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Office of Planning, Design and Construction
Programming Group***

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**BUILDING INFORMATION MODELING (BIM)
LIST OF SERVICES**

Software:

- A) The project shall be designed and implemented using Building Information Modeling software (BIM) and subsidiary models as may be necessary for design, fabrication and construction. All subsidiary models must be interoperable and support robust exchange with the BIM software. (Integrated Project Delivery Agreement - © Hanson Bridgett)

Modeling Goals:

- A) Throughout the design and construction phases, BIM will be utilized to develop a parametrically coordinated project.
 - 1. Throughout the pre-construction phases, the Architect's project design software will be utilized to develop and model the design of the project, to tag material components, systems and/or assemblies, and for 2-D and 3-D presentations. During construction, the Architect will develop, model and incorporate relevant approved change order sketches (SK's). Prior to achieving Final Completion of construction the Architect will incorporate all recorded (as-built) conditions into the model. (NOTE: Approved shop drawings and submittals will not be included into the model).
 - 2. During the pre-construction phases, the Construction Manager (CM) will use the Architect's model to generate quantity takeoffs for estimating purposes, and develop periodic clash reports. During construction, the CM will provide virtual scheduling with updates, and utilize the upgraded models during coordination meetings to inform tradesmen of affected phases of construction.

General Requirements:

- A) A description of how the modeling goals will be met (i.e., an implementation plan) is required by the Architect and, subsequently, by the Construction Manager (CM). The Architect's implementation plan shall identify how the Architect and the engineering disciplines (i.e., the design team) will incorporate their information into the model. The BIM model will be developed, managed and coordinated by the Architect. The Architect's implementation plan will identify their proposed in-house or outsourcing plan, and all software programs that will be used to satisfy the design modeling goals.

- B) All model deliverables shall be saved and delivered in their native format (i.e., .rvt for Revit, .pln for ArchiCAD, etc.) and in IFC format, .dwg and .dwt format, .nwd, .nwf, .nwc as required and placed on the required FTP site for the entire project team to review.
- C) The project team will have access to the current model on the FTP site throughout the design, pre-construction and construction phases. "Project team" is defined as: Architect, Engineering Consultants to the Architect, relevant third parties, DCAM and CM.
- D) A team approach is required for the BIM process. The model will be used simultaneously with different parties for different tasks. For example, as part the integration and virtual coordination scope of work, the Architect will make design files available to the CM who will integrate all 3D content into the NavisWorks JetStream v5 (or approved equal) application to satisfy the CM modeling goals. The Architect and CM will work collaboratively to resolve all detected clashes and develop an end product model that represents a fully workable, constructible project; with phasing projected and linked to the virtual schedule. If early packages are bid, it is understood that the model may not be fully developed for those work elements (i.e., substructure, superstructure and under- slab utilities); however, the end product model that will be used for final bids must be complete and approved by the DCAM Project Manager prior to receiving final bids.
 - 1. Physical conflicts exceeding the specified tolerance of 0.5 inch (to be adjusted in consultation with the project design team and DCAM) will be documented and provided to the Architect for review.
 - 2. All adjustments to resolve conflicts, as determined by the design team, will be incorporated in the 3D model before a new integration and clash detection iteration is performed.
 - 3. Attendance at specific coordination meetings with the design team, the CM and DCAM, is required.
 - 4. The Architect and the CM will be responsible to update the DCAM Project Manager on the status of the model coordination, virtual scheduling and quantity takeoffs in a bi-monthly BIM report submitted to DCAM.

Communication and Management:

- A) The Architect and the CM shall each appoint a "model administrator" (MA). The MAs will be responsible for receiving modeling information from their related team and to ensure the model information is being communicated, updated and incorporated into a master building information model. Each party is responsible for maintaining any individual design or analysis models and providing their modeling information, at appropriate intervals. (Integrated Project Delivery Agreement - © Hanson Bridgett)
- B) An FTP site will be provided by the Architect throughout the design and construction phases. The FTP site will be used by the project team. The FTP site will be password protected and is required to be accessible for only one project.

BIM Model Elements:

- A) Site/Civil Elements
 - 1.Existing Conditions Modeling
 - a. Existing site grading surface modeling of the entire property. The surface model shall extend 50' beyond the property line in all directions to provide site context to the information model.
 - b. Existing manhole locations shall be modeled with appropriate depth and

size of existing structures. Pipe inverts and pipe sizes should be modeled and extended 10' minimum in direction of pipe location from the existing manholes.

- c. Elements to include in the basic site plan model are:
 - Surface model contours
 - Architectural massing model of surrounding buildings
 - Driveways
 - Parking areas
 - Walkways
 - Landscaping beds
 - Major underground utilities (primary electrical feed, water mains, sewer connection, etc.)

2. Proposed Site Modeling

- a. Proposed site grading surface model should extend to the property line.
- b. Proposed manholes and piping elevations should be modeled with sloping or horizontal gradients as designed.
- c. All underground piping should be modeled to within 10' of the proposed building footprint.
- d. All proposed vehicular paving and pedestrian walkway paths should be modeled with appropriate slopes and elevations.

B) Architectural Elements

1. The architectural model is to include partition walls, ceilings, chases, door and window openings, exterior envelope, roof, stairs and railings.

