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Structural Narrative

Historical St. Mary's County Boutique Hotel
St. Mary's County, Maryland

Prepared For:
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1 Gravity System

1.1 Foundation Design

We assume the foundation shall be supported on spread footings underneath columns or perimeter wall footings. Using a presumptive bearing pressure of 1,500 psf, in accordance with IBC section 1806.2 when geotechnical data is not available, we would anticipate a maximum size for a spread footing of 13x13-ft square. This can likely be reduced upon receipt of geotechnical data and with the progression of the full design scope.

1.2 Typical Hotel Framing

Levels 2, 3, and 4 are majority hotel rooms. We assume the typical structural framing system for the hotel rooms will be wood trusses supported by wood bearing wall construction. For the typical 12'-6" room width, a 12" deep wood truss spaced at 24" on center can be used. For the longer spans (approximately 25'-0" length) the trusses would need to be increased to 16" deep spaced at 16" on center. This does not yet take vibration into account, as that will depend on the final floor assembly selected for the project.

Assuming all of the hotel walls are bearing, with a 12'-6" truss span, the typical stud design at Level 2 would either be (2) 2x6 at 24" o/c or (4) 2x4 at 24" o/c. If the longer 25'-0" span is the typical condition, the bearing walls should be 2x6 as it would require more than (4) 2x4 studs to support each truss at the lower levels. Additionally, if the bearing walls at the southwest corner of the building continue down to Level 1 those walls should also be 2x6 due to the taller floor-to-floor height coupled with the additional level to support.

It is our understanding that the project wants to utilize as much natural materials as possible, which contributes to the assumed structural system described above. For alternative consideration, the bearing walls can be a cold-form metal stud bearing wall system with a long-span composite deck, or the entire building could be reinforced concrete construction up to the roof.

1.3 Transfer Framing

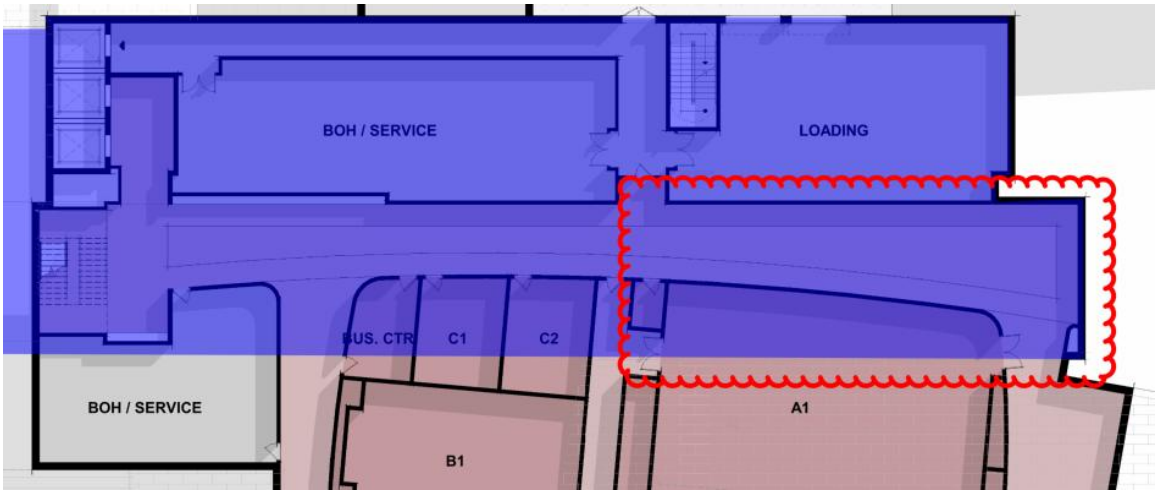


Transfer framing will be required starting at Level 3 to span over an upper lounge, overlook, and pool and spa facilities at Level 2, along with a 2-story volume above the Level 1 lobby entrance below. Beam supports will be required at the blue locations in the sketch at the right. Alternatively if the structure is a concrete flat-plate system, the only beams required will be to support the edge of the 2-story open space above the lobby.

At Level 2, the majority of the hotel rooms will be transferred out above the lobby, amenity, kitchen, and other back-of-house spaces within Level 1 (shaded in blue below). There will be a roof for the new bar, restaurant, and other event spaces (shaded in green below) at Level 2 as well. There is also a porte-cochere that will be framed at Level 2 for the main hotel entrance.



Below Level 1 there is a basement area (outlined in orange above) that contains several large ballroom/meeting spaces along with other back-of-house, service, and storage spaces along with the loading dock in the northeast corner of the building. The ballrooms will be framed with long-span beams, but special consideration will be required where the 4-story hotel overlaps the ballrooms.



From our initial discussions with the design team, we understand that there is flexibility to locate columns such that once they are introduced they can continue down to the foundation except for in the area clouded above. In this area the framing will need to have

a second transfer design at Level 1 to pick up the columns above and maintain the open space of the ballroom below.

