LEARN. DO. LIVE.

CENTRAL WASHINGTON UNIVERSITY

SMALL WORKS PROJECT

GEP1-2_3R Control Valve Install

CWU Contract No. 17257-11

Project Manual - Bid Documents

June 2, 2026

Prepared by:

Capital Planning & Projects
400 East University Way
Ellensburg, WA 98926-7523
Office: 509-963-3000

Bid Documents
Table of Contents

Specification Sections

PROJECT DESCRIPTION: See attached Project Documents

ELECTRONIC BID OPENING:
The electronic bid opening process shall consist of an email submitted to Joe Chanes, Joe.Chanes@cwu.edu and Rachel Ketter Rachel.Ketter@cwu.edu . The email submission shall have the **Bid Form** (See **Section 00 2000)** attached in PDF format. The email with the Bid Form must be submitted prior to **2:00 PM, Pacific Time, Tuesday June 16, 2026,** upon receipt of the electronic bid, the CWU Project Manager will reply to the email address and acknowledge receipt of the Bid Form.

BASE BID:
The base bid amount the Contractor submits shall be to furnish all labor, supervision, materials, services, and equipment required for **17257-11 GEP1-2_3R Control Valve Install** in accordance with the Bid/Construction Documents.

PROJECT SCHEDULE:

June 1, 2026:	Contractors will be solicited by CWU to submit bids.
June 16, 2026:	Bids must be received prior to **2:00 PM PST, Tuesday June 16, 2026.**
September 30, 2026:	Project shall be completed by **September 30, 2026**.

CWU CONTACT:
Direct all questions regarding the project to Joe Chanes, at Joe.Chanes@cwu.edu, or (509)963-3000.

SITE VISIT & PARKING:
The pre-planned site walk through is highly recommended and scheduled for **Tuesday June 9, 2026 at 11:00 AM**. Interested bidders can meet at our Brooks Library Parking Lot. Brooks library is located at the corner of North Wildcat Way an E Dean Nicholson Blvd. Limited visitor street parking is available or daily passes ($6.00) can be purchased at brown ticket dispensers located throughout campus or pre-purchased online at https://www.cwu.edu/parking/ . Parking without a permit may result in receiving parking ticket that will not be reimbursed by the university.

BID/CONSTRUCTION DOCUMENT CLARIFICATIONS AND PRODUCT SUBSTITUTIONS:
Any clarifications requests to the Bid/Construction Documents must be submitted to the CWU Construction Coordinator at least five (5) working days prior to the bid opening. Substitutions on the mechanical manufacturer will not be accepted on this bid.

AMENDMENTS TO BID SPECIFICATIONS:
Any amendment(s) to or error(s) in bid documents (specifications, drawings, etc.) called to the attention of the Owner will be corrected and furnished to all Contractors holding bid documents.

CONTRACTOR QUALIFICATIONS:
All bidders must have a current Washington State Contractor's License. Bidders must have successfully performed work of a similar scope and nature. Qualifications of bidders will be evaluated when determining award of bid.

PREVAILING WAGE:
The Contractor shall pay prevailing wages in accordance with RCW 39.12. Before payment is made by the Owner to the Contractor for any work performed by the Contractor and subcontractors whose work is included in the application for payment, the Contractor shall submit a statement of Intent to pay prevailing wages approved by the Department of Labor and Industries, certifying the rate of hourly wage paid.

APPRENTICE UTILIZATION PLAN: **JULY 2026 NEW SECTION******
In accordance with July 1st 2026 revisions to RCW 39.04.350 based on House Bill 1549 the winning bidder shall submit an apprentice utilization plan to the awarding agency before receiving the notice to proceed. Contractor is responsible for submitting project to LNI through the contractor portal. Contractor shall utilize apprentice templated supplied by Labor and Industries (L&I) and provided completed apprentice utilization to L&I at completion of the project to obtain the Notice of Completion (NOC).

RESERVED RIGHTS:
The Owner expressly reserves the right: to accept or waive any and/or all irregularities in the bids submitted, to reject any and/or all bids, to base awards with due regard to quality, and to award to any bidder whose bid in the opinion of the Owner, is the lowest and best bid.

MINORITY AND WOMEN'S BUSINESS PARTICIPATION:
Minority and Women owned business are encouraged to submit bids. For assistance verifying certification, contact: Office of Minority and Women's Business Enterprises, 406 South Water, Mail Stop FK-11, Olympia WA 98504-4611, telephone (360) 753-9693.

DIVERSE BUSINESS INCLUSION:
The Owner is committed to providing the maximum practicable opportunity for participation by diverse businesses enterprises (DBE). DBE are defined as; small business, microbusiness, mini-business, minority owned business (MBE), and women owned business (WBE), as defined in RCW 39.26.010 and veteran-owned businesses as defined in RCW 43.60A.010. CWU strongly encourages contractors to work with DBE to meet or exceed the Owner's goals for each project of MBE 10%, WBE 6%, WA Small Business 5% and WA Veterans 5% participation. The successful bidder shall provide a plan to Michael Cox, CWU Construction Coordinator, for inclusion efforts undertaken to utilize DBE for any CWU goods and services contracted prior to commencing with the work.

CENTRAL WASHINGTON UNIVERSITY

GEP1-2_3R Control Valve Install
Public Works Project
BID FORM

TOTAL BASIC BID *(Not including Washington State Sales Tax):*
The undersigned hereby proposes to furnish all labor, supervision, materials, services, and equipment required for the GEP1-2_3R Control Valve Install on the campus of Central Washington University in Ellensburg, Washington, and to perform the Work for the General Contract in accordance with the project Bid/Construction Documents for the following lump sum of money:

A) TOTAL BASIC BID (NOT INCLUDING WASHINGTON STATE SALES TAX):

_____ Dollars ($_____)
(Print written dollar amount in space above) (Print numeric amount in space above)

TRENCH EXCAVATION SAFETY PROVISIONS:
If the project includes any work which requires trenching exceeding a depth of four feet, costs for safety systems need to be shown as a separate bid item in compliance with RCW 39.04 and to ensure that the bidder agrees to comply with trench safety requirements of RCW 49.17. The bid amount shall be considered as part pf the total base bid set above. *If trench excavation safety provisions do not pertain to this project, put N.A. for the dollar amount. Failure to complete this requirement shall be considered as non-responsive to the bid solicitation.*

Trench Excavation Safety Provisions Only: $_____

TIME FOR COMPLETION:
The undersigned hereby agrees to substantially complete all the work by September 30, 2026. Work may begin after Notice to Proceed.

ADDENDUM RECEIPT
Bidder acknowledges receipt, understanding and full consideration of the following addenda to the Contract Documents:

Addendum No.____ **Date**_____

Addendum No.____ **Date**_____

Addendum No.____ **Date**_____

BID SECURITY:
Per RCW 39.08.010, no Bid Bond is required for projects under $150,000. For projects over $150,000, enclose a Bid Bond, certified check or cashier's check in the amount shown below, which shall be at least 5 % of the total bid.

LABOR AND INDUSTRIES FEES
In compliance with WAC 296-127 Contractor(s) shall pay to the Department of Labor and Industries required fee with each Statement of Intent to Pay Prevailing Wages or Affidavit of Wages Paid submitted to that department for certification and these costs shall be included in their bid.

BID GUARANTEE

If written notice of acceptance of this bid is mailed, telegraphed or delivered to the undersigned within the time limit noted in the Instructions to Bidders sixty (60) calendar days after the date of bid opening, or any time thereafter before this bid is withdrawn, the undersigned will, within ten (10) days after the date of such mailing, telegraphing or delivering of such notice, execute and deliver a contract on the included Contract Forms to the Owner, together with satisfactory payment and performance bond in an amount equal to one hundred percent (100%) of the contract sum - base bid plus Owner accepted alternates (not including Washington State Sales Tax).

