WASHINGTON COUNTY – PUBLIC SERVICES BUILDING
STRUCTURAL NARRATIVE

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Consulting Engineers

Concept

The new public service building will be constructed on the site of the existing public services building in downtown Washington, PA. The project has three main components.

a. The new public services building will include the County 911 Center, Sheriff's Office, Probation, Booking, and Buildings and Grounds. The structure will be four stories and have a total area of 65,000 gross square feet.
b. Approximately 50 to 60 parking spaces will be located at the lowest level and accessed from Beau Street.
c. A storm shelter will be required for the occupants of the 911 Center.

The existing 911 Center, located at the west side of the site, will remain in operation throughout the construction of the new facility.

Design Requirements

Building Code:	International Building Code (IBC) 2018
Building Standards:	
Loads	American Society of Civil Engineers (ASCE) 7-16
Steel	American Institute of Steel Construction (AISC)
Concrete	American Concrete Institute (ACI) 318-14
Steel Deck	Steel Deck Institute (SDI)
Use and Occupancy Classification	Emergency Operations Center
Building Risk Category (Structural)	Category IV
Construction Type	Type IIA

Gravity Live Loads:

Roof:	Minimum Live			20 psf	
	Snow			24 psf	(1)
	Ground Snow Load	Pg	=	25 psf	
	Snow Exposure Factor	Ce	=	1.0	
	Snow Importance Factor	Is	=	1.2	
	Thermal Factor	Ct	=	1.0	
Floors:					
	Parking			40 psf	
	Remaining Slab-on-Grade Areas			125 psf	
	Lobby, Entrances, Stairs and Exits			100 psf	(2)
	911 Center, Storm Shelter			100 psf	
	Mechanical (Level 1 and Penthouse)			150 psf	(3)

Notes:

1. Include snow drift at all roof projections and parapets.
2. Minimum concentrated load on stair treads is 300 pounds over an area of 4 square inches.
3. Equipment loads to be included in the seismic analysis.
4. psf denotes pounds per square foot.

Live load reduction will be considered to maximize member efficiency and meet the requirements of IBC 2018 and ASCE 7-16 Section 4.7.

Special loading conditions to account for handrail and guardrail forces will be accounted for at stairs and open slab-edges. Impact loads at elevators and other equipment will also be accounted for in the structural design.

Lateral Loads:

Wind: The building's overall lateral bracing system (as defined in the *Super-Structure* section) will comply with appropriate provisions for main wind-force resisting system. Building components and cladding will be designed for larger loads, which is required for all members supporting 700 square feet or less. The requirements are identified in IBC 2018 Section 1609.0 and ASCE 7-16.

Basic Wind Speed (Ultimate Design)			121 mph
Nominal Design Wind Speed			94 mph
Wind Importance Factor	Iw	=	1.0
Wind Exposure			Exposure B

Seismic: The building's overall lateral bracing system (as defined in the *Super-Structure* section) will comply with appropriate seismic provisions of IBC 2018 Section 1613.0 and ASCE 7-16.

Seismic Importance Factor	Ie	=	1.5
Spectral Response Modification Coefficient	R	=	3
Building Location Zip Code			15301
Short Period Response	Sds	=	0.078
1-Second Period Response	Sd1	=	0.046
Site Class (per geotechnical report section)			C
Seismic Design Category			A
Basic Seismic Force Resisting System			
Structural Steel Not Specifically Detailed for Seismic Resistance			
Analysis Procedure	Equivalent Lateral Force Procedure		

Storm Shelter:

			ICC-500
Basic Wind Speed (Ultimate Design)			250 mph
Spectral Response Modification Coefficient	GCpi	=	±0.55
Basic Seismic Force Resisting System			
Bearing Wall System – Reinforced Masonry Shear Walls			

Structural Material Requirements

Reinforced Concrete

- Concrete: Foundations to be normal weight (145 pcf) with a minimum compressive strength (f'c) of 4,000 pounds per square inch (psi). Slabs-on-grade and slabs-on-deck to be normal weight concrete with f'c equal to 4,000 psi. Exterior concrete to be normal weight (145 pcf), an air content of 6%±1% with a minimum compressive strength (f'c) of 5,000 pounds per square inch (psi).
- Reinforcement will conform to all requirements of ASTM A615, Grade 60. Welded wire reinforcement will comply with ASTM A185.
- Reinforced concrete to conform to all requirements of ACI 318, ACI 315 and ACI 301.

