SCOPE OF WORK

I. GENERAL
Provide complete design-build contracting and turn-key project delivery as described below for the Humboldt State University building controls system replacement at select campus buildings.

II. SCOPE OF THE PROJECT
The University is pursuing new building HVAC automation controls in the following buildings: Siemens Hall, Harry Griffith Hall, Natural Resources, Science D and E, and the Student Health Center. The University will be replacing the existing ControlPAK building automation HVAC control system with a new system to improve controllability, reliability, and manageability of each building’s space conditioning systems. The University will be utilizing a design-build process, in which the awarded contractor will design, install, and program the new controls system. Design-build projects are implemented as turnkey projects, providing a complete design with streamlined implementation. The budgeted guaranteed maximum price or GMP for the design-build contract is set at $1,255,000.

In addition to this Scope of Work, all other exhibits shall be considered in the total project scope which includes the Control Drawings, the DDC Points List, the Sequence of Operations, HSU Standard Division 1 Specification, and the HSU Controls Specification. The drawings, points list, and sequence of operations identify the specific HVAC systems, miscellaneous controlled equipment, and needed control functionality per building. The specifications and scope of work identify the requirements for the BAS and BAS installation.

III. SCOPE OF THE DESIGN-BUILD CONTRACTOR
In support of the effort outlined in the project scope, the services summarized below will be required of the design-build contractor:

A. Project Requirements and Goals

Owner and User Requirements are listed as follows:

- The University will be replacing the existing ControlPAK building automation HVAC control system with a new system to improve controllability, reliability, and functionality of each building’s space conditioning systems. The new system is intended to be the campus BAS standard going forward to minimize the cost associated with maintaining multiple BAS.
- Existing HVAC equipment will remain in place: existing BAS inputs and outputs are to be replicated in the new BAS, which will also serve as a control system “foundation” capable of integrating future buildings and replacement equipment with industry-standard communications protocols.
- The building pneumatic systems will be converted to direct-digital control (DDC), to the zone level.
- The Building Automation System (BAS) shall be capable of integrating multiple building functions, including equipment supervision and control, alarm management, energy management, and trend data collection.
- System shall be web based system with support from two or more contractors.
• All hardware, software, and training must be directly purchasable by the University through a source other than the awarded contractor, alternate sources to include manufacturer, and distributor.

• Ability to negotiate BAS hardware prices and programming (“parts and smarts”), and competitively bid installation work to two or more contractors. Ability to see hardware costs and programming labor (hourly) costs as separate items.

• The University will be utilizing a design-build process, in which the awarded contractor will design, install, and program the new controls system. Design-build projects are implemented as turnkey projects, providing a complete design with streamlined implementation.

Energy Efficiency Goals are listed as follows:

• As allowed by existing HVAC equipment functionality and system design, implement industry best-practice control strategies for efficient building operation while maintaining occupant comfort. This includes, but is not limited to:
  o Un-occupied zone temperature setbacks
  o Supply temperature resets
  o Static pressure resets
  o Building and equipment scheduling
  o Optimum start
  o Demand-based controls

• Where limited by existing HVAC equipment functionality and system design, replicate current control system strategies and function in the new BAS

• Integrate existing utility sub-metering, and have the capability to integrate future communicating sub-meters as they are added to each building

Indoor Environmental Quality requirements are listed as follows:

• Thermal comfort requirements:
  o Per-original design intent.

• Setpoints
  o Ability to define campus standard zone setpoints (both occupied and un-occupied) and master scheduling of buildings and zones Per-original design intent.

• Ventilation and Filtration requirements.
  o Per-original design intent.

• Occupancy HVAC control requirements.
  o Scheduling and setback functionality to be managed at the server level, with optional user unoccupied overrides.

Equipment and System Expectations are listed as follows:

• BAS Equipment
  o Johnson Controls Metasys shall serve as the basis of design. Approved equals are accepted and shall demonstrate all functionality and features found in the basis of design.
o BACnet, MODBUS, and Lon drivers shall reside in the Supervisory controller and Open licensing shall be included in each Supervisory controller.
o All valve and damper actuators to be replaced, whether electronic or pneumatic.

