently: <http://www.cityofsparks.us/bids>).

- (a) A notice of protest must include a written statement setting forth with specificity the reasons the person filing the notice believes the applicable provisions of law were violated.
- (b) A person filing a notice of protest may be required by the governing body or its authorized representative, at the time the notice of protest is filed, to post a bond with a good and solvent surety authorized to do business in this State or submit other security, in a form approved by the governing body or its authorized representative, to the governing body or its authorized representative who shall hold the bond or other security until a determination is made on the protest. A bond posted or other security submitted with a notice of protest must be in an amount equal to the lesser of:
 - (1) Twenty-five percent of the total value of the bid submitted by the person filing the notice of protest;
 - or
 - (2) Two hundred fifty thousand dollars (\$250,000).
- (c) A notice of protest filed in accordance with the provisions of this section operates as a stay of action in relation to the awarding of any contract until a determination is made by the governing body or its authorized representative on the protest.

General Conditions



- (d) A person who submits an unsuccessful bid may not seek any type of judicial intervention until the governing body or its authorized representative has made a determination on the protest and awarded the contract.
- (e) A governing body or its authorized representative is not liable for any costs, expenses, attorney's fees, loss of income or other damages sustained by a person who submits a bid, whether or not the person files a notice of protest pursuant to this section.
- (f) If the protest is upheld, the bond posted or other security submitted with the notice of protest must be returned to the person who posted the bond or submitted the security. If the protest is rejected, a claim may be made against the bond or other security by the governing body or its authorized representative in an amount equal to the expenses incurred by the governing body or its authorized representative because of the unsuccessful protest. Any money remaining after the claim has been satisfied must be returned to the person who posted the bond or submitted the security.

36. Documentation:

Due to the time constraints that affect contract performance, all required documents, certificates of insurance and bonds shall be provided to the City within ten (10) calendar days following award or date of request by City, whichever is later. Any failure to comply may result in bid being declared non-responsive and rejected, and at City's option, the bid bond may be attached for damages suffered.

37. Discounts:

- (a) Prompt payment discounts will not be considered in evaluating bids for award. However, offered discounts will be taken if payment is made within the discount period, even though not considered in the evaluation of bids.
- (b) In connection with any discount offered, time will be computed from date of delivery and acceptance, or invoice receipt, whichever is later. Payment is deemed to be made for the purpose of earning the discount on the date of mailing of the City check.
- (c) Any discount offered other than for prompt payment should be included in the net price quoted and not included in separate terms. In the event this is not done, the City reserves the right to accept the discount offered and adjust prices accordingly on the Purchase Order.

38. Seller's Invoice:

Invoices shall be prepared and submitted in duplicate to the address shown on the Purchase Order. Separate invoices are required for each Purchase Order. Invoices shall contain the following information: Purchase Order number, item number, description of supplies or services, sizes, unit of measure, quantity, unit price and extended totals.

39. Inspection and Acceptance:

Inspection and acceptance will be at destination unless specified otherwise, and will be made by the City department shown in the shipping address or other duly authorized representative of the City. Until delivery and acceptance, and after any rejection, risk of loss will be on the bidder unless loss results from negligence of the City.

40. Lost and Damaged Shipments:

Risk of loss or damage to items prior to the time of their receipt and acceptance by the City is upon the bidder. The City has no obligation to accept damaged shipments and reserves the right to return at the bidder's expense damaged merchandise even though the damage was not apparent or discovered until after receipt of the items.

General Conditions



41. Late Shipments:

Bidder is responsible to notify the City department receiving the items and the Purchasing Manager of any late or delayed shipments. The City reserves the right to cancel all or any part of an order if the shipment is not made as promised.

42. Document Ownership:

All technical documents and records originated or prepared pursuant to this contract, including papers, reports, charts, and computer programs, shall be delivered to and become the exclusive property of the City and may be copyrighted by the City. Bidder assigns all copyrights to City by undertaking this agreement.

43. Advertisements, Product Endorsements:

City employees and agencies or organizations funded by the City of Sparks are prohibited from making endorsements, either implied or direct, of commercial products or services without written approval of the City Manager. No bidder may represent that the City of Sparks has endorsed their product or service without prior written approval.

44. Vendor Workplace Policies

No Vendor providing a service, program or activity to the public on behalf of the City shall discriminate against any person because of sex, race, color, creed, national origin or disability. Vendor, if providing a service, program or activity to the public on behalf of the City, shall comply with the Americans with Disability Act and City's policies pursuant thereto when providing said service, program or activity.

The City of Sparks is an Affirmative Action/Equal Opportunity Employer. Bidders shall be cognizant of the requirements for compliance with Executive Order 11246, entitled "Equal Employment Opportunity" as amended by Executive Order 11375 and as supplemented in regulations of the U.S. Department of Labor (41 CFR part 60).

45. Business License Requirement:

All companies doing business with, or within, the City of Sparks are required to obtain and maintain a current business license from the City of Sparks prior to the commencement of work per Sparks Municipal Code Section 5.08.020A. Bidder(s) awarded a contract resulting from this bid shall be required to obtain a current business license if they do not already possess one.

46. City Provisions to Prevail:

Except as indicated in the specifications, the City's standard General Conditions shall govern any contract award. Any standard terms and conditions of bidder submitted by bidder shall not be acceptable to City unless expressly agreed to by the City. The City reserves the right to reject bidder's bid as non-responsive, to consider the bid without bidder's standard terms and conditions, or to require bidder to delete reference to such, as a condition of evaluation or award of the bid. If, after award of contract, bidder (contract vendor) provides materials or services accompanied by new or additional standard terms or conditions, they too shall be considered void and City may require deletion as a further condition of performance by vendor.

47. Invalid Provisions:

In the event that any one or more of the provisions of this agreement shall be found to be invalid, illegal or unenforceable, the remaining provisions shall remain in effect and be enforceable.



48. Amendments and Modifications:

The Purchasing Manager may at any time, by written order, and without notice to the sureties, make a modification to the contract or an amendment to the Purchase Order, within the general scope of this contract, in (1) quantity of materials or service, whether more or less; (2) drawings, designs, or specifications, where the supplies to be furnished are to be specially manufactured for the City; (3) method of shipment or packing; and (4) place of delivery. If any such change causes an increase or decrease in the cost or the time required for the performance of this contract, an equitable adjustment shall be made by written modification of the contract or amendment to the Purchase Order. Any claim by the bidder for adjustment under this clause must be asserted within 30 calendar days from the notification date.

49. Assignment:

Vendor shall not assign or delegate duties or responsibilities under this agreement, in whole or in part, without prior written approval of the City.

50. Disputes After Award:

Except as otherwise provided in these provisions, any dispute concerning a question of fact arising under this contract which is not disposed of by agreement shall be decided by the Purchasing Manager, who shall reduce this decision to writing and mail a copy to the bidder. The decision of the Purchasing Manager shall be final and conclusive, unless bidder requests arbitration within ten (10) calendar days. Pending final decision of a dispute, the bidder shall proceed diligently with the performance of the contract and in accordance with the Purchasing Manager's decision.

51. Arbitration after Award:

Any and all disputes, controversies or claims arising under or in connection with the contract resulting from this bid, including without limitation, fraud in the inducement of this Contract, or the general validity or enforceability of this Contract, shall be governed by the laws of the State of Nevada without giving effect to conflicts of law principles, may be submitted to binding arbitration before one arbitrator, and shall be conducted in accordance with the Commercial Arbitration Rules of the American Arbitration Association in a private manner in Washoe County, Nevada. This award shall be final and judgment may be entered upon it in any court having jurisdiction thereof. In reaching this final award, the arbitrator shall have no authority to change or modify any provision of this Contract. All other expenses of arbitration shall be borne equally by the parties. All fees, including legal fees, shall be borne by the party who incurred them. All costs of enforcement shall be borne by the losing party. Each party shall have the right to discovery in accordance with the Nevada Rules of Civil Procedure.

52. Lawful Performance:

Vendor shall abide by all Federal, State and Local Laws, Ordinances, Regulations, and Statutes as may be related to the performance of duties under this agreement. In addition, all applicable permits and licenses required shall be obtained by the vendor, at vendor's sole expense.

53. Annual Appropriation of Funds:

Multi-year term supply and service contracts and leases are subject to annual appropriation of funds by the City Council. The City plans and makes appropriations to the City Budget with respect to a fiscal year that starts July 1st and ends June 30th of each year. Payments made under term contracts and leases are considered items of current expense. Purchase Orders are funded when issued; therefore, they are current expense items and are not subject to any subsequent appropriation of funds.

General Conditions



Continuance of a multi-year contract beyond the limits of funds available shall be contingent upon appropriation of the requisite funds in the ensuing fiscal year and the termination of this contract due to lack of appropriation shall be without penalty.

54. Extension:

When in the City's best interest, this agreement may be extended on a daily, month-to-month, or annual basis by mutual agreement of both parties. Services and/or materials received under an extension shall be in accordance with pricing, terms, and conditions, as described herein.

55. Termination:

The City may terminate this agreement and be relieved of any consideration to the vendor should vendor fail to perform in the manner required. Furthermore, the City may terminate this agreement for any reason without penalty upon giving thirty (30) days written notice to the vendor. In the event of termination, the full extent of City liability shall be limited to an equitable adjustment and payment for materials and/or services authorized by and received to the satisfaction of the City prior to termination.

56. Venue:

This agreement shall be governed by and interpreted according to the laws of the State of Nevada, and venue for any proceeding shall be in Washoe County.

Apprenticeship Utilization Act Information and Forms

APPRENTICESHIP UTILIZATION ACT

BACKGROUND

Senate Bill 207 (Apprenticeship Utilization Act) passed during the 2019 Legislative Session added sections 338.0116 and 338.01165 to the NRS. These new provisions apply to bids for public works where the value exceeds \$100,000.00. In passing SB 207, The Legislature hereby finds and declares that: (1) A skilled workforce in construction is essential to the economic well-being of the State; (2) Apprenticeship programs are a proven method of training a skilled workforce in construction; and (3) Requiring the use of apprentices on the construction of public works will ensure the availability of a skilled workforce in construction in the future for this State.

A contractor or subcontractor engaged in **horizontal construction** who employs a worker on a public work pursuant to NRS 338.040 shall use one or more apprentices for at least 3 percent of the total hours of labor worked for each apprenticed craft or type of work to be performed on the public work for which more than three workers are employed.

“Horizontal Construction” means the construction of any fixed work, including any irrigation, drainage, water supply, flood control, harbor, railroad, highway, tunnel, airport or airway, sewer, sewage disposal plant or water treatment facility and any ancillary vertical components thereof, bridge, inland waterway, pipeline for the transmission of petroleum or any other liquid or gaseous substance, pier, and work incidental thereto. The term does not include vertical construction, the construction of any terminal or other building of an airport or airway, or the construction of any other building.

A contractor or subcontractor engaged in **vertical construction** who employs a worker on a public work pursuant to NRS 338.040 shall use one or more apprentices for at least 10 percent of the total hours of labor worked for each apprenticed craft or type of work to be performed on the public work for which more than three workers are employed.

“Vertical Construction” means the construction or remodeling of any building, structure or other improvement that is predominantly vertical, including, without limitation, a building, structure or improvement for the support, shelter and enclosure of persons, animals, chattels or movable property of any kind, and any improvement appurtenant thereto.

A Public Body/Awarding Body, upon the request of a contractor or subcontractor, **MAY** submit a request for a modification or waiver of the percentage of hours of labor of one or more apprentices prior to (1) the bid advertisement; (2) the bid opening; or (3) the award of the contract if, “Good Cause” exists. The Labor Commissioner may also grant a modification or waiver from the requirements of NRS 338.01165 after work on the public work has commenced.

CITY OF SPARKS – OPERATIONAL PROCESS FOR COMPLIANCE (POST-BID)

The timeline associated with initial collection of materials associated with compliance with the Apprenticeship Utilization Act (“the Act”) is as follows:

Pre-Award Meeting – Following the public opening of bids (as soon as practical), a meeting will be scheduled with the apparent low bidder to discuss the bidder’s ability to meet the requirements of the Act. At this meeting, the contractor will provide a “Project Workforce Checklist” that indicates the expected classification of workers on the project and the determination as to whether or not apprentices may be required per the provisions of the Act.

Determination of Availability of Apprentices

Immediately following the Pre-Award Meeting, the low bidder will survey the market to determine whether there are a sufficient number of apprentices available in the jurisdiction to meet the requirements of the Act, specific to the project at-hand. The contractor will then communicate the results of this survey to the City of Sparks by either indicating they can go forward without further action by the City or by delivering a completed “Apprenticeship Utilization Act Waiver Request” form(s) for consideration by the City and the Nevada Labor Commissioner.

Communications concerning compliance and/or delivery of waiver requests should occur within 14 calendar days of the Pre-Award Meeting.

Waiver Requests

Upon receipt of any waiver requests, the City will consider the materials provided and, as required, forward the materials to the Nevada Labor Commissioner for consideration and possible approval. Upon receipt of that determination, the City of Sparks will communicate the results back to the Contractor as soon as possible.

Contract Award

Once the City and the low bidder have completed the work required to determine the apparent compliance with the Act, the award of the construction contract will be scheduled for consideration by the City Council.

Post-Award Requests

As allowed by the Act, should an awarded Contractor determine in the course of a project that their ability to comply with the requirements of the Act has changed, additional waiver requests or other relevant information should be communicated to the City as soon as practical for further action and consideration by the City and/or the Nevada Labor Commissioner.

Sample Forms

Additional information and sample forms for use in compliance with the Act may be found on the website of the Nevada Labor Commissioner at:

http://labor.nv.gov/Apprenticeship_Utilization_Act/Apprenticeship_Utilization_Act/

This information may also be found following this page and include:

- 1) Apprenticeship Utilization Guide
- 2) Apprenticeship Verification Process
- 3) Project Workforce Checklist
- 4) Request for Apprentice Availability on a Public Work
- 5) Apprenticeship Utilization Act Waiver Request

STEVE SISOLAK
Governor

TERRY REYNOLDS
Director

SHANNON M. CHAMBERS
Labor Commissioner

STATE OF NEVADA



OFFICE OF THE LABOR COMMISSIONER
1818 COLLEGE PARKWAY, SUITE 102
CARSON CITY, NEVADA 89706
PHONE (775) 684-1890
FAX (775) 687-6409

OFFICE OF THE LABOR COMMISSIONER
3300 W. SAHARA AVE. SUITE 225
LAS VEGAS, NEVADA 89102
PHONE (702) 486-2650
FAX (702) 486-2660

Department of Business & Industry

OFFICE OF THE LABOR COMMISSIONER

<http://www.labor.nv.gov>

Senate Bill 207 – Apprenticeship Utilization Act becomes effective January 1, 2020
<https://www.leg.state.nv.us/App/NELIS/REL/80th2019/Bill/6351/Text>

APPRENTICE VERIFICATION PROCESS

When a Contractor and/or Subcontractor first lists an Apprentice on a Certified Payroll Report (CPR) they must submit with that CPR documentation to substantiate that the Apprentice is registered with the Bureau of Apprenticeship and Training of the Office of Apprenticeship, Training, Employer and Labor Services of the Employment and Training Administration of the United States Department of Labor or its successor **and** the State Apprenticeship Council. (Emphasis added). A properly enrolled and registered Apprentice is exempt from NRS 338.020 to NRS 338.090, inclusive. An Apprentice is paid pursuant to terms of the Apprenticeship Agreement/Standards for the type of work covered by the Apprenticeship Agreement/Standards as approved by the State Apprenticeship Council and/or Nevada Revised Statutes (NRS) section 610 or Nevada Administrative Code (NAC) section 610. (See NRS 338.080)

ELECTRONIC REPORTING/VERIFICATION OF APPRENTICES FOR CERTIFIED PAYROLL REPORTS AND SENATE BILL 207

Contractor and/or Subcontractors utilizing electronic Certified Payroll Reporting software, such as LCP Tracker or other software, should upload the documentation substantiating that the Apprentice is registered with the Bureau of Apprenticeship and Training of the Office of Apprenticeship, Training, Employer and Labor Services of the Employment and Training Administration of the United States Department of Labor or its successor **and** the State Apprenticeship Council. The Contractor and/or Subcontractor should upload any Apprentice Forms verifying the Apprentice's registration and any expiration parameters that need to be applied for the Apprentice in the Certified Payroll Reporting software.

The Awarding/Public Bodies should verify and review /certify that the Apprentice is registered and that the supporting documents were electronically uploaded before a Contractor and/or Subcontractor can certify them on the first Certified Payroll Report. The Awarding/Public Bodies and/or other entities as necessary, will validate the Apprentice information as the database Administrator for that project or multiple projects. This will allow the database Administrator, typically, the Awarding/Public Bodies, to verify and accept the Apprentice Forms for the Apprentice/Worker in question, regardless of the number of projects the Apprentice/Employee may be assigned to within the database.

****Contractors and/or Subcontractors and/or Awarding/Public Bodies will not need to obtain an Apprentice Verification Form because, the Apprentice Forms will be loaded into the database by the Contractor and/or Subcontractor along with any expiration parameters. This information will then be reviewed and verified by the Awarding/Public Bodies and/or other entities as necessary.**

This Apprentice approval process ensures an Apprentice is: 1.) Registered with the Bureau of Apprenticeship and Training of the Office of Apprenticeship, Training, Employer and Labor Services of the Employment and Training Administration of the United States Department of Labor or its successor **and** the State Apprenticeship Council; and 2.) Assists with validating Apprentice %'s for purposes of Senate Bill 207.

Compliance with Senate Bill 207 (Passed during 2019 Legislative Session.) The Awarding/Public Bodies and Contractors or Subcontractors must ensure the reporting of Apprentices complies with Senate Bill 207, unless a Waiver has been granted by the Labor Commissioner. Apprentices shall be used and reported for at least 10 % of the total hours on vertical construction and 3 % of the total hours for horizontal construction of the total hours of labor worked for each apprenticed craft or type of work to be performed on the public work when more than three employees of each a craft are employed at the site of work.

Apprenticeship Ratio: Be sure to review the apprenticeship standards to see if they provide for a ratio of apprentices to journeymen. If the ratio is not complied with the apprentice is to be paid at full journeyman rate for the type of work performed. (See NAC 338.0095). Awarding/Public Bodies may contact the Governor's Office of Workforce Innovation to verify the proper apprenticeship ratio because, they have jurisdiction over the Nevada State Apprenticeship Council and apprenticeship standards/agreements and the registration of apprentices.

STEVE SISOLAK
Governor

TERRY REYNOLDS
Director

SHANNON M. CHAMBERS
Labor Commissioner

STATE OF NEVADA



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Department of Business & Industry

OFFICE OF THE LABOR COMMISSIONER

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Senate Bill 207 – Apprenticeship Utilization Act effective January 1, 2020

<https://www.leg.state.nv.us/App/NELIS/REL/80th2019/Bill/6351/Text>

APPRENTICE VERIFICATION PROCESS

When a Contractor and/or Subcontractor first lists an Apprentice on a Certified Payroll Report (CPR) they must submit documentation and verification with that CPR to substantiate that the Apprentice is registered with the Bureau of Apprenticeship and Training of the Office of Apprenticeship, Training, Employer and Labor Services of the Employment and Training Administration of the United States Department of Labor or its successor **and** the State Apprenticeship Council. (Emphasis added). A properly enrolled and registered Apprentice is exempt from NRS 338.020 to NRS 338.090, inclusive. An Apprentice is paid pursuant to terms of the Apprenticeship Agreement/Standards for the type of work covered by the Apprenticeship Agreement/Standards as approved by the State Apprenticeship Council and/or Nevada Revised Statutes (NRS) section 610 or Nevada Administrative Code (NAC) section 610. (See NRS 338.080)

KEY POINTS OF THE APPRENTICE VERIFICATION PROCESS:

- Contractors/Subcontractors and/or Awarding/Public Bodies will not need to obtain a new Apprentice Verification Form from the State Apprenticeship Council (SAC) every 60-days.
- Once verified with the State Apprenticeship Council, an Apprentice can work for multiple Contractors/Subcontractors on various PWP's.
- Contractors/Subcontractors are responsible for submitting the Apprentice Verification Forms, documentation, information with Certified Payroll Reports (CPR's) that are submitted to the Awarding/Public Bodies for each PWP.
- While not required, if an Apprenticeship Verification Form from SAC for an individual Apprentice is older than 1-year or the Apprentice goes to work for a new Contractor/Subcontractor, it is recommended that a Contractor/Subcontractor obtain a new Apprenticeship Verification Form from SAC to submit with the CPR's on any PWP that the Apprentice may be working on.

ELECTRONIC REPORTING/VERIFICATION OF APPRENTICES FOR CERTIFIED PAYROLL REPORTS AND SENATE BILL 207

The following guidance is being provided by the Labor Commissioner.

- (1) Contractors and/or Subcontractors utilizing electronic Certified Payroll Reporting (CPR) software, such as LCP Tracker or other software, should verify that the Apprentice is registered with the Bureau of Apprenticeship and Training of the Office of Apprenticeship, Training, Employer and Labor Services of the Employment and Training Administration of the United States Department of Labor or its successor **and** the State Apprenticeship Council.
- (2) The Apprentice Verification Form from the State Apprenticeship Council along with the Apprentice Certificates, documents, etc., would be the information that is needed to verify an Apprentice pursuant to number (1) above.
- (3) **A new Apprentice Verification Form is not required every 60 days from the SAC or if the Apprentice works on a new PWP for the same Contractor/Subcontractor.**
- (4) A new Apprentice Verification Form, while not required, should be obtained from SAC if the Apprentice starts work for a new Contractor/Subcontractor or the Apprentice Verification Form is over one 1-year old.
- (5) The Contactor/Subcontractor submits and uploads the forms/documents/information verifying the Apprentice along with the CPR reporting the Apprentice into the CPR payroll system or submits this information manually to the Awarding/Public Body.
- (6) The Awarding/Public Bodies should verify the documentation submitted by the Contractor/Subcontractor verifying the apprentice and review that the CPR was submitted correctly. The Awarding/Public Bodies and/or other entities as necessary, will validate the Apprentice verification/information as the database Administrator for that project or multiple projects.
- (7) It is up to each Contractor/Subcontractor to make sure the necessary Apprenticeship Verification documents and/or forms are uploaded and submitted with the CPR's on every PWP that the Apprentice is working on.

Contractor and/or Subcontractors utilizing electronic Certified Payroll Reporting (CPR) software, such as LCP Tracker or other software, should upload the documentation substantiating that the Apprentice is registered with the Bureau of Apprenticeship and Training of the Office of Apprenticeship, Training, Employer and Labor Services of the Employment and Training Administration of the United States Department of Labor or its successor **and** the State Apprenticeship Council. The Contractor and/or Subcontractor should also upload any Apprentice Forms verifying the Apprentice's registration and any expiration parameters that need to be applied for the Apprentice in the Certified Payroll Reporting software.

The Awarding/Public Bodies should verify and review /certify that the Apprentice is registered and that the supporting documents were electronically uploaded before a Contractor and/or Subcontractor can certify them on the first CPR. The Awarding/Public Bodies and/or other entities as necessary, will validate the Apprentice information as the database Administrator for that project or multiple projects. This will allow the database Administrator, typically, the Awarding/Public Bodies, to verify and accept the Apprentice Forms for the Apprentice/Worker in question, regardless of the number of projects the Apprentice/Employee may be assigned to within the database. However, it will be up to each Contractor/Subcontractor to make sure the necessary Apprenticeship Verification documents and/or forms are uploaded and submitted with the CPR's.

****Once an Apprentice is verified by a Contractor/Subcontractor on a specific project, Contractors and/or Subcontractors and/or Awarding/Public Bodies will not need to obtain an additional Apprentice Verification Form within 60 days. This is because the Apprentice Forms including, the Apprentice Verification Form will be loaded into the database by the Contractor and/or Subcontractor along with any expiration parameters. This information will then be reviewed and verified by the Awarding/Public Bodies and/or other entities as necessary. If the Apprentice changes Contractors/Subcontractors, the new employer should review the Apprentice Verification documents to determine if they need to request further information. Apprentice Verification documents and forms should be good for at least 1-year but will need to accompany any CPR reporting.**

This Apprentice approval process ensures an Apprentice is: 1.) Registered with the Bureau of Apprenticeship and Training of the Office of Apprenticeship, Training, Employer and Labor Services of the Employment and Training Administration of the United States Department of Labor or its successor **and** the State Apprenticeship Council; and 2.) Assists with validating Apprentice %'s for purposes of Senate Bill 207.

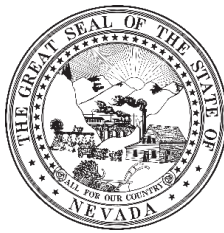
Compliance with Senate Bill 207 (Passed during 2019 Legislative Session.) The Awarding/Public Bodies and Contractors or Subcontractors must ensure the reporting of Apprentices complies with Senate Bill 207, unless a Waiver has been granted by the Labor Commissioner. Apprentices shall be used and reported for at least 10 % of the total hours on vertical construction and 3 % of the total hours for horizontal construction of the total hours of labor worked for each apprenticed craft or type of work to be performed on the public work when more than three employees of each a craft are employed at the site of work.

Apprenticeship Ratio: Be sure to review the apprenticeship standards to see if they provide for a ratio of apprentices to journeymen. If the ratio is not complied with the apprentice is to be paid at full journeyman rate for the type of work performed. (See NAC 338.0095). Awarding/Public Bodies may contact the Governor's Office of Workforce Innovation to verify the proper apprenticeship ratio because, they have jurisdiction over the Nevada State Apprenticeship Council and apprenticeship standards/agreements and the registration of apprentices.

**Governor's Office of Workforce
Innovation (OWINN)**

Main Phone # 702-486-8080

When completed, email to:
NVApprenticeship@gov.nv.gov



**REQUEST FOR NEVADA
REGISTERED APPRENTICE
VERIFICATION**

| | |
|---|--|
| Name of requesting contractor/awarding body/organization: | |
| Name and title of person requesting this verification: | |
| Contact phone # of person requesting this verification: | |
| Email address of person requesting this verification: | |
| Date this request was submitted to OWINN: | |
| Additional information regarding current Public Works projects for requester: (for example, project owner(s), PWP/contract #(s), project name(s), etc.) | |

| *APPRENTICE NAME (First, Last) | RAPIDS ID # | OCCUPATION | APPRENTICESHIP PROGRAM (for example, Local 12) |
|--|-------------|------------|---|
| | | | |
| | | | |
| | | | |
| Additional information regarding apprentice(s): (for example, apprentice status, wage %, etc.) | | | |

*Apprentices only need to be verified once per year/per contractor, and once approved, can be used for multiple Public Works.

Note: The Requesting Contractor/Awarding Body/Organization certifies and assures the information above is true and correct. It also acknowledges that Journeymen wages must be paid for time worked during canceled or suspended time periods or when required ratios are not met. Furthermore, the OWINN office will not process this Apprentice Verification request unless this form is signed, and ALL FIELDS are completed.

Signed: _____ **Date:** _____

Name/Title: _____

FOR OWINN USE ONLY

Date Received: _____

| Occupation | Initial Ratio | | Ratio Thereafter | |
|------------|---------------|----------------|------------------|----------------|
| | Apprentice(s) | per Journeymen | Apprentice(s) | per Journeymen |
| | _____ / _____ | | _____ / _____ | |
| | _____ / _____ | | _____ / _____ | |

OWINN Verified by: _____ Date: _____

CITY OF SPARKS

Project Workforce Checklist

For Compliance with the Nevada Apprenticeship Utilization Act, 2019

Project: _____ Contractor: _____

| Craft/Type of Work | More than 3 Employees Anticipated? | Anticipate Needing Waiver?† |
|---|---|--|
| Air Balance Technician | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Alarm Installer | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Boilermaker | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Bricklayer , can also include tile setter, terrazzo workers and marble masons. | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Carpenter , can also include cement masons, floor coverer, millwright and piledriver (non-equipment), plasterers and terrazzo workers. | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Cement Mason | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Electrician , includes communication technician, line, neon sign and wireman. Can also include alarm installer. | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Elevator Constructor | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Fence Erector | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Flag Person | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Floor Coverer | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Glazier (see also Painters and Allied Trades) | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Highway Striper | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Hod Carrier , includes brick-mason tender and plaster tender. | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Iron Worker , can also include fence erectors (steel/iron) | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Laborer , can also include fence erector (non-steel/iron), flag person, highway striper and traffic barrier erector | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Lubrication and Service Engineer | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Mason , can also cement, plasterer, tile setter, terrazzo workers and marble masons | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Mechanical Insulator | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Millwright | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Operating Engineer , can also include equipment greaser, piledriver, soils and material tester, steel fabricator/erector (equipment) and surveyor (non-licensed) and well driller. | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Painters and Allied Trades , can also include glaziers, floor coverers, and tapers. | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Pile Driver (non-equipment) | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |

| Craft/Type of Work | More than 3 Employees Anticipated? | Anticipate Needing Waiver? [‡] |
|---|---|--|
| Plasterer | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Plumber/Pipefitter | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Refrigeration | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Roofer (not sheet metal) | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Sheet Metal Worker, can also include air balance technician. | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Soils and Materials Tester, includes certified soil tester | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Sprinkler Fitter | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Surveyor (non-licensed) | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Taper | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Tile/Terrazzo Worker/Marble Mason | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Traffic Barrier Erector | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Truck Driver | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Well Driller (see also Operating Engineer) | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Other*: | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| | Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| <p>[‡]Pursuant to the Labor Commissioner’s Nov. 27, 2019 Advisory Opinion, waivers are not required in those crafts/types of work where no recognized apprenticeship program exists in the region where the public work is located. Contractor is responsible for verifying whether recognized apprenticeship programs exist in the region for each craft/type of work to be performed.</p> | | |
| <p>*Contractor is responsible for ensuring all crafts/types of work to be performed on the public work are accounted for in this checklist. Attach additional pages if needed.</p> | | |

I affirm I am fully authorized to acknowledge, on behalf of the Contractor listed above, the anticipated workforce, and acknowledge that changes to the anticipated workforce which may have an impact on compliance with the Nevada Apprenticeship Utilization Act, 2019 will require the submittal of a revised form within ten (10) working days of such change.

Signed: _____

Name and Title: _____

Date: _____

Contractor Name: _____

STATE OF NEVADA
Office of the Labor Commissioner

REQUEST FOR APPRENTICE AVAILABILITY ON A PUBLIC WORK

Senate Bill (SB) 207 - Apprenticeship Utilization Act passed during the 2019 Legislative Session adds a section to NRS section 338. In passing SB 207, The Legislature hereby finds and declares that: (1) A skilled workforce in construction is essential to the economic well-being of the State; (2) Apprenticeship programs are a proven method of training a skilled workforce in construction; and (3) Requiring the use of apprentices on the construction of public works will ensure the availability of a skilled workforce in construction in the future for this State. <https://www.leg.state.nv.us/App/NELIS/REL/80th2019/Bill/6351/Text>

You may use this form to request an Apprentice or determine availability of an Apprentice from a Registered Apprenticeship Program in the applicable craft or trade in the area of the Public Works Project. For information about Registered Apprenticeship Programs in your area and Registered Apprentices, please visit www.labor.nv.gov or the Nevada State Apprenticeship Council at www.owinn.nv.gov/Apprenticeship/AboutSAC/ *The Governor's Office of Workforce Innovation (OWINN) is responsible for the Nevada State Apprenticeship Council and the approval and registration of Apprenticeship Programs and Apprentices.

Requests for dispatch must be in writing and submitted (and received) at least 5 business days in advance (excluding weekends and holidays) via first class mail, fax or email. Proof of submission (and receipt) will be required. Please refer to Chapter 610 of the Nevada Revised Statutes and Nevada Administrative Code Chapter 610 for the laws and regulations governing Registered Apprenticeship Programs and Registered Apprentices.

Request Submitted to: _____ Date Request Submitted: _____

Name of Registered Apprenticeship Program: _____
Contact Person/Title: _____
Address: _____, _____, NV _____
Tel No.: (____) _____ Fax No.: (____) _____ Email: _____

Requestor Information:
Contractor/Subcontractor: _____ License Number: _____
Contact Person/Title: _____
Address: _____, _____, _____
Tel No.: (____) _____ Fax No.: (____) _____ Email: _____

Availability Request Information:
Number of Apprentice(s) Required: ____ Craft or Trade: _____
Apprentice(s) Report Date: _____ (5 business days' notice required) Report Time: __: __ __.
Name of Person to Report to: _____
Address to Report to: _____, _____, NV _____

Project Information:
Contract Name/Number: _____ Project Location: _____
Awarding Body Name: _____
Contact Person/Title: _____
Tel No.: (____) _____ Fax No.: (____) _____ Email: _____

 Print Name/Title _____ *Signature ____/____/____ Date

*By signing this form you certify that the information you have provided is true and correct to the best of your knowledge.

Request Approved: Request Denied:

Notes: _____

 Print Name/Title _____ Signature ____/____/____ Date
 Date Received: _____ Date Returned: _____

STATE OF NEVADA
Office of the Labor Commissioner

APPRENTICESHIP UTILIZATION ACT WAIVER REQUEST

Senate Bill (SB) 207 - Apprenticeship Utilization Act passed during the 2019 Legislative Session adds a section to NRS section 338. In passing SB 207, The Legislature hereby finds and declares that: (1) A skilled workforce in construction is essential to the economic well-being of the State; (2) Apprenticeship programs are a proven method of training a skilled workforce in construction; and (3) Requiring the use of apprentices on the construction of public works will ensure the availability of a skilled workforce in construction in the future for this State. <https://www.leg.state.nv.us/App/NELIS/REL/80th2019/Bill/6351/Text>

A Public Body, upon the request of a contractor or subcontractor, may submit a request for a modification or waiver of the percentage of hours of labor of one or more apprentices prior to (1) the bid advertisement; (2) the bid opening; or (3) the award of the contract if, "Good Cause" exists. The Labor Commissioner may also grant a waiver from the requirements of SB 207 after work on the public work has commenced if the public body, contractor or subcontractor submits documentation and evidence that meets the requirements to establish "Good Cause."

Public Works Project (PWP) # _____
Awarding Body Name: _____
Contact Person/Title: _____
Address: _____, NV _____
Phone: (____) _____ **Fax:** (____) _____ **E-Mail:** _____

Contractor/Subcontractor: _____ **License Number:** _____
Contact Person/Title: _____
Address: _____
Phone: (____) _____ **Fax:** (____) _____ **E-Mail:** _____

Please check the box for the reason for a Waiver Request and provide/submit supporting documentation/evidence:

- Yes No
 There are no Apprentices available from an Apprenticeship Program Registered by the Nevada State Apprenticeship Council within the jurisdiction where the public work is to be completed.
- Yes No
 The contractor or subcontractor is required to perform uniquely complex or hazardous tasks on the public work that require the skill and expertise of a greater percentage Apprentice or Journeyworkers.
- Yes No
 The contractor or subcontractor has requested Apprentices from a Registered Apprenticeship Program and the request has been denied or the request has not been approved within 5 business days.

Please attach additional documentation/evidence supporting the Waiver Request or describe why an Apprentice is not available or cannot be provided:

 Contractor/Subcontractor Name Date Waiver Request Submitted to Awarding Body *Signature

 Awarding Body Printed Name/Title *Signature Date

**By signing this form, you certify that the information you have provided is true and correct to the best of your knowledge.*

For Office of the Labor Commissioner's Use Only:

Waiver Request Approved: Waiver Request Denied:

Notes: _____

 Printed Name/Title Signature Date

Date Received: _____ **Date Returned:** _____

Special Conditions and Specifications (Specific to Project)

In instances where the Special Conditions conflict with the General Conditions, the Special Conditions will prevail with respect to that instance or item(s).

SPECIAL PROVISIONS
EASTERN PRATER WAY STORM DRAIN
Bid Number 20/21-002, PWP# WA-2020-319

These Special Provisions supplement and modify the "Standard Specifications for Public Works Construction" (Orange Book), 2012 version, and adopted by the City of Sparks, Nevada. All of the requirements and provisions of said Standard Specifications shall apply except where modified by the City General Conditions, contract forms, plans, technical specifications and these Special Provisions (all contained within this bid document).

SECTION 1: SCOPE OF WORK

The work performed under this contract consists of but is not limited to: Construction of approximately 3,000 feet of storm drain force main, a lift station, high capacity catch basins and approximately 600 feet of gravity storm drain that are within the City limits of the City of Sparks, Washoe County, Nevada, and is more specifically designated in the plans for this project.

SECTION 2: SPECIAL PROVISIONS

The requirements set forth in these "Special Provisions" shall be used in addition to those set forth in "Standard Specifications for Public Works Construction".

SECTION 3: STANDARD SPECIFICATIONS AND DETAILS

All materials furnished and work performed shall be done in accordance with the 2012 version of the Standard Specifications for Public Works Construction or "Orange Book" (hereinafter designated "Standard Specifications"), and any revisions thereto if not covered or amended by the Special Technical Provisions; and the Standard Details for Public Works Construction (hereinafter designated "Standard Details"), except as modified by the drawings.

SECTION 4: NOTICE TO PROCEED

Contract time will begin on the date specified in the "Notice to Proceed", unless operations begin at an earlier date, in which case the date that such operations begin will apply. The CONTRACTOR shall immediately begin and diligently prosecute the work to completion. The CONTRACTOR shall obligate himself to complete the work within the stated working days.

SECTION 5: WORKING DAYS

The work to be performed under this contract shall be commenced after all executed Contract Documents have been submitted, within five (5) calendar days of the commencement date set forth in the Notice to Proceed. The work, including any and all alternates and options, shall be completed within one hundred (100) working days after the commencement date set forth in the Notice to Proceed. The CONTRACTOR shall be allowed to select a commencement date between the dates of October 1, 2020 and February 31, 2021.

SECTION 6: LIQUIDATED DAMAGES

In case all work called for under the contract is not completed before or upon the expiration of the time limits set forth above, it is agreed by the parties to the contract that damage will be sustained by the City and that it will be impracticable to determine accurately the actual damage the City will sustain in the event of any such delay. Therefore, the CONTRACTOR shall pay to the City, ONE THOUSAND DOLLARS (\$1000.00) for each and every working day delay in finishing the work in excess of the number of working days prescribed and the City shall further have the right to charge to the

CONTRACTOR, his heirs, assigns or sureties and to deduct from the final payment for the work, all or any part as it may deem proper of the actual cost of which are directly chargeable to the contract and which accrue during the period of such extensions, except that the cost of the final surveys and preparation of final estimate shall not be included in such charges. The City may deduct this amount from any money due or that may become due the CONTRACTOR under the contract. This payment shall not be considered as a penalty, but as liquidated damages suffered by the City on account of the failure of the CONTRACTOR to complete the work within the time limit of the contract.

SECTION 7: EXCUSABLE DELAYS

The CONTRACTOR shall not be assessed with liquidated damage nor the cost of engineering inspection during any delay in the completion of the work caused by acts of God, the public enemy, fire, floods, epidemics, quarantine restrictions, strikes, freight embargoes, unusually severe weather, or due to such causes, provided that the CONTRACTOR shall within ten (10) days from the beginning of such delay notify the Project Manager in writing of the causes of delay. The Project Manager's findings of the facts thereon shall be final and conclusive.

SECTION 8: INTENT OF THE PLANS AND SPECIFICATIONS

The intent of the plans and specifications is to prescribe a complete outline of work, which the CONTRACTOR undertakes to do in full compliance with the contract.

The CONTRACTOR shall furnish all required materials, equipment, tools, labor and incidentals, unless otherwise provided in the contract and shall include the cost of these items in the contract unit prices for the several units of work. All items of work called for on the plans or in the specifications and not included as a separate item in the proposal shall be considered as incidental to the other items listed in the proposal and the payment for such incidental items shall be considered as included in the contract unit prices bid.

SECTION 9: AUTHORITY OF THE PROJECT MANAGER AND INSPECTOR

All work shall be done under the supervision of the Project Manager acting on behalf of the City. He shall decide all questions that arise as to the quality and acceptability of materials furnished, work performed, manner of performance, rates of progress, interpretation of the plans and specifications, acceptable fulfillment of the contract and compensation under the specifications. He shall determine the amount of work performed and materials furnished, and his decision and estimate shall be final. His estimate shall be "condition precedent" to the right of the CONTRACTOR to receive money due him under the contract. The Project Manager does not have authority to authorize changes in plans and specifications without prior written approval of the Director of Community Services.

The City shall provide an inspector who will represent the City and the Engineer and shall make inspections of all work, sample and test materials and do such other work relative to supervision of the project as he may be assigned by the City. All instructions given by the inspector are subject to approval by the Engineer.

SECTION 10: CHANGE ORDERS

The City of Sparks reserves the right to make alterations or supplements to the Contract. Change Order Forms are required for all changes in decreases and/or increases of quantities and/or dollar amount changes in accordance with the "Standard Specifications".

SECTION 11: COOPERATION WITH OTHER CONTRACTORS

The CONTRACTOR shall cooperate with other CONTRACTOR's who may be employed by the City on construction of other work adjacent to or in the proximity of the location of the project.

SECTION 12: DISPOSAL OF EXCESS AND WASTE MATERIALS

Trash, construction debris, cleared vegetation, excavated material unsuitable to be incorporated in the construction shall become the property of the CONTRACTOR and shall be removed by the CONTRACTOR and shall be legally disposed of offsite in accordance with all federal, state and local regulations.

SECTION 13: LIMITS OF CONTRACTOR'S OPERATIONS

The CONTRACTOR will confine his operations within the limitations of construction easements or limits as shown on the drawings. If the CONTRACTOR's operations result in damage to any publicly or privately owned facilities outside the limitations of the construction easement, the CONTRACTOR shall, at his expense, repair such damage or indemnify the owner of the damaged property.

If the CONTRACTOR negotiates with property owners for the use of land for construction operations outside the limits of the construction easements, he shall do so at his own risk and the City will assume no liability for such use of private property. All agreements between the CONTRACTOR and private property owners shall be in writing and the City will be furnished copies of such agreements.

SECTION 14: PROTECTION OF EXISTING UTILITIES

The location of existing utilities and drain lines shown on the plans are not guaranteed but indicates generally their location according to the best knowledge of the Project Manager. The CONTRACTOR shall notify Underground Services Alert (USA Dig) at 1-800-227-2600, and NV Energy, Truckee Meadows Water Authority (TMWA), SBC, Charter Communications and other cable companies not less than five (5) working days prior to the start of construction to verify the location and depths of utilities.

The CONTRACTOR shall take inventory of the exact location of all vaults, boxes, conduits, ducts, cables, pipe systems, etc. and shall protect said utilities. Any damage caused by operation of the CONTRACTOR shall be repaired by the CONTRACTOR at his own expense. It shall be the CONTRACTOR's responsibility to contact the impacted utility for any replacement hardware.

The CONTRACTOR shall submit the utility inventory to the Project Manager and the utility companies upon the completion of utility lowering activities. The CONTRACTOR shall also keep a copy of the utility location inventory list on the project work site at all times for emergency shutoff purposes.

It shall be the CONTRACTOR's responsibility to adjust all surface mounted utility appurtenances, such as manholes, survey monument covers and valve boxes to grade consistent with the grade of the restored street surface.

SECTION 15: CONTRACT AMOUNT

The total amount payable under this contract shall be determined by the sum of the amounts earned and the various quantities of repairs actually made and determined from unit prices as furnished by the CONTRACTOR in the schedule of prices contained in his proposal. The various quantities of repairs in the bid proposal are estimates and the City of Sparks reserves the right to vary quantities as may be necessary.

SECTION 16: PRECONSTRUCTION CONFERENCE

After the execution of the contract, but prior to the commencement of any work, a preconstruction conference between the CONTRACTOR and the City of Sparks will be held at a mutually acceptable time and place.

SECTION 17: MEASUREMENT FOR PAYMENT

Whenever possible, the actual quantities installed, or work performed on any project shall be measured on the site of the work by a crew composed of both the CONTRACTOR and the Project Manager or Inspector. This combined crew shall record all measured quantities in field notebooks, in legible and understandable entries. The CONTRACTOR and the Department shall each have a set of field notes which are to be in agreement on all quantities and items measured and shall include all work accomplished on the project under contract. Each set of field measurements shall be initialed and dated by responsible representatives of the CONTRACTOR and the Project Manager or Inspector participating on the combined crew. In the event that it is not possible to form a combined crew for the measurements, the area repaired shall be measured by the Project Manager or Inspector.

SECTION 18: PRE/POST-CONSTRUCTION WALK-THRU

The CONTRACTOR, Inspector, and/or Project Manager shall conduct a pre and post construction walk-thru. This shall be accomplished to determine limits of construction and existing conditions at each site and the surrounding area.

The CONTRACTOR will be required to video the entire project prior to any construction including all effected properties and staging locations. This video will be provided to the City. Areas near the property lines, back of sidewalk and driveways, landscaping, mow strips, fences and edging should be filmed in great detail to avoid any damage or disputes with property owners. The CONTRACTOR will be required to replace and or repair all areas that damaged by construction activities. Areas that are in question or concern should be noted on the video and the CONTRACTOR should notify the Project Manager or inspector.

SECTION 19: WORKING DAY, WORK HOURS, SATURDAY, SUNDAY, HOLIDAY AND OVERTIME WORK

Sparks Municipal Code 20.04.005.D restricts construction hours to 7:00 A.M. until 7:00 P.M., Monday through Friday and 9:00 A.M. until 5:00 P.M. on Saturday. For this project, the defined construction hours will be 7:00 A.M until 7:00 P.M., Monday through Friday and 9:00 A.M. until 5:00 P.M. on Saturday unless otherwise required by these specifications or requested by the City Project Coordinator. The CONTRACTOR shall not commence Construction operations before seven o'clock (7:00 A.M. Pacific Time) Monday through Friday, nor nine o'clock (9:00 A.M. Pacific Time) on Saturdays except as directed by the City Project Coordinator and as specified herein. Any deviation from the above defined construction hours require City approval.

The CONTRACTOR shall not perform any contract work on Sunday, legal Holidays and outside of the above specified time frames on a regular working day except as directed and approved by the City Project Coordinator and as specified herein.

When directed to work outside of the legally permitted construction hours defined above, the CONTRACTOR shall first obtain approval from the City Project Coordinator at least seventy-two (72) hours prior to commencing such overtime work. If the CONTRACTOR plans to perform work on Saturday or Sunday, he/she shall obtain approval by the Wednesday prior to work on the Saturday or Sunday for which work is planned. If the CONTRACTOR plans to perform work on a legal Holiday, he/she shall first obtain approval from the City Project Coordinator at least 72 hours in advance.

CONTRACTOR shall obtain approval through the Temporary Use Permit (T.U.P.) and pay a fee of one hundred (\$100.00) dollars to work outside of the above legally permitted construction hours. The request shall include justification of how public safety will be enhanced through working outside of the restricted construction hours. Submittal and payment of fees does not guarantee approval.

The CONTRACTOR shall be charged for all of City of Sparks' employee(s) time spent for overtime, Saturday, Sunday or Holiday work, based on the employee's hourly rate, plus benefits. The CONTRACTOR will be notified of the costs incurred and if the payment is not made, such costs will be deducted from any payment due to the CONTRACTOR. In addition to the charge for the City employee(s) time outside a standard workday,

| | |
|--------------------------------------|-------------------------------------|
| January 1 | New Year's Day |
| 3 rd Monday in January | Martin Luther King, Jr. Birthday |
| 3 rd Monday in February | President's Day |
| Last Monday in May | Memorial Day |
| July 4 | Independence Day |
| 1 st Monday in September | Labor Day |
| Last Friday in October | Nevada Day |
| November 11 | Veteran's Day |
| 4 th Thursday in November | Thanksgiving Day |
| 4 th Friday in November | Family Day (day after Thanksgiving) |
| December 25 | Christmas Day |

SECTION 20: MATERIAL SUBMITTALS

Submittals for the following items shall be provided at the time of the preconstruction meeting and shall have been performed within the previous 12 months. Two (2) copies of each submittal should be submitted.

- Aggregate Base
- Asphalt Mix Designs
- Concrete Mix Designs
- Concrete curing compound
- Expansion Material

SECTION 21: TRAFFIC CONTROL PLANS

All traffic control shall conform to the latest edition of the Manual on Uniform Traffic Control Devices (MUTCD) and as directed by the City of Sparks Community Services Department.

The CONTRACTOR shall designate a Traffic Control Supervisor (TCS), certified by the American Traffic Safety Services Association (ATSSA), who shall be responsible for planning, initiating, installing and maintaining all traffic control devices, as shown on the traffic control plan, as specified in the MUTCD and these specifications. The designated construction TCS shall be available to be contacted twenty-four (24) hours a day, seven (7) days a week, for the life of this Contract.

The traffic control plan shall be scaled such that all proposed signage and traffic control for all streets in the entire unit can be seen on one full size (24" x 36") plan sheet. The CONTRACTOR shall submit two (2) copies of proposed traffic control plan to the Project Manager for review and comments five (5) working days prior to the pre-construction meeting. The proposed traffic control plan shall be prepared and signed by a certified TCS, retained by the CONTRACTOR.

The CONTRACTOR's traffic control plan shall include, but not be limited to, the following:

- Proposed construction zone and existing speed limits
- All construction signing
- Message board locations
- Location of flaggers
- Types and locations of traffic control devices

- Temporary lane striping
- Construction phasing
- Lane crossovers between construction phases
- Method for maintaining traffic signal functions
- Special events accommodations
- Detours
- Accommodations for pedestrian, bicycle, and transit facilities

If, during construction, revisions to the accepted plan is necessary for safety or accommodation to traffic, these changes must be prepared by the ATSSA certified, Traffic Control Supervisor.

The Project Manager may authorize a suspension of work during unfavorable weather or other conditions beyond the control of the CONTRACTOR. During such a suspension, the CONTRACTOR shall make passable and shall open to two-way traffic all portions of the project. The maintenance, replacement or renewal of any work or materials lost or damaged during the period of suspension shall be at the expense of the CONTRACTOR.

During non-working hours, the CONTRACTOR shall make passable and shall open to two-way traffic all portions of the project.

When the CONTRACTOR's hauling equipment is required to merge with cross traffic and at such other points which may be necessary to maintain safe traffic conditions, flaggers shall be provided to each side of the impairment to stop and direct traffic.

Construction Zone Signs shall be placed on all cross streets where traffic is to be maintained. They shall be placed a sufficient distance from the construction to give motorists adequate warning of the construction. None of the provisions herein shall be construed to restrict or prohibit, at any time, the prosecution of items of work, which will not interfere with the use of existing streets.

For this project, existing roadways shall maintain one lane of traffic in each direction at all times unless specifically approved by the City Project Coordinator. On divided roadways, the CONTRACTOR may shift traffic to either side of the median as needed, so long as two-way traffic is maintained. Flaggers may be required if Project Manager or the Inspector believes it is needed due to current activity or traffic safety. Failure to comply with Flagger requirements will result in an immediate shut down of all construction activity. Work will resume when the flagger requirement has been satisfied.

SECTION 22: CLEANUP AND DUST CONTROL

It shall be the CONTRACTOR's responsibility to provide cleanup and dust control throughout all phases of construction, including suspension of work, and until final acceptance of the project. The CONTRACTOR shall keep the work site and other adjacent areas clean and free from rubbish and debris. The CONTRACTOR shall also abate dust nuisance by cleaning, sweeping, and sprinkling with water, or other means as necessary. A power broom will not be an acceptable means of cleaning the site unless used in conjunction with water to prevent dust from the power broom operation. The use of water resulting in mud on public streets will not be permitted as a substitute for sweeping or other methods. All water used for dust control must be from a potable water source.

All construction procedures shall conform to WCDHD-AQMD standards.

Excess excavated material from trenches, manholes, catch basins or similar structures in public streets shall be removed from the site immediately. At no time will the CONTRACTOR be allowed to store

debris or materials on the street overnight. All asphalt, concrete, soil and aggregate base will be hauled off at the conclusion of each working day. Materials for installation of Drop Inlets (Pipe, boxes frame and cover) will be allowed to be stored onsite with the approval of the project manager or inspector. Sufficient material may remain for use as backfill but shall not remain during non-working hours. Forms and form lumber shall be removed from the site as soon as practical after stripping. No screening of excavated material will be allowed in the street. The CONTRACTOR shall remove all trash from the site in a timely manner. At no time shall the CONTRACTOR permit disposal of trash in any excavation.

Materials and equipment shall be removed from the site as soon as they are no longer necessary; and, upon completion of the work and before final inspection, the entire worksite shall be cleared of equipment, waste and unused materials, construction debris and rubbish so as to present a satisfactory clean and neat appearance.

Care shall be taken to prevent spillage on haul routes. Any such spillage shall be removed immediately and the area cleaned.

Failure of the CONTRACTOR to comply with the Agency's cleanup orders may result in an order to suspend work until the condition is corrected. Working days will continue to be counted during the suspension. No additional compensation will be allowed as a result of such suspension. No extension of contract time will be allowed as a result of such suspension.

If the contract time expires before final cleanup has been completed, liquidated damages, as specified in the contract, may be imposed.

SECTION 23: FORCE ACCOUNT

THIS ITEM SHALL BE IDENTIFIED AS A CONTINGENT ITEM. The use of this contingent item will be as directed by the Engineer. The quantity of the above contingent item of work, as set forth on the bid schedule represent no actual estimate, is nominal only and may be greatly increased or decreased or reduced to zero. The increase or reduction of this quantity as compared with that set forth on the bid schedule shall not constitute a basis for claim by the CONTRACTOR for extra payment or damages.