Name of Contractor:_____

Signed by:_____ Title:_____

Address:_____

Telephone:_____Date:_____

Email address:_____

State of Washington Contractor's License No. _____

Federal Tax Identification No. _____

UBI Tax Number: _____

License Expiration Date: _____

The Firm represented by the above signature is:

Sole Proprietorship:_____
Partnership:_____
Corporation:_____
Other: _____
State of Incorporation:_____

END OF BID FORM

SCOPE OF WORK: The Contractor shall provide all labor, materials, and equipment necessary for the GEP1-2_3R Control Valve Install in accordance with the Bid Documents. As shown in the attached documents.

PROJECT SITE: To find the exact location of the project, refer to ***cwu.edu/map*** for an interactive online campus plan. The Contractor shall schedule and coordinate all of the work with Joe Chanes, Project Manager, Joe.Chanes@cwu.edu 509-963-1488. The Contractor shall communicate with Joe Chanes for any CWU shop support assistance as needed.

DESIGN AND CONSTRUCTION STANDARDS (DACS): CWU has developed a resource of typical design and construction standards associated with campus projects. These standards follow industry CSI Master format specifications and should be referenced for general guidelines on expectations of various building components and systems. For questions regarding the DACS and any conflict or request for material substitution, please submit them to the CWU project point of contact prior to the bid opening. The DACS are available for review here:
https://www.cwu.edu/about/offices/facilities/capital-planning-projects/design-construction-standards.php#accordion-08813969-ac05-471c-bb1e-ad991be5b916-0

GENERAL CONDITIONS:

Regarding the project terms and conditions (Insurance, Prevailing Wages, Payment and Performance Bonds, Contract Sum, etc.), the Contractor shall comply with:

Section 00 7200 General Conditions for Washington State Facility Construction – access the following hyperlink:

https://www.cwu.edu/about/offices/facilities/_documents/cwu-general-conditions.pdf

END OF SECTION

SUPPLEMENTAL CONDITIONS
FOR WASHINGTON STATE FACILITIES CONSTRUCTION

(Paragraphs keyed to the State's General Conditions)

2.02 Replaces Section 2.02 – INSURANCE COVERAGE LIMITS and CERTIFICATES

A. Insurance Coverage Certificates and Policies

The Contractor shall furnish acceptable proof of insurance coverage on the state of Washington Certificate of Insurance form SF500A, dated 07/02/92 or ACORD form, as well as copies of insurance policies.

B. Required Insurance Coverages

1. For a contract less than $100,000.00, the coverage required is:

   a. Comprehensive General Liability Insurance – The Contractor shall at all times during the term of this contract, at its cost and expense, carry and maintain general public liability insurance, including contractual liability, against claims for bodily injury, personal injury, death or property damage occurring or arising out of services provided under this contract. This insurance shall cover claims caused by any act, omission, or negligence of the Contractor or its officers, agents, representatives, assigns or servants. The limits of liability insurance, which may be increased as deemed necessary by the contracting parties, shall be:

Each Occurrence	$1,000,000.00
General Aggregate Limits (other than products – commercial operations)	$1,000,000.00
Products – Commercial Operations Limit	$1,000,000.00
Personal and Advertising Injury Limit	$1,000,000.00
Fire Damage Limit (any one fire)	$50,000.00
Medical Expense Limit (any one person)	$5,000.00

   b. If the contract is for underground utility work, then the Contractor shall provide proof of insurance for that above in the form of Explosion, Collapse and Underground (XCU) coverage.

   c. Employers Liability on an occurrence basis in an amount not less than $1,000,000.00 per occurrence.

2. For contracts over $100,000.00 but less than $5,000,000.00 the contractor shall obtain the coverage limits as listed for contracts below $100,000.00 and General Aggregate and Products – Commercial Operations Limit of not less than $2,000,000.00.

3. Coverage for Comprehensive General Bodily Injury Liability Insurance for a contract over $5,000,000.00 is:

Each Occurrence	$2,000,000.00
General Aggregate Limits (other than products – commercial operations)	$4,000,000.00
Products – Commercial Operations limit	$4,000,000.00
Personal and Advertising Injury Limit	$2,000,000.00

Fire Damage Limit (any one fire)	$50,000.00
Medical Expense Limit (any one Person)	$5,000.00

4. For all Contracts – Automobile Liability: in the event that services delivered pursuant to this contract involve the use of vehicles or the transportation of clients, automobile liability insurance shall be required. If Contractor-owned personal vehicles are used, a Business Automobile Policy covering at a minimum Code 2 "owned autos only" must be secured. If Contractor employee's vehicles are used, the Contractor must also include under the Business Automobile Policy Code 9, coverage for non-owned autos. The minimum limits for automobile liability is: $1,000,000.00 per occurrence, using a combined single limit for bodily injury and property damage.

5. For Contracts for Hazardous Substance Removal (Asbestos Abatement, PCB Abatement, etc.)

   a. In addition to providing insurance coverage for the project as outlined above, the Contractor shall provide Pollution Liability insurance for the hazardous substance removal as follows:

EACH OCCURRENCE	AGGREGATE
$500,000.00	$1,000,000.00

   or $1,000,000.00 each occurrence/aggregate bodily injury and property damage combined single limit.

   1) Insurance certificate must state that the insurer is covering hazardous substance removal.
   2) Should this insurance be secured on a "claims made" basis, the coverage must be continuously maintained for one year following the project's "final completion" through official completion of the project, plus one year following.

   For Contracts where hazardous substance removal is a subcomponent of contracted work, the general contractor shall provide to the Owner a certificate of insurance for coverage as defined in 5a. above. The State of Washington must be listed as an additional insured. This certificate of insurance must be provided to the Owner prior to commencing work.

2.04 Replaces Section 2.04 - PAYMENT AND PERFORMANCE BONDS

Conditions for bonds: Payment and performance bonds for 100% of the Contract Award Amount, plus state sales tax, shall be furnished for the Work, using the Payment Bond and Performance Bond form published by and available from the American Institute of Architects (AIA) – form A312. Prior to execution of a Change Order that, cumulatively with previous Change Orders, increases the Contract Award Amount by 15% or more, the Contractor shall provide either new payment and performance bonds for the revised Contract Sum, or riders to the existing payment and performance bonds increasing the amount of the bonds. The Contractor shall likewise provide additional bonds or riders when subsequent Change Orders increase the Contract Sum by 15% or more.

No payment or performance bond is required if the Contract Sum is $150,000 or less and the Contractor or General Contractor/Construction Manager agrees that Owner may, in lieu of the bond, retain 10% of the Contract Sum for the period allowed by RCW 39.08.010.

3.02 Replaces Section 3.02 B – CONSTRUCTION SCHEDULE

B. Form of Progress Schedule: The Progress Schedule shall be in the form of a Critical Path Method (CPM) logic network or, with the approval of the Owner, a bar chart schedule may be submitted. The scheduling of construction is the responsibility of the Contractor and is included in the contract to assure adequate planning and execution of the work. The schedule will be used to evaluate progress of the work for payment based on the Schedule of Values. The schedule shall show the Contractor's planned order and interdependence of activities, and sequence of work. As a minimum the schedule shall include:

1. Date of Notice to Proceed;
2. Activities (resources, durations, individual responsible for activity, early starts, late starts, early finishes, late finishes, etc.);
3. Utility Shutdowns;
4. Interrelationships and dependence of activities;
5. Planned vs. actual status for each activity;
6. Substantial completion;
7. Punch list;
8. Final inspection;
9. Final completion, and
10. Float time

The Schedule Duration shall be based on the Contract Time of Completion listed on the Bid Form. The Owner shall not be obligated to accept any Early Completion Schedule suggested by the Contractor. The Contract Time for Completion shall establish the Schedule Completion Date.

If the Contractor feels that the work can be completed in less than the Specified Contract Time, then the Surplus Time shall be considered Project Float. This Float time shall be shown on the Project Schedule. It shall be available to accommodate changes in the work and unforeseen conditions.

Neither the Contractor nor the Owner have exclusive right to this Float Time. It belongs to the project.

