Rider 1
Commissioning (Cx) for CSU Projects

1.0 Commissioning (Cx) Objectives

A.) By statute, the California Building Code, Part 6 - California Energy Code, requires building commissioning be included in the design and construction processes of the building project to verify that the building energy systems and components meet the owner’s or owner representative's project requirements. All building systems and components covered by The California Energy Code Sections 110.0, 120.0, 130.0 and 140.0 shall be included in the scope of the commissioning for new construction of 10,000 SF and greater. By policy, the California State University expands this requirement to all construction for projects $3,000,000 or greater in construction costs. (As an approximation of the 10,000 SF Title 24 metric).

Service Provider will confirm the applicability and extent of commissioning to be provided on each individual project with the campus at the onset of each project.

B.) The objective of the CSU commissioning process is to provide documented confirmation that a project’s mechanical, electrical, and plumbing (MEP) systems when constructed realize planned performance benchmarks, to address the California Energy Code requirements and to promote reasonably prepared CSU building staff to operate and maintain its systems and equipment so as to continue to realize the anticipated performance.

C.) The ‘Cx Scope – Base Commissioning Scope (Section 2) applies to all projects. Each project shall also adhere to one of the identified supplemental scope packages (Sections 3, 4, 5, or 6) described herein. The specific scope to be used for the project is identified in Section 13 - Modifications to Scope Summary.

The Cx Scope of Work for each project will vary based on project cost, size and complexity. The supplemental scopes align with project construction costs and become more comprehensive as project cost, and complexity increase. The supplemental scope cost thresholds are a recommended paring. For smaller, but mechanically demanding projects it may be more appropriate to utilize a more comprehensive commissioning scope. Conversely for larger, but mechanically simple projects, a lesser commissioning scope may be appropriate.

1.1 The Service Provider engaged for this work is hereby designated as the Commissioning Agent (CxA) for the project. In this role the CxA acts as a campus agent and as a consulting campus advisor to the design team and contractor on issues that affect commissioning. The CxA’s role is advisory. The Architect/Engineer and Contractor under their own separate contracts with the University are the respective Architect/Engineer-of-Record and Contractor-of-Record.

1.2 The CxA shall perform to the selected individual Scope of Work using the most current CSU Commissioning Guidelines (available on the CSU CPDC website) as a reference. The CxA shall seek direction from the campus where guideline or scope requirements relative to the specific project appear inappropriate.
1.3 The CxA Scope of Work will involve the CxA from the onset of the project through its completion and potentially a one year post-occupancy period thereafter. The scope of involvement will vary based on the project and its construction delivery method.

a. **During the pre-design phase**, the CxA shall work with the campus project team to challenge and define project performance expectations and document project performance and commissioning goals. In the case of a design-build delivery the CxA shall develop commissioning requirements suitable for use in a project RFQ/RFP.

b. **During the design phases**, the role of the CxA is to develop commissioning specification and testing plan recommendations for the design team. In a design-build delivery the CxA shall be impartially available to each proposing design team to offer independent and non-partisan recommendations relative to each respective design-build team’s development of their own outline commissioning plan.

As the design is developed the CxA shall monitor to ensure that the project design documents are generally consistent with the commissioning recommendations as to quality, constructability, operability and campus-identified objectives. In the case of a design-build delivery, the CxA shall confirm that the selected design-build team is developing the design and commissions consistent with the RFP award. The CxA shall also provide design phase reviews as required by the California Energy Code.

c. **During construction**, the CxA shall monitor to ensure commission related tasks are completed consistent with the approved Construction Documents and the commissioning testing plan incorporated therein.

d. **During the one-year post-occupancy period**, if requested the CxA shall provide an independent assessment of warranty claims relative to MEP commissioning issues.

2.0 **The Base Commissioning Scope**
The Base Cx scope in this section is applicable to all CSU commissioning projects. Each project shall also adhere to a supplemental scope package (Section 3, 4, 5, or 6). This will be identified in Section 13 - Scope Summary. The ‘Base Cx Scope’ and the selected ‘Supplementary Scope’ for the project shall be read as complimentary and additive. The appointed Commissioning Agent shall:

2.1 **Base Scope - Cx Pre-Design Phase 1**

2.1.1 Actively coordinate the commissioning work effort during pre-design and all design phases. Provide a brief written assessment to the University at the completion of each design phase on the progress of the commissioning effort.

