

SMITHGROUP

**Ann Arbor Housing Commission
350 S 5th Ave.**

SCHEMATIC DESIGN NARRATIVE

Date of Report: December 22, 2022

City of Ann Arbor
301 E Huron St., Ann Arbor, MI 48104

SmithGroup Project Number: 14177

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I. INTRODUCTION

A. GENERAL

The Ann Arbor Housing Commission (AAHC) is developing a 294 unit, 312,000gsf mixed-income multi-family residential facility on an existing 34,928sf (.75 acre) parking lot site in Ann Arbor, MI. The site is bounded by Fifth Avenue to the East, William Street to the South, Fourth Avenue to the West, and the existing Ann Arbor Area Transit Authority Blake Transit Center to the North. Over the previous 2 years, SmithGroup has assisted the AAHC in evaluating the development viability and capacity of the site, while also successfully establishing a Planned Unit Development (PUD) designation to pre-entitle and guide future development on the site. The 350 South Fifth Avenue site – often referred to as the Y-Lot in recognition of the previous long-standing YMCA facility on the site – is one of several affordable housing sites being developed by the AAHC with professional design assistance from SmithGroup.

Consistent with the PUD and the AAHC's objectives, the current Schematic Design floor area for the 350 South Fifth development is just under the 900% Floor Area Ratio (FAR) limit per the PUD and underlying D1 zoning.

The 294 units are broken down into two separate, but adjacent and connected towers:

- 17 story West Tower
 - Floor 17: outdoor roof top amenity and enclosed tenant amenity space
 - Floors 3 thru 16: 95 housing units, planned to be fully affordable, with permanently supportive (9%) Low Income Housing Tax Credits; Third floor to include community space with support areas.
 - Floor 2: Supportive clinic, tenant operated store, administrative offices, toilet rooms and generator space
 - Floor 1: Tenant lobby, reception, administrative offices, mail/package room, bike parking and trash room,
- 18 story East Tower (with mechanical penthouse)
 - Floor 18: outdoor roof top shared amenity and 5 housing units and mechanical space
 - Floors 3 thru 17: 194 housing units, planned to be mixed-income, with 80% market rate, and 20% affordable; with amenity on the third floor. The amenity space and south facing units on the third floor will connect to an outdoor terrace.
 - Floor 2: Community spaces, fitness room, amenity space, conference room and building management reception, offices, and toilet rooms
 - Floor 1: Tenant lobby, reception, mail/package room, bike parking, loading and trash room, as well as commercial retail tenant space

The upper portions of the building, above Floor 2, typically include large unitized glazed windows and infill rainscreen panels with terra cotta or fiber reinforced concrete dividing elements that also work to help mitigate sun impacting the south façade. The East Tower includes proportionately greater glazing area, while the West Tower includes greater infill brick masonry.

The Two-Story podium includes a brick masonry enclosure, with second story large windows, and a ground floor with glazed storefront system for retail and resident lobbies along William Street and portions of the South Fourth Avenue and South Fifth Avenue, with a masonry enclosure facing the northern service lane, and rigid canopy.

All facets of the development are intended to integrate design features, amenities, materials and other systems to help reduce stress for tenants, especially those within the permanently supportive housing within the West Tower. To do this, “Trauma-Informed Design” techniques are being incorporated, including daylighting, ample visibility, natural elements such as indoor plants and access to outdoor spaces, as well materials and fixtures that are durable and beautiful, extending sense of belonging and dignity to residents and visitors.

To realize the overall development, consistent with the PUD and the objectives of the AAHC, the AAHC will form a development partnership with a future private developer to be selected through a Request for Proposals (RFP). For professional design and engineering services, the AAHC will engage SmithGroup for full Architecture, Engineering and Site design, documentation and construction contract administration services. Prior to the formation of the developer partnership, the AAHC has requested SmithGroup to design and document the overall development’s Schematic Design package to serve as a basis of design. The basis of design will also include the Site Plan Approval submission, and the combined documentation will inform any future private developer partnership agreements and supporting cost modeling.

For areas used in the FAR calculations, refer to Floor Area Diagram included in the appendix Unit area tabulation is included on the cover sheet of the drawing set. Net square foot area is measured from ‘paint to paint’ and excludes shafts. Gross square foot area is measured from centerline of demising walls, interior face of glass at exterior walls and corridor side of wall at corridors. Refer to Unit Gross Square Foot Area included in the appendix for a graphic representation of unit gross area.

B. OPERATORS

C. ALTERNATES

Structural System: Refer to Structural and Architectural narrative

Interior Finishes

FLOOR

Vinyl Composition Tile (in lieu of polished concrete flooring)

- 12” x 12” tile size, direct glue installation.
- Locations: Community Kitchen.

Hard Tile Flooring (in lieu of polished concrete flooring)

- Hard tile, 12” x 24” porcelain tile with epoxy grout.
- Locations: Lobby

BASE

Tile Base (in lieu of hardwood base)

- Hard tile, 12” high porcelain tile with epoxy grout.
- Locations: Lobby

Acrovyn Base (in lieu of hardwood base)

- 12” high Acrovyn base trim.

- Locations: Lobby, corridors, community lounges/kitchen.

CEILING

- Exposed painted ceiling (in lieu of acoustical ceiling tile)
- Locations: Community lounge/ kitchen.

MILLWORK

Countertops: Solid Surface Material (in lieu of Quartz)

- 2cm thickness, eased edge profile, gloss finish.
- Locations: All countertops with exception of the millwork in the lobby.

D. SCHEDULE

PHASE	ESTIMATED COMPLETION
Schematic Design	Jan - 2023
RFP	Mar - 2023
Design Development	Aug - 2023
Construction Documents	Feb - 2024
Bid/Award/Permit	Jun - 2024
Construction	Jul - 2025
Occupancy	Sep - 2025

II. LIFE SAFETY AND CODE ANALYSIS

A. APPLICABLE CODES AND STANDARDS

- The Authority Having Jurisdiction (AHJ) for this project is the City of Ann Arbor.
- 2015 Michigan Building Code
- 2015 International Fire Code
- 2013 ASHRAE 90.1
- 2015 Michigan Mechanical Code
- 2018 Michigan Plumbing Code
- NFPA 10, Portable Fire Extinguishers, 2013
- NFPA 13, Installation of Sprinkler systems, 2013
- NFPA 14, Installation of Standpipe and Hose Systems, 2013
- NFPA 20, Installation of Stationary Pumps for Fire Protection, 2013
- NFPA 70, National Electrical Code, 2017
- NFPA 72, National Fire Alarm and Signaling Code, 2013
- 2009 ICC / ANSI 117.1 Accessible and Useable Buildings and Facilities
- ASME A17.1, 2010 ed. – Safety Code for Elevators and Escalators, as amended by Michigan Elevator Rules (2014)

B. USE GROUP AND OCCUPANCY

The building will be a non-separated mixed-use occupancy comprised of the following occupancies:

Basement: S-2 MEP/Storage

Level 1: M Mercantile, B Business, S-2 MEP/Storage

Level 2: A-3 Assembly, B Business, S-2 MEP/Storage

Level 3: A-3 Assembly, B Business, R-2 Residential, S-2 MEP/Storage

Level 4-16 (Typical): R-2 Residential, S-2 MEP/Storage

Level 17: A-3 Assembly, R-2 Residential, S-2 MEP/Storage

Level 18: R-2 Residential, S-2 MEP/Storage

C. BUILDING CONSTRUCTION AND LIMITATIONS

The Ann Arbor Housing Commission Building will be classified as a high-rise building and constructed as Type IA construction. The building will comply with high-rise requirements including automatic sprinkler and standpipe system, emergency voice and communication fire alarm system, emergency responder radio coverage, a fire command center, smoke removal facilitation, standby and emergency power, stairway communication systems, smokeproof exit and elevator lobby enclosures, fire service access elevators, and luminous egress path markings.

D. STRUCTURAL FIRE RESISTANCE

As the building most closely resembles Type IA Construction, all new construction will meet the structural fire resistance requirements of MBC Table 601:

STRUCTURAL ELEMENT	FIRE RESISTANCE (HOURS)
Primary Structural Frame	3 ^a /2
Load Bearing Walls - Exterior	3 ^b /2
Load Bearing Walls - Interior	3 ^b /2
Exterior Nonbearing Walls and Partitions	0 ^c /1
Interior Nonbearing Walls and Partitions	0
Shafts and Elevator Hoistways (connecting four or more stories)	2
Shafts and Elevator Hoistways (connecting three or fewer stories)	1
Floor/Ceiling Assemblies	2
Roof/Ceiling Assemblies	1 -1/2 ^b /1

^a Columns supporting only roofs are permitted to be reduced by 1 hour.

^b Elements are permitted to be reduced to the minimum ratings required for Type IB construction.

^c 1 hour rating is required where walls are less than 30 feet from the lot line, expected to be the northern wall of the west tower and the northern canopy structure of the east tower.

E. OCCUPANT LOAD

The number of occupants for whom exit facilities will be provided is based on the following occupant load factors: The most restrictive factors between the MBC and NFPA 101 will be utilized to determine the total occupant load and egress capacity for each floor.