5.01 Replaces Section 5.01 B & D - CONTRACTOR CONTROL AND SUPERVISION

B. Competent Superintendent required: Performance of the Work shall be directly supervised by a competent superintendent who has authority to act for Contractor. The superintendent must be satisfactory to the Owner and shall not be changed without the prior written consent of Owner. Owner may require Contractor to remove the superintendent from the Work or Project site, at no cost to the Owner for delay or any other claim, if Owner reasonably deems the superintendent incompetent, negligent, or otherwise objectionable, provided Owner has first notified Contractor in writing and allowed a reasonable period for transition. Noncompliance with the Owner's request to remove and replace the superintendent for a material reason shall also be grounds for terminating the Contract for cause.

D. Contractor to employ competent and disciplined workforce: Contractor shall enforce strict discipline and good order among all of the Contractor's employees and other persons performing the Work. Contractor shall not permit employment of persons not skilled in tasks assigned to them. Contractor's employees shall at all times conduct business in a manner which assures fair, equal, and nondiscriminatory treatment of all persons. Owner may, by written notice, require Contractor to remove from the Work or Project site, at no cost to the Owner for delay or any other claim, any employee Owner reasonably deems incompetent,

negligent, or otherwise objectionable. Noncompliance with the Owner's request to remove and replace personnel at any level for a material reason shall also be grounds for terminating the Contract for cause.

5.02 Replaces Section 5.02 B – PERMITS, FEES AND NOTICES

B. Allowances for permit fees: The actual cost of the general building permit (only) and the public utility hook-up fees will be a direct reimbursement to the Contractor or paid ***directly to the permitting agency*** *by the Owner.* ***Fees for these permits should not be included by the Contractor in his bid amount***

Add New Section 5.02 D – PERMITS, FEES, AND NOTICES

D. Contractor to submit copies: The General Contractor shall submit copies of each valid permit required on the project to the Owner's representative. Nothing in this part shall be construed as imposing a duty upon the Owner or A/E to secure permits.

5.04 Replaces 5.04, Section A – PREVAILING WAGES

A. Contractor to pay Prevailing Wages or applicable Federal Wages: Contractor shall pay the prevailing rate of wages to all workers, laborers, or mechanics employed in the performance of any part of the Work in accordance with RCW 39.12 and the rules and regulations of the Department of Labor and Industries. The schedule of prevailing wage rates for the locality or localities of the Work, is determined by the Industrial Statistician of the Department of Labor and Industries. It is the Contractor's responsibility to verify the applicable prevailing wage rate. If applicable, the Contractor shall comply with all Federal Funding requirements of the Davis Bacon Act that will be addressed in a separate "DIVISION 00 SPECIAL CONDITIONS" specification section that will be based on the specific requirements of the funding source. .

5.04 Replaces 5.04, Section G – Certified Payrolls

G. Certified Payrolls: Consistent with WAC 296-127-320, the Contractor and any subcontractor shall submit a certified copy of payroll records if requested. If applicable, the Contractor shall comply with all Federal Funding requirements of the Davis Bacon Act that will be addressed in a separate "DIVISION 00 SPECIAL CONDITIONS" specification section that will be based on the specific requirements of the funding source.

5.06 Replaces 5.06, Section A – NONDISCRIMINATION

A. Discrimination prohibited by applicable laws: The Contractor and all Subcontractors shall comply with all applicable federal and state non-discrimination laws, regulations, and policies. No person shall, on the grounds of age, race, creed, color, sex, sexual orientation, religion, national origin, marital status, honorably discharged veteran or military status, or disability (physical, mental, or sensory) be denied the benefits of, or otherwise be subjected to discrimination under any project, program, or activity, funded, in whole or in part, under this Agreement.

5.07 Replaces 5.07, Section A – SAFETY PRECAUTIONS

A. In performing this contract, the Contractor shall provide for protecting the lives and health of employees and other persons; preventing damage to property, materials, supplies, and equipment; and avoid work interruptions. For these purposes, the Contractor shall:

1. Follow Washington Industrial Safety and Health Act (WISHA) regional directives and provide a site-specific safety program that will require an accident prevention and hazard analysis plan for the contractor and each subcontractor on the work site. The Contractor shall submit a site-specific safety plan to the Owner's representative prior to the initial scheduled construction meeting.

2. Provide adequate safety devices and measures including, but not limited to, the appropriate safety literature, notice, training, permits, placement and use of barricades, signs, signal lights, ladders, scaffolding, staging, runways, hoist, construction elevators, shoring, temporary lighting, grounded outlets, wiring, hazardous materials, vehicles, construction processes, and equipment required by all applicable state, federal, and local laws and regulations.

3. Comply with the State Environmental Policy Act (SEPA), Clean Air Act, Shoreline Management Act, and other applicable federal, state, and local statutes and regulations dealing with the prevention of environmental pollution and the preservation of public natural resources.

4. Post all permits, notices, and/or approvals in a conspicuous location at the construction site.

5. Provide any additional measures that the Owner determines to be reasonable and necessary for ensuring a safe environment in areas open to the public. Nothing in this part shall be construed as imposing a duty upon the Owner or A/E to prescribe safety conditions relating to employees, public, or agents of the Contractors.

5.20 Add New Paragraph A. 6. – SUBCONTRACTORS AND SUPPLIERS

6. Within the three-year period immediately preceding the date of the bid solicitation, not have been determined by a final and binding citation and notice of assessment issued by the department of labor and industries or through a civil judgment entered by a court of limited or general jurisdiction to have willfully violated, as defined in RCW 49.48.082, any provision of chapter 49.46, 49.48, or 49.52 RCW.

5.20 Replace Paragraph B – SUBCONTRACTORS AND SUPPLIERS

B. Use qualified Subcontractors: Contractor shall utilize Subcontractors and suppliers, which are experienced and qualified, and meet the requirements of the Contract Documents, if any. Contractor shall not utilize any Subcontractor or supplier to whom the Owner has a reasonable objection, and shall obtain Owner's written consent before making any substitutions or additions.

7.02 Replace Paragraph B.7.c – CHANGE IN THE CONTRACT SUM, Change Order Pricing – Fixed Price, Components of Increased Cost

c. Equipment costs: This is an itemization of the type of equipment and the estimated or actual length of time the construction equipment appropriate for the Work is or will be

used on the change in the Work. Costs will be allowed for construction equipment only if used solely for the changed Work, or for additional rental costs actually incurred by the Contractor. Equipment charges shall be computed on the basis of actual invoice costs or if owned, from the current edition of one of the following sources:

(1) The National Electrical Contractors Association for equipment used on electrical work.

(2) The Mechanical Contractors Association of America for equipment used on mechanical work.

(3) The EquipmentWatch Fleet Manager Estimator Package (digital). The maximum rate for standby equipment shall not exceed that shown in the Associated General Contractors Washington State Department of Transportation (AGC WSDOT) Equipment Rental Agreement, current edition on the Contract execution date.

10.11 Add Part 10.11 – DIVERSE BUSINESS PARTICIPATION

The state of Washington encourages participation in all of its contracts by Diverse Businesses as found in RCW Chapters 39, 43, and WAC 326. The voluntary Diverse Business goal of 26%, which is an aggregate of: 10% Minority Business Enterprises (MBE), 6% Women Business Enterprises (WBE), 5% Veteran-owned Business, and 5% Washington Small Businesses self-identified in the Washington Electronic Business Solution (WEBS) http://www.des.wa.gov/services/ContractingPurchasing/Business/Pages/WEBSRegistration.aspx. Contractors are encouraged to meet or exceed the project goals in the advertisement by any level of participation, regardless of category.

DES reserves the right to adjust the voluntary participation goals.

Businesses are encouraged to register in WEBS, as well as registering as a state certified M/WBE/Veteran Business.

For reporting, Contractor is required to register and create an account in the DES Diversity Compliance Program (B2GNow) at https://des.diversitycompliance.com/.

Every month for the duration of your contract, and while your contract is active in the B2Gnow system, submit and accurately maintain the following information through B2Gnow:

a. Payments received by the prime contractor from the Agency
b. Payments paid to each first tier subcontractor
c. Payments paid to each first tier supplier

You must also ensure the following information is reported in the B2Gnow system by your first tier subcontractors and suppliers for the duration of your contract:

a. Confirmation of payments from the prime contractor to the first tier subcontractor
b. Confirmation of payments from the prime contractor to first tier suppliers

10.12 Add Part 10.12 - MINIMUM LEVELS OF APPRENTICESHIP PARTICIPATION

In accordance with RCW 39.04.320, the State of Washington requires 15% apprenticeship participation for projects estimated to cost one million dollars or more.