Force Account items as defined by the City of Sparks will be additions to the contract arising within the course and scope of the contract for incidental costs due to unforeseen circumstances. Unforeseen circumstances include but are not limited to the following:

Emergency repairs, complications arising with interfacing new improvements to existing improvements, emergency pumping, emergency light/power plants, premium time or overtime to accelerate portions of work, unexpected utility modifications or conflicts, correcting existing substandard work, requested traffic control measures or signage, over-excavation of unsuitable materials, unknown field conditions, underground storage tanks, asbestos encountered, or any other miscellaneous or incidental items related to unforeseen circumstances.

Any force account items shall be adjusted daily upon report sheets, furnished to the Engineer by the CONTRACTOR and signed by both parties. These daily reports shall thereafter be considered the true record of force account items for unforeseen circumstances. No additional incidental work shall be performed or made except upon a written order from the Engineer.

SECTION 24: INSURANCE AND INDEMNIFICATION

The CONTRACTOR shall not commence any work nor permit a Subcontractor to commence work on this project until satisfactory proof has been presented to the City of Sparks Purchasing Division that all insurance requirements as outlined by the City have been met.

The CONTRACTOR shall provide and maintain, during the effective life of the awarded contract, Comprehensive General Liability Insurance covering the CONTRACTOR and the City of Sparks.

SECTION 25: RECORD DOCUMENTS

The CONTRACTOR shall maintain, in a safe place at the job site, one record copy of the construction Drawings in good order and annotated to show all changes made during construction and all existing facilities exposed during construction. These record drawings shall be kept current and made available to the Project Manager and inspector for reference upon request. CONTRACTOR shall, at the completion of the project, return one completed copy of the Record Drawings to the Project Manager. The City will not release CONTRACTOR's retention until the Record Drawings have been received and reviewed by the Project Manager.

SECTION 26: GARBAGE PICK UP

This is for recycled materials and garbage. It will be the responsibility of the CONTRACTOR to coordinate with Waste Management and residents to ensure that garbage collection is uninterrupted.

SECTION 27: PROJECT SUPERVISION

The CONTRACTOR will provide a superintendent for this project that is available during working hours. The CONTRACTOR will also provide a foreman for supervision of crews that are currently working on site. A "Working foreman" will not be permitted to supervise daily activities, Subcontractors will be subject to this rule as well. Supervision of several crews by one foreman will be permitted; the superintendent can also act as the supervision of the crews however the superintendent must remain on the job at all times during working hours.

SECTION 28: SURVEYING AND TESTING

The city will provide construction surveying for the project. Reference points with grades will be provided as well as cut sheets. The CONTRACTOR should exercise extreme care around stakes, PK nails and any reference points. Any re-staking that is needed due to damage by the CONTRACTOR will be the responsibility of the CONTRACTOR .

Compaction testing, asphalt and concrete testing will be provided by the city. 24-hour notice must be given by the CONTRACTOR to the project manager or inspector prior to any testing. Three copies of aggregate base, concrete and asphalt submittals will be required for approval prior to any installation.

SECTION 29: LOCATION OF WORK, PUBLIC RELATIONS

It shall be the CONTRACTOR'S responsibility to notify, in writing, all residents and businesses adjacent to this project of the construction working hours and duration of work. Notification shall be provided directly to impacted properties (i.e. properties abutting the work) fourteen (14) calendar days prior to beginning work at that location excepting notification for Monday and Tuesday work shall be provided no later than 7:00 PM Thursday. Notification shall be in the form of a letter and "door hanger" or flyer that is hand-delivered by the CONTRACTOR to each residence/business. The CONTRACTOR shall coordinate with the City while drafting the letter. Letters will include construction schedule, start and stop times, any weekend work, and contact telephone numbers of project superintendent. The City will provide contact info of the Project Engineer to be included in the notification. A generic copy of the door hanger shall be provided to the Engineer for approval at the Pre-Construction Meeting. In the event of substantial delays or temporary cessation of the work for a period of more than five (5) Contract calendar days, the CONTRACTOR shall again notify affected residents and businesses of the delay and revised work schedule. This notification shall be in the form of a letter and "door hanger" or flyer that is hand-delivered by the CONTRACTOR to each residence/business. The CONTRACTOR shall coordinate with

the City while drafting the letter and a generic copy shall be provided to the Engineer for approval prior to distribution. The CONTRACTOR shall keep a log of all letters, door hangers and person to person contacts including date, address, and the name of the person they spoke with. A copy of the log shall be submitted to the Engineer each week.

Special consideration shall be given to schools to accommodate schedules for pedestrians, student drop-off, and busses.

In the event of delays that require rescheduling of work, the CONTRACTOR shall re-notify impacted properties in the same manner as described in the paragraphs above.

Special consideration shall be given to schools to accommodate schedules for pedestrians, student drop-off, and busses.

“NO PARKING” signs shall be displayed on streets at least 24 hours prior to operations. Signs shall be legible from inside vehicles and state the day and dates work will be performed. Signs shall be free from defects and unbroken.

In the event of delays that require rescheduling of work, the CONTRACTOR shall re-notify impacted properties in the same manner as described in the paragraphs above.

BID ITEM CLARIFICATIONS
EASTERN PRATER WAY STORM DRAIN
Bid Number 20/21-002, PWP# WA-2020-319

GENERAL INFORMATION

Engineer's estimated quantity as contained in the bid schedule shall be the final pay quantity. For bid items measured in lineal feet, the quantities are estimated by taking the horizontal projected lengths. For bid items measured in square feet, the quantities are estimated by taking the horizontal projected areas.

The Engineer's estimated quantity, as contained in the bid schedule, is based on the details and dimensions shown on the plans, and no guarantee is made that the quantity, which can be determined by measurements and computations, will equal the estimated quantity. No allowance will be made in the event that the quantity based on measurements and computations does not equal the estimated quantity.

In case of discrepancy between the quantity contained in the bid schedule and the quantity or summation of quantities for the same item shown on the plans, payment will be based on the quantity contained in the bid schedule.

If the quantity of a particular item of work is intentionally increased or decreased during construction, the final pay quantity of that item will be adjusted to reflect the change.

The CONTRACTOR is cautioned that they may encounter large boulders, hard rock excavation and/or ground water during trench excavation. Special construction techniques and additional permanent asphalt patching/surface restoration may be necessary and will be considered normal for this construction.

The CONTRACTOR is cautioned that they may encounter unstable trench walls due to granular backfill of the existing, adjacent utilities. Special construction techniques including but not limited to removal of additional surface improvements, reduction of open trench length, and use of trench boxes may be necessary and will be considered normal for this construction. All cost associated with removal and replacement of surface improvements, reduction of open trench length, use of trench box, additional export, additional backfill, temporary and permanent pavement shall not be subject to additional payment and be included in the applicable trenching and excavation bid items.

The CONTRACTOR shall verify all inverts and make exploratory excavations (potholing) as required to locate all possible conflicting utilities and notify the Engineer in writing of all conflicts at least forty-eight (48) hours prior to commencement of any underground construction. A dense corridor of utilities is located on the north and south side of the street throughout the project area. CONTRACTOR should be aware that the design plans may not show every utility and take extra precaution to identify and protect when excavating near these areas to avoid damage.

The CONTRACTOR shall coordinate the relocation of existing private utilities to be performed by said private utility where shown on the Improvement Plans and where it is determined during construction that said relocation will be necessary due to conflicts with new facilities to be installed or constructed under this Contract.

The CONTRACTOR shall cooperate fully with all utility forces, other Contractors, and forces of other public or private agencies engaged in any type of work which may interfere with the progress of the CONTRACTOR's work. The CONTRACTOR shall schedule the work so as to minimize any interference with the hereinbefore mentioned forces.

BID ITEM 1: MOBILIZATION/DEMobilIZATION (LUMP SUM)

No specific unit of measurement shall apply to this lump sum item. The lump sum bid price shall constitute full payment for mobilization and demobilization, complete as specified. The lump sum price for mobilization shall include all costs for obtaining all bonds, permits, and licenses; moving onto and off the site equipment and materials; furnishing and erecting construction trailers and other construction facilities; and all preparatory work as required for the proper performance and completion of the project, including work items not identified in a separate bid item.

Partial payment will be 20% for each 10% of project completion thru 50% completion.

BID ITEM 2: TRAFFIC CONTROL (LUMP SUM)

No specific unit of measurement shall apply to this lump sum item. The lump sum bid price shall constitute full compensation for all labor, equipment, tools, supplies and materials to complete this item, including, but not limited to, preparation and distribution of plans, notices and reports; setup, removal and maintenance of all barricades, signs (including custom signs), channelizing devices, barrel cones, flag persons, detours, temporary paving, temporary aggregate base, plantmix, and asphalt pavement ramps. There shall be no additional payment for changes in the traffic control plan required as a result of changes in the CONTRACTOR's work method or schedule. Payment for traffic control shall be made at the contract unit price bid per lump sum for entire project.

Partial payment will be made based upon percent completion of the work.

BID ITEM 3: DEWATERING (LUMP SUM)

No specific unit of measurement shall apply to this lump sum item. The lump sum bid price shall constitute full compensation for all labor, equipment, tools, supplies and materials to complete this item, including, but not limited to, permitting, pumping, and disposing of construction trench water.

SDR-35 PVC

BID ITEM 4: INSTALL 12" SDR-35 PVC

BID ITEM 5: INSTALL 18" SDR-35 PVC

Measurement of this bid item shall be by the linear foot along the pipe centerline. Measurement shall be made from inside wall of manhole (or catch basin) to inside wall of manhole (or catch basin).

12" SDR-35 PVC shall be PS 46 per ASTM D3034. 18" SDR-35 PVC shall be PS 46 per ASTM F679.

The unit price shall constitute full compensation for furnishing all labor, materials, tools, equipment, and incidentals for excavating, trenching, removal of existing pipe/structures, backfilling pipe, connecting to existing structures, complete in place. Reference Standard Specifications Sections 203.00, 305.00, and 306.00.

BID ITEM 6: INSTALL 24" C900 PVC (DR 18)

Measurement of this bid item shall be by the linear foot along the pipe centerline. Measurement shall be made from inside wall of manhole (or catch basin) to inside wall of manhole (or catch basin).

C900 (DR 18) PVC shall conform to AWWA C900 with gaskets meeting ASTM F477 and joints meeting ASTM D3139.

The unit price shall constitute full compensation for furnishing all labor, materials, tools, equipment, and incidentals for excavating, trenching, removal of existing pipe/structures, backfilling pipe, connecting to existing structures, complete in place. Reference Standard Specifications Sections 203.00, 305.00, and 306.00.

BID ITEM 7: INSTALL 24" FORCE MAIN

Measurement of this bid item shall be by the linear foot along the pipe centerline. Measurement shall be made from inside wall of the pump station access hatch to inside wall of downstream pipe connection.

Force main construction may be completed with either 24" C900 (DR 18) PVC or Class 250 Ductile Iron. Force main construction shall be entirely with one type of pipe and not change. If C900 (DR 18) PVC is used, it shall conform to AWWA C900 with gaskets meeting ASTM F477 and joints meeting ASTM D3139. If Ductile Iron Pipe is used, it shall be pressure class 250 with rubber gasket/mechanical joints meeting AWWA C111, Pg. 77 of OB).

Where restrained joints are indicated on the plans, restrained joints shall meet or exceed the pressure rating of the pipe. Self-restrained joint gaskets or restraint harnesses may be used for C900 PVC and push-on restrained joint gaskets or mechanically restrained joints may be used for Ductile Iron. CONTRACTOR shall submit proposed restraining product to Engineer for approval prior to construction.

The unit price shall constitute full compensation for furnishing all labor, materials, tools, equipment, and incidentals for excavating, trenching, restraining joints, backfilling pipe and connecting force main to the existing storm drain, complete in place. Reference Standard Specifications Sections 203.00, 305.00, and 306.00.

CLASS III RCP

BID ITEM 8: INSTALL 18" CLASS III RCP

BID ITEM 9: INSTALL 24" CLASS III RCP

BID ITEM 10: INSTALL 30" CLASS III RCP

BID ITEM 11: INSTALL 42" CLASS III RCP

BID ITEM 12: INSTALL 53" X 34" CLASS III RCP

Measurement of this bid item shall be by the linear foot along the pipe centerline. Measurement shall be made from inside wall of manhole (or catch basin) to inside wall of manhole (or catch basin).

Round Class III RCP fabrication shall conform to ASTM C76. Elliptical Class III RCP fabrication shall conform to ASTM C507.

The unit price shall constitute full compensation for furnishing all labor, materials, tools, equipment, and incidentals for excavating, trenching, removal of existing pipe/structures, backfilling pipe, connecting to existing structures, complete in place. Reference Standard Specifications Sections 203.00, 305.00, and 306.00.

ELBOW FITTINGS

BID ITEM 13: INSTALL 24" 11.25° ELBOW FITTING

BID ITEM 14: INSTALL 24" 22.5° ELBOW FITTING

BID ITEM 15: INSTALL 24" 45° ELBOW FITTING

Measurement of this bid item shall be by the each. Fitting material and pressure class for each elbow shall match the force main.

The unit price shall constitute full compensation for furnishing all labor, materials, tools, equipment, and incidentals for excavating, trenching, backfilling, and connection to force main, complete in place. Reference Standard Specifications Sections 203.00, 305.00, and 306.00.

BID ITEM 16: INSTALL 4" FLUSH VALVE ASSEMBLY

Measurement of this bid item shall be by the each.

This item shall include providing all labor, materials, supplies, equipment, services and other incidentals necessary for furnishing and installing or constructing flush valve assemblies in accordance with the design plans and specifications.

BID ITEM 17: INSTALL 1" AIR RELEASE VALVE ASSEMBLY

Measurement of this bid item shall be by the each.

This item shall include providing all labor, materials, supplies, equipment, services and other incidentals necessary for furnishing and installing or constructing air release valve assemblies in accordance with the design plans and specifications.

BID ITEM 18: CONSTRUCT CONCRETE COLLAR

Measurement of this bid item shall be by the each.

The unit price shall constitute full compensation for furnishing all labor, materials, tools, equipment, and incidentals for forming and installing the collar, complete in place.

BID ITEM 19: REMOVE STORM DRAIN PIPE

Measurement of this bid item shall be by the linear foot.

This item shall include providing all labor, materials, supplies, equipment, services and other incidentals necessary for removing storm drain pipe (to include excavation, pipe cap, and backfill) in accordance with the design plans.

This bid item does not include removal of storm drain pipe where new pipe is proposed in the same trench. Removal of pipe in these locations are included in the construction of the new pipe.

HIGH CAPACITY CURB INLETS

BID ITEM 20: CONSTRUCT HIGH CAPACITY CURB INLET (DOUBLE GRATE)

BID ITEM 21: CONSTRUCT HIGH CAPACITY CURB INLET (QUADRUPLE GRATE)

Measurement of this bid item shall be by the each.

This item shall include providing all labor, materials, supplies, equipment, services and other incidentals necessary for furnishing and installing or constructing high capacity curb inlets (to include excavation, bedding preparation, and backfill) and connecting to existing pipe in accordance with the plans and specifications. Payment for curb inlets shall include the removal and replacement of all curb, gutter,

sidewalk and existing structures necessary to complete the item of work as shown on the design plans and the standard details including frame and grate/cover.

Inlet shall include two or four (as indicated in the design plans) NEENAH R-3295 (or approved equal) frame, grate, and curb hood with the inlet vault being precast; however, a cast in place design may be submitted for Engineer's approval.

BID ITEM 22: CONSTRUCT TYPE CM2 DROP INLET (SINGLE UNIT FRAME)

Measurement of this bid item shall be by the each.

This item shall include providing all labor, materials, supplies, equipment, services and other incidentals necessary for furnishing and installing or constructing Type CM2 drop inlets (to include excavation, bedding preparation, forming, and backfill) and connecting to existing pipe in accordance with the plans and specifications. Payment for curb inlets shall include the removal and replacement of all curb, gutter, sidewalk and existing structures necessary to complete the item of work as shown on the design plans and the standard details including frame and grate/cover.

Plans call for cast in place inlets to facilitate connections to existing pipes; however precast vaults may be used with engineer approval.

BID ITEM 23: CONSTRUCT NDOT TYPE 4 STORM DRAIN MANHOLE

Measurement of this bid item shall be by the each.

This item shall include providing all labor, materials, supplies, equipment, services and other incidentals necessary for furnishing and installing or constructing Type IV Manholes (to include excavation, removal of existing structure, bedding preparation, forming, backfill, and adjusting to finished grade) and connecting to existing pipe in accordance with the plans and specifications. Plans call for cast in place manholes; however, a precast vault may be used with Engineer approval.

BID ITEM 24: CONSTRUCT TYPE V STORM DRAIN MANHOLE

Measurement of this bid item shall be by the each.

This item shall include providing all labor, materials, supplies, equipment, services and other incidentals necessary for furnishing and installing or constructing Type V Manholes (to include excavation, removal of existing structure, bedding preparation, forming, backfill, and adjusting to finished grade) and connecting to existing pipe in accordance with the plans and specifications. Plans call for a cast in place manhole base; however, a precast base may be used with Engineer approval.

BID ITEM 25: PUMP STATION ELECTRICAL AND INSTRUMENTATION AND CONTROL CONNECTIONS

No specific unit of measurement shall apply to this lump sum item. The lump sum bid price shall constitute full payment for all labor, equipment, materials and incidentals necessary for installation and connection of the electrical equipment. Additionally, the item includes coordination with the City's SCADA controls provider and NVEnergy.

This item shall include providing all labor, materials, supplies, equipment, services and other incidentals necessary for furnishing and installing and installing all electrical equipment in accordance with the Electrical sheets in the design plans and specifications. CONTRACTOR shall coordinate with the City's SCADA controls provider for the work associated with the Instrumentation and Controls. The City's SCADA controls provider shall supply all equipment included on the Instrumentation and Control sheets in the design plans. Instrumentation and Controls design sheets and attached specifications have been

provided for the CONTRACTOR's reference only. The CONTRACTOR's work shall be limited to coordinating installation schedules. CONTRACTOR shall also coordinate with NVEnergy for electrical connection to transformer. Engineer shall be kept informed on installation and connection schedules.

CONTRACTOR shall complete the electrical and instrumentation and control installation noted in the design plans and coordinate NVEnergy (775-834-7520) to schedule an inspection. Upon a successful inspection, NVEnergy will begin their construction phase within approximately 10-15 days and is anticipated to complete within 5 days. After completion of NVEnergy construction, CONTRACTOR shall coordinate with NVEnergy for the final inspection and the setting of the meter.

CONTRACTOR shall perform an operations check for the pump station and coordinate with the City's SCADA controls provider for an operations check of the associated instrumentation and control equipment. Engineer and City shall be onsite for the operations checks and confirm successful operation. If a successful operations check is not confirmed, additional operations checks will be required by the CONTRACTOR until successful operation is confirmed.

See scope list and specifications for IO provided by the City's SCADA controls provider. Reference attached technical specification, SECTION 800 – ELECTRICAL AND INSTRUMENTATION AND CONTROL SCOPE MATRIX

BID ITEM 26: CONSTRUCT PUMP STATION

Measurement of this bid item shall be by the each. Bill of materials/components shall match the design plans or be approved by the Engineer.

This item shall include providing all labor, materials, supplies, equipment, services and other incidentals necessary for furnishing and installing or constructing the pump station (to include excavation, bedding preparation, backfill, and adjusting to finished grade) in accordance with the plans and specifications. The pump station is defined as the wet well, the valve vault, and the entire bill of materials contained within.

BID ITEM 27: CONSTRUCT CONCRETE PAD AND PROTECTIVE BOLLARDS

No specific unit of measurement shall apply to this lump sum item. The lump sum bid price shall constitute full payment for all labor, equipment, materials and incidentals necessary for the construction of concrete pads, conduit, and protective bollards for the pump station as indicated on the design plans.

This item shall include providing all labor, materials, supplies, equipment, services and other incidentals necessary for furnishing and installing or constructing the concrete pads and protective bollards (to include excavation, bedding preparation, forming, and backfill) in accordance with the plans and specifications.

BID ITEM 28: TMWA WATER LINE REPLACEMENT

No specific unit of measurement shall apply to this lump sum item. The lump sum bid price shall constitute full compensation for all labor, equipment, tools, supplies and materials necessary for working around as well as replacing and/or relocating TMWA water lines at storm drain crossings (to include excavation, bedding preparation, slurry, backfill, and thrust blocks) in accordance with the plans and specifications.

All work and materials affecting TMWA facilities shall be in accordance with the current Truckee Meadows Water Authority (TMWA) Construction and Design Standards and Details. TMWA facilities shall be inspected and approved by a TMWA inspector. Complete TMWA specifications and standards can be located at www.tmwa.com. CONTRACTOR shall obtain, become familiar with and keep TMWA standards available on the project site.

Reference attached technical specification, SECTION 700 – SUPPLEMENTAL WATER SPECIFICATIONS FOR WATER CONSTRUCTION

BID ITEM 29: TMWA WATER MAIN SUPPORT AND SLURRY BACKFILL

No specific unit of measurement shall apply to this lump sum item. The lump sum bid price shall constitute full compensation for all labor, equipment, tools, supplies and materials necessary to support the 24” water main during excavation through the backfill process, including slurry backfill. Support plan shall be submitted to the Engineer for approval prior to construction. Plan shall include measures to minimize trench width under the exposed water line.

The 24” water main has a coal tar coating. Upon exposing the water line, CONTRACTOR shall determine if the coating contains asbestos and take necessary precautions if needed.

BID ITEM 30: REMOVE AND REPLACE P.C.C. SIDEWALK, DRIVEWAY, OR VALLEY GUTTER

Measurement of this bid item shall be by the square foot.

This item shall include providing all labor, materials, supplies, equipment, services and other incidentals necessary for constructing P.C.C. sidewalk, driveway, or valley gutter (to include excavation, aggregate base preparation, forming, and backfill) in accordance with the design plans.

This bid item does not include removal and replacement incidental to drop inlet or curb inlet construction.

BID ITEM 31: REMOVE AND REPLACE P.C.C. CURB (MEDIAN)

Measurement of this bid item shall be by the linear foot.

This item shall include providing all labor, materials, supplies, equipment, services and other incidentals necessary for constructing P.C.C. median curb (to include excavation, aggregate base preparation, forming, and backfill) in accordance with the design plans.

There shall be no direct payment for painting of the tops and sides of curb with red/yellow/blue paint. Compensation shall be considered included in other items of work.

BID ITEM 32: REMOVE AND REPLACE P.C.C. CURB AND GUTTER (TYPE 1, 1A, & ROLLED)

Measurement of this bid item shall be by the linear foot.

This item shall include providing all labor, materials, supplies, equipment, services and other incidentals necessary for constructing P.C.C. curb and gutter (to include excavation, aggregate base preparation, forming, and backfill) in accordance with the design plans.

There shall be no direct payment for painting of the tops and sides of curb with red/yellow/blue paint. Compensation shall be considered included in other items of work.

This bid item does not include removal and replacement incidental to drop inlet or curb inlet construction.

BID ITEM 33: REMOVE EXISTING AND CONSTRUCT PORTLAND CEMENT CONCRETE PEDESTRIAN RAMP

Measurement of this bid item shall be by the square foot.

This item shall include providing all labor, materials, supplies, equipment, services and other incidentals necessary for constructing P.C.C. pedestrian ramps (to include excavation, aggregate base preparation, forming, backfill, and detectable warning) in accordance with the design plans.

BID ITEM 34: PERMANENT BITUMINOUS PAVEMENT PATCHING

Measurement of this bid item shall be by the linear foot.

This item shall include providing all labor, materials, supplies, equipment, services and other incidentals necessary for installing permanent bituminous pavement patching (to include preparation, mixing, hauling, placement, and compaction of plantmix bituminous pavement, as specified, and/or as directed by the Engineer.

Within City right-of-way, if trench edges for longitudinal excavations fall within a travel lane, the entire travel lane outside the trench shall be cold milled to a depth of two inches and overlaid with two inches of dense grade plantmix bituminous pavement as shown on the design plans. Plantmix Bituminous Pavement patches within City right-of-way shall conform to Section 201 of the Standard Specifications. Saw cuts that extend into the existing pavement surface that was not removed shall be filled with a crack sealant compound such as CRAFCO 222 or equivalent, as approved by the Engineer. If sawcut is within two (2) feet from the gutter lip line, then the CONTRACTOR shall remove the pavement to the gutter lip line and place Permanent Patch.

The CONTRACTOR shall install a 3-inch temporary HOT MIX patch over exposed utility trench excavated areas at the end of each work day. Cold mix asphalt is not permitted on this project. All temporary hot-patches are to be maintained by the CONTRACTOR until the permanent asphalt patch is placed or roadway reconstruction has started.

BID ITEM 35: 2" GRIND AND OVERLAY

Measurement for this bid item will be on a Square Yard basis.

This item shall include providing all labor, materials, supplies, equipment, services and other incidentals necessary for the removal and disposal of 2 inches of existing roadway paving and the construction of a new 2 inches of roadway paving (bituminous plantmix). Excavation trenches shall be backfilled and patched per plans prior to removal of existing 2 inches of existing roadway. Roadway removal and construction limits are shown on plans.

Final adjustment of all valves and manholes to finished grade is included in this bid item.

BID ITEM 36: PROTECT AND ADJUST UTILITY VALVE BOXES AND MANHOLES TO FINISHED GRADE

No specific unit of measurement shall apply to this lump sum item. The lump sum bid price shall constitute full compensation for all labor, equipment, tools, supplies and materials to raise all utility valves and manhole covers to finished grade within the limits of the grind and overlay.

PREFORMED THERMOPLASTIC PAVEMENT MARKINGS

BID ITEM 37: PREFORMED THERMOPLASTIC PAVEMENT MARKINGS, 12" & 24" STOP BAR AND YIELD

BID ITEM 38: PREFORMED THERMOPLASTIC PAVEMENT MARKINGS, 24" BY 10' LONG CROSSWALK

BID ITEM 39: PREFORMED THERMOPLASTIC PAVEMENT MARKINGS, BIKE SYMBOL

BID ITEM 40: PREFORMED THERMOPLASTIC PAVEMENT MARKINGS, TRIANGLES

BID ITEM 41: PREFORMED THERMOPLASTIC PAVEMENT MARKINGS, ARROW (TURN OR STRAIGHT OR COMBINATION)

Measurement of this bid item shall be by the linear foot for stop bars, yields, crosswalks, and triangles. The work shall consist of the placements of painted pavement markings of the size and type as indicated on the Improvement Plans. Measurement of this bid item shall be by the each for bike symbols, "Only" symbols, and arrows. Each combination of bicyclist symbol and direction arrow shall constitute a single "bike symbol".

This item shall include all labor, equipment, materials and incidentals necessary to install thermoplastic markings including, but not limited to, surface preparation; priming; and application.

Application of permanent pavement markings on the completed pavement shall conform to Section 632 Permanent Painted Pavement Markings of the Standard Specifications for Road and Bridge Construction, Nevada Department of Transportation, latest edition.

CONTRACTOR shall inventory existing striping locations, lane widths, crosswalks, stop bars, yield bars, storage lanes, and symbol markings prior to construction. CONTRACTOR shall obtain the City's approval and Engineer's review of the permanent striping layout prior to final installation.

If the CONTRACTOR elects to increase the extents of the pavement replacement the additional pavement striping, and markings shall be replaced in-kind at no additional cost to the City.

CONTRACTOR shall grind existing thermoplastic symbols and markings that are proposed to be replaced per the striping plans which are outside of the repaving limits. Grinding shall be done in such a manner that the underlying surface shall sustain minimal scarring, gouging or damage. Excessive damage to the asphalt surface may require full depth pavement removal and replacement at the CONTRACTOR's expense. In addition, CONTRACTOR shall replace any striping that has been damaged or removed due to construction that is not identified on the striping plans at no additional cost to the City.

PAVEMENT MARKING

BID ITEM 42: PAVEMENT MARKING 4" DOUBLE SOLID YELLOW OR WHITE PAINT

BID ITEM 43: PAVEMENT MARKING 4" SINGLE SOLID YELLOW OR WHITE PAINT

BID ITEM 44: PAVEMENT MARKING 4" SINGLE DASHED YELLOW OR WHITE PAINT (10' STRIPE 30' GAP)

BID ITEM 45: PAVEMENT MARKING 4" SINGLE DASHED YELLOW OR WHITE PAINT (2.5' STRIPE 3.5' GAP)

Measurement of this bid item shall be by the linear foot.

The item shall include all labor, equipment, materials and incidentals necessary to install all painted linear pavement markings including center lines, lane lines, hatching and other striping and markings, including, but not limited to, surface preparation; priming; and application of the required number of coats of paint to complete the work as specified.

Application of permanent pavement markings on the completed pavement shall conform to Section 632 Permanent Painted Pavement Markings of the Standard Specifications for Road and Bridge Construction, Nevada Department of Transportation, latest edition.

The placement and maintenance of temporary striping and tabs shall be considered incidental to the project.

Prior to application of temporary striping or markings, it shall be necessary to completely obliterate existing markings in such a manner so as to leave no residue or other trace of the former line that may be misconstrued by a driver to be a traffic line under any condition of daylight, darkness, or wetness of pavement. Use of gray or black paint to cover existing markings shall not be an acceptable method of obliteration.

During construction, CONTRACTOR shall provide temporary pavement markings and striping to any areas damaged by construction operations and shall be considered incidental to the project.

CONTRACTOR shall inventory existing striping locations, lane widths, crosswalks, stop bars, yield bars, storage lanes, and symbol markings prior to construction. CONTRACTOR shall obtain the City's approval and Engineer's review of the permanent striping layout prior to final installation.

If the CONTRACTOR elects to increase the extents of the pavement replacement the additional pavement striping, and markings shall be replaced in-kind at no additional cost to the City.

CONTRACTOR shall grind existing thermoplastic symbols and markings that are proposed to be replaced per the striping plans which are outside of the repaving limits. Grinding shall be done in such a manner that the underlying surface shall sustain minimal scarring, gouging or damage. Excessive damage to the asphalt surface may require full depth pavement removal and replacement at the CONTRACTOR's expense. In addition, CONTRACTOR shall replace any striping that has been damaged or removed due to construction that is not identified on the striping plans at no additional cost to the City.

BID ITEM 46: REMOVE AND REPLACE LOOP DETECTORS

No specific unit of measurement shall apply to this lump sum item. The lump sum bid price shall constitute full payment for all labor, equipment, materials and incidentals necessary for the removal and replacement of loop detectors within the project limits, complete as specified (including, but not limited to, pavement saw cut, installation, and sealant).

Traffic signal loop detector wire shall be #14 AWG MSA No. 51-5-1984 with polyethylene encased tube.

Loop detectors shall be installed in accordance with Standard Details for Public Works Construction Details S-405A and S-405B, as applicable. Loop detectors shall be sealed with hot-melt rubberized asphalt sealant or an elastomeric loop sealant in accordance with City of Sparks Traffic Signal Standards.

BID ITEM 47: LANDSCAPE RESTORATION (CONTINGENT ITEM)

No specific unit of measurement shall apply to this lump sum item. The lump sum bid price shall constitute full payment for all labor, equipment, materials and incidentals necessary for the replacement of landscaping within the project limits as indicated on the design plans.

Replacement of existing shrubs, bushes, and land covering shall be with items of similar composition to the existing coverage as identified by the City project coordinator. Trees will not be replaced in the pump station island; however, trees will be replaced in the East Prater Way median (if necessary). CONTRACTOR shall coordinate with Engineer and City project coordinator regarding limits of disturbance for the pump station island prior to beginning activities in the area.

BID ITEM 48: OVER EXCAVATION OF UNSUITABLE MATERIAL AND BACKFILL (CONTINGENT ITEM)

Measurement of this bid item shall be by the cubic yard. Material that is unsuitable for the planned use shall be excavated and disposed of as directed by the Engineer.

The CONTRACTOR shall immediately notify the Engineer of any questionable conditions, such as pumping areas or expansive subgrade soils so an over excavation determination may be made in a timely fashion. If in the opinion of the Engineer, the existing subgrade is unsatisfactory for the planned use including but not limited to sanitary sewer, storm drain, domestic water or roadway improvements, the CONTRACTOR shall over excavate and backfill using the recommendations on site preparation and stabilization from the geotechnical information included in Section 600 of these documents.

BID ITEM 49: LATERAL PIPE DAMAGE (CONTINGENT ITEM)

Measurement of this bid item shall be by the linear foot along the pipe centerline. Measurement shall be made from inside wall of the structure or pipe connection to the location of planned connection. Pipe that is unsuitable for the planned connection shall be replaced as directed by the Engineer.

The CONTRACTOR shall immediately notify the Engineer of any existing pipe connections that cannot be made due to condition of the existing pipe so a determination may be made in a timely fashion. The unit price shall constitute full compensation for furnishing all labor, materials, tools, equipment, and incidentals for excavating, trenching, coupling, and backfilling pipe, complete in place. Reference Standard Specifications Sections 203.00, 305.00, and 306.00.

BID ITEM 50: FORCE ACCOUNT (CONTINGENT ITEM)

A force account has been established for this project and shall be included in each bid. The force account will be utilized only as necessary for extra work authorized and approved by the Engineer and the City of Sparks.

**TECHNICAL SPECIFICATIONS
EASTERN PRATER WAY STORM DRAIN
Bid Number 20/21-002, PWP# WA-2020-319**

Unless otherwise amended by these Technical Specifications, all materials, construction methods, etc. shall follow the Standard Specifications for Public Works Construction (Orange Book), 2012 version.

TECHNICAL SPECIFICATIONS INCLUDED IN THIS SECTION:

SECTION 400 – ELECTRICAL FOR LIFT STATIONS

SECTION 500 – INSTRUMENTATION AND CONTROL FOR LIFT STATIONS

SECTION 600 – GEOTECHNICAL REPORT

SECTION 700 – SUPPLEMENTAL WATER SPECIFICATIONS FOR WATER CONSTRUCTION

SECTION 800 – ELECTRICAL AND INSTRUMENTATION AND CONTROLS SCOPE MATRIX

SECTION 900 – TRANSITE PIPE REMOVAL

SECTION 400
ELECTRICAL FOR LIFT STATIONS

Section 400 is comprised of the following specification sections:

SECTION 260519 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

SECTION 260523 - CONTROL-VOLTAGE ELECTRICAL POWER CABLES

SECTION 260526 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

SECTION 260529 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

SECTION 260533 – RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

SECTION 260543 – UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

SECTION 260544 – SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

SECTION 260548.16 – SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

SECTION 260573 – SHORT-CIRCUIT, DEVICE SETTING, ARC-FLASH HAZARD ANALYSIS

SECTION 261216 – DRY-TYPE, MEDIUM-VOLTAGE TRANSFORMERS

SECTION 262413 – SWITCHBOARDS

SECTION 262416 – PANELBOARDS

SECTION 262419 – MONITOR-CONTROL CENTERS

SECTION 262726 – WIRING DEVICES

SECTION 262923 – VARIABLE-FREQUENCY MONITOR CONTROLLERS

SECTION 265613 – LIGHTING POLES AND STANDARDS

SECTION 265619 – LED EXTERIOR LIGHTING

SECTION 260519 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.
2. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:

1. Section 260523 "Control-Voltage Electrical Power Cables" for control systems communications cables and Classes 1, 2, and 3 control cables.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: Indicate type, use, location, and termination locations.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

C. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

D. Conductor Insulation:

1. Type THHN and Type THWN-2: Comply with UL 83.

2. Type XHHW-2: Comply with UL 44.

2.2 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.
- C. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
 1. Material: Copper.
 2. Type: One hole with standard barrels.
 3. Termination: Compression.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Feeders: Copper for feeders smaller than No. 4 AWG; copper or aluminum for feeders No. 4 AWG and larger. Conductors shall be solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- C. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- D. Branch Circuits: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.
- E. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.
- B. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

3.3 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."

3.4 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.

3.5 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.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 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."

END OF SECTION 260519

SECTION 260523 - CONTROL-VOLTAGE ELECTRICAL POWER CABLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Category 5e balanced twisted pair cable.
 - 2. Balanced twisted pair cabling hardware.
 - 3. RS-485 cabling.
 - 4. Low-voltage control cabling.
 - 5. Control-circuit conductors.

1.2 DEFINITIONS

- A. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency, RCDD, layout technician, installation supervisor, and field inspector.
- B. Source quality-control reports.
- C. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Accredited by NETA.
 - 1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- 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. Flame Travel and Smoke Density in Plenums: As determined by testing identical products according to NFPA 262, by a qualified testing agency. Identify products for installation in plenums with appropriate markings of applicable testing agency.
 - 1. Flame Travel Distance: 60 inches (1520 mm) or less.
 - 2. Peak Optical Smoke Density: 0.5 or less.
 - 3. Average Optical Smoke Density: 0.15 or less.
- C. Flame Travel and Smoke Density for Riser Cables in Non-Plenum Building Spaces: As determined by testing identical products according to UL 1666.
- D. Flame Travel and Smoke Density for Cables in Non-Riser Applications and Non-Plenum Building Spaces: As determined by testing identical products according to UL 1685.
- E. RoHS compliant.

2.2 CATEGORY 5e BALANCED TWISTED PAIR CABLE

- A. Description: Four-pair, balanced-twisted pair cable, certified to meet transmission characteristics of Category 5e cable at frequencies up to 100 MHz.
- B. Standard: Comply with ICEA S-90-661, NEMA WC 63.1, and TIA-568-C.2 for Category 5e cables.
- C. Conductors: 100-ohm, 24 AWG solid copper.
- D. Shielding/Screening: Unshielded twisted pairs (UTP).
- E. Cable Rating: Riser.
- F. Jacket: Gray thermoplastic.

2.3 BALANCED TWISTED PAIR CABLE HARDWARE

- A. Description: Hardware designed to connect, splice, and terminate balanced twisted pair copper communications cable.
- B. General Requirements for Balanced Twisted Pair Cable Hardware:
 - 1. Comply with the performance requirements of Category 5e or better.
 - 2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
 - 3. Cables shall be terminated with connecting hardware of same category or higher.

2.4 LOW-VOLTAGE CONTROL CABLE

- A. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.
 - 1. Multi-pair, twisted, No. 18 AWG, stranded (19x30) tinned-copper conductors.

2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with NFPA 262.

2.5 CONTROL-CIRCUIT CONDUCTORS

- A. Class 1 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.
- B. Class 2 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.
- C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.

2.6 SOURCE QUALITY CONTROL

- A. Factory test balanced twisted pair cables according to TIA-568-C.2.
- B. Cable will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Test cables on receipt at Project site.
 1. Test each pair of twisted pair cable for open and short circuits.

3.2 INSTALLATION OF RACEWAYS AND BOXES

- A. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for raceway selection and installation requirements for boxes, conduits, and wireways as supplemented or modified in this Section.
 1. Outlet boxes shall be no smaller than 2 inches (50 mm) wide, 3 inches (75 mm) high, and 2-1/2 inches (64 mm) deep.
 2. Outlet boxes shall be no smaller than 4 inches (102 mm) square by 2-1/8 inches (53 mm) deep with extension ring sized to bring edge of ring to within 1/8 inch (3.1 mm) of the finished wall surface.
 3. Flexible metal conduit shall not be used.
- B. Comply with TIA-569-D for pull-box sizing and length of conduit and number of bends between pull points.

- C. Install manufactured conduit sweeps and long-radius elbows if possible.
- D. Raceway Installation in Equipment Rooms:
 - 1. Position conduit ends adjacent to a corner on backboard if a single piece of plywood is installed, or in the corner of the room if multiple sheets of plywood are installed around perimeter walls of the room.
 - 2. Install cable trays to route cables if conduits cannot be located in these positions.
 - 3. Secure conduits to backboard if entering the room from overhead.
 - 4. Extend conduits 3 inches (75 mm) above finished floor.
 - 5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling:
 - 1. Comply with TIA-568-C Series of standards.
 - 2. Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems."
 - 3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
 - 4. Cables may not be spliced and shall be continuous from terminal to terminal. Do not splice cable between termination, tap, or junction points.
 - 5. Cables serving a common system may be grouped in a common raceway. Install network cabling and control wiring and cable in separate raceway from power wiring. Do not group conductors from different systems or different voltages.
 - 6. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 - 7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Install lacing bars and distribution spools.
 - 8. Do not install bruised, kinked, scored, deformed, or abraded cable. Remove and discard cable if damaged during installation and replace it with new cable.
 - 9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Do not use heat lamps for heating.
 - 10. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Monitor cable pull tensions.
 - 11. Support: Do not allow cables to lay on removable ceiling tiles.
 - 12. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.
 - 13. Provide strain relief.
 - 14. Keep runs short. Allow extra length for connecting to terminals. Do not bend cables in a radius less than 10 times the cable OD. Use sleeves or grommets to protect cables from vibration at points where they pass around sharp corners and through penetrations.
 - 15. Ground wire shall be copper, and grounding methods shall comply with IEEE C2. Demonstrate ground resistance.

- C. Balanced Twisted Pair Cable Installation:
 - 1. Comply with TIA-568-C.2.
 - 2. Install termination hardware as specified in Section 271513 "Communications Copper Horizontal Cabling" unless otherwise indicated.
 - 3. Do not untwist UTP cables more than 1/2 inch (12 mm) at the point of termination to maintain cable geometry.
- D. Installation of Control-Circuit Conductors:
 - 1. Install wiring in raceways. Comply with requirements specified in Section 260533 "Raceways and Boxes for Electrical Systems."

3.4 CONTROL-CIRCUIT CONDUCTORS

- A. Minimum Conductor Sizes:
 - 1. Class 1 remote-control and signal circuits; No 14 AWG.
 - 2. Class 2 low-energy, remote-control, and signal circuits; No. 16 AWG.
 - 3. Class 3 low-energy, remote-control, alarm, and signal circuits; No 12 AWG.

3.5 FIRESTOPPING

- A. Comply with requirements in Section 078413 "Penetration Firestopping."
- B. Comply with TIA-569-D, Annex A, "Firestopping."
- C. Comply with BICSI TDMM, "Firestopping" Chapter.

3.6 GROUNDING

- A. For data communication wiring, comply with TIA-607-B and with BICSI TDMM, "Bonding and Grounding (Earthing)" Chapter.
- B. For low-voltage control wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.7 IDENTIFICATION

- A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- B. Identify data and communications system components, wiring, and cabling according to TIA-606-B; label printers shall use label stocks, laminating adhesives, and inks complying with UL 969.
- C. Identify each wire on each end and at each terminal with a number-coded identification tag. Each wire shall have a unique tag.

3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections with the assistance of a factory-authorized service representative.
- B. Tests and Inspections:
 - 1. Visually inspect cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA-568-C.1.
 - 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
- C. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 260523

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes grounding and bonding systems and equipment.
- B. Section includes grounding and bonding systems and equipment, plus the following special applications:
 - 1. Underground distribution grounding.
 - 2. Ground bonding common with lightning protection system.
 - 3. Foundation steel electrodes.

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article.
- B. Qualification Data: For testing agency and testing agency's field supervisor.
- C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.
 - 1. Plans showing as-built, dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:
 - a. Test wells.
 - b. Ground rods.
 - c. Ground rings.
 - d. Grounding arrangements and connections for separately derived systems.
 - 2. Instructions for periodic testing and inspection of grounding features at test wells based on NETA MTS.
 - a. Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
 - b. Include recommended testing intervals.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Certified by NETA.

PART 2 - PRODUCTS

2.1 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 UL 467 for grounding and bonding materials and equipment.

2.2 CONDUCTORS

- A. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
- C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.3 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- C. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

- D. Bus-Bar Connectors: Compression type, copper or copper alloy, with two wire terminals.
- E. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.
- F. Cable-to-Cable Connectors: Compression type, copper or copper alloy.
- G. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.
- H. Conduit Hubs: Mechanical type, terminal with threaded hub.
- I. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.
- J. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.
- K. Lay-in Lug Connector: Mechanical type, aluminum terminal with set screw.
- L. Service Post Connectors: Mechanical type, bronze alloy terminal, in short- and long-stud lengths, capable of single and double conductor connections.
- M. Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.
- N. Straps: Solid copper, copper lugs. Rated for 600 A.
- O. Tower Ground Clamps: Mechanical type, copper or copper alloy, terminal one-piece clamp.
- P. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.
- Q. Water Pipe Clamps:
 - 1. Mechanical type, two pieces with zinc-plated bolts.
 - a. Material: Tin-plated aluminum.
 - b. Listed for direct burial.
 - 2. U-bolt type with malleable-iron clamp and copper ground connector rated for direct burial.

2.4 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; 5/8 by 96 inches (16 by 2400 mm).
- B. Ground Plates: 1/4 inch (6 mm) thick, hot-dip galvanized.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum.
 - 1. Bury at least 24 inches (600 mm) below grade.
- C. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
 - 1. Install bus horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.
 - 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.
- D. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING SEPARATELY DERIVED SYSTEMS

- A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

3.4 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.
- B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches (100 mm) will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches (50 mm) above to 6 inches (150 mm) below concrete. Seal floor opening with waterproof, nonshrink grout.

- C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.
- D. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches (150 mm) from the foundation.

3.5 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
 - 3. Receptacle circuits.
 - 4. Single-phase motor and appliance branch circuits.
 - 5. Three-phase motor and appliance branch circuits.
 - 6. Flexible raceway runs.
 - 7. Armored and metal-clad cable runs.
 - 8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
- C. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.6 FENCE GROUNDING

- A. Fence Grounding: Install at maximum intervals of 1500 feet (450 m) except as follows:
 - 1. Fences within 100 Feet (30 m) of Buildings, Structures, Walkways, and Roadways: Ground at maximum intervals of 750 feet (225 m).
 - a. Gates and Other Fence Openings: Ground fence on each side of opening.
- B. Protection at Crossings of Overhead Electrical Power Lines: Ground fence at location of crossing and at a maximum distance of 150 feet (45 m) on each side of crossing.
- C. Fences Enclosing Electrical Power Distribution Equipment: Ground as required by IEEE C2 unless otherwise indicated.

3.7 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
- C. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
- D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- E. Grounding and Bonding for Piping:
 - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 - 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 - 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections with the assistance of a factory-authorized service representative.
- B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
 4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- C. Grounding system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.
- E. Report measured ground resistances that exceed 10 ohms.
- F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel slotted support systems.
2. Conduit and cable support devices.
3. Support for conductors in vertical conduit.
4. Structural steel for fabricated supports and restraints.
5. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
6. Fabricated metal equipment support assemblies.

B. Related Requirements:

1. Section 260548.16 "Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.

1. Hangers. Include product data for components.
2. Slotted support systems.
3. Equipment supports.
4. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

C. Delegated-Design Submittal: For hangers and supports for electrical systems.

1. Include design calculations and details of hangers.
2. Include design calculations for seismic restraints.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, and coordinated with each other, using input from installers of the items involved.

B. Seismic Qualification Data: Certificates, for hangers and supports for electrical equipment and systems, accessories, and components, from manufacturer.

- C. Welding certificates.

1.4 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M.
 - 2. AWS D1.2/D1.2M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design hanger and support system.
- B. Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified and the supported equipment and systems will be fully operational after the seismic event."
 - 2. Component Importance Factor: 1.5.
- C. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame Rating: Class 1.
 - 2. Self-extinguishing according to ASTM D 635.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch- (10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c. in at least one surface.
 - 1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
 - 2. Material for Channel, Fittings, and Accessories: Galvanized steel.
 - 3. Channel Width: 1-5/8 inches (41.25 mm).
 - 4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 5. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 - 6. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 - 7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

- B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored 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 made of malleable iron.
- D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.
- E. 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.
 - 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 where used.
 - 3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
 - 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are 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.

2.3 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

3.1 APPLICATION

- A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:
 - 1. NECA 1.
 - 2. NECA 101
 - 3. NECA 102.

4. NECA 105.
 5. NECA 111.
- B. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
- C. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."
- D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
- E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- F. 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.

3.2 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, according to 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 comply with seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

END OF SECTION 260529

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Nonmetallic conduits and fittings.
3. Surface raceways.
4. Boxes, enclosures, and cabinets.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for firestopping at conduit and box entrances.
2. Section 260543 "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.
3. Section 270528 "Pathways for Communications Systems" for conduits, wireways, surface pathways, innerduct, boxes, faceplate adapters, enclosures, cabinets, and handholes serving communications systems.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.3 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. Seismic Qualification Data: Certificates, for enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Metal Conduit:

1. 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.
 2. GRC: Comply with ANSI C80.1 and UL 6.
 3. ARC: Comply with ANSI C80.5 and UL 6A.
 4. IMC: Comply with ANSI C80.6 and UL 1242.
 5. EMT: Comply with ANSI C80.3 and UL 797.
- B. Metal Fittings: Comply with NEMA FB 1 and UL 514B.
1. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Fittings, General: Listed and labeled for type of conduit, location, and use.
 3. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
 4. Fittings for EMT:
 - a. Material: Steel.
 - b. Type: Setscrew.
 5. 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.
 6. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.
- C. 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.

2.2 NONMETALLIC CONDUITS AND FITTINGS

- A. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
1. RNC: Type EPC-40-PVC complying with NEMA TC 2 and UL 651 unless otherwise indicated.
 2. LFNC: Comply with UL 1660.
- B. Nonmetallic Fittings:
1. Fittings, General: Listed and labeled for type of conduit, location, and use.
 2. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
 3. Fittings for LFNC: Comply with UL 514B.
 4. Solvents and Adhesives: As recommended by conduit manufacturer.

2.3 BOXES, ENCLOSURES, AND CABINETS

- A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.
- D. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- F. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, [**cast aluminum**] [**galvanized, cast iron**] with gasketed cover.
- G. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- H. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).
- I. Gangable boxes are allowed.
- J. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 3R with continuous-hinge cover with flush latch unless otherwise indicated.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- K. Cabinets:
 - 1. NEMA 250, Type 3R 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.

2.4 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.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed Conduit: GRC.
 2. Concealed Conduit, Aboveground: EMT.
 3. Underground Conduit: RNC, Type EPC-40-PVC.
 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. Minimum Raceway Size: 3/4-inch (21-mm) trade size.
- C. 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, steel 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.
- D. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- E. Install surface raceways only where indicated on Drawings.
- F. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

3.2 INSTALLATION

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- B. 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.
- C. Do not install raceways or electrical items on any "explosion-relief" walls or rotating equipment.
- D. Do not fasten conduits onto the bottom side of a metal deck roof.
- E. 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.

- F. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- G. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- H. 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.
- I. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.
- J. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- K. Support conduit within 12 inches (300 mm) of enclosures to which attached.
- L. 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.
- M. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- N. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- O. 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 (35-mm) 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.
- P. 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.
- Q. 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.
- R. 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.

- S. 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. Conduit extending from interior to exterior of building.
 - 4. Conduit extending into pressurized duct and equipment.
 - 5. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
 - 6. Where otherwise required by NFPA 70.
- T. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 36 inches (915 mm) of flexible conduit for 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.
- U. 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.
- V. 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 the box and cover plate or the supported equipment and box.
- W. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- X. Locate boxes so that cover or plate will not span different building finishes.
- Y. 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.
- Z. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- AA. Set metal floor boxes level and flush with finished floor surface.
- BB. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 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. Install backfill as specified in Section 312000 "Earth Moving."
3. 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."
4. Install manufactured duct elbows for stub-up at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
5. 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.
6. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 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, 24-inches below grade.
- E. 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.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

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

3.7 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 260533

SECTION 260543 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits and fittings, including GRC and PVC-coated steel conduit.

1.2 DEFINITIONS

- A. Direct Buried: Duct or a duct bank that is buried in the ground, without any additional casing materials such as concrete.
- B. Duct: A single duct or multiple ducts. Duct may be either installed singly or as component of a duct bank.
- C. Duct Bank:
 1. Two or more ducts installed in parallel, with or without additional casing materials.
 2. Multiple duct banks.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Precast or Factory-Fabricated Underground Utility Structures:
 - a. Include plans, elevations, sections, details, attachments to other work, and accessories.
 - b. Include duct entry provisions, including locations and duct sizes.
 - c. Include reinforcement details.
 - d. Include frame and cover design and manhole chimneys.
 - e. Include ladder details.
 - f. Include grounding details.
 - g. Include dimensioned locations of cable rack inserts, pulling-in and lifting irons, and sumps.
 - h. Include joint details.
2. Factory-Fabricated Handholes and Boxes Other Than Precast Concrete:
 - a. Include dimensioned plans, sections, and elevations, and fabrication and installation details.
 - b. Include duct entry provisions, including locations and duct sizes.
 - c. Include cover design.

- d. Include grounding details.
- e. Include dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

1.4 INFORMATIONAL SUBMITTALS

- A. Duct and Duct-Bank Coordination Drawings: Show duct profiles and coordination with other utilities and underground structures. Drawings shall be signed and sealed by a qualified professional engineer.
- B. Qualification Data: For professional engineer and testing agency responsible for testing nonconcrete handholes and boxes.
- C. Product Certificates: For concrete and steel used in precast concrete manholes and handholes, as required by ASTM C 858.
- D. Source quality-control reports.
- E. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND FITTINGS

- A. GRC: Comply with ANSI C80.1 and UL 6.

2.2 SOURCE QUALITY CONTROL

- A. Test and inspect precast concrete utility structures according to ASTM C 1037.
- B. Nonconcrete Handhole and Pull-Box Prototype Test: Test prototypes of manholes 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 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

3.1 PREPARATION

- A. Coordinate layout and installation of duct, duct bank, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field. Notify Architect if there is a conflict between areas of excavation and existing structures or archaeological sites to remain.
- B. Coordinate elevations of duct and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of duct and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct and duct bank will drain to manholes and handholes, and as approved by Architect.

3.2 EARTHWORK

- A. Excavation and Backfill: Comply with Section 312000 "Earth Moving," but do not use heavy-duty, hydraulic-operated, compaction equipment.
- B. Restoration: Replace area immediately after backfilling is completed or after construction vehicle traffic in immediate area is complete.
- C. Restore surface features at areas disturbed by excavation, and re-establish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.
- D. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Section 329200 "Turf and Grasses" and Section 329300 "Plants."
- E. Cut and patch existing pavement in the path of underground duct, duct bank, and underground structures according to "Cutting and Patching" Article in Section 017300 "Execution."

