APPENDIX D.2

CONSULTANT REPORTS – STRUCTURAL

CARROLL ENGINEERING, INC.
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Coppin State University Public Safety Facility – Structural Narrative

Site 1 Baker Street - General Description

The proposed Public Safety Facility will consist of a five (5) story building with below-grade parking. There will be three (3) levels below grade. The garage parking will occupy the two (2) lowest levels, with partial parking, apparatus bay and firing ranges on the top level.

The ground floor will have a volume space containing the scenario village, outdoor terrace space (above the parking below), police labs and fitness center. The upper four (4) levels will have classrooms, lockers, offices, cafeteria and administration space. The top level has a smaller footprint than the floors below and will contain classrooms.

A significant portion of the roof will be green, with the balance supporting the MEP and firing range ventilation equipment.

Design Criteria

Codes & Standards:

The following structural design criteria, codes, standards, and regulations will be observed in the structural design:

Baltimore City Building Code
IBC 2018 - International Building Code
ASCE 7-16 - Minimum Design Loads for Buildings & other Structures

Design Loads:

The structure will be designed to resist all applicable dead loads as well as the following live loads. Live load reductions shall be taken where applicable.

Office/Admin	50 psf
Partitions	20 psf
Terraces	100 psf
Assembly	100 psf
Lab	100 psf
Stairs	100 psf
Fitness	100 psf
Storage	125 psf
Mechanical Rooms	150 psf
Roof	30 psf + Green roof system + snow drift

Snow loading shall be based on the following. Snow loads produced by drift shall be considered.

Ground Snow Load	30 psf
Building Risk Category	IV
Exposure	B
Exposure Factor	1.00
Thermal Factor	1.00
Importance Factor	1.20

Wind loading for the main-wind-force-resisting system shall be based on the following:

Basic Wind Speed	(Ultimate)	116.2	mph
Basic Wind Speed	(Nominal)	90	mph
Exposure		B	
Topographical Factor		1.00	
Directionality Factor		0.85	

Seismic loading shall be based on the following:

Site Classification	D (Pending Geotechnical Investigation)
S_S	0.135
S_1	0.052
S_{DS}	0.144
S_{D1}	0.084
Seismic Use Group	IV
Importance Factor	1.50
Seismic Design Category	C

Structural Systems

Superstructure:

The roof construction will consist of 1 ½" x 22 gauge metal deck supported by steel joists spaced at 5'-0"± on center which will bear on structural steel wide flange beams & wide flange columns. The perimeter wide flange steel will support light gauge backup for the building façade. Based on the architectural layout of the interior space of the building, the roof joists will clear-span. The portions of roof supporting the MEP and ventilation systems will be steel framed with wide-flange purlins.

The second thru fifth floor framing will consist of 3 ¼" lightweight concrete over 3" composite metal deck. The concrete and metal deck will be supported by composite steel beams, and a regular grid of steel wide flange columns. Steel Transfer girders are anticipated at the scenario village, to allow for a more column free space.

The ground floor and below grade levels will be concrete framed. The typical floor framing will consist of 8” thick framed concrete slabs with mild steel reinforcement. The slabs will be supported from a regular grid of rectangular concrete columns with 8” deep drop caps. Where possible, the concrete columns will be concentric with the steel columns from the above grade levels. Where column do not align, concrete transfer beams will be used. The slabs supporting the outdoor terraces, scenario village, and the apparatus bays will be 12” thick due to the added loading.

Foundations:

Pending the results of the geotechnical investigation, it is anticipated that the building will be supported by a shallow foundation system consisting of spread footings below columns, and shallow mat foundations below the concrete shear wall cores. Based on the depth of excavation, fill soils requiring soil modification are not anticipated. It is possible that deep foundations, consisting of drilled shafts or piles may be required due to the anticipated foundation reactions.

In-line sheeting and shoring will be required due to the depth of the excavation for the below grade levels. The retaining walls will be 12” reinforced concrete, braced at each floor level and supported from a zero lot line foundation. The lowest level will be a 6” slab-on-grade with wire mesh reinforcing over granular base and vapor barrier.

Material Requirements

Steel wide flange sections: ASTM A992

Steel tube sections: ASTM A500 Gr 46.