- HVAC Equipment
  o Failed economizer dampers will be replaced or repaired by the University in parallel with the controls replacement, as proper economizer operation is key to returning the buildings to original design intent and operation.
o Existing hydronic valve bodies to remain.

**Building Occupant and O&M Personnel Expectations are listed as follows:**

- Day-to-day HVAC operation by Facilities staff via BAS server graphical interface
- Training required for building operators
- Responsive BAS technical support and service from awarded contractor

**For other owner and BAS related requirements, refer to the HSU BAS specification.**

**B. Design-Build Contractor Requirements**

The following summary of services will be required of the design-build contractor:

- Provide turn-key, design-build implementation of the HVAC control system replacements and upgrades for Siemens Hall, Harry Griffith Hall, Natural Resources, Science D and E, and the Student Health Center.
  o Includes all design and installation labor, parts, panels, materials, programming, documentation, and permits.
  o Includes 120-volt control power system design, transformers, wiring, and installation in addition to all low-voltage cabling and installation.
  o Engineer of Record will aid the University through construction activity by providing services as outlined in the following sections
  o Engineer of Record will provide complete as-built records of the project and aid the University in commissioning by third party. Third party commissioning will be procured and coordinated through by HSU.

- Provide and install a University-approved HVAC control system that meets the University’s control system specifications.
  o Provide server-level software to integrate trending, graphics, schedules, and set-points across all upgraded buildings. System architecture to be expandable to incorporate additional buildings in the future.
  o Provide all needed building-level and field-level controllers.
  o Provide all needed graphical interfaces and trending per the campus specification.
  o Provide all needed control system programming to meet the specified sequence of operations.
  o Complete the startup and documentation of the control system
Provide resources to support the University’s control system commissioning agent in the functional testing, issue resolution, and acceptance of the delivered control systems.

- System air-flow setpoints to be programmed starting with original design drawing CFM values, then adjusting based on changes to the building program since original system design.

Provide complete as-built documentation at project close-out showing (but not limited to) control system architecture, all installed equipment, inputs/outputs, control sequences, and control system equipment cut sheets.

For control system hardware shown on control system replacement drawings:

- Temperature sensors: Replace with new or add new. Re-use thermowells where possible
- Thermostats: Replace with new
- Pressure sensors: Replace with new or add new
- CO2 sensors: Replace with new or add new
- Flow meters: Integrate existing
- Flow switch: Integrate existing
- Power meters: Integrate existing
- Outside air temperature/humidity: Add new
- Damper actuators: Replace old actuators with new. Failed AHU dampers will be replaced or repaired by University concurrent with this project.
- Hydronic valve actuators: Replace old actuators with new. Valve bodies to remain.
- Pneumatic controls: Disconnect, demo in place (cap), and provide new DDC control actuators and linkage as needed. University to demo compressed air system.
- Motor starters: Use existing
- Variable speed drives: Use existing
- Current switches: Provide new
- Smoke shutdown: Maintain existing shutdown and alarm connections
- Support the University through the warranty period per General Conditions

- Design Submittals: The Project Engineer will be responsible for the following design submittals. Each submittal phase will be treated as a design milestone which will undergo university review and agency review. The university will provide written comments to the architect/engineer for each submittal. The Project Engineer shall provide a written response to each item and return to the university prior to the next submittal. When the response indicates work has been incorporated into the documents, the response must indicate the appropriate drawing location and specification section incorporating the work and the comment will be closed

- Preliminary Design:
  - General Requirements: Review the program specifications upon receipt of the authorization to begin work. Attend the planning conferences to receive instruction from the campus and its designated representatives. Secure project planning information
including information on site constraints. Request any additional data needed from the campus. Submit a listing of proposed consultants planned for the project to the project administrator. Coordinate the project with other campus projects. Consult with the campus consultants regarding the project when directed by the University Administrator. Design shall be in accordance with all applicable codes and standards. Request and obtain approval from the project administrator before initiating any work to modify the project documents, which may require performance of extra services. The Project Engineer shall make a submittal at 100% of phase. The following items describe the Preliminary Phase submittal requirements for a 100% submittal.