3.3 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting duct, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of duct, and seal joint between box and extension as recommended by manufacturer.
- 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 and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.
- D. Install handholes and boxes with bottom below frost line, **<Insert depth of frost line below grade at Project site>** 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 duct 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.

3.4 GROUNDING

- A. Ground underground ducts and utility structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

3.5 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Demonstrate capability and compliance with requirements on completion of installation of underground duct, duct bank, and utility structures.
 - 2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide a minimum 12-inch- (300-mm-) long mandrel equal to duct size minus 1/4 inch (6 mm). If obstructions are indicated, remove obstructions and retest.
 - 3. Test and handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Correct deficiencies and retest as specified above to demonstrate compliance.
- C. Prepare test and inspection reports.

3.6 CLEANING

- A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of duct until duct cleaner indicates that duct is clear of dirt and debris. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.
- B. Clean internal surfaces of manholes, including sump.
 - 1. Sweep floor, removing dirt and debris.
 - 2. Remove foreign material.

END OF SECTION 260543

SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeve-seal systems.
2. Sleeve-seal fittings.
3. Grout.
4. 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. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 2. Pressure Plates: Carbon steel.
 3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, 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.

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.
- 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 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 260548.16 - SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Restraint channel bracings.
2. Restraint cables.
3. Seismic-restraint accessories.
4. Mechanical anchor bolts.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
 - a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
 - b. Annotate to indicate application of each product submitted and compliance with requirements.

B. Delegated-Design Submittal: For each seismic-restraint device.

1. Include design calculations and details for selecting seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Design Calculations: Calculate static and dynamic loading caused by equipment weight, operation, and seismic and wind forces required to select seismic and wind restraints and for designing vibration isolation bases.
 - a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
3. Seismic- and Wind-Restraint Details:
 - a. Design Analysis: To support selection and arrangement of seismic and wind restraints. Include calculations of combined tensile and shear loads.
 - b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.

- c. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
- d. Preapproval and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Show coordination of seismic bracing for electrical components with other systems and equipment in the vicinity, including other supports and seismic restraints.
- B. Qualification Data: For professional engineer and testing agency.
- C. Welding certificates.
- D. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Seismic-restraint devices shall have horizontal and vertical load testing and analysis. They shall bear anchorage preapproval from OSHPD in addition to preapproval, showing maximum seismic-restraint ratings, by ICC-ES or another agency acceptable to authorities having jurisdiction. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) that support seismic-restraint designs must be signed and sealed by a qualified professional engineer.
- D. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Wind-Restraint Loading:
 - 1. Basic Wind Speed: 70 mph.
 - 2. Minimum 10 lb/sq. ft. (48.8 kg/sq. m) multiplied by maximum area of component projected on vertical plane normal to wind direction and 45 degrees either side of normal.
- B. Seismic-Restraint Loading:

1. Assigned Seismic Use Group or Building Category as Defined in the IBC: I.
 - a. Component Importance Factor: 1.0.
 - b. Component Response Modification Factor: 1.5.
 - c. Component Amplification Factor: 1.0.

2.2 RESTRAINT CHANNEL BRACINGS

- A. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end, with other matching components, and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.3 RESTRAINT CABLES

- A. Restraint Cables: ASTM A 603 galvanized-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; with a minimum of two clamping bolts for cable engagement.

2.4 SEISMIC-RESTRAINT ACCESSORIES

- A. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.
- B. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings and restraint cables.
- C. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings and matched to type and size of anchor bolts and studs.
- D. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings and matched to type and size of attachment devices used.
- E. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.5 MECHANICAL ANCHOR BOLTS

- A. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.
- B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods caused by seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.2 SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in other specification sections.
- B. Equipment and Hanger Restraints:
 - 1. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch (3.2 mm).
 - 2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.
- C. Install cables so they do not bend across edges of adjacent equipment or building structure.
- D. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- E. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- F. Drilled-in Anchors:
 - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 - 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 - 4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.

5. Set anchors to manufacturer's recommended torque using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.3 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 1. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
 2. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
 3. Test to 90 percent of rated proof load of device.
- B. Seismic controls will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION 260548.16

SECTION 260573 – SHORT-CIRCUIT, DEVICE SETTING, & ARC-FLASH HAZARD ANALYSIS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Electrical contractor shall supply and provide a computer-based, short-circuit, protective device setting, & arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment.

1.3 DEFINITIONS

- A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.
- B. Field Adjusting Agency: An independent electrical testing agency with full-time employees and the capability to adjust devices and conduct testing indicated and that is a member company of NETA.
- C. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.
- D. Power System Analysis Software Developer: An entity that commercially develops, maintains, and distributes computer software used for power system studies.
- E. Power Systems Analysis Specialist: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located.
- F. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.
- G. SCCR: Short-circuit current rating.
- H. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.
- I. Single-Line Diagram: See "One-Line Diagram."

1.4 ACTION SUBMITTALS

- A. Product Data: For computer software program to be used for studies.
- B. Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.
 - 1. Short-circuit study input data, including completed computer program input data sheets.
 - a. Short-circuit study and equipment evaluation report; signed, dated, and sealed by a qualified professional engineer.

- 1) Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.
 - 2) Revised one-line diagram, reflecting field investigation results and results of short-circuit study.
- C. Study Submittals: Submit the following submittals after the approval of system protective devices submittals. Submittals shall be in digital form:
1. Arc-flash study input data, including completed computer program input data sheets.
 2. Arc-flash study report; signed, dated, and sealed by Power Systems Analysis Specialist.
 3. Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Engineer for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For short-circuit, protective device setting, & arc-flash hazard analysis software, certifying compliance with IEEE 1584 and NFPA 70E.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data:
1. Provide maintenance procedures in equipment manuals according to requirements in NFPA 70E.
 2. The following are from the Short-Circuit Study Report:
 - a. Final one-line diagram.
 - b. Final Short-Circuit Study Report.
 - c. Short-circuit study data files.
 - d. Power system data.
 3. Operation and Maintenance Procedures: In addition to items specified in "Operation and Maintenance Data," provide maintenance procedures for use by Owner's personnel that comply with requirements in NFPA 70E.

1.7 QUALITY ASSURANCE

- A. Study shall be performed using commercially developed and distributed software designed specifically for power system analysis.
- B. Software algorithms shall comply with requirements of standards and guides specified in this Section.
- C. Manual calculations are unacceptable.

- D. Power System Analysis Software Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.
 - 1. Computer program shall be designed to perform arc-flash analysis or have a function, component, or add-on module designed to perform arc-flash analysis.
 - 2. Computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.
- E. Power Systems Analysis Specialist Qualifications: Professional engineer in charge of performing the arc-flash study, analyzing the arc flash, and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.
- F. Short-Circuit Study Certification: Short-Circuit Study Report shall be signed and sealed by Power Systems Analysis Specialist.
- G. Arc-Flash Study Certification: Arc-Flash Study Report shall be signed and sealed by Power Systems Analysis Specialist.
- H. Field Adjusting Agency Qualifications:
 - 1. Employer of a NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification responsible for all field adjusting of the Work.
 - 2. A member company of NETA.
 - 3. Acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

- A. Comply with IEEE 1584 and NFPA 70E.
- B. Comply with IEEE 242 and IEEE 399.
- C. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective Setting by computer-generated, time-current Setting plots.
 - 1. Optional Features:
 - a. Arcing faults.
 - b. Simultaneous faults.
 - c. Explicit negative sequence.
 - d. Mutual coupling in zero sequence.
- D. Analytical features of device Setting study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

2.2 SHORT-CIRCUIT STUDY REPORT CONTENTS

- A. Executive summary of study findings.
- B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.
- C. One-line diagram of modeled power system, showing the following:
 - 1. Protective device designations and ampere ratings.
 - 2. Conductor types, sizes, and lengths.
 - 3. Transformer kilovolt ampere (kVA) and voltage ratings.
 - 4. Motor and generator designations and kVA ratings.
 - 5. Switchgear, switchboard, motor-control center, and panelboard designations and ratings.
 - 6. Derating factors and environmental conditions.
 - 7. Any revisions to electrical equipment required by the study.
- D. Comments and recommendations for system improvements or revisions in a written document, separate from one-line diagram.
- E. Protective Device Evaluation:
 - 1. Evaluate equipment and protective devices and compare to available short-circuit currents. Verify that equipment withstand ratings exceed available short-circuit current at equipment installation locations.
 - 2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.
 - 3. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
 - 4. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in standards to 1/2-cycle symmetrical fault current.
 - 5. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
- F. Short-Circuit Study Input Data:
 - 1. One-line diagram of system being studied.
 - 2. Power sources available.
 - 3. Manufacturer, model, and interrupting rating of protective devices.
 - 4. Conductors.
 - 5. Transformer data.
- G. Short-Circuit Study Output Reports:
 - 1. Low-Voltage Fault Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
 - a. Voltage.
 - b. Calculated fault-current magnitude and angle.
 - c. Fault-point X/R ratio.
 - d. Equivalent impedance.

2. Momentary Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
 - a. Voltage.
 - b. Calculated symmetrical fault-current magnitude and angle.
 - c. Fault-point X/R ratio.
 - d. Calculated asymmetrical fault currents:
 - 1) Based on fault-point X/R ratio.
 - 2) Based on calculated symmetrical value multiplied by 1.6.
 - 3) Based on calculated symmetrical value multiplied by 2.7.
3. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
 - a. Voltage.
 - b. Calculated symmetrical fault-current magnitude and angle.
 - c. Fault-point X/R ratio.
 - d. No AC Decrement (NACD) ratio.
 - e. Equivalent impedance.
 - f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
 - g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

2.3 PROTECTIVE DEVICE STUDY REPORT CONTENTS

- A. Executive summary of study findings.
- B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.
- C. One-line diagram of modeled power system, showing the following:
 1. Protective device designations and ampere ratings.
 2. Conductor types, sizes, and lengths.
 3. Transformer kilovolt ampere (kVA) and voltage ratings.
 4. Motor and generator designations and kVA ratings.
 5. Switchgear, switchboard, motor-control center, and panelboard designations.
 6. Any revisions to electrical equipment required by the study.
 7. Study Input Data: As described in "Power System Data" Article.
- D. Protective Device Setting Study:
 1. Report recommended settings of protective devices, ready to be applied in the field. Use manufacturer's data sheets for recording the recommended setting of overcurrent protective devices when available.
 - a. Phase and Ground Relays:
 - 1) Device tag.

- 2) Relay current transformer ratio and tap, time dial, and instantaneous pickup value.
 - 3) Recommendations on improved relaying systems, if applicable.
- b. Circuit Breakers:
- 1) Adjustable pickups and time delays (long time, short time, and ground).
 - 2) Adjustable time-current characteristic.
 - 3) Adjustable instantaneous pickup.
 - 4) Recommendations on improved trip systems, if applicable.
- c. Fuses: Show current rating, voltage, and class.
- E. Time-Current Setting Curves: Determine settings of overcurrent protective devices to achieve selective Setting. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:
1. Device tag and title, one-line diagram with legend identifying the portion of the system covered.
 2. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.
 3. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
 4. Plot the following listed characteristic curves, as applicable:
 - a. Power utility's overcurrent protective device.
 - b. Medium-voltage equipment overcurrent relays.
 - c. Medium- and low-voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
 - d. Low-voltage equipment circuit-breaker trip devices, including manufacturer's tolerance bands.
 - e. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves.
 - f. Cables and conductors damage curves.
 - g. Ground-fault protective devices.
 - h. Motor-starting characteristics and motor damage points.
 - i. Generator short-circuit decrement curve and generator damage point.
 - j. The largest feeder circuit breaker in each motor-control center and panelboard.
 5. Maintain selectivity for tripping currents caused by overloads.
 6. Maintain maximum achievable selectivity for tripping currents caused by overloads on series-rated devices.
 7. Provide adequate time margins between device characteristics such that selective operation is achieved.
 8. Comments and recommendations for system improvements.

2.4 ARC-FLASH STUDY REPORT CONTENTS

- A. Executive summary of study findings.
- B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.
- C. One-line diagram, showing the following:
 - 1. Protective device designations and ampere ratings.
 - 2. Conductor types, sizes, and lengths.
 - 3. Transformer kilovolt ampere (kVA) and voltage ratings, including derating factors and environmental conditions.
 - 4. Motor and generator designations and kVA ratings.
 - 5. Switchgear, switchboard, motor-control center, panelboard designations, and ratings.
- D. Study Input Data: As described in "Power System Data" Article.
- E. Arc-Flash Study Output Reports:
 - 1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each equipment location included in the report:
 - a. Voltage.
 - b. Calculated symmetrical fault-current magnitude and angle.
 - c. Fault-point X/R ratio.
 - d. No AC Decrement (NACD) ratio.
 - e. Equivalent impedance.
 - f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
 - g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.
- F. Incident Energy and Flash Protection Boundary Calculations:
 - 1. Arcing fault magnitude.
 - 2. Protective device clearing time.
 - 3. Duration of arc.
 - 4. Arc-flash boundary.
 - 5. Restricted approach boundary.
 - 6. Limited approach boundary.
 - 7. Working distance.
 - 8. Incident energy.
 - 9. Hazard risk category.
 - 10. Recommendations for arc-flash energy reduction.
- G. Fault study input data, case descriptions, and fault-current calculations including a definition of terms and guide for interpretation of computer printout.

2.5 ARC-FLASH WARNING LABELS

- A. Comply with requirements in "Identification for Electrical Systems" for self-adhesive equipment labels. Produce a 3.5-by-5-inch self-adhesive equipment label for each work location included in the analysis.

- B. Label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:
 - 1. Location designation.
 - 2. Nominal voltage.
 - 3. Protection boundaries.
 - a. Arc-flash boundary.
 - b. Restricted approach boundary.
 - c. Limited approach boundary.
 - 4. Arc flash PPE category.
 - 5. Required minimum arc rating of PPE in Cal/cm squared.
 - 6. Available incident energy.
 - 7. Working distance.
 - 8. Engineering report number, revision number, and issue date.
- C. Labels shall be machine printed, with no field-applied markings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine Project overcurrent protective device submittals. Proceed with arc-flash study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to arc-flash study may not be used in study.
- B. Obtain all data necessary for conduct of the study.
 - 1. Verify completeness of data supplied on one-line diagram. Call any discrepancies to Architect's attention.
 - 2. For equipment included as Work of this Project, use characteristics submitted under provisions of action submittals and information submittals for this Project. Product Data for Project's overcurrent protective devices involved in overcurrent protective device Setting studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
 - 3. Obtain electrical power utility impedance at the service.
 - 4. Power sources and ties.
 - 5. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
 - 6. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
 - 7. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip, SCCR, current rating, and breaker settings.
 - 8. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
 - 9. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
 - 10. Motor horsepower and NEMA MG 1 code letter designation.

11. Conductor sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).
12. Derating factors.

3.2 SHORT-CIRCUIT STUDY

- A. Perform study following the general study procedures contained in IEEE 399.
- B. Calculate short-circuit currents according to IEEE 551.
- C. Base study on device characteristics supplied by device manufacturer.
- D. Extent of electrical power system to be studied is indicated on Drawings.
- E. Begin short-circuit current analysis at the service, extending down to system overcurrent protective devices as follows:
 1. To normal system low-voltage load buses where fault current is 10 kA or less.
- F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.
- G. Include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and apply to low- and medium-voltage, three-phase ac systems. Also account for the fault-current dc decrement to address asymmetrical requirements of interrupting equipment.
- H. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and a single line-to-ground fault at each equipment indicated on one-line diagram.
 1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.
- I. Include in the report identification of any protective device applied outside its capacity.

3.3 DEVICE SETTINGS STUDY

- A. Comply with IEEE 242 for calculating short-circuit currents and determining setting time intervals.
- B. Comply with IEEE 399 for general study procedures.
- C. Base study on device characteristics supplied by device manufacturer.
- D. Extent of electrical power system to be studied is indicated on Drawings.
- E. Begin analysis at the service, extending down to system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 10 kA or less.
- F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.
- G. Transformer Primary Overcurrent Protective Devices:
1. Device shall not operate in response to the following:
 - a. Inrush current when first energized.
 - b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
 - c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.
 2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.
- H. Motor Protection:
1. Select protection for low-voltage motors according to IEEE 242 and NFPA 70.
 2. Select protection for motors served at voltages more than 600 V according to IEEE 620.
- I. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and protection recommendations in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.
- J. Generator Protection: Select protection according to manufacturer's written instructions and to IEEE 242.
- K. Include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and apply to low- and medium-voltage, three-phase ac systems. Also account for fault-current dc decrement, to address asymmetrical requirements of interrupting equipment.
- L. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and a single line-to-ground fault at each equipment indicated on one-line diagram.
1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.
- M. Protective Device Evaluation:
1. Evaluate equipment and protective devices and compare to short-circuit ratings.
 2. Adequacy of switchgear, motor-control centers, and panelboard bus bars to withstand short-circuit stresses.

3. Any application of series-rated devices shall be recertified, complying with requirements in NFPA 70.
4. Include in the report identification of any protective device applied outside its capacity.

3.4 FIELD ADJUSTING

- A. Adjust relay and protective device settings according to recommended settings provided by the setting study. Field adjustments shall be completed by the engineering service division of equipment manufacturer under the "Startup and Acceptance Testing" contract portion.
- B. Make minor modifications to equipment as required to accomplish compliance with short-circuit and protective device setting studies.
- C. Testing and adjusting shall be by a full-time employee of the Field Adjusting Agency, who holds NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification.
 1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters. Perform NETA tests and inspections for all adjustable overcurrent protective devices.

3.5 ARC-FLASH HAZARD ANALYSIS

- A. Comply with NFPA 70E and its Annex D for hazard analysis study.
- B. Preparatory Studies: Perform the Short-Circuit and Protective Device Setting studies prior to starting the Arc-Flash Hazard Analysis.
- C. Calculate maximum and minimum contributions of fault-current size.
 1. Maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.
 2. Calculate arc-flash energy at 85 percent of maximum short-circuit current according to IEEE 1584 recommendations.
- D. Calculate the arc-flash protection boundary and incident energy at locations in electrical distribution system where personnel could perform work on energized parts.
- E. Calculate the limited, restricted, and prohibited approach boundaries for each location.
- F. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators shall be decremented as follows:
 1. Fault contribution from induction motors shall not be considered beyond three to five cycles.
 2. Fault contribution from synchronous motors and generators shall be decayed to match the actual decrement of each as closely as possible (for example, contributions from permanent magnet generators will typically decay from 10 per unit to three per unit after 10 cycles).

- G. Arc-flash energy shall generally be reported for the maximum of line or load side of a circuit breaker. However, arc-flash computation shall be performed and reported for both line and load side of a circuit breaker as follows:
 - 1. When the circuit breaker is in a separate enclosure.
 - 2. When the line terminals of the circuit breaker are separate from the work location.
- H. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

3.6 POWER SYSTEM DATA

- A. Obtain all data necessary for conduct of the arc-flash hazard analysis.
 - 1. Verify completeness of data supplied on one-line diagram on Drawings. Call discrepancies to Engineer's attention.
 - 2. For new equipment, use characteristics from approved submittals under provisions of action submittals and information submittals for this Project.
 - 3. For existing equipment, whether or not relocated, obtain required electrical distribution system data by field investigation and surveys conducted by qualified technicians and engineers.
- B. Electrical Survey Data: Gather and tabulate the following input data to support study. Comply with recommendations in IEEE 1584 and NFPA 70E as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study and shall be by the engineer or its representative who holds NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification. Data include, but are not limited to, the following:
 - 1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device Setting studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
 - 2. Obtain electrical power utility impedance or available short circuit current at the service.
 - 3. Power sources and ties.
 - 4. Short-circuit current at each system bus (three phase and line to ground).
 - 5. Full-load current of all loads.
 - 6. Voltage level at each bus.
 - 7. For reactors, provide manufacturer and model designation, voltage rating and impedance.
 - 8. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
 - 9. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
 - 10. Busway manufacturer and model designation, current rating, impedance, lengths, size, and conductor material.
 - 11. Motor horsepower and NEMA MG 1 code letter designation.
 - 12. Low-voltage conductor sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).

3.7 LABELING

- A. Apply one arc-flash label on the front cover for each equipment included in the study. Base arc-flash label data on highest values calculated at each location.
- B. Install an arc-flash single-line diagram applied to the back of the front cover of the:
 - 1. Power & control cabinet.
- C. Each piece of equipment listed below shall have an arc-flash label applied to it:
 - 1. Metering / main circuit breaker panel.
 - 2. Manual Transfer Switch.
 - 3. Power & control cabinet.
 - 4. Others as required by NFPA 70E.

3.8 APPLICATION OF WARNING LABELS

- A. Install arc-flash warning labels under the direct supervision and control of Power System Analysis Specialist.

3.9 DEMONSTRATION

- A. Engage Power Systems Analysis Specialist to train Owner's maintenance personnel in potential arc-flash hazards associated with working on energized equipment and the significance of arc-flash warning labels.

END OF SECTION 260573

SECTION 261216 - DRY-TYPE, MEDIUM-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes dry-type, medium-voltage transformers.

1.2 DEFINITIONS

- A. VPI: Vacuum Pressure Impregnation.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For dry-type, medium-voltage transformers.
 - 1. Include plans and elevations showing major components and features.
 - 2. Include single-line diagram.

1.4 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For transformer assembly, accessories, and components, from manufacturer.
- B. Source quality-control reports.
- C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.6 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

2.1 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 IEEE C2.
- C. Comply with IEEE C57.12.01.

2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: The transformers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the transformer will remain in place without separation of any parts when subjected to the seismic forces specified and the transformer will be fully operational after the seismic event."
 - 2. Component Importance Factor: 1.5.
 - 3. Component Amplification Factor: 2.5.
 - 4. Component Response Modification Factor: 6.0.
- B. Windings Material: Aluminum.
- C. Coils Insulation Systems:
 - 1. Primary and secondary coil assemblies shall be manufactured using polyester VPI system.
- D. Winding Connections: Connection of windings and terminal markings shall comply with IEEE C57.12.70.
- E. Bushings shall comply with IEEE C57.19.01 requirements for impulse and low-frequency insulation levels.
- F. Tap Changer: External, for de-energized operation.
- G. Sound level shall comply with requirements of NEMA TR 1.
- H. Capacities and Characteristics:
 - 1. Enclosure: Ventilated power transformer, NEMA 250 Type 1 enclosure.
 - 2. Comply with UL 1562 listing requirements.
 - 3. Connections:
 - a. Primary: Air-filled terminal cabinet for cable connection.
 - b. Secondary: Air-filled terminal cabinet for cable connection.

4. Transformer Ratings.
 - a. Impedance: Not less than 5.75 percent.
 - b. Temperature Rise: 150 deg C.
5. Taps: Two 2-1/2-percent, full-capacity taps above and two 2-1/2-percent, full-capacity taps below rated voltage. Comply with IEEE C57.12.51 requirements.
6. Transformer Accessories:
 - a. Dial-type analog thermometer with alarm contacts.
 - b. At least four stainless-steel ground connection pads.
 - c. Provisions for jacking, lifting, and towing.
 - d. Machine-engraved nameplate made of anodized aluminum or stainless steel.

2.3 CONTROL NETWORK

- A. Controllers: Support serial MS/TP and Ethernet IP communications, and able to communicate directly via RS-485 serial networks and Ethernet 10Base-T networks as a native device.

2.4 WARNING LABELS AND SIGNS

- A. Comply with requirements for labels and signs specified in Section 260553 "Identification for Electrical Systems."
 1. Warning signs shall be made of baked enamel.
 2. Equipment Identification Labels: Engraved, laminated-acrylic or -melamine label.

2.5 SOURCE QUALITY CONTROL

- A. Provide manufacturer's certificate that the transformer design tests comply with IEEE C57.12.91.
- B. Perform the following factory-certified routine tests on each transformer 500 kVA and less for this Project:
 1. Turns ratio, polarity, and phase relation on rated voltage connection.
 2. Transformer no-load losses and excitation current at 100 percent of ratings. This test may be based on a statistical sample.
 3. Applied voltage and induced voltage.
 4. Partial discharge.
- C. Perform the following factory-certified tests on each transformer 500 kVA and larger for this Project. Reports shall comply with the minimum information requirements of IEEE C57.12.01:
 1. Resistance measurements of all windings on rated voltage tap and at tap extremes.
 2. Turns ratio, polarity, and phase relation on rated voltage connection.
 3. Transformer no-load losses and excitation current at 100 percent of ratings.
 4. Impedance voltage and load loss at rated current and rated frequency on rated voltage connection and at tap extremes.

5. Applied voltage and induced voltage.
6. Partial discharge.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Pre-Installation Checks:
 1. Verify removal of any shipping bracing after placement.
- B. Verify that ground connections are in place and that requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at transformer location.
- C. Install transformers on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in other specification sections.
- D. Transformer shall be installed level and plumb and shall tilt less than 1.5 degrees while energized.
- E. Comply with requirements for vibration isolation and seismic control devices specified in Section 260529 "Hangers and Supports for Electrical Systems" and Section 260548.16 "Seismic Controls for Electrical Systems."
- F. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and NFPA 70.

3.2 CONNECTIONS

- A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
 1. For grounding to grounding electrodes, use bare copper cable not smaller than No. 4/0 AWG. Bond surge arrester and neutrals directly to transformer enclosure and then to grounding electrode system with bare copper conductors. Keep leads as short as practicable, with no kinks or sharp bends. Make joints in grounding conductors and loops by exothermic weld or compression connector.
 2. Terminate all grounding and bonding conductors on a common equipment grounding terminal on transformer enclosure. Install supplemental terminal bars, lugs, and bonding jumpers as required to accommodate number of conductors for termination.
 3. Complete transformer tank grounding and lightning arrester connections prior to making any other electrical connections.
- B. Terminate medium-voltage cables in incoming section of substations according to Section 260513 "Medium-Voltage Cables."

3.3 SIGNS AND LABELS

- A. Comply with installation requirements for labels and signs specified in Section 260553 "Identification for Electrical Systems."
- B. Install warning signs as required to comply with 29 CFR 1910.269.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. General Field-Testing Requirements:
 - a. Comply with provisions of NFPA 70B, Ch. "Testing and Test Methods."
 - b. After installing transformer but before primary is energized, verify that grounding system at substation is tested at specified value or less.

3.5 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain systems.

END OF SECTION 261216

SECTION 262413 - SWITCHBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Service and distribution switchboards rated 600 V and less.
2. Disconnecting and overcurrent protective devices.
3. Instrumentation.
4. Control power.
5. Accessory components and features.
6. Identification.

1.2 ACTION SUBMITTALS

A. Product Data: For each switchboard, overcurrent protective device, surge protection device, ground-fault protector, accessory, and component.

B. Shop Drawings: For each switchboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Detail short-circuit current rating of switchboards and overcurrent protective devices.
5. Detail utility company's metering provisions with indication of approval by utility company.
6. Include evidence of NRTL listing for series rating of installed devices.
7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
8. Include time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graph paper; include selectable ranges for each type of overcurrent protective device.
9. Include schematic and wiring diagrams for power, signal, and control wiring.

C. Delegated Design Submittal:

1. For arc-flash hazard study.
2. For arc-flash labels.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

- B. Seismic Qualification Data: Certificates, for switchboards, overcurrent protective devices, accessories, and 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.

- 1.4 Field quality-control reports.

- 1.5 CLOSEOUT SUBMITTALS
 - A. Operation and maintenance data.

- 1.6 QUALITY ASSURANCE
 - A. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.
 - B. Testing Agency Qualifications: Member company of NETA or an NRTL.

- 1.7 FIELD CONDITIONS
 - A. Installation Pathway: Remove and replace access fencing, doors, lift-out panels, and structures to provide pathway for moving switchboards into place.
 - B. Environmental Limitations:
 - 1. Do not deliver or install switchboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above switchboards is complete.
 - 2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a. Ambient Temperature: Not exceeding 104 deg F (40 deg C).
 - b. Altitude: Not exceeding 6600 feet (2000 m).

- 1.8 WARRANTY
 - A. Manufacturer's Warranty: Manufacturer agrees to repair or replace switchboard enclosures, buswork, overcurrent protective devices, accessories, and factory installed interconnection wiring that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Three years from date of Substantial Completion.

- B. **Manufacturer's Warranty:** Manufacturer's agrees to repair or replace surge protection devices that fail in materials or workmanship within specified warranty period.
 - 1. **Warranty Period:** Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. **Seismic Performance:** Switchboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. **Basis for Certification:** Indicate whether withstand certification is based on actual test of assembled components or on calculation. Shake-table testing shall comply with ICC-ES AC156.
 - 2. 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 SWITCHBOARDS

- A. **Source Limitations:** Obtain switchboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- B. **Product Selection for Restricted Space:** Drawings indicate maximum dimensions for switchboards including clearances between switchboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Comply with NEMA PB 2.
- D. Comply with NFPA 70.
- E. Comply with UL 891.
- F. **Front-Connected, Front-Accessible Switchboards:**
 - 1. **Main Devices:** Fixed, individually mounted.
 - 2. **Branch Devices:** Panel mounted.
 - 3. Sections front and rear aligned.
- G. **Nominal System Voltage:** 480Y/277 V.
- H. **Main-Bus Continuous:** 1000 A.
- I. **Seismic Requirements:** Fabricate and test switchboards according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation. Shake-table testing shall comply with ICC-ES AC156.
 - a. 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."
 - b. 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."
- J. Outdoor Enclosures: Type 3R.
 1. Finish: Factory-applied finish in manufacturer's standard color; undersurfaces treated with corrosion-resistant undercoating.
 2. Enclosure: Flat roof; bolt-on rear covers for each section, with provisions for padlocking.
 3. Doors: Personnel door at each cabinet section; opening outwards; with provisions for padlocking. At least one door shall be sized to permit the largest single switchboard section to pass through without disassembling doors, hinges, or switchboard section.
- K. Service Entrance Rating: Switchboards intended for use as service entrance equipment shall contain from one to six service disconnecting means with overcurrent protection, a neutral bus with disconnecting link, a grounding electrode conductor terminal, and a main bonding jumper.
- L. Utility Metering Compartment: Barrier compartment and section complying with utility company's requirements; hinged sealable door; buses provisioned for mounting utility company's current transformers and potential transformers or potential taps as required by utility company. If separate vertical section is required for utility metering, match and align with basic switchboard. Provide service entrance label and necessary applicable service entrance features.
- M. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.
- N. Removable, Hinged Rear Doors and Compartment Covers: Secured by standard bolts, for access to rear interior of switchboard.
- O. Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.
- P. Buses and Connections: Three phase, four wire unless otherwise indicated.
 1. Provide phase bus arrangement A, B, C from front to back, top to bottom, and left to right when viewed from the front of the switchboard.
 2. Phase- and Neutral-Bus Material: Tin-plated, high-strength, electrical-grade aluminum alloy with tin-plated aluminum circuit-breaker line connections.
 3. Tin-plated aluminum feeder circuit-breaker line connections.
 4. Load Terminals: Insulated, rigidly braced, runback bus extensions, of same material as through buses, equipped with mechanical connectors for outgoing circuit conductors. Provide load terminals for future circuit-breaker positions at full-ampere rating of circuit-breaker position.
 5. Ground Bus: 1/4-by-2-inch- (6-by-50-mm-) hard-drawn copper of 98 percent conductivity, equipped with mechanical connectors for feeder and branch-circuit ground conductors.

6. Main-Phase Buses and Equipment-Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions from both ends.
 7. Disconnect Links:
 - a. Isolate neutral bus from incoming neutral conductors.
 - b. Bond neutral bus to equipment-ground bus for switchboards utilized as service equipment or separately derived systems.
 8. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with mechanical connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.
- Q. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with series-connected rating or interrupting capacity to meet available fault currents.
1. Thermal-Magnetic Circuit Breakers: Inverse time-current 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.
 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
 3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
 - a. Instantaneous trip.
 - b. Long- and short-time pickup levels.
 - c. Long and short time adjustments.
 - d. Ground-fault pickup level, time delay, and I^2t response.
 4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
 5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.
 6. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
 7. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
 8. MCCB Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.
 - c. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

- d. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
 - e. Communication Capability: Circuit-breaker-mounted communication module with functions and features compatible with power monitoring and control system specified in Section 260913 "Electrical Power Monitoring and Control."
 - f. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
 - g. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
 - h. 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.
 - i. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
- B. Insulated-Case Circuit Breaker (ICCB): 100 percent rated, sealed, insulated-case power circuit breaker with interrupting capacity rating to meet available fault current.
1. Fixed circuit-breaker mounting.
 2. Two-step, stored-energy closing.
 3. Standard-function, microprocessor-based trip units with interchangeable rating plug, trip indicators, and the following field-adjustable settings:
 - a. Instantaneous trip.
 - b. Time adjustments for long- and short-time pickup.
 - c. Ground-fault pickup level, time delay, and I^2t response.
 4. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
 5. Remote trip indication and control.
 6. Communication Capability: Web enabled integral Ethernet communication module and embedded Web server with factory-configured Web pages (HTML file format). Provide functions and features compatible with power monitoring and control system specified in Section 260913 "Electrical Power Monitoring and Control."
 7. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
 8. Control Voltage: Per system integrator.

2.4 CONTROL POWER

- A. Control Circuits: 120-V ac, supplied through secondary disconnecting devices from control-power transformer.
- B. Electrically Interlocked Main and Tie Circuit Breakers: Two control-power transformers in separate compartments, with interlocking relays, connected to the primary side of each control-power transformer at the line side of the associated main circuit breaker. 120-V secondaries connected through automatic transfer relays to ensure a fail-safe automatic transfer scheme.
- C. Control-Power Fuses: Primary and secondary fuses for current-limiting and overload protection of transformer and fuses for protection of control circuits.

- D. Control Wiring: Factory installed, with bundling, lacing, and protection included. Provide flexible conductors for No. 8 AWG and smaller, for conductors across hinges, and for conductors for interconnections between shipping units.

2.5 ACCESSORY COMPONENTS AND FEATURES

- A. Portable Test Set: For testing functions of solid-state trip devices without removing from switchboard. Include relay and meter test plugs suitable for testing switchboard meters and switchboard class relays.
- B. Spare-Fuse Cabinet: Suitably identified, wall-mounted, lockable, compartmented steel box or cabinet. Arrange for wall mounting.
- C. Mounting Accessories: For anchors, mounting channels, bolts, washers, and other mounting accessories, comply with requirements in Section 260548.16 "Seismic Controls for Electrical Systems" or manufacturer's instructions.

2.6 IDENTIFICATION

- A. Service Equipment Label: NRTL labeled for use as service equipment for switchboards with one or more service disconnecting and overcurrent protective devices.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Receive, inspect, handle, and store switchboards according to NECA 400.
- B. Install switchboards and accessories according to NECA 400.
- C. Equipment Mounting: Install switchboards on concrete base, 4-inch (100-mm) nominal thickness. Comply with requirements for concrete base specified in other specification sections.
 - 1. Install conduits entering underneath the switchboard, entering under the vertical section where the conductors will terminate. Install with couplings flush with the concrete base. Extend 2 inches (50-mm) above concrete base after switchboard is anchored in place.
 - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
 - 3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 - 4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 5. Install anchor bolts to elevations required for proper attachment to switchboards.
 - 6. Anchor switchboard to building structure at the top of the switchboard if required or recommended by the manufacturer.

- D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, straps and brackets, and temporary blocking of moving parts from switchboard units and components.
- E. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- F. Operating Instructions: Frame and mount the printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.
- G. Install filler plates in unused spaces of panel-mounted sections.
- H. Install overcurrent protective devices, surge protection devices, and instrumentation.
 - 1. Set field-adjustable switches and circuit-breaker trip ranges.
- I. Install spare-fuse cabinet.
- J. Comply with NECA 1.
- K. Comply with requirements for terminating feeder bus specified in Section 262500 "Enclosed Bus Assemblies." Drawings indicate general arrangement of bus, fittings, and specialties.
- L. Comply with requirements for terminating cable trays specified in Section 260536 "Cable Trays for Electrical Systems." Drawings indicate general arrangement of cable trays, fittings, and specialties.

3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- B. Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- C. Device Nameplates: Label each disconnecting and overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Acceptance Testing:

- a. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit. Open control and metering circuits within the switchboard, and remove neutral connection to surge protection and other electronic devices prior to insulation test. Reconnect after test.
 - b. Test continuity of each circuit.
2. Test ground-fault protection of equipment for service equipment per NFPA 70.
 3. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 4. Correct malfunctioning units on-site where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 5. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Switchboard will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports, including a certified report that identifies switchboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.4 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain switchboards, overcurrent protective devices, instrumentation, and accessories.

END OF SECTION 262413

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.2 DEFINITIONS

- A. MCCB: Molded-case circuit breaker.
- B. SPD: Surge protective device.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard.
- B. Shop Drawings: For each panelboard and related equipment.
1. Include dimensioned plans, elevations, sections, and details.
 2. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
 3. Detail bus configuration, current, and voltage ratings.
 4. Short-circuit current rating of panelboards and overcurrent protective devices.
 5. Include evidence of NRTL listing for series rating of installed devices.
 6. Include evidence of NRTL listing for SPD as installed in panelboard.
 7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 8. Include wiring diagrams for power, signal, and control wiring.
 9. Key interlock scheme drawing and sequence of operations.
 10. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.

1.4 INFORMATIONAL SUBMITTALS

- A. Panelboard schedules for installation in panelboards.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.6 FIELD CONDITIONS

- A. Service Conditions: NEMA PB 1, usual service conditions, as follows:
1. Ambient temperatures within limits specified.
 2. Altitude not exceeding 6600 feet (2000 m).

1.7 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.
1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANELBOARDS COMMON REQUIREMENTS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."
- B. 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.
- C. Comply with NEMA PB 1.
- D. Comply with NFPA 70.
- E. Enclosures: Flush-mounted inside Motor Control Center with dead-front cabinets.
1. Rated for environmental conditions at installed location.
 - a. Outdoor Locations: NEMA 250, Type 3R.
 2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
 3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
- F. Incoming Mains Location: Bottom.
- G. Phase, Neutral, and Ground Buses: Tin-plated aluminum.
- H. Conductor Connectors: Suitable for use with conductor material and sizes.
1. Material: Tin-plated aluminum.
 2. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.

3. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
 4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
 5. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
- I. NRTL Label: Panelboards shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards shall have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.
 - J. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
 - K. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include label or manual with size and type of allowable upstream and branch devices listed and labeled by an NRTL for series-connected short-circuit rating.
 - L. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Panelboards 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."

2.3 POWER PANELBOARDS

- A. Panelboards: NEMA PB 1, distribution type.
- B. Mains: Circuit breaker.
- C. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
- D. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.
- E. Branch Overcurrent Protective Devices: Fused switches.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. MCCB: Comply with UL 489, with series-connected rating or interrupting capacity to meet available fault currents.
1. Thermal-Magnetic Circuit Breakers:
 - a. Inverse time-current element for low-level overloads.
 - b. Instantaneous magnetic trip element for short circuits.
 - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
 3. Electronic Trip Circuit Breakers:
 - a. RMS sensing.
 - b. Field-replaceable rating plug or electronic trip.
 - c. Digital display of settings, trip targets, and indicated metering displays.
 - d. Multi-button keypad to access programmable functions and monitored data.
 - e. Ten-event, trip-history log. Each trip event shall be recorded with type, phase, and magnitude of fault that caused the trip.
 - f. Integral test jack for connection to portable test set or laptop computer.
 - g. Field-Adjustable Settings:
 - 1) Instantaneous trip.
 - 2) Long- and short-time pickup levels.
 - 3) Long and short time adjustments.
 - 4) Ground-fault pickup level, time delay, and I squared T response.
 4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
 5. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
 6. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).
 7. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
 8. Subfeed Circuit Breakers: Vertically mounted.
 9. MCCB Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Breaker handle indicates tripped status.
 - c. UL listed for reverse connection without restrictive line or load ratings.
 - d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
 - f. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

- g. Communication Capability: Circuit-breaker-mounted communication module with functions and features compatible with power monitoring and control system specified in Section 260913 "Electrical Power Monitoring and Control."
 - h. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
 - i. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
 - j. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.
- B. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.
- 1. Fuses and Spare-Fuse Cabinet: Comply with requirements specified in Section 262813 "Fuses."

2.5 IDENTIFICATION

- A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.
- B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.
- C. Circuit Directory: Directory card inside panelboard door, mounted in transparent card holder.

2.6 ACCESSORY COMPONENTS AND FEATURES

- A. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Install panelboards and accessories according to NECA 407.
- C. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- D. Install overcurrent protective devices and controllers not already factory installed.
 - 1. Set field-adjustable, circuit-breaker trip ranges.

- E. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
- F. Install filler plates in unused spaces.
- G. Stub four 1-inch (27-EMT) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-EMT) empty conduits into raised floor space or below slab not on grade.
- H. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- E. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- D. Panelboards will be considered defective if they do not pass tests and inspections.

- E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262416

SECTION 262419 - MOTOR-CONTROL CENTERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes MCCs for use with ac circuits rated 600 V and less, with combination controllers and having the following factory-installed components:
1. Automatic power transfer.
 2. Feeder-tap units.
 3. Measurement and control.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each MCC, manufacturer's approval and production drawings as defined in UL 845. In addition to requirements specified in UL 845, include dimensioned plans, elevations, and sections; and conduit entry locations and sizes, mounting arrangements, and details, including required clearances and service space around equipment.
1. Show tabulations of installed devices, equipment features, and ratings. Include the following:
 - a. Each installed unit's type and details.
 - b. Factory-installed devices.
 - c. Enclosure types and details.
 - d. Nameplate legends.
 - e. Short-circuit current (withstand) rating of complete MCC, and for bus structure and each unit.
 - f. Features, characteristics, ratings, and factory settings of each installed controller and feeder device, and installed devices.
 - g. Specified optional features and accessories.
 2. Schematic Wiring Diagrams: For power, signal, and control wiring for each installed controller.
 3. Nameplate legends.
 4. Vertical and horizontal bus capacities.
 5. Features, characteristics, ratings, and factory settings of each installed unit.

1.3 INFORMATIONAL SUBMITTALS

- A. Standard Drawings: For each MCC, as defined in UL 845.
- B. Seismic Qualification Data: Certificates, for MCCs, accessories, and components, from manufacturer.

- C. Product Certificates: For each MCC.
- D. Source quality-control reports.
- E. Field quality-control reports.
- F. Load-Current and Overload Relay Heater List: Compile after motors have been installed, and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.
- G. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed, and arrange to demonstrate that switch settings for motor running overload protection suit actual motors to be protected.
- H. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace MCC that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. NEMA Compliance: Fabricate and label MCCs to comply with NEMA ICS 18.
- B. Ambient Environment Ratings:
 - 1. Ambient Temperature Rating: Not less than 0 deg F (minus 18 deg C) and not exceeding 104 deg F (40 deg C), with an average value not exceeding 95 deg F (35 deg C) over a 24-hour period.
 - 2. Ambient Storage Temperature Rating: Not less than minus 4 deg F (minus 20 deg C) and not exceeding 140 deg F (60 deg C)
 - 3. Humidity Rating: Less than 95 percent (noncondensing).
 - 4. Altitude Rating: Not exceeding 6600 feet (2000 m), or 3300 feet (1000 m) if MCC includes solid-state devices.
- C. 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.

2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: MCCs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified and the system will be fully operational after the seismic event."
 2. Component Importance Factor: 1.5.
 3. Component Amplification Factor: 2.5.
 4. Component Response Modification Factor: 6.0.
- B. Capacities and Characteristics:
1. MCC Enclosure and Assembly:
 - a. Nominal System Voltage: 480 V.
 - b. Service Equipment Rated: No.
 - c. Enclosure: NEMA 250, Type 3R
 - d. Integrated Short-Circuit Rating for MCC:
 - 1) Combination series rated; 17 kA.
 - 2) Fully rated; 17 kA.
 - e. Integrated Short-Circuit Rating for Each Unit:
 - 1) Combination series rated; 17 kA.
 - 2) Fully rated; 17 kA.
 - f. Bus:
 - 1) Neutral Bus: Full size.
 2. Main Disconnect Device:
 - a. Main Disconnect: MCCB, UL 489, three pole, 1,000 A.
 3. VFCs:
 - a. Tag Number: 175 hp, 261 full-load A.
 - 1) Bypass Mode: Field selectable, manual or automatic.
 - 2) Bypass Style: Two contactor style.
 - 3) Bypass Contactor Classification: Reduced-voltage autotransformer, open transition.
 - 4) Overload Relays: Solid state.
 - 5) Isolated Overload Alarm Contact: Per system integrator.
 4. Panelboards:
 - a. Mains: MCCB, 1 phase, 120/240 V, 1-phase, 40 A.

- b. Bolt-on circuit breakers.
5. Transformer(s): 10 kVA, 480 V, 1-Phase primary, 120/240 V, 1-phase secondary.
 - a. Primary Circuit Breaker: MCCB, 30 A.

2.3 ENCLOSURES

- A. Space Heaters: Factory-installed electric space heaters of sufficient wattage in each vertical section to maintain enclosure temperature above expected dew point.
 1. Space-Heater Control: Thermostats to maintain temperature of each section above expected dew point.
 2. Space-Heater Power Source: 120-V external branch circuit.
- B. Outdoor Enclosures: Type 3R, non-walk-in aisle.
 1. Finish: Factory-applied finish in manufacturer's standard color; undersurfaces treated with corrosion-resistant undercoating.
 2. Enclosure: Flat roof; bolt-on rear covers for each section, with provisions for padlocking.
 3. Doors: Personnel door for each section, opening outwards; with provisions for padlocking.
 4. Accessories: LED lighting fixtures, ceiling mounted; wired to a three-way light switch at each end of enclosure; GFCI duplex receptacle.
 5. Power for space heaters, ventilation, lighting, and receptacle supplied from a remote source.

2.4 ASSEMBLY

- A. Structure:
 1. Comply with UL requirements for service entrance equipment.
 2. Units up to and including Size 3 shall have drawout mountings with connectors that automatically line up and connect with vertical-section buses while being racked into their normal, energized positions.
 3. Units in Type B and Type C MCCs shall have pull-apart terminal strips for external control connections.
 4. Pull Boxes:
 - a. Include provisions for ventilation to maintain temperature in pull box within same limits as the MCC.
 - b. Set the box back from front to clear circuit-breaker removal mechanism.
 - c. Covers: Removable covers forming top, front, and sides.
 - d. Insulated bottom of fire-resistive material with separate holes for cable drops into MCC.
 - e. Cable Supports: Arranged to facilitate cabling and adequate to support cables, including supports for future cables.
 - f. When equipped with barriers, supply with access to check bus bolt tightness.

- B. Compartments: Modular; individual lift-off doors with concealed hinges and quick-captive screw fasteners.
 - 1. Interlock compartment door to require that the disconnecting means is "off" before door can be opened or closed, except by operating a concealed release device.
 - 2. Compartment construction shall allow for removal of units without opening adjacent doors, disconnecting adjacent compartments, or disturbing operation of other units in MCC.
 - 3. The same-size compartments shall be interchangeable to allow rearrangement of units, such as replacing three single units with a unit requiring three spaces, without cutting or welding.
- C. Bus Transition and Incoming Pull Sections: Included and aligned with the structure of the MCC.
- D. Interchangeability: Compartments constructed to allow for removal of units without opening adjacent doors, disconnecting adjacent compartments, or disturbing operation of other units in MCC; same-size compartments to permit interchangeability and ready rearrangement of units, such as replacing three single units with a unit requiring three spaces, without cutting or welding.
- E. Wiring Spaces:
 - 1. Vertical wireways in each vertical section for vertical wiring to each unit compartment; supports to hold wiring in place.
 - 2. Horizontal wireways in bottom and top of each vertical section for horizontal wiring between vertical sections; supports to hold wiring in place.
- F. Provisions for Future:
 - 1. Compartments marked "future" shall be bused, wired and equipped with guide rails or equivalent, and ready for insertion of drawout units.
 - 2. Compartments marked "spare" shall include provisions for connection to the vertical bus.
- G. Integrated Short-Circuit Rating:
 - 1. Short-Circuit Current Rating for Each Unit: Fully rated; 17 kA.
 - 2. Short-Circuit Current Rating of MCC: Fully rated with its main overcurrent device; 17 kA.
- H. Factory-Installed Wiring: Factory installed, with bundling, lacing, and protection included. Use flexible conductors for No. 8 AWG and smaller, for conductors across hinges, and for conductors for interconnections between shipping units.
 - 1. Control and Load Wiring: Factory installed, with bundling, lacing, and protection included. Use flexible conductors for No. 8 AWG and smaller, for conductors across hinges, and for conductors for interconnections between shipping units.
- I. Bus:

1. Main Horizontal and Equipment Ground Buses: Uniform capacity for entire length of MCC's main and vertical sections. Provide for future extensions.
2. Vertical Phase and Equipment Ground Buses: Uniform capacity for entire usable height of vertical sections, except for sections incorporating single units.
3. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent minimum conductivity or tin-plated alloy, with mechanical connectors for outgoing conductors.
4. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent minimum conductivity or tin-plated, high-strength, electrical-grade aluminum alloy, with mechanical connectors for outgoing conductors.
5. Ground Bus: Hard-drawn copper of 98 percent minimum conductivity, with pressure connector for ground conductors, minimum size 1/4-by-2 inches (6 by 50 mm). Equip with mechanical connectors for outgoing conductors.
6. Neutral Disconnect Link: Bolted, uninsulated, 1/4-by-2-inch (6-by-50-mm) copper bus, arranged to connect neutral bus to ground bus.
7. Bus-Bar Insulation: Factory-applied, flame-retardant, tape wrapping of individual bus bars or flame-retardant, spray-applied insulation. Insulation temperature rating shall not be less than 105 deg C.

2.5 MAIN DISCONNECT AND OVERCURRENT PROTECTIVE DEVICE(S)

- A. MCCB (to 1600 A): Fixed mounted, manually operated air-circuit breaker. Comply with UL 489.
1. MCCB shall have quick-make, quick-break, over-center switching mechanism that is mechanically trip-free, its position shall be shown by the position of the handle, and manual push-to-trip push button.
 2. Solid-state monitoring and tripping system to show system status monitoring, adjustable time-current protection, and shunt trip.
 - a. Interchangeable current sensors and timing circuits for adjustable time-current protection settings and status signals.
 - b. Trip-setting dials or interchangeable plugs to establish the continuous trip of the circuit breaker. Plugs shall not be interchangeable between frames, and the breaker may not be closed without the plug. With neutral ground-fault sensor.
 - c. Time-current adjustments to achieve protective-device coordination as follows:
 - 1) Adjustable long-time delay.
 - 2) Adjustable short-time setting and delay to shape the time-current curve.
 - 3) Adjustable instantaneous setting.
 - 4) Individually adjustable ground-fault setting and time delay.
 - d. Built-in connector to test the long-time delay, instantaneous, and ground-fault functions of the breaker. Provide one test set for testing the installed circuit breakers 225-A frame and higher.
 - e. Built-in digital ammeter display, showing load current and tripping cause.
 3. Switch operator power shall be from control power specified in "Assembly" Article.
- B. MCC Main Disconnect Device: Fusible switch; fixed-mounted, manually operated, electrically tripped, quick-make, quick-break switch. Comply with UL 98.

1. Indication whether the switch is open or closed, and provisions for padlocking the operating handle.
2. Fuse clips and fuses.
3. Electrically tripped switches shall include the following:
 - a. Shunt trip.
 - b. Ground-fault protection, with adjustable time delay and test panel.
 - c. Single-phase protection, tripping the switch on loss of a source phase.
 - d. Blown fuse protection, tripping the switch on a blown fuse, with blown fuse indication.
 - e. Switch operator power shall be from control power specified in "Assembly" Article.