The structural system for the transfer levels can either be concrete or steel framed. There are advantages and disadvantages for each system that are listed below. The final decision shall be coordinated with the design team and ownership prior to the start of full design.

1.3.1 Concrete Transfer Design

The support for the hotel rooms can largely be achieved utilizing a concrete flat-plate design, with columns and drop panels spaced approximately 20-to-25 feet on center and a 12-to-16 inch thick concrete slab, depending on what floor level is being transferred and the final spacing of the coordinated column grid.

At locations requiring long clear spans, concrete beams can be added to span between adjacent columns. For the long-span transfer beam at the ballroom, a 60-ft long beam that supports the edge of the hotel area above would be approximately 30-inches wide by 60-inches deep and heavily reinforced (conservatively 20 sq-inches of bottom reinforcement).

Advantages:

- Flexibility – once a column grid is coordinated with the design team, the interiors layout above and below can still adjust slightly assuming the proposed occupancy does not change.

Disadvantages:

- Weight – the system will be heavier, which will have impacts on the size of the transfer framing and foundations below.
- Column Size – minimum column size shall be 24x24.

1.3.2 Steel Transfer Design

The steel required for the various transfer levels will range from 18-to-24 inch deep steel beams, assuming composite action and a typical column spacing of approximately 25 feet, to align with the 12'-6" bearing walls. Assuming a 2-hour fire rating, the floor can be 4-1/2" normal weight concrete over 2" composite steel deck.

For the same long-span transfer beam described above for the ballroom, a 40-inch deep composite steel beam would be required.

Advantages:

- Weight – the system will be significantly lighter. Based on initial assumptions the structure will be approximately half the weight of the proposed concrete transfer system.
- Column Size – W12 or W14 column shapes can be used for the project.
- Long-span Structure Efficiency – Steel framing design is more efficient when it comes to spanning long distances.

Disadvantages:

- Flexibility – steel beams will be required under every bearing wall, which will lock the proposed program into place or necessitate more coordination if a change is

desired after initial design. This could also impact MEP coordination, as typically pipe risers like to run vertically through the bearing walls, which would then conflict with the transfer beams below.

2 Lateral System

2.1 Preliminary Lateral Design Values

2.1.1 Wind Criteria

Risk Category II
Design Wind Speed (Ultimate) ..... 115 mph
Serviceability Wind Speed (MRI 25 Year) ..... 84 mph
* *Project Site is not located in a wind-borne debris region*

2.1.2 Seismic Design Criteria

Risk Category II
Seismic Design Category ..... B
Site Class ..... D*
S_S ..... S_S = 0.112
S_1 ..... S_1 = 0.041
S_{DS} ..... S_{DS} = 0.120
S_{D1} ..... S_{D1} = 0.065
**Site Class D has been conservatively assumed, and shall be confirmed and updated, as required, pending receipt of the Geotechnical Report.*

2.2 Main Wind Force Resisting System

The lateral system will be ordinary reinforced concrete shear walls, which are assumed to be located at the stair and elevator cores. These walls are assumed to run full height, although they can transfer to ordinary reinforced CMU walls within the hotel portion of the building. An additional moment frame may be required at the south end of Level 2 with the addition of the bar and restaurant space to supplement the lateral resistance in the East-West direction.

3 Additional Considerations

3.1 Retaining Wall & Exterior Pool

There are significant grade changes around the perimeter of the building. The grade is lowest in the southeast corner, where the ballroom exits to grade at the basement level. The main lobby entrance exits to grade at the Level 1 elevation, approximately 20-feet above the basement. Fill will be added on the north side of the building to align the top of an exterior pool with the Level 2 upper lounge area, approximately 12-feet above Level 1.

Concrete basement and retaining walls will be used around the perimeter of the building, at the exterior pool, and stepped down to the loading dock, which also exits at the Basement level in the northeast corner of the building.

For feasibility purposes, an 18-inch thick basement wall, reinforced with #6@10" o/c, can be assumed for a worst-case condition where a 20-ft tall basement wall is resisting 20-ft of soil. The wall thickness can be reduced to 12-inch minimum if the reinforcement is increased to #8@10" o/c, for comparison.

The site retaining walls appear to step down a maximum of 32-ft between the Level 2 pool and basement loading dock in three separate tiers/terraces. Assuming a maximum retained height of 11-ft of earth, the retaining wall can be 12-inch thick with an 18-inch thick x 9-ft wide footing with a shear key below the footing. The assumed reinforcement for #6@10" o/c for the vertical earth-face bars, toe, and heel reinforcement.

These preliminary designs assume conservative values for the lateral earth properties. These values should be confirmed by the geotechnical engineer prior to the start of full design.

3.2 Feature Wood Framing

Exposed wood is proposed for the east end of the 4-story building (right side of the image below). This will likely require glulam framing for the long-unbraced spans, which can be connected back and integrated into the wood bearing wall system of the building.



3.3 Expansion Joint

The span of the proposed building footprint ranges from 200-400 ft in length. Based on our review of the building footprint and technical data, we do not anticipate that an expansion joint will be required for this building.