Area Use	Occupant Load Factor (persons/ft ²) MBC
Assembly - unconcentrated	15 net
Business Areas	100 gross
Exercise Rooms w/o Equipment	15 gross
Exercise Rooms w/ Equipment	50 gross
Mercantile	60 gross
Residential	50 gross
Storage/MEP Rooms	300 gross

F. EXIT CAPACITY

The capacity of means of egress components for the area served shall be sufficient to accommodate the calculated occupant load on each level. The following exit capacity factors are applicable.

- i. Stairways: 0.2 inches of clear width per person.
- ii. Doorways, corridors, and ramps: 0.15 inches of clear width per person.

Ann Arbor Housing Commission has four egress stairs. All four stairs serve the basement level through level 16. Three of the stairs serve level 17 and 18. The stairs that serve up to level 18 are 42, 44, and 46 inches clear for a total capacity of 210, 220, and 230 occupants, respectively. The stair that stops at Level 16 is 48 inches clear for a capacity of 240 occupants. Each door to each stair is 34" clear for an exit capacity of 226 occupants. Using the most restrictive egress component for each exit, the total exit capacity is 882 occupants for Levels Basement through 16 and 656 for Level 17 and 18.

G. ARRANGEMENT OF MEANS OF EGRESS

At least two exits in a high-rise shall be required to be separated by one-fourth of the maximum diagonal dimension of the building, or 30 feet, whichever is less. The distance shall be measured along the most direct path between the closest points of each exit.

Maximum travel distance, common path of travel, and dead ends in corridors for a fully sprinklered building in accordance with MBC are outlined below.

Occupancy	Maximum Travel Distance (ft)	Maximum Common Path of Travel (ft)	Maximum Dead End (ft)
Business (B)	300	100	50
Residential (R-2)	250	125	50
Assembly (A-3)	250	75	20

All travel distances will be measured along a rectilinear path of travel and avoid building obstructions.

H. FIRE SEPARATION

Per MBC §420, walls separating dwelling units are to be separated from each other and other occupancies with a 1-hour fire resistance rated partition. Additionally, corridors within Group R occupancies are required to be protected with a 30-minute fire rated partition. As the building will be provided with a new automatic sprinkler system, smoke compartments are not required in accordance with NFPA 101 §29.3.7.1.

I. SMOKEPROOF ENCLOSURES

Per MBC §403.5.4 requires stairways and elevators to be smokeproof enclosures in accordance with MBC §1023.11 and MBC §3006, respectively. Stairs will be accessed via vestibules enclosed by 2-hour fire barriers with natural or mechanical ventilation in both the stairwell and vestibule. Elevator hoistways will be protected by enclosed elevator lobbies. As an alternative to either, stairwell and/or elevator hoistway pressurization may be provided in accordance with MBC §909.20.5 and §909.21, respectively. A rational analysis shall be provided with construction documents to confirm all criteria are met.

III. SITE CIVIL AND LANDSCAPE

A. PROJECT LIMITS

The property consists of 32,670 sq ft (0.75 acres). Site improvements will extend beyond the property to include adjacent streetscape and improvements on the adjacent Ann Arbor Area Transit Authority (AAATA) property. Total area of disturbance to accommodate the future building and site improvements is estimated to be 45,900 sq ft. All work proposed on AAATA property shall be priced separately. Fourth Avenue reconstruction will take place concurrently with the construction of 350 S. Fifth. Streetscape and utility improvements along Fourth Avenue should also be priced separately, as funding may come from separate sources. Refer to the preliminary Dimensional Layout Plan for extents of improvements.

B. VEHICULAR CIRCULATION

The project includes two vehicular lanes: a 12.5'-wide service lane for the proposed building and a 28'-wide bus lane and bus loading area to support AAATA operations. The vehicular lanes and associated drive approaches are anticipated to be heavy-duty concrete. The bus lane and service lane are separated by building columns surrounded by 6-inch curbs. The bus lane and loading area will have a 6-inch curb. The service lane and egress zone are flush and are separated by bollards. There is no on-site parking provided.

C. PEDESTRIAN CIRCULATION

The project includes new public sidewalk and streetscape improvements adjacent to the building, including 6-inch curb. A 5'-wide egress zone is provided on the north side of the building. A new loading area for buses is provided and connects to the existing loading area adjacent to the site via a set of steps, ramp, and small plaza. Extents of new concrete on AAATA property is approximate. Concrete sidewalks shall be 6-inches. Unit pavers are proposed for the plaza and ramp. The ramp and stairs require handrails to meet ADA standards. Tactile warning strips shall be located at all street crossings and drive approaches.

The site design of the bus platform and connection to the existing transit center is preliminary and will likely be refined based on coordination with DTE and AAATA.

D. GRADING, EARTHWORK, AND REMOVALS

As mentioned previously, the existing site is a porous asphalt surface parking lot. It was previously the site of a recreational use building which was demolished in 2002. Buried building foundations and abandoned utilities will need to be removed.

The site will need to be cleared of all existing pavement and curbs, vegetation, and site amenities such as bike hoops, site lighting, benches, signs, bollard, concrete planters. Eighteen trees of various sizes are anticipated to be removed, eight of which are on AAATA property. Benches and bike hoops are to be removed and salvaged. Bus shelters on Fifth Avenue shall be removed and salvaged for use by AAATA elsewhere. Two existing transformers and transfer switches shall remain in place but are being considered for relocation pending discussions with DTE.

The existing site slopes five feet from east to west at approximately 2-percent. Grades will be changed minimally as to not impact the adjacent street elevations. Some fill will be required on the north side

of the site to make a connection to the existing Blake Transit Center platform. All pedestrian areas will be graded to accommodate ADA standards.

E. STORM WATER MANAGEMENT AND DRAINAGE

The existing site does not exist within a floodplain. Soil borings are currently in progress by SME and a geotechnical report will be provided upon completion. SME is also currently completing infiltration testing for site as required by the city of Ann Arbor. Based on historical geotechnical information and environmental evaluations completed by SME, it is anticipated, and assumed, that infiltration will not be feasible on site.

This site is within the jurisdiction of the City of Ann Arbor. A review by Washtenaw County Water Resources is not required. Meetings have occurred between SmithGroup, City of Ann Arbor staff, and WCWRC staff. Design standards shall adhere to the City of Ann Arbor and the Unified Development code.

Within those standards, it states all runoff generated by proposed impervious surfaces must be conveyed into a stormwater storage facility for water quality treatment and detention prior to being discharged from the site. Detention requirements also state that the volume of storage provided for flood control shall be designed for the 100-year frequency storm. If it is deemed that infiltration cannot be provided on site, the site must provide detention for the 100 year storm +20%.

The site is 0.75 acres designed with 98% imperviousness. Roof drains will collect stormwater from the building areas and direct them to an underground detention system in the northeast portion of the site. Curb inlets will collect runoff from the bus lane and parking areas and direct them to the underground detention system. The underground detention system outlets to a proposed manhole that connects to the city storm sewer on the west side of the site. The connection that is currently shown is to an existing 15" City of Ann Arbor Concrete pipe; this pipe will be relocated and reconstructed with the Fourth Avenue Streetscape reconstruction project previously mentioned. The underground detention system is sized for the 100 year event + 20% which accounts for not infiltrating. The allowable release rate is 0.15 cfs/acre. It is estimated that 16,100 cf of detention volume is required.

F. UTILITIES

See stormwater management and drainage above for details.

Sanitary sewer and water utilities are reviewed by The City of Ann Arbor. All utility connections will follow guidelines set forth by the City of Ann Arbor.

The proposed paths for the sanitary sewer is to exit the south side of the building and connect to the existing 10-inch sewer main running along the south side of William Street. Two 10" sanitary connections are required.

The site will have 2 water connections. Both connections will be made on the south east side of the building along Williams Street. One 6" lead will be for water service to the building and the other 6" lead will provide fire protection. Both leads will connect to the existing 12" water main on the north side of William Street within the existing bikeway

Most existing hydrants surrounding the site will be maintained. One alteration will be done along the north east side of the site. An existing hydrant is located in the proposed drive path. This hydrant will be moved north approximately 60'. Existing and proposed hydrants will be maintained to ensure adequate building coverage as required by all applicable codes.

Natural gas, electrical, and telecommunication services will be provided on site to make connections with the building as determined by the Mechanical and Electrical Engineers. Connections will be made into existing facilities along the west side of the building site.

The following are utility removal and proposed additions:

Removals

Existing Watermain 10 LF

Existing Storm 0 LF (storm removal to be included in Fourth Ave Streetscape redesign)

Proposed

Sanitary Sewer 90 LF

Watermain 85 LF (includes hydrant relocation)

Storm Sewer 370 LF

Gas 80 LF

G. SITE AMENITIES AND LANDSCAPE

The amenity zone of public sidewalk improvements shall include benches, curbed planters with canopy trees, and bike hoops. Three existing cobra street lights will be replaced with pedestrian-scale globe lights to match city standards - the location, type, and quantity is to be determined.

The proposed bus loading area will include landscape beds and canopy trees, trees in grates, 18 to 24-inch-tall concrete seat and retaining walls, and benches. A screen wall is proposed between the service lane and bus lane to visually separate the bus area from 'back-of-house' building operations. The material of the screen wall is yet to be determined but may be perforated steel. Festoon lighting is proposed over the plaza that connects the existing and proposed platforms.