2.6 VFC

- A. Controller Units: Combination controllers, consisting of variable-frequency power converter that is factory packaged in an enclosure, with integral disconnecting means and overcurrent and overload protection; listed and labeled by an NRTL as a complete unit; arranged for self-protection, protection, and variable-speed control of one or more three-phase induction motors by adjusting output voltage and frequency. Comply with NEMA ICS 7, NEMA ICS 61800-2, UL 508C, and UL 508E.
 1. Units suitable for operation of NEMA MG 1, Design A and Design B motors as defined by NEMA MG 1, Section IV, Part 30, "Application Considerations for Constant Speed Motors Used on a Sinusoidal Bus with Harmonic Content and General Purpose Motors Used with Adjustable-Voltage or Adjustable-Frequency Controls or Both."
 2. Units suitable for operation of inverter-duty motors as defined by NEMA MG 1, Section IV, Part 31, "Definite-Purpose Inverter-Fed Polyphase Motors."
 3. Listed and labeled for integrated short-circuit current (withstand) rating by an NRTL acceptable to authorities having jurisdiction.
 4. Listed and labeled for single-phase use by an NRTL acceptable to authorities having jurisdiction.
- B. Disconnects:
 1. MCP:
 - a. UL 489, with interrupting capacity complying with available fault currents, instantaneous-only circuit breaker with front-mounted, field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.
 - b. Lockable Handle: For three padlocks and interlocks with cover in closed position.
 - c. Auxiliary contacts "a" and "b" arranged to activate with MCP handle.
 - d. NO alarm contact that operates only when MCP has tripped.
 - e. Current-limiting module to increase controller short-circuit current (withstand) rating to 100 kA.
 2. MCCB:

- a. UL 489, with interrupting capacity to comply with available fault currents; thermal-magnetic MCCB, with inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits.
 - b. Front-mounted, adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - c. Lockable Handle: For three padlocks and interlocks with cover in closed position.
 - d. Auxiliary contacts "a" and "b" arranged to activate with MCCB handle.
 - e. NO alarm contact that operates only when MCCB has tripped.
3. Molded-Case Switch:
- a. UL 489, with in-line fuse block for UL 248-8 Class J power fuses (depending on ampere rating), providing an interrupting capacity to comply with available fault currents; MCCB with fixed, high-set instantaneous trip only.
 - b. Lockable Handle: For three padlocks and interlocks with cover in closed position.
 - c. Auxiliary contacts "a" and "b" arranged to activate with molded-case switch handle.
 - d. NO alarm contact that operates only when molded-case switch has tripped.
4. Disconnect Rating: Not less than 115 percent of VFC input current rating.
5. Disconnect Rating: Not less than 115 percent of NFPA 70 motor full-load current rating or VFC input current rating, whichever is larger.
6. Auxiliary Contacts: NO, arranged to activate before switch blades open.
7. Auxiliary contacts "a" and "b" arranged to activate with circuit-breaker handle.
8. NO alarm contact that operates only when circuit breaker has tripped.
- C. Operating Requirements:
1. Input AC Voltage Tolerance: Plus 10 and minus 10 percent of VFC input voltage rating.
 2. Input AC Voltage Unbalance: Not exceeding [3] [5] percent.
 3. Input Frequency Tolerance: Plus or minus 3 percent of VFC frequency rating.
 4. Minimum Efficiency: 96 percent at 60 Hz, full load.
 5. Minimum Displacement Primary-Side Power Factor: 96 percent under any load or speed condition.
 6. Overload Capability:
 - a. For variable-torque controllers, 1.1 times the base load current for 60 seconds; minimum of 1.8 times the base load current for three seconds.
 - b. For constant-torque controllers, 1.5 times the base load current for 60 seconds; minimum of 1.8 times the base load current for three seconds.
 7. Starting Torque: Minimum of 100 percent of rated torque from 3 to 60 Hz.
 8. Speed Regulation: Plus or minus 5 percent.
 9. Output Carrier Frequency: Field selectable.
 10. Stop Modes: Programmable; includes fast, free-wheel, and dc injection braking.
 11. Internal Adjustability Capabilities:
 - a. Minimum Speed: 5 to 25 percent of maximum rpm.
 - b. Maximum Speed: 80 to 100 percent of maximum rpm.
 - c. Acceleration: 0.1 to 999.9 seconds.
 - d. Deceleration: 0.1 to 999.9 seconds.

- e. Current Limit: 30 to a minimum of 150 percent of maximum rating.
12. Self-Protection and Reliability Features:
- a. Input surge protection by means of SPDs for three-phase protection against damage from supply voltage surges 10 percent or more above nominal line voltage.
 - b. Loss of Input Signal Protection: Selectable response strategy including speed default to a percent of the most recent speed, a preset speed, or stop; with alarm.
 - c. Under- and overvoltage trips.
 - d. Inverter overcurrent trips.
 - e. VFC and Motor Overload/Overtemperature Protection: Microprocessor-based thermal protection system for monitoring VFCs and motor thermal characteristics, and for providing VFC overtemperature and motor overload alarm and trip; settings selectable via the keypad; NRTL approved and listed and labeled by an NRTL.
 - f. Critical frequency rejection, with three selectable, adjustable deadbands.
 - g. Instantaneous line-to-line and line-to-ground overcurrent trips.
 - h. Loss-of-phase protection.
 - i. Reverse-phase protection.
 - j. Short-circuit protection.
 - k. Motor overtemperature fault.
13. Torque Boost: Automatically varies starting and continuous torque to at least 1.5 times the minimum torque to ensure high-starting torque and increased torque at slow speeds.
14. Motor Temperature Compensation at Slow Speeds: Adjustable current fall-back based on output frequency for temperature protection of self-cooled, fan-ventilated motors at slow speeds.
- D. Operator Station:
- 1. Inverter Logic: Microprocessor based, 32 bit, isolated from all power circuits.
 - 2. Isolated Control Interface: Allows VFCs to follow remote-control signal over a minimum 40:1 speed range.
 - 3. Panel-mounted, manufacturer's standard front-accessible, sealed keypad and plain-English-language digital display; allows complete programming, program copying, operating, monitoring, and diagnostic capability.
 - a. Keypad: In addition to required programming and control keys, include keys for HAND, OFF, and AUTO modes.
 - b. Security Access: Electronic security access to controls through identification and password with at least three levels of access: View only; view and operate; and view, operate, and service.
- E. Displays:
- 1. Historical Logging Information and Displays:
 - a. Real-time clock with current time and date.
 - b. Running log of total power versus time.
 - c. Total run time.

- d. Fault log, maintaining last four faults with time and date stamp for each.
2. Indicating Devices: Digital display and additional readout devices as required, mounted flush in VFC door and connected to display VFC parameters including the following:
 - a. Output frequency (Hz).
 - b. Motor speed (rpm).
 - c. Motor status (running, stop, fault).
 - d. Motor current (amperes).
 - e. Motor torque (percentage).
 - f. Fault or alarming status (code).
 - g. PID feedback signal (percentage).
 - h. DC-link voltage (V dc).
 - i. Set-point frequency (Hz).
 - j. Motor output voltage (V ac).
- F. Bypass Systems:
1. Bypass Operation: Safely transfers motor between power converter output and bypass circuit, manually, automatically, or both. Selector switches set modes, and indicator lights indicate mode selected. Unit is capable of stable operation (starting, stopping, and running) with motor completely disconnected from power converter.
 2. Bypass Mode: Manual operation only; requires local operator selection at VFC. Transfer between power converter and bypass contactor and retransfer shall only be allowed with the motor at zero speed.
 3. Bypass Mode: Field-selectable automatic or manual, allows local and remote transfer between power converter and bypass contactor and retransfer, either via manual operator interface or automatic control system feedback.
 4. Bypass Controller: Two-contactor-style bypass allows motor operation via the power converter or the bypass controller; with input isolating switch and barrier arranged to isolate the power converter and permit safe troubleshooting and testing, both energized and de-energized, while motor is operating in bypass mode.
 - a. Bypass Contactor: Load-break, NEMA-rated contactor.
 - b. Output Isolating Contactor: Non-load-break, NEMA-rated contactor.
 - c. Isolating Switch: Non-load-break switch arranged to isolate power converter and permit safe troubleshooting and testing of the power converter, both energized and de-energized, while motor is operating in bypass mode; pad-lockable, door-mounted handle mechanism.
 5. Bypass Controller: Three-contactor-style bypass allows motor operation via the power converter or the bypass controller; with input isolating switch and barrier arranged to isolate the power converter input and output and permit safe testing and troubleshooting of the power converter, both energized and de-energized, while motor is operating in bypass mode.
 - a. Bypass Contactor: Load-break, NEMA-rated contactor.
 - b. Input and Output Isolating Contactors: Non-load-break, NEMA-rated contactors.
 - c. Isolating Switch: Non-load-break switch arranged to isolate power converter and permit safe troubleshooting and testing of the power converter, both energized and

de-energized, while motor is operating in bypass mode; pad-lockable, door-mounted handle mechanism.

6. Bypass Contactor Classification: Reduced-voltage autotransformer, open transition type.
 7. NORMAL/BYPASS selector switch.
 - a. HAND/OFF/AUTO selector switch.
 - b. NORMAL/TEST Selector Switch: Allows testing and adjusting of VFC while the motor is running in the bypass mode.
 - c. Contactor Coils: Pressure-encapsulated type with coil transient suppressors.
 - 1) Operating Voltage: Depending on contactor NEMA size and line-voltage rating, manufacturer's standard matching control power or line voltage.
 - 2) Power Contacts: Totally enclosed, double break, and silver-cadmium oxide; assembled to allow inspection and replacement without disturbing line or load wiring.
 8. Overload Relays: NEMA ICS 2.
 - a. Solid-State Overload Relays:
 - 1) Switch or dial selectable for motor-running overload protection.
 - 2) Sensors in each phase.
 - 3) Class 10 tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.
 - 4) Class II ground-fault protection, with start and run delays to prevent nuisance trip on starting.
 - 5) Analog communication module.
 - b. NO isolated overload alarm contact.
 - c. External overload reset push button.
 - G. Automatic Reset/Restart: Attempt three restarts after drive fault or on return of power after an interruption and before shutting down for manual reset or fault correction; adjustable delay time between restart attempts.
 - H. Power-Interruption Protection: To prevent motor from re-energizing after a power interruption until motor has stopped, unless "Bidirectional Autospeed Search" feature is available and engaged.
 - I. Bidirectional Autospeed Search: Capable of starting VFC into rotating loads spinning in either direction and returning motor to set speed in proper direction, without causing damage to drive, motor, or load.
 - J. Communication Port: Per system integrator.
- 2.7 CONTROLLER-MOUNTED AUXILIARY DEVICES
- A. Control-Circuit and Pilot Devices: Factory installed in controller enclosure cover unless otherwise indicated. Comply with NEMA ICS 5.

1. Push Buttons, Pilot Lights, and Selector Switches: Heavy-duty, oiltight type.
 - a. Push Buttons: Covered types; momentary contact unless otherwise indicated.
 - b. Pilot Lights: LED types; push to test.
 - c. Selector Switches: Rotary type.
- B. Meters: Panel type, 2-1/2-inch (64-mm) minimum size with 90- or 120-degree scale and plus or minus 2 percent accuracy, with selector switches having an off position.
- C. Auxiliary Dry Contacts: Reversible NC/NO.
- D. Control Relays:
 1. Time Delay: Auxiliary and adjustable solid-state time-delay relays.
 2. Phase-Failure, Phase-Reversal, and Undervoltage and Overvoltage Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connections and adjustable undervoltage, overvoltage, and time-delay settings.

2.8 FEEDER TAP UNITS

- A. MCCBs (to 1200 A): Fixed mounted, with inverse time-current 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. Comply with UL 489, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
 1. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
 2. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
 - a. Instantaneous trip.
 - b. Long- and short-time pickup levels.
 - c. Long- and short-time time adjustments.
 - d. Ground-fault pickup level, time delay, and I^2t response.
 3. Communication Capability: Circuit-breaker-mounted communication module with functions and features compatible with power monitoring and control system specified in Section 260913 "Electrical Power Monitoring and Control."
 4. With built-in digital ammeter and a digital display, showing tripping cause.
 5. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
 6. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
 7. 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.
 8. Alarm Switch: One NO contact that operates only when circuit breaker has tripped.
 9. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
 10. Zone-Selective Interlocking: Integral with electronic ground-fault trip unit; for interlocking ground-fault protection function.
 11. Electrical Operator: Remote control for on, off, and reset operations.

- B. Fusible Switches (to 600 A): Fixed-mounted, manually operated, electrically tripped, fusible, quick-make, quick-break switch with 200-kA interrupting and short-circuit current rating when fitted with UL 248-8 Class J fuses. Comply with UL 98.
 - 1. Indication whether the switch is open or closed, and provisions for padlocking the operating handle.
 - 2. Include fuse clips and fuses.
 - 3. Electrically tripped switches shall include the following:
 - a. Shunt trip.
 - b. Ground-fault protection, with adjustable time delay and test panel.
 - c. Single-phase protection, tripping the switch on loss of a source phase.
 - d. Blown fuse protection, tripping the switch on a blown fuse, with blown fuse indication.

2.9 SOURCE QUALITY CONTROL

- A. MCC Testing: Test and inspect MCCs according to requirements in NEMA ICS 18.
- B. MCCs will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. NEMA Industrial Control and Systems Standards: Comply with parts of NEMA ICS 2.3 for installation and startup of MCCs.
- B. Floor Mounting: Install MCCs on 4-inch (100-mm) nominal-thickness concrete base. Comply with requirements for concrete base specified in other specification sections.
- C. Seismic Bracing: Comply with requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- E. Install fuses in control circuits if not factory installed. Comply with requirements in Section 262813 "Fuses."
- F. Install heaters in thermal-overload relays. Select heaters based on actual nameplate full-load amperes after motors have been installed.
- G. Install, connect, and fuse thermal-protector monitoring relays furnished with motor-driven equipment.

- H. Install power factor correction capacitors. Connect to the [**line**] [**load**] side of overload relays. If connected to the load side of overload relays, adjust overload heater sizes to accommodate the reduced motor full-load currents.
- I. Comply with NECA 1.
- J. Comply with requirements in Section 260553 "Identification for Electrical Systems" for identification of MCC, MCC components, and control wiring.
 - 1. Identify field-installed conductors, interconnecting wiring, and components.
 - 2. Install required warning signs.
 - 3. Label MCC and each cubicle with engraved nameplate.
 - 4. Label each enclosure-mounted control and pilot device.

3.2 CONTROL WIRING INSTALLATION

- A. Install wiring between enclosed controllers and remote devices. Comply with requirements in Section 260523 "Control-Voltage Electrical Power Cables."
- B. Bundle, train, and support wiring in enclosures.
- C. Connect selector switches and other automatic-control selection devices where applicable.
 - 1. Connect selector switches to bypass only those manual- and automatic-control devices that have no safety functions when switch is in manual-control position.
 - 2. Connect selector switches within enclosed controller circuit in both manual and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.3 CONNECTIONS

- A. Comply with requirements for installation of conduit in Section 260533 "Raceways and Boxes for Electrical Systems." Drawings indicate general arrangement of conduit, fittings, and specialties.
- B. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections with the assistance of a factory-authorized service representative.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each enclosed controller, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 4. Perform the following infrared (thermographic) scan tests and inspections and prepare reports:
 - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each multipole enclosed controller. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each multipole enclosed controller 11 months after date of Substantial Completion.
 - c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Submit calibration record for device.
 5. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
 6. Mark up a set of manufacturer's drawings with all field modifications incorporated during construction and return to manufacturer for inclusion in Record Drawings.
- D. MCCs will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and overload relay pickup and trip ranges.
- B. Adjust overload relay heaters or settings if power factor correction capacitors are connected to the load side of the overload relays.
- C. Adjust the trip settings of MCPs and thermal-magnetic circuit breakers with adjustable, instantaneous trip elements. Initially adjust to six times the motor nameplate full-load amperes and attempt to start motors several times, allowing for motor cool-down between starts. If tripping occurs on motor inrush, adjust settings in increments until motors start without tripping. Do not exceed eight times the motor full-load amperes (or 11 times for NEMA Premium Efficient motors if required). Where these maximum settings do not allow starting of a motor, notify Owner before increasing settings.
- D. Set the taps on reduced-voltage autotransformer controllers at 80 percent.
- E. Set field-adjustable switches and program microprocessors for required start and stop sequences in reduced-voltage, solid-state controllers.

- F. Program microprocessors in VFCs for required operational sequences, status indications, alarms, event recording, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.
- G. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573 "Short-Circuit, Device Setting, & Arc-Flash Hazard Analysis."

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain enclosed controllers, and to use and reprogram microprocessor-based, reduced-voltage, solid-state controllers.

END OF SECTION 262419

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. GFCI receptacles.
2. Toggle switches.
3. Digital timer light switches.
4. Wall plates.

1.2 DEFINITIONS

A. Abbreviations of Manufacturers' Names:

1. Cooper: Copper Wiring Devices; Division of Cooper Industries, Inc.
2. Hubbell: Hubbell Incorporated: Wiring Devices-Kellems.
3. Leviton: Leviton Mfg. Company, Inc.
4. Pass & Seymour: Pass& Seymour/Legrand.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 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.
- 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.
- D. Devices for Owner-Furnished Equipment:
 - 1. Receptacles: Match plug configurations.
- E. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GFCI RECEPTACLES

- A. General Description:
 - 1. 125 V, 20 A, straight blade, non-feed-through type.
 - 2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, 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.

2.3 TOGGLE SWITCHES

- A. Comply with NEMA WD 1, UL 20, and FS W-S-896.
- B. Pilot-Light Switches, 120/277 V, 20 A:
 - 1. Description: Single pole, with LED-lighted handle, illuminated when switch is off.
- C. Key-Operated Switches, 120/277 V, 20 A:
 - 1. Description: Single pole, with factory-supplied key in lieu of switch handle.
- D. Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors.

2.4 DIGITAL TIMER LIGHT SWITCH

- A. Description: Switchbox-mounted, combination digital timer and conventional switch lighting-control unit, with backlit digital display, with selectable time interval in 10minute increments.
 - 1. Rated 960 W at 120-V ac for tungsten lighting, 10 A at 120-V ac or 10 A at 277-V ac for fluorescent or LED lighting, and 1/4 hp at 120-V ac.
 - 2. Integral relay for connection to BAS.

2.5 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: Steel with white baked enamel, suitable for field painting.
 - 3. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

PART 3 - EXECUTION

3.1 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. Pigtailling 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.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount 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. GFCI Receptacles: Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.2 FIELD QUALITY CONTROL

A. Test Instruments: Use instruments that comply with UL 1436.

- B. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Tests for Convenience Receptacles:
 - a. Line Voltage: Acceptable range is 105 to 132 V.
 - b. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
 - c. Ground Impedance: Values of up to 2 ohms are acceptable.
 - d. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 - e. Using the test plug, verify that the device and its outlet box are securely mounted.
 - f. 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.
- D. Wiring device will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

END OF SECTION 262726

SECTION 262923 - VARIABLE-FREQUENCY MOTOR CONTROLLERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes separately enclosed, preassembled, combination VFCs, rated 600 V and less, for speed control of three-phase, squirrel-cage induction motors.
- B. See Section 262419 "Motor-Control Centers" for VFCs installed in motor-control centers.

1.2 DEFINITIONS

- A. CE: Conformance Europeene (European Compliance).
- B. CPT: Control power transformer.
- C. DDC: Direct digital control.
- D. EMI: Electromagnetic interference.
- E. OCPD: Overcurrent protective device.
- F. PID: Control action, proportional plus integral plus derivative.
- G. RFI: Radio-frequency interference.
- H. VFC: Variable-frequency motor controller.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type and rating of VFC indicated.
- B. Shop Drawings: For each VFC indicated.
 - 1. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Seismic Qualification Certificates: For each VFC, accessories, and components, from manufacturer.

1. Certificate of compliance.
 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.
- C. Product certificates.
- D. Field quality-control reports.
- 1.5 CLOSEOUT SUBMITTALS
- A. Operation and maintenance data.
- 1.6 QUALITY ASSURANCE
- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
- 1.7 WARRANTY
- A. Special Warranty: Manufacturer agrees to repair or replace VFCs that fail in materials or workmanship within specified warranty period.
1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

- 2.1 SYSTEM DESCRIPTION
- A. General Requirements for VFCs:
1. VFCs and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Comply with NEMA ICS 7, NEMA ICS 61800-2, and UL 508A.
- B. Application: Constant torque and variable torque.
- C. VFC Description: Variable-frequency motor controller, consisting of power converter that employs pulse-width-modulated inverter, factory built and tested in an enclosure, with integral disconnecting means and overcurrent and overload protection; listed and labeled by an NRTL as a complete unit; arranged to provide self-protection, protection, and variable-speed control of one or more three-phase induction motors by adjusting output voltage and frequency.
1. Units suitable for operation of NEMA MG 1 motors.
 2. Listed and labeled for integrated short-circuit current (withstand) rating by an NRTL acceptable to authorities having jurisdiction.

- D. Design and Rating: Match load type, such as fans, blowers, and pumps; and type of connection used between motor and load such as direct or through a power-transmission connection.
- E. Output Rating: Three phase; 10 to 60 Hz, with voltage proportional to frequency throughout voltage range; maximum voltage equals input voltage.
- F. Unit Operating Requirements:
 - 1. Input AC Voltage Tolerance: Plus 10 and minus 10 percent of VFC input voltage rating.
 - 2. Input AC Voltage Unbalance: Not exceeding 5 percent.
 - 3. Input Frequency Tolerance: Plus or minus 3 percent of VFC frequency rating.
 - 4. Minimum Efficiency: 96 percent at 60 Hz, full load.
 - 5. Minimum Displacement Primary-Side Power Factor: 96 percent under any load or speed condition.
 - 6. Minimum Short-Circuit Current (Withstand) Rating: 22 kA.
 - 7. Ambient Temperature Rating: Not less than 32 deg F (0 deg C) and not exceeding 104 deg F (40 deg C).
 - 8. Humidity Rating: Less than 95 percent (noncondensing).
 - 9. Altitude Rating: Not exceeding 3300 feet (1000 m).
 - 10. Vibration Withstand: Comply with NEMA ICS 61800-2.
 - 11. Overload Capability: 1.1 times the base load current for 60 seconds; minimum of 1.8 times the base load current for three seconds.
 - 12. Starting Torque: Minimum 100 percent of rated torque from 3 to 60 Hz.
 - 13. Speed Regulation: Plus or minus 5 percent.
 - 14. Output Carrier Frequency: Selectable; 0.5 to 15 kHz.
 - 15. Stop Modes: Programmable; includes fast, free-wheel, and dc injection braking.
- G. Inverter Logic: Microprocessor based, 32 bit, isolated from all power circuits.
- H. Isolated Control Interface: Allows VFCs to follow remote-control signal over a minimum 40:1 speed range.
 - 1. Signal: Electrical.
- I. Internal Adjustability Capabilities:
 - 1. Minimum Speed: 5 to 25 percent of maximum rpm.
 - 2. Maximum Speed: 80 to 100 percent of maximum rpm.
 - 3. Acceleration: 0.1 to 999.9 seconds.
 - 4. Deceleration: 0.1 to 999.9seconds.
 - 5. Current Limit: 30 to minimum of 150 percent of maximum rating.
- J. Self-Protection and Reliability Features:
 - 1. Surge Suppression: Factory installed as an integral part of the VFC, complying with UL 1449 SPD, Type 1 or Type 2.
 - 2. Surge Suppression: Field-mounted surge suppressors complying with Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits," UL 1449 SPD, Type 2.
 - 3. Loss of Input Signal Protection: Selectable response strategy, including speed default to a percent of the most recent speed, a preset speed, or stop; with alarm.
 - 4. Under- and overvoltage trips.

5. Inverter overcurrent trips.
 6. VFC and Motor-Overload/Overtemperature Protection: Microprocessor-based thermal protection system for monitoring VFCs and motor thermal characteristics, and for providing VFC overtemperature and motor-overload alarm and trip; settings selectable via the keypad.
 7. Critical frequency rejection, with three selectable, adjustable deadbands.
 8. Instantaneous line-to-line and line-to-ground overcurrent trips.
 9. Loss-of-phase protection.
 10. Reverse-phase protection.
 11. Short-circuit protection.
 12. Motor-overtemperature fault.
- K. Automatic Reset/Restart: Attempt three restarts after drive fault or on return of power after an interruption and before shutting down for manual reset or fault correction; adjustable delay time between restart attempts.
- L. Power-Interruption Protection: To prevent motor from re-energizing after a power interruption until motor has stopped, unless "Bidirectional Autospeed Search" feature is available and engaged.
- M. Bidirectional Autospeed Search: Capable of starting VFC into rotating loads spinning in either direction and returning motor to set speed in proper direction, without causing damage to drive, motor, or load.
- N. Torque Boost: Automatically varies starting and continuous torque to at least 1.5 times the minimum torque to ensure high-starting torque and increased torque at slow speeds.
- O. Motor Temperature Compensation at Slow Speeds: Adjustable current fall-back based on output frequency for temperature protection of self-cooled, fan-ventilated motors at slow speeds.
- P. Integral Input Disconnecting Means and OCPD: UL 489, instantaneous-trip circuit breaker with pad-lockable, door-mounted handle mechanism.
1. Disconnect Rating: Not less than 115 percent of VFC input current rating.
 2. Disconnect Rating: Not less than 115 percent of NFPA 70 motor full-load current rating or VFC input current rating, whichever is larger.
 3. Auxiliary Contacts: NO or NC, arranged to activate before switch blades open.
 4. Auxiliary contacts "a" and "b" arranged to activate with circuit-breaker handle.
 5. NO alarm contact that operates only when circuit breaker has tripped.

2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: VFCs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7. The designated VFCs shall be tested and certified by an NRTL as meeting the ICC-ES AC 156 test procedure requirements.
1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.3 CONTROLS AND INDICATION

- A. Status Lights: Door-mounted LED indicators displaying the following conditions:
1. Power on.
 2. Run.
 3. Overvoltage.
 4. Line fault.
 5. Overcurrent.
 6. External fault.
- B. Panel-Mounted Operator Station: Manufacturer's standard front-accessible, sealed keypad and plain-English-language digital display; allows complete programming, program copying, operating, monitoring, and diagnostic capability.
1. Keypad: In addition to required programming and control keys, include keys for HAND, OFF, and AUTO modes.
 2. Security Access: Provide electronic security access to controls through identification and password with at least one level of access: View only; view and operate; and view, operate, and service.
 - a. Control Authority: Supports at least four conditions: Off, local manual control at VFC, local automatic control at VFC, and automatic control through a remote source.
- C. Historical Logging Information and Displays:
1. Real-time clock with current time and date.
 2. Running log of total power versus time.
 3. Total run time.
 4. Fault log, maintaining last four faults with time and date stamp for each.
- D. Indicating Devices: Digital display and additional readout devices as required, mounted flush in VFC door and connected to display VFC parameters including, but not limited to:
1. Output frequency (Hz).
 2. Motor speed (rpm).
 3. Motor status (running, stop, fault).
 4. Motor current (amperes).
 5. Motor torque (percent).
 6. Fault or alarming status (code).
 7. PID feedback signal (percent).
 8. DC-link voltage (V dc).
 9. Set point frequency (Hz).
 10. Motor output voltage (V ac).
- E. Control Signal Interfaces:
1. Electric Input Signal Interface:
 - a. A minimum of two programmable analog inputs: per system integrator.

- b. A minimum of six multifunction programmable digital inputs.
 2. Remote Signal Inputs: Capability to accept any of the following speed-setting input signals from the DDC system for HVAC or other control systems:
 - a. 0- to 10-V dc.
 - b. 4- to 20-mA dc.
 - c. Potentiometer using up/down digital inputs.
 - d. Fixed frequencies using digital inputs.
 3. Output Signal Interface: A minimum of one programmable analog output signal(s) (per system integrator) which can be configured for any of the following:
 - a. Output frequency (Hz).
 - b. Output current (load).
 - c. DC-link voltage (V dc).
 - d. Motor torque (percent).
 - e. Motor speed (rpm).
 - f. Set point frequency (Hz).
- F. PID Control Interface: Provides closed-loop set point, differential feedback control in response to dual feedback signals. Allows for closed-loop control of fans and pumps for pressure, flow, or temperature regulation.
 1. Number of Loops: One.

2.4 BYPASS SYSTEMS

- A. Bypass Operation: Manually transfers motor between power converter output and bypass circuit. Unit is capable of stable operation (starting, stopping, and running) with motor completely disconnected from power converter.
- B. Bypass Mode: Manual operation only; requires local operator selection at VFC. Transfer between power converter and bypass contactor, and retransfer shall only be allowed with the motor at zero speed.
- C. Bypass Controller: Two-contactor-style bypass allows motor operation via the power converter or the bypass controller; with input isolating switch and barrier arranged to isolate the power converter and permit safe troubleshooting and testing, both energized and de-energized, while motor is operating in bypass mode.
 1. Bypass Contactor: Load-break, NEMA-rated contactor.
 2. Output Isolating Contactor: Non-load-break, NEMA-rated contactor.
 3. Isolating Switch: Non-load-break switch arranged to isolate power converter and permit safe troubleshooting and testing of the power converter, both energized and de-energized, while motor is operating in bypass mode; pad-lockable, door-mounted handle mechanism.
- D. Bypass Contactor Configuration: Reduced-voltage (autotransformer) type.

1. NORMAL/BYPASS selector switch.
2. HAND/OFF/AUTO selector switch.
3. NORMAL/TEST Selector Switch: Allows testing and adjusting of VFC while the motor is running in the bypass mode.
4. Contactor Coils: Pressure-encapsulated type with coil transient suppressors.
 - a. Operating Voltage: Depending on contactor NEMA size and line-voltage rating, manufacturer's standard matching control power or line voltage.
 - b. Power Contacts: Totally enclosed, double break, and silver-cadmium oxide; assembled to allow inspection and replacement without disturbing line or load wiring.
5. Control Circuits: 120-V ac; obtained from integral CPT, with primary and secondary fuses, with CPT of sufficient capacity to operate all integral devices and remotely located pilot, indicating, and control devices.
 - a. CPT Spare Capacity: 100 VA.
6. Overload Relays: NEMA ICS 2.

2.5 OPTIONAL FEATURES

- A. Damper control circuit with end-of-travel feedback capability.
- B. Communication Port: Per system integrator.

2.6 ENCLOSURES

- A. VFC Enclosures: NEMA 250, to comply with environmental conditions at installed location.
- B. Plenum Rating: UL 1995; NRTL certification label on enclosure, clearly identifying VFC as "Plenum Rated."

2.7 ACCESSORIES

- A. General Requirements for Control-Circuit and Pilot Devices: NEMA ICS 5; factory installed in VFC enclosure cover unless otherwise indicated.
 1. Push Buttons: Covered.
 2. Pilot Lights: Push to test.
 3. Selector Switches: Rotary type.
- B. Reversible NC/NO bypass contactor auxiliary contact(s).
- C. Control Relays: Auxiliary and adjustable solid-state time-delay relays.
- D. Phase-Failure, Phase-Reversal, and Undervoltage and Overvoltage Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connections. Provide adjustable undervoltage, overvoltage, and time-delay settings.

1. Current Transformers: Continuous current rating, basic impulse insulating level (BIL) rating, burden, and accuracy class suitable for connected circuitry. Comply with IEEE C57.13.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Wall-Mounting Controllers: Install with tops at uniform height and with disconnect operating handles not higher than 79 inches (2000 mm) above finished floor, unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not on walls, provide freestanding racks complying with Section 260529 "Hangers and Supports for Electrical Systems."
- B. Roof-Mounting Controllers: Install VFC on roofs with tops at uniform height and with disconnect operating handles not higher than 79 inches (2000 mm) above finished roof surface unless otherwise indicated, and by bolting units to curbs or mounting on freestanding, lightweight, structural-steel channels bolted to curbs. Seal roof penetrations after raceways are installed.
 1. Curbs and roof penetrations are specified in Section 077200 "Roof Accessories."
 2. Structural-steel channels are specified in Section 260529 "Hangers and Supports for Electrical Systems."
- C. Seismic Bracing: Comply with requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- E. Install fuses in each fusible-switch VFC.
- F. Install fuses in control circuits if not factory installed. Comply with requirements in Section 262813 "Fuses."
- G. Install heaters in thermal-overload relays. Select heaters based on actual nameplate full-load amperes after motors are installed.
- H. Install, connect, and fuse thermal-protector monitoring relays furnished with motor-driven equipment.
- I. Comply with NECA 1.

3.2 CONTROL WIRING INSTALLATION

- A. Install wiring between VFCs and remote devices and facility's central-control system. Comply with requirements in Section 260523 "Control-Voltage Electrical Power Cables."
- B. Bundle, train, and support wiring in enclosures.

3.3 IDENTIFICATION

- A. Identify VFCs, components, and control wiring. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each VFC with engraved nameplate.
 - 3. Label each enclosure-mounted control and pilot device.

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections with the assistance of a factory-authorized service representative.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each VFC element, bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Inspect VFC, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.
 - 2. Test insulation resistance for each VFC element, component, connecting motor supply, feeder, and control circuits.
 - 3. Test continuity of each circuit.
 - 4. Verify that voltages at VFC locations are within 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Owner before starting the motor(s).
 - 5. Test each motor for proper phase rotation.
 - 6. Perform tests according to the Inspection and Test Procedures for Adjustable Speed Drives stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 8. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- D. VFCs will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies the VFC and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations made after remedial action.

3.5 ADJUSTING

- A. Program microprocessors for required operational sequences, status indications, alarms, event recording, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.

- B. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and overload-relay pickup and trip ranges.
- C. Adjust the trip settings of instantaneous-only circuit breakers and thermal-magnetic circuit breakers with adjustable, instantaneous trip elements. Initially adjust to 6 times the motor nameplate full-load amperes and attempt to start motors several times, allowing for motor cool-down between starts. If tripping occurs on motor inrush, adjust settings in increments until motors start without tripping. Do not exceed 8 times the motor full-load amperes (or 11 times for NEMA Premium Efficient motors if required). Where these maximum settings do not allow starting of a motor, notify Owner before increasing settings.
- D. Set the taps on reduced-voltage autotransformer controllers.
- E. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573 "Short-Circuit, Device Setting, & Arc-Flash Hazard Analysis."
- F. Set field-adjustable pressure switches.

3.6 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, reprogram, and maintain VFCs.

END OF SECTION 262923

SECTION 265613 - LIGHTING POLES AND STANDARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Poles and accessories for support of luminaires.
 - 2. Luminaire-lowering devices.

1.2 DEFINITIONS

- A. EPA: Equivalent projected area.
- B. Luminaire: Complete luminaire.
- C. Pole: Luminaire-supporting structure, including tower used for large-area illumination.
- D. Standard: See "Pole."

1.3 ACTION SUBMITTALS

- A. Product Data: For each pole, accessory, and luminaire-supporting and -lowering device.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and mounting and attachment details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Detail fabrication and assembly of poles and pole accessories.
 - 4. Foundation construction details, including material descriptions, dimensions, anchor bolts, support devices, and calculations, signed and sealed by a professional engineer licensed in the state of installation.
 - 5. Anchor bolt templates keyed to specific poles and certified by manufacturer.
 - 6. Method and procedure of pole installation. Include manufacturer's written installations.

1.4 INFORMATIONAL SUBMITTALS

- A. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements according to AASHTO LTS-6-M and that load imposed by luminaire and attachments has been included in design. The certification shall be based on design calculations signed and sealed by a professional engineer.
- B. Seismic Qualification Certificates: For lighting poles, accessories, and components, from manufacturer.

- C. Material test reports.
- D. Field quality-control reports.
- E. Sample warranty.
- F. Soil test reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data for pole-lowering devices and pole-mounted accessories.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of pole(s) that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within a specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs from special warranty period.

- 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design pole foundation and pole power system.
- B. Seismic Performance: Foundation and pole shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified and the system will be fully operational after the seismic event."
 - 2. Component Importance Factor: 1.5.
- C. Structural Characteristics: Comply with AASHTO LTS-6-M.
- D. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied according to AASHTO LTS-6-M.
- E. Live Load: Single load of 500 lbf (2200 N) distributed according to AASHTO LTS-6-M.
- F. Ice Load: Load of 3 lbf/sq. ft. (145 Pa), applied according to AASHTO LTS-6-M for applicable areas on the Ice Load Map.

- G. Wind Load: Pressure of wind on pole and luminaire, calculated and applied according to AASHTO LTS-6-M.
 - 1. Basic wind speed for calculating wind load for poles 50 feet (15 m) high or less is 100 mph (45 m/s).
 - a. Wind Importance Factor: 1.0.
 - b. Minimum Design Life: 25 years.
 - c. Velocity Conversion Factor: 1.0.
- H. Strength Analysis: For each pole, multiply the actual EPA of luminaires and brackets by a factor of 1.1 to obtain the EPA to be used in pole selection strength analysis.
- I. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.

2.2 STEEL POLES

- A. Source Limitations: Obtain poles from single manufacturer or producer.
- B. Source Limitations: For poles, obtain each color, grade, finish, type, and variety of pole from single source with resources to provide products of consistent quality in appearance and physical properties.
- C. Poles: Comply with ASTM A 500/A 500M, Grade B carbon steel with a minimum yield of 46,000 psig (317 MPa); one-piece construction up to 40 feet (12 m) in height with access handhole in pole wall.
 - 1. Shape: Square, straight.
 - 2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.
- D. Steel Mast Arms: Single-arm type, continuously welded to pole attachment plate. Material and finish same as plate.
- E. Brackets for Luminaires: Detachable, cantilever, without underbrace.
 - 1. Adaptor fitting welded to pole, allowing the bracket to be bolted to the pole-mounted adaptor, then bolted together with galvanized-steel bolts.
 - 2. Cross Section: Tapered oval, with straight tubular end section to accommodate luminaire. Match pole material and finish.
- F. Fasteners: Galvanized steel, size and type as determined by manufacturer. Corrosion-resistant items compatible with support components.
 - 1. Materials: Compatible with poles and standards as well as the substrates to which poles and standards are fastened and shall not cause galvanic action at contact points.
 - 2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.

- G. Grounding and Bonding Lugs: Welded 1/2-inch (13-mm) threaded lug, complying with requirements in Section 260526 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size indicated, and accessible through handhole.
- H. Handhole: Oval shaped, with minimum clear opening of 2-1/2 by 5 inches (65 by 130 mm), with cover secured by stainless-steel captive screws.
- I. Cable Support Grip: Wire-mesh type with rotating attachment eye, sized for diameter of cable and rated for a minimum load equal to weight of supported load multiplied by a 5.0 safety factor.
- J. Prime-Coat Finish: Manufacturer's standard prime-coat finish ready for field painting.
- K. Galvanized Finish: After fabrication, hot-dip galvanize according to ASTM A 123/A 123M.
- L. Factory-Painted Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.
 - 1. Surface Preparation: Clean surfaces according to SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, according to SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
 - 2. Interior Surfaces of Pole: One coat of bituminous paint, or otherwise treat for equal corrosion protection.
 - 3. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high gloss, high-build polyurethane enamel.
 - a. Color: As indicated by on electrical drawings.
- M. Powder-Coat Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.
 - 1. Surface Preparation: Clean surfaces according to SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair powder coat bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, according to SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
 - 2. Powder Coat: Comply with AAMA 2604.
 - a. Electrostatic-applied powder coating; single application and cured to a minimum 2.5- to 3.5-mils dry film thickness. Coat interior and exterior of pole for equal corrosion protection.
 - b. Color: As indicated by on electrical drawings.

2.3 POLE ACCESSORIES

- A. Base Covers: Manufacturers' standard metal units, finished same as pole, and arranged to cover pole's mounting bolts and nuts.

- B. Transformer-Type Base: Same material and color as pole. Coordinate dimensions to suit pole's base flange and to accept **[ballast(s)] [indicated accessories]**. Include removable flanged access cover secured with bolts or screws.

2.4 MOUNTING HARDWARE

- A. Anchor Bolts: Manufactured to ASTM F 1554, Grade 55, with a minimum yield strength of 55,000 psi (380,000 kPa).
- B. Nuts: ASTM A 563, Grade A, Heavy-Hex
- C. Washers: ASTM F 436, Type 1.

2.5 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 POLE FOUNDATION

- A. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Structural steel complying with ASTM A 36/A 36M and hot-dip galvanized according to ASTM A 123/A 123 M; and with top-plate and mounting bolts to match pole-base flange and strength required to support pole, luminaire, and accessories. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."
- B. Anchor Bolts: Install plumb using manufacturer-supplied **[steel] [plywood]** template, uniformly spaced.

3.2 POLE INSTALLATION

- A. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Section 033000 "Cast-in-Place Concrete."
- B. Foundation-Mounted Poles: Mount pole with leveling nuts and tighten top nuts to torque level according to pole manufacturer's written instructions.
- C. Poles and Pole Foundations Set in Concrete-Paved Areas: Install poles with a minimum 6-inch- (150-mm-) wide, unpaved gap between the pole or pole foundation and the edge of the adjacent

concrete slab. Fill unpaved ring with pea gravel. Insert material to a level 1 inch (25 mm) below top of concrete slab.

- D. Raise and set pole using web fabric slings (not chain or cable) at locations indicated by manufacturer.

3.3 CORROSION PREVENTION

- A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum using insulating fittings or treatment.
- B. Steel Conduits: Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50-percent overlap.

3.4 GROUNDING

- A. Ground Metal Poles and Support Structures: Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."
 - 1. Install grounding electrode for each pole unless otherwise indicated.
 - 2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.
- B. Ground Nonmetallic Poles and Support Structures: Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."
 - 1. Install grounding electrode for each pole.
 - 2. Install grounding conductor and conductor protector.
 - 3. Ground metallic components of pole accessories and foundation.

END OF SECTION 265613

SECTION 265619 - LED EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
2. Luminaire supports.

B. Related Requirements:

1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
2. Section 260926 "Lighting Control Panelboards" for panelboard-based lighting control.
3. Section 260943.16 "Addressable-Luminaire Lighting Controls" and Section 260943.23 "Relay-Based Lighting Controls" for manual or programmable control systems with low-voltage control wiring or data communication circuits.
4. Section 265613 "Lighting Poles and Standards" for poles and standards used to support exterior lighting equipment.

1.2 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color rendering index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating
- E. Lumen: Measured output of lamp and luminaire, or both.
- F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of luminaire.
- B. Shop Drawings: For nonstandard or custom luminaires.
 1. Include plans, elevations, sections, and mounting and attachment details.
 2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

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

C. Delegated-Design Submittal: For luminaire supports.

1. Include design calculations for luminaire supports and seismic restraints.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale and coordinated.

B. Seismic Qualification Data: For luminaires, accessories, and components, from manufacturer.

C. Product Certificates: For each type of the following:

1. Luminaire.
2. Photoelectric relay.

D. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.
2. Provide a list of all photoelectric relay types used on Project; use manufacturers' codes.

1.6 FIELD CONDITIONS

A. Mark locations of exterior luminaires for approval by Architect prior to the start of luminaire installation.

1.7 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 2 year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.

1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

2.2 LUMINAIRE REQUIREMENTS

- 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. UL Compliance: Comply with UL 1598 and listed for wet location.
- C. CRI of minimum 80. CCT of 4000 K.
- D. L70 lamp life of 50,000 hours.
- E. Lamps dimmable from 100 percent to 10 percent of maximum light output.
- F. Nominal Operating Voltage: 120 V ac.
- G. In-line Fusing: On the primary for each luminaire.
- H. Lamp Rating: Lamp marked for outdoor use.
- I. Source Limitations: Obtain luminaires from single source from a single manufacturer.
- J. Source Limitations: For luminaires, obtain each color, grade, finish, type, and variety of luminaire from single source with resources to provide products of consistent quality in appearance and physical properties.

2.3 LUMINAIRE TYPES

- A. Area and Site:
 1. Luminaire Shape: Per manufacturer.
 2. Mounting: Pole with extruded-aluminum rectangular arm, 9 inches (280 mm) in length.
 3. Luminaire-Mounting Height: 12'-0".
 4. Distribution: Type IV.

2.4 MATERIALS

- A. Metal Parts: Free of burrs and sharp corners and edges.
- B. Sheet Metal Components: Corrosion-resistant aluminum. Form and support to prevent warping and sagging.
- C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during

relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.

- D. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
- E. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
- F. Housings:
 - 1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
 - 2. Provide filter/breather for enclosed luminaires.

2.5 FINISHES

- A. Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- B. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.
- C. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
 - 2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20 requirements; and seal aluminum surfaces with clear, hard-coat wax.
 - 3. Class I, Clear-Anodic Finish: AA-M32C22A41 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
 - 4. Class I, Color-Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker), complying with AAMA 611.
 - a. Color: Dark bronze.
- D. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
 - a. Color: As selected from manufacturer's standard catalog of colors.
 - b. Color: Match Architect's sample of manufacturer's standard color.
 - c. Color: As selected by Architect from manufacturer's full range.

2.6 LUMINAIRE SUPPORT COMPONENTS

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

- A. Comply with NECA 1.
- B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.
- C. Luminaire shall feature integral lamp.
- D. Fasten luminaire to structural support.
- E. Supports:
 1. Sized and rated for luminaire weight.
 2. Able to maintain luminaire position after cleaning and relamping.
 3. Support luminaires without causing deflection of finished surface.
 4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.
- F. Wiring Method: Install cables in raceways. Conceal raceways and cables.
- G. Install luminaires level, plumb, and square with finished grade unless otherwise indicated.
- H. Coordinate layout and installation of luminaires with other construction.
- I. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.
- J. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and Section 260533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.2 INSTALLATION OF INDIVIDUAL GROUND-MOUNTED LUMINAIRES

- A. Aim as indicated on Drawings.
- B. Install on concrete base with top above finished grade or surface at luminaire location per lighting pole base detail on electrical drawings. Cast conduit into base, and finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Section 033000 "Cast-in-Place Concrete."

3.3 CORROSION PREVENTION

- A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.
- B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.4 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

- A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
 - 2. Verify operation of photoelectric controls.
- C. Illumination Tests:
 - 1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):
 - a. IES LM-5.
 - b. IES LM-50.
 - c. IES LM-52.
 - d. IES LM-64.
 - e. IES LM-72.
 - 2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
- D. Luminaire will be considered defective if it does not pass tests and inspections.

- E. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.6 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain luminaires.

END OF SECTION 265619

SECTION 500
INSTRUMENTATION AND CONTROL FOR LIFT STATIONS

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Contents: This Section Includes Information regarding the Process Control and Instrumentation System including logic controllers (and related hardware), control software systems, control systems programming, and controls system training.
- B. Related Sections: Specification sections directly related to the scope of this section include, but are not limited to the following:
1. Section 400 - 260519 – Low-Voltage Electrical Power Conductors and Cables
 2. Section 400 - 260533 – Raceways and Boxes for Electrical Systems
 3. Section 400 - 260526 – Grounding and Bonding for Electrical Systems
 4. Section 400 - 262419 – Monitor-Control Centers
 5. Section 400 - 262923 – Variable-Frequency Monitor Controllers
- C. Definitions:
1. PCIS: Process Control and Instrumentation Systems
 2. SCADA: Supervisory Control and Data Acquisition
 3. Terms and references for PCIS and SCADA can be used interchangeably within this section.
 4. ISA: International Society of Automation. ISA provides standards and guidelines for Instrumentation symbols, drawings, layouts, and general controls.
 5. PLC: Programmable Logic Controller
 6. RTU: Remote Terminal Unit. An RTU is generally equal to a PCIS panel that is mounted at any local or remote site. The RTU many times contains a PLC and/or radio or other control related equipment.
 7. HMI: Human Machine Interface. The HMI is normally referring to the system-wide computer software used within the PCIS or SCADA system and is used for operator interaction with the general system.
 8. OIT: Operator Interface Terminal. The OIT is normally referring to the local device and/or software used at a specific PCIS panel or SCADA RTU and is used for operator interaction with the local equipment.
 9. I/O: Inputs and/or Outputs, usually related to a logic controller or other smart controller.

10. Titles and Roles: The Following titles are used in the form of roles to define responsibilities and tasks described throughout this section.
 - a. OWNER: The Legal Owner of the facilities which will be added or modified as part of this project. The OWNER of this project is the City Of Sparks.
 - b. ENGINEER: The lead engineering firm or person employed by the OWNER and who will be providing consultation to the OWNER. The lead engineering firm for this project is Atkins - Reno. Contributing PCIS engineering is provided by Sierra Controls, LLC.
 - c. CONTRACTOR: The General Contractor who is hired to perform work, and provide goods, and services for this project.
 - d. SUPPLIER: The Contractor who is hired to supply, build, install and/or certify installation of PCIS equipment in compliance with this specification. The role of SUPPLIER for this project shall be performed by Sierra Controls, LLC. The SUPPLIER's representative is Andrew Ward and can be contacted at (775) 236-3350 or andreww@sierracontrols.com. The SUPPLIER shall work directly for the City.
 - e. INTEGRATOR: The Contractor who is hired to integrate all PCIS equipment associated with the sites added or modified as part of this project. The role of INTEGRATOR for this project shall be performed by Sierra Controls, LLC. The INTEGRATOR's representative is Andrew Ward and can be contacted at (775) 236-3350 or andreww@sierracontrols.com. The INTEGRATOR shall work directly for the City.
 - f. PCIS INSPECTOR: The Contractor(s) or Engineer(s) who is hired to inspect all PCIS related equipment and all PCIS related installations associated with the sites added or modified as part of this project. The role of PCIS INSPECTOR for this project shall be performed by the OWNER and/or ENGINEER (as designated by the OWNER). The PCIS INSPECTOR shall be employed by the OWNER and will NOT be part of the CONTRACTOR's contract.

1.02 DESCRIPTION

- A. General Contract Roles: General contract roles shall be as outlined in the following paragraphs as well as all other sections related to the PCIS and SCADA systems.
 1. The ENGINEER shall be responsible for providing design and project coordination services for the OWNER. The ENGINEER shall review contract documents, submittals, correspondence from the CONTRACTOR, and SUPPLIER, as well as other documents as required to assist with assuring the project is completed with the utmost quality and value for the OWNER.
 2. The CONTRACTOR shall be responsible for providing all PCIS equipment, complete and operational, in accordance with the contract documents. It is the intent of these specifications to have the CONTRACTOR be responsible for contracting to provide services and equipment to fulfill the individual roles of system SUPPLIER, and system INTEGRATOR. The requirements of this section, and others relating to it, define these roles as they pertain

to the equipment and services required to supply, integrate, and provide a complete and operational PCIS for the OWNER.

3. The SUPPLIER shall be responsible for providing equipment in accordance with the contract documents. All equipment submittals and equipment related correspondence provided by the SUPPLIER shall be coordinated such that it may be reviewed by all entities with listed roles in this project with the primary audience being the ENGINEER, INTEGRATOR, and PCIS INSPECTOR. Such submittal and correspondence shall be reviewed and approved by the INTEGRATOR and PCIS INSPECTOR prior to purchase by the SUPPLIER to verify that all project needs are met as understood by the INTEGRATOR or PCIS INSPECTOR and required by the OWNER. Primary methods of review and communication between the SUPPLIER and other entities shall be at the discretion of the CONTRACTOR. Unless communicated otherwise by the CONTRACTOR, e-mail and cloud-based file sharing shall be the primary medium for review and communication between the SUPPLIER and other entities and roles within this project. The SUPPLIER shall be responsible for providing complete and fully operational, loop tested PCIS equipment for integration and programming by the INTEGRATOR. All testing requirements detailed in this specification shall be completed by the SUPPLIER prior to handing the system over to the INTEGRATOR for subsequent programming and integration. All products and services provided by the SUPPLIER shall be subject to inspections and subsequent modifications as required by the PCIS INSPECTOR.
 4. The INTEGRATOR shall be responsible for integrating a complete and operational PCIS with appropriate and approved control methods, appropriate and approved logic programming styles and methods, appropriate and approved HMI/OIT styles and methods, and appropriate and approved file and naming structures in accordance with contract documents and existing PCIS components as directed by the OWNER. Unless directed otherwise, it is the responsibility of the INTEGRATOR to fully understand existing PCIS components within the OWNER's system and provide additions and changes to the existing PCIS in accordance with existing standards and/or practices. All products and services provided by the INTEGRATOR shall be subject to inspections and subsequent modifications as required by the OWNER.
 5. The PCIS INSPECTOR shall be responsible for reviewing all products and services, including mechanical, electrical, or any other discipline as related to the PCIS system within this project. The PCIS INSPECTOR shall enforce the standards and requirements of these specifications to satisfy the needs of the OWNER as well as the OWNER's established PCIS and SCADA system(s).
- B. General Project Overview: This project consists of supplying new PCIS equipment and integrating such equipment into the City of Sparks East Prater Way Storm Drain Lift Station Project as part of the City of Sparks stormwater management system. Monitoring of all equipment added or modified as part of this project shall be accomplished by adding or modifying communications, programming, and other components within the existing PCIS. Currently all master equipment, including the HMI, for the SCADA system is housed at the City of Sparks Town Hall.
- C. General Project Scheduling: Scheduling of field work for additions and modifications to PCIS equipment at each site shall be in accordance with the requirements of the OWNER. Generally this requirement dictates that the CONTRACTOR, SUPPLIER, and INTEGRATOR shall coordinate all activities with the OWNER in such a way that equipment downtime and outages are

minimized. Specific scheduling guidelines, where applicable, are provided later in this section for each site affected by this project.

1.03 REQUIREMENTS

- A. Due to the complexities associated with the interfacing of numerous control system devices, it is the intent of these Specifications that the INTEGRATOR work in conjunction with the OWNER, ENGINEER, PCIS INSPECTOR, and CONTRACTOR for the integration of the PCIS with devices provided under other sections, with the objective of providing a completely integrated control system free of signal incompatibilities.
- B. Minimum SUPPLIER Scope: The exact contractual relationship and scope definition shall be established exclusively between the CONTRACTOR and the SUPPLIER. It is the intent of these Specifications that the SUPPLIER, under the direction of the CONTRACTOR, shall assume full responsibility for the following, as a minimum:
1. Submit appropriate design and engineering documents for PCIS control panels and hardware, shop drawings, loop drawings, and spare parts submittals in accordance with the Contract Documents.
 2. Coordinate installation schedules with the OWNER and CONTRACTOR to minimize disruption of service at each site.
 3. Procure, furnish, and install all hardware required to conform to these specifications. Installation tasks shall be performed by experienced and qualified personnel who are familiar with the implications of their efforts related to the disruption of service at the site. If SUPPLIER provides the role of Panel Fabrication to fulfill the requirements of this paragraph, the requirements for "Panel Fabrication" as outlined later in this section shall apply to the SUPPLIER.
 4. Perform all required PCIS pre-delivery/installation hardware tests, adjustments, and calibrations.
 5. Prepare and conduct witnessed factory panel testing
 6. Oversee and certify hardware installation.
 7. Provide termination of equipment wires and cables.
 8. Provide proper marking and labeling of equipment wires and cables.
 9. Perform all required PCIS post-delivery/installation hardware tests, adjustments, and calibrations.
 10. Oversee, document, and certify loop testing.
 11. Edit existing loop drawings and control panel designs to show any and all changes to the design upon installation.
 12. Furnish all required PCIS related tools, test equipment, spare parts, and supplies.

