SEATTLE DISTRICT
ADVANCED MODELING REQUIREMENTS

FOR:

BUILDING INFORMATION MODELING (BIM)

CIVIL INFORMATION MODELING (CIM)

GEOGRAPHIC INFORMATION SYSTEMS (GIS)

COMPUTER-AIDED DESIGN (CAD)

PORTABLE DOCUMENT FORMAT (PDF)

MARCH 4, 2020

1. GENERAL ADVANCED MODELING REQUIREMENTS

1.1 GENERAL

1.1.1 Advanced Modeling Requirements pertain to all submittals which contain geometric electronic data with associated non-geometric data including but not limited to Building Information Modeling (BIM), Civil Information Modeling (CIM), Geographic Information Systems (GIS), Computer Aided Design (CAD), and Portable Document Format (PDF).

1.1.2 Requirements. This project shall adhere within applicability requirements to ECB 2018-7 "Advanced Modeling Requirements on USACE Projects", ECB 2018-6 "Operations & Maintenance (O&M) Facility Data Requirements", ECB 2017-22, "Electronic Red-lines, As-builts, and Record Drawings", UFGS 01 33 16.00 10 "DESIGN DATA (DESIGN AFTER AWARD)", and UFGS 01 78 24.00 10 "Facility Data Requirements."

1.2 SUBMITTALS

1.2.1 Directory Structure. The submittal directory structure to be used for all Advanced Modeling Submittals is:

- Root Folder: [YYYYMMDD] [Submittal Transmittal Number]
    - 00 Submittal Summary
    - 01 Project Execution Plan and M3
    - 02 DWG File List
    - 03 Static Model
        - 01 DWF
        - 02 Navisworks
    - 04 Drawing PDFs
    - 05 BIM-CIM
    - 06 CAD
    - 07 GIS
    - 08 QC Reports
        - 01 Standards Checks
        - 02 Model Integrity Checks
        - 03 Visual Checks
        - 04 Interference Management Checks
    - 09 IFC
    - 10 COBie
    - 11 Other Contractor Electives

1.2.2 00 Submittal Summary. Contractor shall provide a summary list of changes included from prior submittals in addition to a summary of how prior RMS or Dr. Checks comments were addressed.

1.2.3 02 DWG File List. List of all CAD sheets including a list of the Sheet Titles, Sheet Numbers and filenames. Identify which sheets have NOT been produced from the Model(s) and Data. Identify sheets containing schedules which were not derived from the model, such as from imported spreadsheets, CAD linework, or drafted elements in the model.

1.2.4 03-01 DWF. Provide one DWF file with the entire model (all Revit and Civil3D content, all disciplines) and a separate DWF with all sheets. If model and sheet content can be combined and are less than 20MB in size, combining both into one DWF is preferred.

1.2.5 04 Drawing PDFs. PDF files of the CAD Sheets reflecting submitted CAD/BIM/CIM content. Provide one PDF file per Discipline and an additional PDF file combining all disciplines, following the AEC CAD Standard discipline and drawing order.

1.2.6   05 BIM-CIM. To include Revit and Civil3D native authoring files. Two eTransmit transmittals shall be utilized, one for Revit and the other for Civil3D. Associated transmittal reports shall be included in folder 08-02, and illustrate no missing files. For Civil3D, AEC CAD Standard discipline directory structure will be retained and retain external references (do not bind).

1.2.7   06 CAD. To include exported DWG sheets from Revit, and Civil3D DWG sheets without proxy objects. For clarification files in folder "06 CAD" are for users which have not yet converted fully to a BIM/CIM workflow and need to be standalone, fully editable AutoCAD files with no proxy elements. Contractor shall utilize eTransmit and associated transmittal report shall be included in folder 08-02, and illustrate no missing files. AEC CAD Standard discipline directory structure will be retained and retain external references (do not bind).

1.2.8   08-01 Standards Checks. To include Revit Model Checker Report, AutoCAD Reference Manager Report, and AutoCAD Batch Standards Checker Report for all delivered files.

1.2.9   08-02 Model Integrity Checks. To include Revit Warnings Report, report confirming No Unassigned Systems (for MEP, Fire Protection, Telecom), and list of schedules NOT derived from the Model(s).

2. PDF REQUIREMENTS

2.1   GENERAL

2.1.1   Restrictions. All PDF documents must not have any protections, restrictions, or usage limitations applied.

2.1.2   Standards. Adhere to the Construction PDF Coalition Standards (cpcoalition.com) with the following modifications.

