

ARCHITECTURAL/ENGINEERING (A/E) DESIGN REQUIREMENTS, STANDARDS, EXPECTATIONS and FORMAT

1. Design Process Overview

This section summarizes the intent of SUBCONTRACTOR requirements and the design process as specified in CONTRACTOR *OP-0000.009, Revision 1, Engineering Design Process*. That document provides details on internal CONTRACTOR processes for SUBCONTRACTOR's information, including section 4.27 Subcontracted Architectural /Engineering (A/E Services).

- 1.1. SUBCONTRACTOR shall be professionally engaged in the practice of architecture and/or engineering with appropriate registered professionals in Nevada with the experience to provide the services.
- 1.2. SUBCONTRACTOR shall have resources available to perform all areas of architectural and engineering work along with appropriate resources associated with construction support such as commissioning, inspections, estimating, and scheduling.
- 1.3. CONTRACTOR will provide general design criteria, which contains standard base design requirements and adopted versions of codes and standards. SUBCONTRACTOR shall be responsible for reviewing documents and adapting requirements in design deliverables.
- 1.4. CONTRACTOR will provide deliverable list with each task order that will describe the level of information to be provided at each phase i.e., 30%, 60%, 90%.
- 1.5. CONTRACTOR retains the right to continue to provide input and finalize the concepts up through the 60% Design Stage, or 90% if no 60% review is specified. This applies when the nature of the input falls within the intent of the "Project Description and Criteria", is minor in nature, does not increase, change, or modify the direction of major portions of the work, and is authorized by the Subcontract Administrator (SA). These inputs will be at no additional cost to the CONTRACTOR. Any changes after the 60% review shall require SUBCONTRACTOR to submit a written estimate for additional fees and obtain approval from the SA prior to making the changes.
- 1.6. SUBCONTRACTOR is responsible for addressing/resolving all design comments after each design phase submittal. The outcome of all comments must be resolved and incorporated into the design before the next design review submittal after resolution is accepted by the CONTRACTOR. Any design comments that the SUBCONTRACTOR proposes not to incorporate must be coordinated and agreed to by the person who made the comment and the STR.
- 1.7. SUBCONTRACTOR will provide documentation of the as-built condition or adequacy of existing mechanical, electrical, environmental control, monitoring equipment, or other affected systems and components as directed by the subcontract. The SUBCONTRACTOR shall notify the STR in writing of deficiencies identified during the process of design and/or while investigating the existing conditions.
- 1.8. SUBCONTRACTOR shall be responsible for verification of all dimensions, measurements, regulatory criteria, and equipment. This may be accomplished by using as-built drawings, on-site investigations, and coordination with applicable manufacturers for design information or guidance, as necessary to assure accuracy and compliance.
- 1.9. Technical requirements and specifications will be provided to the extent appropriate, within individual task orders.
- 1.10. Final Issued for Construction drawings, calculations, etc. shall be stamped and signed by a registered Professional Engineer (PE). Documents that require subsequent submittal to the State of Nevada shall be stamped and signed by a PE licensed in the State of Nevada. These include designs for water and sewage systems plus others specified in task orders.

2. Drawings:

- 2.1. Drawings shall be complete so the work can be constructed. Drawings shall be detailed to the