2.1.2 Develop commissioning plan and specification recommendations for design team use. *The Cx Agent’s role is to provide advisory support. The project A/E retains record authority for the functionality and appropriateness of the design.*

2.1.3 Consistent with the California Energy Code requirements, develop an Owner’s Project Requirement document (OPR) to memorialize the project’s functional requirements, expectations of building use and operation as it relates to systems being commissioned.
2.2 **Base Scope - Cx Pre-Design Phase 2**

2.2.4 Develop commissioning specification recommendations for each system to be commissioned. Commissioning specification recommendations shall generally include:

a. Reporting and documentation requirements
b. Alerts to coordination issues
c. Construction checklist and startup requirements
d. Contractor functional test requirements. Include testing conditions and acceptance criteria for each piece of equipment and systems being commissioned.

The following resources offer model guidelines for content, rigor and format of Cx specifications:


2.2.5 Provide commissioning plan and specification recommendations to design team and contractor.

2.2.6 Monitor for incorporation into the Construction Documents. Review to ensure that Cx specifications incorporate the elements specified by *California Energy Code*. Periodically advise the campus as to efficacy of this effort.

2.2.7 Develop building enclosure commissioning specification and testing plan recommendations for the design team. In a design-build delivery the CxA shall be impartially available to each proposing design team to offer independent and non-partisan recommendations relative to each respective design-build team’s development of their own outline building enclosure commissioning plan. As the design is developed the CxA shall monitor to ensure that the project design documents are generally consistent with the building enclosure commissioning recommendations as to quality, constructability, operability and campus-identified objectives. In the case of a design-build delivery, the CxA shall confirm that the selected design-build team is developing the design and building enclosure commissions consistent with the RFP award.

2.2.8 Review Design Team’s Basis of Design (BOD) report. Ensure that it adequately describes the building systems being commissioned and design assumptions made.

2.3 **Base Scope - Cx Construction Phase 3**

2.3.1 Coordinate as required to ensure that commissioning activities occur in a logical and efficient manner using consistent protocols and forms. Coordinate as required to ensure that clear, effective and regular communications with all parties on commissioning related items occurs.

2.3.2 Monitor to ensure that commissioning activities are appropriately incorporated into the contractor’s project construction schedule.
2.3.3 Monitor construction meeting minutes. Participate periodically in construction meetings as needed to ensure that commissioning activities are adequately and effectively represented. At appropriate points during the construction process the CxA shall call for and conduct a commissioning-centric meeting. The CxA shall draft and issue minutes for these meetings.

2.3.4 Seek to be notified on and participate in the resolution of RFI’s, Substitution Requests and proposed Change Orders where they impact commissioning objectives. Where the University approves changes to the Contract that materially impact commissioning objectives work with the project team to ensure that the commissioning requirements accommodate the planned Change Order work.

2.3.5 Participate as an owner’s advocate in reviews related to commissioning, i.e., building envelope, HVAC and lighting submittals, testing and balancing submittals and systems Operations and Maintenance materials.

2.3.8 Monitor construction progress and conduct periodic site observations sufficient to confirm commissioning activities are being appropriately completed consistent with the progress of the completion of the work.

2.3.6 Review HVAC piping pressure testing and flushing documentation, sufficient to assess that proper procedures were followed and satisfactory results obtained.

2.3.7 Review HVAC ductwork testing and cleaning documentation sufficient to assess that proper procedures were followed and satisfactory results were obtained.

2.3.9 Review systems startup reports to ensure satisfactory results were achieved. Conduct related site observations as may be warranted.

2.3.10 Review air and water balancing reports. Conduct related site observations as may be warranted. Provide written assessment to the University recommending acceptance (or not) of the test and balance report.

2.3.11 Monitor building envelope construction to ensure building enclosure commissioning related tasks are completed consistent with the approved Construction Documents and the building enclosure commissioning testing plan.

2.3.12 Analyze functional performance trend logs and monitoring data to verify planned system(s) performance is realized. Provide written assessment recommending acceptance (or not) to the University.