13. Furnish all equipment related record drawings and operations and maintenance manuals for items provided by the SUPPLIER.
 14. Coordinate the handover of PCIS equipment for programming and integration by INTEGRATOR.
- C. Minimum INTEGRATOR Scope: The exact contractual relationship and scope definition shall be established exclusively between the OWNER, and the INTEGRATOR. It is the intent of these Specifications that the INTEGRATOR, under the direction of the CONTRACTOR, shall assume full responsibility for the following, as a minimum:
1. Provide an experienced and qualified lead SCADA engineer as Project Manager for the project. This person should have in-depth and successful integration experience with PLCs, radio telemetry, SCADA, systems, HMI systems, and more importantly this person shall have in-depth experience with the stormwater process(es) addressed in the project. This person should be intimately involved in the project and be prepared to champion the integration of the project for the OWNER.
 2. Review all submitted PCIS hardware and spare parts submittals provided by the SUPPLIER. The ENGINEER shall be responsible for the submittal process, but the INTEGRATOR shall be responsible for providing input and direction to the ENGINEER or PCIS INSPECTOR as required.
 3. Witness the factory panel testing if such testing is required.
 4. Witness all required PCIS post-delivery/installation hardware tests, adjustments, and calibrations where appropriate.
 5. Witness loop testing where appropriate.
 6. Procure non-equipment specific software and programming tools.
 7. Provide the development of all software programs including PLC, OIT, HMI, and all other PCIS related software.
 8. Integration and implementation of the PCIS.
 9. Startup and commissioning of the PCIS.
 10. Prepare the process and site test plan and/or commissioning plan and the training plan.
 11. Witness termination of hardware equipment and cables by the SUPPLIER where appropriate. Coordination of this effort shall be the responsibility of the INTEGRATOR.
 12. Compile and prepare technical manuals related to the PCIS.
 13. Compile and prepare completed set of record drawings using documents from the SUPPLIER for equipment provided by the SUPPLIER, and documents related to the integration of the PCIS provided by the INTEGRATOR.

- D. **Minimum PCIS INSPECTOR Scope:** The exact contractual relationship and scope definition shall be established exclusively between the OWNER or ENGINEER and the PCIS INSPECTOR. It is the intent of these Specifications that the PCIS INSPECTOR, under the direction of the OWNER or ENGINEER, shall assume full responsibility for the following, as a minimum:
1. Provide an experienced and qualified PCIS/SCADA engineer as inspector for the project. This person should have in-depth and successful integration experience with PLCs, radio telemetry, SCADA, systems, HMI systems, and more importantly this person shall have in-depth experience with the water or stormwater process(es) addressed in the project. This person should be intimately involved in the project and be prepared to champion the integration of the project for the OWNER.
 2. Review all submitted PCIS hardware and spare parts submittals provided by the SUPPLIER and the INTEGRATOR.
 3. Review all submitted general equipment and spare parts submittals provided by the mechanical, electrical, and other disciplines for items related in any way with the PCIS.
 4. Witness the PCIS factory panel testing if such testing is required.
 5. Witness all required PCIS post-delivery/installation hardware tests, adjustments, and calibrations where appropriate.
 6. Witness loop testing where appropriate.
 7. Witness termination of hardware equipment and cables by the SUPPLIER or CONTRACTOR where appropriate. Coordination of this effort shall be the responsibility of the INTEGRATOR.
 8. Inspect any and all equipment (mechanical, electrical, or otherwise) modified or added as part of this project that is PCIS/SCADA related with the intent of supporting the success of the PCIS portion of this project for the benefit of the OWNER. This includes inspecting for proper installation methods, termination methods, proper locations, wire labeling, pipe labeling, equipment labeling, setup, configurations, operator accessibility, etc. The inspector shall not be limited in making recommendations to the various entities for improvements and or compliance with the contract documents. Items deemed important to the success of the project but not covered in the contract documents shall be recommended to the ENGINEER for consideration.
- E. **Panel Fabrication**
1. PCIS panel fabrication and testing shall be provided by a qualified panel building facility with a minimum of five (5) years of experience in the control and SCADA systems industry.
 2. The PCIS panel building facility shall be located within 150 driving miles of the main office of the OWNER. This allows the OWNER, ENGINEER, INTEGRATOR, or PCIS INSPECTOR to visit the facility for testing (if required and/or desired) and return within a day.
 - a. Exception: For manufacturing facilities located greater than the specified driving miles from the PLANT that wish to supply panels, the SUPPLIER agrees to pay all related

travel expenses including mileage, airfare, hotel and meals in accordance with standard federal expense guidelines as part of the basic bid package. Travel costs shall be based on two separate trips each consisting of two witnesses for a minimum of two days. Distances greater than 150 miles will require airfare and associated ground transportation from Reno/Tahoe (RNO) airport. No manufacturing facilities outside the continental US will be considered or allowed for this exception.

F. Equal Equipment:

1. These specifications require the provision and installation of specific equipment, software, and other PCIS items pertinent to the project. Such equipment has been selected and specified for the benefit of an operational and long-lasting PCIS system for the OWNER.
2. Equipment specified as having “no equal” or “no substitution” shall be provided as specified.
3. Equipment specified as having substitutes in the form of an “approved equal” shall only be provided and/or installed following submittal by the requesting party and receipt of approval by the ENGINEER, the INTEGRATOR, and the PCIS INSPECTOR.
4. “Approved equal” equipment shall be provided and installed at no additional cost to the OWNER or other entities or roles related to this project. Additional engineering or other services required to accommodate such equipment shall be provided by the requesting party.

1.04 SUBMITTALS

- A. Submittal information provided by the SUPPLIER shall be incorporated into the final manual developed by the INTEGRATOR. The INTEGRATOR shall coordinate the transfer of all materials from the SUPPLIER. Minimum specific requirements for PCIS submittals shall include the following:
1. Submittals shall be provided in the form of a portable electronic document in pdf file format.
 2. Submittals shall be produced in a format that allows for later intentional use and inclusion in the PCIS Operations and Maintenance manual.
 3. The first page of the submittal shall include the name of the OWNER, the project name, the submittal name, the submittal date and revision, and the filename used for the pdf file in which is provided.
 4. Drawings shall be produced such that when printed all native scaling is accurate and appropriately represented on 11x17 sheets of paper.
 5. Each product submitted shall have an appropriately sized set of submittal pages for the product.
 - a. The first sheet of the set (for each product) shall be a cover page containing the following items.
 - 1) Item name

- 2) ISA or other instrument/equipment designator (if assigned within the contract documents or developed as part of the project)
 - 3) Listing of all pertinent specification sections (including notation of the location in the specifications section)
 - 4) Listing of All Pertinent drawing sheet references
 - 5) Manufacturer's Name
 - 6) Manufacturer's series, model, and part number
 - 7) Short Description of Item
 - 8) Listing of all locations and/or sites where the item is to be installed
 - 9) Listing of All loops in which the item will be incorporated.
 - 10) Listing of exceptions. This field shall not be left blank and shall contain pertinent description and detail of any exceptions taken to the requirements of the contract documents for the submitted item. If no exceptions are taken for the item this field shall include markings such as "None". If this field is left blank the submittal may be rejected at the discretion of the ENGINEER.
 - 11) General remarks or notes as appropriate
- b. The second and following sheets of the set shall include pertinent submittal information for the item.
 - c. Submittal documents shall be neatly and clearly marked so as to represent the actual equipment to be provided. Sections of the pages that do not apply shall be marked or crossed out to minimize confusion for the exact model or part number represented.
 - d. Submittal sets for items requiring more than several sheets of paper shall include a table of contents and a bookmark to separate each topic of the submittal set such as bill of materials, test data, drawings, and other information.
 - e. Information provided within the set shall include appropriate product brochures, data sheets, and bulletins which include specifications for power, environmental operation and storage conditions, connections, process ratings, accuracies, appropriate chemical compatibilities, and other information pertinent to the specifications such that the product can be verified as compatible with the requirements of the specifications.
6. Multiple instances of the same product may be combined into one set as long as the cover sheet for the set clearly indicates all instances for which the submittal data applies.
- B. A spare parts submittal shall be provided for any PCIS equipment requiring spares. This submittal shall be similar to the hardware and equipment submittal described above. The cover sheet page shall indicate what equipment the spare part is used with. If no spare parts for PCIS equipment are required as part of this project, this spare parts submittal shall consist of a cover page as described above stating that no spare parts are required.

- C. A special tools submittal shall be provided for any PCIS equipment requiring special tools. This submittal shall be similar to the hardware and equipment submittal described above. The cover sheet page shall indicate what equipment the special tools are used with. If no special tools for PCIS equipment are required as part of this project, this special tool submittal shall consist of a cover page as described above stating that no special tools are required.
- D. Verification of Specifications Review and Acceptance: The submittal package, as provided by either SUPPLIER or INTEGRATOR, shall include a formal memo to the ENGINEER indicating that this section of the specifications has been read, reviewed, and accepted by the submitting party. General exceptions, if any, to this section shall be documented in the memo. Product specific exceptions may be duplicated in the memo if desired, however all product specific exceptions shall be included and documented on the cover sheets of each product as specified above. If this memo is omitted, the submittal package may be rejected with no further comment at the discretion of the ENGINEER.

1.05 TECHNICAL MANUAL

- A. A technical manual shall be developed and provided by the INTEGRATOR for use with the PCIS.
 - 1. The technical manual shall be developed throughout the duration of the project. At the time of expected substantial completion the technical manual should be near completion and available in draft form for use during testing and start up. To allow for updated and final control descriptions, as well as updated and final as-built drawings, the final technical manual shall not be required for submittal until 10 days after final completion, startup, or final testing whichever is later. Final payment to the SUPPLIER and the INTEGRATOR shall not be allowed until the technical manuals required of the SUPPLIER are submitted and approved. Final payment to the INTEGRATOR shall not be allowed until the technical manuals required of the INTEGRATOR are submitted and approved. Technical manuals for which the control descriptions or as built drawings are not updated after final completion, startup, and testing shall be rejected without comment.
 - 2. The manual shall be provided as a portable electronic document in pdf file format. Care should be taken during the development of the technical manual to allow for paper and electronic versions that are compatible in format such that the electronic version can be printed at any time to produce a similar paper version.
 - 3. Sections shall include information developed throughout the project. The format of the manual shall be at the discretion of the INTEGRATOR such that general information and site-specific information can be appropriately separated. When multiple sites are affected by the project, the technical manuals shall include sections with site-specific information in addition to the general sections.
 - 4. Sections shall be included with information for all PCIS equipment which has been installed or modified as part of this project. Within the documentation for each site, PCIS equipment information shall include but not be limited to the following.
 - a. As-Built drawings
 - b. Coordinated instrument lists and loop lists

- c. Control descriptions that are functional and accurate such that an operator could use the control description to operate equipment within the PCIS
 - d. Communications parameters and addresses
 - e. Loop drawings (when loop drawings are required) in a format as close as practical to ISA 54 formats
 - f. Equipment submittals (up to date and complete including any and all changes throughout the project)
 - g. Signed test results
 - h. PLC and OIT field replacement guidelines and training material. This portion of the document shall provide detailed instructions for use by OWNER's operators in the situation where a PLC or OIT must be replaced in the field and then programmed using the latest version of the appropriate program for the equipment. Guidelines and training material shall include all steps to download the programs as well as activate pre-determined default setpoints required for the PLC to run.
 - i. OIT and HMI operational guides (either in printed or electronic form)
 - j. Software operational manuals (either in printed or electronic form)
5. Security Information: The technical manual will inherently require the inclusion of secure information that should be protected to the best extent possible. To help with this intent the following items shall only be visible in the final electronic version of the manual that is provided to the OWNER and shall NOT be visible or included in any draft version or submittal version of the manual.
- a. Network IP addresses, including gateways, etc.
 - b. Modbus ID addresses
 - c. Passwords for any hardware or software
 - d. Other information deemed secure by the OWNER, ENGINEER, or INTEGRATOR.

1.06 MEETINGS

- A. The SUPPLIER, INTEGRATOR, and PCIS INSPECTOR shall be required to attend progress or coordination meetings as required and organized by the ENGINEER. The minimum frequency, duration, and location of meetings shall be as indicated in other sections of the contract documents. At a minimum the SUPPLIER, INTEGRATOR, and PCIS INSPECTOR shall plan to attend miscellaneous meetings at least twice prior to PCIS installation as well as weekly progress meetings during active PCIS installation, testing, and startup. The SUPPLIER shall not be required to attend weekly meetings once equipment and installations have been tested per the requirements of the specifications.

1.07 WARRANTY

- A. Equipment and materials provided by the SUPPLIER that do not achieve the required design requirements, or demonstrate possibilities of defect or workmanship, shall be replaced or modified by the SUPPLIER to attain compliance.
- B. Programming and integration services provided by the INTEGRATOR that do not achieve the required design requirements, or demonstrate possibilities of defect or workmanship, shall be replaced or modified by the INTEGRATOR to attain compliance.
- C. The warranty period for all equipment, materials, installation, and integration services provided by the SUPPLIER and INTEGRATOR shall be one year from the date of final acceptance of the PCIS portion of the project or one year from substantial completion, whichever is later.
- D. All work and equipment costs required for warranty work shall be at no extra cost to the OWNER.
- E. Following any warranty work the SUPPLIER and/or INTEGRATOR shall retest the system components affected by the warranty work to verify compliance with the requirements of the contract documents.
- F. If warranty work is performed prior to final completion of the project, the ENGINEER shall be responsible for acceptance of the warranty work. If warranty work is performed following final completion of the project the OWNER shall be responsible for acceptance of the warranty work.

PART 2 – MATERIALS

2.01 GENERAL

- A. Code and Regulatory Compliance: All PCIS work shall conform to applicable requirements of the National Electrical Code and local building codes.
- B. Hardware Commonality: All PCIS equipment which utilizes a common function, such as a PLC for logic control, or pressure transmitter for pressure monitoring, or any other instrument or device for which multiple units may be required within the project, shall be furnished by a single manufacturer with models matching existing owner desired equipment. It is the responsibility of the INTEGRATOR to maximize hardware commonality to the greatest extent feasible.
- C. Loop accuracy: Loop accuracy shall be as determined by the combination of the individual accuracy of the analog circuit (including PLC and any isolation equipment) AND the individual accuracy of the instrument or equipment being monitored or controlled. Requirements for the individual accuracy of instruments shall be as indicated in the specifications for the instrument.
 - 1. Calculation of anticipated accuracy (when required) for the loop shall be the square root of the sum of the squares of anticipated or certified accuracy of all the components in the loop.
 - 2. Field verification of loop accuracy (when required) shall be calculated based on five measured values checked against known values during testing procedures. Testing values at a minimum shall include 0%, 25%, 50%, 75%, and 100% of span.
 - 3. For the purpose of field verification, when an instrument can provide simulated or driven values, such values shall be used to test the loop. When in instrument cannot provide simulated or driven values, the process for which the instrument is providing measurement shall be adjusted where feasible to provide the required testing points. Unless specifically addressed in the specifications, adjustments to the process which are either unfeasible or destructive shall not be required for loop testing.

2.02 PCIS AND CONTROL PANEL EQUIPMENT

- A. Existing Equipment
 - 1. All PCIS equipment will be new at the site. No existing equipment will need to be addressed by the CONTRACTOR or INTEGRATOR.
- B. Modified and New PCIS Equipment
 - 1. PCIS General Requirements
 - a. Function: Each PCIS panel installed or modified as part of this project shall function as a stand-alone unit and shall perform all of the functions specified for the respective site or installation described in these specifications. The PCIS panel shall be microprocessor based. The PCIS panel shall have the capability to accept digital inputs, analog inputs, pulse inputs, and counter inputs. The PCIS panel shall produce digital outputs, perform local control and data manipulation functions, transmit measured and calculated values to other sites and equipment as specified, and accept configuration data from the master computer or other sites as required.

- b. Environmental: The intent of this design is to provide equipment that as much as feasible can function normally in the Tahoe environment without the requirement of ancillary heating and cooling. Expected ambient temperatures are between -10 F and 110 F. Enclosures with heaters are permissible and expected where required for moisture reduction or panel heating but the primary control equipment shall be selected and installed with the intended operation to be within the published environmental specifications for such equipment without supplementary heat in the enclosure as is experienced during a power fail condition. As the RTU battery is expected to last for a specified duration without utility power, the primary control equipment is also expected to function in an unheated environment for the equal amount time or greater. It is understood that some equipment will not fully meet such a requirement, but this equipment shall be the exception, and in all cases where possible, shall not be primary control components or instruments.
- c. Programmable Logic Controller (PLC): To maintain common parts and compatibility with existing equipment, the PLC in each PCIS panel installed or modified as part of this project shall be equipped with the SCADAPack 350/357 series of controllers as manufactured by Schneider Electric. The specific model to be used at each PCIS panel shall be as indicated in the equipment tables included below.
- d. Serial Devices: The PLC shall be selected to provide for specific serial devices as listed and approved in the I/O list. Local serial communications shall be kept within the limits of 50 feet of cable. Cable and wiring types shall be according to manufacturer specifications for both the PLC and the serial device. The communications protocol used between the PLC and the serial device shall be Modbus. Exceptions for other protocols shall only be allowed upon special approval by the INTEGRATOR and the ENGINEER.
- e. PLC Programs: The PLC in the PCIS panel shall be programmed in Telepace ladder logic for all control functions. "C" programs are acceptable for communications and computing functions but are not encouraged unless necessary to accommodate requirements that are not easily met using ladder logic.
 - 1) Subroutines: Programming logic shall include subroutines for appropriate division of tasks where needed.
 - 2) Programming logic shall include startup/default setpoints required for the PCIS to function normally and shall have the ability to apply such startup/default setpoints during specific situations. This logic will effectively provide startup/default setpoints upon installation of a new PLC, a reprogrammed PLC, or in a situation where PLC memory has been erased for maintenance purposes. This logic shall be integrated into the program in the form of a subroutine. The trigger for this subroutine shall occur only upon PLC boot and shall be based upon a pre-determined revision number stored within the PLC as a standard unsigned register. The revision number shall consist of a four or five digit number that represents the site ID and the program revision. For example, for site 15 with a program revision of 3, the revision number shall be 1503. Upon any boot of the PLC, if the currently stored revision number is not greater than or equal to the hardcoded revision number in the ladder logic, the subroutine is run to move all startup/default setpoints, including the hardcoded revision number, into their operational registers. This logic will effectively provide

startup/default setpoints upon installation of a new PLC (or PLC where memory has been erased) since the stored revision number will be zero, thus the subroutine will be commanded to run and populate the setpoints and revision number. As future revisions are made to the PLC program, startup/default setpoints and revision numbers shall be hardcoded into the subroutine by the programmer for future use as required.

- 3) PLC Register Monitoring Group For Site Commissioning: The Telepace Studio file for the PLC shall include a custom monitoring group named “Required To Run” and shall contain every setpoint or parameter required for the PLC to run in a normal state for the site. This custom group allows the user to view and modify setpoints as required to commission the entire site for normal operation all in one place. This custom group shall not include any informational registers or other non-setpoint registers. Such informational or non-setpoint registers should be included in other custom groups based on process, equipment, instrument, or subject of control. Upon commissioning a site and enabling the monitor mode in Telepace Studio, the operator should be able to review this custom group and manipulate a list of well-defined tags with their live setpoint values, all in one place.
- 4) PLC Analog Scaling: Analog input signal scaling shall be performed within the PLC logic. Operator adjustable setpoints shall be located within the factory set up OIT screens for the system. These screens are not intended to be used by the operator, but rather are used for detailed configuration by the integrator or the installer. Please note that if incorrect values are entered into these setpoints the system will likely not function correctly. Signal scaling takes into consideration a number of parameters and values including the following:
 - a) Signal high limits
 - b) Signal low limits
 - c) Signal fail logic
 - d) Raw count limits for clamping
 - e) Zero scale parameters
 - f) Engineering full scale parameters
 - g) Offset parameters
 - h) Scaling logic

PLC programming shall incorporate programmed analog scaling that is configurable, and which produces a signal fail alarm for the channel without using hardware alarms for out of range signals. Analog scaling setpoints for each analog input and output (if used) shall be operator adjustable on the OIT using password protected factory setpoint windows. Setpoints shall be labeled or named for the actual input or output instrument used in the field.

- 5) Equipment Spindown: All discrete outputs for rotating equipment shall include spindown timers that inhibit the re-energizing of the output for a preset period of time once the output is de-energized.
- 6) Debounce: All discrete inputs shall include logic for debounce.
- 7) Alarm Grouping: Alarm grouping shall be implemented such that if specific alarms are active, other alarms are inhibited because they are a consequence of the underlying alarm. For example, if there is a site power fail alarm, the alarms that are consequences of no utility power such as RTU power fail alarm, flowmeter signal fail, and possibly others shall be inhibited until the site power fail alarm is no longer active. It shall be the responsibility of the INTEGRATOR to define all possible alarm groups and coordinate with the OWNER for approval of the groups and their consequences.
- 8) Local Alarm Latching / Inter-poll Alarming: Some alarms generated by the local PCIS are of such a severity that the operator should be absolutely notified that the alarm has been present even if the alarm was active only for a short period of time and was consequently not active during a communications polling cycle between the HMI and the PLC at the site. In such a case, even though the OIT may present the alarm as having been active, the operator will not be aware through the HMI that the alarm was active between polling cycles. Since Modbus is the current protocol being used, it is the responsibility of the INTEGRATOR to create a list during project development of all alarms generated by the PLC at the site for alarm notification at the HMI and coordinate with the OWNER regarding possible use of latched alarms or parallel latched alarms (where the primary alarm is not latched but the parallel alarm is latched in order to guarantee presence during a poll and providing subsequent notification) for some or all alarms at the site. For all alarms that require the use of latches, the alarm shall latch upon becoming active and shall remain latched until reset by the operator either using the OIT or the HMI. Future use of more advanced protocols such as DNP3 or others will likely affect the decisions made while negotiating the list of alarms and therefore alternative methods for the control of missed alarms should be considered by the INTEGRATOR and the OWNER rather than latching all alarms for the site.
- 9) Remote Pump Control: Remote pump control logic shall include the ability for the operator to initiate or clear a pump call using pushbuttons on the OIT or the office HMI. When the operator uses a pushbutton on the OIT or HMI to initiate a pump call, the PLC logic latches the standard lead pump call as if the start level had been achieved. If the current level in the wetwell is already below the off level when the pushbutton to initiate a call is depressed, the action to initiate the call shall have no effect on the latching pump call. When the operator uses a pushbutton on the OIT or HMI to clear (or cancel) a lead pump call, the PLC logic unlatches the standard lead pump call as if the stop level had been achieved. If the current level in the wetwell is already above the lead start level, the action to clear the pump call shall have no effect on the latching pump call. Remote pump controls shall only initiate or clear the lead pump call and shall never directly control (such as manually energize or inhibit) the pumps in any way. If the operator wishes to manually control one of the pumps such that it is manually

energized or manually inhibited, such action shall be available only on-site using the HOA switch for the pump.

- f. **Operator Interface Terminal (OIT):** Each lift station PCIS panel added or modified as part of this project shall be equipped with a new OIT to provide trained operating personnel the ability to read process values and change setpoints without the use of or connection to external devices. The OIT shall be Maple Systems HMI5070P touchscreen using both Ethernet and serial communications cabling. The OIT shall communicate with the PCIS LAN via Ethernet for remote access, programming, and testing. The OIT shall communicate with the PLC for PCIS display data via serial communications only. The OIT shall not communicate with the PLC via Ethernet communications for PCIS data to be displayed on the OIT. When the OIT is properly configured, this requirement provides greater dedicated data throughput and guarantees that Ethernet communications within the RTU are not overwhelmed to the point that PLC to Office communications are diminished if OIT Ethernet settings are inadvertently adjusted too fast. This also allows for unimpeded remote VNC connections to the OIT depending on the communications media for the site.
- g. **Communications Equipment:** New cellular communications equipment is required as part of this project and shall be of same model as currently integrated into the existing SCADA system, or as currently planned for integration into the existing SCADA system, whichever is latest. See additional information elsewhere in this section.
- h. **Power Supply and Battery Charging System or Combination Power Supply/ DC UPS:** Each lift station PCIS panel added or modified as part of this project shall be equipped with a high-quality AC to DC power supply and either a battery charging system and appropriately sized battery for backup power, or an appropriately sized combination power supply/DC UPS and battery. An AC UPS shall not be allowed. Sizing of backup power shall be such that the local PCIS panel, including instruments powered by the PCIS panel in any way, shall be powered and operational for a period of 24 to 36 hours in the case of a utility power failure, blown fuse/tripped breaker, power supply failure, or any failure removing full time AC power to the PCIS panel. Battery sizing information shall be included in the submittal. The RTU drawings show the recommended power supply and battery charging system and circuit that creates a robust true online DC UPS system similar to what has been used within the District for many years. For the combination power supply/DC UPS equipment alternative, the SENS Microgenius2 series, including Modbus monitoring, shall be used.
- i. **Surge Protection:** Surge protection shall be provided for all circuits that span more than one facility grounding plane or leave the facility grounding plane where the PCIS panel is located. Surge protection includes all I/O and all communicating equipment based on these guidelines regardless of whether recommended or required surge protection may or may not be listed in the equipment tables below.
- j. **Loop Isolation:** Loop isolators shall be used in any and all loops where grounding issues can develop signal interference. Installations in which a VFD or similar equipment is installed shall be evaluated for interference when the VFD or similar equipment is actually running. Final drawings shall include all loop isolation equipment.

- k. Enclosures: Enclosures shall be NEMA rated for their appropriate installation. All uncovered outdoor enclosures shall be NEMA 4 (minimum) for PCIS control equipment and NEMA 3R for batteries or installations where fume-based ventilation is required. All indoor enclosures shall be NEMA 12 (minimum) for PCIS control equipment and NEMA 3R for batteries or installations where fume-based ventilation is required. For chemically harsh environments, enclosures shall be stainless steel NEMA 4X. For covered outdoor enclosures, NEMA 3R enclosures will be considered for PCIS control equipment based on the level of protection provided by the cover. Enclosures shall be provided as indicted in the equipment tables below.
- l. Enclosure Heaters: Enclosure heaters shall be required when the PLC, OIT, or associated ancillary equipment is installed in an outdoor enclosure for the primary purpose of managing moisture and the secondary purpose of accommodating the parts that have the least forgiving low temperature ratings. Heaters shall not be used to heat an enclosure because a primary control component was improperly selected for the cold environment.
- m. Labels and Nameplates: All new wires, instruments, and enclosures installed as part of this project shall contain labels and nameplates in accordance with this or other sections in the contract documents.
- n. Pump Run Status Indication: Pump run status indication for any major pump or other significant piece of rotating equipment shall be provided using a dedicated current switch installed around one motor lead per motor. Use of motor starter auxiliary contacts shall not be permitted for PLC inputs but shall be allowed for panel mounted status lamps. The location of the current switch installation shall be field determined. Such location shall meet the switch manufacturer's requirements for sufficient space as well as general PCIS requirements for separation of DC signals from AC circuits.
- o. Flowmeter Communications: Flow metering equipment shall include Modbus (serial RS-485, RS-422, or Ethernet) communications to allow the PLC to directly poll the flowmeter for totalization data. Appropriate signal cable shall be provided and installed in conduit between each flowmeter or flowmeter transmitter and its respective PCIS panel to accommodate the Modbus communications signal.
 - 1) Flow Totalization: Flow total values displayed on the flowmeter/transmitter display shall be in units of tenths of kGals. Primary flow totalization within the flowmeter/transmitter shall be non-resettable by the operator. Secondary (and additional) resettable flow totalization values may be included on the display or in the PLC if required by the OWNER, but primary values shall not automatically reset or have readily available means for a manual reset. Flow total values shall be polled from the flowmeter by the PLC using standard Modbus functions and registers. Flow totalization values shall be integrated into the PCIS and displayed on each local OIT as well as the HMI. Units for flow totalization shall be converted in the PLC as required and displayed at the OIT and HMI as tenths of kGals, thus the level of viewable unit of granularity is 100 gallons while the major unit of totalization is 1,000 gallons.
 - 2) Flow Rate: Flow rates displayed on the flowmeter/transmitter display shall be in units of GPM. Flow rate values shall be polled from the flowmeter/transmitter by the PLC using standard Modbus functions and registers. Flow rate values

shall be integrated into the PCIS and displayed on each local OIT as well as the HMI. Units for flow rate shall be converted in the PLC as required and displayed at the OIT and HMI as GPM. Alternative units shall be MGD only if directed by the OWNER.

- p. **Signal Wiring and Conduits:** All signal wires for any and all instruments or DC signaling devices, including but not limited to flowmeters, transmitters, transducers, sensors, and communications signals, shall be run in appropriate conduits and raceways such that AC power is never included in the same conduit or raceway as the DC wires or signals listed above. All AC power shall be appropriately located in a separate conduit or raceway from DC signal wiring. When DC signal wiring and AC wiring are required to be together within an enclosure for the purpose of connecting the same piece of equipment, separation between AC and DC wiring shall be maximized and crossings shall be kept at right angles to the greatest extent possible. All Ethernet cabling that passes through an MCC section or enclosure containing switching gear, starters, VFDs or similar equipment shall have 600V insulation.
- q. **Circuit Breakers and Fusing:** Circuit breakers and/or supplementary protectors shall only be allowed for non-critical or slow reacting power systems (such as panel lamps or AC convenience receptacles) or panel AC supply to the main DC power supply and shall not be used as primary protection devices for PLCs, radios, OIT's or other such electronic devices within any portion of the PCIS. Such devices shall be protected by fuses, no exceptions. Power buses for PLC I/O and instruments shall be protected by fuses, no exceptions. All fuse holders shall be finger-safe and of the swing-out or removable terminal block type. Fuse holder manufacturer and series shall match that of the terminal block manufacturer and series where possible. Blown fuse indicators are not required and are not recommended due to false indications at PLC inputs under specific conditions.
- r. **Instrument Communications Monitoring:** For any usage of Modbus or any other means of communicating with an instrument, the communications scheme shall incorporate integrity monitoring of the polling cycle. Where feasible, watchdog values are preferred. Where watchdog values are not producible in the instrument, built-in diagnostics shall suffice for this requirement. In any case, monitored values and/or diagnostics shall be made visible at the OIT for troubleshooting of communications with the instrument. Generally, all polled communications shall incorporate Communications Fail alarms based on field data such as watchdog values where possible and not upon polling statistics.

C. Site-Specific Requirements

1. Lift Station RTUs.

- a. **General Information:** A new stormwater lift station site will be constructed with new pumping equipment, new PCIS equipment including ancillary instruments or supporting equipment.
 - 1) **Lift Station:** This site collects stormwater from the City of Sparks collection system. A new PCIS panel (RTU Panel) shall be required for this site.

During construction, the SUPPLIER and/or CONTRACTOR shall mount each new PCIS enclosure and shall install new instrumentation according to the tables below. The CONTRACTOR shall also provide all conduit and wiring between each instrument and the PCIS enclosure. All instrument wiring shall be terminated by the SUPPLIER at the PCIS panel and the instrument. Once all PCIS equipment is tested and verified by the SUPPLIER, the INTEGRATOR shall complete all programming. Tasks within this project include the provision, installation, and integration of a new PCIS panel to provide a new PLC, OIT, and other PCIS equipment.

- b. Cellular Communications: Primary communications with the office network and HMI shall be cellular router based and shall match the OWNER's designated standard equipment. A new cellular router shall be installed as part of this project.
- c. Pump Control: Each Lift Station site shall be equipped with across the line starters, soft starters, or VFDs for electrical/rotational control of the pump motors. Each starter shall be equipped with the appropriate inputs and outputs to accommodate the requirements of these specifications as outlined in the I/O list (Table 3) for this site. Substitutions for other signal types shall not be allowed. It is the responsibility of the CONTRACTOR to provide and install the proper motor starter containing the proper I/O as required. It is the responsibility of the INTEGRATOR to verify that the submittal provided by the CONTRACTOR for the motor starter substantiates the I/O requirements as listed in the I/O list for the site. All power cabling, including supply and load cables shall be terminated and tested by the CONTRACTOR. All signal wires shall be installed by the CONTRACTOR and terminated by the PCIS SUPPLIER.

Detailed requirements for automatic and manual pump control are provided in the Control Description portion of this Section of the contract documents. It is the responsibility of the SUPPLIER to provide the appropriate control equipment such that the pump system can be controlled in both manual and automatic conditions. It is the responsibility of the INTEGRATOR to program the PLC and provide control logic according to the control description provided.

- d. Backup Float System: Each Lift Station shall contain PCIS equipment that allows for simple redundant pump control via a backup float system. This backup float system shall have no dependency on the PLC or primary level instrument in any way. The PLC however will monitor the backup float system to display and alarm anytime the backup float system is actively controlling one or more pumps. Additional requirements for automatic pump backup float control and how it is alarmed is provided in the Control Description portion of this Section of the contract documents. Intrinsically safe equipment protection for the two floats used in the backup float system shall be provided by the Intrinsically Safe Relay (ISR) float controller used along with properly separated wiring for the mounted location of the ISR controller and the wiring to the wetwell. It is the responsibility of the SUPPLIER to provide the backup float system hardware and equipment according to the control description provided and the requirements listed throughout this section. The backup float system is hardwired into the pump controls and therefore no programming (other than the monitoring of an active backup system) shall be required for the float backup system.
- e. High Wetwell Alarm Float: Each Lift Station shall contain PCIS equipment that allows for a "High Wetwell Alarm Float" for wetwell level high indication. This float is not included as part of the backup float system discussed above but is rather a DC powered

(via RTUs DC power system) high wetwell alarm float which will provide alarming for a high wetwell condition regardless of AC power or control conditions. Additional requirements for the High Wetwell Alarm Float are provided in the Control Description portion of this Section of the contract documents. Intrinsically safe equipment protection for the float used in the High Wetwell Alarm Float system shall be provided by a dedicated Intrinsically Safe Barrier (ISB) with properly separated wiring for the mounted location of the ISB and the wiring to the wetwell. It is the responsibility of the SUPPLIER to provide the High Wetwell Alarm Float hardware and equipment according to the control description provided and the requirements listed throughout this section.

- f. Responsibilities: Table 33 09 30-1: Lift Stations – List of Responsibilities provides the general list of tasks and responsibilities for these sites. Deviations from this table shall only be allowed upon approval of the ENGINEER.
- g. New PCIS Equipment: Table 33 09 30-2: Lift Stations – List of New PCIS Equipment provides a detailed list of new equipment required for the development of the new PCIS panels at these sites. All equipment in this list shall be provided as listed. Substitutes or equals shall be permitted as listed in the table.
- h. PCS I/O: Table 33 09 30-3: Lift Stations – List of PCIS I/O provides a listing of all I/O for these sites. Additional requirements for items in this list may be found elsewhere in the contract documents.
- i. New PCIS Instruments: Table 33 09 30-5: New PCIS Instruments provides a list of new instruments required as part of this project. This list includes one or more instruments that are required for these sites. All instruments in this list shall be provided as listed.

Table 33 09 30-1: Lift Stations - List of Responsibilities

| Item | Responsibility |
|---|--|
| Provide, install, wire, and terminate new electrical distribution, grounding, motor starters and soft starters (except PCIS signals) | CONTRACTOR |
| Provide new PCIS panel enclosure | SUPPLIER |
| Provide new instruments | SUPPLIER |
| Provide new or updated PCIS related conduit and wiring list for site. Take lead for coordination of this list with others. | SUPPLIER |
| Coordinate installation of instruments | SUPPLIER, CONTRACTOR |
| Install instruments (piping related instruments such as flow tube elements and annular elements installed by CONTRACTOR) | SUPPLIER, CONTRACTOR |
| Install new PCIS panel enclosure (empty enclosure only if required by the supplier) at site and install new conduit and wiring per electrical specifications (and PCIS related conduit and wiring list by SUPPLIER) to all instruments and PCIS related equipment | CONTRACTOR |
| Provide and install new PLC and OIT | SUPPLIER |
| Terminate and label wires for PCIS and instrumentation | SUPPLIER |
| Terminate and label wires for pump equipment (panel and field) | CONTRACTOR |
| Perform PCIS related electrical and loop testing | SUPPLIER |
| Provide PLC programming and testing | INTEGRATOR |
| Provide OIT programming and testing | INTEGRATOR |
| Provide functional system testing | SUPPLIER, CONTRACTOR, INTEGRATOR |
| Provide PCIS/SCADA integration (wireless link, HMI, alarm notification) | INTEGRATOR |
| Provide detailed documentation including as-built drawings and technical manual for supplied PCIS equipment | SUPPLIER |
| Provide detailed documentation including as-built programming and technical manual for programmed PCIS equipment | INTEGRATOR |
| Provide PCIS training | INTEGRATOR |
| Provide PCIS Inspections of all PCIS related equipment including mechanical and electrical | PCIS INSPECTOR |

Table 33 09 30-2: Lift Stations – List of New PCIS Equipment

| Description | Manufacturer | Model/Series | Part Number | Substitutions | Quantity |
|--------------------------------------|--------------------|-----------------------|------------------|-------------------|-------------|
| PCIS enclosures and appurtenances | As Approved | As required | As required | - | As required |
| 24VDC Power Supply | Allen Bradley | 1606-XLP Series | As required | SENS as specified | 1 |
| Battery Charger | Sierra Controls | | 73-091AA | | 1 |
| Programmable Logic Controller | Schneider Electric | SCADAPack 357 series. | As required | None | 1 |
| Pilot lamps and selector switches | Allen Bradley | As required | As required | None | As req'd |
| Operator Interface Terminal | Maple Systems | 5000 Series | HMI5070P | None | 1 |
| Ethernet Switch | Moxa | - | SDS-3008-T | None | 1 |
| Cellular Router | Pepwave | Max BR1 Series | As Required | None | 1 |
| Terminal Blocks/Fuse Holders | Allen Bradley | As required | As required | None | As req'd |
| Pilot Relays and Bases | IDEC | RH Series | As required | None | As req'd |
| Surge Protectors | EDCO | DRS-036 series | As required | Approved Equal | As req'd |
| Ethernet Surge Protector | Tycon Power | - | TP-ESP-100-POE24 | Approved Equal | As req'd |
| Lightning Protector | Polyphaser | - | As required | None | 1 |
| Intrinsically Safe Barrier | GEMS | 65800 Series | As required | Approved Equal | As req'd |
| Batteries | Duracell | As required | As required | Approved Equal | As req'd |
| Battery enclosures and appurtenances | | As required | As required | Approved Equal | As req'd |
| Spare fuse box – DIN Rail mounted | ITC | BORDCASE | 799-103 BC-G | Approved Equal | 1 |

Table 33 09 30-3: Lift Station – List of PCIS I/O
 (Table includes basic I/O related items for each lift station –see requirements elsewhere for additional logic and communication related alarms, etc.)

| Description | Field Device or ID Tag-Loop-(Pos) | | PLC ID Tag-Loop-(Pos) | Field Location | PLC I/O Type | Alarm | Notes |
|--------------------------------|--------------------------------------|--|--------------------------|----------------|--------------|-------|------------------------------------|
| Pump 1 HOA - Hand | | | | MCC | DI | | |
| Pump 1 HOA - Auto | | | | MCC | DI | | |
| Pump 1 Not In Auto | | | | n/a | Derived | Yes | PLC Logic |
| Pump 1 Call To Run | | | | RTU | DO | | To VFD |
| Pump 1 Run Status Lamp | | | | MCC | n/a | | Green PTT LED Lamp, use VFD Status |
| Pump 1 Starter Fault/Overload | | | | MCC | DI | Yes | From VFD |
| Pump 1 Overtemp | | | | MCC | DI | Yes | From MiniCAS or equal |
| Pump 1 Seal Fail/Moisture | | | | MCC | DI | Yes | From MiniCAS or equal |
| Pump 1 Motor Speed Command | | | | MCC | AO | | To VFD |
| Pump 1 Motor Speed Reference | | | | MCC | AI | | From VFD |
| Pump 1 Motor Speed Signal Fail | | | | n/a | Derived | Yes | PLC Logic |
| Pump 1 Run Status | | | | MCC | DI | | From VFD |
| Pump 1 Fail To Run | | | | n/a | Derived | Yes | PLC Logic |
| Pump 1 Excessive Starts | | | | n/a | Derived | Yes | PLC Logic |
| Pump 1 Excessive Runtime | | | | n/a | Derived | Yes | PLC Logic |
| Pump 2 HOA - Hand | | | | MCC | DI | | |
| Pump 2 HOA - Auto | | | | MCC | DI | | |

| Description | Field Device or ID Tag-Loop-(Pos) | | PLC ID Tag-Loop-(Pos) | Field Location | PLC I/O Type | Alarm | Notes |
|--------------------------------|--------------------------------------|--|--------------------------|----------------|--------------|-------|------------------------------------|
| Pump 2 Not In Auto | | | | n/a | Derived | Yes | PLC Logic |
| Pump 2 Call To Run | | | | RTU | DO | | To Motor Starter |
| Pump 2 Run Status Lamp | | | | MCC | n/a | | Green PTT LED Lamp, use VFD Status |
| Pump 2 Starter Fault/Overload | | | | MCC | DI | Yes | From VFD |
| Pump 2 Overtemp | | | | MCC | DI | Yes | From MiniCAS or equal |
| Pump 2 Seal Fail/Moisture | | | | MCC | DI | Yes | From MiniCAS or equal |
| Pump 2 Motor Speed Command | | | | MCC | AO | | To VFD |
| Pump 2 Motor Speed Reference | | | | MCC | AI | | From VFD |
| Pump 2 Motor Speed Signal Fail | | | | n/a | Derived | Yes | PLC Logic |
| Pump 2 Motor Current | | | | MCC | Data | Yes | VFD Data |
| Pump 2 Run Status | | | | MCC | DI | | From VFD |
| Pump 2 Fail To Run | | | | n/a | Derived | Yes | PLC Logic |
| Pump 2 Excessive Starts | | | | n/a | Derived | Yes | PLC Logic |
| Pump 2 Excessive Runtime | | | | n/a | Derived | Yes | PLC Logic |
| Pump 3 HOA - Hand | | | | MCC | DI | | |
| Pump 3 HOA - Auto | | | | MCC | DI | | |
| Pump 3 Not In Auto | | | | n/a | Derived | Yes | PLC Logic |
| Pump 3 Call To Run | | | | RTU | DO | | To VFD |

| Description | Field Device or ID | | PLC ID Tag-Loop-(Pos) | Field Location | PLC I/O Type | Alarm | Notes |
|---------------------------------------|--------------------|-----|--------------------------|----------------|--------------|-------|--|
| | Tag-Loop-(Pos) | Pos | | | | | |
| Pump 3 Run Status Lamp | | | | MCC | n/a | | Green PTT LED Lamp, use VFD Status |
| Pump 3 Starter Fault/Overload | | | | MCC | DI | Yes | From VFD |
| Pump 3 Overtemp | | | | MCC | DI | Yes | From MiniCAS or equal |
| Pump 3 Seal Fail/Moisture | | | | MCC | DI | Yes | From MiniCAS or equal |
| Pump 3 Motor Speed Command | | | | MCC | AO | | To VFD |
| Pump 3 Motor Speed Reference | | | | MCC | AI | | From VFD |
| Pump 3 Motor Speed Signal Fail | | | | n/a | Derived | Yes | PLC Logic |
| Pump 3 Motor Current | | | | MCC | Data | Yes | VFD Data |
| Pump 3 Run Status | | | | MCC | DI | | From VFD |
| Pump 3 Fail To Run | | | | n/a | Derived | Yes | PLC Logic |
| Pump 3 Excessive Starts | | | | n/a | Derived | Yes | PLC Logic |
| Pump 3 Excessive Runtime | | | | n/a | Derived | Yes | PLC Logic |
| Wetwell Level | | | | Wetwell | AI | | Include ISBs |
| Wetwell Level Signal Fail | | | | n/a | Derived | Yes | PLC Logic |
| Wetwell Backup Float – Level Lo/Stop | | | | Wetwell | n/a | | Hardwired float and logic. Include ISR/Controller at control voltage |
| Wetwell Backup Float – Level Hi/Start | | | | Wetwell | n/a | | Hardwired Float and logic. Include ISR/Controller at control voltage |

| Description | Field Device or ID | | PLC ID Tag-Loop-(Pos) | Field Location | PLC I/O Type | Alarm | Notes |
|---|--------------------|--|--------------------------|----------------|--------------|-------|--|
| | Tag-Loop-(Pos) | | | | | | |
| Wetwell – Backup Float Control Active | | | | MCC | DI | Yes | Result of hardwired float logic |
| High Wetwell Alarm Float | | | | Wetwell | DI | Yes | Include ISB to match RTU battery voltage. Float pulls to common. |
| Door Security Intrusion Status | | | | Enclosure | DI | | Panel Door Switch |
| Security Intrusion / Person In Station Status | | | | | Derived | | PLC Logic |
| Security Intrusion Alarm | | | | | Derived | Yes | PLC Logic |
| RTU Battery Voltage | | | | RTU | AI | | |
| Battery High / Low Voltage | | | | | Derived | Yes | PLC Logic |
| PLC Temp | | | | PLC | On-Board | | |
| PLC Temp High / Low | | | | | Derived | Yes | PLC Logic |
| RTU Power Available | | | | RTU | DI | | 110 VAC Relay |
| RTU Power Fail | | | | | Derived | Yes | PLC Logic |
| RTU Power Supply Okay | | | | RTU | DI | | From Power Supply |
| RTU Power Supply Fail | | | | n/a | Derived | Yes | PLC Logic |
| RTU DC Fuse Okay | | | | RTU | DI | | DC DI Bus Status |
| RTU DC Fuse Alarm | | | | | Derived | Yes | PLC Logic |
| Site Power – Three Phase Monitor | | | | MCC | Discrete | Yes | |

| Description | Field Device or ID Tag-Loop-(Pos) | | PLC ID Tag-Loop-(Pos) | Field Location | PLC I/O Type | Alarm | Notes |
|---|--------------------------------------|--|--------------------------|-----------------------------------|--------------|-------|---|
| Surge Protection Fault | | | | SPD in MCC | DI | Yes | |
| Help Needed Mushroom Switch | | | | RTU Section Deadfront | DI | Yes | Red Mushroom Switch |
| Common Alarm Lamp | | | | RTU | DO | | Red PTT LED Lamp On RTU Deadfront |
| Common Alarm Reset | | | | Red PTT LED Lamp On RTU Deadfront | DI | | Alarm Reset Via Additional Contact Set on Common Alarm PTT Lamp |
| Spare Inputs and Outputs – wired to terminal blocks equal to assigned I/O | | | | RTU & Backpanel | Varies | | 20% Minimum For Each I/O Type Used |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

D. Spare Parts

- Spare parts shall be provided directly to the OWNER on or before the date of substantial completion of the project. Spare parts shall be as listed in Table 4.

Table 33 09 30-4: Spare Parts List

| Description | Manufacturer | Model | Part Number | Quantity |
|----------------|--------------------|-------------|--------------|--|
| Fuses | Match as installed | | | 5 each per size and type at each lift station. Store in DIN Rail mounted spare fuse box at each site |
| Wetwell Floats | MJK | 7030 Series | As Installed | 1 |
| ISBs and ISRs | GEMS / Warrick | | As Installed | 1 of each part number used |

2.03 COMMUNICATIONS

A. SCADA Communications System

1. New Cellular communications are required at the Lift Station.
2. Cellular Router shall be as listed in tables above. Antenna type and model shall be determined per site conditions. Wherever possible, the antenna profile shall be minimized to prevent vandalism. If cellular communications are tested during installation to provide excellent cellular communications with the antenna physically located inside the enclosure or on the actual router, then the antenna location shall remain inside the enclosure. If cellular communications are not found to be excellent inside the enclosure, then an external antenna shall be used. On-site testing shall determine type and mounting location.

2.04 PCIS/SCADA COMPUTER HARDWARE AND SOFTWARE

- A. Existing SCADA computer hardware and software is located at the office. Integration of new points and site displays shall be the responsibility of the INTEGRATOR under contract to the OWNER.
- B. Modifications to the existing SCADA computer system as part of this project include the following tasks:
 1. Software: HMI updates for each site added or modified as part of this project. Updates shall include site information, trends, reports, DAS software, alarming, etc., to provide a complete and functional update for the site(s).

2.05 NEW PCIS INSTRUMENTS

- A. New PCIS instruments shall be provided and installed as listed below in Table 5: New PCIS Instruments.

Table 33 09 30-5: New PCIS Instruments

| Description | Requirements And Approved Model | Quantity |
|---|--|----------|
| Wetwell Level Transmitter (LT) | <p><u>Requirements</u> Pressure Range: 0-30 Ft Temperature Range: 14 °F to 150 °F Temperature Deviation: Better than ± 0.005 % / °F Linearity/Stability: Better than ± 0.5 %FS / ± 0.5 %FS Measurement Accuracy: Better than ± 0.25 % FS @ 50-85 °F, and better than ± 0.5 % FS @ full temp. range Supply Voltage: 10 - 30 V DC Output Signal: 2-wire 4 - 20 mA</p> <p><u>Approved Model</u> MJK Expert 2100 Series (no equal)</p> | 1 |
| Door Switch (ZS) | <p><u>Requirements</u> Contact System: N.O. Magnetic Reed Switch DC Contact Ratings: 200V / 0.5A Loop Type: Closed Housing: Aluminum Cable: 22 AWG Armored Cable</p> <p><u>Approved Model</u> GRI 200-36HD (no equal)</p> | 3 |
| Intrinsically Safe Relay/Controller (Backup Float Controller) | <p><u>Requirements</u> Channels: 1 Control Style: Solid State, Direct Action Voltage: 120 VAC Output: Form C Temperature Range: -40 to 150 F Approvals: UL 913, Class 1 Division 1 Group A-D</p> <p><u>Approved Model</u> Warrick 27A1D0 (no equal)</p> | 1 |

| Description | Requirements And Approved Model | Quantity |
|-------------------------|--|----------|
| Float Level Switch (LS) | <p><u>Requirements</u> Contact System: Microswitch Output: Form C Type Contacts Max Load: 250 VAC / 16 A 220 VDC / 0.5A 24 VDC / 16A Housing: Polypropylene Cable: Oil Resistant PVC Counterweight: Yes Mercury: No</p> <p><u>Approved Model</u> MJK 7030 Series or approved equal</p> | 3 |

PART 3 – EXECUTION

3.01 PCIS/SCADA HARDWARE ADDITIONS AND MODIFICATIONS

- A. The existing PCIS hardware shall be modified as listed throughout this section.
- B. New hardware to be installed at sites added or modified as part of this project shall be coordinated between the SUPPLIER, the INTEGRATOR, and the CONTRACTOR to assure full compatibility and functionality of all equipment and/or changes to the sites.
- C. The SUPPLIER and CONTRACTOR shall supply and install all electrical panels, starters, VFDs and transfer switches as required in this and other sections.
- D. The SUPPLIER shall supply to the INTEGRATOR all connection drawings and all technical information regarding the installation, connection, and coordination with the PCIS equipment.
- E. The CONTRACTOR shall be responsible for all entry into, and installation inside of, any hazardous location associated with the project. The SUPPLIER, INTEGRATOR, and PCIS INSPECTOR shall not be required to enter any hazardous location as part of the installation, startup, or commissioning of this project. Such entries shall be provided solely by the CONTRACTOR or the CONTRACTOR shall mitigate and control the location such that it is no longer considered a classified or hazardous location.

3.02 PCIS/SCADA SOFTWARE MODIFICATIONS

- A. The existing Ignition HMI and associated supporting programs, including IO servers (Topservers), drivers, etc., shall be modified to add all new or modified points monitored by the PCIS as part of this project. The existing PC Network shall remain fully functional throughout all modifications made as part of this project.

- B. The existing Ignition alarm notification configuration shall be updated or modified to include all changes for alarms added or modified as part of this project. The alarm and notification software shall remain functional within the PCIS/SCADA system throughout the duration of the project.
- C. The existing trend data shall be preserved for future use with the specified software. Configuration changes shall correlate with the newly updated HMI and shall include all appropriate remote points that were modified or added as part of this project. Trending software shall remain functional within the PCIS/SCADA system throughout the duration of the project.
- D. The existing report generation software shall be modified to add any new points as specified by the customer to existing or new reports.

3.03 PCIS/SCADA INTEGRATION

- A. Integration of new PCIS/SCADA equipment and/or instrumentation into the existing system as operated by the OWNER shall include but not be limited to the new RTU, communications equipment and integration, HMI development, alarm development, and other ancillary requirements as required to provide a complete and operational installation. All such tasks shall be provided by the INTEGRATOR.
 - 1. Control Descriptions for each of the sites shall adhere to the following:
 - a. **General Overview.** The stormwater pumps at each lift station shall be automatically controlled using two separate but integrated PCIS control systems. The primary control shall be provided by the PLC in the RTU using the analog wetwell level as the primary control variable. The secondary, or backup control, shall be provided by hardwired backup control and relay devices using two discrete level float switches as the control elements. Aside from the stormwater pumps, all other process and site related equipment at the lift station shall not require backup control systems but rather shall be monitored by the RTU. The RTU shall monitor the local site and process points and provide such information to the SCADA system for remote monitoring, recording, and alarming. Details and requirements for the processing of such information is found elsewhere in this document.
 - b. **Automatic RTU Primary Control.** Operator adjustable wetwell level control setpoints reside in the Lift Station RTU for control of the pumps. These setpoints are accessible to the operator at the OIT and the HMI. Anytime that the HOA selector switch for one or more of the pumps is in AUTO and the liquid level in the wetwell (as measured by the wetwell level transducer and monitored by the RTU) is above the lead pump call setpoint (LEAD START) for a preset period of time (START DELAY), a pump call is initiated and latched in the control logic and the control relay within the RTU for the lead pump is energized. If the liquid level in the wetwell continues to rise such that it is above the lag pump call setpoint (LAG START), then the lag pump call is initiated and latched in the control logic and the relay for the lag pump is energized. If the liquid level in the wetwell continues to rise such that it is above the lag-lag pump call setpoint (LAG-LAG START), then the lag-lag pump call is initiated and latched in the control logic and the relay for the lag-lag pump is energized. An operator adjustable setpoint is available within the pump logic to determine which pump is designated as lead pump, lag pump, and lag-lag pump at the beginning of any pump cycle. The setpoint can also direct the pump logic to alternate the lead, lag, and lag-lag pumps. Such alternation for control of lead, lag, and lag-lag pump assignments only

takes place when all three pumps have been de-energized, thus alternation is complete and ready for the next pump cycle. Pump alternation shall be interrupted when the lead pump becomes unavailable, and the available pump will be designated as lead. A pump is considered available when the HOA selector switch for the pump is in AUTO, the pump overload is not tripped and there are no other pump-related faults in alarm. Conditions that create pump unavailability must be cleared for pump alternation to resume to the normal sequence. When the liquid level in the wetwell is below the pump-off setpoint (ALL STOP) for a preset period of time (STOP DELAY), the pump call logic is unlatched for all pump calls, thus the pump control relays are de-energized for all pumps, and therefore the stormwater pumps are all de-energized to complete the pump cycle.