- **Project Schedule:** The Project Engineer shall develop a simple project schedule identifying the following criteria. The schedule shall be reviewed with the University at all project meetings and updated by the Project Engineer at each submittal.

- **Architectural Requirements**
  - **Floor Plans:** (Scale: Minimum 1/8 inch = 1 foot).
    - Indicate the locations, room names, and space numbers for all spaces including entrances, lobbies, corridors (with widths), stairs, elevators, and mechanical/electrical equipment rooms as applicable. Floor plans for additions or alterations to existing buildings shall show the existing floor plan and indicate the existing space usage and any proposed changes as applicable.
    - Indicate the locations of all doors (showing door swings) and windows.
    - Indicate the overall dimensions of the major elements of each building.
    - Indicate the locations and fire ratings of fire separations, exit enclosures, fire doors, and similar elements.
    - Indicate the location of plumbing fixtures such as lavatories, floor drains, water closets, urinals, service sinks, drinking fountains, eyewash fountains, deluge showers, and fire-hose cabinets as applicable.
    - Provide a demolition plan whenever a project requires the demolition of any building or portions thereof.
    - Provide a roof plan showing associated equipment, slopes, ridges, drains, and other items as applicable.
  - **Elevations and Sections:** (Scale: Minimum 1/16 inch = 1 foot).
    - Depict in building elevations, all building elements including penthouses, entrances, windows, doors, stairs, platforms, louvers, vents, exhaust stacks, retaining walls, and similar items. Indicate proposed finished grades as applicable.
o Indicate the overall building and floor-to-floor heights as applicable.

o Include longitudinal and transverse sections for each major area, indicating floor elevations, ceiling heights, pipe tunnels, unexcavated areas, basement areas, rooflines, and parapets as applicable. Where appropriate, show connections to adjoining buildings.

o Cross-reference sections and elevations to floor plans.

o Indicate in the sections, provisions for HVAC distribution and hood venting as applicable.

• **Interior Details:** (Scale: Minimum 1/4 inch = 1 foot).

  o Provide detail plans, sections, and elevations for the following types of space: mechanical rooms, attic spaces, corridors, chase ways, and other areas of special design as applicable.

• **Schedules:** Provide schedules indicating type, size, material, hardware and pertinent comments as necessary. Provide a preliminary device schedule indicating the make, model interface, and other relative information.

• **Code Analysis Report & Plans:** Develop a narrative of the Code Analysis Report & Plans. This shall document and illustrate the code implications of design development, and requirements. This narrative will be updated through the design process in response to issues arising from outside agency reviews (e.g. DSA, Fire Marshal interpretation).

• **Outline Specifications,** The preliminary design phase outline specifications shall provide a detailed description of all building components and systems as related to the other documents. Prior to developing the specifications for this phase, the architect/engineer shall schedule a meeting with university's Design and Construction, and Contract Administration units to review specifications guidelines. At this meeting, the university will provide guidelines for preparing specifications. Attendees at this meeting shall include architect/engineer, architect/engineer's Consultants, and architect/engineer's specifications writer. The preliminary design outline specifications shall include the following:

  o An index showing divisions and sections intended to be used. The format shall be that recommended by the Construction Specifications Institute (CSI), narrow scope type.

  o A general description of the construction, including the structural system; wall, ceiling, roofing, and waterproofing systems; exterior and interior finishes; and doors, windows, and case work as applicable. These descriptions shall include applicable code references.
A general description of the plumbing and HVAC systems including controls, ducts, filtration, and piping as applicable. These descriptions shall include applicable code references.