2.3.13 Witness and document functional performance tests by the installing sub-contractors.

Functional testing is expected to include operation of the mechanical systems and components through all specified sequences of operation. I.e., startup, shutdown, unoccupied mode, manual mode, staging, miscellaneous alarms, power failure, security alarm, etc.

Confirm correct functioning of interlocks with other systems or equipment.

Confirm that sensors and actuators are appropriately calibrated by the installing contractors.

Witness re-testing as necessary until satisfactory performance is achieved.

Provide written assessment recommending acceptance (or not) to the University.
2.3.14 Confirm calibration and certification of utility meters (gas, water, electric). For electric meters ensure that tests are against a known standard or load to ensure correct values. Provide written assessment recommending acceptance (or not) to the University.

2.3.15 Confirm integrity of utility meters data connection to building Energy Management Systems. Verify reliable communication, consistency, and accuracy of values being recorded by EMS. If a central utility metering system connection is provided, verify same for that data connection. Provide written assessment recommending acceptance (or not) to the University.

2.3.16 Witness tests on HVAC equipment to verify heating and cooling operation. The override of certain control values to simulate seasonal conditions may be necessary. Verify functional testing using conventional manual methods, control system trend logs, and/or stand-alone data loggers, as necessary to confirm proper and reliable system function. Provide written assessment recommending acceptance (or not) to the University.

2.3.17 Review/audit for adequacy systems training provided by the contractor. Review records that training of campus personnel was completed and that a licensed copy of the control system’s operational software is provided. Review to ensure that scope and content of training complies with requirements of the California Energy Code. Provide written assessment recommending acceptance (or not) to the University.

2.3.18 Review for adequacy the O&M manuals on commissioned equipment and systems provided by the contractor. Provide written assessment recommending acceptance (or not) to the University.

2.3.19 Where and if present, identify non or marginally compliant commissioned elements. If present each non-compliance issue shall be referenced to the specific functional test, inspection, trend log, etc. where the deficiency is documented. Provide written assessments to the University.

2.3.20 Compile a Project Commissioning Reference Manual. This manual shall include:

1. Campus Project Requirements
2. Basis of Design; Performance Metrics, completed during design
3. Space and use descriptions; single-line drawings and schematics for major systems
4. Control drawings, sequences of operation
5. Recommendations for re-commissioning frequency by equipment type
6. Energy tracking recommendations
7. Annotated building trend logs with a brief descriptions of acceptable readings and variances

2.3.21 Compile a Project Commissioning Record. This record shall include:

1. A summary report that includes a list of participants and roles, facility/building description, description of commissioning and testing scope, and a general narrative of testing and verification methods.
2. For each piece of commissioned equipment and system, the report shall contain an assessment by the CxA of the following:

1. Equipment and systems compliance with contract documents
2. Equipment and systems installation
3. Functional performance
4. Provision of systems O &M documentation
5. Operator training

2.3.22 The Commissioning Record shall meet all requirements of the California Energy Code for a ‘Commissioning Report’.

2.3.23 Deliver the Project Commissioning Record and Project Commissioning Reference Manual to campus and CSU Contract Administrator. Set up a meeting and review the document package with staff. Pick up requested edits and/or clarifications.

2.4 Base Scope - Cx Post-Occupancy Phase 4

2.4.1 The post-occupancy phase of this commissioning work begins with the acceptance of the project by the campus and extends for approximately a one (1) year period to coincide with the contractor’s warranty expiration date for the project. It is critical that all post-occupancy commissioning work under this agreement be identified and completed in advance of this date.

2.4.2 During the post-occupancy period the CxA shall be available to provide an independent knowledgeable opinion on whether an issue should be considered as a warranty or construction contract scope item.

2.4.3 Return to the project site at ten months into the 12-month post-occupancy period. Coordinate with the campus and the contractor to identify and schedule testing dates.

2.4.4 Interview facility staff and identify any problems or concerns relative to operating the facility as originally intended. Document any outstanding issues related to the original commissioning effort. Send copy of this report to the campus project administrator and CSU Contract Administrator.

2.4.5 Develop corrective action plan recommendations based on the post-occupancy testing, staff interviews and observed operational concerns. Compile the final corrective action plan testing documentation and assessment as an amendment to finalize and complete the Project Commissioning Record. Deliver/present to campus and CSU Contract Administrator.