Pump control logic shall include operator adjustable timer setpoints for spindown (pump restart inhibit), and pump fail alarms (call but no start indication). These setpoints are accessible only at the OIT and are placed in a secured window for setup type setpoints. Pump fault (equipment related alarms) shall be provided for all motor starters. Submersible motors shall be monitored for moisture and overtemp alarms.

- c. **Automatic Hardwired Backup Control.** The wetwell shall be equipped with two fixed level discrete float switches (aside from the DC powered High Wetwell Alarm Float discussed elsewhere in these specifications) solely for the purpose of providing backup control in the case of an RTU or wetwell level transducer failure. These two float switches are used for pump start and pump stop logic only. The two float switches shall be wired to a self-contained Intrinsically Safe simplex pump controller module such as the one listed in these specifications for the initiation, monitoring, and completion of a single pump cycle. Use of simple hard-wired relay logic is allowed instead of the self-contained Intrinsically Safe controller but float switches in all cases shall be provided with Intrinsically Safe devices between the PCIS enclosure and the wet well. The automatic hardwired backup control system shall always energize all three pumps in a controlled and sequential stepped manner in the case the liquid level in the wetwell determines a backup float control cycle is required. Alternation shall not be performed during any backup pump cycle. Anytime that the HOA switch for one or more of the pumps is in AUTO and the liquid level in the wetwell rises causing both the Backup Stop Float (lower float) and Backup Start Float (upper float) to be in the floating position, the backup pump cycle shall be latched and the backup start control relays for all pumps shall be energized and the VFD for each pump shall be energized and ramp up in speed according to the pre-programmed start ramp setting in the VFD. Hardwired backup start control relays shall include time delays with the intent to provide staggered control delay settings for each pump in a backup pump cycle condition to assure that 1) the power source is ready and 2) none of the pumps are not energized simultaneously. The time delays for pumps 2 and 3 shall be manually set at 30 seconds and 60 seconds respectively or as directed by the OWNER during startup. A reasonable range for this hardwired and staggered time delay shall be 30 to 300 seconds depending upon site, power, and hydraulic conditions. When the liquid level in the wetwell drops such that both the backup start float and backup stop float are in the hanging position, the hardwired pump call logic is unlatched for all pump calls, thus the pump control relays are de-energized for all pumps, and therefore the stormwater pump control relays are all de-energized and the pump VFDs shall ramp down pump speed according to pre-programmed stop ramp settings to complete the hardwired backup pump cycle. The automatic hardwired backup control system shall

include a relay closure that is monitored by the PCIS as a discrete input for “Backup Control Active” which shall be monitored and annunciated similar to all other alarms. Such an alarm shall latch within the PLC logic and shall effectively be an indication that analog level control is either non-functional or has drifted beyond the span of the hardwired floats. The latched alarm shall be reset by the Operator using the appropriate control/reset button on a screen in the OIT or the HMI.

d. **Hardwired Pump Control.**

- 1) AUTO: Anytime the HOA selector switch is in the AUTO position, the pump starting circuit shall be energized as directed by the PLC for primary automatic operation, or the hardwired backup control circuit for backup automatic operation.
- 2) HAND: Anytime the HOA selector switch is in the HAND position, the pump starting circuit shall be energized without regard to wetwell level and control status.
- 3) OFF: Anytime the HOA selector switch is in the OFF position, the pump starting circuit shall be de-energized without regard to wet well level and control status.

e. **Pump Run Status and Run Statistics.** Each pump at the Lift Station is monitored for run status using either an output point from the VFD (if installed) or a current switch attached to one leg of the pump feed line after it exits the motor starter. Each time a pump run is indicated by the switch to the PLC, the pump start counter within the PLC for the respective pump will increment by one. Any time that a pump run is indicated to the PLC, the pump runtime meter within the PLC for the respective pump will run. The runtime meter keeps a continuous count of pump run times in units of tenths of hours. The status of a pump run and the start and time statistics as described above are all monitored through the SCADA system. The start count and runtime registers in the PLC for any pump shall be 32 bit long integers and shall be operator adjustable (under password) at the local OIT.

f. **Transducer Fail and Flowmeter Output Fail Alarms.** The lift stations are equipped with level transducers and/or other analog sensors or other output devices. Each of these devices produce a 4-20 mA output in relation to the process parameter being measured or controlled. Upon failure of the device or failure of the signal from the device, a transducer signal fail or flowmeter signal fail alarm will be triggered. Such an alarm is monitored and alarmed through the SCADA system. These alarm points are discrete on/off alarms based on the status of the signal and the scaled values in the RTU. Possible states for these points include NORMAL and ALARM. These alarms are latched within the RTU at the site and will return to a normal state once the alarm condition is returned to normal based upon a good signal which is determined to be in the appropriate range. Parameters for defining the appropriate signal are programmed within the PLC and are operator adjustable (under password) at the local OIT.

g. **Wet Well Level Monitoring Point and Associated Alarms.** The wet well level monitoring point is provided such that the wet well level at a stormwater pump site is monitored and alarmed through the SCADA system. The liquid level in the wet well at each site is displayed and recorded in units of inches. The liquid level in the wet well is measured by a submersible pressure transducer mounted in the wetwell.

Pressures measured by the transducer are converted to a 4-20 mA output. This transducer output is monitored by the PLC in the RTU which then scales the measured value to provide a value in engineering units for liquid level in the wet well. Alarms for high and low wet well levels (analog values) are generated when the value for the level is measured to be above or below the respective alarm trip setpoint. A short delay period is included in the alarming logic to help eliminate false alarms. Once an alarm has been triggered, the alarm is latched and will remain latched until the measured level returns to a normal range defined by the respective reset setpoint. The measured level must pass through the reset setpoint before the alarm will reset. The trip and reset setpoints for high and low wet well level alarms are operator adjustable at the OIT and the HMI. High wet well level setpoint values should be provided and programmed by the operator. The value for high level should be above the lag pump on setpoint and the value for low level alarm should be below the lead pump off level.

- h. **Wetwell Float Alarms.** A fixed level, DC powered discrete float switch (RTU battery backed and not dependent upon AC power and/or control power) shall be included within the PCIS to monitor for a high wetwell level condition and shall be known as the “High Wetwell Alarm Float”. This float shall be physically adjusted to be above all other floats and all expected wetwell level control setpoints in the wetwell and shall be alarmed at the highest priority to inform the operator of a high wetwell condition. A fixed level, DC powered discrete float switch shall also be included within the PCIS to monitor for a low wetwell level condition and shall be known as the “Low Wetwell Alarm Float”. This float shall be physically adjusted to be below all other floats and all expected wetwell level control setpoints in the wetwell and shall be alarmed to inform the operator of a low wetwell condition. This float is strictly part of the Automatic and Hardwired Control circuits as listed above and is intended to both indicate a low low level in the wetwell and inhibit the energizing of any pump under AUTO control when not tipped.
- i. **Pump Fail Alarms.** A pump fail alarm exists for each stormwater pump at a site. A pump fail alarm for any pump is generated when an automatic pump call (thus the HOA switch for the respective pump must be in the AUTO position) has been determined and energized but the respective pump does not show indication of actually running based on the pump run status input to the PLC. Basically, this alarm point indicates that a pump is not running automatically when it should be. A short delay period is included in the alarming logic to help eliminate false alarms. Once an alarm has been triggered, the alarm is latched and will remain latched until either the measured level returns to a range where the pump call is removed, or the HOA or pump status changes such that correct control conditions exist. A pump fail alarm is strictly informational and does not inhibit pump availability or pump control logic.
- j. **Pump Seal Failure/Moisture Alarms.** A pump seal failure (leakage or moisture) alarm exists for each stormwater pump at a site using the Mini-CAS II module in the pump control panel motor starting circuit for the pump. Seal Failure alarms in the Mini-CAS II have an automatic reset and will return to a normal state once the alarm condition has returned to normal.
- k. **Pump Overtemp Alarms.** A pump overtemp alarm exists for each stormwater pump at a site using the Mini-CAS II module in the pump control panel motor starting circuit for the pump. Overtemp alarms in the Mini-CAS II have a manual reset and will return

to a normal state once the alarm condition has returned to normal and the reset button to cycle the power to the Mini-CAS II module is physically depressed by the operator.

- l. **RTU Power Fail Alarms.** The RTU power fail alarm point is provided such that the status of utility power supplying the RTU is monitored and alarmed through the SCADA system. This point is a discrete on/off alarm based on the presence of incoming utility power to the RTU. Possible states for this point include NORMAL and ALARM. A short delay period is included in the alarming logic to help eliminate false alarms. This alarm is not latched in the field and will return to a normal state once utility power has been restored.
- m. **Site Power Fail Alarms.** AC utility power for the site shall be monitored at the MCC enclosure using a three-phase power monitoring relay. The power monitoring relay shall alarm upon phase loss, phase reversal, or phase imbalance with the intent of providing status for good power at the site. The phase monitoring relay shall have multiple sets of contacts such that one set can be used in the hardwired control circuitry for the pumps and the other set can be used for status indication to the RTU. This status point is used by the RTU as a discrete on/off alarm based on the presence of incoming utility power to the MCC enclosure. Possible states for this point include NORMAL and ALARM. A short delay period is included in the alarming logic to help eliminate false alarms. This alarm is not latched in the field and will return to a normal state once utility power has been restored.
- n. **Equipment Excessive Performance Alarms.** Each piece of major equipment such as pumps and generators shall be monitored and alarmed for the following:
 - 1) **Excessive Starts.** This alarm is generated if a piece of equipment starts more times than expected in a specific period of time. Setpoints, for how many starts and how long the time period is, are operator adjustable at the OIT. This alarm is intended to provide information to the operator that equipment operation is abnormal including but not limited to the following:
 - a) For some pumps this is critical to indicate the recommended motor starts per hour is being exceeded and thus the process setpoints for the wetwell need adjustment.
 - b) This can indicate that a pumping process is short cycling due to a leaky check valve on the respective pump and thus the wetwell quickly re-fills through the leaky valve when the pump shuts off.
 - c) This can indicate that a generator is short cycling and possibly compromising its performance. This is likely an indication of a much bigger problem under development at the site.
 - 2) **Excessive runtime.** This alarm is generated anytime the piece of equipment runs continuously and exceeds an operator adjustable setpoint for time at the OIT. This alarm is intended to provide information to the operator that equipment operation is abnormal including but not limited to the following:

- a) This can indicate that a pumping process is short cycling due to a leaky check valve on the opposing pump and thus the wetwell re-fills through the leaky valve on the other pump when the lead pump runs.
 - b) This can indicate that a pump has lost its prime or has a partially clogged impeller and is continuing to run much longer than expected during a standard pump cycle. For low inflow conditions this alarm will likely catch such a condition. For high inflow conditions the level will eventually rise until the lag pump is called or one of the high wetwell alarms is activated or the backup floats make a pump call and notify the operator that a backup call is active. In either case the presence of this alarm will help the operator understand why other conditions or alarms may exist.
- o. **Communications Monitoring Point and Communications Alarm.** Each site in the system is equipped with a basic communications logic system. The PLC in each RTU calculates a communications watchdog value for monitoring by the SCADA HMI computers at the office or by other remote sites that are requesting process information such as a pump site requesting level information from a tank. The calculated watchdog value represents either the number of elapsed minutes for the day or the number of elapsed seconds for the day divided by two.

The office HMI monitors the watchdog value that it receives from each site. Each time a new watchdog value is received, a timer for monitoring the age of the data from the respective site is reset to zero. The age timer then increases each minute or second until a different watchdog value is received from the site. If the age of the data exceeds a preset limit due to the lack of a new watchdog value, a communications alarm is triggered for the site. Possible states for this alarm include NORMAL and ALARM. This alarm is latched within the HMI and will return to a normal state once the alarm condition is removed by either the reception of a new watchdog value from the site or by a communications system reset or change of IO Servers.

The watchdog age limit is operator adjustable at the HMI for the SCADA system as well as through the OIT for site to site communications such as any site requesting data from another site.

- p. **Temperature High/Low Alarms.** The PLC in the RTU is equipped with a simple on-board temperature sensor for detecting the board temperature within the PLC. The temperature of the sensor is monitored and alarmed through the SCADA system. Upon indicating a high or low temperature in the PLC, the RTU will communicate a respective high or low temperature alarm for the site. The actual value for the PLC temperature is shown on the HMI window for the site. The alarm points are discrete on/off alarms based on the value of the temperature monitored and the alarm parameters set within the controller. Possible states for these alarm points include NORMAL and ALARM. These alarms are latched in the field and will return to a normal state once the temperature within the PLC rises or falls such that the current temperature satisfies the operator adjustable setpoints within the PLC.

3.04 FIELD TESTING

- A. Field testing shall be provided by the parties as defined by the roles and responsibilities listed throughout this section.

- B. Field testing of the PCIS shall be complete, including documentation where required, prior to system startup and commissioning.
- C. Field testing of the PCIS shall include all loop testing, software testing, and coordination with existing and new process equipment affected by any PCIS equipment added or modified as part of this project.
- D. Field testing schedules and procedures shall be fully coordinated with the OWNER and CONTRACTOR to minimize process interruptions. At no time shall field testing be performed on equipment that may affect existing processes without the participation of a representative of the OWNER.

3.05 SYSTEM STARTUP AND COMMISSIONING

- A. System startup shall be provided by the parties as defined by the roles and responsibilities listed throughout this section.

3.06 PCIS ON-SITE TRAINING - INTEGRATOR

- A. PCIS on-site training shall be provided by the INTEGRATOR with the intent of providing detailed information, hands-on demonstration, and pertinent operational information related to all PCIS functions that were added or modified as part of this project.
- B. On-site training shall include relevant training for each site added or modified as part of this project.
- C. On-site training shall be coordinated with the OWNER such that training schedules allow all operators as designated by the OWNER to attend where feasible. The OWNER shall make all attempts possible to minimize conflicts of schedule for such operators. For the intent of this requirement, the integrator shall plan to provide two (2) training sessions with each session having a duration of two (2) to four (4) hours. The training sessions may or may not necessarily be planned for the same day therefore the INTEGRATOR must plan accordingly.
- D. On-site training shall include the use of the technical manual where feasible. Control descriptions contained within the technical manual shall be the basis for discussion within each training session.
- E. At a minimum, training shall cover the following topics:
 - 1. Hardware overview
 - 2. Software overview
 - 3. Maintenance
 - 4. Troubleshooting
 - 5. Operation

3.07 ON-SITE TRAINING – MANUFACTURER’S REPRESENTATIVE

- A. No on-site PCIS related training by Manufacturer’s Representatives is expected as part of this project.

END OF SECTION

**SECTION 600
GEOTECHNICAL REPORT**

Black Eagle Consulting, Inc.

Geotechnical Investigation
**East Prater Way
Storm Drain
Project**

Sparks, Nevada

November 28, 2017

Prepared for
Atkins



Black Eagle Consulting, Inc.
Geotechnical & Construction Services

Mr. Brian Janes, P.E.
Atkins
10509 Professional Circle, Suite 102
Reno, NV 89521

November 28, 2017
Project No.: 0324-13-1

L

**RE: Geotechnical Investigation
East Prater Way Storm Drain Project
Sparks, Nevada**

Dear Mr. Janes:

Black Eagle Consulting, Inc. is pleased to present the results of our geotechnical investigation for the above-referenced project. Our investigation consisted of research, field exploration, laboratory testing, and engineering analysis to allow formulation of geotechnical conclusions and recommendations for design and construction of the proposed storm drain project.

The project will involve the design and construction of upgrades to the existing storm drain network in the area of Prater Way generally between Sparks Boulevard and Vista Boulevard. In addition, storm drain improvements will extend into the residential area northwest of the intersection of Prater Way and Vista Boulevard along Feeder Street, Wabash Circle, and Frisco Way.

The native subsurface soils profile along the proposed storm drain alignment consists of a heterogeneous mixture of clay and granular sand soils. In general, the near-surface native materials underlying the existing pavement section contain a significant percentage of plastic fines and exhibit high moisture contents. A high groundwater table along portions of the alignment will complicate construction of this project. The deeper soils are predominantly granular sands; however, the high groundwater table may locally result in unstable conditions at the excavation base and could necessitate trench bottom stabilization prior to placement of storm drain pipe. Imported trench backfill materials will be needed for this project.

We appreciate having the opportunity to work with you on this project. If you have any questions regarding the content of the attached report, please do not hesitate to contact us.

Sincerely,

Black Eagle Consulting, Inc.

Vimal P. Vimalaraj, P.E.
Engineering Division Manager



A handwritten signature in blue ink that reads "Jeffrey M. Jones".

Jeffrey M. Jones, P.E.
Senior Geotechnical Engineer

Copies to: Addressee (3 copies and PDF via email)

JP:JM:LJJ:PV:cjr



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Introduction

Presented herein are the results of Black Eagle Consulting, Inc.'s (BEC's) geotechnical investigation, laboratory testing, and associated geotechnical design recommendations for the proposed storm drain improvement project to be located along East Prater Way from Sparks Boulevard to east of Vista Boulevard and extending north along Feeder Street, Wabash Circle and Frisco Way. These recommendations are based on surface and subsurface conditions encountered in our explorations and on details of the proposed project as described in this report. The objectives of this study were to:

1. Determine general soil and groundwater conditions pertaining to design and construction of the proposed storm drain improvements.
2. Provide recommendations for design and construction of the project as related to these geotechnical conditions.

The area covered by this report is shown on Plate 1 (Plot Plan). Our investigation included field exploration, laboratory testing, and engineering analysis to determine the physical and mechanical properties of the various on-site materials. Results of our field exploration and testing programs are included in this report and form the basis for all conclusions and recommendations.

The services described above were conducted in accordance with the BEC proposal dated June 27, 2017, and the associated Atkins Subcontract for Professional Services and Purchase Order Number 1002851.



Project Description

The project will involve increasing the capacity of the existing storm drain network. The main segment of the project will be constructed in East Prater Way beginning near Dolce Drive and progressing west to the existing North Truckee Drain within the median of Sparks Boulevard. A feeder line will begin near Vista Boulevard on Frisco Way and then follow Wabash Circle and Feeder Street up to East Prater Way. The storm drain alignment is entirely contained in Section 2, Township 19 North, Range 20 East, Mount Diablo Meridian.

The proposed project includes 2 alternative alignments within East Prater Way, Alternative 1 and Alternative 2. One of these alternatives will be selected for final design and construction. Alternative 1 would extend along the southern travel lane of East Prater Way from near Dolce Drive to about Feeder Street, and the northern (westbound) lane from Feeder Street to Sparks Boulevard. The Alternative 1 alignment would include 5,493 lineal feet of Reinforced Concrete Pipe (RCP) and Horizontal Elliptical Reinforced Concrete Pipe (HERCP). The proposed RCP ranges in size from 30 to 66 inches in diameter, and the proposed HERCP ranges in size from a 38-inch by 24-inch to a 38-inch by 60-inch cross section. Alternative 2 would extend along the southern travel lane of East Prater Way the entire distance and include a crossing at Feeder Street for the connection from the residential neighborhood. The Alternative 2 alignment would include 3,521 lineal feet of Reinforced Concrete Box culvert ranging in size from a 4-foot by 3-foot to an 8-foot by 4-foot rectangular section and 2,285 feet of 36- to 48-inch diameter RCP and 38-inch by 24-inch HERCP. The alternative alignments remain the same in the northern segment in the residential neighborhood along Feeder Street, Wabash Circle and Frisco Way.

Final storm drain depth information was not available at the time of this report. We expect the storm drain will be installed at depths of 10 feet or less. In order to construct the proposed storm drain, the project will involve removal and replacement of existing asphalt paving and possibly portions of curbs and gutters, as well as sidewalk improvements.



Alignment Conditions

The section of East Prater Way along the proposed storm drain alignment is an arterial street. East Prater Way is an asphalt concrete (AC) paved roadway with Portland cement concrete (PCC) curbs, gutters and sidewalks throughout most of the alignment. From Sparks Boulevard to Vista Boulevard (within the project limits), East Prater Way includes 2 travel lanes in both directions separated by landscaping medians or center turn lanes (up to 5 total lanes). Both Sparks Boulevard and Vista Boulevard are controlled by traffic signals, while side streets are controlled by stop signs. Crosswalks are present at the intersections and several uncontrolled locations between the traffic signals. Bus routes exist in both directions along the East Prater Way alignment.



Site Conditions – East Prater Way

The streets in the residential neighborhood (Feeder Street, Wabash Circle, and Frisco Way) are considered local streets. The local streets are AC paved roadways consisting of 1 travel lane and 1 parking (parallel) lane in both directions. Curbs, gutters and sidewalks are present throughout the alignment.

Underground utilities including storm drain, sewer, water, natural gas, and communications are present throughout the entire project limits. Electricity is generally carried by overhead lines, but there is also underground electric in various locations. Powerlines are present intermittently on both sides of East Prater Way.

Within the project limits, East Prater Way gently slopes down to the west. Within the neighborhood section, the alignment slopes down gently to the south and gently to moderately along Frisco Way. Drainage across the project area is generally achieved by sheet flow across the impermeable surfaces to existing PCC curbs and gutters that flow into catch basins and into the existing storm drain system.



Exploration

Prior to exploration, BEC obtained utility clearance from Underground Service Alert. In addition, BEC obtained an encroachment permit from the City of Sparks for the exploration activities. During exploration, BEC subcontracted Silver State Barricade and Sign of Sparks, Nevada, to provide traffic control/setup for our exploration activities within the roadways.

Drill

The East Prater Way Storm Drain Project alignment was explored on October 25, 2017, by drilling 8 test borings. The borings were drilled using 8-inch-outside-diameter (O.D.), 4- $\frac{1}{4}$ -inch-inside-diameter (I.D.), hollow-stem augers and a truck-mounted CME 75 soils sampling drill rig. The maximum depth of exploration was 16.5 feet below the existing ground surface. The locations of the test borings are shown on Plate 1.

The native soils were sampled in-place every 2 to 5 feet by use of a standard, 2-inch-O.D., split-spoon sampler driven by a 140-pound safety/automatic drive hammer with a 30-inch stroke.

The number of blows to drive the sampler the final 12 inches of an 18-inch penetration (Standard Penetration Test - American Society for Testing and Materials [ASTM] D 1586) into undisturbed soil is an indication of the density and consistency of the material. Pocket penetrometer testing was performed on various samples of fine-grained soils in order to evaluate unconfined compressive strength.

Groundwater levels were measured at the time of exploration.

Material Cl_z

A geologist examined and identified all soils in the field in general accordance with ASTM D 2488. During drilling, representative bulk samples were placed in sealed plastic bags and returned to our Reno, Nevada, laboratory for testing. Upon completion of laboratory testing, additional soil classification was subsequently performed in accordance with ASTM 2487 (Unified Soil Classification System [USCS]), as described in the **Laboratory Testing** section. Logs of the borings are presented as Plate 2 (Boring Logs), and a USCS chart is included as Plate 3 (USCS Soil Classification Chart).



Site Exploration



Laboratory Testing

All soils testing performed in the BEC soils laboratory is conducted in general accordance with the standards and methodologies described in Volume 4.08 of the ASTM Standards.

Index

Samples of each significant soil type were analyzed to determine their in-situ moisture content (ASTM D 2216), grain size distribution (ASTM D 422), and plasticity index (ASTM D 4318). The results of these tests are shown on Plate 4 (Index Test Results). Test results were used to classify the soils according to ASTM D 2487 and to verify field logs, which were then updated as appropriate. Classification in this manner provides an indication of the soil's mechanical properties and can be correlated with standard penetration testing and published charts (Bowles, 1996; Naval Facilities Engineering Command [NAVFAC], 1986a and b) to develop appropriate geotechnical recommendations for the project.



Grain Size Analysis

Laboratory Moisture-Density Relations

Moisture-density relation tests (ASTM D 1557) were performed on representative samples of the native materials likely to be reused as trench backfill. The native materials collected from drill cuttings from 1 to 6 feet depth were used in the moisture-density relation testing. The maximum density shown by this test is compared with field densities to determine the percent of relative compaction. The moisture density curves are included as Plate 5 (Compaction Test Report).

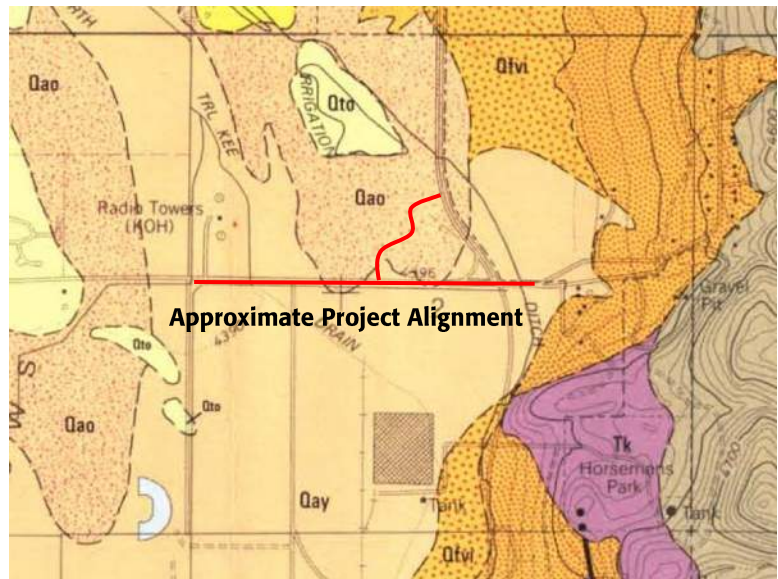
Chemical

Chemical testing was performed on representative samples of site soils to evaluate their potential to corrode PCC in contact with the ground. The samples were tested for soluble sulfates. The results of the chemical tests are shown in Appendix A (Chemical Test Results). Chemical testing was performed by Silver State Analytical Laboratories of Reno, Nevada.



Geologic and General Soil Conditions

The alignment lies in an area mapped by the Nevada Bureau of Mines and Geology ([NBMG] Bell and Bonham, 1987) as Quaternary age *Alluvium of the Truckee Meadows (younger and older)* [Qay, Qao]. The NBMG describes these materials as *gray to brown, pebble to cobble sand and medium sand, silty sand, and sandy silt; derived from reworking of Truckee River deposits and deposition along large drainages from Sun Valley and Spanish Springs Valley*. Sedimentation in the Truckee Meadows has been in progress at varying rates since the formation of the block-faulted basin. Most of the sediments, including the coarse-grained, gravelly sands that underlie the majority of the Truckee Meadows, were abruptly deposited in the post-glacial period during torrential flooding. With the advent of a warmer, drier climate, the volume and size distribution of transported sediment were greatly reduced, and the sedimentation process became largely limited to the reworking of earlier deposits. The native soils encountered during site exploration are generally consistent with the NBMG geologic map and the reworked younger deposits.



Geologic Map

All exploration areas encountered a pavement structural section including AC pavement and crushed rock aggregate base (AB). The soils are a heterogeneous mixture of granular and clay soils. The soils profile generally consists of a fill layer about 1 foot thick underlying the structural section and overlying the native soils. Within the central and western portions of Prater Way, the native soils consist of clayey sand, silty sand, and sandy clay from about 2 to 7 feet beneath the existing pavement. The northern and eastern portions of the alignment, and the deeper soils throughout the project, consist of silty sand, clayey sand, silty clayey sand, and poorly graded sand with silt. Deeper layers of lean clay with varying amounts of sand were encountered along the eastern portion of the alignment. Native soils locally contain trace amounts of gravel.

The existing pavement section within Prater Way consists of approximately 6 inches of AC underlain by 6 to 10 inches of AB. Within the residential neighborhood, the existing pavement section consists of approximately 4



inches of AC and 6 inches of AB. The boring in Wabash Circle (B-02) encountered cement-treated soils at subgrade.

The existing fill soils consist of clayey to silty sand with gravel and are about 1 foot thick. These fill soils are described as brown, moist, medium dense to dense, and contain about 20 to 40 percent non-plastic to medium plasticity fines and 10 to 30 percent gravel.

Native clayey sand to lean clays soils are present in the central and western portions of the site (borings B-04 through B-07) at depths of about 2 to 7 feet beneath existing grades. These clay soils are described as dark gray to dark brown to olive, moist to wet, loose to medium dense (soft to firm), and contain approximately 39 to 90 percent low to high plasticity fines and 25 to 60 percent sand. Near-surface soils in the northern and eastern portions of the storm drain alignment (borings B-01, B-02, B-03 and B-08), and beneath the clay soils in the remainder of the site, are native silty sand and poorly graded sands. These sand soils are described as brown to gray, moist to wet, very loose to dense, and contain about 5 to 25 percent non-plastic to low plasticity fines and up to 15 percent gravel. Silt, clay and clayey sand are interbedded in the deeper sand soils profile, and these interbedded layers are about 1 to 2 feet thick.

Groundwater was encountered at depths of 5.5 to 11.5 feet beneath the existing pavement. Groundwater was not encountered at the east end of the project (boring B-08). Groundwater will complicate construction of this project.



Geologic Hazards

Seismicity and

The Truckee Meadows lies within an area with a high potential for strong earthquake shaking. Seismicity within the Reno-Sparks area is considered about average for the Western Basin and Range Province (Ryall and Douglas, 1976). It is generally accepted that a maximum credible earthquake in this area would be in the range of magnitude 7 to 7.5 along the frontal fault system of the Eastern Sierra Nevada. The most active segment of this fault system in the Sparks area is located at the base of the mountains near Thomas Creek, Whites Creek, and Mt. Rose Highway, some 11 miles south of the project.

No fault hazards map has been published for the project area. The geologic map (Bell and Bonham, 1987) and the United States Geological Survey (USGS) *Quaternary Faults and Folds Database* (USGS, 2017) identify north-south trending Quaternary age faults located 1,800 feet south and 3,400 feet east of the project. No further fault investigation is considered necessary for the project that will include upgrades to the existing storm drain infrastructure.

Other Geologic

A low potential for dust generation is present if trenching activities are performed in dry weather. No other geologic hazards that would affect the proposed underground storm drain infrastructure were identified.



Discussion and Recommendations

General In

The subsurface soils encountered in our borings along the proposed storm drain alignment contained a heterogeneous mixture of clayey sand, lean clay and granular sand soils. The materials we observed/tested in our investigation are generally well above optimum moisture. We anticipate very moist to wet (over optimum) soils will be encountered extensively during construction of this project. These materials will be impossible to compact at their existing moisture content when replaced as backfill. Accordingly, import backfill soils will be needed for this project.

With the exception of boring B-08, groundwater was encountered in each of our borings at depths ranging between approximately 5.5 to 11.5 feet. Construction dewatering and localized trench bottom stabilization will be required for this project.

The recommendations provided herein are intended to minimize risks of structural distress primarily related to excessive consolidation of trench backfill. These recommendations, along with proper design and construction of the improvements, work together as a system to improve overall performance. If any aspect of this system is ignored or is poorly implemented, the performance of the project will suffer. Sufficient quality control should be performed to verify that the recommendations presented in this report are followed.

Structural areas referred to in this report include all areas of concrete slabs and AC pavements. The term engineer, as presented below, pertains to the civil engineer that has prepared the geotechnical engineering report for the project or who serves as a qualified geotechnical professional on behalf of the owner.

All compaction requirements presented in this report are relative to ASTM D 1557. For the purposes of this project:

- **Fine-grained soils are defined as those with more than 40 percent by weight passing the number 200 sieve, and a plasticity index lower than 10.**
- **Clay soils are defined as those with more than 50 percent passing the number 200 sieve, and a plasticity index greater than 10.**
- **Granular soils are those not defined by the above criteria.**

Any evaluation of the site for the presence of surface or subsurface hazardous substances is beyond the scope of this investigation. When suspected hazardous substances are encountered during routine geotechnical



investigations, they are noted in the exploration logs and immediately reported to the client. No such substances were revealed within the limits of our exploration.

Alignment Preparation and Trench Bottom

The proposed storm drain alignment will traverse areas of AC pavement and within close proximity of PCC curbs, gutters and sidewalks. All pavements shall be saw-cut in accordance with Drawing No. 1-16 of the *Standard Details for Public Works Construction (SDPWC, 2014)*. Saw-cuts should not be located in or within 12 inches on either side of a wheel path of travel lanes. The existing AC pavement may be pulverized and reused as base material or shall be removed from the site. When practical, the existing AB section below pavements and flatwork can be removed and stockpiled for use as structural fill.

Native clay soils were encountered from Sparks Boulevard to Vista Boulevard along East Prater Way and Feeder Street. These clay soils are present beneath subbase fill material and extend to depths in excess of 5 feet beneath the existing pavement. Existing subbase fill soils are of adequate quality and adequate thickness (generally about 12 inches in thickness) to generally provide the needed structural fill separation for the asphalt patching from native clay soils with expansive and/or low subgrade strength characteristics. If clay soils are locally encountered within 12 inches of the subgrade elevation within the limits of the AC pavement or PCC saw-cut limit (beyond the limit of trenches), they shall be over-excavated through a minimum 12 inches depth and backfilled with compacted structural fill.

The subsurface soils encountered at the bottom of the excavation will be over optimum moisture, possibly below the groundwater table, and difficult or impossible to compact. Mechanical stabilization of the trench bottom may be achieved by 12 inches of over-excavation and by providing a geotextile/gravel system consisting of Class C or D drain rock (*Standard Specifications for Public Works Construction [SSPWC], 2012*). The drain rock shall be placed in a single loose lift that is densified using a vibratory plate compactor until no further deflection is observed.

Where the pavement saw-cut area to be patched extends well beyond the trench walls, subgrade soils may begin to pump and rut after the existing structural section is removed. It is common to find very moist to wet subgrade soils beneath existing pavements. Areas of soft soils will need to be over-excavated and stabilized. Typically, an over-excavation depth of 12 to 18 inches below subgrade is adequate when the backfill consists of compacted Type 2, Class B AB (*SSPWC, 2012*) or AC grindings. Shallow utilities may limit the depth of practical over-excavation, such that geogrid/AB "sandwiches" or even soil cement backfill may need to be used on a case-by-case basis. Black Eagle Consulting, Inc. can provide problem-specific recommendations during construction either as part of our inspection/testing services or as extra work under the geotechnical investigation contract.



Trenching and

Trenching will be possible with conventional medium-sized excavators to the design depths. When nearing excavation bottoms, equipment and procedures that do not cause significant disturbance to excavation bottoms shall be used, when practical. Excavators with buckets having large claws to loosen the soil should be avoided when excavating the bottom 6 to 12 inches of excavations, as such equipment may disturb the excavation base.

Neat-line trenching will be possible near the surface, but shallow groundwater and clean sand soils at depth will cause trench stability concerns. As excavations extend below the groundwater table, local caving of trench sidewalls will occur. The use of trench boxes or shoring will be necessary for this project.

Temporary trenches with near-vertical sidewalls should be stable to a depth of approximately 4 feet. Temporary trenches are defined as those that will be open for less than 24 hours. Excavations to greater depths will require shoring or laying back of sidewalls to maintain adequate stability. Temporary shoring systems will likely be necessary, and their design will be subjected to lateral loads resulting from earth pressures and surcharge pressures from adjacent equipment and materials. A design professional with adequate experience in designing shoring systems for temporary excavations should be consulted by the contractor during the design of the shoring system.

Regulations contained in Part 1926, Subpart P, of Title 29 of the Code of Federal Regulations (CFR, 2010) require that temporary sidewall slopes be no greater than those presented in Table 1 (Maximum Allowable Temporary Slopes).

TABLE 1 - MAXIMUM ALLOWABLE TEMPORARY SLOPES

| Soil or Rock Type | Maximum Allowable Slopes ¹ for Deep Excavations less than 20 Feet Deep ² |
|---------------------|--|
| Stable Rock | Vertical (90 degrees) |
| Type A ³ | 3H:4V (53 degrees) |
| Type B | 1H:1V (45 degrees) |
| Type C | 3H:2V (34 degrees) |

Notes:

¹ Numbers shown in parentheses next to maximum allowable slopes are angles expressed in degrees from the horizontal. Angles have been rounded off.

² Sloping or benching for excavations greater than 20 feet deep shall be designed by a registered professional engineer.

³ A short-term (open 24 hours or less) maximum allowable slope of 1H:2V ([horizontal to vertical] 63 degrees) is allowed in excavation in Type A soils that are 12 feet or less in depth. Short-term maximum allowable slopes for excavations greater than 12 feet in depth shall be 3H:4V (53 degrees).



The State of Nevada, Department of Industrial Relations, Division of Occupational Safety and Health Administration (OSHA) has adopted and strictly enforces these regulations, including the classification system and the maximum slopes. In general, Type A soils are cohesive, non-fissured soils with an unconfined compressive strength of 1.5 tons per square foot (tsf) or greater. Type B are cohesive soils with an unconfined compressive strength between 0.5 and 1.5 tsf. Type C soils have an unconfined compressive strength below 0.5 tsf. Numerous additional factors and exclusions are included in the formal definitions. The client, owner, design engineer, and contractor shall refer to Appendix A and B of Subpart P of the previously referenced Federal Register for complete definitions and requirements on sloping and benching of trench sidewalls. Appendices C through F of Subpart P apply to requirements and methodologies for shoring.

On the basis of our exploration, the existing fill and clay/fine-grained soils are predominately Type B, and the sandy soils are Type C. All soils beneath the groundwater table shall be considered Type C. Any area in question shall be considered Type C unless specifically examined by the engineer during construction. All trenching shall be performed and stabilized in accordance with local, state, and OSHA standards.

Construction

Groundwater was encountered in each of our borings except boring B-08 at depths ranging between approximately 5.5 to 11.5 feet below the existing pavement. Groundwater levels fluctuate; depending on the time of year, the groundwater level could be higher at the time of construction, particularly if construction commences during spring. Dewatering of excavations that extend down to or below the groundwater table will be appropriate. The dewatering scheme may include pumping of groundwater from well points within or outside of the shoring. The well point or pump design should be performed by a specialty dewatering contractor. Disposal of groundwater should be performed in accordance with guidelines of the governing agencies such as the Regional Water Quality Control Board.

Utility Trench

Bedding and initial backfill 12 inches over the pipe will require import. In general, Class B or C drain rock (*SSPWC*, 2012) can be used. Bedding and initial backfill shall be densified by 5 complete passes with approved compaction equipment until no deflection is observed. Drain rock should be used for backfill up to the high groundwater level. Native clay and fine-grained soils are not suitable for use as trench backfill. Native granular soils would provide adequate final backfill; however, these materials were found generally below a depth of 7 feet and are well above optimum moisture content, resulting in impossible conditions for compaction. Air-drying of the soils could be considered but will be difficult due to space constraints. In addition, air-drying is weather dependent and time consuming and will likely result in schedule delays. Accordingly, we anticipate imported backfill will be needed for this project. Imported backfill shall conform to the requirements of Class E Backfill (*SSPWC*, 2012). Within at least 3 feet of the street surface, we recommend Type 2, Class B AB (*SSPWC*, 2012) be used for backfill



for improved performance of the patched street section. Trench backfill shall be placed in maximum 12-inch-thick loose lifts each densified to at least 90 percent relative compaction.

When Class B or C materials (drain rock) are used as trench backfill, they shall be considered a rock backfill and shall be placed in maximum 12-inch-thick loose lifts, with each lift densified by at least 5 complete passes with approved compaction equipment and until no deflection is observed. A separator geotextile shall be placed between the drain rock and any native soil backfill. The separator geotextile shall meet or exceed the following minimum properties presented in Table 2 (Minimum Required Properties for Separator Geotextile).

| TABLE 2 - MINIMUM REQUIRED PROPERTIES FOR SEPARATOR GEOTEXTILE | |
|--|------------------|
| Trapezoid Strength (ASTM D 4533) | 80 x 80 lbs. |
| Puncture Strength (ASTM D 4833) | 500 lbs. |
| Grab Tensile Strength/Elongation (ASTM D 4632) | 200 x 200 @ 50 % |

Frozen soil should not be used as trench backfill. The frozen soil may be reused (provided it meets the selection criteria) once it has thawed completely. In addition, compaction of the soils may be more difficult due to the viscosity change in water at lower temperatures.

Site Drainage

The ponding of water on all finished surfaces shall be prevented by proper grading and by high quality workmanship during all trench backfill operations.

Concrete

The project may include the replacement of PCC curbs, gutters, and sidewalks at various locations throughout the alignment. Portland cement concrete curbs, gutters, and sidewalks shall be constructed in accordance with the City of Sparks standard details (*SDPWC*, 2014). All concrete slabs shall be directly underlain by imported Type 2, Class B AB (*SSPWC*, 2012). The thickness of base material beneath PCC flatwork shall be 6 inches beneath curbs and gutters and 4 inches beneath sidewalks. Aggregate base courses shall be densified to at least 95 percent relative compaction.

Sparks lies within a region with exceptionally low relative humidity. As a consequence, concrete flatwork is prone to excessive shrinking and curling. Concrete mix proportions and construction techniques, including the addition of water and improper curing, can adversely affect the finished quality of concrete and result in cracking, curling, and the spalling of slabs. We recommend that all placement and curing be performed in accordance with procedures outlined by the American Concrete Institute (ACI, 2008) and this report. Special considerations shall be given to



concrete placed and cured during hot or cold weather temperatures, low humidity conditions, and windy conditions such as are common in the Truckee Meadows.

Concrete shall not be placed on frozen in-place soils.

Asphalt C

Asphalt concrete pavements within all roadways will require saw-cutting and patching at new storm drain trenches. Saw-cutting and patching of affected pavement sections shall adhere to the requirements of Drawing No. 1-16 of the *SDPWC* (2014).

The pavement section shall match or exceed the existing section. The City of Sparks minimum structural section for arterial streets, major and minor, is 6 inches of AC underlain by 10 inches of Type 2, Class B AB (*SSPWC*, 2012). The City of Sparks minimum structural section for local/residential streets is 4 inches of AC underlain by 8 inches of Type 2, Class B AB (*SSPWC*, 2012). All AB beneath AC pavements shall be densified to at least 95 percent relative compaction. Subgrade soils shall be densified to at least 90 percent relative compaction. Prior to paving, a proof roll should be performed to determine if any soft, yielding or otherwise unacceptable areas exist. The proof rolling should be accomplished with a heavily loaded pneumatic tire vehicle provided by the contractor. Areas deemed unacceptable as evaluated by a representative of BEC shall be removed and replaced.

Corrosion

Soluble sulfate content has been determined for representative samples of the site foundation soils. The sulfate was extracted from the soil at a 10:1 water-to-soil ratio in order to assure that all soluble sodium sulfate was dissolved. The results are reported in milligrams of sulfate per kilogram of soil and can be directly converted to percent by dividing by 10,000. The percent sulfate in the soil is used to determine the sulfate exposure Class (S) from the information presented in Table 3 (Sulfate Exposure Class).



TABLE 3 - SULFATE EXPOSURE CLASS*

| Sulfate | | | Water-Soluble Sulfate (SO ₄) in Soil, Percent by Weight | Dissolved Sulfate (SO ₄) in Water, ppm |
|-------------|----------------|-------------------------------|---|--|
| | Not Applicable | S0 | SO ₄ < 0.10 | SO ₄ < 150 |
| Moderate | S1 | 0.10 ≤ SO ₄ < 0.20 | 150 ≤ SO ₄ < 1,500 Seawater | |
| Severe | S2 | 0.20 ≤ SO ₄ ≤ 2.00 | 1,500 ≤ SO ₄ ≤ 10,000 | |
| Very Severe | S3 | SO ₄ > 2.00 | SO ₄ > 10,000 | |

*From Table 4.2.1 Exposure Categories and Classes. ACI 318, *Buildings Code and Comments*.

The results of the testing (Appendix A) indicate that concrete in contact with the site soils should be designed for Class S0 Sulfate exposure. Therefore, Type II cement can be used for all concrete work.



Anticipated Construction Problems

Difficulty will be encountered in trenching due to the presence of groundwater, over optimum soil moisture, and clean sand and gravel soils below the groundwater table.

Native clay and fine-grained soils that are not suitable to directly use as final trench backfill will be encountered within upper portions of trenching for the majority of the storm drain alignment. Native granular soils are very moist to wet (over optimum) and will likely be impossible to compact at their present moisture content. Limited space is available for spreading and drying of excavated soils.

The locally high groundwater table may cause unstable trench bottoms; stabilization could be needed in addition to construction dewatering.



Quality Control

All plans and specifications should be reviewed for conformance with this geotechnical report and approved by the engineer prior to submitting them to the building department for review.

The recommendations presented in this report are based on the assumption that sufficient field testing and construction review will be provided during all phases of construction. We should review the final plans and specifications to check for conformance with the intent of our recommendations. Prior to construction, a pre-job conference should be scheduled to include, but not be limited to, the owner, civil engineer, contractor and subcontractors, and engineer. The conference will allow parties to review the project plans, specifications, and recommendations presented in this report and discuss applicable material quality and mix design requirements. All quality control reports should be submitted to and reviewed by the engineer.

During construction, we should have the opportunity to provide sufficient on-site observation of preparation and grading, fill placement, and paving. These observations would allow us to verify that the geotechnical conditions are as anticipated and that the contractor's work is in conformance with the approved plans and specifications.



Standard Limitations Clause

This report has been prepared in accordance with generally accepted geotechnical practices. The analyses and recommendations submitted are based on field exploration performed at the locations shown on Plate 1. This report does not reflect soils variations that may become evident during the construction period, at which time re-evaluation of the recommendations may be necessary. We recommend our firm be retained to perform construction observation in all phases of the project related to geotechnical factors to ensure compliance with our recommendations.

Equilibrium water level readings were made on the date shown on Plate 2. Fluctuations in the water table may occur due to rainfall, temperature, seasonal runoff or adjacent irrigation practices. Construction planning should be based on assumptions of possible variations in the water table.

This report has been produced to provide information allowing the engineer to design the project. The owner is responsible for distributing this report to all designers and contractors whose work is affected by geotechnical aspects. In the event there are changes in the design, location, or ownership of the project from the time this report is issued, recommendations should be reviewed and possibly modified by the engineer. If the engineer is not granted the opportunity to make this recommended review, he or she can assume no responsibility for misinterpretation or misapplication of his or her recommendations or their validity in the event changes have been made in the original design concept without his or her prior review. The engineer makes no other warranties, either express or implied, as to the professional advice provided under the terms of this agreement and included in this report.



References

American Concrete Institute (ACI), 2008, *ACI Manual of Concrete Practice: Parts 1 through 5*.

American Society for Testing and Materials (ASTM), 2015, *Soil and Rock (I and II)*, Volumes 4.08 and 4.09.

Bell, J.W., and Bonham, H. F., 1987, *Geologic Map, Vista Quadrangle*: Nevada Bureau of Mines and Geology, Map 4Hg.

Bowles, J. E., 1996, 5th ed., *Foundation Analysis and Design*, McGraw Hill.

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NAVFAC, 1986b, *Soil Mechanics*, Design Manual 7.1.

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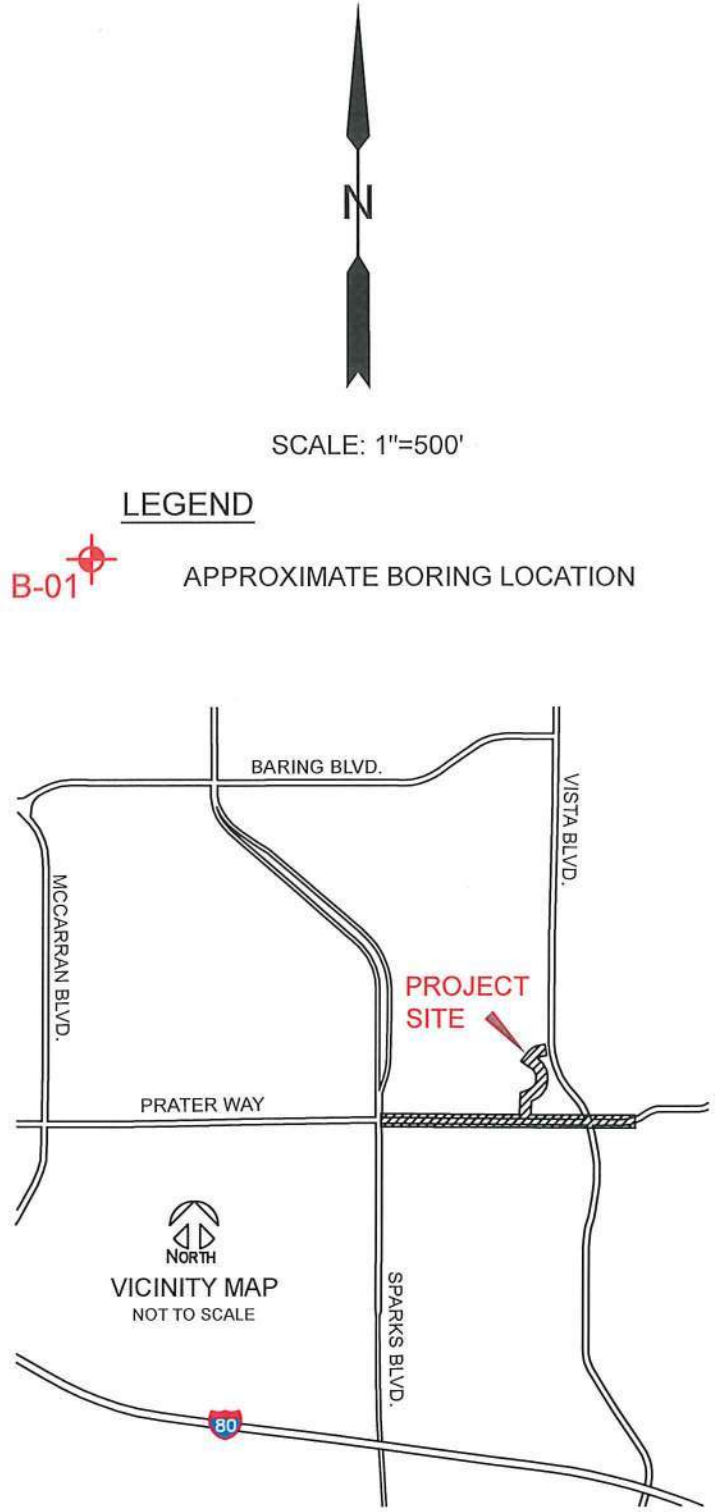
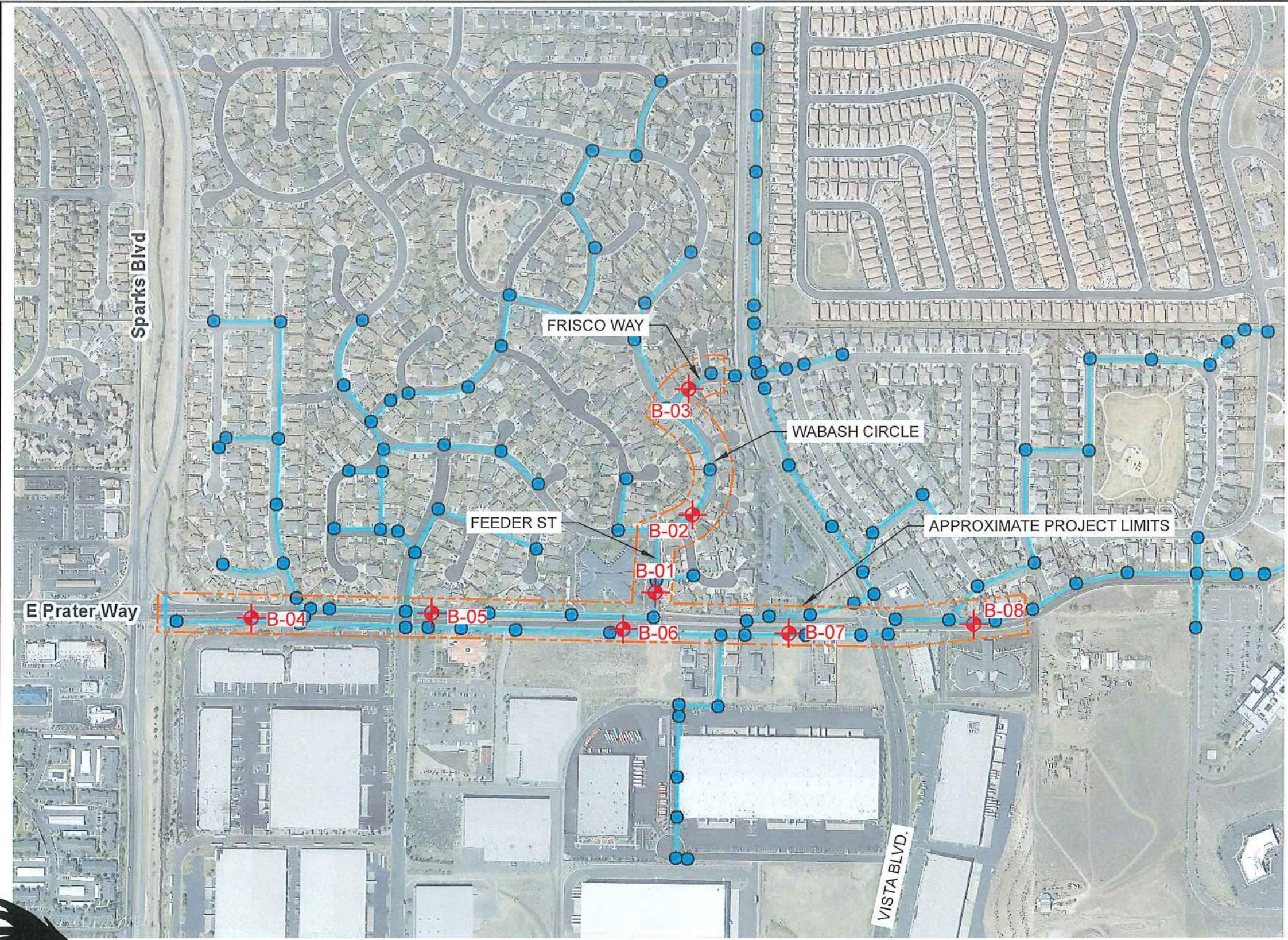
Standard Details for Public Works Construction (SDPWC), 2014 (Washoe County, Sparks-Reno, Carson City, Yerington, Nevada).

