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REFERENCES
AF Services Facilities Design Guide: Visiting Quarters
2010 UFC 4-720-01: Lodging Facilities
INTRODUCTION

Executive Summary

The intent of this Dynamic Prototype BIM (Building Information Model) Manual is to describe the process for utilizing the electronic design tool to improve efficiency and effectiveness in the implementation of the Visiting Quarters Design Guide. Dynamic Prototype is a flexible design model that leverages the advantages of BIM to standardize components of a building type (in this case a Visiting Quarters facility) through a schematic 3D model. Design models can vary from performance criteria to prescriptive criteria depending on the number of variables. For visiting quarters the prototype is utilizing a kit-of-parts approach. The kit-of-parts models are broken down into disciplines (Architecture, Structure, Mechanical, Electrical/Telecom, Plumbing, and Fire Suppression). Version 1.0 contains a model for each discipline with many individual modules within each model.

Goals

The goal of the BIM prototypes is to communicate vital information from the Visiting Quarters Design Guide as well as lessons learned from other installations in a BIM platform that will allow A/Es to expedite future Visiting Quarters designs. The prototypes help A/Es and prospective users start the conversation about the final design, identify project scope, and discover design options.

Scope and Use

In accordance with the Visiting Quarters Design Guide, the kit-of-parts models meet the minimum net living area (NLA) requirements along with the gross module area (GMA) as specified within the VQ Guide Space Planning Spreadsheet. Additional assumptions for the models were made to test the assembly of the kit-of-parts models into a building that meets the gross building area (GBA). Examples of these arrangements can be found on the Mega Module and Building Plans. The assumptions for Version 1.0 are as follows:

1. Program Assumptions
   - Guest room modules include standard guest room, ADA standard guest room, suite, and ADA suite.
   - 200-room VQ is the basis for conceptual engineering and sizing requirements.
   - All units meet the minimum net living area requirements.
   - Guest services is the most flexible and will require manipulation for site adaptation and installation-specific functional requirements.
   - Mechanical, Electrical, Telecommunication, and other building utility spaces will need to be designed and integrated depending upon the location and specific installation requirements in all modules other than the guest rooms and suites.
   - Structural CMU or steel are the recommended system; however, all building systems should be explored based on installation-specific requirements.
   - Building envelope systems will be applied based on installation-specific requirements.
   - All modules have been approved by AFSVA.
   - Any reconfigurations of the units must meet the requirements listed in the Visiting Quarters Design Guide.

2. Kit of Parts
   a. Architectural
      i. Kit of Parts include:

ii. Modules1-6 have been included in the design of Mega Module 1, Modules 7-12 and 22-23 have been included in Mega Module 2 and Modules 13-20 have been included in Mega Module 3 as options for a residential wing, guest services/administration, and the back of house support respectively.

iii. It is intended that all modules can be utilized to configure site adapt building floor plans as needed (Refer to Building Plan Examples).

b. Structural
   i. Kit of Parts include:

   ii. Modules 1-23 will include floor slabs only.

c. Mechanical
   i. Kit-of-Parts include: Module 1-4 (Hot/Arid, Hot/Humid, and Cold/Arid climates).

d. Electrical
   i. Kit-of-Parts include: Module 1-4.

e. Plumbing
   i. Kit-of-Parts include: Module 1-4.

f. Fire Protection
GUIDE INTEGRATION

Site Design

Tool Utilization Strategies

1. Siting Requirements
   - Utilize the kit-of-parts to assemble the initial massing model.
   - Group units before multiplying the units to take advantage of BIM.
   - Configure model to the appropriate site dimensions and established setback requirements listed in the Visiting Quarters Design Guide and other references.
   - After multiplying units into assembled massing model, "exclude" duplicated elements such as party-walls (Refer to Figure 46 for Duplication Example).

2. Circulation
   - Ideas and concepts should be explored through other mediums quickly before narrowing the concepts to the selected proposition.
   - Establish site circulation to maximize building site efficiency.
   - Create outdoor spaces that are extensions of the building entrances allowing for small groups to stop and gather.
   - After all site circulation constraints and siting requirements have been established the A/E should utilize the prototype tool to configure the initial massing model.

3. Establishing the Model
   - A/E is responsible for establishing a clear File Directory Structure (Refer to Figure 45 – File Directory Structure Example).
   - See Attachment F to the contract for full extent of BIM related deliverables.

Additional Requirements and Integration Concepts

1. Parking & Site Considerations
   - All disciplines need to have their own model that is linked to the master model.
   - All work shall be in 3D with associated parametric information and linked to the master model.
   - Establish finish floor and floor-to-floor elevations early in the process.
   - Coordinate utilities between all disciplines early in the process.