A general description of electrical services including the voltage and the number of feeders. The specifications shall provide a specific description of items to be served by emergency power and shall describe design considerations for special areas as applicable. This description shall include applicable code references.

A general description of fire safety mechanical and electrical systems and devices required by the State Fire Marshal for the intended occupancy of the building as applicable.

A description of special systems including laboratory control systems, energy management systems, and special exhaust systems as applicable.

- Estimated Project Construction Costs
  - Provide an estimate of the total construction cost of the project. Estimates for building projects shall be arranged in CSI Uniformat format (a building systems organization format) detailed to Level 3. This cost information shall also be summarized in a CPDC “2-7” format, contact university project administrator for further information.
  - Provide a written narrative explaining in detail any deviation from the approved estimated construction cost.
  - Bring any unusual cost item to the attention of university's project administrator.

Construction Document Phase:

- General Requirements: The following items constitute the minimum construction document phase submittal requirements. The construction documents phase submittal shall include all elements previously shown on the preliminary design documents but with greater detail and specificity. 50%, 95% and corrected 100% back-check construction documents phase submittals are required.

- 50% Progress Submittal Requirements: The 50% construction document submittal shall include one set of the following:
  - A progress set of all working drawings from all disciplines
  - A updated cost estimate reflecting current work to date
  - Full specifications need not be submitted as a part of the 50% CD submittal, since normally these documents are prepared late in the development of the working drawings.

- 95% Progress Submittal Requirements: All documents in the 50% submittal shall be further developed by architect/engineer in sufficient detail as to be deemed 100% complete and buildable. This submittal shall also provide full book specifications for the project. The 95% designation is solely to acknowledge that the plans have not been plan checked. The standard of completion shall be 100% complete. Prior to submitting the 95% construction documents, the
architect/engineer and their consultants shall have thoroughly checked, coordinated, and revised all documents to bring them to 100% completed level. General Condition items shall not be included on drawings or schedules. Notes must coordinate with, and conform to the written contract documents. Products and materials specified on the drawings must be identical to the products and materials required in the written contract documents specifications.

- **Estimated Project Construction Costs:**
  - Provide updated estimates of the total construction cost of the project at 95% and 100%. Estimates for building projects shall be arranged in CSI Uniformat format detailed to **Level 4**. This cost information shall also be summarized in a 2-7 format (format will be made available by the university).
  - The 95% and final 100% Estimated Project Construction Cost shall include materials quantities and unit prices. The estimates shall include itemized cost breakdowns of all work activities on the project; these breakdowns will be used to establish the format used by the contractor in applying for progress payments.
  - The final 100% completed Estimated Project Construction Cost shall be revised and updated from the 95% cost estimate to reflect any changes in the design of the Project as well as all revisions made to the Construction Documents after the 95% submittal.
  - The architect/engineer shall compare the 95% and final 100% Estimated Project Construction Cost with the construction budget. Any significant differences between the revised estimates and the construction budget shall be brought to the immediate attention of the project administrator.
  - Provide a written narrative explaining in detail any deviation from the approved estimated construction cost.

- **Agency Plan Review Submittals:** The architect/engineer shall be responsible for obtaining review and approval by regulatory agencies. Submittals must be coordinated through the university project administrator. The university will initiate all contracts for plan reviews and make payment for all plan check services. Obtain approval of the construction documents from the required plan check reviewers.
  - State Fire Marshal Review: Obtain approval of the construction documents directly from the State Fire Marshal. Submit one complete set of working drawings and specifications for plan check. Upon approval by the SFM, provide an original wet signed set, for stamping by as required by the SFM for certification of compliance.
  - Building Code Review: Submit set of working drawings, specifications, calculations, and other fire, life, safety reports to the university for submission to an independent fire, life, safety plan-checking agency.