Standard Specifications for Public Works Construction (SSPWC), 2012 (Washoe County, Sparks-Reno, Carson City, Yerington, Nevada).

United States Geological Survey (USGS), 2017, *Online Quaternary Fault and Fold Database of United States*, Google Earth Files at <https://earthquake.usgs.gov/hazards/qfaults/> accessed November 2017.



PLATES




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ATKINS
PLOT PLAN
 EAST PRATER WAY STORM DRAIN PROJECT
 SPARKS, NEVADA

Project No.
 0324-13-1

 Plate 1

BORING LOG

BORING NO.: B-01
 TYPE OF RIG: CME 75
 LOGGED BY: JP

DATE: 10/25/2017
 DEPTH TO GROUND WATER (ft): 7.5
 GROUND ELEVATION (ft): NA

| SAMPLE NO. | SAMPLE TYPE | BLOWS/12 inches | MOISTURE (%) | PLASTICITY INDEX | DEPTH (ft) | USCS SYMBOL | LITHOLOGY | DESCRIPTION |
|------------|-------------|-----------------|--------------|------------------|------------|-------------|-----------|--|
| | | | | | | GW | | Asphalt Concrete Approximately 4 inches thick. |
| | | | | | | SC | | Aggregate Base Approximately 6 inches thick. |
| A | SPT | 16 | | | 2 | SC | | Clayey Sand with Gravel (Fill) Brown, moist, medium dense, with an estimated 25% medium plasticity fines, 55% fine to coarse sand, and 20% subrounded gravel up to 1 inch. |
| B | SPT | 15 | 18.8 | 31 | 4 | SC | | Clayey Sand Brown, very moist, medium dense, with 32% high plasticity fines, 65% fine to coarse sand, and 3% gravel up to 1.5 inches. Bulk sample of drill cuttings collected for laboratory testing. |
| C | SPT | 14 | | | 6 | SM | | Silty Sand Brown to gray, moist, medium dense, with an estimated 15% non-plastic fines and 85% fine to medium sand. |
| | | | | | 8 | ML | | Silt with Sand Light brown, wet, hard, with an estimated 85% non-plastic fines and 15% fine sand. |
| D | SPT | 44 | | | | | | Silty Sand Gray, wet, medium dense, with an estimated 15% non-plastic fines and 85% fine sand. |
| E | SPT | 25 | | | 10 | SM | | |
| | | | | | 14 | SC | | Clayey Sand Brown to tan, wet, loose, with an estimated 25% low to medium plasticity fines and 75% fine to medium sand. |
| F | SPT | 5 | | | 16 | | | |
| | | | | | 18 | | | |

Feeder Street
 N 4380477 E 267372 UTM NAD83

BORING_LOG_0324131.GPJ BLKEAGLE.GDT 11/28/2017



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Atkins
East Prater Way Storm Drain Project
Sparks, NV

PROJECT NO.:
 0324-13-1
 PLATE:
 2

BORING LOG

BORING NO.: B-02
 TYPE OF RIG: CME 75
 LOGGED BY: JP

DATE: 10/25/2017
 DEPTH TO GROUND WATER (ft): 5.5
 GROUND ELEVATION (ft): NA

| SAMPLE NO. | SAMPLE TYPE | BLOWS/12 inches | MOISTURE (%) | PLASTICITY INDEX | DEPTH (ft) | USCS SYMBOL | LITHOLOGY | DESCRIPTION |
|------------|-------------|-----------------|--------------|------------------|------------|-------------|-----------|---|
| | | | | | | GW | | Asphalt Concrete Approximately 3.5 inches thick. |
| | | | | | | SM | | Aggregate Base Approximately 6 inches thick. |
| A | SPT | 47 | | | 2 | SM | | Silty Sand Light gray, moist, dense. Cement treated soil. |
| B | SPT | 24 | | | 4 | SM | | Silty Sand Gray, moist, medium dense, with an estimated 20% non-plastic fines and 80% fine to medium sand. |
| | | | | | 5.5 | ▼ | | Groundwater |
| C | SPT | 30 | | | 6 | SP-SM | | Poorly Graded Sand with Silt Gray, very moist to wet, medium dense, with an estimated 10% non-plastic fines and 90% fine to coarse sand. |
| D | SPT | 13 | | | 8 | SM | | Silty Sand Brown to gray, wet, medium dense, with an estimated 15% non-plastic fines and 85% mostly fine sand. |
| E | SPT | 16 | | | 10 | SM | | |
| | | | | | 12 | | | |
| | | | | | 14 | | | |
| F | SPT | 24 | | | 16 | SM | | Silty Sand Brown, wet, medium dense, with an estimated 20% non-plastic fines and 80% fine to medium sand. |
| | | | | | 18 | | | |

Wabash Circle
 N 4380561 E 267429 UTM NAD83

BORING_LOG_0324131.GPJ BLKEAGLE_GDT_11/28/2017



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East Prater Way Storm Drain Project
Sparks, NV

PROJECT NO.:

0324-13-1

PLATE:

2

BORING LOG

BORING NO.: B-03
 TYPE OF RIG: CME 75
 LOGGED BY: JP

DATE: 10/25/2017
 DEPTH TO GROUND WATER (ft): 6.2
 GROUND ELEVATION (ft): NA

| SAMPLE NO. | SAMPLE TYPE | BLOWS/12 inches | MOISTURE (%) | PLASTICITY INDEX | DEPTH (ft) | USCS SYMBOL | LITHOLOGY | DESCRIPTION |
|------------|-------------|-----------------|--------------|------------------|------------|-------------|------------------------------|--|
| | | | | | | | GW | Asphalt Concrete Approximately 4.5 inches thick. |
| A | SPT | 30/0" Bouncing | | | 2 | SC | Aggregate Base | Approximately 6 inches thick. |
| B | SPT | 11 | 17.6 | 7 | 2 | SC-SM | Clayey Sand (Fill) | Brown to gray, very moist, loose, with an estimated 40% medium plasticity fines, 50% fine to coarse sand, and 10% subrounded gravel up to 1 inch. Hard cobble indicated by SPT blowcount and drilling response. Blowcount not valid due to oversized material. |
| | | | | | 4 | | Silty, Clayey Sand | Brown to gray, moist, medium dense, with 27% low plasticity fines, 70% fine to medium sand and 3% subrounded gravel up to 1 inch. Bulk sample of drill cuttings collected for laboratory testing. |
| C | SPT | 26 | | | 6 | | Poorly Graded Sand with Silt | Gray, moist to wet, medium dense, with an estimated 10% non-plastic fines and 90% fine to medium sand. |
| D | SPT | 12 | | | 8 | SP-SM | | |
| E | SPT | 8 | | | 10 | | | |
| | | | | | 14 | | Silt | Tan to olive, wet, hard, with an estimated 90% non-plastic to low plasticity fines and 10% mostly fine sand. |
| F | SPT | 29 | | | 16 | ML | | |
| | | | | | 18 | | | |

Frisco Way
 N 4380730 E 267405 UTM NAD83

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Sparks, NV

PROJECT NO.:

0324-13-1

PLATE:

2

BORING LOG

BORING NO.: B-04
 TYPE OF RIG: CME 75
 LOGGED BY: JP

DATE: 10/25/2017
 DEPTH TO GROUND WATER (ft): 11.5
 GROUND ELEVATION (ft): NA

| SAMPLE NO. | SAMPLE TYPE | BLOWS/12 inches | MOISTURE (%) | PLASTICITY INDEX | DEPTH (ft) | USCS SYMBOL | LITHOLOGY | DESCRIPTION |
|------------|-------------|-----------------|--------------|------------------|------------|-------------|-------------------------------|---|
| | | | | | | | Asphalt Concrete | Approximately 5.75 inches thick. |
| | | | | | | | Aggregate Base | Approximately 6 inches thick. |
| A | SPT | 50 | | | 2 | SM | Silty Sand with Gravel (Fill) | Brown, moist, very, with an estimated 20% non-plastic fines, 60% fine to coarse sand, and 20% subrounded gravel up to 1.25 inches in diameter. |
| B | SPT | 13 | 17.8 | 20 | 4 | SC | Clayey Sand | Dark gray to dark brown, moist to very moist, very loose to medium dense, with 39% medium plasticity fines, 51% fine to coarse sand, and 10% gravel up to 1.5 inches in diameter. |
| C | SPT | 4 | | | 6 | | No SPT sample recovery. | Bulk sample of drill cuttings collected for laboratory testing. |
| D | SPT | 32 | | | 8 | | Poorly Graded Sand with Silt | Gray, moist to wet, dense, with an estimated 10% non-plastic fines, 85% fine to coarse sand, and 5% rounded gravel up to 1.25 inches in diameter. |
| E | SPT | 36 | | | 10 | SP-SM | Poorly Graded Sand with Silt | Gray, wet, medium dense, with an estimated 10% non-plastic fines and 90% fine to medium sand. |
| F | SPT | 20 | | | 16 | SP-SM | | |
| | | | | | 18 | | | |

East Prater Way

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East Prater Way Storm Drain Project
Sparks, NV

PROJECT NO.:
 0324-13-1
 PLATE:
 2

BORING LOG

BORING NO.: B-05
 TYPE OF RIG: CME 75
 LOGGED BY: JP

DATE: 10/25/2017
 DEPTH TO GROUND WATER (ft): 6.8
 GROUND ELEVATION (ft): NA

| SAMPLE NO. | SAMPLE TYPE | BLOWS/12 inches | MOISTURE (%) | PLASTICITY INDEX | DEPTH (ft) | USCS SYMBOL | LITHOLOGY | DESCRIPTION |
|------------|-------------|-----------------|--------------|------------------|------------|-------------|-----------|---|
| | | | | | 0 | GW | | Asphalt Concrete Approximately 5 inches thick. |
| | | | | | 0 | SM | | Aggregate Base Approximately 6 inches thick. |
| A | SPT | 31 | | | 2 | SM | | Silty Sand with Gravel (Fill) Brown, moist, medium dense, with an estimated 20% non-plastic to low plasticity fines, 60% fine to coarse sand, and 20% subrounded gravel up to 1.25 inches. |
| B | SPT | 4 | | | 4 | CL | | Sandy Lean Clay Dark brown, very moist, soft, with an estimated 55% medium plasticity fines and 45% fine to coarse sand. |
| | | | | | 4 | | | Pocket penetrometer (PP) = 2.0 tons per square foot (tsf). |
| C | SPT | 6 | | | 6 | CL | | Lean Clay Olive to tan, very moist, firm, with an estimated 90% low to medium plasticity fines and 10% fine to medium sand. |
| | | | | | 6.8 | ▼ | | Groundwater level |
| D | SPT | 35 | | | 8 | SP | | Poorly Graded Sand with Gravel Gray, wet, dense, with an estimated 5% non-plastic fines, 80% fine to coarse sand, and 15% rounded gravel up to 1.25 inches. |
| | | | | | 10 | | | |
| E | SPT | 14 | | | 10 | SP | | Poorly Graded Sand Gray, wet, medium dense, with an estimated 5% non-plastic fines and 95% fine to coarse sand. |
| | | | | | 12 | | | |
| | | | | | 14 | | | |
| F | SPT | 15 | | | 14 | ML | | Silt with Sand Light brown to gray, wet, stiff, with an estimated 85% non-plastic fines and 15% fine sand. |
| | | | | | 16 | | | |
| | | | | | 18 | | | |

East Prater Way
 N 4380429 E 267092 UTM NAD83

BORING_LOG_0324131.GPJ BLKEAGLE_GDT_11/28/2017



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East Prater Way Storm Drain Project
Sparks, NV

PROJECT NO.:

0324-13-1

PLATE:

2

BORING LOG

BORING NO.: B-06
 TYPE OF RIG: CME 75
 LOGGED BY: JP

DATE: 10/25/2017
 DEPTH TO GROUND WATER (ft): 7.0
 GROUND ELEVATION (ft): NA

| SAMPLE NO. | SAMPLE TYPE | BLOWS/12 inches | MOISTURE (%) | PLASTICITY INDEX | DEPTH (ft) | USCS SYMBOL | LITHOLOGY | DESCRIPTION |
|------------|-------------|-----------------|--------------|------------------|------------|-------------|-----------|--|
| | | | | | | | GW | Asphalt Concrete Approximately 6 inches thick. |
| | | | | | | | SM | Aggregate Base Approximately 6 inches thick. |
| A | SPT | 30 | | | 2 | | | Silty Sand with Gravel (Fill) Brown, moist, medium dense, with an estimated 20% low plasticity fines, 60% fine to coarse sand, and 20% subrounded gravel up to 1.25 inches. |
| B | SPT | 17 | | | 4 | | | Silty Sand Brown, moist, medium dense, with an estimated 25% non-plastic to low plasticity fines and 75% fine to medium sand. |
| | | | | | 6 | | | Sandy Lean Clay Tan to olive, very moist, firm, with 64% medium plasticity fines, 34% fine to medium sand, and 2% fine gravel. |
| C | SPT | 6 | 24.0 | 20 | 6 | CL | | |
| | | | | | 8 | | | Poorly Graded Sand with Silt Gray, wet, medium dense, with an estimated 10% non-plastic fines and 90% fine to coarse sand. |
| D | SPT | 15 | | | 8 | | | |
| | | | | | 10 | | | |
| E | SPT | 22 | | | 10 | SP-SM | | |
| | | | | | 14 | | | Silt Light brown, wet, stiff, with an estimated 95% non-plastic fines and 5% fine sand. |
| F | SPT | 14 | | | 14 | ML | | |
| | | | | | 16 | | | |
| | | | | | 18 | | | |

East Prater Way
 N 4380418 E 267295 UTM NAD83

Black Eagle Consulting, Inc.
 1345 Capital Blvd., Suite A
 Reno, Nevada 89502-7140
 (775) 359-6600

Atkins
East Prater Way Storm Drain Project
Sparks, NV

PROJECT NO.:
 0324-13-1

PLATE:
 2



BORING LOG

BORING NO.: B-07
 TYPE OF RIG: CME 75
 LOGGED BY: JP

DATE: 10/25/2017
 DEPTH TO GROUND WATER (ft): 7.5
 GROUND ELEVATION (ft): NA

| SAMPLE NO. | SAMPLE TYPE | BLOWS/12 inches | MOISTURE (%) | PLASTICITY INDEX | DEPTH (ft) | USCS SYMBOL | LITHOLOGY | DESCRIPTION |
|------------|-------------|-----------------|--------------|------------------|------------|-------------|---------------------|--|
| | | | | | | | Asphalt Concrete | Approximately 6.5 inches thick. |
| | | | | | | GW | Aggregate Base | Approximately 6 inches thick. |
| A | SPT | 25 | | | 2 | SC | Clayey Sand | Dark brown to dark gray, very moist, medium dense, with an estimated 30% medium plasticity fines and 70% fine to coarse sand. |
| B | SPT | 6 | | | 4 | SC | Clayey Sand | Tan to olive, moist to very moist, loose to medium dense, with an estimated 40% medium plasticity fines and 60% fine to medium sand. |
| C | SPT | 14 | | | 6 | | Silty Sand | Gray, very moist to wet, dense, with an estimated 15% non-plastic fines and 85% fine to coarse sand. |
| | | | | | 7.5 | ▼ SM | | Groundwater level |
| D | SPT | 41 | | | 8 | | Lean Clay with Sand | Tan to light brown, wet, hard, with an estimated 85% low to medium plasticity fines and 15% fine sand. |
| E | SPT | 35 | | | 10 | CL | Lean Clay with Sand | Pocket penetrometer (PP) >4.5 tons per square foot (tsf). |
| | | | | | 14 | | Silty Sand | Gray, wet, medium dense, with an estimated 30% non-plastic fines and 70% fine sand. |
| F | SPT | 25 | | | 16 | SM | Silty Sand | Gray, wet, medium dense, with an estimated 30% non-plastic fines and 70% fine sand. |
| | | | | | 18 | | | |

East Prater Way
 N 4380403 E 267532 UTM NAD83

Black Eagle Consulting, Inc.
 1345 Capital Blvd., Suite A
 Reno, Nevada 89502-7140
 (775) 359-6600

Atkins
East Prater Way Storm Drain Project
Sparks, NV

PROJECT NO.:
 0324-13-1

PLATE:
 2



BORING LOG

BORING NO.: B-08
 TYPE OF RIG: CME 75
 LOGGED BY: JP

DATE: 10/25/2017
 DEPTH TO GROUND WATER (ft): NE
 GROUND ELEVATION (ft): NA

| SAMPLE NO. | SAMPLE TYPE | BLOWS/12 inches | MOISTURE (%) | PLASTICITY INDEX | DEPTH (ft) | USCS SYMBOL | LITHOLOGY | DESCRIPTION |
|------------|-------------|-----------------|--------------|------------------|------------|-------------|-----------|--|
| | | | | | | | | Asphalt Concrete Approximately 6.5 inches thick. |
| | | | | | | GW | | Aggregate Base Approximately 10 inches thick. |
| A | SPT | 12 | | | 2 | SC | | Clayey Sand with Gravel (Fill) Brown, moist, medium dense, with an estimated 25% medium plasticity fines, 45% fine to coarse sand, and 30% subrounded gravel up to 1.25 inches. |
| B | SPT | 29 | | | 4 | SM | | Silty Sand with Gravel Poor recovery. Brown, moist, medium dense. |
| C | SPT | 26 | 11.5 | 6 | 6 | SC-SM | | Silty, Clayey Sand Brown, moist, medium dense, with 27% low plasticity fines, 70% fine to coarse sand, and 3% gravel up to 1 inch. |
| D | SPT | 15 | | | 8 | | | |
| E | SPT | 16 | | | 10 | SM | | Silty Sand Brown to gray, moist, medium dense, with an estimated 15% non-plastic fines and 85% fine to coarse sand. |
| F | SPT | 15 | | | 14 | CL | | Sandy Lean Clay Tan to brown, very moist, stiff, with an estimated 70% low to medium plasticity fines and 30% fine to medium sand. PP = 2.5 tsf. |
| | | | | | 16 | | | |
| | | | | | 18 | | | |

East Prater Way
 N 4380403 E 267784 UTM NAD83

Black Eagle Consulting, Inc.
 1345 Capital Blvd., Suite A
 Reno, Nevada 89502-7140
 (775) 359-6600

Atkins
East Prater Way Storm Drain Project
Sparks, NV

PROJECT NO.:
 0324-13-1

PLATE:
 2

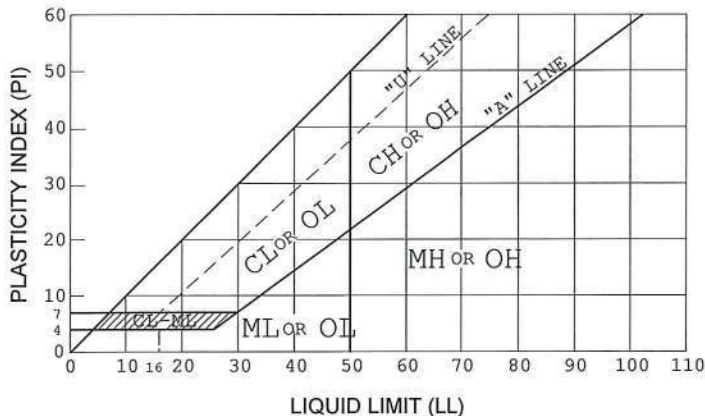


SOIL CLASSIFICATION CHART

| MAJOR DIVISIONS | | | SYMBOLS | | TYPICAL | |
|----------------------|------------------------------|---|---------------------------|---|---|--|
| | | | GRAPH | LETTER | DESCRIPTIONS | |
| COARSE GRAINED SOILS | GRAVEL AND GRAVELLY SOILS | CLEAN GRAVELS (LITTLE OR NO FINES) | | GW | WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES | |
| | | GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES) | | GP | POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES | |
| | | GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES) | | GM | SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES | |
| | | GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES) | | GC | CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES | |
| | SAND AND SANDY SOILS | CLEAN SANDS (LITTLE OR NO FINES) | | SW | WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES | |
| | | SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES) | | SP | POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES | |
| | | SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES) | | SM | SILTY SANDS, SAND - SILT MIXTURES | |
| | | SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES) | | SC | CLAYEY SANDS, SAND - CLAY MIXTURES | |
| | | SILTS AND CLAYS | LIQUID LIMIT LESS THAN 50 | | ML | INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY |
| | | | | | CL | INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS |
| | OL | | | ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY | | |
| SILTS AND CLAYS | LIQUID LIMIT GREATER THAN 50 | | MH | INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS | | |
| | | | CH | INORGANIC CLAYS OF HIGH PLASTICITY | | |
| | | | OH | ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS | | |
| HIGHLY ORGANIC SOILS | | | | PT | PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS | |
| FILL MATERIAL | | | | -- | FILL MATERIAL, NON-NATIVE | |

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS.

PLASTICITY CHART



FOR CLASSIFICATION OF FINE-GRAINED SOILS AND FINE-GRAINED FRACTION OF COARSE-GRAINED SOILS

EXPLORATION SAMPLE TERMINOLOGY

| Sample Type | Sample Symbol | Sample Code |
|-----------------------------|---------------|-------------|
| Auger Cuttings | | Auger |
| Bulk (Grab) Sample | | Grab |
| Modified California Sampler | | MC |
| Shelby Tube | | SH or ST |
| Standard Penetration Test | | SPT |
| Split Spoon | | SS |
| No Sample | | |

GRAIN SIZE TERMINOLOGY

| Component of Sample | Size Range |
|---------------------|---------------------------------------|
| Boulders | Over 12 in. (300mm) |
| Cobbles | 12 in. to 3 in. (300mm to 75mm) |
| Gravel | 3 in. to #4 sieve (75mm to 4.75mm) |
| Sand | # 4 to #200 sieve (4.75mm to 0.074mm) |
| Silt or Clay | Passing #200 sieve (0.074mm) |

RELATIVE DENSITY OF GRANULAR SOILS

| N - Blows/ft | Relative Density |
|-----------------|------------------|
| 0 - 4 | Very Loose |
| 5 - 10 | Loose |
| 11 - 30 | Medium Dense |
| 31 - 50 | Dense |
| greater than 50 | Very Dense |

CONSISTENCY OF COHESIVE SOILS

| Unconfined Compressive Strength, psf | N - Blows/ft | Consistency |
|--------------------------------------|-----------------|-------------|
| less than 500 | 0 - 1 | Very Soft |
| 500 - 1,000 | 2 - 4 | Soft |
| 1,000 - 2,000 | 5 - 8 | Firm |
| 2,000 - 4,000 | 9 - 15 | Stiff |
| 4,000 - 8,000 | 16 - 30 | Very Stiff |
| 8,000 - 16,000 | 31 - 60 | Hard |
| greater than 16,000 | greater than 60 | Very Hard |

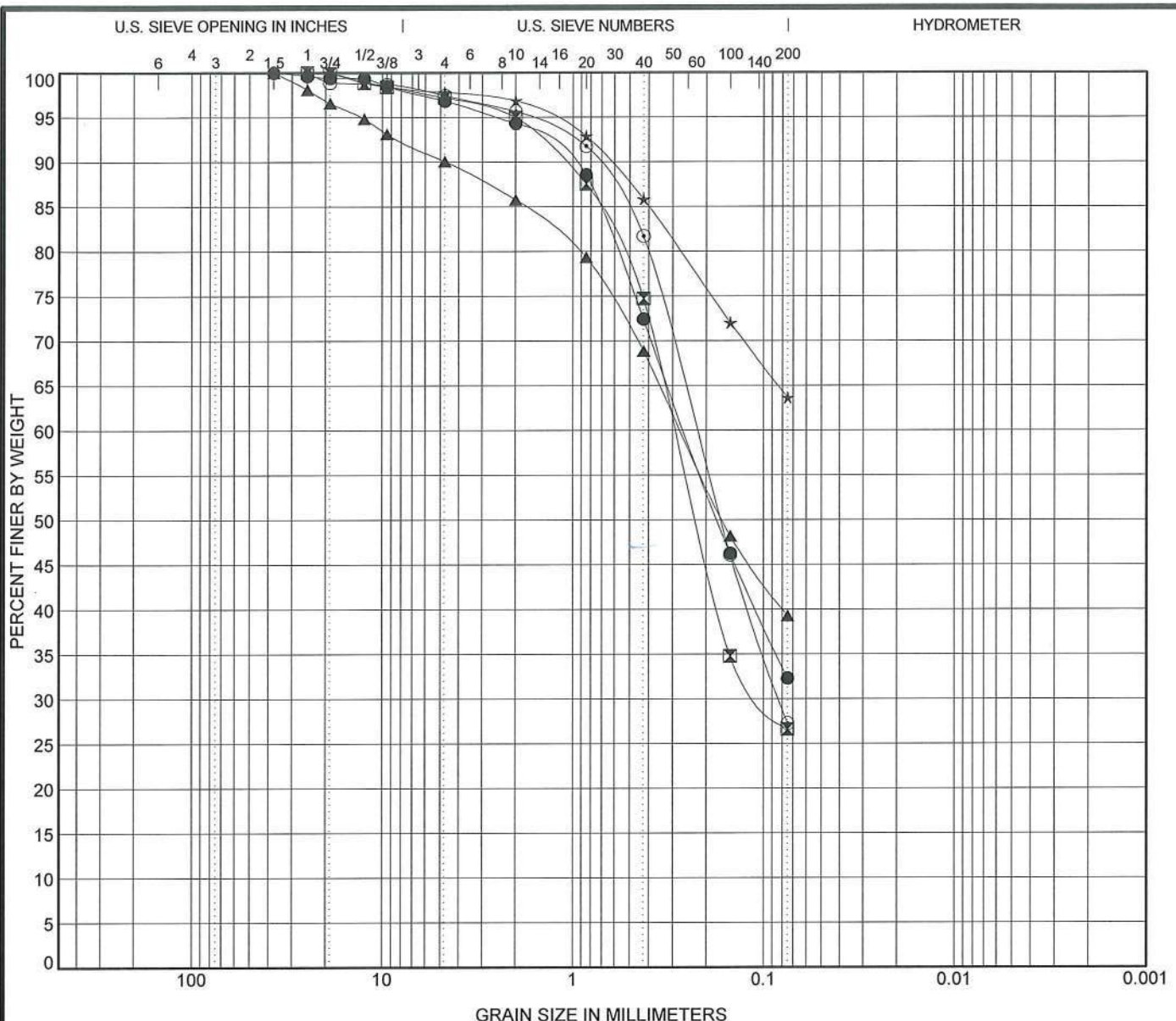
USCS CHART 0324131.GPJ US LAB.GDT 11/20/2017



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USCS Soil Classification Chart

Project: East Prater Way Storm Drain Project
Location: Sparks, NV
Project Number: 0324-13-1 Plate:



| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---------|--------|------|--------|--------|------|--------------|
| | coarse | fine | coarse | medium | fine | |

| Specimen Identification | USCS Classification | | | | | LL | PL | PI | Cc | Cu |
|-------------------------|----------------------------|-------|-------|-----|------|---------|-------|-------|-------|----|
| ● B-01 1.0' | CLAYEY SAND (SC) | | | | | 50 | 19 | 31 | | |
| ⊠ B-03 2.0' | SILTY, CLAYEY SAND (SC-SM) | | | | | 25 | 18 | 7 | | |
| ▲ B-04 2.0' | CLAYEY SAND (SC) | | | | | 35 | 15 | 20 | | |
| ★ B-06 5.0' | SANDY LEAN CLAY (CL) | | | | | 36 | 16 | 20 | | |
| ⊙ B-08 5.0' | SILTY, CLAYEY SAND (SC-SM) | | | | | 26 | 20 | 6 | | |
| Specimen Identification | D100 | D60 | D30 | D10 | MC % | %Gravel | %Sand | %Silt | %Clay | |
| ● B-01 1.0' | 37.5 | 0.259 | | | 18.8 | 3.2 | 64.5 | 32.3 | | |
| ⊠ B-03 2.0' | 25 | 0.289 | 0.1 | | 17.6 | 2.8 | 70.6 | 26.6 | | |
| ▲ B-04 2.0' | 37.5 | 0.272 | | | 17.8 | 9.9 | 50.8 | 39.3 | | |
| ★ B-06 5.0' | 19 | | | | 24.0 | 2.2 | 34.2 | 63.6 | | |
| ⊙ B-08 5.0' | 25 | 0.225 | 0.083 | | 11.5 | 2.6 | 70.2 | 27.3 | | |

US GRAIN SIZE2 0324131.GPJ US LAB.GDT 11/20/2017

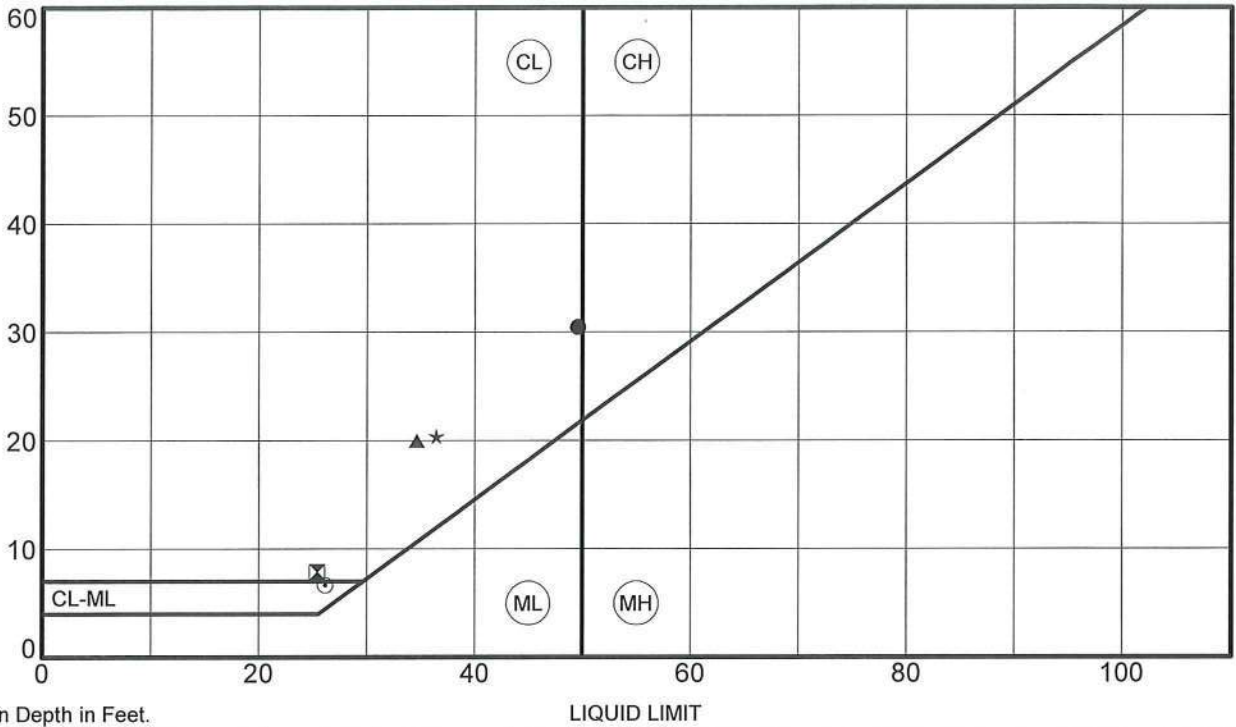


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GRAIN SIZE DISTRIBUTION

Project: East Prater Way Storm Drain Project
 Location: Sparks, NV
 Project Number: 0324-13-1 Plate: 4a
 Page 269

P L A S T I C I T Y
I N D E X



Specimen Depth in Feet.

LIQUID LIMIT

| Specimen Identification | LL | PL | PI | Fines | USCS Classification |
|-------------------------|----|----|----|-------|----------------------------|
| ● B-01 A 1.0' | 50 | 19 | 31 | 32 | CLAYEY SAND (SC) |
| ☒ B-03 2.0' | 25 | 18 | 7 | 27 | SILTY, CLAYEY SAND (SC-SM) |
| ▲ B-04 2.0' | 35 | 15 | 20 | 39 | CLAYEY SAND (SC) |
| ★ B-06 C 5.0' | 36 | 16 | 20 | 64 | SANDY LEAN CLAY (CL) |
| ⊙ B-08 C 5.0' | 26 | 20 | 6 | 27 | SILTY, CLAYEY SAND (SC-SM) |
| | | | | | |
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US ATTERBERG LIMITS 0324131.GPJ US LAB.GDT 11/20/2017

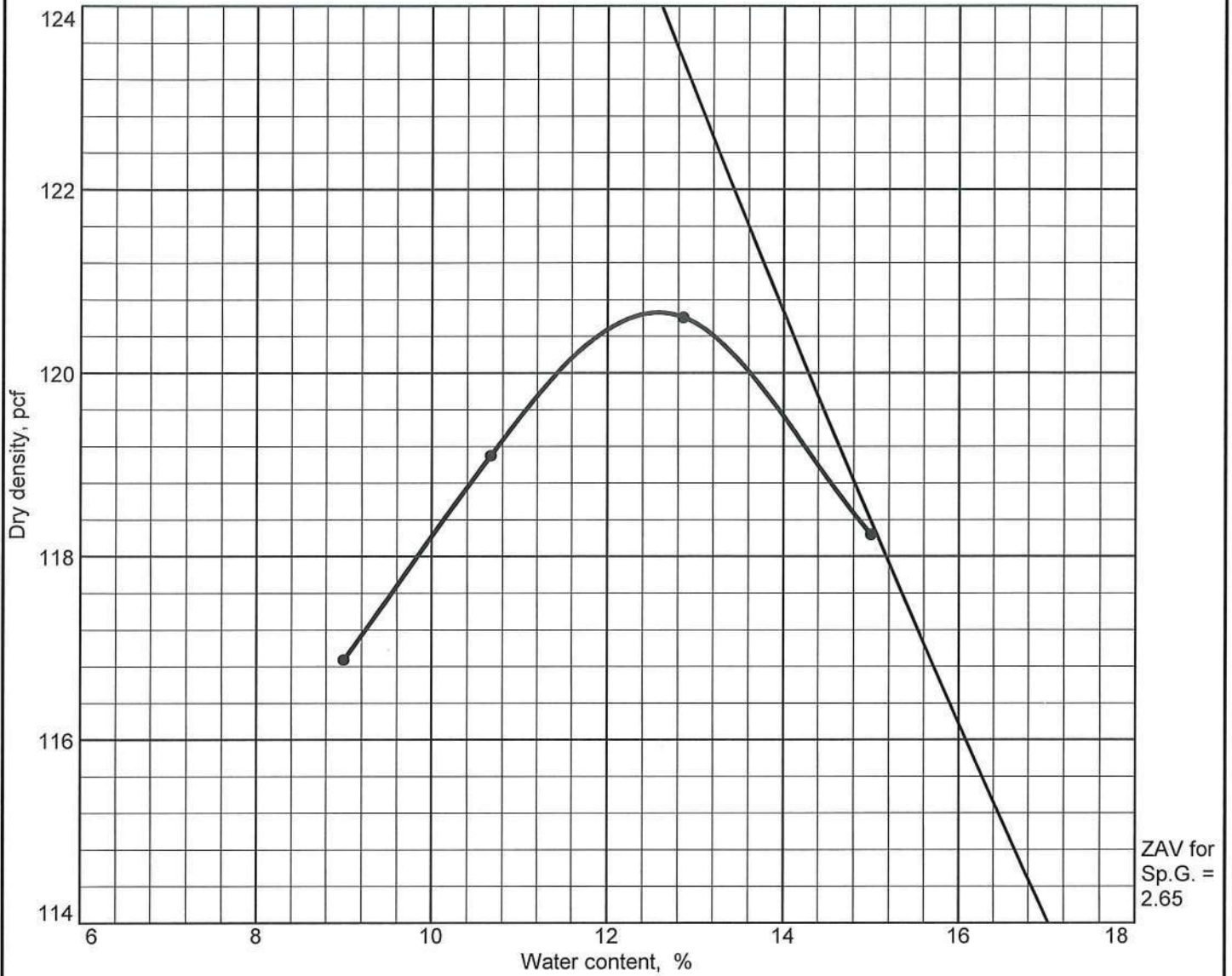


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 Reno, Nevada 89502-7140
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ATTERBERG LIMITS RESULTS

Project: East Prater Way Storm Drain Project
 Location: Sparks, NV
 Project Number: 0324-13-1 Plate: _____

COMPACTION TEST REPORT



Test specification: ASTM D 1557 Procedure C Modified

| Elev/ Depth | Classification | | Nat. Moist. | Sp.G. | LL | PI | % > 3/4 in. | % < No.200 |
|----------------|----------------|--------|----------------|-------|----|----|----------------|---------------|
| | USCS | AASHTO | | | | | | |
| 1-5 | SC | | 18.8 | | 50 | 31 | 0.6 | 32.3 |

| TEST RESULTS | MATERIAL DESCRIPTION |
|---|----------------------|
| Maximum dry density = 120.7 pcf Optimum moisture = 12.6 % | Clayey sand |
| Project No. 0324-13-1 Client: Atkins Project: EAST PRATER WAY STORM DRAIN PROJECT ● Source: B-01 Sample No.: 2-5 Elev./Depth: 1-5 | Remarks: |
| BLACK EAGLE CONSULTING, INC. Reno, Nevada | |

Figure 5a

COMPACTION TEST REPORT



Test specification: ASTM D 1557 Procedure B Modified

| Elev/ Depth | Classification | | Nat. Moist. | Sp.G. | LL | PI | % > 3/8 in. | % < No.200 |
|----------------|----------------|--------|----------------|-------|----|----|----------------|---------------|
| | USCS | AASHTO | | | | | | |
| 2-6 | SC-SM | | 17.6 | | 25 | 7 | 1.6 | 26.6 |

| TEST RESULTS | MATERIAL DESCRIPTION |
|---|----------------------|
| Maximum dry density = 123.1 pcf Optimum moisture = 12.5 % | Silty, clayey sand |
| Project No. 0324-13-1 Client: Atkins Project: EAST PRATER WAY STORM DRAIN PROJECT ● Source: B-03 Sample No.: 1-5 Elev./Depth: 2-6 | Remarks: |
| BLACK EAGLE CONSULTING, INC. Reno, Nevada | |

Figure 5b

APPENDIX A
CHEMICAL TEST RESULTS



Silver State Labs-Reno
 1135 Financial Blvd
 Reno, NV 89502
 (775) 857-2400 FAX: (888) 398-7002
 www.ssalabs.com

Analytical Report

Workorder#: 17110027
 Date Reported: 11/10/2017

Client: BLACK EAGLE CONSULTING, INC
Project Name: 0324-13-1 B-03 2-6'
PO #: 0324-13-1

Sampled By: J. Payne

Laboratory Accreditation Number: NV015/CA2990

| Laboratory ID | Client Sample ID | Date/Time Sampled | Date Received |
|---------------|---------------------|-------------------|---------------|
| 17110027-01 | 0324-13-1 B-03 2-6' | 10/25/2017 0:00 | 11/1/2017 |

| Parameter | Method | Result | Units | PQL | Analyst | Date/Time Analyzed | Data Flag |
|-------------------------------|--------------|----------|----------|-----|---------|--------------------|-----------|
| Oxidation-Reduction Potential | SM 2580B | 543 | mV | | LRB | 11/02/2017 9:33 | |
| pH | SW-846 9045D | 8.06 | pH Units | | LRB | 11/02/2017 8:40 | |
| pH Temperature | SW-846 9045D | 20.0 | °C | | LRB | 11/02/2017 8:40 | |
| Resistivity | EPA 120.1 | 4000 | Ohms-cm | | LRB | 11/02/2017 9:40 | |
| Sulfate | EPA 300.0 | 200 | mg/Kg | 10 | JF | 11/02/2017 19:15 | |
| Sulfide | AWWA C105 | Negative | POS/NEG | | LRB | 11/03/2017 16:34 | |

Laboratory Accreditation Number: NV015/CA2990

| Laboratory ID | Client Sample ID | Date/Time Sampled | Date Received |
|---------------|---------------------|-------------------|---------------|
| 17110027-02 | 0324-13-1 B-04 2-5' | 10/25/2017 0:00 | 11/1/2017 |

| Parameter | Method | Result | Units | PQL | Analyst | Date/Time Analyzed | Data Flag |
|-------------------------------|--------------|----------|----------|-----|---------|--------------------|-----------|
| Oxidation-Reduction Potential | SM 2580B | 533 | mV | | LRB | 11/02/2017 9:33 | |
| pH | SW-846 9045D | 7.61 | pH Units | | LRB | 11/02/2017 8:40 | |
| pH Temperature | SW-846 9045D | 21.0 | °C | | LRB | 11/02/2017 8:40 | |
| Resistivity | EPA 120.1 | 1500 | Ohms-cm | | LRB | 11/02/2017 9:40 | |
| Sulfate | EPA 300.0 | 770 | mg/Kg | 100 | JF | 11/04/2017 1:58 | |
| Sulfide | AWWA C105 | Negative | POS/NEG | | LRB | 11/03/2017 16:34 | |

SECTION 700**SUPPLEMENTAL WATER SPECIFICATIONS FOR WATER CONSTRUCTION****PART 1 – GENERAL****1.01 SUMMARY**

This section includes information regarding working around as well as removing and replacing of TMWA water facilities.

1.02 DESCRIPTION

This Section covers the construction methods involved in the replacement of TMWA water facilities at storm drain/sewer crossings (section replacement), slurry backfill under water mains, and mitigation requirements when storm drain to water line separation requirements are not met.

Contractor shall consult with TMWA inspector regarding construction means and methods around TMWA facilities. If necessary, all water shutdowns shall be coordinated with TMWA inspector. Where water main section replacement is not required per TMWA, TMWA inspector may require slurry or other backfill type and/or method below water main.

All work and materials affecting TMWA facilities shall be in accordance with the current Truckee Meadows Water Authority (TMWA) Construction and Design Standards and Details. TMWA facilities shall be inspected and approved by a TMWA inspector. Complete TMWA specifications and standards can be located at www.tmwa.com. Contractor shall obtain, become familiar with and keep TMWA standards available on the project site.

PART 2 – MATERIALS

Pipe material used for TMWA section replacements and all water main work shall be cement lined Class 350 Ductile Iron (DI). Repair all defects in lining and cut ends of pipe per manufacturer's recommendations. When PVC is approved all pipe shall be AWWA C900 Class 235 unless otherwise indicated on the Improvement Plans. Fittings shall be cement lined, ductile iron, and mechanical joint or flanged fittings with 150 class bolt pattern unless otherwise indicated. New service lines shall be CTS HDPE with approved compression style fittings. All hardware, nipples, corporation stops, etc. shall be brass. Use stainless steel service taps per TMWA Standard Details. All potable water system materials shall be lead free and NSF approved as applicable.

Where indicated on the Improvement Plans, metallic pipe, fittings and valves shall be wrapped in V-Bio Enhanced Polyethylene Encasement meeting the following specifications:

1. Polyethylene encasement for use with ductile iron pipe shall meet all the requirements for ANSI/AWWA C105/A21.5, Polyethylene Encasement for Ductile Iron Pipe Systems. In addition, polyethylene encasement for use with ductile iron pipe systems shall consist of three layers of co-extruded linear low-density polyethylene (LLDPE), fused into a single thickness of not less than eight mils. The inside surface of the polyethylene wrap to be in contact with the pipe exterior

shall be infused with a blend of antimicrobial compound to mitigate microbiologically influenced corrosion and a volatile corrosion inhibitor to control galvanic corrosion.

2. Ductile iron pipe and the polyethylene encasement used to protect it shall be installed in accordance with AWWA C600 and ANSI/AWWA C105/A21.5 and also in accordance with all recommendations and practices of the AWWA M41, Manual of Water Supply Practices – Ductile Iron Pipe and Fittings. Specifically, the wrap shall be overlapped one foot in each direction at joints and secured in place around the pipe, and any wrap at tap locations shall be taped tightly prior to tapping and inspected for any needed repairs following the tap. All installations shall be carried out by personnel trained and equipped to meet these various requirements.
3. The installing contractor shall submit an affidavit stating compliance with the requirements and practices of ANSI/AWWA C150/A21.50, ANSI/AWWA C151/A21.51, ANSI/AWWA C105/A21.5, AWWA C600 and M41.
4. Polyethylene encasement shall be V-Bio Enhanced Polyethylene Encasement for Ductile Iron Pipe or approved equivalent.

Epoxy coating shall be applied to all indicated parts (valves, fittings, slip-on weld flanges, piping interior and exterior, etc.) for corrosion protection in compliance with AWWA C210. Epoxy coating shall be a NSF-61 drinking water approved 2-part system with 100% solids. Coating shall be 3M Scotchkote Liquid Epoxy Coating 323, Brush Grade, or TMWA approved equal.

Slip-on weld flanges shall be Ring-Type, Class D. Surfaces shall be faced and drilled in accordance with ANSI Class 125 B16.1. Flange bolts shall be Grade B in compliance with ASTM A307. Flange Nuts shall be Grade A, Heavy Hex and ASTM A563 compliant.

Fabricated steel plates for one-piece reinforcement, collar shall be compliant with ASTM A36. Nuts and bolts shall be supplied with a factory applied fluoropolymer coating. The coating shall be low friction, wear resistant, and corrosion resistant. Prior to application, surfaces shall be chemically cleaned, abrasive-blasted and primed. Wear resistance (K-factor) shall be in the range of 6-8. Nuts and bolts shall be coated with Tripac 2000 Blue as provided by Tripac Fasteners, or TMWA approved equal. Factory coated nuts and bolts shall not require field applied mastic unless damage to the coating occurs.

Transition couplings shall meet the requirements of AWWA 219 and be Hymex 2000 series as manufactured by Total Piping Solutions, Inc. or approved equal.

Pipe materials for water main relocations and water service relocations shall be per the Improvement Plans, Details, and (TMWA) Construction and Design Standards and Details.

For installation at all storm drain/sewer crossings, the Contractor shall refer to the Improvement Plans and Details.

PART 3 – EXECUTION

Water main section replacement locations are identified on the Improvement Plans. Contractor shall note that water main section replacement shall also be dependent on soil conditions, trench slope stability, vertical separation distance between storm drain/sewer and water, and location of water mains relative to storm drain/sewer. The Contractor shall be aware that TMWA section replacements may require horizontal and/or vertical offsets in order to clear the proposed storm drain/sewer crossings. If after

exposure and inspection, TMWA deems that a water section replacement is not needed, slurry backfill may be substituted.

In cases where water section replacement is 4" to 8" transite and/or cast iron, TMWA will provide the materials for section replacements and the Contractor shall arrange for pickup of materials.

Slurry backfill under water mains shall also be coordinated with the TMWA inspector. Locations for potential slurry backfill are based on the anticipated water main exposure at storm drain/sewer crossings as indicated on the Improvement Plans and Details. The minimum slurry shall be from the top of sewer pipe bedding or the top of mechanically compacted backfill when possible to the spring line of the water pipe. Slurry shall be allowed 24 hours of cure time prior to the application of water line bedding and backfill. At the direction of TMWA inspector, the use a plastic sheet bond breaker where slurry is in direct contact with pipe may be required. Refer to the Improvement Plan Details. No additional payment will be made if the Contractor selected means and methods result in wider trench.

Water main interconnection/relocation/reconnection shall be per Improvement Plan Details. Coordinate with TMWA inspector on public notices, shut downs, and disinfection procedures. Contractor shall be responsible for all work.

When a water main is exposed within the excavation, TMWA should be notified immediately and shall approve the measures proposed by the contractor to support, protect, and restore the water main.

SECTION 700**SUPPLEMENTAL WATER SPECIFICATIONS FOR WATER CONSTRUCTION****PART 1 – GENERAL****1.01 SUMMARY**

This section includes information regarding working around as well as removing and replacing of TMWA water facilities.

1.02 DESCRIPTION

This Section covers the construction methods involved in the replacement of TMWA water facilities at storm drain/sewer crossings (section replacement), slurry backfill under water mains, and mitigation requirements when storm drain to water line separation requirements are not met.

Contractor shall consult with TMWA inspector regarding construction means and methods around TMWA facilities. If necessary, all water shutdowns shall be coordinated with TMWA inspector. Where water main section replacement is not required per TMWA, TMWA inspector may require slurry or other backfill type and/or method below water main.

All work and materials affecting TMWA facilities shall be in accordance with the current Truckee Meadows Water Authority (TMWA) Construction and Design Standards and Details. TMWA facilities shall be inspected and approved by a TMWA inspector. Complete TMWA specifications and standards can be located at www.tmwa.com. Contractor shall obtain, become familiar with and keep TMWA standards available on the project site.

PART 2 – MATERIALS

Pipe material used for TMWA section replacements and all water main work shall be cement lined Class 350 Ductile Iron (DI). Repair all defects in lining and cut ends of pipe per manufacturer's recommendations. When PVC is approved all pipe shall be AWWA C900 Class 235 unless otherwise indicated on the Improvement Plans. Fittings shall be cement lined, ductile iron, and mechanical joint or flanged fittings with 150 class bolt pattern unless otherwise indicated. New service lines shall be CTS HDPE with approved compression style fittings. All hardware, nipples, corporation stops, etc. shall be brass. Use stainless steel service taps per TMWA Standard Details. All potable water system materials shall be lead free and NSF approved as applicable.

Where indicated on the Improvement Plans, metallic pipe, fittings and valves shall be wrapped in V-Bio Enhanced Polyethylene Encasement meeting the following specifications:

1. Polyethylene encasement for use with ductile iron pipe shall meet all the requirements for ANSI/AWWA C105/A21.5, Polyethylene Encasement for Ductile Iron Pipe Systems. In addition, polyethylene encasement for use with ductile iron pipe systems shall consist of three layers of co-extruded linear low-density polyethylene (LLDPE), fused into a single thickness of not less than eight mils. The inside surface of the polyethylene wrap to be in contact with the pipe exterior

shall be infused with a blend of antimicrobial compound to mitigate microbiologically influenced corrosion and a volatile corrosion inhibitor to control galvanic corrosion.

2. Ductile iron pipe and the polyethylene encasement used to protect it shall be installed in accordance with AWWA C600 and ANSI/AWWA C105/A21.5 and also in accordance with all recommendations and practices of the AWWA M41, Manual of Water Supply Practices – Ductile Iron Pipe and Fittings. Specifically, the wrap shall be overlapped one foot in each direction at joints and secured in place around the pipe, and any wrap at tap locations shall be taped tightly prior to tapping and inspected for any needed repairs following the tap. All installations shall be carried out by personnel trained and equipped to meet these various requirements.
3. The installing contractor shall submit an affidavit stating compliance with the requirements and practices of ANSI/AWWA C150/A21.50, ANSI/AWWA C151/A21.51, ANSI/AWWA C105/A21.5, AWWA C600 and M41.
4. Polyethylene encasement shall be V-Bio Enhanced Polyethylene Encasement for Ductile Iron Pipe or approved equivalent.

Epoxy coating shall be applied to all indicated parts (valves, fittings, slip-on weld flanges, piping interior and exterior, etc.) for corrosion protection in compliance with AWWA C210. Epoxy coating shall be a NSF-61 drinking water approved 2-part system with 100% solids. Coating shall be 3M Scotchkote Liquid Epoxy Coating 323, Brush Grade, or TMWA approved equal.

Slip-on weld flanges shall be Ring-Type, Class D. Surfaces shall be faced and drilled in accordance with ANSI Class 125 B16.1. Flange bolts shall be Grade B in compliance with ASTM A307. Flange Nuts shall be Grade A, Heavy Hex and ASTM A563 compliant.

Fabricated steel plates for one-piece reinforcement, collar shall be compliant with ASTM A36. Nuts and bolts shall be supplied with a factory applied fluoropolymer coating. The coating shall be low friction, wear resistant, and corrosion resistant. Prior to application, surfaces shall be chemically cleaned, abrasive-blasted and primed. Wear resistance (K-factor) shall be in the range of 6-8. Nuts and bolts shall be coated with Tripac 2000 Blue as provided by Tripac Fasteners, or TMWA approved equal. Factory coated nuts and bolts shall not require field applied mastic unless damage to the coating occurs.

Transition couplings shall meet the requirements of AWWA 219 and be Hymex 2000 series as manufactured by Total Piping Solutions, Inc. or approved equal.