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- extent that an accurate detailed construction estimate can be prepared and shop drawings can be checked.
- 2.2. Drawings shall be CAD generated using AutoCAD or Autodesk Revit. Drawings issued for reviews and the final set issued for construction shall be plotted on Arch "D" size. Drawings shall be dimensioned In English Standard and/or Metric (SI) units, as specified in the specifications. Unless a cover sheet is used, the location plan(s), drawing index, legend, reviewing agency signature blocks, and general notes, codes of record, as applicable, shall be located on the first drawing sheet. All sections shall be of adequate size, detail, and clarity to enable proper and satisfactory completion of the project. The SUBCONTRACTOR shall submit a sample of its standard Title Block for review and approval prior to the generation of any drawings.
 - 2.3. Drawing shall be generated and layers shall be used in a manner that is consistent with US National CAD Standard V6. Drawings shall include a Bill of Materials and SUBCONTRACTOR shall provide a Material Assignment Schedule when requested in a task order.
 - 2.4. Drawing scales to be used for all drawings shall meet ANSI standards and be of sufficient scale to clearly identify and illustrate all required work. Provide a graphic scale on all scaled drawings. North arrows shall also be provided on drawings where relevant.
 - 2.5. Drawings shall be prepared to allow for half size reduction, "B" size drawing, while remaining clear and legible when reduced. New work shall be clearly distinguished from existing features. Half size drawings shall be submitted to the STR at each scheduled milestone for review. The SUBCONTRACTOR shall resolve review comments, and additions incorporated prior to final approval and signature. Final drawings shall be stamped and signed by the appropriate registered professionals.
 - 2.6. CAD data delivered to CONTRACTOR shall identify SUBCONTRACTOR as the preparer but the CAD data need not include the professional stamp or signature of an engineer or architect.
 - 2.7. SUBCONTRACTOR shall provide CONTRACTOR with native CAD files (.dwg, .dgn, etc.) along with final appropriate registered professional stamped and signed drawings. Where deliverables utilize 3D point clouds or models, the native files shall be provided to the CONTRACTOR.
 - 2.8. CONTRACTOR shall provide available, existing drawings that are necessary for the execution of a task order. However, SUBCONTRACTOR shall verify all dimensions and other information provided on these drawings.
3. Specifications:
- 3.1. SUBCONTRACTOR shall be responsible for the accurate preparation of the technical specifications as required by the SUBCONTRACT and as defined in task orders. Specifications shall be prepared in CSI format. The specifications shall be clear, concise, and complete and shall not be subject to interpretation. Specifications shall be well coordinated with the drawings and include detailed requirements for materials and equipment. Descriptions shall permit full and free competition among potential suppliers of components, materials, and equipment. Specifications shall be prepared in accordance with the instructions and standards specified by the task order, as amended by design reviews and as identified herein.
 - 3.2. Outline Specifications shall be submitted as part of the 30% design review submittal and will list those specification sections that have been selected for use and provide a description of any specifications which must be developed for the task order.
 - 3.3. Specifications shall be written in Microsoft Word and prepared in the quantity specified in the task order with at least one of the final sets unbound and suitable for reproduction by offset printing. A copy of the final specifications shall be submitted to the STR in PDF and native Word format.
 - 3.4. Division 0 and Division 1 shall be outlined by the SUBCONTRACTOR and provided to the CONTRACTOR for input for site-specific information. When these sections are necessary the

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SUBCONTRACTOR shall allow for schedule time in the proposals for CONTRACTOR.

4. Estimates:

- 4.1. SUBCONTRACTOR, when directed by the task order, shall prepare a construction cost estimate consistent with the best estimating practice of the construction industry. The estimate shall be current, accurate, complete, and prepared by personnel competent in construction cost estimating. Estimates shall reflect the expected cost to the Government to perform the work by contract and include all reasonable costs which a prudent, experienced, and well-equipped Contractor might include in its proposal.
- 4.2. Cost estimates shall be submitted in accordance with the task order schedule and be detailed to correspond to the level of design.
- 4.3. Estimates for construction projects shall be submitted on a spreadsheet, entitled "Construction Cost Estimate Breakdown". Divisions arranged in the same manner, as the specifications shall separate the cost estimate. Total project cost shall be the sum of each division's cost estimate and included as the first page of the cost estimate.
- 4.4. Cost estimates shall be based on material prices (prevailing in the project locality), labor (using the most current hourly Davis-Bacon wage rates), other direct costs (e.g., equipment, transportation, etc.), and shall include overhead, general and administrative expenses, profit, insurance, permits, taxes, labor burden, and bonds. The cost estimate shall be all inclusive with sufficient detail to include all distinct operations of work required, including material quantities, installed or provided equipment, hourly work estimates, and unit costs.
- 4.5. Cost estimate must separately identify the work items and totals for each additive, or deductive, as included in the project scope.
- 4.6. Included with the construction cost estimate shall be the SUBCONTRACTOR's estimated schedule for completion of construction based on experience with similar projects. The schedule shall identify procurement of long lead items, mobilization and demobilization, and start/end and duration of each trade involved in the construction. The schedule shall include identification of inspection hold points and material and shop drawing submittals. The Construction Schedule shall be prepared in Primavera format.
- 4.7. Any construction cost estimate prepared by SUBCONTRACTOR shall represent their judgment as a design professional and is supplied for the general guidance of the CONTRACTOR.