All Other Steel: ASTM A36.

Floor Construction Concrete (above grade): f'c = 3500 PSI, Lightweight

Framed Concrete (below grade) and Retaining walls

Foundation Concrete: f’c = 4000 PSI, Normal Weight: f’c = 5000 PSI, Normal Weight

Composite Deck: ASTM A611, Grade C

Slab Welded Wire Fabric: ASTM A1064

Slab / shear wall Reinforcing: ASTM A615, Grade 60

Roof Deck: ASTM A653, Quality SS, Grade 33

Lateral Load Resisting System:

Systems and Design Options

Lateral load resistance for wind, and seismic forces will be provided by a combination of steel moment frames; and normally reinforced masonry (above grade) or concrete (below grade) shear walls at the stair & elevator cores. The concrete shear cores will be supported by mat foundations at the base.

The load path for lateral loads will consist of the concrete over metal deck acting as the diaphragm at the above grade levels, and the metal deck acting as a diaphragm at the roof

level. The diaphragms will connect to the shear walls will steel angle collectors bolted to the face of the core walls, or welded to embed plates cast into the walls.

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Coppin State University Public Safety Facility – Structural Narrative

Site 2 Braddish Avenue - General Description

The proposed Public Safety Facility will consist of a three (3) story building with a partial lower level and adjacent parking garage.

The lower level will contain the firing ranges and range support space. The ground floor will have a volume space containing the scenario village, lockers, classrooms and administration space. The upper five (4) levels will have classrooms, lockers, offices, and the cafeteria.

A significant portion of the roof will be green, with two (2) terraces, and the balance supporting the MEP and firing range ventilation equipment.

The adjacent garage will have a partial basement and three (3) levels above grade. The ground floor will contain the apparatus bays.

Design Criteria

Codes & Standards:

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ASCE 7-16 - Minimum Design Loads for Buildings & other Structures

Design Loads:

The structure will be designed to resist all applicable dead loads as well as the following live loads. Live load reductions shall be taken where applicable.

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Assembly	100 psf
Lab	100 psf
Stairs	100 psf
Fitness	100 psf
Storage	125 psf
Mechanical Rooms	150 psf

Roof	30 psf + Green roof system + snow drift

Snow loading shall be based on the following. Snow loads produced by drift shall be considered.

Ground Snow Load	30 psf
Building Risk Category	IV
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Superstructure:

The roof construction will consist of 1 ½" x 22 gauge metal deck supported by steel joists spaced at 5'-0"± on center which will bear on structural steel wide flange beams & wide flange columns. The perimeter wide flange steel will support light gauge backup for the building façade. Based on the architectural layout of the interior space of the building, the roof joists will clear-span. The portions of roof supporting the outdoor terraces, MEP and ventilation systems will be steel framed with wide-flange purlins.

The second and third floor framing will consist of 3 ¼" lightweight concrete over 3" composite metal deck. The concrete and metal deck will be supported by composite steel

beams, and a regular grid of steel wide flange columns. Steel Transfer girders are anticipated at the scenario village, to allow for a more column free space.

The adjacent parking garage is will be a precast concrete for the above grade portion. The ground floor slab and lower level retaining walls will be cast-in-place. The ground floor will consist of an 8” thick framed concrete slab with mild steel reinforcement. The slab will be supported from a regular grid of rectangular concrete columns with 8” deep drop caps and retaining walls. The concrete columns and walls will be concentric with the precast columns and light walls from the above grade levels. The slab supporting the apparatus bays will be 12” thick due to the added loading.

Foundations:

Pending the results of the geotechnical investigation, it is anticipated that the building will be supported by a shallow foundation system consisting of spread footings below columns, and shallow mat foundations below the concrete shear wall cores. Based on the depth of excavation, fill soils requiring soil modification are not anticipated. It is possible that deep foundations, consisting of drilled shafts or piles may be required due to the anticipated foundation reactions.

In-line sheeting and shoring will be required due to the depth of the excavation for the below grade level. The retaining walls will be 12” reinforced concrete, braced at the ground level and supported from a zero lot line foundation. The lower level floor will be a 6” slab-on-grade with wire mesh reinforcing over granular base and vapor barrier.

Material Requirements

Steel wide flange sections: ASTM A992

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