2.4.6 Develop a final Building Energy Performance Report using the standard CSU format on the CSU CPD website based on 12 months of measured utility data. The report shall provide the 12-month measurements of all utilities (electrical, gas, chilled water, heating hot water, steam, etc.). Units shall be converted to kBtu and reported by utility and total Energy Use Intensity (EUI) in kBtu/GSF-Yr. The report shall also recommend additional actions that would allow the campus to reduce energy consumption based on observations during the first year of operation. Deliver/present to campus and CSU Contract Administrator.
3.0 Cx Scope of Services - Very Small Projects (less than 10,000SF and less than $6 Million)

3.1. See Section 13, Scope Summary to identify if this section applies (or not) to this work.

3.2. The following systems and assemblies shall be commissioned:
   1. Building energy management and control (EMS) systems
   2. Heating, ventilating and air conditioning systems
   3. Indoor lighting system and controls
   4. Laboratory, hoods and relative rooms pressurization systems (where present)
   5. Domestic water systems
   6. Landscape irrigation systems (where present)
   7. Water reuse systems (where present)
   8. California Energy Code: if the project is greater than 10,000 SF, all California Energy Code mandated systems not otherwise listed above shall be commissioned, using test procedures that meet or exceed California Energy Code requirements.

3.3. For Very Small Projects, modify the scope by the Very Small Projects Checklist (3.4 next page).

End of page
## 3.4. Very Small Projects Checklist (≥ required)

<table>
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### 4.0 Cx Scope of Services - Small Projects (from $6 Million to $15 Million)

4.1. See Section 13, Scope Summary to identify if this section applies (or not) to this work.

4.2. The following systems and assemblies shall be commissioned:

1. Building envelope
2. Building energy management and control (EMS) systems
3. Heating, ventilating and air conditioning systems
4. Indoor lighting system and controls
5. Laboratory, hoods and relative rooms pressurization systems (where present)
6. Domestic water systems
7. Landscape irrigation systems (where present)
8. Water reuse systems (where present)
9. *California Energy Code:* if the project is greater than 10,000 SF, all *California Energy Code* mandated systems not otherwise listed above shall be commissioned, using test procedures that meet or exceed *California Energy Code* requirements.

4.3. For Small Projects, modify the scope by the Small Projects Checklist (4.4 next page).
## 4.4 Small Projects Checklist (-required)

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5.0  Cx Scope of Services - Medium Projects (From $15 Million to less than $30 Million)

5.1. See Section 12, Scope Summary to identify if this section applies (or not) to this work.

5.2. The following systems and assemblies shall be commissioned:

1. Building envelope
2. Building energy management and control (EMS) systems
3. Heating, ventilating and air conditioning systems
4. Indoor lighting system and controls
5. Laboratory, hoods and relative rooms pressurization systems (where present)
6. Domestic water systems
7. Landscape irrigation systems (where present)
8. Water reuse systems (where present)
9. California Energy Code: if the project is greater than 10,000 SF, all California Energy Code mandated systems not otherwise listed above shall be commissioned, using test procedures that meet or exceed California Energy Code requirements.
10. Scheduled or occupancy sensor lighting controls
11. Daylight diming controls (where present)
12. Emergency power generators and transfer switch (where present)
13. Uninterruptable Power Supply (UPS) systems (where present)

5.3. For Medium Projects, modify the scope by the Medium Projects Checklist (5.4 next page).

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### Medium Projects Checklist

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6. **Cx Scope of Services - Large Projects (>$30MM)**

6.1. The following systems and assemblies shall be commissioned:

1. Building envelope
2. Building energy management and control (EMS) systems
3. Heating, ventilating and air conditioning systems
4. Indoor lighting system and controls
5. Laboratory, hoods and relative rooms pressurization systems (where present)
6. Domestic water systems
7. Landscape irrigation systems (where present)
8. Water reuse systems (where present)
9. [California Energy Code: if the project is greater than 10,000 SF, all *California Energy Code* mandated systems not otherwise listed above shall be commissioned, using test procedures that meet or exceed *California Energy Code* requirements.]
10. Scheduled or occupancy sensor lighting controls
11. Daylight diming controls (where present)
12. Emergency power generators and transfer switch (where present)
13. Uninterruptable Power Supply (UPS) systems (where present)