Curbed planters will include three-inch-caliper canopy trees, one-gallon ornamental grasses and perennials, 24-inches of planting media, 24-inches of drainage stone, and two-inches of mulch. Planters adjacent to the bus loading area will include 3-inch-caliper trees as shown on the plans, one-gallon ornamental grasses and perennials, five-gallon shrubs, 24-inches of planting media, and two-inches of mulch. Landscape beds and curbed planters will likely be irrigated.

Snow in the streetscape will be stored in curbed landscape beds. AAATA has a snowmelt system on their existing site, and it may be possible they will want to include snowmelt on the new bus loading area. This needs to be further coordinated with AAATA and will likely not be part of the 350 S. Fifth project cost.

IV. STRUCTURAL

A. PRELIMINARY STRUCTURAL SYSTEMS

The structural systems will be designed for efficiency, flexibility and constructability. The structure(s) will be designed as a completed structure to support in-place design loads as described.

New structural systems will be provided for the new 22-story, high-rise housing development. The building will include a basement and retail space at the lower level(s). The building will be designed for Risk Category III as defined by the Michigan Building Code (MBC). The building will be configured with a column grid system that is approximately 30'-0" x 30'-0" on the lower levels. The width of the building will be reduced on the upper floor levels. The floor-to-floor heights will be dependent upon the structural and distribution systems selected.

Construction methods, procedures, and sequencing is the Contractor's responsibility. This includes and additional supports, bracing, and shoring needed to support forces imposed during handling and erection.

The foundation system is anticipated to consist of either deep augercast pile foundations or a mat foundation. A geotechnical investigation is needed to confirm the recommended foundation system and allowable design capacities. The foundations will be designed accordingly to accommodate the site-specific soil conditions. At the building perimeter the column and wall foundations will bear a minimum of 4'-0" below the lowest grade for frost protection; foundations where frost is not a concern will be located such that the tops of foundations will be a minimum of 1'-6" below the slab on grade to provide adequate space for underground utilities.

The ground floor slab is anticipated to consist of a 5" thick reinforced cast-in-place slab on grade placed on a 15 mil Class A vapor barrier over top of properly prepared subgrade. All sub-grade structural elements, pits, sumps and trenches will be constructed of cast-in-place reinforced concrete. New concrete frost slabs and foundations will be provided at all exterior doors; reinforced with epoxy-coated reinforcing.

The perimeter of the basement will be enclosed with a 16" thick cast-in-place reinforced concrete basement wall with a continuous foundation. The basement wall will be waterproofed, insulated, and will have perimeter drainage. The basement walls will not be backfilled until the ground floor slab on grade and first floor supported slab have been poured and reached a minimum of 75% of their design strength as these diaphragms are used to support the top and bottom of the basement wall. The rest of the perimeter of the building will have a 16" wide concrete grade wall with a continuous foundation.

The structure will be constructed of non-combustible material. The majority of the structural framing will require a fire-rating. The floor and roof framing will be designed for strength, as well as, to limit deflections per the recommendations of the building and design codes for all of the applicable dead and live load conditions. Typical floors will also be designed to limit vibration per AISC recommendations to provide human comfort. As a minimum, the peak acceleration due to walking excitation will be limited to 0.5% of the acceleration due to gravity.

New steel and concrete materials used for construction will contain recycled content and be regional materials to the extent possible. Fly ash, Portland limestone cement, and other acceptable replacement materials will be used as a replacement of Portland cement, to the extent possible. Additional energy conservation and sustainability opportunities will be considered, including measures to reduce the embodied carbon of the structural systems.

There are two options, a structural steel and a cast-in-place concrete option, being considered for the superstructure of the building:

STRUCTURAL STEEL OPTION

The structural systems for the superstructure of the buildings constructed of structural steel will consist of steel w-shape columns (W14's) will support composite steel girders (W24's) and steel beams (W18's and W21's). The composite steel beams will be located at a maximum spacing of 10'-0" on center. All structural steel girders and beams will have headed shear studs welded to their top flange.

The beams and girders will support a composite slab that will consist of 3" composite metal floor deck with 3 1/4" light weight concrete topping. At a minimum, the composite slab will be reinforced with W2.9xW2.9 - 6 x 6 welded wire fabric. Additional steel reinforcing will be provided as required to control cracking at slab edges, penetrations, corners and over top of girders. Steel bent plates with headed shear studs will provide a pour stop around the entire building perimeter and at all of the openings.

The roofs will consist of structural steel beams and girders supporting 1 1/2" metal roof deck. The roof beams will be spaced at a maximum spacing 6'-6" on center and the deck will be welded to meet factory mutual requirements. In addition to the recommended live loads, the roof will be designed to support roof-mounted mechanical and electrical, food service, and communications equipment. The roof may also have enclosures for stair, and elevator overrun, a partial penthouse, and/or rooftop mechanical equipment surrounded by a screen wall enclosure supported by structural steel framing.

The canopy above the transit center will be constructed of structural steel beams and girders supporting 1 1/2" metal roof deck. The roof beams will be spaced at a maximum spacing 6'-6" on center and the deck will be welded to meet factory mutual requirements. The framing to support the canopy will penetrate the exterior wall at column grid lines where required.

The proposed lateral force resisting system to withstand the wind and seismic lateral forces on the building will be constructed of ordinary concrete shear walls at stair and elevator shafts. A braced frame will be provided along column grid line A

Framing along the east end of the building along column grid line B between column grid lines 9 and 11 at each floor level will cantilever to support the discontinuous column at the intersection of B and 11. 36 inch deep long span beams will be provided along column line B between column grid lines 4 and 6 at each floor level to support the discontinuous column at the intersection of B and 5. Alternatively sloped columns can be provided between levels 1 and 3 to eliminate the need for the deep beam at each level

**AAHC 350 S 5th AVE.
SCHEMATIC DESIGN**

Structural steel beam connections including simple shear, beam-to-beam moment, and braced frame connections shall be a delegated design; design of the connections shall be performed by a registered Professional Engineer and calculations shall be signed and sealed.

To achieve the fire rating, spray-applied fire-proofing will be required on the structural steel and metal roof deck. In areas where the steel framing is exposed to view the steel will receive an intumescent coating. The unprotected composite slab will provide a 2-hour fire rating per UL.

All framing that is exposed to weather will be galvanized; this includes, but is not limited to, canopy and balcony framing, screen wall framing, all framing located above the roof and all framing provided to support the exterior wall. All framing that is exposed to view will be AESS.

The steel weights will approximately be as follows for preliminary estimating purposes:

TYPICAL SUPPORTED LEVELS

- | | |
|--|-------|
| 1. Typical floor framing | 8 psf |
| 2. Mechanical, electrical and plumbing spaces | 8 psf |
| 3. Additional approximate steel weight considerations: | |
| a. Connections/bolts | 1 psf |
| b. Columns | 3 psf |
| c. Misc. steel including slab edge plates, opening steel, etc. | 1 psf |
| d. Additional tonnage for braced frames | 3 psf |
| e. Additional tonnage for support of transfer columns | |
| f. Additional tonnage for support of exterior skin | |
| g. Additional tonnage for support of interior walls, hanging toilet partitions, and other miscellaneous architectural features | |
| h. Additional tonnage for steel framed stairs and elevator supports | |

CAST-IN-PLACE REINFORCED CONCRETE OPTION

The structural systems for the superstructure of the buildings constructed of cast-in-place reinforced concrete. Concrete columns (24"x24") will support 10" thick two-way concrete flat floor and roof slabs. Concrete columns may be reduced in size on upper levels or may be rectangular to work with space planning. Where openings are located through slabs, beams may provided that could be as much as 16"-20" deep.

The canopy above the transit center will be constructed of structural steel beams and girders supporting 1 1/2" metal roof deck. The roof beams will be spaced at a maximum spacing 6'-6" on center and the deck will be welded to meet factory mutual requirements. The framing to support the canopy will penetrate the exterior wall at column grid lines where required.

The proposed lateral force resisting system to withstand the wind and seismic lateral forces on the building will be constructed of ordinary concrete shear walls at stair and elevator shafts. A braced frame will be provided along column grid line A.

A cantilevered concrete beam will be provided at the east end of the building along column grid line B between column grid lines 9 and 11 at each floor level to support the discontinuous column at the intersection of B and 11. A 45 inch deep beam will be provided along column line B between column grid lines 4 and 6 at each floor level to support the discontinuous column at the intersection of B and 5. alternatively sloped concrete columns between levels 1 and 3 can be provided to eliminate the deep beam at each floor level. Concrete will achieve fire rating, without the need for additional spray-applied fireproofing.