5. Design Analysis (evaluations, computations, calculations, etc.):

- 5.1. SUBCONTRACTOR shall submit design analyses as specified in the task order or as necessary to support design. The design analysis is a written explanation of project design usually containing the design criteria, justification for the major selections, applicable codes, standards and regulations, assumptions, and supporting calculations. Design Analyses shall be reviewed and verified by a qualified design professional, other than the preparer, provided by the A/E, who is capable of performing the analysis and documented on the Design Analysis cover sheet.
- 5.2. Final design analyses shall be prepared and PE wet stamped by the appropriate licensed design professionals who performed or directly supervised the work and are professionally licensed to perform such work. (Note Nevada licensing as specified elsewhere). Standard eight and one-half inch by eleven-inch (8-1/2" X 11") computation forms shall be used. Calculations need not be typed but must be clear and fully legible and shall incorporate all engineering calculations necessary to demonstrate the adequacy and safety of the proposed design. The design shall be based on the criteria set forth in the task order and other standard practices or methods used in modern engineering design. Engineering properties used and sources shall be listed. Computer generated calculations may be used provided the source program is stated and a professional engineer verifies its accuracy and appropriate use, unless more restrictive criteria are stated in the task order. The resulting design shall incorporate all engineering computations necessary for the complete project as proposed and shall include sketches, formulas, data sources and other information necessary to clearly express the designer's intentions and methods. All

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equations, loadings, and assumptions shall be shown with reference to their source and applicability/justification for use. The analysis shall be in a logical order and easy to follow and understand by other engineers experienced in the subject matter.

- 5.3. SUBCONTRACTOR may be required to participate and/or conduct Value Engineering and/or Sustainable Design studies as required by DOE Order 413.3, Program and Management for the Acquisition of Capital Assets, if specified in the task order.

6. Design Criteria:

- 6.1. SUBCONTRACTOR shall prepare all design documents in conformance with the applicable local and national codes and standards. A comprehensive set of applicable standards will be listed in the Design Criteria Package to the extent required under the task order scope.
- 6.2. Code Analysis shall be provided with design packages to ensure requirements are met if specified in the task order.

7. 3D Models/Point Clouds:

- 7.1. SUBCONTRACTOR when directed by the task order shall prepare 3D models either as part of their design or stand alone. 3D models will be produced with an Autodesk Revit equivalent software package.
- 7.2. CONTRACTOR shall provide point clouds or existing 3D models for SUBCONTRACTOR to utilize to either create or modify per the task order.
- 7.3. SUBCONTRACTOR shall develop 3D models with system/component layers as well as loading information that can be utilized for Building Information Models (BIM) per the scope of work.
- 7.4. SUBCONTRACTOR shall utilize 3D models in the production of design drawings when 3D models are requested to be developed in the scope of work.
- 7.5. SUBCONTRACTOR shall provide CONTRACTOR the native files for 3D models and point clouds generated as part of the scope of work.

8. Design Delivery Phases

- 8.1. SUBCONTRACTOR shall complete the design and deliver the submittals to the STR, in accordance with the following design phases (the applicability and performance period for each phase, in calendar days, will be indicated by the task order).
- 8.2. Preliminary Design Submittal (Title I) - 30% complete- SUBCONTRACTOR shall include the following but not be limited to:
- A. Final Floor Plans (@ 1/4" = 1'-0"/SI equivalent)
 - B. Plans to illustrate preliminary mechanical systems.
 - C. Plans to illustrate the preliminary structural system.
 - D. Plans to illustrate the preliminary architectural layout.
 - E. Plans to illustrate preliminary electrical systems.
 - F. Plans to illustrate preliminary fire protection and detection systems.
 - G. Plans to illustrate preliminary telephone and data communication systems.
 - H. Preliminary Paving/Grading/Drainage Plan
 - I. Plans to illustrate preliminary landscaping and Irrigation layout.
 - J. Preliminary Design Calculations, as applicable to support design requirements
 - K. One set of all documents and drawings as PDFs (and in hard copy if specified in the TO) shall be provided to the STR.