2. Site Amenities
   - Small structures shall reside within discipline models.
   - In the example of site furniture and site lighting establish the furniture in the landscape architect's model and the site lighting in the electrical engineer's model.
   - Coordinate site amenities early and allocate the work to the responsible disciplines.

3. Landscape Architecture
   - Like Civil, the work developed within the discipline of landscape architecture is very specific to the installation and should be developed in 3D with associated data to inform and develop the coordination between other disciplines.
Building Design

Tool Utilization Strategies

1. Structural
   - Prototypes offer two main systems: 1) Load bearing CMU walls with concrete +
     2) Steel with concrete.
   - Other systems shall be explored after initial massing is determined.
   - A/E shall provide cost analysis on 3 structural systems that satisfy Visiting
     Quarters Design Guide requirements.
   - A/E will need to run new load calculations and resize members and spacing
     depending upon final building configuration.

2. Heating, Ventilation and Air Conditioning (HVAC)
   - Prototypes provide a starting point for the A/E with systems that already meet Air
     Force design criteria.
   - Three general climates zones were used to create the models (Hot/Arid,
     Hot/Humid, and Cold/Arid).
   - Systems and equipment in the model such as diffusers, ductwork, piping, FCU’s,
     radiant heaters etc. are all place holders. Actual sizes and selections to be
     determined by A/E.
   - Location of the building will determine the unit general climate zone the A/E
     selects as a starting point for the HVAC system design.
   - Alternative HVAC systems may be proposed on a life cycle cost analysis basis.
     Any variance from the AF Visiting Quarters Design Guide and UFC 4-720-01 will
     require a waiver. The systems utilized must enable the building to meet the
     requirements of EPAct 2005 as well as LEED Silver Certification.
   - A/E will need to run new load calculations for the actual climate zone per
     ASHRAE 90.1 in order to properly select equipment, size ductwork, select
     diffusers/grilles, and size piping. The configuration of mechanical chases can be
     adjusted for each site location depending on Base requirements.
   - Overall building systems such as outside air pretreatment, exhaust air collection,
     and method of chilled and heating water production to be determined by A/E.
   - All HVAC equipment such as diffusers, radiant heaters, PTACs, FCU’s, etc. are
     linked to schedules. Any changes made to equipment data within the model will
     automatically update the associated schedules.
   - All equipment, ductwork, piping, diffusers, dampers, etc. have been created as
     families within the model. The routing of piping and ductwork are suggestions
     only and actual routing and sizing shall be determined by the A/E.
   - Locations of hydronic valves to be determined by A/E.

3. Plumbing
   - The plumbing model consists of plumbing fixtures, domestic CW piping, domestic
     HW piping, and sanitary waste/vent piping.
   - The plumbing models are drawn as the ground floor units to show the underslab
     sanitary piping. The floors above will not require horizontal sanitary piping
     throughout the unit.
   - The piping within the units has been sized in accordance with Uniform Plumbing
     Code (UFC) but will need verification by A/E.
   - Sizes for plumbing risers to be determined by A/E based on the actual building
     height.
   - Overall building plumbing systems such as the method of producing domestic hot
     water to be determined by A/E in accordance with AF Visiting Quarters Design
     Guide and UFC 4-720-01.
   - Location(s) of water heaters either in centralized location or multiple locations to
     be determined by A/E.
• All piping, and plumbing fixtures have been created as families within the model and are intended as place holders for routing purposes. Actual sizes and routing to be determined by A/E.

4. Building Configuration
• Building Circulation – Building placement and site circulation will determine the building circulation parameters.
• In developing the model it is required to use the provided kit-of-parts as a starting point. Each unit is a group and should remain a group to leverage the efficiency of BIM. As the A/E assembles the modules, modifications will be required. It is encouraged that the A/E creates new groups for these units so when one unit is changed within the group, the rest are updated. As the A/E begins Construction Documents and is developing details, groups may no longer be preferred and it is up to the A/E’s discretion to ungroup. (Refer to Figures 46 and 47 for Duplication and Group Manipulation Examples).

5. Interior/Exterior Relationships
• Building Circulation – Develop a clear path of travel. Consider egress distances and associated site considerations to design the hardscapes, surrounding landscape, and outdoor gathering areas.
• Civil and Landscape Models – 3D models that work with the specified BIM platform shall be developed concurrently with the other disciplines and maintained as a linked and integral part of the project development.

6. Noise Considerations
• Wall types – Develop clear requirements as per the AF Visiting Quarters Design Guide and UFC 4-720-01 and manipulate existing wall types as needed.