STRUCTURAL STEEL CONSTRUCTION

Pros	Cons
Future flexibility - adding openings through slabs is easier	Deeper structural depth = 24" + 6.25" = 30.25"
Lighter building weight, less seismic loads, potentially smaller foundations	Increased building height / exterior enclosure
Structural steel typically is most cost-effective and lots of capable sub-contractors are available in Michigan	Fireproofing required, will be required to be patched for future modifications
Anticipate lower embodied carbon for steel construction	Increased structural depth provides less space for MEP utilities routing and coordination and increases the potential need for soffits and lowered ceilings in locations of high congestion. —
Weather is less of an impact on erection	
Typically, steel construction erection can be done faster	

CAST-IN-PLACE REINFORCED CONCRETE CONSTRUCTION

Pros	Cons
Reduced structural depth = 10" in most areas. Isolated locations may have 16"-18" deep framing.	Adding openings through slabs is more difficult
Reduced building height, less enclosure. May allow for an additional floor within the same height as a steel-framed building	Heavier building weight, larger seismic loads, potentially larger foundations
Inherent fire proofing, no additional fireproofing required	Anticipate local sub-contractors may be more limited
Reduced structural depth provides more space for routing MEP utilities and reduces the potential need for soffits and lowered ceilings in locations of high congestion.	Anticipate more embodied carbon for concrete construction
	Weather may play a factor in concrete installation
	Typically, concrete construction installation may take longer

STRUCTURAL SUPPORT FOR NON-STRUCTURAL ELEMENTS

The site class for the building is classified at a seismic site class C which results in a Seismic Design Category (SDC) of "A" for the building. This does not require non-structural architectural and MEP components to be restrained for seismic per ASCE 7.

The design of the building exterior is being developed; it is anticipated that the exterior walls will be constructed of a variety of materials including glass curtainwall and metal panel systems. Design of the curtainwall, cold-formed metal framing, and their connections shall be signed and sealed by a registered Professional Engineer.

The curtainwall will be attached to each floor slab and at the roof; the gravity load will be transmitted to the floor slabs at each level, lateral connections will be directly to the floor and roof diaphragms or will be located at the top of perimeter steel framing (within the top 1/3 of the beam depth). The precast will be attached to the columns at each floor level; the gravity load will be transmitted directly to the columns and lateral connections will be directly to the floor and roof diaphragms or will be located at the top of perimeter steel framing (within the top 1/3 of the beam depth).

The cold formed metal framed walls that are a back-up for brick or concrete masonry fascia will be designed to limit drift/deflection to H/1000 in order to provide a rigid back-up for the fascia. All other exterior cold formed metal framed walls shall be designed to limit drift/deflection to H/720. Additional steel lintels, girts and wind posts will be provided as required to support the exterior wall system above openings and wall system transitions.

B. GOVERNING CODES AND REFERENCES

BUILDING CODES

- 2015 Michigan Building Code (2015 MBC)
- 2015 Michigan Building Rehabilitation Code (2015 MEBC)
- 2010 ASCE Minimum Design Loads for Buildings and Other Structures (ASCE 7-10)

STRUCTURAL DESIGN CODES

- American Concrete Institute, Building Code Requirements for Structural Concrete (ACI 318-14)
- American Concrete Institute, Details and Detailing of Concrete Reinforcement (ACI 315-99)
- Specifications for Structural Concrete, (ACI 301-10)
- American Institute of Steel Construction, Steel Construction Manual, LRFD 14th Edition (AISC LRFD)
- RCSC, Specification for Structural Joints Using ASTM A325 or A490 Bolts
- Structural Welding Code (Steel - AWS D1.1), (Sheet Steel - AWS D1.3), (Reinforcing Bars - AWS D1.4)
- 2013 Masonry Standards Joint Committee, Building Code Requirements for Masonry Structures, (TMS 402-13/ACI 530-13/ASCE 5-13)
- 2013 Masonry Standards Joint Committee, Specification for Masonry Structures (TMS 602-13/ACI 530.1-13/ASCE 6-13)
- Steel Deck Institute, Code of Standard Practice, (SDI)
- American Iron and Steel Institute, North American Specification and for the Design of Cold Formed Steel Structural Members, 2012 Edition (AISI S100-12)
- American Iron and Steel Institute, North American Standard for Cold-Formed Steel Structural Members Commentary, 2015 Edition (AISI S240-15)
- American Iron and Steel Institute, North American Standard for Seismic Design of Cold-Formed Steel Structures, 2015 Edition with Supplement 1 (AISI S400-15)

C. TYPICAL MATERIALS

CONCRETE

Foundations, spread footings, pile caps	f'c= 3,500 psi, normal weight
Augercast piles	f'c= 3,500 psi, normal weight
Grade walls, grade beams, formed piers, pits, trenches	f'c= 4,500 psi, normal weight
Basement and retaining walls	f'c= 4,500 psi, normal weight
Frost pad slabs	f'c= 5,000 psi, normal weight
Slab on grade	f'c= 4,000 psi, normal weight
Concrete shear walls	f'c = 5,000 psi normal weight
All other concrete	f'c= 4,500 psi, normal weight
Steel Option	
Supported floor slabs (composite construction)	f'c = 4,000 psi, light weight
Supported exterior slabs, concrete roofs	f'c = 4,000 psi, normal weight
Concrete Option	
Supported floor slabs, beams, etc.	f'c = 5,000 psi, normal weight
Concrete columns	f'c = 6,000 psi, normal weight

REINFORCING

Reinforcing bars	ASTM A615, Grade 60
Reinforcing bars	ASTM A706, Grade 60
Welded wire fabric	A185

STRUCTURAL STEEL

Wide flanges and tees	ASTM A992, Grade 50
Angles, channels and plates	ASTM A36, Grade 36
Square and rectangular hollow structural steel	ASTM A500, Grade B, 46 ksi
Round hollow structural steel	ASTM A500, Grade B, 42 ksi

METAL FLOOR DECK

2" deep, 18-gauge, composite metal deck	ASTM A653, Grade 33, G60
3" deep, 20-gauge, composite metal deck	ASTM A653, Grade 33, G60

METAL ROOF DECK

1½" deep, 20-gauge, type B (wide rib) deck	ASTM A653, Grade 33, G90
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CONNECTIONS

Bolted connections	ASTM A325 or A490 bolts and shall conform to AISC
Welds	E70xx electrodes
Anchor bolts	ASTM F1554, grade 55 ksi

D. TYPICAL DESIGN LOADS

RISK CATEGORY III

LIVE LOADS	Surface	Concentrated
Roof		
Ordinary flat or pitched	20 psf	300 lbs
Accessible roofs, plazas, and terraces	100 psf	2000 lbs
Floors		
Public Areas, lobbies & retail spaces	100 psf	2000 lbs
Offices with partitions*	70 psf	2000 lbs
Private residential spaces	40 psf	
Public corridors	100 psf	2000 lbs
Stairs and exits	100 psf	300 lbs
Mechanical penthouse	150 psf	2000 lbs
Light storage	125 psf	
Heavy storage	250 psf	
Other areas	100 psf	

Live loads will be reduced as allowed by the [IBC] and ASCE 7.

* 20 psf live load has been included to account for partitions

SUPERIMPOSED DEAD LOADS

Roof	
Roofing, insulation	5 psf
Ceiling, ducts, sprinklers, lighting	10 psf
Supported floor	
Ceiling, flooring, ducts, sprinklers, lighting	10 psf

FLOOD LOADS

Proposed Building Finish Floor Elevation	191'-0"
Design Flood Elevation	185'-0"

The building finished floor is located above the design flood elevation; therefore, the building does not need to be designed for flood loads. Any subgrade elements that extend below the design flood elevation will be designed for hydrostatic loads.

WIND LOADS

As per the MBC and ASCE 7	
Basic wind speed	120 mph
Wind importance factor	1.00
Exposure	C

SNOW LOADS

As per the MBC and ASCE 7	
Ground snow load, p_g	20 psf
Exposure category	C
Exposure factor, C_E	
Thermal factor, C_T	1.0
Importance factor, I_s	1.1
Flat roof snow load, p_f	22 psf
Minimum flat roof snow load, p_m	22 psf

Snow loads will be increased for drift as required by the MBC and ASCE 7.

SEISMIC LOADS

As per the MBC and ASCE 7	
Spectral response acceleration, short periods, S_s	0.094 g
Spectral response acceleration, 1-sec periods, S_1	0.048 g
Seismic importance factor, I_E	1.25
Site class (to be confirmed by Geotech)	C
F_a	1.20
F_v	1.70
S_{DS}	0.075 g
S_{D1}	0.054 g
Seismic design category	A
Seismic design method	Exempt, General structural integrity

E. DEFLECTION CRITERIA

ROOF FRAMING

Maximum live load deflection	L/360
Maximum live load plus dead load deflection	L/240

FLOOR FRAMING

Maximum live load deflection	L/360
Maximum live load plus dead load deflection	L/240
Maximum superimposed deflection when supporting CMU	L/600 or 3/8"

ELEVATOR FRAMING

Elevator machine supports	L/1666
Elevator guide rail supports	1/8"

CURTAIN WALL SUPPORT MEMBERS

Will be designed for architectural deflection and tolerance criteria	
Maximum live load deflection	5/16"
Maximum live load deflection at cantilevers	+/-5/32", 5/16" total

LATERAL DRIFT OF BUILDING

Wind loads; designed for serviceability of architectural materials	H/400
Seismic loads	As required by ASCE 7

FLOOR VIBRATION

Floor vibration will be evaluated per AISC recommendations to provide human comfort. In general, the primary vibration concern is foot-fall impact on the floor slabs, rather than the steady state mechanical or scientific equipment vibration. As a minimum, the peak acceleration due to walking excitation will be limited to 0.5% of the acceleration due to gravity. Any mechanical and/or scientific equipment that induces vibration should be isolated from the rest of the building.

LEED / SUSTAINABILITY

The steel and concrete materials used for construction will contain recycled content and be regional materials to the extent possible. Fly ash, portland limestone cement, slag, etc. shall be used as a replacement of portland cement, to the extent possible. Additional energy conservation and sustainability opportunities will be reviewed in the future.