Structural Steel

- Wide flange members and channels will comply with ASTM A992.
- Hollow structural members will comply with ASTM A500 Grade B.
- Plates and angles (and other shapes not indicated) will comply with ASTM A36.
- Welding to be in accordance with AWS.
- Exposed exterior framing will be hot-dipped galvanized.

- Bolted shear and wind frame moment connections will comply with ASTM F3125, Grade A325, Type 1 with a minimum diameter of ¾-inch. Connections will utilize bearing type bolts (Type N) that are pre-tensioned. Welded shear connections are permitted where deemed practical for construction methods.
- Bolted cantilever moment connections to comply with ASTM F3125, Grade A325, Type 1 with a minimum diameter of ¾-inch. Connections will be designed as slip critical (Type SC). Welded connections are permitted where deemed practical for construction methods.
- Anchor bolts to comply with ASTM F1554.

Permanent Tieback System

- The tie-back system will be specified as a performance-based design.
- The system is permanent and will be designed to provide full lateral support of the soil against the building for the life of the structure.
- The tie-back system to utilize soil and/or rock anchors installed through the existing garage wall to provide lateral support for the wall and permanently retain soils independent from the new building.
- As part of performance-based design requirements, the contractor will:
    - Retain a licensed professional engineer to design and coordinate anchor installation.
    - Be fully responsible for all design and installation including structural verification of the existing concrete wall to be retained.
    - Coordinate sequencing of anchor installation with garage demolition.
    - Coordinate existing utilities to remain with tie-back anchor locations.

Reinforced Masonry

- All structural masonry work to conform with ACI 530.
- Minimum compressive strength (f'm) to be 2,000 psi.
- Concrete masonry units will conform to ASTM C90, Grade N, Type II, normal weight (135 pcf), hollow structural units. All units to be laid in a running bond.
- Mortar to be Type S and conform to ASTM C270.
- Grout to conform with ASTM C476 having a minimum compressive strength of 3,000 psi. Portland cement will meet ASTM C150 requirements.
- Wall reinforcement to conform with requirements of ASTM A615, Grade 60. Foundation dowels matching wall reinforcement will be required in all foundations.

Special Inspection and Testing

- During construction, an independent testing agency will be engaged to perform special inspection and testing in accordance with Chapter 17 of the Building Code. The materials to be tested include earthwork, tie-back systems, foundations, cast-in-place concrete, structural steel, steel deck, and masonry.

Structural Building Systems

Site Preparation

- The new building will be constructed on the site of the razed building.
- Prior to removing the existing concrete framed parking structure, earth shoring will be installed on the north, east, and south sides of the existing structure.
    - At the building's east side and a portion of the south side, a permanent tie-back system will be installed to brace the existing basement walls. The tie-back system to utilize soil and/or rock anchors installed from Basement Level to Level 2 (existing Levels D to A).
    - At the building's North and South sides, a temporary soldier and lagging retaining wall will be installed where necessary to facilitate demolition and construction. Steel soldier piles embedded into the rock strata with wood or concrete lagging will be used. Temporary walls will be positioned approximately 8- to 10-feet from the face of the existing building.
    - Both stabilization system types must be carefully installed below adjacent structures avoiding existing site utilities.
- The existing 911 Center (including its generator and UPS system) will remain in operation during construction of the new facility. After the new 911 Center is operational, portions of the existing garage supporting the generator and UPS will be demolished and new building construction will be completed.
    - Supplemental structure including walls and/or temporary bracing will be required to maintain generator and UPS operation. Structural enhancements must be completed prior to cutting the structure free from the portion of garage to be initially demolished.
- The existing concrete slab-on-grade will remain in place except where new concrete foundations are required. Existing foundations and interior grades adjacent to the existing 911 Center will be removed and lowered to reduce lateral pressures against the existing building and permit installation of new building foundations.
- Existing carbonaceous shale materials have been identified below the existing building's lowest level (Level D). Soil anchors embedded in the rock strata below will be installed through the existing concrete slab to restrain heaving of existing shale materials.