6.2. For Large Projects, modify the scope by the Large Projects Checklist (6.4 next page).

End of page
### 6.4 Large Projects Checklist (\(\checkmark\) = required)

<table>
<thead>
<tr>
<th>Design Area</th>
<th>Review Description</th>
<th>Schematic Design</th>
<th>Preliminary Design</th>
<th>Const Docs 50%</th>
<th>Const Docs 95%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Owner’s Project Requirements</strong></td>
<td>Document project functional requirements, expectations of building use and operational considerations for systems to be commissioned.</td>
<td></td>
<td>(\checkmark)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Basis of Design</strong></td>
<td>Ensure that Basis of Design is clear, complete and meets stated campus project requirements (above).</td>
<td>(\checkmark)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Commissioning facilitation</strong></td>
<td>Ensure that the design will accommodate effective commissioning (i.e., appropriate system access, test ports, monitoring points, etc.).</td>
<td>(\checkmark)</td>
<td>(\checkmark)</td>
<td></td>
<td>(\checkmark)</td>
</tr>
<tr>
<td><strong>Control system &amp; strategies</strong></td>
<td>Review lighting controls, building energy management controls, and HVAC sequences of operation for effectiveness, efficiency and reliability.</td>
<td>(\checkmark)</td>
<td>(\checkmark)</td>
<td></td>
<td>(\checkmark)</td>
</tr>
<tr>
<td><strong>Operations and maintenance (O&amp;M)</strong></td>
<td>Ensure that proposed design support O&amp;M (i.e., equipment access, system control, consumables, etc.).</td>
<td>(\checkmark)</td>
<td>(\checkmark)</td>
<td></td>
<td>(\checkmark)</td>
</tr>
<tr>
<td><strong>Indoor environmental quality</strong></td>
<td>Ensure that HVAC systems provide end user comfort and a pleasant work environment. Review for thermal, visual, acoustical, distribution and air quality issues.</td>
<td>(\checkmark)</td>
<td></td>
<td>(\checkmark)</td>
<td>(\checkmark)</td>
</tr>
<tr>
<td><strong>O&amp;M documentation</strong></td>
<td>Verify adequacy of system Operations and Maintenance documentation.</td>
<td>(\checkmark)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Training</strong></td>
<td>Verify adequacy of operator training.</td>
<td>(\checkmark)</td>
<td>(\checkmark)</td>
<td>(\checkmark)</td>
<td>(\checkmark)</td>
</tr>
<tr>
<td><strong>Commissioning specifications</strong></td>
<td>Verify that bid documents adequately specify building commissioning and supporting testing requirements.</td>
<td>(\checkmark)</td>
<td>(\checkmark)</td>
<td>(\checkmark)</td>
<td>(\checkmark)</td>
</tr>
<tr>
<td><strong>Campus design guideline or standards</strong></td>
<td>Verify that the design complies with the CSU policies on energy efficiency.</td>
<td>(\checkmark)</td>
<td>(\checkmark)</td>
<td>(\checkmark)</td>
<td>(\checkmark)</td>
</tr>
<tr>
<td><strong>Environmental sustainability</strong></td>
<td>Ensure that building sustainable features are well-integrated, practical and durable.</td>
<td>(\checkmark)</td>
<td>(\checkmark)</td>
<td>(\checkmark)</td>
<td>(\checkmark)</td>
</tr>
<tr>
<td><strong>MEP systems</strong></td>
<td>Review MEP systems design for functionality, efficiency, and durability.</td>
<td>(\checkmark)</td>
<td>(\checkmark)</td>
<td>(\checkmark)</td>
<td>(\checkmark)</td>
</tr>
<tr>
<td><strong>Building envelope</strong></td>
<td>Review building envelope design for functionality, efficiency, and durability.</td>
<td>(\checkmark)</td>
<td>(\checkmark)</td>
<td>(\checkmark)</td>
<td>(\checkmark)</td>
</tr>
<tr>
<td><strong>Life cycle costs</strong></td>
<td>Review that life cycle assessments provide consideration of viable alternatives.</td>
<td>(\checkmark)</td>
<td>(\checkmark)</td>
<td>(\checkmark)</td>
<td>(\checkmark)</td>
</tr>
</tbody>
</table>
7.0 **Service Duration**

The term of the service authorization shall begin at the onset of Schematic Design and conclude at the end of the Post-Occupancy phase.