Considerations for reducing building weights and tonnage will be made to reduce the amount of embodied carbon.

G. SPECIAL INSPECTIONS

Special inspections of fabrications and on-site construction required by the IBC include:

- Inspection of fabricators
- Inspection of steel construction

**AAHC 350 S 5th AVE.
SCHEMATIC DESIGN**

Inspection of concrete construction
Inspection of masonry construction
Pile foundations
Wall panels and veneers
Sprayed fire-resistant materials
Structural observations

V. ARCHITECTURAL

A. EXISTING CONDITIONS

The project site currently functions as a parking lot. The former YMCA building has been removed but the foundations for that building were left in place. It is expected that the YMCA building foundations will need to be removed prior to installation of foundations for this project. A drawing that shows the new construction overlay with the YMCA building is included in the Appendix.

B. EXTERIOR CONSTRUCTION

Roof Assemblies

1. Main Roof / Elevator / Stair
 - a. 2-layer Modified Bituminous Roofing System
 - b. White reflective coating with SRI value as described by LEED.
 - c. Modified Bituminous Granulated Cap Sheet with white granules
 - d. Modified Bituminous smooth base sheet
 - i. BOD: Siplast; Paradiene 20/30
 - e. Adhered Cover Board
 - i. 1/2" Dens Deck Prime
 - f. Adhered Rigid Insulation
 - i. Polyisocyanurate with coated glass facers on both major surfaces.
 - ii. 6" thick (R30)
 - g. Mechanically attached Substrate board – for metal decks
 - h. Adhered Air/Vapor Retarder
 - i. Self-Adhered Sheet Membrane, minimum 30 mils (for substrate boards on metal deck)
 - ii. 2-ply built up asphalt roof system (for normal weight concrete decks)

Terrace

2. IRMA Roof Assembly
 - a. Wind uplift Resistant Pavers meeting SRI value as described by LEED.
 - b. BOD: Tile Tech Porcelain Tile Roof Paver on 24" sq tray on pedestal support system with perimeter hold down trim
 - c. Molded sheet drainage panel
 - d. XPS insulation, 40psi, 7.5" thick (R30)
 - e. Molded sheet drainage panel
 - f. Protection course
 - g. Hot fluid-applied waterproofing membrane
 - i. BOD: American Hydrotech, 6125MM
 - h. Slope achieved by sloped normal weight concrete on top of level structural slab, min. 2" thick at drains.

Canopy

3. Decorative Ballast Roof Assembly
 - a. Large river stone aggregate ballast meeting SRI value as described by LEED
 - b. Molded sheet drainage panel
 - c. Protection course
 - d. Hot fluid-applied waterproofing membrane
 - i. BOD: American Hydrotech, 6125MM
 - e. Slope achieved by sloped normal weight concrete on top of level structural slab, min. 2" thick at drains.

4. Window washing/Fall protection anchors:
 - a. Roofs without pavers: Provide anchor points, min 10' o.c. for fall protection and removeable window washing support system.
 - b. Roofs with paver system: provide anchor post below paver system, min. 10' o.c. for removable davit arm. Locate anchors within 2' of edge and at center of paver tile.
 - c. Access to canopy will be via ladder at ground level.
5. Exterior Wall Assemblies
 - a. Wall Type A411, elevator/stair cores
 - i. [Interior side] Layer of 5/8" thick gypsum board on 1 1/2" metal furring on 14" cast-in-place concrete, moisture/weather barrier, 4" insulation, 2" air space, and brick veneer [Exterior side].
 - b. Wall type A414 Level 1 and Level 2 (brick masonry with storefront glazing)
 - i. [Interior side] Layer of 5/8" thick gypsum board on 8" cold-formed metal stud framing, 5/8" exterior sheathing, moisture/weather barrier, 4" insulation, 2" air space, and brick veneer or high-performance concrete panel with alum. storefront [Exterior side]. Studs to be designed for L/1000 deflection.
 - c. Wall type A324 Level 3-17 east tower (modular, pre-fabricated wall panel with terra cotta rainscreen surround and high-performance concrete infill panels)
 - i. [Interior side] Layer of 5/8" thick gypsum board on 8" cold-formed metal stud framing, 5/8" exterior sheathing, moisture/weather barrier, 4" insulation, 2" air space and façade materials as shown. Including:
 - ii. extruded terra cotta (profiled frame) on sub-girt system
 - iii. high-performance concrete panel
 - iv. Storefront fixed windows
 - d. Wall type A414B (terra cotta rainscreen) Level 3-17 west tower
 - i. [Interior side] Layer of 5/8" thick gypsum board on 8" cold-formed metal stud framing, 5/8" exterior sheathing, moisture/weather barrier, 4" insulation, 2" air space and façade materials as shown. Including
 - ii. extruded terra cotta (profiled frame) on sub-girt system
 - iii. brick veneer
 - iv. Storefront fixed windows
 - e. Wall type A414 Level 17 (west tower) & Level 18 and (east tower)
 - i. [Interior side] Layer of 5/8" thick gypsum board on 6" cold-formed metal stud framing, 5/8" exterior sheathing, moisture/weather barrier, 4" insulation, 2" air space, and brick veneer with alum. storefront as shown [Exterior side].
 - f. Wall type A754 Level 17 (west tower) & Level 18 and 19 (east tower)
 - i. [Interior side] Layer of 5/8" thick gypsum board on 6" cold-formed metal stud framing, 5/8" exterior sheathing, moisture/weather barrier, 4" insulation, and metal panel on Z-girt system with alum. storefront as shown [Exterior side].

Exterior Ceilings

6. Underside of West Tower/Bus Canopy
 - a. Armstrong, METALWORKS Linear - SYNCHRO Ceiling Planks (accessible); M1 - unperforated; panel size = 13" x 96"; color: tech black
7. Level 1 East and West Entry Alcove Ceilings/Soffits
 - a. Basis of design: Armstrong, METALWORKS Torsion Spring (accessible); M1 - unperforated; panel size = 24" x 96"; painted finish
 - b. Alternate 1: Plaster; painted finish
 - c. Alternate 2: Exterior Gypsum Board; painted finish

Exterior Doors

8. At Glazing systems: Full light with medium style
9. Swing doors: insulated hollow metal
10. Overhead door: insulated coiling door

Exterior Signage

11. Screen at Grid Line B
 - a. Parasoleil Eclipse Series – Lunar Screen System (face mounted to columns with intermediate floor-mounted posts)

Waterproofing

12. Basement Walls:
 - a. Waterproofing design assumes that the building is not in the ground water
13. At east, west and south walls:
 - a. Provide excavation support and protection system minimum of 4' from basement wall
 - b. Provide post-applied waterproofing membrane with protection course full height of wall, lap over foundation. Post-applied waterproofing to be hot fluid-applied waterproofing
 - c. Provide 4' of board insulation at perimeter.
14. North wall:
 - a. Provide hot fluid-applied waterproofing full height of wall, lap over foundation
 - b. Provide 4' of board insulation at perimeter.
15. Trash rooms:
 - a. Traffic coating on normal weight concrete pavement on molded sheet drainage panel with leak detection system on protection course fully embedded in topcoat and adhered to hot fluid-applied rubberized asphalt membrane
16. Recessed entries/areas over basement:
 - a. Normal weight concrete pavement on molded sheet drainage panel with leak detection system on protection course fully embedded in topcoat and adhered to hot fluid-applied rubberized asphalt membrane
17. Metal grating at areaways:
 - a. BOD: Wheels n' Heels Metro type 42-WH-4 8" x 1/8" grade 50 with slip resistant surface and galvanized finish and rated for heavy trucks (AASHTO HS20) by Ohio Gratings, Inc.
18. Louvers:
 - a. At generator room and substation areaway: Acoustic Louvers – BOD: KCAL-1-12 (48" x 48" x 12") by Kinetics Noise Control; fluoropolymer coating in custom color at generator room, standard color at areaways.
 - b. At all other locations: Drainable stationary extruded aluminum louver, fluoropolymer coating in custom color.

C. INTERIOR CONSTRUCTION

1. Fireproofing
 - a. Utilize cementitious fireproofing to fireproof concealed steel framing. Utilize intumescent coating to fireproof steel that is exposed to view. Refer to Life Safety narrative for required ratings.
2. Interior Wall Assemblies
 - a. Stair and elevator walls are 14" concrete (refer to structural narrative) with 5/8" gypsum board on 1 1/2" metal furring
 - b. Basement walls: 8" CMU to underside of structure (fire ratings as indicated)
 - c. Clear anodized Aluminum Storefront with 1/4" glazing.
 - i. Interior Vestibule walls will match exterior glazing assembly, including insulated glazing.