Sub-Structure

- The DRAFT geotechnical report, prepared by Hillis-Carnes, Geotechnical Engineers, dated March 12, 2025, indicates shallow foundations with an allowable bearing pressure of 8,000 pounds per square foot (psf) or deep foundations with an allowable end bearing capacity of 20 tons per square foot and a side friction of 150 psf. For cost purposes, reinforced concrete shallow foundations are preferred in lieu of concrete drilled piers.
- Perimeter foundations will be continuous reinforced concrete footings supporting reinforced concrete walls (14- to 16-inches thick) between Levels 1 and 2. The bottom of perimeter foundations and interior foundations within the unheated parking area will be placed 42 inches below finished grade for frost protection. The top of remaining foundations will be placed 16-inches below Level 1.
- The bottom of the brick veneer will step to accommodate the sloping site grades.
- Basement Level concrete floor slab-on-grade will be 5-inches thick at parking and mechanical/electrical areas. Below the slab, a 15-mil vapor barrier and 5-inches of compacted granular material will be specified. The granular material and existing sub-grade must be compacted to 98% of optimum laboratory density in accordance with ASTM D698 Standard Proctor Method. The concrete slab-on-ground will be isolated from foundations with ½-inch pre-molded joint filler. Control joint spacing in the slab on grade will be approximately 15 feet on center for 5-inch slabs with isolation diamonds around the columns at the Basement Level.

- The elevator pit slab will be 12-inch reinforced concrete and located 5-feet below the lowest levels they serve. Pit walls will be 12-inch thick reinforced concrete with water stops at construction joints. A sump pit to be provided at the elevator pit.
- Frost-free slabs will be provided at the outside of all exterior doors.

Super-Structure

- An expansion joint will occur between the current 911 Center Building and the new building. In addition, an expansion joint will occur between the new building and the Storm Shelter. A temporary expansion joint will occur between the new building and the existing portion of garage currently supporting the generator and UPS.
- The entrance canopies will be steel-framed with wide-flange, channel or HSS steel shapes and standard roof deck. Canopies will be tied into the main building structure and utilize moment frames as required for additional lateral stability. Thermal shims or fluid applied insulation coating will be used to minimize thermal bridging from canopy framing to main building framing.
- Steel framed metal pan stairs supported from masonry shafts will be utilized.
- Steel columns to be W10 and W12 steel shapes. The floor-to-floor height will be 15-feet between Levels 1 and 3, and 14-feet between Levels 3 and the main roof.
- Level 1 floor construction will be un-shored steel composite beams and girders with a 4½-inch normal-weight concrete slab on 2-inch 20 gage galvanized steel composite deck reinforced with welded wire reinforcement. The total slab thickness is 6½-inches. This slab provides a 2-hour fire-rating (ASTM D916). Some steel framing may be cantilevered.
- Levels 2 and 3 floor (including Penthouse) construction will be un-shored steel composite beams and girders with a 3½-inch normal-weight concrete slab on 2-inch 20 gage galvanized steel composite deck reinforced with welded wire reinforcement. The total slab thickness is 5½-inches. This slab provides a 1-hour fire-rating (ASTM D916). Some steel framing may be cantilevered.
    - At the 911 Center, the floor construction will be lowered 4- to 6-inches to accommodate a raised access floor. The top of the access floor will align with Level 1.
- Typical roof construction will include steel beams and girders with a 1½-inch 20 gage galvanized steel wide rib (Type B) roof deck.
    - The roof of the storm shelter (at Level 2) will include a concrete slab and metal deck system, similar to Level 2 and 3 with 4-inches minimum concrete slab thickness above top of deck per ICC 500.
    - At Level 1, the roof area will be an extension of the adjacent floor construction.
    - Supplemental steel framing will be required to support roof-top mechanical equipment.
    - Screen walls for mechanical equipment will require galvanized steel tube support framing cantilevered up from roof framing.
- The lateral bracing will be steel braced frames in each direction extending from the foundations to the various roof elevations. Connections will be bolted or welded depending on brace configurations, sizes, and shapes needed to resist lateral forces.
- 8-inches reinforced masonry walls will be utilized at the elevator and stair walls.
- The non-load bearing exterior walls will be a combination of metal panel, brick masonry veneer, and curtainwall construction. Cold-formed metal framing will be utilized to support metal panel and brick facades. Galvanized steel shelf angles anchored building floor slabs will be used for vertical support of brick facades. Frequency of shelf angles will be determined based on architectural detailing, but they will at least occur at every other floor resulting in no more than two stories supported from a level.
- Structural integrity requirements specified in IBC Section 1616 apply to Category IV buildings that are also classified as high-rise (occupied floors more than 75 feet above fire truck access). The