A. Apprentice participation, under this contract, may be counted towards the required percentage (%) only if the apprentices are from an apprenticeship program registered and approved by the Washington State Apprenticeship and Training Council (RCW 49.04 and WAC 296-05).

B. Bidders may contact the Department of Labor and Industries, Specialty Compliance Services Division, Apprenticeship Section, P.O. Box 44530, Olympia, WA 98504-4530 by phone at (360) 902-5320, and e-mail at Apprentice@Lni.wa.gov, to obtain information on available apprenticeship programs.

C. For each project that has apprentice requirements, the contractor shall submit a **"Statement of Apprentice and Journeyman Participation"** on forms provided by the Department of Enterprise Services, with every request for progress payment. The Contractor shall submit consolidated and cumulative data collected by the Contractor and collected from all subcontractors by the Contractor. The data to be collected and submitted includes the following:

11. Contractor name and address
12. Contract number
13. Project name
14. Contract value
15. Reporting period "Beginning Date" through "End Date"
16. Name and registration number of each apprentice by contractor
17. Total number of apprentices and labor hours worked by them, categorized by trade or craft
18. Total number of journeymen and labor hours worked by them, categorized by trade or craft
19. Cumulative combined total of apprentice and journeymen labor hours
20. Total percentage of apprentice hours worked

D. No changes to the required percentage (%) of apprentice participation shall be allowed without written approval of the Owner. In any request for the change, the Contractor shall clearly demonstrate a good faith effort to comply with the requirements for apprentice participation.

E. Any substantive violation of the mandatory requirements of this part of the contract may be a material breach of the contract by the Contractor. The Owner may withhold payment pursuant to Part 6.05, stop the work for cause pursuant to Part 3.04, and terminate the contract for cause pursuant to Part 9.01.

10.13 Add Part 10.13 – SPECIAL CONDITIONS

The Owner may have Federal Funding or other special requirements for this project. If applicable, the Contractor will be required to comply with the "DIVISION 00 SPECIAL CONDITIONS" section in the specifications that will be based on the specific requirements of the funding source.

00 7400 MODIFICATIONS TO THE GENERAL CONDITIONS

These Central Washington University Modifications to the General Conditions form a part of, and are incorporated in the Contract Documents and modify, delete, add, and replace provisions of the General Conditions. Provisions not altered remain in effect. All terms defined elsewhere in the Contract Documents shall have the same meaning here.

PART 1 - GENERAL PROVISIONS

1.01A Modify the sentence as follows:
"Application for Payment" means a written request submitted by contractor to Owner for payment of Work.

PART 2 - INSURANCE AND BONDS

2.01 Add the following:
The certificate holder shall be:
Central Washington University
Vice President for Business & Financial Affairs
Ellensburg, WA 98926

PART 4 - SPECIFICATIONS, DRAWINGS, AND OTHER DOCUMENTS

4.01 Add to paragraph 4.02B
…changes and shall be available to Owner and A/E at all times.

PART 5 - PERFORMANCE

5.01 Add a new paragraph
G. Work During Off Hours
When work is to be performed during other than normal working hours or on Central Washington University holidays,Contractor shall give Owner *48 hour* prior notice so that Owner's Police Department may be properly notified. Any construction activity between the hours of *7:00 p.m*. to *7:00 a.m*. PST is subject to approval of Owner.

5.02 Add a new paragraph 5.02E
E. Prior to Final Completion, the building permit and City-approved drawings, signed inspection card(s), and any appropriateoccupancy permits shall be submitted to Owner.

PART 6 - PAYMENTS AND COMPLETION

6.02 Add a new subparagraph:
This schedule shall be based upon any cost loading required as a part of the progress schedule and shall allocate at least 1% of the contract sum (in addition to the statutory retainage described in Paragraph 6.06 to that portion of the work between Substantial and Final Completion.

6.03D Add a new subparagraph 6.03D(9):
9 For material stored off-site not in a warehouse, Contractor may request payment, provided that the remainingrequirements of this paragraph and any additional requirements of Owner are met.

6.04A In the first sentence change "30 days" to "45 days."6.09B Add the following:
Final Acceptance: Final Acceptance of the Work shall be by action of the Board of Trustees or its delegated representative.

PART 8 - CLAIMS AND DISPUTE RESOLUTION

8.01 Add new Paragraphs 8.01 G and 8.01 H:
G Notwithstanding 8.02 below, upon request by Owner, any claims between Owner and Contractor, Architect/Engineer and Contractor, Owner and Architect/Engineer, Owner and Contractor's Guarantor, or Contractor and its Subcontractors and Suppliers shall be submitted in a single forum and Owner may consolidate or join any of the above-named parties in the action. Other parties may be joined upon notice

by either Contractor or Owner with the consent of such third party.
Thereafter, such third parties shall be bound by the results of such dispute resolution process to the same extent as the original parties to the dispute.

H Contractor agrees that any contract with a Sub-contractor to perform any portion of the work shall include a provision whichcontractually requires the Sub-contractor be joined, at the Owner's request, in the dispute process.

8.02 Replace the 8.02 A – E with the following:
DISPUTE RESOLUTION: In order to assist in the resolution of disputes or claims arising out of the work of this project, the Owner has provided for the following procedures in an escalating fashion.

A Within 20 calendar days after receipt of a written directive from the Owner's Project Manager to proceed with the protested work, in accordance with Paragraph 8.01. D, the Contractor shall, if the Contractor still objects to such instruction, file a writtenprotest with the Owner's Director of Facilities Management, clearly detailing all of the following:

1. The basis of the objection(s), and
2. The contract provisions that support the protest, and
3. The actual or estimated dollar cost, if any, of protested work and how that cost was determined, and,
4. Estimates or actual amounts of additional time incurred, if any.

B Within 20 calendar days of receipt of the contractor's appeal for review, the Owner shall arrange a meeting to include the Contractor's Senior Principal (or their designee) and the Owner's Business Manager (or his designee). Such meeting shall be held at a mutually agreed time on the Owner's Campus. Either party may request a Mediator be retained to participate in the dispute resolution process. Both must agree on the choice and share equally in the expense. If in disagreement, the parties agree to allow an independent third party such as the Yakima Dispute Resolution Center to pick one.

C If the Owner and the Contractor are able to resolve their dispute through this process, the Owner will promptly process any contract changes, otherwise the Owner shall, after review of all the pertinent facts, make a written determination of the dispute and such determination shall be final.

D If the Contractor disagrees with the final determination of the Owner, the Contractor may, within 45 calendar days, file a Complaint which shall be subject to judicial review as provided under State of Washington case law, in the Superior Court ofKittitas County, Washington, which shall have exclusive jurisdiction and venue over all matters in question between the Contractor. Failure to file such Complaint within the time prescribed shall be deemed acceptance by the Contractor.

PART 10 - MISCELLANEOUS PROVISIONS

10.11 Change to read as follows:

10.11 W/MBE PARTICIPATION

Goals

CWU encourages participation in all of its contracts by Diverse Businesses as found in RCW Chapters 39, 43, and WAC 326. The voluntary Diverse Business goal of 26%, which is an aggregate of: 10% Minority Business Enterprises (MBE), 6% Women Business Enterprises (WBE), 5% Veteran-owned Business, and 5% Washington Small Businesses self-identified in the Washington Electronic Business Solution (WEBS). Contractors are encouraged to meet or exceed the project goals in the advertisement by any level of participation, regardless of category.