- a. Interior partitions at correct thickness and height.
 - Tag material types (masonry, drywall, shaft wall, glass block, etc.)
- b. MEP chases (vertical)
- c. Elevator shafts
- d. Stairwells
- e. Finish floor at correct elevation and thickness
- f. Ceilings at correct elevation and thickness
 - Tag material types (drywall, acoustical, etc.)
- g. Exterior envelope at correct thickness with proposed exterior material facing to the outside
 - Tag material types (masonry, curtain wall, metal panel, rain screen, etc.)
- h. Interior and exterior door sizes and locations
- i. Reflected ceiling plans of all levels with recessed light locations modeled with approximate dimensions and elevations of lighting fixtures, speakers, etc.
- j. Furniture layouts corresponding to the Furnishings and Equipment (F&E) requirements of the client agencies.
 - Furniture and equipment simulations to be similar in dimensions to actual proposed (use manufacturers blocks if available).
- k. All interior storage units, cabinetry, racks, shelving, etc.

C) Structural Elements

- 1. Structural modeling will be developed first to correspond with the early bid package document preparation. It will include, but not be limited to, all substructure elements (i.e., spread footings, piles, foundations, grade beams, etc.), all superstructure elements (i.e., beams, columns, girders, framing and bracing sans connection details, shear elements, etc), structural floor and roof decks, elevator shafts and stairwells.
- 2. Most steel fabricators use 3D modeling to plan their work. If this is done their model should be procured and infused into the design model, via NavisWorks,

in order to have a more accurate model prior to soliciting final bids. If a fabricator's structural model is unavailable prior to completion of the final bid package, the design model should be updated to the designer's (Structural Engineer) final structural design.

3. All openings.
- D) Mechanical, Electrical, Plumbing and Fire Protection (MEPFP) Elements
1. MEPFP modeling will include, but not be limited to, all horizontal and vertical solid and flexible duct runs, modeled at correct sizes, slopes and shapes. All mechanical equipment elements should be designed and modeled based on largest case manufacturer's equipment (i.e., RTU's, VAV boxes, boilers, generators, chillers, etc.), in order to assure adequate physical space to accommodate "worst case" scenarios.
 - a. Mechanical / sheet metal
 - Ducts
 - Air handling equipment
 - Boilers
 - Pumps
 - Associated piping over 2 inches in diameter
 - Supply and return louvers, grilles and diffusers
 - b. Plumbing
 - Piping over 2 inches in diameter (piping to be modeled to its outside diameter, including insulation)
 - Risers
 - Pitched drains (i.e., roof drain mains, etc.)
 - Pumps and equipment
 - Fixtures will be located with penetration stub into walls, floors and ceilings
 - Sleeved objects will be located in all exterior and load bearing wall penetrations to the correct outside diameter
 - c. Electrical
 - All major equipment and conduit
 - Switchgear
 - Transformers
 - Panel boards
 - Generators
 - Conduit over 1 ½ inches in diameter
 - Locate and model all lighting fixtures as the overall required embed volume
 - d. Fire Protection
 - Equipment (i.e., fire pumps, hose racks, standpipes, etc.)
 - Risers
 - All piping

4D Construction Phasing Model:

- A) General Information Modeling Requirements
1. The CM shall review the coordinated design model at various stages of design for constructability, costing and scheduling purposes.
 2. The Architect shall incorporate reasonable changes requested by the CM. If, for quantification purposes, the CM needs component information rather than assembly information (i.e., components of a cavity or veneer exterior wall assembly), the Architect will accommodate the CM and update the model accordingly. If the CM plans to construct the project in phases for scheduling

purposes, the CM will inform the Architect of planned construction phasing and the CM will update the model accordingly.

- B) Preparation of the 4D Construction Phasing Model
1. The CM shall integrate its approved, electronic CPM schedule with the coordinated design model using NavisWorks JetStream v5 Timeliner module (or approved equal). This will occur at approximately 50% DD's (with emphasis on early package elements), 50% CD's, and 100% CD's, or more frequently if required by the DCAM Project Manager. At completion of CD's a two-week minimum time period will be used to provide a final clash detection review and report with work points, accommodate any last minute changes or modifications by the Architect, and allow the Architect to correct any clashes prior to soliciting final package bids. The intent is to provide bidders with bid documents, based on a coordinated model, that can be constructed within the scheduled timeframe, barring unforeseen conditions and/or Owner-initiated changes.
 2. The CM is responsible for model object / schedule activity resolution and correlation. The CM will provide the Architect with any revised phasing logic information so appropriate model edits that may be required can be accommodated.
 3. The CM will use "Task Types" and "Appearance Definitions" within NavisWorks (or approved equal) to communicate the following:
 - a. (trades by color)
 - b. (critical path by color)
 - c. (other)
 4. The CM shall use the NavisWorks Timeliner 4D schedule (or approved equal) to communicate design intent, means and methods (where possible) and sequencing of work to subcontractors in pre-bid meetings.
 5. Updated or "status" 4D schedules will be prepared for monthly construction coordination meetings. There is the need to have 4D Virtual Construction Model meetings (beginning of each month), chaired by the CM, at which all subcontractors field supervisors whose tradesmen will work that month will need to address the projected following month of work.
 - In the event that one or more subcontractors may prepare 3D models for their own execution of work the CM shall review for acceptability and, if deemed acceptable and consistent with the CM's control of the work and the DCAM Project Manager, the CM shall incorporate this 3D content into the coordinated design (NavisWorks, or equal) model.

Ownership:

- A) In addition to the record documents required by the specifications, the master building information model, and the subsidiary models provided for design and construction of the project will, upon completion of the project, be property of DCAM and the parties agree to provide DCAM, as deliverables prior to Final Completion, the most recent version of all files. Upon DCAM request, the parties will provide the most updated BIM models. (Integrated Project Delivery Agreement - © Hanson Bridgett)

For any question, please feel free to contact

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