maximum height of an occupied floor from the lowest adjacent grade is less than 70 feet. Therefore, complying with structural integrity requirements of IBC Section 1616 is not necessary for this building.

Storm Shelter

- The storm shelter will be designed to meet IBC 2018 and ICC 500 code requirements. An independent peer review of the storm shelter design is required prior to permit application. Enhanced special inspections are required during construction. As part of ICC 500 requirements, the contractor must submit a statement of responsibility. The storm shelter will be structurally independent of the main building structure with expansion joints provided on all sides abutting the main building. Storm shelter foundations must also be completely isolated from main building foundations.
- The shelter will be a two-story reinforced masonry structure. Exterior walls will be 12-inch fully grouted Ivany masonry with vertical reinforcement at 8 inches on center and horizontal reinforcement at 16 inches on center. Each elevated floor and roof will have a 6½-inch composite slab on deck, like the remaining areas of Level 1. The slabs will require enhanced reinforcement and will be supported by composite steel wide flange beams and girders.
- All penetrations through perimeter masonry walls and roofs of the storm shelter will require protection from missile impact per ICC-500. Windows and doors must be certified to withstand storm forces and missile impact. All mechanical penetrations greater than 3½ square inches for rectangular (or 2 11/16-inch diameter for round) will be protected with a steel shroud that can withstand missile impact forces.
- Laydown hazards as defined in IBC 305.3 do not affect the proposed storm shelter.
- Falling debris as defined in IBC 305.3 may affect the proposed storm shelter. Falling debris may include façade materials from the new building and any surrounding buildings within 30 feet of the new storm shelter. The weight of falling debris, including an impact factor of 2.0 as specified in IBC section 305.3.3 will be considered in the structural design of the shelter.
- Structural observations performed by a Professional Engineer licensed in the Commonwealth of Pennsylvania are required during shelter construction. These are not considered special inspections.

Additional Geotechnical Investigation

An existing stone and brick masonry wall occurs east of the construction site. Due to the proximity of the wall to the site, and proposed construction adjacent to the wall, stability of the wall could be affected. To properly design new structural tie backs and site features, details of wall construction are needed. Parameters of interest include depth and size of footing, thickness of wall below and above grade, and general material types and strengths. Acquiring this information from original construction drawings may be possible if they are available. Due to the age of the building (circa 1900), drawings may not be available. In the event drawings are not available or if drawing information is not complete, multiple test pits on each side of the wall should be excavated to observe and measure the wall and foundations. B&H recommends these test pits be performed prior to issuing design development documents.