8.0 **Fee**

8.1 Commissioning fee for this project shall be provided on an hourly rate in accordance with the Billing Rate Table agreed and attached hereto as Exhibit B with a maximum ‘not to exceed’ amount identified. Invoicing for services shall be provided monthly.

8.2 The work effort shall generally align to the percentages ranges below. Advise the trustees at the earliest opportunity if it is anticipated that the required effort will vary materially from these ranges.

<table>
<thead>
<tr>
<th>Percentage of fee</th>
<th>Payment milestone</th>
</tr>
</thead>
<tbody>
<tr>
<td>25%</td>
<td>Completion of Schematic Phase</td>
</tr>
<tr>
<td>25%</td>
<td>Completion of Preliminary Phase</td>
</tr>
<tr>
<td>0%</td>
<td>Bidding</td>
</tr>
<tr>
<td>20%</td>
<td>50% construction completion</td>
</tr>
<tr>
<td>25%</td>
<td>100% construction completion</td>
</tr>
<tr>
<td>5%</td>
<td>1-year Post-Occupancy review and report</td>
</tr>
</tbody>
</table>

9.0 **Deliverables**

Provide electronic copies of report. Deliver via email or FTP, Drop box, etc.
Provide 2 print report copies to campus
Provide 1 electronic report copy to CPDC Office of the Chancellor

10.0 **Reimbursables**

Reasonable non-local travel and outsourced reprographic expenses are reimbursable under this agreement. Claims for reimbursable items shall be without mark-up for directly related project charges incurred. Provide supporting documentation as a part of claim submittal. In general, travel reimbursement will be provided for project-related travel within the following limitations:

10.1 Local travel, less than 30 miles to campus, contractor, or project site is not reimbursable.
10.2 Reasonable travel costs for distances greater than (100) one hundred miles are reimbursable.

1. **Commercial Air Travel:**
   Reasonable airfare costs will be reimbursed when air travel is required. Reimbursement shall be limited to reasonable air fare charges incurred for refundable economy class travel. Generically reasonable example: Southwest Airlines into San Jose with a rental car into Monterey. Generically unreasonable example United Airlines into Monterey and needing to incur similar rental car charges where that cost is disproportionately higher than the San Jose cost.

2. **General Aviation:**
   General aviation travel is reimbursable. *Total* reimbursement (including fuel and tie down) shall be conservatively limited to approximate equivalent fare amounts that would otherwise be incurred via reasonable commercial air travel from a serving regional airport.

3. **Rental Car:**
   Reasonable rental car costs will be reimbursed when air travel is required.

4. **Private Automobile Mileage:**
   Travel by personal automobile beyond a 30 mile radius will be reimbursed at current federal mileage rates.

5. **Lodging:**
   Lodging costs will be reimbursed up to the maximum CSU per diem maximum.

6. **Meals:**
   Meal costs will be reimbursed when overnight travel is required at the CSU per diem maximum.

11.0 **Extra Services**

11.1 This agreement may authorize extras services via issue of an Extra Service Work Authorization describing the supplemental related project work and agreed fee. Such work must be countersigned by the Service Provider to take effect.

11.2 Extra service work MUST be authorized in advance.

12.0 **Invoicing**

12.1 Payment for services will be made upon presentation of a written invoice in arrears of work completed to the satisfaction of the trustees.

12.2 Prepare monthly invoicing using supplied invoicing template. For each invoice provide supporting back-up information identifying staff performing work, hourly rate, previous invoiced amounts, payments received and hours being billed.
13.0 Scope Summary

This work includes

☑ Section 2 - Cx Scope - All Projects

And the following supplemental scope:

☐ Section 3 - Very Small Projects (less than 10,000SF and less than $6 Million)
☐ Section 3 - Small Projects ($6 Million to $15 Million)
☐ Section 3 - Medium Projects (greater than $15 Million to less than $30 Million)
☐ Section 3 - Large Projects (greater than $30 Million)

This combined scope is modified as follows:

☐ No modifications
☐ As listed below:

End of Rider 1