- d. Clear anodized Aluminum two-hour fire rated glazing assembly at Stair W-ST2 on levels 2 and 17.
 - e. Unit Demising walls and Corridor walls: unbalanced wall of two layers Type X gypsum board on one side and one layer Type X gypsum board on opposite side to achieve STC 50 as required by code (MBC 1207.2) and 1-hour fire rating.
 - f. Other one hour fire rated walls: one layer Type X gypsum board each side of metal stud.
 - g. Two hour rated walls: two layers Type X gypsum board each side of metal stud.
 - i. The walls surrounding the generator room on the second floor will have double studs with acoustical batt and 1" air space.
 - h. Two Hour rated Shaft walls: two layers Type X gypsum board on C-H studs with 1" SLC gypsum board on shaft side.
 - i. All other walls: shall be 5/8" Type X gypsum board on metal stud, non-rated
 - i. The walls surrounding the fitness room on the second floor will have double studs with acoustical batt and 1" air space.
 - j. General Partition notes:
 - i. Use cementitious backer units with waterproofing membrane at shower walls.
 - ii. Use Glass-Mat gypsum board at tile walls that are not shower walls.
 - iii. Gypsum board shall also be mold-resistant type for the following conditions:
 - 1. If installed prior to the building being enclosed
 - 2. Shaft wall systems
 - 3. Mechanical room walls
 - 4. Electrical room walls
 - 5. Bathroom and toilet room walls and ceilings
 - 6. Janitor closet walls
 - iv. Wall blocking: provide 16 GA metal or solid treated wood blocking in all walls that support wall mounted items including shelving, equipment, toilet accessories, handrails, wall cabinets, etc.
 - 1. Dwelling units will be defined as Type A or Type B Units. Type A units are accessible units that will include grab bars at the toilet and shower/bath locations. Type B units shall have blocking at toilet and shower/bath locations so that a grab bar can be installed in the future. See the cover sheet for Type A units and Type B units.
 - v. Provide acoustical batt, acoustical outlet box pads and acoustical sealant at all walls that require a sound rating. Walls that require a sound rating include:
 - 1. Dwelling unit demising walls
 - 2. Dwelling unit corridor walls
 - 3. Bathroom walls
 - 4. Office walls
 - 5. Conference room/huddle/meeting room walls
 - 6. Fitness room walls
 - 7. Community room walls
 - 8. Amenity room walls
 - 9. Walls adjacent to elevator shafts
3. Interior Gypsum Ceiling Assemblies
- a. Use mold-resistant type at bathrooms and showers.
 - b. Use type x in all other locations.
 - c. Noise control Ceiling (at generator room: 2 layers 5/8" gypsum on 7/8" furring suspended from deck mounted spring isolation hanger with 6" acoustical batt insulation. Seal all penetrations.
4. Floor Preparation

- a. Provide 2" depression in concrete slab for Type A bathtubs
 - b. Provide sloped concrete topping over water proofing at trash rooms. Structural slab will be held down 6" from finished floor elevation. Concrete topping will be min 3" at drain and 6" at perimeter of room.
 - c. Provide sloped concrete topping at generator room. Structural slab will be held down 6" from finished floor elevation. Concrete topping will be min 3" at drain and 6" at perimeter of room.
 - d. Provide 6" tall concrete curb at perimeter of generator and trash rooms.
 - e. Provide sound deadening mat at all dwelling units and in all spaces that are above dwelling units to achieve minimum IIC rating of 50 per MBC 1207.3.
 - f. Provide pocket for trench drains at east tower passenger elevators.
 - i. BOD: Jay R. Smith Stainless Steel threshold drain, 2" deep, figure 9678-100
 - g. Provide crystalline waterproofing at elevator pits.
 - h. Provide recess in concrete slab for entrance mats.
 - i. Provide membrane forming system to reduce the rate of moisture vapor emission for all concrete slabs to receive flooring material that exceeds allowable vapor emissions.
5. Doors
- a. Common Areas
 - i. Doors shown in storefront system: ¼" glazing in medium style frame.
 - ii. Doors shown in gypsum partition systems: Flush wood door, solid core, transparent finish
 - iii. Doors to Janitor Closets, Storage and MEP rooms: Hollow Metal, painted
 - 1. Metal sound control door at Generator room.
 - iv. Doors to stairs: Hollow Metal with Vision lite, painted
 - b. Dwelling Units
 - i. Entry door: Flush wood door, 20-minute rated door, solid mineral core, transparent finish
 - ii. Other doors: Flush wood door, hollow core, opaque finish
 - c. Ratings: door shall be rated when in rated wall.
6. Stairs, Ramps
- a. Stairs: metal pan stair with concrete fill
 - b. Stair widths:
 - i. Stair W-ST1 and E-ST1 shall be 44" wide
 - ii. Stair W-ST2 and E-ST2 shall be 48" wide
 - c. Handrails and Guardrails: horizontal steel pipe guardrails with 1 ½" diameter handrail.
 - i. Handrails at level 17 ramps and stairs shall be stainless steel. All other handrails shall be painted.
 - ii. Guardrails shall be painted.
 - iii. Provide bumper guard below handrail at first floor ramps.

D. SPECIALITIES

- 1. Toilet Accessories
 - a. Common Areas
 - i. Toilet Tissue Dispenser
 - ii. Grab bars
 - iii. Sanitary Napkin Disposal Unit
 - iv. Mirror Unit
 - v. Automatic Soap dispenser

- vi. Underlavatory Guard
 - vii. Combination Towel Dispenser / Waste Receptacle
 - viii. Mop and Broom holder (Janitor's closet)
- b. Dwelling Units
- i. Grab Bar
 - ii. Toilet tissue dispenser
 - iii. Soap dish (at tile shower/tubs)
 - iv. Underlavatory Guard (Type A units)
 - v. Shower Curtain rod
 - vi. Tub seat (surface mount, type A units only)
 - vii. Rob hook
 - viii. Towel Bar
 - 1. Provide 2 per bathroom
 - 2. Towel bar in west tower shall be 1 ¼" dia. Grab bar.
 - ix. Medicine cabinet (recessed, 16" x 26")
2. Wire mesh storage lockers:
- a. Double tier wire mesh storage locker; 4'x5'x 7'-6" tall. Bottom of top locker shall be 16 GA galvanized steel. BOD: WireCrafters
3. USPS Delivery Postal Specialties: front loading, aluminum, standard powder coat finish or anodized aluminum finish. Some units will have parcel boxes and letter drop.
4. Residential appliances
- a. All appliances shall be Energy Star certified.
 - b. All appliance shall be electric.
 - c. Level 1 breakroom
 - i. Refrigerator: undercounter, Energy Star
 - d. Level 2 kitchenette (west tower) and breakroom (east tower)
 - i. Refrigerator: Bottom freezer, 24" wide, min. capacity is 10 cu ft. , Energy Star
 - ii. Microwave
 - e. Level 2 Community room and Level 3 Community room
 - i. Refrigerator: side by side, 36" wide, min. capacity is 20 cu. ft., Energy Star
 - ii. Oven with cook top and hood
 - 1. Shall be ADA compliant
 - iii. Microwave (provide two ea. community room)
 - f. West Tower Exam room
 - i. Refrigerator: undercounter, Energy Star
 - g. West Tower laundry room (typ, each residential floor)
 - i. Washer - Energy Star
 - ii. Dryer- Energy Star
 - h. West Tower dwelling unit:
 - i. Refrigerator: Bottom freezer, 24" wide, min. capacity is 10 cu ft.
 - ii. Oven with cook top and hood
 - 1. Hood shall have microwave in Type B units
 - 2. Hood shall have ADA compliant controls in Type A units
 - iii. Microwave (Type A units only)
 - i. East Tower dwelling unit:
 - i. Refrigerator: side by side, 36" wide, min. capacity is 20 cu. ft., Energy Star
 - ii. Oven with cook top and hood
 - 1. Hood shall have microwave in Type B units
 - 2. Hood shall have ADA compliant controls in Type A units
 - iii. Microwave (Type A units only)

- iv. Dishwasher
 - 1. In Type A units dishwasher shall fit under 34" high counter
- v. Stacked Washer/Dryer in type B units
- vi. Washer and dryer in Type A units
- 5. Facility Waste Compactors: provide compactor in each trash room. BOD: 350-C5 Compactor by Wilkinson Hi-Rise. In east tower trash room, also provide a bi-sorter with a tenant-activated keypad switch on a control panel incorporated above each chute intake door.
- 6. Residential Casework: BOD shall be SMART Cabinetry
 - a. Quality Standard: Provide cabinets that comply with KCMA A161.1
 - b. Base cabinets shall have swing doors and one shelf and one drawer.
 - i. Provide fixed panel in lieu of drawer at sinks.
 - ii. Provide removable cabinet at sinks in Type A units
 - iii. Provide locks at west tower community room kitchen cabinets.
 - c. Provide upper cabinets where soffits are indicated in the dwelling unit reflected ceiling plan and as follows:
 - i. Level 1 workroom, north wall
 - ii. Level 1 breakroom, west wall
 - iii. Level 2 breakroom, east tower, north wall
 - iv. Level 2 community room, north wall at kitchen
 - v. Level 2 kitchenette, south wall
 - vi. Level 2 copy/print, north wall
 - vii. Level 2, exam room, west wall
 - viii. Level 3, kitchen, north and south wall (except at south wall opening)
 - d. Upper cabinets shall be 12" deep x 30" tall except upper cabinets at refrigerators and hoods shall be 12" tall.
 - e. Bathroom vanity cabinets:
 - i. West Tower: swing doors with one shelf, fixed upper panel.
 - ii. East Tower: two drawers adjacent to swing doors with one shelf, fixed panel at sink and above drawers.
 - iii. Cabinet below sink shall be removable in Type A units, typ. both towers.
- 7. Signage
 - a. Provide modular signage for:
 - i. Stair towers, as required by code
 - ii. Elevators, as required by code
 - iii. Evacuation Maps
 - iv. Identification signs for all common rooms
 - v. Identification signs for all dwelling units
 - vi. Room capacity signs for community rooms and fitness room
 - vii. Directional signs at elevator lobby levels 2-18
 - viii. No smoking signs at each lobby and terrace (except private terrace)
 - ix. Standpipe sign.