If Contractor has been unsuccessful in complying with these goals for any craft, Contractor shall broaden recruitment, trainingand job referral opportunities for minorities and women by undertaking each of the following:

1 Notify Owner;

2 Notify state and community organizations of opportunities for employment, and retain evidence of their responses. Trade associations maintain lists of community organizations that refer minority and women workers for employment in construction trade;

3 Maintain a file in which is recorded the name and address of each minority and woman worker referred to Contractor and specifically what action was taken with respect to each such referred worker. If such worker was not employed by Contractor, Contractor's file shall document this and the reason therefore;

4 Notify Owner whenever the union with which Contractor has a collective bargaining agreement has not

referred to Contractor a minority or woman worker requested by Contractor, or Contractor has other information that the union referral process has impeded Contractor's efforts to effect minority or women utilization. Contractor shall show what relief has been sought under the collective bargaining agreement or through appropriate federal and state agencies. Appropriate steps can include, but are not limited to, arbitration or administrative relief;

5 Hire directly on a non-discriminatory basis for performance of Work, if a court of competent jurisdiction finds that a union with which Contractor has a collective bargaining agreement racially or sexually discriminates in recruitment ordispatch of worker; and

6 Use of apprentices or other appropriate entry classifications up to limits allowed or required by applicable collectivebargaining agreements to meet the goals.

B Reports

Contractor shall report monthly the total hours of employment on site by craft and category. Reports will be submitted on the form attached to this Section titled “Affidavit of Amount Paid MBA/WBE”.

C Compliance Meetings

Upon Owner's request, Contractor and Owner will hold a conference to discuss affirmative action with regard to equalemployment opportunity. Review will be made of Contractor's reports and evidence of good faith efforts.

D Definitions

1 "Minority is defined as Blacks, Asians (Japanese, Chinese, Filipino), American Indians, Spanish-Americans (includes Mexican-American, Puerto Rican and other people with Spanish surnames not otherwise reported) and other (includingKorean, Polynesian, Indonesian, Hawaiian, Aleut, and Eskimo).

2 "Craft" is defined as a recognized construction trade for which minimum wage categories are established by the Department of Labor and Industries.

10.14 Add the Following:

10.14 ASBESTOS

A Asbestos Products

Contractor shall ensure that no Asbestos products in any form are incorporated into the Work.

B Good Faith Inspection

1 Owner has performed a good faith inspection to determine whether the materials to be worked on or removed containAsbestos, and will make this inspection report available to all bidders. Contractor shall not commence Work without receiving a copy of this report.

2 Contractor shall keep the asbestos inspection report on site.

3 The usual policy of the Owner is to identify and abate Asbestos before the Work begins, unless Asbestos abatement isincluded in the scope of Work of theses Contract Documents. In limited cases where Owner is reasonably certain that Asbestos will not be disturbed, Asbestos material are to remain intact in the work area. These materials would be identified in the Asbestos inspection report and Contractor advised of protective measures.

4 In some cases, where certain construction or demolition tasks must be performed before the Asbestos can be accessed for removal, or where phasing of the construction does not permit scheduled during the Contract Time. In such cases, Owner and Contractor must coordinate the scheduling of the work of the separate Asbestos contractor.

C Notice

If in the course of performing the Work Contractor encounters an Asbestos Project which was not specifically reference in theContract Documents, or disturbs Asbestos, Contractor shall immediately stop work and notify Owner. Contractor shall not recommence work until authorized by Owner.

D Delays

Owner will use its best efforts to identify the scope of an Asbestos Project in the Contract Documents. Contractor acknowledges that the condition or scope of an Asbestos Project cannot be fully determined if it would result in disturbance orexposure of asbestos prior to undertaking the Work. If Contractor is significantly delayed during the course of performance because of the presence of Asbestos not identified in the Contract Documents, Contractor may request an equitable adjustment in the Contract Sum in accordance with the provisions of section 7.02.

E Permits

Contractor shall file a Notice of Intent to Remove Asbestos with the Department of Labor and Industries. Prior

to submitting such notice to the Department of Labor and Industries, Contractor shall submit for approval to Owner Contractor's proposed procedures for undertaking the Asbestos Project to assure compliance with Owner's performance standards and applicableregulations.

F Safety Precautions

Contractor shall provide, at Contractor's cost, appropriate clothing, caution sign, supply items, and safety equipment in order to perform the Asbestos Project in accordance with the Regulations and the performance standards of Owner.

During the course of performing an Asbestos Project, Contractor shall monitor the work place and adjacent areas in accordance with the regulations and the performance standards of Owner to ensure that permissible levels of airborne concentrations of asbestos fibers are not exceeded. The results of all monitoring shall be immediately provided to Owner. If the prescribed exposure limits are exceeded, Contractor shall immediately execute a compliance program of engineering and work practices approved by Owner.

G Certification

No Contractor or person shall undertake an Asbestos Project unless certified by the Department of Labor and Industries as aqualified asbestos contractor, supervisor, or worker in accordance with the requirements of WAC Chapter 296-65.

H Records

Contractor shall maintain complete records of personal and environmental monitoring. A copy of these records shall be provided to Owner before Final Acceptance. Contractor is also required by regulation to arrange for medical examinations for those employees who work on an Asbestos Project and to maintain those records for at least twenty years.

I Definitions

1 "Asbestos" includes different forms of chrysotile, amosite, crocidolite, tremolite, anthophyllite, and actinolite.

2 "Asbestos Project" means the construction, demolition, repair, maintenance or renovation of any building, mechanicalpiping equipment or system involving the demolition, removal, encapsulation, salvage, or disposal of material which may release asbestos fibers into the air.

3 "Regulations". For purpose of this section Regulations shall mean the National Emission Standards for Hazardous Air Pollutants (40 CFR 61), Occupational Safety and Health Requirements Pertaining to Asbestos (29 CFR 1910), the Regulations of the Washington State Department of Labor and Industries, WAC Chapters 296-62, -65, -155, and PugetSound Air Pollution Control Agency (PSAPCA) regulating Asbestos Projects as adopted or hereafter amended.

Attachment: “Affidavit of Amounts Paid MBE/WBE Participants”

END OF SECTION

AFFIDAVIT OF AMOUNTS PAID MBE/WBE PARTICIPANTS
(provide report monthly with each application for payment)

CONTRACTOR: ADDRESS:

CITY: STATE: ZIP: DATE:

STATE CONTRACT/AGREEMENT NO. JOB TITLE/DESCRIPTION

CONTRACT BID PRICE MBE COND. OF AWARD WBE COND. OF AWARD

MBE/WBE PARTICIPANT NAME AND ADDRESS WBE	MBE UTILIZATION	DESCRIPTION OF PARTICIPANTS	AMOUNT PAID

AFFIDAVIT

I, the undersigned, do hereby certify that in connection with all work for the project for which this statement is submitted each MBE/WBE participant contacted by me has been paid the amounts as listed.

$_____
TOTAL WBE PARTICIPATION ACHIEVED

SIGNATURE TITLE

Subscribed and sworn to me this _____day of 20_

_____ Notary Public in and for the State of Washington residing

at_____

INSTRUCTIONS:

1. *Complete this form in triplicate and have it notarized.*
2. *This form is required to be updated monthly and provided with each payment request from the General Contractor.*

SECTION 01 0100 - SUMMARY OF WORK

Extraction and Injection Well Scope

This is an overview of the items required to complete the extraction and injection well installation.

1) Extraction well pump / motor and piping installation.

2) Extraction well level transmitter and spare (for manual measurements) conduit installation with well piping.

3) Extraction well pump / motor VFD procurement.

4) Extraction well and injection well level and temperature transmitters procurement.

5) VFD installation.

6) VFD power and controls.

- **a. Power from the existing 480 VAC switchboard to VFD.**
- **b. Well pump motor power from VFD to well pump motor.**
- **c. Communications from the VFD to the Geothermal Heat System control.**

7) Geothermal Heat System discharge pressure transmitter procurement.

8) Geothermal Heat System discharge pressure transmitter and associated hardware installation and wiring to downhole control panel.

9) Installation and wiring of extraction well level / temperature transmitter to downhole control panel.

10) Installation and wiring of injection well level / temperature transmitter to downhole control panel.

11) Install Owner supplied downhole control panel.

12) Supply power, controls and communications as shown or mentioned in this scope to the downhole control panel.

13) Owner supplied downhole control panel drawings are included in the bid drawings for reference.

14) Install extraction well and injection well conduits. Coordinate with Owner for locations of existing conduits to extend.