2.1.2.1   Reference Annotation Symbology Hyperlinks. Hyperlink all reference annotation symbology (e.g. section cut symbology, detail callout symbology, elevation callout symbology, etc.) to the sheet referenced by the annotation.

2.1.2.2   Bookmarks. Include one Parent Bookmark per Discipline and one Child Bookmark per sheet within each discipline. Format Parent Bookmarks as [DISCIPLINE] (i.e. Architectural). Format Child Bookmarks as [SHEET ID] [SHEET TITLE] (i.e. A-101 First Floor Plan).

3. BIM/CIM REQUIREMENTS

3.1   GENERAL

3.1.1   Versions. Autodesk Revit 2018, Civil3D 2018, and Navisworks 2018 are preferred.

3.1.2   PxP and M3. Provide electronic copies of the Project Execution Plan in PDF format and associated M3 submittals in both native Excel format and PDF format.

3.1.3   Navisworks. In reference to 01 33 16.00 10, 2.2.3.1., the preferred interactive review format is Autodesk Navisworks.

3.1.4   Structural Interior Design (SID)/Furniture, Fixtures & Equipment (FF&E). Contractor shall utilize 01 33 16.00 10 requirements for SID and FF&E products.

3.1.5   Revit Model Composition. Revit models shall be organized by the following requirements.

3.1.5.1   The highest level container is the Site Model (SITE) which contains all of the Building Models linked and oriented in the correct location in world coordinates by the Civil/Survey disciplines.

3.1.5.2   Building Models (BLDG) contain all of the Discipline Models linked utilizing Origin to Origin.

3.1.5.3   Separate Discipline Models are required for separate buildings.

3.1.5.4   Discipline Models will link all other Discipline Models Origin to Origin.

3.1.6   Revit File Naming Standard
[PN]_[BLDGCODE]_[MODEL TYPE]_[DISC]_[CENTRAL].rvt
PN: USACE Project Number prefixed with "PN"
BLDGCODE: Building Acronym
MODEL TYPE: Required if Site Model (SITE) or Building Model (BLDG).
DISC: Discipline as one of Architecture, Electrical, Fire Protection, Interiors, MEP, Mechanical, Plumbing, Structural, or Telecom. Other AEC CAD Standard defined Disciplines are acceptable. Following discipline Acronyms are also acceptable: ARCH, ARCH-STR, ELEC, FP, INT, MECH, MEP, PLMB, STR, TEL.

Examples:
1. PN12345_COF_SITE.rvt
2. PN12345_COF_BLDG.rvt
3. PN12345_COF_Architecture_CENTRAL.rvt
4. PN12345_COF_ARCH_CENTRAL.rvt

3.1.7   Red Zone Meeting Submittal. In addition to submittal requirements established in Section 01 78 02.0010, Paragraph 1.10 "RED ZONE MEETING," Contractor shall also submit BIM/CIM As-Builts for review.

4. CAD REQUIREMENTS

4.1   GENERAL

4.1.1   Version. AutoCAD 2018 is preferred unless otherwise specified.

4.1.2   Accuracy. Geometry shall be dimensionally correct and Civil, Geotechnical, Landscape, and MEP site content shall be located in the proper geospatial coordinates.

4.1.3   Resources. Contractor shall include all files, both graphic and non-graphic, required for the project, including but not limited to color tables, pen tables, font libraries, raster files, blocks, macros, and plotter configuration files.

4.1.4   Record File Number. Contractor shall obtain a Record File Number from the Seattle District Project Manager in conjunction with Seattle District Engineering Records.

4.1.5   Extraneous Content. By the initial As-Built submittal, Contractor shall remove all graphics outside the design and border areas and remove all other information (geometry and layers) not relevant to the project. All unused resources such as Blocks, Dimstyles, Layers, Linetypes, Shapes and Styles shall be purged and compressed from all files.

4.1.6   Drawing Composition. Contractor shall utilize Layout and Model Views. All drawings shall be drawn full size (1 to 1) in Model View. Title sheet and border sheets shall be drawn in Layout View. AutoCAD View Ports shall be used to frame applicable Model Views. The AutoCAD drawing Layout View and printed hard copies shall be identical.

4.2   REFERENCING (XREF)

4.2.1   Unused References. All references shall be displayed and "work in progress" reference files removed.

4.2.2   Pathing. All reference files shall use "Relative Paths", and "Full Path" or "No Path" options are not permitted.

4.2.3   Self Contained Referencing. All files must be within the project directory and all references limited to files within the project directory. References may not reference external files.

4.2.4   Sheet and Model Standards. Sheet files may not reference other sheets, and the contents of Sheets and Models should adhere to the AEC CAD Standard.