7. Architecture
• Building Envelope – Designs shall be appropriate for local climate and architectural character of the installation.
• All windows and current glazing systems are place holders within the wall types. The ultimate size and quantities depend upon installation requirements and building envelope design.
• Coordinate chases within units after mechanical system is selected as there may be the opportunity to eliminate chases (specifically those associated with base board heaters in the corner of each bedroom).

8. Interior Design
• Comprehensive Interior Design – The furniture provided within the model only dictates the scale and placement of furniture for the units. A/E’s should develop a comprehensive interior design package per installation requirements. It is recommended that local culture be incorporated in public areas through art and information displays.
• Finishes and Materials – The prototype units have the Air Force’s preference modeled. The A/E may explore other options as long as they meet or exceed the materials’ characteristics listed.
• Bathrooms and Kitchens – The prototype units provide cabinets and millwork for dimensional purposes only. The A/E can alter the style, countertops, and back splashes to fit the appropriate aesthetics of that particular installation.

9. Electrical
• Electrical prototypes include lighting, receptacles, telephone, cable, light switches, fans, fire detection, and personnel alerting systems located within the units.
• Models also have the distribution equipment created however this will need to be reconsidered as the design is assembled and the A/E establishes the full extent of the buildings power requirements.
• Exterior lighting and other associated work with the buildings exterior or landscape will be developed as part of the local installation design.
• Actual building electrical loads and service to be determined by A/E.

10. Fire Protection
• Sprinkler heads are laid out in accordance with NFPA 13, *Installation of Sprinkler Systems*.
• There is flexibility within the model to relocate heads depending upon modifications in the floor plan to meet base needs.
• Any relocation of sprinkler heads must still be in accordance with NFPA 13.
• Fire alarm equipment has been laid out within the model in accordance with NFPA 72, *National Fire Alarm Code*.

Specifications

*Tool Utilization Strategies*

1. ESpecs for Revit 4.1 with MASTERSPEC 2004
   • ESpecs links specifications sections with objects in the Prototypes through the use of assembly codes listed within each objects property elements.
   • After all of the specification sections have been properly bound to the objects within Revit notes on drawings will be coordinated, listing the same language tied to the specification language. Text will be consistent and concise.
   • Specifications for the prototypes have been developed based upon the Visiting Quarters Design Guide, UFC, and the developed Prototypes
   • Other specifications specific to the development of the full design at local installations will need to be developed. Some of these include:
     o Civil associated specifications
     o Landscape associated specifications
     o Foundation systems
     o Building envelope
     o Roof structure

2. Linking ESpecs for Prototypes
   • A Microsoft SQL database will be provided on the website for download. This database will contain all information related to the prototype project manual. This also holds the bindings to each Revit file.
   • E-Specs for Revit should be installed per installation instructions given by InterSpec ([http://www.e-specs.com/](http://www.e-specs.com/)).
   • E-Specs for Revit plug-in should also be installed per installation instructions given by InterSpec ([http://www.e-specs.com/](http://www.e-specs.com/)).
   • Special interaction will be required to ensure that the database file downloaded is set as the main database file during installation.
   • A uniformClassifications.txt file will be provided which contains information on bindings from and to Revit and E-Specs. This must be placed in the following directory: C:\Program Files\Revit Architecture 2009\Program
   • Once files have been downloaded all questions and problems related to integration and setup of E-Specs should be directed to InterSpec @ 888-50-SPECS.
LEED Checklist

Tool Utilization Strategies

1. LEED 2009 Checklist
   - Consolidates all points from Federal Mandates and creates an initial starting point for the A/E to utilize.

Software Requirements

Additional Requirements

1. Autodesk Revit 2011 or higher (latest Service Pack)
   - Revit was utilized in developing the Prototypes and shall be utilized in developing all discipline models.
2. E-Specs for Revit (latest release) with MASTERSPEC 2004
   - E-Specs for Revit 5.0 was utilized in developing the Prototypes specifications and shall be utilized in developing the specifications throughout the completion of design.
   - MASTERSPEC 2004 licenses must be purchased as E-Specs uses MASTERSPEC 2004 format.
   - E-Specs and Masterspec are separate entities and each require the purchase of software/Licenses which can be coordinated through InterSpec.
   - Software licensing agreements will supersede all information in this document and must be followed.

Square Footage Calculations

Additional Requirements

1. The modules have been designed based on a 120, 200 and 350, room facility. Facilities reviewed include.
   - 120 rooms (Small Facility) - Buckley AFB with 3 levels
   - 200 rooms (Medium Facility) - Kunsig AFB with 4 levels
   - 350 rooms (Large Facility) - Nellis and Travis AFB with 6 levels
2. Reference the corresponding square footage calculation Spreadsheet for guidance.
**Individual Module Illustrations**

The following figures show floor plans and reflected ceiling plans for individual modules designed for a 200-room facility. Adjustments to square footage and configuration may be required for a different size visiting quarters. Figures are not to scale.