E. VERTICAL CONVEYANCE AND CIRCULATION

Refer to Vertical Traffic Analysis report in the Appendix.

VI. INTERIORS

A. GENERAL

The overall design aesthetic is being driven by a “Big Idea” defined by nature and making connections to the outdoors. Ann Arbor has many beautiful nature parks filled with character defining monuments that have significance to the community and act as a destination. There is a strong desire to incorporate biophilia design elements to reinforce the human connection to nature and the community. Biophilia also creates a warm, welcoming and calming environment that supports trauma informed design goals for this project. The palette will be timeless and inviting with incorporating various textures and colors inspired by nature. Accented features on the Interior will be limited to key/ high impact spaces that will also support wayfinding and creating identity at special moments throughout the building. All proposed finishes be of commercial quality and will align with the overall building design aesthetic. There will be special consideration made specifically for low maintenance, high durability, mindful life cycle costs and sustainability of all finish selections. Corridors will be designed integrating pattern, color and material variations to walls to break up long corridor runs and to also to support residential unit identity and wayfinding. Finish materials and proposed locations are listed in the section below:

B. INTERIOR FINISHES

COMMON SPACES

The following space types are identified as common spaces.

- Vestibules
- Lobby
- Main Office
- General Office
- Elevator Lobby
- Corridors
- Community Lounge
- Kitchen, Laundry,
- Trash Rooms
- Building Support

FLOOR

Vestibule Flooring

- Wall to wall entry type flooring carpet tile, 24” x 24”.
- Locations: All entry vestibules.

Polished Concrete

- Polished color concrete with exposed decorative aggregate.
- Locations: Lobby, corridors, community lounges/ kitchen, elevator lobbies, trash room.
- Refer to “Alternate” section.

Sealed Concrete

- Locations: Back of house spaces, MEP rooms, storage, building maintenance.

Carpet Tile

- Commercial type carpet tile, plank size, direct glue down installation.
- Locations: All administration offices and office support spaces (ie. conference rooms, circulation in office suites).

Area Rugs

- Loose lay area rugs at lounge seating areas,
- Locations: Lobby lounge, community lounges.

WALL BASE

Acrovyn Wall Base: 12” high

- Refer to “Alternate” section.

Hardwood

- Solid poplar painted wood trim, 12” high.
- Locations: Lobby, corridors, community lounges/kitchens

Resilient Wall Base: 4” high

- Standard covered wall base.
- Locations: Lobby, all administration offices and office support spaces (ie. Conference rooms, circulation in office suites), building support spaces.

WALL

Gypsum Walls - Painted with latex paint, eggshell finish.

- Location: Lobby, all administration offices and office support spaces (ie. Conference rooms, circulation in office suites), corridors, community lounges/kitchens, building support spaces.

Wood Feature Wall

- Decorative full height solid wood panel, x-clip installation.
- Locations: Level 1 Elevator Lobby.

Wallcovering

- Level identification/ wayfinding, type II Custom art wallcovering, from 4’ aff to finished ceiling. Wall protection will be below.
- Locations: All elevator lobbies.

Display Tackboards

- Surface mounted fabric wrapped display tackboards.
- Locations: All elevator lobbies.

Markerboards

- Markerboards to be porcelain type, surface mounted with z-clip installation.
- Locations: All private offices and conference rooms.

Wall Protection

- Acrovyn type, surface mounted panels with all inside and outside corner accessories and trim pieces.
- Locations: Corridors

Corner Guards

- Acrovyn Type, surface mounted, size to match door heights.

- Locations: Corridors.

CEILINGS

Acoustical Ceiling Tile

- 24" x 24" square tegular lay-in ceiling type with standard 9/16" ceiling grid.
- Locations: Lobby, corridors, community lounges/kitchens, building support spaces.

Acoustical Ceiling Tile

- 24" x 72" square tegular lay-in ceiling type with standard 9/16" ceiling grid.
- Locations: East tower corridors.

Gypsum Ceilings

- Painted with latex paint, flat finish.
- Location: All gypsum ceilings.

Accent: Wood Ceiling Element

- Wood veneer accent ceiling, plank type with standard 9/16" ceiling grid suspension system, standard veneer type.
- Locations: Lobby, elevator lobbies.

MILLWORK

Countertops: Quartz

- 2cm thickness, eased edge profile, gloss finish.
- Locations: All millwork in kitchen and bathroom.

Cabinets: Standard Veneer with modified full overlay configuration.

- Stained standard veneer with matte polyurethane finish, hardware to match design aesthetic.
- Locations: All millwork in kitchen and bathroom.

WINDOW TREATMENT

Roller Shades

- Manual shades with coated woven shade cloth material. Provide openness factor of 3-5%, include valance and mounting hardware.
- Location: All exterior windows at administration and public spaces.

MISCELLANEOUS

Artwork

- Artwork locations to be provided at the following locations; Level 1 lobby/lounge, elevator lobbies, community lounges, upper level elevator lobbies, strategic corridor locations.

Wayfinding and Signage

- Wayfinding and room numbers to match the overall design aesthetic. Metal type with commercial grade adhesive.

RESIDENTIAL UNITS

The following spaces are identified in each residential unit.

- Foyer

**AAHC 350 S 5th AVE.
SCHEMATIC DESIGN**

- Kitchen
- Living/ Dining
- Bedroom
- Bathroom
- Closets

FLOOR

Carpet Tile

- Commercial type carpet tile, square size, monolithic and direct glue down installation.
- Locations: All dry spaces.

Vinyl Composition Tile

- 12" x 12" tile size, direct glue installation.
- Locations: All wet spaces.

WALL

Gypsum Walls - Painted with latex paint, eggshell finish.

- Locations: Gypsum walls in all spaces.

WALL BASE

Resilient Wall Base: 4" high

- Standard coved wall base.
- Locations: All standard residential units.

Resilient Wall Base: 12" high

- Standard coved wall base.
- Locations: All ADA residential units.

CEILING

Gypsum Ceilings - Painted with latex paint, flat finish.

- Locations: All gypsum ceilings.

MILLWORK

Countertops: Quartz

- 2cm thickness, eased edge profile, gloss finish.
- Locations: All millwork in kitchen and bathroom.

Cabinets: Standard Veneer with modified full overlay configuration.

- Stained standard veneer with matte polyurethane finish, hardware to match design aesthetic.
- Locations: All millwork in kitchen and bathroom.

WINDOW TREATMENT

Vertical Blinds

- Metal type, with valance and mounting hardware.
- Location: All exterior windows.

MISCELLANEOUS

- Unit and room numbers to match the overall design aesthetic. Metal type with commercial grade adhesive.
- Coated wire shelving at all closets.

VII. FIRE PROTECTION

A. FIRE SUPPRESSION

A. Water Supply for Fire Protection System

1. The existing site has a 12-inch water line around the southern perimeter of the building. A new incoming 8-inch fire water line will be provided to serve the fire pump room. A double check detector backflow preventer will be provided upstream of the connections to the fire pumps located in the southwest corner of the basement.
3. Two horizontal split-case, electric motor drive, fire pumps estimated to flow 1000 gpm at 200 psi and 155 psi will be located within the fire pump room. The fire pump motors are estimated to be rated for 200 hp and 125 hp, respectively. The 200 psi fire pump will feed Levels 11 through Level 18 and the 155 psi fire pump will feed Levels Basement through Level 10. The fire pump room will be fire rated for 2 hours and will be served by an adjacent 2-hour stairwell and exit passageway per NFPA 20 Table 4.13.1.1.2. Each fire pump will be supported by a pressure maintenance (jockey) pump and controller.
4. Variable frequency drive (VFD) fire pump controllers will be provided for each fire pump to preclude pressure reducing valves on all levels except for Basement Level and Level 1. The fire pumps will be powered by an emergency generator.

B. Automatic Sprinklers

1. A new automatic sprinkler system will be supplied by each fire pump located within the Basement Level.
2. The building shall be protected in accordance with the hazard classification requirements for Light Hazard (for Residential, Business, and Assembly Occupancies) and Ordinary Hazard (MEP/Storage Occupancies) as defined by NFPA 13.
 - (a)
3. All new automatic sprinkler systems will be hydraulically calculated and designed to meet the requirements of NFPA 13.
4. Wet sprinkler piping with a diameter of less than 2.5 inches will be Schedule 40 black steel. Wet sprinkler piping with a diameter of 2.5 inches and larger may be reduced to Schedule 10 black steel pipe. Threaded, roll grooved, and mechanical tee fittings are permitted for all pipe sizes, however, cut grooved is permitted for nominal pipe size 5 inches and larger only. Hangers will be provided per the requirements of NFPA 13 Chapter 9.
5. All sprinklers in public areas will be concealed pendant type with white cover plates or concealed sidewall sprinklers factory-painted to match adjacent architectural finishes. Rooms without finished ceilings will be provided with upright sprinklers with a brass finish or factory-painted to match adjacent architectural finishes if located in a public area. Sprinklers will be ordinary temperature except areas specified in NFPA 13. All sprinklers will be quick response type, except where prohibited by NFPA 13.
6. A dry pipe sprinkler system will be provided for any areas that are normally not heated and subject to temperatures below 40 degrees °F. Dry pipe valves will be in a conditioned, heated space in the vicinity of the protected area. Areas expected to be protected by a dry pipe

sprinkler system are the Basement Level Substation, Level 2 Generator Room, and under exterior canopy spaces.