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- 8.3. CONTRACTOR shall review and comment on 30% submittal package with the option to conduct a comment review conference.
- 8.4. Intermediate Design Submittal (Title II) - 60% complete (if required in TO) - SUBCONTRACTOR shall include the following but not limited to:
- A. Incorporate all comments approved at the 30% review
 - B. Preliminary structural, electrical, and mechanical calculations
 - C. Proposed equipment selections
 - D. Preliminary construction cost estimate (identify long lead items)
 - E. All drawings to be in the final submittal shall be submitted for review
 - F. One set of all documents and drawings as PDFs (and in hard copy if specified in the TO) shall be provided to the STR
- 8.5. CONTRACTOR shall review and comment on 60% submittal package with the option to conduct a comment review conference.
- 8.6. Final Design Submittal (Title II) - 90% complete- SUBCONTRACTOR shall include the following but not limited to:
- A. Incorporate all comments approved at 60% or previous review
 - B. Complete drawings ready for proposal and construction
 - C. Complete specifications ready for proposal and construction
 - D. Final design analyses/calculations for entire project
 - E. Detailed construction cost estimate (identify long lead items)
 - F. One set of all documents and drawings as PDFs (and in hard copy if specified in the TO) to be provided to the STR
- 8.7. CONTRACTOR shall review and comment on 90% submittal package with the option to conduct a comment review conference.
- 8.8. Final Submittal for Construction (Title II) -100% complete- SUBCONTRACTOR shall include the following but not limited to:
- Note: All files shall be scanned and made free of any viruses prior to submittal.

Document Type	Printed/Stamped	Native File	PDF
Drawings	PDF Submittal with PE stamp/seal i.a.w. Nevada requirements, plus 2 size D sets signed/sealed if required by TO	Yes, with models/references	Yes
Specifications	PDF submittal with PE stamp/seal i.a.w. Nevada requirements, plus 2 signed/sealed printed version sets if required by TO	Yes MS Word/Excel	Yes
Spreadsheets	PDF Submittal	Yes MS Excel	Yes
3D Models/Scans	N/A	Yes, for Bentley Suite of Applications	N/A

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Calculations	PDF submittal with PE stamp/seal i.a.w.. Nevada requirements, plus 2 signed/sealed printed version sets if required by TO	Yes, with software specific native/source files i.e. HASS, Trane Trace, SKM, Mathcad...	Yes
Proposal Schedule	PDF Submittal	Yes	Yes
Construction Cost Estimate/Schedule	PDF Submittal	Yes	Yes
Review Comments	PDF Submittal	Yes	Yes
Other Documents	PDF Submittal	Yes	Yes
Material Submittal Schedule	PDF Submittal	Yes	Yes

8.9. Following completion of each design phase, CONTRACTOR will perform a review of the submittals. CONTRACTOR shall review and approve with or without comments, each schedule item prior to the SUBCONTRACTOR initiating work on the subsequent phase. A design review conference at the STR option will be held after completion of this review and technical comments will be given to the SUBCONTRACTOR. The SUBCONTRACTOR shall be required to attend these conferences (normally a remote teleconference unless specified differently in the task order), take meeting minutes, and provide a copy of the comments with proposed resolutions within five (5) workdays of the meeting to the STR. Design conferences shall include but are not limited to working sessions and presentations for each phase submittal. The technical comments shall be incorporated into the design before completion of the next design phase. SUBCONTRACTOR may be required to make a presentation at each phase submittal at the discretion of the STR. The time and place (including remote connectivity if used) of these conferences and presentations will be established by the STR.

Upon each phase of submittal, the CONTRACTOR shall status the submittal with the following designations:

Status Code	Notation
1	Work may proceed
2	Revise and resubmit – work may proceed subject to resolution
3	Revise and resubmit – work may not proceed
4	Review not required – work may proceed

Although work may proceed on receipt of a design submittal with a Code 2 notation, SUBCONTRACTOR must resolve the comments indicated, resubmit, and obtain a Code 1 notation before acceptance of the completed work. Receipt of a Code 1 or 2 does not relieve the SUBCONTRACTOR of any responsibility if technical errors are found in the deliverable.

Additional reviews and/or submittals may be required for selected tasks to conform with CONTRACTOR obligations, such as compliance with DOE Order 413.3 review and submittal criteria. When these or other review schedules are required, they will be addressed in sufficient detail in the SUBCONTRACT to support resource, pricing and scheduling considerations. These reviews will be specified in the task orders.