15) Install injection valve (with the assistance of downhole valve manufacturer), hydraulic hosing to surface.

16) Injection well level transmitter and spare (for manual measurements) conduit installation with well piping.

17) Assist with installation of downhole hydraulic hose from mechanical room to injection well head.

END OF SECTION

SECTION 260453
VARIABLE-FREQUENCY MOTOR CONTROLLERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

B. Related Sections:

1. Section 260101 “Basic Electrical Requirements”

2. Section 260553 “Electrical Identification”

3. Section 260800 “Electrical Systems Commissioning”

1.2 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. The Electrical Mechanical Control System Integrator (CSI) shall be responsible for furnishing the Variable Frequency Controllers including all related equipment as shown on the drawings and as specified herein. The Electrical Contractor shall be responsible for installing the Variable Frequency Controllers, interconnecting wiring and all related equipment per CSI’s design.

1.3 DEFINITIONS

A. CE: Conformite Europeene (European Compliance).

B. CPT: Control power transformer.

C. CSI: Control System Integrator.

D. DDC: Direct digital control.

E. EMI: Electromagnetic interference.

F. IGBT: Insulated-gate bipolar transistor

G. LAN: Local area network.

H. LED: Light-emitting diode.

I. MCC: Motor-control center.

J. MCCB: Molded-case circuit breaker.

K. MCP: Motor-circuit protector.

L. NC: Normally closed.

M. NO: Normally open.

N. OCPD: Overcurrent protective device.

O. PID: Control action, proportional plus integral plus derivative.

P. PWM: Pulse-width modulated.

Q. RFI: Radio-frequency interference.

R. SPD: Surge protective device.

S. VFC: Variable-frequency motor controller.

1.4 ACTION SUBMITTALS

A. In accordance with the submittal requirements of Section 260100, the CSI shall work with the motor control manufacturer to develop and submit to the Engineer, through the Contractor, the following project data:

1. Itemized list of all motor control features and components.

2. System wiring diagrams for each unit of motor control equipment including, but not limited to: all instruments, relays, starters, switches, lights, breakers, terminals, etc. Indicate on submitted diagrams the terminals for remote devices as shown on the wiring diagrams in the contract drawings. Wire and terminal numbers shall be included on the schematic diagrams. Relay contacts shall be indicated for type and number available for each relay used.

3. Information on ratings and sizes of all equipment such as control transformers, fuses, breakers, etc. on the wiring diagrams for each unit.

4. Shop Drawings shall be provided on 11 by 17 inch sheets maximum size and shall be scaled using standard engineering or architectural scales.

5. Connection diagrams showing physical wiring layout for each unit.

6. Technical data sheets for all components with the complete part number of the component clearly designated with all required options as specified in PART 2. Provide at a minimum one tab section for each product listed in PART 2 of this section.

7. Scaled elevation drawings of the motor control equipment exterior and interior with all devices clearly labeled.

8. Scaled arrangement drawings of all panel front- and internal-mounted instruments, switches, devices and equipment indicated. Show all mounting details required. Deviations from approved arrangements require resubmittal and approval prior to installation.

9. Bill of materials showing quality, manufacturer, catalog number and the supplier name and phone number for all components of the motor control.

B. Product Data: For each type and rating of VFC indicated.

1. Include dimensions and finishes for VFCs.

2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

C. Shop Drawings: For each VFC indicated.

1. For each VFC indicated:

a. Include plans, elevations, sections, and mounting details.

b. Indicate dimensions, weights, required clearances, and location and size of each field connection.

c. Wire Termination Diagrams and Schedules: Include diagrams for signal, and control wiring. Identify terminals and wiring designations and color-codes to facilitate installation, operation, and maintenance. Indicate recommended types, wire sizes, and circuiting arrangements for field-installed wiring, and show circuit protection features. Differentiate between manufacturer-installed and field-installed wiring.

d. Include features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

e. Comply with other “Shop Drawing” requirements.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans, drawn to scale, showing dimensioned layout on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Required working clearances and required area above and around VFCs.

2. Show VFC layout and relationships between electrical components and adjacent structural and mechanical elements.

3. Show support locations, type of support, and weight on each support.

4. Indicate field measurements.

B. Qualification Data: For testing agency.

C. Seismic Qualification Data: 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.

D. Product Certificates: For each VFC from manufacturer.

E. Harmonic Analysis Report: Provide Project-specific calculations and manufacturer's statement of compliance with IEEE 519.

F. Source quality-control reports.

G. Field quality-control reports.

H. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For VFCs to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in "Installation, Operation, and Maintenance Manuals," include the following:

a. Manufacturer’s record drawings as defined in UL 845 for controllers installed in MCCs or as described in Section 16928. In addition to requirements specified in UL 845, include field modifications and field assigned wiring identification incorporated during construction by manufacturer, Contractor or both.

b. Manufacturer's written instructions for testing and adjusting thermal-magnetic circuit breaker and motor-circuit protector trip settings.

c. Manufacturer's written instructions for setting field-adjustable overload relays.

d. Manufacturer's written instructions for testing, adjusting, and reprogramming microprocessor control modules.

e. Manufacturer's written instructions for setting field-adjustable timers, controls, and status and alarm points.

f. 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.

g. Warranty: Sample of special warranty.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

2. Control Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.

3. Indicating Lights: Two of each type and color installed.

4. Auxiliary Contacts: Furnish one spare(s) for each size and type of magnetic controller installed.

5. Power Contacts: Furnish three spares for each size and type of magnetic contactor installed.

1.8 QUALITY ASSURANCE

A. Source Limitations: Obtain VFCs and controllers of a single type from a single source from a single manufacturer.

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. Testing Agency Qualifications: Accredited by NETA.

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

D. Comply with NFPA 70.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment to the job site at the appropriate time for installation and only after receiving final approval on Factory Acceptance Testing from the Engineer. Equipment items shall be crated or affixed to pallets with protective wrappings. Exercise care to prevent damage from handling. Store mechanical and electrical components off the ground in weathertight enclosures. Keep equipment dry at all times.

B. If stored in space that is not permanently enclosed and air conditioned, remove loose packing and flammable materials from inside controllers and install temporary electric heating, with at least 250 W per controller or connect factory installed space heaters to temporary electrical service.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for VFCs, including clearances between VFCs, and adjacent surfaces and other items.

1.10 COORDINATION

A. Coordinate sizes and installation location of VFCs.

B. Coordinate features of VFCs, installed units and accessory devices with remote pilot devices and control circuits to which they connect.

C. Coordinate features, accessories and functions of each controller and each installed unit with ratings and characteristics of supply circuits, motors, required control sequences, and duty cycle of motors and loads.

1.11 COORDINATION WITH CONTROL SYSTEM

A. The CSI shall be solely and completely responsible for coordination and integration of the Control System with the Motor Controllers.

1.12 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 MANUFACTURERS

A. To provide an integrated facility control system and common maintenance the following motor control manufacture was used as the basis of design. Other manufactures are not acceptable.

1. ABB: ACS880-07-0503A-5+C129+K490.

a. Contractor to confirm part number with specifications.

2.2 SYSTEM DESCRIPTION

A. Voltage: 480VAC Three Phase

B. HP Rating: 400 HP

C. Power Input Disconnecting Means: Main Switch.

D. 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 508C.

E. Application: Constant torque and variable torque.

F. 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, 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.

G. 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.

H. Output Rating: Three phase; 10 to 60 Hz, with voltage proportional to frequency throughout voltage range; maximum voltage equals input voltage.

I. 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: 97 percent at 60 Hz, full load.

5. Minimum Displacement Primary-Side Power Factor: 98 percent under any load or speed condition.

6. Ambient Temperature Rating: Not less than 32 deg F and not exceeding 104 deg F with and average value exceeding 95 deg F over a 24-hour period.

7. Humidity Rating: Less than 95 percent (noncondensing).

8. Altitude Rating: Not exceeding 3300 feet.

9. Vibration Withstand: Comply with NEMA ICS 61800-2.

10. Overload Capability for Variable-Torque Applications: 1.5 times the base load current for 60 seconds; minimum of 1.8 times the base load current for three seconds.