Pipe materials for water main relocations and water service relocations shall be per the Improvement Plans, Details, and (TMWA) Construction and Design Standards and Details.

For installation at all storm drain/sewer crossings, the Contractor shall refer to the Improvement Plans and Details.

PART 3 – EXECUTION

Water main section replacement locations are identified on the Improvement Plans. Contractor shall note that water main section replacement shall also be dependent on soil conditions, trench slope stability, vertical separation distance between storm drain/sewer and water, and location of water mains relative to storm drain/sewer. The Contractor shall be aware that TMWA section replacements may require horizontal and/or vertical offsets in order to clear the proposed storm drain/sewer crossings. If after

exposure and inspection, TMWA deems that a water section replacement is not needed, slurry backfill may be substituted.

In cases where water section replacement is 4" to 8" transite and/or cast iron, TMWA will provide the materials for section replacements and the Contractor shall arrange for pickup of materials.

Slurry backfill under water mains shall also be coordinated with the TMWA inspector. Locations for potential slurry backfill are based on the anticipated water main exposure at storm drain/sewer crossings as indicated on the Improvement Plans and Details. The minimum slurry shall be from the top of sewer pipe bedding or the top of mechanically compacted backfill when possible to the spring line of the water pipe. Slurry shall be allowed 24 hours of cure time prior to the application of water line bedding and backfill. At the direction of TMWA inspector, the use a plastic sheet bond breaker where slurry is in direct contact with pipe may be required. Refer to the Improvement Plan Details. No additional payment will be made if the Contractor selected means and methods result in wider trench.

Water main interconnection/relocation/reconnection shall be per Improvement Plan Details. Coordinate with TMWA inspector on public notices, shut downs, and disinfection procedures. Contractor shall be responsible for all work.

When a water main is exposed within the excavation, TMWA should be notified immediately and shall approve the measures proposed by the contractor to support, protect, and restore the water main.

SECTION 800
ELECTRICAL AND INSTRUMENTATION AND CONTROLS SCOPE MATRIX

Scope Matrix

Quote / Project #:20-6232

| East Prater Way Storm Drain Lift Station | | | | | | | | | | | |
|--|----|----|----|----|---|----|---------------|--------------|----------------------|-------------------------|--|
| Item | AI | AO | DI | DO | P | MB | Supplied By | Installation | Field Conduit & Wire | Electrical Terminations | Notes / Discussion Items |
| Demolition of existing equipment | | | | | | | | | n/a | | |
| Electrical supply, distribution, grounding, fusing, and disconnects | | | | | | | | | Others | | |
| Intermediate junction boxes, conduits, termination boxes, fittings, field wiring, etc. | | | | | | | | | Others | | |
| Motor Breakers | | | | | | | | | Others | | |
| Motor VFDs Disconnects and Enclosure(s) | | | | | | | | | Others | | |
| I/O List and Features | | | | | | | | | | | |
| Wet Well Level Transducer | 1 | | | | | | SC | Others | Others | SC | MJK Submersible Pressure Transducer - PN: 209935. Wired through Intrinsically Safe Barriers - GEMS 114175 & GEMS 114166 |
| Pump 1 | | | | | | | Others | Others | Others | Others | 150 HP |
| Motor Starter (Call, Fault) | | | 1 | 1 | | | Others | Others | Others | SC | Discrete signals to VFD (1DO - Call, 1 DI - Fault) |
| Pump Run | | | 1 | | | | Others | Others | Others | SC | Discrete Signal from VFD |
| HOA Switch - Auto | | | 1 | | | | SC | SC | SC | SC | |
| HOA Switch - Hand | | | 1 | | | | SC | SC | SC | SC | To be determined based on VFD selection |
| Pump Electrical, including disconnect(s) | | | | | | | Others | Others | Others | Others | |
| VFD Speed Command | | 1 | | | | | Others | Others | Others | SC | Analog Output to VFD |
| VFD Speed Reference | 1 | | | | | | Others | Others | Others | SC | Analog Input from VFD |
| VFD Modbus Communications | | | | | | 1 | Others | Others | Others | SC | ModbusTCP Communication Protocol to VFD |
| Pump Seal Fail (Moisture) | | | 1 | | | | Pump Supplier | Others | Others | Shared | Digital Input from pump supplier moisture and overtemp device. Signal terminated by SC |
| Pump Over Temp | | | 1 | | | | Pump Supplier | Others | Others | Shared | |
| Pump 2 | | | | | | | Others | Others | Others | Others | 150 HP |
| Motor Starter (Call, Fault) | | | 1 | 1 | | | Others | Others | Others | SC | Discrete signals to VFD (1DO - Call, 1 DI - Fault) |
| Pump Run | | | 1 | | | | Others | Others | Others | SC | Discrete Signal from VFD |
| HOA Switch - Auto | | | 1 | | | | SC | SC | SC | SC | |
| HOA Switch - Hand | | | 1 | | | | SC | SC | SC | SC | To be determined based on VFD selection |
| Pump Electrical, including disconnect(s) | | | | | | | Others | Others | Others | Others | |
| VFD Speed Command | | 1 | | | | | Others | Others | Others | SC | Analog Output to VFD |
| VFD Speed Reference | 1 | | | | | | Others | Others | Others | SC | Analog Input from VFD |
| VFD Modbus Communications | | | | | | 1 | Others | Others | Others | SC | ModbusTCP Communication Protocol to VFD |
| Pump Seal Fail (Moisture) | | | 1 | | | | Pump Supplier | Others | Others | Shared | Digital Input from pump supplier moisture and overtemp device. Signal terminated by SC |
| Pump Over Temp | | | 1 | | | | Pump Supplier | Others | Others | Shared | |
| Pump 3 | | | | | | | Others | Others | Others | Others | 150 HP |
| Motor Starter (Call, Fault) | | | 1 | 1 | | | Others | Others | Others | SC | Discrete signals to VFD (1DO - Call, 1 DI - Fault) |
| Pump Run | | | 1 | | | | Others | Others | Others | SC | Discrete Signal from VFD |
| HOA Switch - Auto | | | 1 | | | | SC | SC | SC | SC | |
| HOA Switch - Hand | | | 1 | | | | SC | SC | SC | SC | To be determined based on VFD selection |
| Pump Electrical, including disconnect(s) | | | | | | | Others | Others | Others | Others | |
| VFD Speed Command | | 1 | | | | | Others | Others | Others | SC | Analog Output to VFD |
| VFD Speed Reference | 1 | | | | | | Others | Others | Others | SC | Analog Input from VFD |
| VFD Modbus Communications | | | | | | 1 | Others | Others | Others | SC | ModbusTCP Communication Protocol to VFD |
| Pump Seal Fail (Moisture) | | | 1 | | | | Pump Supplier | Others | Others | Shared | Digital Input from pump supplier moisture and overtemp device. Signal terminated by SC |
| Pump Over Temp | | | 1 | | | | Pump Supplier | Others | Others | Shared | |
| High Wet Well Float | | | 1 | | | | SC | Others | Others | SC | MJK 7030 Float Switch W/ Counterweight - Placed between the analog on set point and the pump on float, with the purpose of verifying analog input. |
| Pump On Float (Hardwired to ISR Controller) | | | | | | | SC | Others | Others | SC | MJK 7030 Float Switch W/ Counterweight |
| Pump Off Float (Hardwired to ISR Controller) | | | | | | | SC | Others | Others | SC | MJK 7030 Float Switch W/ Counterweight |
| Backup Float Active | | | 1 | | | | SC | SC | SC | SC | |
| Common Alarm Lamp & Reset | | | 1 | 1 | | | SC | SC | SC | SC | Allen-Bradley Red Push-To-Test LED - 800T-QTH2RG1 with extra contact block |
| Help Needed Mushroom Switch | | | 1 | | | | SC | SC | SC | SC | Model TBD |
| Site Power - Three Phase Monitor | | | 1 | | | | SC | Others | Others | Shared | Timemark - Model TBD |
| RTU Power - Surge Protection Fault | | | 1 | | | | SC | SC | SC | SC | Model TBD |
| RTU Security Switch | | | 2 | | | | SC | SC | SC | SC | Omron V-10G6-1C24K Security Switch |
| RTU Power Supply Alarm | | | 1 | | | | SC | SC | SC | SC | Internal |
| RTU Power Fail | | | 1 | | | | SC | SC | SC | SC | Internal |
| RTU DC Fuse OK | | | 1 | | | | SC | SC | SC | SC | Internal |
| Field I/O Count | 4 | 3 | 29 | 4 | 0 | | | | | | |
| RTU I/O Count (Without Add-On Modules) | 13 | 4 | 40 | 12 | 3 | | SC | n/a | n/a | n/a | |
| I/O Count For Add-On Modules | | | | | | | SC | n/a | n/a | n/a | |
| Spare I/O | 9 | 1 | 11 | 8 | 3 | | SC | n/a | n/a | n/a | TBD (>=20% Where Possible) |
| Enclosure Mounted with PLC, OIT, Ethernet Switch, Relays. Control Voltage = 110VAC. | | | | | | | | | | | |
| PLC Base: SP357 | | | | | | X | SC | SC | SC | SC | |
| PLC I/O Modules: 5401 (0 ea) | | | | | | | | | | | |
| PLC I/O Relays: DI (0 ea) DO (0 ea) | | | | | | | | | | | |
| OIT: Maple Systems HMIS070P | | | | | | | | | | | |
| PLC programming and testing | | | | | | | SC | SC | n/a | n/a | |
| Local OIT/HMI programming and testing | | | | | | | SC | SC | n/a | n/a | |
| Batteries and Battery Enclosure | | | | | | | SC | SC | n/a | SC | |

SECTION 900**TRANSITE PIPE REMOVAL****PART 1 – GENERAL****1.01 SUMMARY**

This section includes information regarding the handling, removing, disposing, and documentation regarding removal of transite pipe.

1.02 DESCRIPTION

CONTRACTOR acknowledges and agrees that CONTRACTOR is required to perform work on or remove certain water pipes, which may be constructed of transite and asbestos containing materials regulated as a potentially hazardous material. Any disturbance, removal, disposal, handling or work activity on transite or asbestos containing pipe by CONTRACTOR and/or Subcontractor must be done in strict compliance with applicable laws and regulations governing the safe handling practices for disturbance, removal, handling and disposal of asbestos-containing material, and CONTRACTOR and/or Subcontractor shall be solely responsible for all costs and actions necessary to comply with such laws and regulations.

1.03 REQUIREMENTS

CONTRACTOR shall be or shall contract with a properly licensed Subcontractor certified in handling, removing and disposing of asbestos containing materials and transite pipe. CONTRACTOR shall provide copies of the required certification and training for all personnel that will perform work or supervise the work on the transite or asbestos containing pipe to the TMWA Inspector at the site of the work prior to performing any work on the transite or asbestos containing pipe. CONTRACTOR shall be responsible for removal and disposal of asbestos materials. CONTRACTOR shall provide the disposal manifest to the TMWA inspector showing all transite pipe and asbestos containing material has been disposed of in accordance with all applicable laws and regulations. TMWA may require the CONTRACTOR and/or Subcontractor to provide a bond, letter of credit or guarantee acceptable to TMWA relative to the removal of transite pipe as a condition of permitting Applicant to commence construction of Applicant installed facilities or improvements. CONTRACTOR must provide TMWA with a final manifest attesting to the proper disposal of all transite pipe and asbestos containing material in a form and of such content acceptable to TMWA, prior to TMWA have any obligation to provide water service to, or capacity for, CONTRACTOR's project. CONTRACTOR shall, and shall require its Subcontractor to, indemnify and hold TMWA harmless from any claims, injuries, demands or liabilities arising from CONTRACTOR or its Subcontractor's handling, removal, disposal or work on or about transite pipe or asbestos containing material on this project.

Forms

(to be used following award of bid)

- 1) Contract Form**
- 2) Performance Bond**
- 3) Payment Bond**



TITLE
BID # BIDNUMBER
PWP# PWPNUMBER

THIS CONTRACT made and entered into on this DAY day of MONTH, YEAR by and between the City of Sparks, Nevada, a municipal corporation, existing under and by virtue of the laws of the State of Nevada, hereinafter called "City", and **CONTRACTORNAME**, a qualified Contractor in the class of work required, hereinafter called "Contractor".

W I T N E S E T H

WHEREAS, the City has awarded a contract to Contractor for providing material and/or performing the work hereinafter mentioned in accordance with the proposal of said Contractor;

WHEREAS, the Contractor will provide the material and/or perform the work for the compensation stated in said proposal, an amount which has been arrived at between the parties;

WHEREAS, each party is willing to and does assume joint liability for the contents of this Contract, and each party accordingly agrees that it shall not be construed against any party as a drafting party;

NOW, THEREFORE, IT IS AGREED as follows:

1. Scope of Work:

The scope of work for this contract is generally defined as **TITLE**. The City's Contract Documents and Contractor's Entire Proposal are on file with the City of Sparks. All terms, conditions and requirements contained within these Documents, including any and all bid documents, addenda and specifications issued by the City, are hereby incorporated by reference into this Contract.

The Contractor shall perform within the time stipulated, the Contract as herein defined and shall provide and furnish any and all of the labor, materials, methods or processes, equipment implements, tools, machinery and equipment, and all utility, transportation and other services required to construct, install and put in complete order for use in a good and workmanlike manner all of the work covered by the Contract in connection with strict accordance with the plans and specifications therein, which were approved by said City and are on file with the City, including any and all addenda issued by the City, and with the other contract documents hereinafter enumerated.

2. Payment for Project Services

As full consideration for the Services to be performed by Contractor, City agrees to pay Contractor as set forth in accordance with the bid and not to exceed fee of **\$AMOUNT** for the project.

A monthly progress payment in the amount of ninety-five percent (95%) of the value of the work completed may be made every thirty (30) days upon application by the Contractor and certification by the Project Manager that such work has been completed.

Partial payments will be made once each month as the work satisfactorily progresses and after acceptance



by the authorized City representative. The progress estimates shall be based upon materials in place, or on the job site and invoiced, and labor expended thereon. From the total of the amount ascertained will be deducted an amount equivalent to five percent (5%) of the whole, which five percent (5%) will be retained by the City until after completion of the entire Contract in an acceptable manner. Any time after fifty percent (50%) of the value of the work has been completed, the City will make any of the remaining partial payments in full.

No such estimates or payments shall be required to be made, when, in the judgment of the City Project Manager, the work is not proceeding in accordance with the provision of the Contract, or when in his judgment the total value of the work done since last estimate amounts to less than Five Hundred Dollars (\$500.00).

The cost of materials conforming to the plans and specifications (materials being those which are required to be contained and incorporated in a finished contract bid item) delivered to the project and not at the time incorporated in the work, may also be included in the estimate for payment. No such estimate or payment shall be construed to be an acceptance of any defective work or improper material. The Contractor shall be responsible for, and shall not remove from the project any material that has been included in the estimate for payment.

Final payment shall be made upon the Project Manager certifying that the Contractor has satisfactorily completed the work in conformity with the Contract Documents.

3. Time for Completion:

The Contractor shall deliver the material and/or services called for in the specifications/proposal and within the delivery time specified and in accordance with the terms of the contract. Work shall be completed within _____ days from the Notice to Proceed issued by the City of Sparks Purchasing Division. The Contractor shall not alter or vary any terms or conditions contained or incorporated herein, including but not limited to, the quantity, price, delivery date or date designated as After Receipt of Order (ARO) or date for commencement or completion of services as mutually agreed upon, unless such alteration or variation is consented to in writing by a duly authorized representative of the City.

The City reserves the right to cancel resultant Contract upon ten days written notice in the event the type and quality of the product or work performance is unsatisfactory or in default, subject to Contractor's right to cure as outlined in termination clause.

This is a non-exclusive Contract and the City reserves the right to acquire the material and/or services at its discretion, from other sources during the term of this Contract.

4. No Unlawful Discrimination:

In connection with the performance of work under this contract, the contractor agrees not to discriminate against any employee or applicant for employment because of race, creed, color, national origin, sex, sexual orientation, gender identity or expression, or age, including, without limitation, with regard to employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including, without



limitation, apprenticeship. The contractor further agrees to insert this provision in all subcontracts hereunder, except subcontracts for standard commercial supplies or raw materials.

Any violation of these provisions by Contractor shall constitute a material breach of contract. In all cases where persons are employed in the construction of public works, preference must be given when the qualifications of the applicants are equal:

- A) First: To honorably discharged soldiers, sailors and marines of the United States who are citizens of the State of Nevada.
- B) Second: To other citizens of the State of Nevada

If the provisions of this section are not complied with by the contractor engaged on the public work, the contract is void, and any failure or refusal to comply with any of the provisions of this section renders any such contract void and subject to the exceptions contained in this section, no money may be paid out of the State Treasury or out of the treasury of any political subdivision of the State to any person employed on any work mentioned in this section unless there has been compliance with the provisions of this section. Any contractor engaged on a public work or any other person who violates any of the provisions of this section is guilty of a misdemeanor. The penalties provided for in this section do not apply where violations thereof are due to misrepresentations made by the employee or employees.

5. No Illegal Harassment:

Violation of the City's harassment policy, which is incorporated by reference and available from the Human Resource Division, by the Contractor, its officers, employees, agents, vendors, consultants, subcontractors and anyone from whom it is legally liable, while performing or failing to perform Contractor's duties under this Contract shall be considered a material breach of contract.

6. Lawful Performance:

Vendor shall abide by all Federal, State and Local Laws, Ordinances, Regulations, and Statutes as may be related to the performance of duties under this agreement. In addition, all applicable permits and licenses required shall be obtained by the vendor, at vendor's sole expense.

7. Preferences (This Section IS IS NOT Applicable to this contract):

To the extent Contractor has sought and qualified for a bidding preference and this project has a value of over \$250,000 pursuant to Nevada Revised Statutes Chapter 338, Contractor acknowledges and agrees that the following requirements will be adhered to, documented and attained for the duration of the Project:

- 1. At least 50 percent of the workers employed on the Project (including subcontractors) hold a valid driver's license or identification card issued by the Nevada Department of Motor Vehicles;
- 2. All vehicles used primarily for the public work will be (a) registered and (where applicable) partially apportioned to Nevada; or (b) registered in Nevada; and
- 3. The Contractor shall maintain and make available for inspection within Nevada all payroll records related to the Project.

Contractor recognizes and accepts that failure to comply with any requirements herein shall be a



material breach of the contract and entitle the City of Sparks to liquidated damages in the amount set by statute. In addition, the Contractor recognizes and accepts that failure to comply with any requirements herein may lose its certification for a preference in bidding and/or its ability to bid on any contracts for public works pursuant to NRS Chapter 338.

To the extent Contractor has sought and qualified for a bidding preference and this project has a value of over \$250,000 pursuant to Nevada Revised Statutes Chapter 338, each contract between the contractor, applicant or design-build team and a subcontractor must provide for the apportionment of liquidated damages assessed pursuant to this section if a person other than the Contractor was responsible for the breach of a contract for a public work caused by a failure to comply with a requirement of Items 1-5 within this section. The apportionment of liquidated damages must be in proportion to the responsibility of each party for the breach.

8. Prevailing Wages:

The Contractor and subcontractors shall be bound by and comply with all federal, state and local laws with regard to minimum wages, overtime work, hiring and discrimination, including Chapter 338 of the NRS, which is entitled, "Public Works Projects."

The Contractor shall ensure that all employees on the work site are paid in accordance with the CURRENT PREVAILING WAGE RATES AS APPROVED BY THE STATE LABOR COMMISSIONER, whenever the actual value of the Contract totals One Hundred Thousand Dollars (\$100,000) or more, or when required by the Supplementary Conditions. If a Change Order causes a Contract to exceed One Hundred Thousand Dollars (\$100,000), the State Labor Commissioner may audit the entire Contract period.

Questions involving the Prevailing Wage Rates for the City of Sparks should be referred to the Labor Commissioner, State of Nevada, at (775) 687-4850.

When federal money is associated with the project making the Contract subject to both state and federal wage rates, the Contractor shall not pay less than the higher rate when the two rates differ for similar kinds of labor.

- A. Posting of Minimum Wage Rates - In accordance with NRS, Chapter 338, Section 338.020, the Contractor shall post the hourly and daily rate of wages to be paid to each of the classes of mechanics and workers on the site of Work of this Contract in a place generally visible to the workers.
- B. Pursuant to NRS 338.060 and 338.070, the Contractor hereby agrees to forfeit, as a penalty to the City of Sparks, not less than Twenty Dollars (\$20) nor more than Fifty Dollars (\$50) for each calendar day or portion thereof that each worker employed on the Contract is paid less than the designated rate for any work done under the Contract, by the Contractor or any subcontractor under him, or is not reported to the City of Sparks as required by NRS 338.070.
- C. The contractor and each subcontractor shall keep or cause to be kept an accurate record showing, for each worker employed by the contractor or subcontractor:
 - (1) The name of the worker;



-
- (2) The occupation of the worker;
 - (3) If the worker has a driver's license or identification card, an indication of the state or other jurisdiction that issued the license or card; and
 - (4) The actual per diem, wages and benefits paid to the worker.

In addition, the contractor and each subcontractor shall keep or cause to be kept an accurate record showing, for each worker employed by the contractor or subcontractor who has a driver's license or identification card:

- (1) The name of the worker;
- (2) The driver's license number or identification card number of the worker; and
- (3) The state or other jurisdiction that issued the license or card.

D. The records in Section C above must be open at all reasonable hours to the inspection of the City of Sparks, and its officers and agents. A copy of the each record for each calendar Month for the General Contractor and all Sub-Contractors must be submitted to the City of Sparks no later than 15 days after the end of each month for the previous months' wages.

9. Apprenticeship Utilization Act:

Senate Bill 207 (Apprenticeship Utilization Act) passed during the 2019 Legislative Session added sections 338.0116 and 338.01165 to the NRS. These new provisions apply to bids for public works where the value exceeds \$100,000.00. In passing SB 207, The Legislature hereby finds and declares that: (1) A skilled workforce in construction is essential to the economic well-being of the State; (2) Apprenticeship programs are a proven method of training a skilled workforce in construction; and (3) Requiring the use of apprentices on the construction of public works will ensure the availability of a skilled workforce in construction in the future for this State.

A contractor or subcontractor engaged in **horizontal construction** who employs a worker on a public work pursuant to NRS 338.040 shall use one or more apprentices for at least 3 percent of the total hours of labor worked for each apprenticed craft or type of work to be performed on the public work for which more than three workers are employed.

“Horizontal Construction” means the construction of any fixed work, including any irrigation, drainage, water supply, flood control, harbor, railroad, highway, tunnel, airport or airway, sewer, sewage disposal plant or water treatment facility and any ancillary vertical components thereof, bridge, inland waterway, pipeline for the transmission of petroleum or any other liquid or gaseous substance, pier, and work incidental thereto. The term does not include vertical construction, the construction of any terminal or other building of an airport or airway, or the construction of any other building.

A contractor or subcontractor engaged in **vertical construction** who employs a worker on a public work pursuant to NRS 338.040 shall use one or more apprentices for at least 10 percent of the total hours of labor worked for each apprenticed craft or type of work to be performed on the public work for which more than three workers are employed.



“Vertical Construction” means the construction or remodeling of any building, structure or other improvement that is predominantly vertical, including, without limitation, a building, structure or improvement for the support, shelter and enclosure of persons, animals, chattels or movable property of any kind, and any improvement appurtenant thereto.

A Public Body/Awarding Body, upon the request of a contractor or subcontractor, **MAY** submit a request for a modification or waiver of the percentage of hours of labor of one or more apprentices prior to (1) the bid advertisement; (2) the bid opening; or (3) the award of the contract if, “Good Cause” exists. The Labor Commissioner may also grant a modification or waiver from the requirements of NRS 338.01165 after work on the public work has commenced.

10. Acceptance by the City:

It is expressly understood and agreed that all materials provided and/or work done by the Contractor shall be subject to inspection and acceptance by the City at its discretion, and that any progress inspections and approval by the City of any item or work shall not forfeit the right of the City to require the correction of faulty workmanship or material at any time during the course of the work, although previously approved by oversight. Nothing herein contained shall relieve the Contractor of the responsibility for proper construction and maintenance of the work, materials and equipment required under the terms of this Contract until all work has been completed and accepted by the City.

11. Waiver:

No waiver of any term, provision or condition of this Contract, whether by conduct or otherwise, in any one or more instances, shall be deemed to be nor shall it be construed as a further or continuing waiver of any such term, provision or condition of this Contract. No waiver shall be effective unless it is in writing and signed by the party making it.

12. Notices:

All notices required to be given in writing by this Contract shall be deemed to be received (i) upon delivery if personally delivered, or (ii) when receipt is signed for if mailed by certified or registered mail, postage prepaid, or by express delivery service or courier, when addressed as follows (or sent to such other address as a Party may specify in a notice to the others):

PURCHASING MANAGER
CITY OF SPARKS
431 PRATER WAY
PO BOX 857
SPARKS, NV 89432-0857

CONTRACTOR:
CONTACT
CONTRACTORNAME
ADDRESS
CITY, STATE ZIP

13. Arbitration:

Any and all disputes, controversies or claims arising under or in connection with this Contract, including without limitation, fraud in the inducement of this Contract, or the general validity or enforceability of this Contract, shall be governed by the laws of the State of Nevada without giving effect to conflicts of law principles, may be submitted to binding arbitration before one arbitrator, and shall be conducted in accordance with the Commercial Arbitration Rules of the American Arbitration Association in a private manner in Washoe County, Nevada. This award shall be final and judgment may be entered upon it in



any court having jurisdiction thereof. In reaching this final award, the arbitrator shall have no authority to change or modify any provision of this Contract. All other expenses of arbitration shall be borne equally by the parties. All fees, including legal fees, shall be borne by the party who incurred them. All costs of enforcement shall be borne by the losing party. Each party shall have the right to discovery in accordance with the Nevada Rules of Civil Procedure.

14. Jurisdiction and Venue:

In the event the arbitration award is challenged, any action or proceeding seeking to do so must be brought in the courts of the State of Nevada, County of Washoe, or if the party can acquire subject-matter jurisdiction, in the United States District Court for the District of Nevada in the City of Reno. Each of the parties consents to the personal jurisdiction of such courts (and of the appropriate appellate courts) in any such action or proceeding and waives any objection to venue laid therein. Process in any action or proceeding referred to in the preceding sentence may be served on either party by sending it certified mail to the respective addresses designated for notice.

15. Indemnification:

To the fullest extent permitted by law, upon award, Contractor shall hold harmless, indemnify, defend and protect City, its affiliates, officers, agents, employees, volunteers, successors and assigns (“Indemnified Parties”), and each of them from and against any and all claims, demands, causes of action, damages, costs, expenses, actual attorney’s fees, losses or liabilities, in law or in equity, of every kind and nature whatsoever (“Claims”) arising out of or related to any act or omission of Contractor, its employees, agents, representatives, or Subcontractors in any way related to the performance of work under this Agreement by Contractor, or to work performed by others under the direction or supervision of Contractor, including but not limited to:

1. Personal injury, including but not limited to bodily injury, emotional injury, sickness or disease, or death to persons;
2. Damage to property of anyone, including loss of use thereof;
3. Penalties from violation of any law or regulation caused by Contractor’s action or inaction;
4. Failure of Contractor to comply with the Insurance requirements established under this Agreement;
5. Any violation by Contractor of any law or regulation in any way related to the occupational safety and health of employees.

In determining the nature of the claim against City, the incident underlying the claim shall determine the nature of the claim, notwithstanding the form of the allegations against City.

If City’s personnel are involved in defending such actions, Contractor shall reimburse City for the time and costs spent by such personnel at the rate charged City for such services by private professionals.

In cases of professional service agreements, requiring professional liability coverage:

If the insurer by which a Consultant is insured against professional liability does not so defend the City and applicable agents and/or staff, and the Consultant is adjudicated to be liable by a trier of fact, the City shall be entitled to reasonable attorney’s fees and costs to be paid to the City by the



Consultant in an amount which is proportionate to the liability of the of the Consultant.

Nothing in this contract shall be interpreted to waive nor does the City, by entering into this contract, waive any of the provisions found in Chapter 41 of the Nevada Revised Statutes.

16. Licenses and Permits:

The Contractor shall procure at his own expense all necessary licenses and permits and shall adhere to all the laws, regulations and ordinances applicable to the performance of this Contract.

All Contractors, Sub-Contractors and Suppliers doing business within the City of Sparks are required to obtain a current business license from the City of Sparks prior to commencement of this contract. Per Sparks Municipal Code Section 5.08.020A: "It is unlawful for any person to transact business in the City without first having obtained a license from the City to do so and without complying with all applicable provisions of this title and paying the fee therefore."

17. Insurance:

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

The City may, unless otherwise required by law, waive or reduce the insurance requirements itemized here, at the discretion of the city's Contracts and Risk Manager.

Should work be required on City premises or within the public right-of-way, upon award of the contract, the bidder shall provide proof of insurance for the types of coverage, limits of insurance and other terms specified herein, prior to initiation of any services under City, Bid, Proposal or Contract. Coverage shall be from a company authorized to transact business in the State of Nevada and the City of Sparks and shall meet the following minimum specifications:

Contractor shall at its own expense carry and maintain at all times the following insurance coverage and limits of insurance no less than the following or the amount customarily carried by Contractor or any of its subcontractors, whichever is greater. Contractor shall also cause each subcontractor employed by Contractor to purchase and maintain insurance of the type specified herein. All insurers must have AM Best rating not less than A-VII, and be acceptable to the City. Contractor shall furnish copies of certificates of insurance evidencing coverage for itself and for each subcontractor. Failure to maintain the required insurance may result in termination of this contract at City's option. If Contractor fails to maintain the insurance as set forth herein, City shall have the right, but not the obligation, to purchase said insurance at Contractor's expense.

Contractor shall provide proof of insurance for the lines of coverage, limits of insurance and other terms specified below prior to initiation of any services. Coverage shall be from a company authorized to



transact business in the State of Nevada and the City of Sparks. Contractor and any of its subcontractors shall carry and maintain coverage and limits no less than the following or the amount customarily carried by Contractor or any of its subcontractors, whichever is greater.

| Applicable to this Contract | Insurance Type | Minimum Limit | Insurance Certificate | Additional Insured | Waiver of Subrogation |
|-----------------------------|---|---------------|-----------------------|--------------------|-----------------------|
| Yes | General Liability/Umbrella (Excess) Liability | \$2,000,000 | ✓ | ✓ | ✓ |
| Yes | Automobile Liability | \$1,000,000 | ✓ | ✓ | |
| Yes | Workers' Compensation | Statutory | ✓ | N/A | ✓ |
| Yes | Employer's Liability | \$1,000,000 | ✓ | N/A | |
| No | Professional Liability | \$1,000,000 | ✓ | N/A | N/A |
| No | Pollution Legal Liability | \$1,000,000 | ✓ | N/A | N/A |

Commercial General Liability

Contractor shall carry and maintain Commercial General Liability (CGL) and, if necessary to meet required limits of insurance, commercial umbrella/excess liability insurance with a total limit of not less than the limits specified herein.

For contracts that are for the construction or improvement of public facilities, the Contractor shall obtain and maintain products and completed operations liability coverage through the statute of repose after completion of the project. Continuing commercial umbrella coverage, if any, shall include liability coverage for damage to the insured's completed work equivalent to that provided under ISO form CG 00 01.

There shall be no endorsement or modification of the CGL limiting the scope of coverage for liability arising from pollution, explosion, collapse, underground property damage, or damage to the named insured's work unless Subcontractor carries and maintains separate policies providing such coverage and provides Contractor evidence of insurance confirming the coverage.

Minimum Limits of Insurance

- \$2,000,000** Each Occurrence Limit for bodily injury and property damage
- \$2,000,000** General Aggregate Limit
- \$2,000,000** Products and Completed Operations Aggregate Limit
- \$10,000** Medical Expense Limit

If Commercial General Liability Insurance or other form with a general aggregate limit is used, it shall be revised to apply separately to this PROJECT or LOCATION.



Coverage Form

Coverage shall be at least as broad as the unmodified Insurance Services Office (ISO) Commercial General Liability (CGL) "Occurrence" form CG 00 01 04/13 or substitute form providing equivalent coverage and shall cover liability arising from premises, operations, independent contractors, products-completed operations, personal and advertising injury, and liability assumed under an insured contract (including the tort liability of another assumed in a business contract).

Additional Insured

City, its officers, agents, employees, and volunteers are to be included as insureds using the applicable ISO additional insured endorsement(s) or substitute forms providing equivalent coverage, in respects to damages and defense arising from: activities performed by or on behalf of Contractor, including the insured's general supervision of Contractor; products and completed operations of Contractor; premises owned, occupied, or used by Contractor. The coverage shall contain no special limitations on the scope of protection afforded to City, its officers, employees, or volunteers. Additional insured status for City shall apply until the expiration of time within which a claimant can bring suit per applicable state law.

Primary and Non-Contributory

Contractor's insurance coverage shall apply as primary insurance with respect to any other insurance or self-insurance programs afforded to City, its officers, agents, employees, and volunteers. There shall be no endorsement or modification of the CGL to make it excess over other available insurance; alternatively, if the CGL states that it is excess or pro rata, the policy shall be endorsed to be primary with respect to the additional insured. Any insurance or self-insurance maintained by City, its officers, employees, or volunteers shall be excess of Contractor's insurance and shall not contribute with it in any way.

Waiver of Subrogation

Contractor waives all rights against City and its agents, officers, directors and employees for recovery of damages to the extent these damages are covered by the commercial general liability or commercial umbrella liability insurance maintained pursuant to this agreement. Insurer shall endorse CGL policy as required to waive subrogation against the City with respect to any loss paid under the policy.

Endorsements

Policy forms or endorsements are required confirming coverage for all required additional insureds. The forms or endorsements for CGL shall be at least as broad as the unmodified ISO additional insured endorsement CGO 20 10 07/04 and CG 20 37 07/04 or substitute forms providing additional insured coverage for products and completed operations.

A waiver of subrogation in favor of City shall be endorsed to the policy using an unmodified Waiver of Transfer of Rights of Recovery of Others to Us ISO CG 24 04 05 09, or a substitute form providing equivalent coverage.

Electronic Data Liability

If any underground work will be performed, Contractor shall maintain electronic data liability insurance applicable to the Project and insuring against liability arising out of the loss of, loss of use of, damage to, corruption of, inability to access, or inability to manipulate electronic data. This coverage shall be



maintained with a limit of liability of not less than \$1,000,000 and provide coverage at least as broad as electronic data liability coverage form CG 04 37 (or substitute form providing equivalent coverage).

Railroad Protective Liability

For any construction or demolition work within fifty (50) feet of a railroad, Contractor shall maintain Railroad Protective Liability insurance on behalf of and in the name of the railroad, as named insured, with a limit of \$6,000,000 per occurrence or higher limit if required by the railroad. Contractor shall also ensure that any exclusions pertaining to the indemnification of a railroad are removed from its CGL policy or that ISO form CG 24 17 (Contractual Liability-Railroads Endorsements) is included in the coverage.

Business Automobile Liability

Minimum Limits of Insurance

\$1,000,000 Combined Single Limit per accident for bodily injury and property damage or the limit customarily carried by Contractor, whichever is greater. No aggregate limit may apply. Coverage may be combined with Excess/Umbrella Liability coverage to meet the required limit.

Coverage Form

Coverage shall be at least as broad as the unmodified Insurance Services Office (ISO) Business Automobile Coverage form CA 00 01 10/13, CA 00 25 10/13, CA 00 20 10/13 or substitute form providing equivalent coverage. Such insurance shall cover liability arising out of any auto (including owned, hired, and non-owned autos).

Pollution liability coverage at least as broad as that provided under the ISO pollution liability—broadened coverage for covered autos endorsement (CA 99 48) shall be provided, and the Motor Carrier Act endorsement (MCS 90) shall be attached for all contracts involving transportation of “hazardous material” as this term is defined by applicable law, including, but not limited to, waste, asbestos, fungi, bacteria and mold.

Additional Insured

City, its officers, agents, employees, and volunteers are to be included as insureds with respect to damages and defense arising from the ownership, maintenance or use of automobiles owned, leased, hired, or borrowed by the Contractor. The coverage shall contain no special limitations on the scope of protection afforded to City, its officers, employees, or volunteers. Additional insured status for City shall apply until the expiration of time within which a claimant can bring suit per applicable state law.

Endorsements

A policy endorsement is required listing all required additional insureds. The endorsement for Business Automobile Liability shall be at least as broad as the unmodified ISO CA 20 48 10/13 or a substitute form confirming City’s insured status for Liability Coverage under the Who Is An Insured Provision contained in Section II of the coverage form ISO CA 00 01 10/13.

Waiver of Subrogation.

Contractor waives all rights against City, its officers, agents, employees, and volunteers for recovery of damages to the extent these damages are covered by the commercial general liability or



commercial umbrella liability insurance maintained pursuant to this agreement. Contractor's insurer shall endorse policy to waive subrogation against City with respect to any loss paid under the policy.

Workers' Compensation and Employer's Liability

Contractor shall carry and maintain workers' compensation and employer's liability insurance meeting the statutory requirements of the State of Nevada, including but not limited to NRS 616B.627 and NRS 617.210 or provide proof that compliance with the provisions of Nevada Revised Statutes Chapters 616A-D and all other related chapters is not required. It is understood and agreed that there shall be no coverage provided for Contractor or any Subcontractor of the Contractor by the City. Contractor agrees, as a precondition to the performance of any work under this Agreement and as a precondition to any obligation of the City to make any payment under this Agreement to provide City with a certificate issued by an insurer in accordance with NRS 616B.627 and with a certificate of an insurer showing coverage pursuant to NRS 617.210.

It is further understood and agreed by and between City and Contractor that Contractor shall procure, pay for and maintain the above-mentioned coverage at Contractor's sole cost and expense.

Should Contractor be self-funded for workers' compensation and employer's liability insurance, Contractor shall so notify City in writing prior to the signing of this Contract. City reserves the right to approve said retentions, and may request additional documentation, financial or otherwise, for review prior to the signing of this Contract.

Upon completion of the project, Contractor shall, if requested by City, provide a Final Certificate for itself and each Subcontractor showing that Contractor and each Subcontractor had maintained the required Workers Compensation and Employer's Liability by paying all premiums due throughout the entire course of the project.

Nevada law allows the following to reject workers' compensation coverage if they do not use employees or subcontractors in the performance of work under the contract:

- Sole proprietors (NRS 616B.627 and NRS 617.210)
- Unpaid officers of quasi-public, private or nonprofit corporations (NRS 616B.624 and NRS 617.207)
- Unpaid managers of limited liability companies (NRS 616B.624 and NRS 617.207)
- An officer or manager of a corporation or limited liability company who owns the corporation or company (NRS 616B.624 and NRS 617.207)

If a contractor has rejected workers' compensation coverage under applicable Nevada law, the contractor must indicate the basis for the rejection of coverage and complete, sign and have notarized an Affidavit of Rejection of Coverage. The Affidavit must be completed, signed and notarized prior to performance of any work.

Minimum Limits of Insurance

| | |
|------------------------|--|
| Workers' Compensation: | Statutory Limits |
| Employer's Liability: | \$1,000,000 Bodily Injury by Accident – Each Accident |
| | \$1,000,000 Bodily Injury by Disease – Each Employee |



\$1,000,000 Bodily Injury by Disease – Policy Limit

Coverage Form

Coverage shall be at least as broad as the unmodified National Council on Compensation Insurance (NCCI) Workers Compensation and Employer's Liability coverage form WC 00 00 07/11 or substitute form providing equivalent coverage.

OTHER INSURANCE COVERAGES (IF APPLICABLE)

Professional Liability Insurance (if Applicable) \$1,000,000 each claim limits of liability or whatever limit is customarily carried by the Contractor, whichever is greater, for design, design-build or any type of professional services. If coverage is required on a claims-made or claims-made and reported basis, any applicable retroactive or pending & prior litigation dates must precede the effective date of this contract. Continuous coverage shall be maintained, or an extended reporting period shall be obtained for a period of at least three (3) years following completion of the project.

Contractors Pollution Liability Insurance (If Applicable)- \$1,000,000 per occurrence and \$2,000,000 aggregate or whatever amount is acceptable to the City for any exposure to "hazardous materials" as this term is defined in applicable law, including but not limited to waste, asbestos, fungi, bacterial or mold.

Coverage shall apply to bodily injury; property damage, including loss of use of damaged property or of property that has not been physically injured; cleanup costs; and defense, including costs and expenses incurred in the investigation, defense, or settlement of claims.

City shall be included as an insured under Contractor's pollution liability insurance.

If coverage is required on a claims-made or claims-made and reported basis, any applicable retroactive or pending & prior litigation dates must precede the effective date of this contract. Continuous coverage shall be maintained, or an extended reporting period shall be obtained for a period of at least three (3) years following completion of the project.

If the scope of services as defined in this contract includes the disposal of any hazardous materials from the job site, Contractor must furnish to City evidence of pollution liability insurance maintained by the disposal site operator for losses arising from the insured facility accepting waste under this contract. Coverage certified to the City under this section must be maintained in minimum amounts of \$1,000,000 per loss, with an annual aggregate of at least \$2,000,000.

Lower tier sub-subcontractors, Truckers, Suppliers: Evidence confirming lower tier subcontractors, truckers and suppliers are maintaining valid insurance prior to beginning work on the project to meet the requirements set forth herein on Subcontractor, including but not limited to all additional insured requirements of Subcontractor.

ALL COVERAGES

Coverage shall not be suspended, voided, canceled, or non-renewed by either CONTRACTOR or by the insurer, reduced in coverage or in limits except after thirty (30) days' prior written notice has been given



to CITY except for ten (10) days' notice for nonpayment of premium.

DEDUCTIBLES AND RETENTIONS

Any deductibles or self-insured retentions that exceed \$100,000.00 per occurrence or claim must be declared to and approved by the City's Contracts and Risk Manager and prior to signing this Contract. City is entitled to request and receive additional documentation, financial or otherwise, prior to giving its approval of the deductibles and self-insured retentions. Any changes to the deductibles or self-insured retentions made during the term of this Contract or during the term of any policy must be approved by City's Contracts and Purchasing Manager prior to the change taking effect. Contractor is responsible for any losses within deductibles or self-insured retentions.

OTHER INSURANCE PROVISIONS

Should City and Contractor agree that higher coverage limits are needed warranting a project policy, project coverage shall be purchased and the premium for limits exceeding the above amount may be borne by City. City retains the option to purchase project insurance through Contractor's insurer or its own source.

Any failure to comply with reporting provisions of the policies shall not affect coverage provided to City, its officers, agents, employees, or volunteers.

ACCEPTABILITY OF INSURERS

Insurance is to be placed with insurers with a Best's rating of no less than A-VII and acceptable to the City. City, with the approval of the Risk Manager, may accept coverage with carriers having lower Best's ratings upon review of financial information concerning Contractor and insurance carrier. City reserves the right to require that Contractor's insurer be a licensed and admitted insurer in the State of Nevada, or meet any applicable state and federal laws and regulations for non-admitted insurance placement.

VERIFICATION OF COVERAGE

Contractor shall furnish City with certificates of insurance and with original endorsements affecting coverage required by this contract. The certificates and endorsements for each insurance policy are to be signed by a person authorized by that insurer to bind coverage on its behalf.

Prior to the start of any Work, Contractor must provide the following documents to City of Sparks, Attention: Purchasing Division, P.O. Box 857, Sparks, NV 89432-0857:

- A. Certificate of Insurance.** Contractor must provide a Certificate of Insurance form to the City of Sparks to evidence the insurance policies and coverage required of Contractor.
- B. Additional Insured Endorsements.** An original Additional Insured Endorsement, signed by an authorized insurance company representative, must be submitted to the City of Sparks, by attachment to the Certificate of Insurance, to evidence the endorsement of the City of Sparks as additional insured.
- C. Policy Cancellation Endorsement.** Except for ten (10) days' notice for non-payment of premium, each insurance policy shall be endorsed to specify that without thirty (30) days prior



written notice to the City of Sparks, the policy shall not be suspended, voided, cancelled or non-renewed, and shall provide that notices required by this paragraph shall be sent by certified mailed to the address specified above. A copy of this signed endorsement must be attached to the Certificate of Insurance. If endorsements are not available, Contractor shall be responsible to provide prior written notice to City as soon as practicable upon receipt of any notice of cancellation, non-renewal, reduction in required limits or other material change in the insurance required under this Agreement.

D. Bonds (as Applicable). Bonds as required and/or defined in the original bid documents.

All certificates and endorsements are to be addressed to the City of Sparks, Purchasing Division and be received and approved by City before work commences. The City reserves the right to require complete certified copies of all required insurance policies at any time.

SUBCONTRACTORS

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

MISCELLANEOUS CONDITIONS

1. Contractor shall be responsible for and remedy all damage or loss to any property, including property of City, caused in whole or in part by Contractor, any Subcontractor, or anyone employed, directed, or supervised by Contractor.
2. Nothing herein contained shall be construed as limiting in any way the extent to which Contractor may be held responsible for payment of damages to persons or property resulting from its operations or the operations of any Subcontractors under it, and such coverage and limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to City in this contract.
3. In addition to any other remedies City may have if Contractor fails to provide or maintain any insurance policies or policy endorsements to the extent and within the time herein required, City may, at its sole option:
 - a. Purchase such insurance to cover any risk for which City may be liable through the operations of Contractor under this Agreement and deduct or retain the amount of the premiums for such insurance from any sums due under the Agreement;
 - b. Order Contractor to stop work under this Agreement and/or withhold any payments which become due Contractor here under until Contractor demonstrates compliance with the requirements hereof; or,
 - c. Terminate the Agreement.
4. If Contractor's liability policies do not contain the standard ISO separation of insureds condition, or a substantially similar clause, they shall be endorsed to provide cross-liability coverage.

18. Liquidated Damages:

If the Product is not delivered/Project is not completed within the time stipulated in the bid, the Contractor shall pay to the City of Sparks as fixed, agreed and liquidated damages for delay and not as a



penalty (it being impossible to determine the actual damages occasioned by the delay) \$AMT for each _____ day of delay until delivery is completed; the Contractor shall be liable to the City of Sparks for the amount herein. This amount may be deducted from money due or to become due to the Contractor as compensation under this proposal in the event the Contractor fails to meet delivery schedules or product specifications.

19. Material Breach of Contract:

In the event Contractor fails to deliver the product and services as contracted for herein, to the satisfaction of the City of Sparks or otherwise fails to perform any provisions of this Contract, the City, after providing five (5) days written notice and Contractor's failure to cure such breach within the time specified in the notice, may without waiving any other remedy, make good the deficiencies and deduct the actual cost of providing alternative products and/or services from payment due the Contractor. Non-performance after the first notice of non-performance shall be considered a material breach of contract.

20. Force Majeure:

Neither party to the Contract shall be held responsible for delay or default caused by fire, riot, acts of God, and/or war which is beyond that party's reasonable control. City may terminate the Contract upon written notice after determining such delay or default will reasonably prevent successful performance of the Contract.

21. Termination:

The City may terminate the Contract for material breach of contract upon ten (10) days written notice and recover all damages, deducting any amount still due the Contractor from damages owed to the City, or seek other remedy including action against all bonds. The Contractor may terminate the Contract for material breach of contract upon thirty (30) days written notice to the City.

22. Assignment:

All of the terms, conditions and provisions of this Contract, and any amendments thereto, shall inure to the benefit of and be binding upon the parties hereto, and their respective successors and assigns. The Contractor shall not assign this Contract without the written consent of the City which will not be unreasonably withheld.

23. Entire Contract:

This Contract constitutes the entire agreement of the parties and shall supersede all prior offers, negotiations, agreements and contracts whether written or oral. Any modifications to the terms and conditions of this Contract must be in writing and signed by both parties.

24. Severability:

If any part of this Contract is found to be void it will not affect the validity of the remaining terms of this Contract which will remain in full force and effect.

25. Headings:

Paragraph titles or captions contained in this Contract are inserted only as a matter of convenience and for reference only, and in no way define, limit, extend, or describe the scope of this Contract or the intent of any provision herein.



26. Singular Includes the Plural; Gender; Title Reference:

Whenever the singular number is used in this Contract and when required by the context, the same shall include the plural, and the use of any gender, be it masculine, feminine or neuter, shall include all of the genders, and the word “person” or “entity” shall include corporation, firm, partnership, or any other combination or association.

The use of the title “Bidder”, “Vendor”, “Contractor” or “Consultant” within this contract or associated bid documents shall be deemed interchangeable and shall refer to the person or entity with whom the City of Sparks is contracting for the service or product referenced within this contract.

27. Execution:

The parties agree to execute such additional documents and to take such additional actions as are reasonably necessary or desirable to carry out the purposes hereof. They also agree, acknowledge and represent that all corporate authorizations have been obtained for the execution of this Contract and for the compliance with each and every term hereof. Each undersigned officer, representative or employee represents that he or she has the authority to execute this Contract on behalf of the party for whom he or she is signing.

THIS SPACE INTENTIONALLY LEFT BLANK



IN WITNESS WHEREOF, the City of Sparks has caused this Contract to be executed by its officers thereunto duly authorized and the Consultant has subscribed same, all on the day and year first above written.

(Vendor)

CITY OF SPARKS, NEVADA
A Municipal Corporation

By: _____

By: _____
Ronald E. Smith, Mayor

(Title)

APPROVED AS TO FORM

ATTEST:

City Attorney

City Clerk

CITY OF SPARKS, NEVADA - BOND OF FAITHFUL PERFORMANCE

Bid #: _____

Bond #: _____

Surety Rating: _____

NV License #: _____

Appt. Agent Countersigning - List below with address

KNOW ALL MEN BY THESE PRESENTS: That WHEREAS, the City of Sparks in the State of Nevada has awarded to **CONTRACTORNAME** hereinafter designated as the "Principal" a contract for Bid # **BIDNUMBER**, PWP # **PWPNUMBER**, for the **TITLE** and

WHEREAS, said Principal is required under the terms of said contract to furnish a bond for the faithful and proper performance of the Contract and the Bonding Company has an "A" or better rating with Moody's or A.M. Best and T-Listed with the U.S. Treasury Department;

NOW, THEREFORE, we the Principal and _____ as Surety, are held and firmly bound unto the City of Sparks in the State of Nevada, in the penal sum of **WRITTENAMOUNT** dollars (**\$AMOUNT**), lawful money of the United States, being not less than one hundred percent (100%) of the estimated contract cost of the work, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that if the above bound Principal, his or its heirs, executors, administrators, successors or assigns, shall in all things stand to and abide by, and well and truly keep and faithfully perform the covenants, conditions and agreements in the said contract and any alterations made as therein provided on his or their part to be kept and performed at the time and in the manner therein specified, and in all respects according to their true intent and meaning, and shall indemnify and save harmless the City of Sparks in the State of Nevada, its officers and agents as therein stipulated, then this obligation shall become null and void; otherwise, it shall be and remain in full force and virtue.

As a condition precedent to the satisfactory completion of the said contract, the above obligation shall hold good for a period of one (1) year after the completion and acceptance of the said work, during which time, if the above bounden principal, his or its heirs, executors, administrators, successors or assigns shall fail to make full, complete and satisfactory repair and replacements or totally protect the said City of Sparks in the State of Nevada from loss or damage made evident during said period of one (1) year from the date of acceptance of said works, and resulting from or caused by defective materials or faulty workmanship in the prosecution of the work done, the obligation in the said sum of **WRITTENAMOUNT** dollars (**\$AMOUNT**), shall remain in full force and virtue; otherwise the above obligation shall be void.

And the said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration, or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same shall in anyway effect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration, or addition to the terms of the contract, to the work or to the specifications.

IN WITNESS WHEREOF, the above bound parties have executed this instrument under their seals this ____ day of _____, 20__, the name and corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Principal

By _____

Surety

By _____

CITY OF SPARKS, NEVADA – Payment Bond – Labor & Materials

Bid #: _____

Bond #: _____

Surety Rating: _____

NV License #: _____

Appt. Agent Countersigning - List below with address

KNOW ALL MEN BY THESE PRESENTS: That WHEREAS, the City of Sparks in the State of Nevada, has awarded to **CONTRACTORNAME** hereinafter designated as the “Principal” a contract for Bid # **BIDNUMBER**, PWP # **PWPNUMBER**, for the **TITLE** and

WHEREAS, said Principal is required under the terms of said contract to furnish a Bond for the faithful and proper performance of the Contract and the Bonding Company has an “A” or better rating with Moody’s or A.M. Best and T-Listed with the U.S. Treasury Department;

NOW, THEREFORE, we, the Principal, and _____ as Surety, are held and firmly bound unto the City of Sparks in the State of Nevada, in the penal sum of **WRITTENAMOUNT** dollars (**\$AMOUNT**), lawful money of the United States, being not less than one hundred percent (100%) of the estimated contract cost of the work for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally firmly by these presents.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH that if the above bounden principal, his or its heirs, executors, administrators, successors, or assigns, shall fail to pay for any materials, provisions, provender or other supplies, implements, or machinery used in, upon, for, or about the performance of the work contracted to be done or for any work or labor thereon of any kind, or for amounts due under the Unemployment Compensation Law with respect to such work or labor as required by the provisions of NRS 612, and provided that the claimant shall have complied with the provisions of said law, the Surety hereon will pay for the same within thirty (30) calendar days an amount not exceeding the sum specified in this bond, then the above obligation shall be null and void; otherwise to remain in full force and account. In case suit is brought upon this bond, the said Surety agrees to pay a reasonable attorney’s fees to be fixed by the Court.

The Bond shall insure to the benefit of any and all persons, companies and corporations entitled to file claims under NRS 339 as to give a right of action to them or their assigns in any suit brought upon this Bond.

IN WITNESS WHEREOF, the above bound parties have executed this instrument under their seals this ____ day of _____, 20____, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Principal

By _____

Surety

By _____