4.2.5   Retain References. Upon delivery references should remain intact, ie. Model content should not be merged or bound to the Sheets.

4.3   SYMBOLOGY

4.3.1   ByLayer. All geometry symbology must be assigned "ByLayer."

4.3.2   Line Weight. All geometry shall utilize line weight symbology settings defined by the layer (see ByLayer above) instead of utilizing line weights by color.

4.3.3   Half-Toning. All geometry half-toning must utilize colors defined in the AEC CAD Standard for this purpose.

4.4   AS-BUILT SUBMITTAL REQUIREMENTS

4.4.1   Cover Sheet and Revision Block. Wording "RECORD DRAWINGS / AS-BUILT CONDITIONS" shall be annotated with the project's as-built Date on the Cover Sheet drawing. When final revisions have been completed, show the wording "RECORD DRAWINGS / AS-BUILT CONDITIONS" followed by the name of the Contractor in letters at least 3/16 inch high on the cover sheet drawing. Label all other drawings either "Record" drawing denoting no revisions on the sheet or "Revised Record" denoting one or more revisions. Retain the original titleblock drawing date and add date of drawing revisions in the revision block.

4.4.2   Scanned Submittal Items. Contractor shall submit electronic versions of As-Built Field Data (Redlines) and Shop Drawings for review by the customer and USACE at Beneficial Occupancy. If native electronic files are not available, Contractor shall provide full sized color scanned versions in PDF format.

5.   GIS REQUIREMENTS

5.1   GIS DOCUMENTATION

5.1.1   See Section 01 78 02.00 10, Paragraph 1.2.9.2 'GIS Documentation.' Add submittal register item 'SD-02 As-Built GIS – G'.

5.1.2   GIS Database Deliverable. The electronic deliverables for GIS shall be in Environmental Systems Research Institute's (ESRI) ArcGIS Personal Geodatabase, version 10.3.

5.1.3   Standard GIS Database Template. USACE PM will coordinate with customer in providing the most current Standard GIS Database Template to the Contractor. Documentation of required attributes and schema definitions will be provided along with the Standard GIS Database Template as available.

5.1.4   Protection of GIS Data. GIS source data and product data remain the property of the US Government. The contractor may be required to explain and demonstrate the company's process

for protecting all geospatial data, including but not limited to geometry, attributes, metadata, topologies, and relational database schemas and operations used in association with this contract. The contractor may be required to sign a non-disclosure agreement attesting to the same before source data are released. Further information about security and nondisclosure requirements should be obtained from the customer. Some installation map data, source and/or product, may be considered by the government to be "Controlled Unclassified Information" (CUI) also known as "Sensitive but Unclassified" (SBU). The intent of this clause is to prevent intentional or unintentional dissemination of CUI/SBU information to include unauthorized access to the source and product data by any entity wishing to do harm to the United States Government while the data resides on the contractor's computer network. The contractor is not authorized to release this information to any third party without the explicit consent by the customer. All source information must be returned to the government POC or destroyed upon completion of this contract. Special requirements for handling classified map data, if applicable, will be addressed.

5.1.5   Geo-referenced Data of Subsurface Existing Utilities. Contractor shall collect GIS geo-referenced data pertaining to location and attribute data of subsurface utilities obtained at the time of project site excavation. All data collection for underground utilities shall include the collection of elevation (Z) values.

5.1.6   As-Built GIS. In addition to submittal requirements established in Section 01 78 02.0010, Paragraph 1.10 "RED ZONE MEETING," Contractor shall also submit GIS As-Builts for review. Provide final geo-referenced GIS database of the new building footprint, and site surface and subsurface features that exist 5' outside the building footprint(s) out to the project extents.

5.2   COORDINATE SYSTEM AND DATUM

5.2.1   Joint Base Lewis McChord (JBLM) GIS Coordinate System and Datum. See ECB No. 2012-22, Paragraph 8.

> **Coordinate System:** UTM Coordinate System
> **Zone:** 10 North
> **Units:** Meters
> **Horizontal Datum:** WGS1984
> **Vertical Datum:** North American Vertical Datum 1988 (NAVD 88)

5.2.2   Umatilla GIS Coordinate System and Datum. See ECB No. 2012-22, Paragraph 8.

> **Coordinate System:** State Plane Coordinate System
> **Zone:** Oregon North
> **Units:** International Feet
> **Horizontal Datum:** NAD1983 (1986)
> **Vertical Datum:** North American Vertical Datum 1988 (NAVD 88)

5.2.3   Other. For coordinate system and datum information not included herein, coordinate with USACE Project Manager and NWS Geospatial Section.