11. Starting Torque for Constant Torque Applications: Minimum 100 percent of rated torque from 3 to 60 Hz.

12. Speed Regulation: Plus or minus 1 percent of rated speed.

13. Output Carrier Frequency: Selectable; 1 to 12 kHz.

14. Stop Modes: Programmable; includes fast, free-wheel, and dc injection braking.

J. Inverter Logic: Microprocessor based, 16 bit, isolated from all power circuits.

K. Isolated Control Interface: Allows VFCs to follow remote-control signal over a minimum 40:1 speed range.

1. Signal: Electrical.

L. 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 999.9 seconds.

5. Current Limit: 30 to minimum of 150 percent of maximum rating.

M. Self-Protection and Reliability Features:

1. Input transient protection by means of surge suppressors to provide three-phase protection against damage from supply voltage surges 10 percent or more above nominal line voltage.

2. Surge Suppression: Factory installed as an integral part of the VFC, complying with Section 16483 “Surge-Protection for Low-Voltage Electrical Power Circuits”.

N. Surge Suppression: Field-mounted surge suppressors complying with Section 16483 "Surge Protection for Low-Voltage Electrical Power Circuits”.

1. 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.

2. Undervoltage and overvoltage trips.

3. Inverter overcurrent trips.

4. 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.

5. Critical frequency rejection, with three selectable, adjustable deadbands.

6. Instantaneous line-to-line and line-to-ground overcurrent trips.

7. Loss-of-phase protection.

8. Reverse-phase protection.

9. Short-circuit protection.

10. Motor-overtemperature fault.

O. 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.

P. 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.

Q. 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.

R. 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.

S. 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.

T. Integral Input Disconnecting Means and OCPD: UL 489, thermal-magnetic circuit breaker with pad-lockable, door-mounted handle mechanism.

1. Disconnect Rating: Not less than 115 percent of NFPA 70 motor full-load current rating or VFC input current rating, whichever is larger.

2. Auxiliary Contacts: NO or NC, arranged to activate before switch blades open.

3. Auxiliary contacts "a" and "b" arranged to activate with circuit-breaker handle.

4. NC alarm contact that operates only when circuit breaker has tripped.

U. Control Power

1. 120-VAC; obtained from CPT integral with controller size to be determined by the C.S.I based on loads served. The CPT shall be of sufficient capacity to operate integral devices and remotely located pilot, indicating and control devices with spare capacity as indicated.

    a. Spare Capacity: 25% excess capacity.

2. Primary and secondary fuses for current-limiting and overload protection of transformer and fuses for protection of control circuits.

2.3 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."

2.4 CONTROLS AND INDICATION

A. Status Lights: Door-mounted LED indicators displaying the following conditions:

1. Run. (RED)

2. Drive Fault. (AMBER)

3. Motor Overtemperature. (AMBER)

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 three levels 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: 4- to 20-mA dc.

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) (4- to 20-mA dc), 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).

4. Remote Indication Interface: A minimum of two programmable dry-circuit relay outputs (120-V ac, 1 A) for remote indication of the following:

a. Motor running.

b. H-O-A in Hand.

c. H-O-A in Auto.

d. Fault and warning indication (overtemperature or overcurrent).

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: Two.

G. Building Automation and PLC Interface: Factory-installed hardware and software to enable the Building Automation and PLC system to monitor, control and display VFC status, alarms and energy usage. Allows VFC to be used with an external system within a multidrop LAN configuration; settings retained within VFC's nonvolatile memory.

1. Network Communications Ports:

a. Ethernet

b. RS-422/485.

c. BACnet.

2. Protocols for Network Communications: Ethernet TCP/IP; protocols accessible

via the communications ports.

2.5 CONDUIT ENTRY

A. Provide bottom entry for the electrical conduits.

2.6 LINE CONDITIONING AND FILTERING

A. Input Line Conditioning: Based on the manufacturer's harmonic analysis study and report, provide input filtering, as required, to limit total demand (harmonic current) distortion and total harmonic voltage demand at the defined point of common coupling to meet IEEE 519 recommendations.

B. Input Line Conditioning: 3 percent line reactor or as indicated on the drawings.

C. Output Filtering: As indicated on the drawings.

D. EMI/RFI Filtering: As indicated on the drawings.

2.7 BYPASS SYSTEMS (WHERE INDICATED ON THE DRAWINGS)

A. 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.

B. 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.

C. 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.

1. Bypass Contactor: Load-break, NEMA-rated contactor.

2. Input and Output Isolating Contactors: Non-load-break, NEMA-rated contactors.

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: Full-voltage (across-the-line) 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: 25% excess capacity.

    b. Solid-State Overload Relays:

        1) Switch or dial selectable for motor-running overload protection.

        2) Sensors in each phase.

        3) Class 10/20 selectable tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.

    c. NO isolated overload alarm contact.

    d. External overload, reset push button.

2.8 OPTIONAL FEATURES

A. Multiple-Motor Capability: VFC suitable for variable-speed service to multiple motors. Overload protection shuts down VFC and motors served by it, and generates fault indications when overload protection activates.

1. Configure to allow two or more motors to operate simultaneously at the same speed; separate overload relay for each controlled motor.

2. Configure to allow two motors to operate separately; operator selectable via local or remote switch or contact closures; single overload relay for both motors; separate output magnetic contactors for each motor.

3. Configure to allow two motors to operate simultaneously and in a lead/lag mode, with one motor operated at variable speed via the power converter and the other at constant speed via the bypass controller; separate overload relay for each controlled motor.

B. Damper control circuit with end-of-travel feedback capability.

C. Sleep Function: Senses a minimal deviation of a feedback signal and stops the motor. On an increase in speed-command signal deviation, VFC resumes normal operation.

D. Motor Preheat Function: Preheats motor when idle to prevent moisture accumulation in the motor.

E. Remote Indicating Circuit Terminals: Mode selection, controller status, and controller fault.

F. Remote digital operator kit.

G. Communication Port: RS-232 port, USB 2.0 port, or equivalent connection capable of a notebook computer.

2.9 ENCLOSURES

A. All Other Controllers: Reference specification Section for enclosure requirements.

B. Provide corrosion inhibitors in all motor control enclosures prior to shipping. Amount of inhibitor shall be provided for the volume of the enclosure for one year.

C. The construction of the enclosures shall comply with NEMA ICS 6.

D. Controllers in hazardous (classified) locations shall comply with UL 1203.

E. Enclosed VFD's shall be NEMA 12 in a conditioned space.

F. Enclosed VFD's shall be NEMA 4X in non-conditioned spaces.

2.10 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, Pilot Lights, and Selector Switches: Heavy-duty, oil-tight type. Standard-duty, except as needed to match enclosure type. Heavy-duty or oil-tight where indicated in the controller schedule.

a. Push Buttons: Unguarded types; momentary contact unless otherwise indicated.

b. Pilot Lights: LED Types; push to test. As indicated in the controller

schedule.

c. 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. Control Relays, General Purpose: Relays for general purpose use shall be DPDT or 3PDT, 10 amp contacts with appropriate coil voltage for the application. They shall have an 8-pin base, matching socket and contact status indicator.

E. 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.

F. Supplemental Digital Meters:

1. Elapsed-time meter.

2. Kilowatt meter.

3. Kilowatt-hour meter.

G. Space heaters, with NC auxiliary contacts, to mitigate condensation in enclosures installed outdoors or in unconditioned interior spaces subject to humidity and temperature swings.

H. Cooling Fan and Exhaust System: Cooling fans shall maintain the enclosure rating of the enclosures in which they are installed. UL 508 component recognized: Supply fan, with stainless-steel intake and exhaust grills and filters; 120-V ac; obtained from integral CPT.

I. Sun shields installed on fronts, sides, and tops of enclosures installed outdoors and subject to direct and extended sun exposure.

J. Spare control-wiring terminal blocks; wired.

K. Terminal Blocks: Terminal boards shall be 300 or 600 volt modular terminal blocks with tubular screw and pressure plate. Terminal shall be sized to accept #2-14 AWG wire minimum. Provide a minimum of 20% or four (whichever is more) spare terminals in each bucket. Allen-Bradley Bulletin 1492-CA1 or approved equal.