**Figure 1 – Module 1: Standard Guest Room**

**Figure 2 – Module 2: Accessible Guest Room**
Figure 5 – Module 5: Guest Laundry/Ice

Figure 6 – Module 6: Residential Wing Support

Figure 7.1 – Module 7A: Vestibule & Lobby
Figure 7.2 – Module 7B: Reception/ Retail/ Luggage

Figure 7.3 – Module 7C: Business Center

Figure 8 – Module 8: Fitness Room
Figure 12 – Module 12: Administration
Figure 13 – Module 13: Staff Locker Rooms

Figure 14 – Module 14: Staff Break Room
Figure 15 – Module 15: Equipment/ Bulk Storage
Figure 18 – Module 18: Service Elevator

Figure 19 – Module 19: Service Elevator

Figure 20 – Module 20: Receiving Area
Figure 21 – Module 21: Electrical Room

Figure 22 – Module 22: Mechanical Room

Figure 23 – Module 23: Guest Elevator
Figure 24 – Module 24: Stairs

Mega Module Illustrations
The following figures show floor plans of mega modules (not to scale). Mega modules are shown to illustrate one possible way the individual modules can be arranged and are not intended to constitute a final design.
Figure 25 – Mega Module 1: Residential Wing
Figure 26 – Adjacency Diagram for Guest Services

Figure 27 – Adjacency Diagram for Administration

LEGEND
- ROOM
- FLEXIBLE/OPEN SPACE
- EXTERIOR ACCESS REQUIRED
- OPEN AREA WITH EXTERIOR ACCESS REQUIRED
- CRITICAL ADJACENCY
- PREFERRED ADJACENCY
Figure 29 – Adjacency Diagram for Mega Module 3: Back of House Support

LEGEND
- ROOM
- FLEXIBLE/OPEN SPACE
- EXTERIOR ACCESS REQUIRED
- OPEN AREA WITH EXTERIOR ACCESS REQUIRED
- CRITICAL ADJACENCY
- PREFERRED ADJACENCY
Figure 30 – Mega Module 3: Back of House Support
Building Illustrations

The following figures show building floor plans (not to scale). Building plans are shown to illustrate one possible way the individual modules & mega modules can be arranged and are not intended to constitute a final design.

Figure 31 – Building: 120-Room Visiting Quarters First Floor Key Plan

Figure 32 – Building: 120-Room Visiting Quarters Enlarged First Floor Plan
Figure 33 – Building: 120-Room Visiting Quarters Second Floor Key Plan

Figure 34 – Building: 120-Room Visiting Quarters Enlarged Second Floor Plan
Figure 35 – Building: 200-Room Visiting Quarters First Floor Key Plan

Figure 36 – Building: 200-Room Visiting Quarters Enlarged First Floor Plan
Figure 37 – Building: 200-Room Visiting Quarters Second Floor Key Plan

Figure 38 – Building: 200-Room Visiting Quarters Enlarged Second Floor Plan
Figure 39 – Building: 300-Room Visiting Quarters First Floor Key Plan

Figure 40 – Building: 300-Room Visiting Quarters Enlarged First Floor Plan
Figure 41 – Building: 300-Room Visiting Quarters Second Floor Key Plan

Figure 42 – Building: 300-Room Visiting Quarters Enlarged Second Floor Plan
Figure 43 – Building: 300-Room Visiting Quarters Third and Fourth Floor Key Plan

Figure 44 – Building: 300-Room Visiting Quarters Enlarged Third and Fourth Floor Plan
Figure 45 – File Directory Structure Example

FILE DIRECTORY STRUCTURE

REVITBIM
- 01 ARCH
- 02 CMVL
- 03 ELECT
- 04 HVAC
- 05 PLBG
- 06 STRUCT
- 07 FIRE
- 08 MASTER RVT
- 09 STDS

REVIT CENTRAL
- A - CENTRAL.RVT
- SCRIPT.EXE

REVIT ARCHME

OVERALL MASTER MODEL TO SYNCH COORDINATES

BORDER

KEYNOTE FILES

SHARED PARAMETERS

REVIT FAMILIES
- GENERAL
  - ANNOTATION SYMBOLS
    - ARCH
    - ELECT
    - FIRE
    - MECH
    - PLUMB
    - STRUCT

PROJECT TEMPLATES
Figure 46 – Duplication Example

Step 1

Step 2

Step 3

Figure 47 – Group Manipulation Example

With groups if one window is moved or changed all windows within that group move or changed.