- **Final Submittal of 100% Construction Documents**
  - Certify, by a signed statement on the drawings and by provision of required calculations that the construction documents comply with the energy conservation standards set forth in Title 24.
  - Stamp all drawings and specifications as required by law for registered architects and engineers.
  - Submit set of completed, stamped and signed construction documents to the project administrator.
• Provide the same items in their electronic equivalents. Verify current software versions accepted with the university project administrator prior to transmitting electronic files.

• Construction Phase

• General Requirements: The duties and responsibilities of the architect/engineer during the construction phase include:
  o Observe construction throughout the construction of the project.
  o Periodically examine the contractor's work to ascertain its conformance with contract documents.
  o Coordinate with the university on all change orders, the University will issue all change proposals, cost request bulletins, and contract change orders.
  o Coordinate with the university on all change proposals, cost request bulletins, and contract change orders complete with approved back-up.
  o Issue clarifications and interpretations of construction documents to the University, University will facilitate coordination with contractor.
  o Coordinate with the University and be responsible for review and interpretation of Project Submittals, and request for information’s.
  o Attend project site meetings as required and managed by the university (remote attendance is acceptable).
  o Review the testing program, including specifying tests that are required in accordance with the construction documents and checking test compliance.
  o Assist the University in litigation or disputes arising from the project construction, including claim rebuttals and attendance at hearings.
  o Conduct the pre-final and final inspections with the project manager/construction inspector, the construction administrator, and campus officials.
  o Review contractor as-built drawings, and prepare final as-built record drawings.

• Inspection: Construction phase inspection will be provided and paid for by university. The architect/engineer shall:
  o Provide design-related technical direction to, and design-related interpretation of, the contract documents for the University project management team.
  o Review inspection reports submitted by the University project management team and any reports furnished by others retained or employed by university to review the work.
  o Issue recommendations of directives that, based on architect/engineers' evaluation of the report data, are deemed necessary to obtain compliance with the requirements of the contract documents to the University’s project management team.

• Pre-Final Inspection of Project (Punch Lists)
  o The architect/engineer shall inspect the construction with the university and the contractor when notified by the contractor that the construction is substantially complete, and again when notified by the contractor that the construction is fully complete.
The architect/engineer shall compile a punch list indicating any lack of compliance with contract document requirements. The punch lists shall be issued to the University and the university will enforce the punch list in completing the project. When it is judged that all the items on the punch list have been corrected or completed, the final inspection shall be scheduled by the architect/engineer.

All operation and maintenance manuals for the project shall be delivered by the contractor, reviewed by the inspector of record and found to be complete and in good form, before the final inspection is scheduled.

**Final Inspection and Acceptance**

- The architect/engineer shall review the contractor's as-built documents, guarantees, and operating data to assess compliance with the contract document requirements and notify university's representative in writing of its findings.
- The architect/engineer shall assist university's representative to assemble written guarantees, operating and maintenance instruction books, diagrams, and charts required of contractor. University's representative is responsible for verifying that all required submittals have been received.
- The architect/engineer shall assist university's representative to conduct the final acceptance inspection of the construction with university and contractor and shall advise university's representative of the acceptability of the work performed by contractor.
- An inspection acceptance form must be executed by university's representative and received by university within seven (7) calendar days from the inspection acceptance date. All parties required to sign the Inspection Acceptance form must be present for the final inspection.

**System Commissioning**

- The Engineer of Record/Design-Build Contractor shall aid the University in system commissioning by responding to and physically adjusting controls system in coordination with commissioning agent. Commissioning agent will be a third party services procured by the University and named herein: Ecovox engineering.

**Record Documents (As Builts)**

- During construction, the architect/engineer shall have reviewed all revisions and changes and shall have recommended approval of the set of drawings and specifications maintained by contractor during the course of construction.
- The architect/engineer's preparation of the final record documents shall indicate all revisions and changes that have been made during construction so as to provide the university with a correct and complete record of the project as actually constructed.
- The architect/engineer shall furnish an initial review copy of the as-builts for review by the university (inspector of record).
- An identical copy of the record documents shall also be submitted in electronic format.