2.11 SOURCE QUALITY CONTROL

A. Testing: Test and inspect VFCs according to requirements in NEMA ICS 61800-2.

1. Test each VFC while connected to a motor that is comparable to that for which the VFC is rated.
2. Verification of Performance: Rate VFCs according to operation of functions and features specified.

B. VFCs will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

PART 3 EXECUTION

3.1 GENERAL

A. It is the Contractor's responsibility to verify that the motor starters, protection equipment and other components provided are suitable (correct phase, voltage, starter type, breakers and overload relays) for the motors and equipment loads being served.

B. Operator interface devices such as metering and devices with control and displays shall be installed between 5' and 5'-8" above finished floor. Operator interface devices on full height sections shall be installed between 4'-6" and 6' above finished floor.

C. Provide wire and terminal numbering on all wires and terminals.

D. Provide schematic and layout drawings for each individual unit.

3.2 FACTORY ACCEPTANCE TESTING

A. Motor control equipment shall be tested in the CSI's shop along with the control system per the requirements in this Section and "Control System". Operation of the motor control equipment shall be tested in the shop by the Control System Integrator. The testing shall include, but not be limited to, operation of all input and output (I/O) points, control devices and motor controllers 24 hours per day for a continuous period of at least one (1) week.

B. Testing and inspection of motor control equipment shall include all components. All motor controllers shall be interconnected with the control system and powered with rated incoming voltage.

C. After completion of initial testing, the CSI shall conduct subsequent testing for inspection by the Engineer. The CSI shall provide for time, equipment and support in their shop for the Engineer to test the motor control equipment for a period of up to 3 days. All control functions and all status and alarm monitoring and indication shall be demonstrated under simulated operating conditions. Simulating equipment shall be provided and wired into the motor control equipment for this testing. The CSI shall revise, modify and adjust the motor control equipment as required by the Engineer during the testing period.

D. Once all changes and modifications required by the Engineer identified during the

testing are made and the corrective action taken is to the satisfaction of the Engineer, motor control equipment may be released for delivery to the site upon receiving approval from the Engineer.

3.3 EXAMINATION

A. Examine areas, surfaces, and substrates to receive VFCs, with Installer present, for compliance with requirements for installation tolerances, and other conditions affecting performance of the Work.

B. Examine VFC before installation. Reject VFCs that are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for conduit systems to verify actual locations of conduit connections before VFC installation.

D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.4 HARMONIC ANALYSIS STUDY

A. Perform a harmonic analysis study to identify the effects of nonlinear loads and their associated harmonic contributions on the voltages and currents throughout the electrical system. Analyze designated operating scenarios, including recommendations for VFC input filtering to limit TDD and THD(V) at the defined PCC to specified levels.

B. Prepare a harmonic analysis study report complying with IEEE 519-2014 and NETA Acceptance Testing Specifications.

3.5 INSTALLATION

A. GENERAL

1. The motor control equipment shall not be shipped to the site until it has been inspected and tested to the satisfaction of the Engineer and a suitable environment is available for installation of the equipment. A suitable environment for the purposes of this contract for motor control equipment shall be dry, covered and heated to maintain a minimum ambient temperature of 60 degrees F. Prior to shipment of electrical equipment, the Contractor shall contact the Engineer for field verification of a suitable environment.

2. The motor control center shall be installed in accordance with the installation drawings and instructions. Installation shall be performed by workers who are skilled and experienced in the installation of motor control equipment. It is the contractor’s responsibility to provide sufficient space for the equipment and size

of equipment to fit within the space requirements and meet all cod requirements.

3. Installation shall include all elements and components of motor control equipment and all conduit and interconnecting wiring between all elements, components and sensors. All wiring between cabinets, sensors, pumps and equipment shall be multiple color coded with at least twenty individual colors for ease of servicing. All terminations shall be made with solderless pressure connectors. All wiring shall be in accordance with the requirements of Section 260519 and 260526. Intrinsically safe wiring shall be separated with barriers per NEC requirements.

B. Coordinate layout and installation of VFCs with other construction work including conduit, piping, equipment and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

C. Wall-Mounting Controllers: Install with tops at uniform height and with disconnect operating handles not higher than 79 inches 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 262727 “Supporting Devices.”

D. Floor-Mounting Controllers: Install VFCs on 4-inch nominal thickness concrete base. Comply with requirements for concrete base specified in Section 03300 "Cast-in-Place Concrete."

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.

2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.

3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

4. Install anchor bolts to elevations required for proper attachment to supported equipment.

E. Seismic Bracing: Comply with requirements specified in Section 16148 "Seismic Controls for Electrical Systems."

F. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

G. Install fuses in each fusible-switch VFC.

H. Install fuses in control circuits if not factory installed.

I. Install heaters in thermal-overload relays. Select heaters based on actual nameplate full-load amperes after motors are installed.

J. Install, connect, and fuse thermal-protector monitoring relays furnished with motor-driven equipment.

K. Comply with NECA 1.

3.6 CONTROL WIRING INSTALLATION

A. Install wiring between VFCs and remote devices and facility's central-control system. Comply with requirements in Section 260520 “Equipment Wiring.”

B. Bundle, train, and support wiring in enclosures.

C. Connect selector switches and other automatic-control devices where applicable.

1. Connect selector switches to bypass only those manual- and automatic-control devices that have no safety functions when switches are in manual-control position.

2. Connect selector switches with control 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.

3.7 IDENTIFICATION

A. Identify VFCs, components, and control wiring. Comply with requirements for identification specified in Section 16153 "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.

4. Mark up a set of manufacturer’s connection wiring diagrams with field assigned wiring identifications and return to manufacturer for inclusion in Record Drawings.

B. Operating Instructions: Frame printed operating instructions for VFCs, including control sequences and emergency procedures. Fabricate frame of finished metal and cover instructions with clear acrylic plastic. Mount on front of VFC units.

3.8 CONNECTIONS

A. Comply with requirements for installation of conduit in Section 260530 “Conduit.” Drawings indicate general arrangement of conduit, fittings and specialties.

B. Comply with requirements in Section 260526 “Grounding And Bonding.”

3.9 FIELD QUALITY CONTROL

A. Perform tests and inspections as specified in Section 16670 “Electrical Testing”.

3.10 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.11 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 Engineer before increasing settings.

D. Set field-adjustable circuit-breaker trip ranges.

E. Set field-adjustable pressure switches.

3.12 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions until controllers are ready to be energized and placed into service.

B. Replace VFCs whose interiors have been exposed to water or other liquids prior to Substantial Completion.

3.13 DEMONSTRATION

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

END OF SECTION

Extraction and Injection Well Scope

This is an overview of the items required to complete the extraction and injection well installation.

1) Extraction well pump / motor and piping installation.
2) Extraction well level transmitter and spare (for manual measurements) conduit installation with well piping.
3) Extraction well pump / motor VFD procurement.
4) Extraction well and injection well level and temperature transmitters procurement.
5) VFD installation.
6) VFD power and controls.
    a. Power from the existing 480 VAC switchboard to VFD.
    b. Well pump motor power from VFD to well pump motor.
    c. Communications from the VFD to the Geothermal Heat System control.
7) Geothermal Heat System discharge pressure transmitter procurement.
8) Geothermal Heat System discharge pressure transmitter and associated hardware installation and wiring to downhole control panel.
9) Installation and wiring of extraction well level / temperature transmitter to downhole control panel.
10) Installation and wiring of injection well level / temperature transmitter to downhole control panel.
11) Install Owner supplied downhole control panel.
12) Supply power, controls and communications as shown or mentioned in this scope to the downhole control panel.
13) Owner supplied downhole control panel drawings are included in the bid drawings for reference.
14) Install extraction well and injection well conduits. Coordinate with Owner for locations of existing conduits to extend.
15) Install injection valve (with the assistance of downhole valve manufacturer), hydraulic hosing to surface.
16) Injection well level transmitter and spare (for manual measurements) conduit installation with well piping.
17) Assist with installation of downhole hydraulic hose from mechanical room to injection well head.