7. Control valves will be provided with supervised valve supervisory (tamper) switches. In addition, waterflow switches will be provided on floor zone control assemblies and on the discharge side of the fire pump(s). The sprinkler contractor is responsible for coordination with the fire alarm contractor to connect all valve supervisory (tamper) switches and water flow switches to the fire alarm system.

C. Standpipes

1. Class I automatic standpipes with 2-1/2" fire hose connections will be provided in each interior exit stair per NFPA 14. There will be a low zone and high zone of standpipes to serve the tower. The low zone will serve Basement Level through Level 10 and the high zone will serve Level 11 through Level 18.

2. Supervised, OS&Y type, standpipe isolation valves will be provided at the bottom of each standpipe system. The standpipe system will be sized to provide the 500 gpm at the most remote standpipe and 250 gpm for each additional standpipe for a maximum of 1000 gpm as required by NFPA 14 §7.10.1.1.5 for fully-sprinklered buildings. The outlet of the most hydraulically remote hose connection will be provided with a minimum operating pressure of 100 psi as required per NFPA 14 §7.8.1.

B. FIRE ALARM

1. The building will be provided with an emergency voice and communication fire alarm system and automatic smoke detection system. Fire alarm control equipment will be provided in the Fire Command Center located on Level 1 as well as west and east tower electrical rooms on each level. The fire alarm and detection system will be designed in accordance with the MBC, and NFPA 72.

2. Manual Pull Stations

a. Manual fire alarm pull stations are to be provided within 5 feet of each exit within the path of egress per NFPA 72 §17.14.8.4. The maximum travel distance to a manual station shall not exceed 200 feet per NFPA 72 §17.14.8.5.

b. The height of the manual fire alarm boxes shall be not less than 42 inches and not more than 48 inches measured vertically, from the floor level to the activating handle or lever of the box NFPA 72 §17.14.5.

3. Automatic Smoke Detection

a. Automatic smoke detection will be installed in each elevator lobby for elevator recall; in any room with fire alarm equipment; in any sleeping room; and in ducts/mechanical rooms to shunt trip air handling units in the event of smoke detection per MBC §907.2.

- b. Addressable duct smoke detection and fan shut down will be provided on the return side for all systems with a capacity of 2,000 CFM per MMC §606.2. The duct smoke detectors will be arranged to indicate a supervisory alarm only and not to sound a building evacuation alarm. Alarm verification for duct smoke detectors is not recommended because it increases delay in addition to the delay inherently caused by smoke dilution from air distribution systems.
- c. Smoke detectors shall be either ionization or photo-electric type capable of sensing visible or invisible particles of combustion and providing a suitable audible alarm thereof.
- d. At least one (1) smoke detector with sounder base shall be installed to protect each sleeping area.

4. Carbon Monoxide Detection

- a. Carbon monoxide detection shall be provided in sleeping units that contain a fuel-burning appliance or fuel-burning fireplace per MBC §915.1.2.
- b. Carbon monoxide detection shall be provided in dwelling units and sleeping units served by a fuel-burning, forced-air furnace unless carbon monoxide detection is provided in the first room or area served by each main duct leaving the furnace, and the carbon monoxide alarm signals area automatically transmitted to an approved location per MBC §915.1.3.
- c. Where fuel-burning appliances are outside of sleeping units, carbon monoxide detection shall not be required in sleeping units if there are no communicating openings between the fuel-burning appliance or fuel-burning fireplace and sleeping area, if the carbon monoxide detector is provided in an approved location between the fuel-burning appliance or fuel-burning fire place and the sleeping unit, or on the ceiling of the room containing the fuel-burning appliance or fuel-burning fire place per MBC §915.1.4.
- d. Combination carbon monoxide/smoke alarms shall be an acceptable alternative to carbon monoxide alarms. Combination carbon monoxide/smoke alarms shall be listed in accordance with UL 2034 and UL 217.

5. Fire Command Center

- a. A Fire Command Center in accordance with MBC §911 will be provided on Level 1 and its location approved by the fire department.
- b. The Fire Command Center will contain the fire alarm control panel, auxiliary power panels, smoke control panels, elevator panels, and all other equipment necessary to the fire alarm system described herein.

6. Initiating Zones:

- a. Each floor of the building will be zoned separately.

7. Building Evacuation System

- a. The fire alarm evacuation system will be a partial evacuation notification system meeting the requirements of the NFPA 72. Visible strobe/speaker combination appliances will be utilized throughout public spaces. Level 2 pathway survivability will be provided for the system.
- b. The audio alarm system will be designed to output a minimum 15 dB above the ambient noise level. A speaker will be provided in each dwelling unit.
- c. The visible alarm strobe indicating appliances will generally be field selectable 15, 30, 75, and 110 candela synchronized devices.
- d. ADA compliance visible alarm strobe appliances will be designed per ADA Section 2.2 provisions for "equivalent facilitation." Therefore, the visible strobe signal appliances will be designed in accordance with the tabular data contained in NFPA 72. This will provide the 0.0375 lumens/square foot referenced in ADA guidelines.
- e. Each floor will have its own notification appliance power extender panel and amplifier panel. This equipment will be located in the electrical rooms on each floor.

8. Fire Alarm Monitoring

- a. Addressable interface modules (AI) shall be provided to monitor valve supervisory and water flow switches for the fire sprinkler system at the fire pump and at each zone control assembly.
- b. Additional AIs shall be provided to monitor the emergency generator, elevator machine rooms, two-way communication, and other locations.
- c. Addressable relay modules (AR) shall be provided to close doors on hold open, close smoke dampers, shut down AHUs, and other required actions by the fire alarm system.

9. Two-Way Communication

- a. Two-way communication call boxes will be provided at elevator landings and areas of rescue assistance above and below the level of exit discharge in accordance with MBC §1009. Pathway survivability will be a minimum of Level 2. Call boxes will be recess mounted within areas of refuge and at elevator lobbies. The call boxes will communicate with a central panel located in a location accessible to first responders. As the panel will not be monitored 24/7, the panel will dial out to a constantly monitored central station.
- b. All associated signage will be provided in accordance with NFPA requirements. The two-way communication system will provide both an audible and visual alert at the building security desk communication point. When local security personnel are not present, the communication line will contact an off-site emergency responder as approved by the authority having jurisdiction. The two-way communication system will be equipped with a 24-hour battery backup system and will be monitored by the fire alarm system.

10. Annunciation

- a. A graphic annunciator will be provided at the main entrance lobby and Fire Command Center based on the requirements of the local AHJ.

11. Location

- a. The main fire alarm panels will be located in the Fire Command Center. The room will be protected with a 1-hour fire resistance rating.
- b. Additional Notification Appliance Power Extender Panels and Amplifier Panels will be located in electrical rooms throughout the building.

12. Supervision

- a. The entire fire alarm wiring system will be supervised in accordance with NFPA 72. Addressable signaling line initiating circuits and notification circuits will be supervised in accordance with Class B with alarm receipt for a single ground. Conventional notification circuits will also be Class B. These Class B supervised circuits will report trouble conditions for a single open and a single ground condition.

13. Secondary Power

- a. The fire detection and alarm system is provided with standby battery secondary power which will be designed to provide a minimum of 24 hours of standby service under normal conditions and a minimum of 15 minutes in alarm per NFPA 72 §10.6.7.2.1.2.
- b. In addition, as an added factor of safety, the entire fire alarm system will be connected to the emergency power distribution system.

14. Emergency Responder Radio Coverage (ERRCS)

- a. An emergency responder radio coverage system is to be tentatively planned throughout the building in accordance with IFC §510 and NFPA 1221. A survey to be conducted by a qualified third party will take place after electrical rough-in to determine the coverage levels and if supplementation in the form of ERRCS is required.
- b. The ERRCS panel will be located at Level 18 in the east tower electrical room with a Level 2 Pathway running down to the basement level. Each electrical tower will be protected by 2-hour fire barriers.

VIII. MECHANICAL

A. GENERAL

The Ann Arbor Housing Commissioning has engaged the SmithGroup to design the apartment building at 350 S. 5th St. The apartment building will be a mixed use development with storage and building service spaces in the basement, retail and public spaces in the first three floors and residential apartments in the remaining upper floors.

The project currently is being designed to pursue Enterprise Green Communities certification and a decarbonized HVAC system. The final decision on the direction for this project will be determined during the SD budget review process.

The building is new construction.

B. CODES AND STANDARDS

Applicable Governing Codes and/or Design Guidelines

- 2015 Michigan Building Code (OBC)
- 2015 Michigan Mechanical Code (OMC)
- 2015 Michigan Plumbing Code (OPC)
- 2013 ASHRAE 90.1 – Energy Code
- 2016 ASHRAE 62.1 – Ventilation Code
- NFPA 70 – National Electric Code
- NFPA 72 – Fire Alarm Code
- NFPA 13 – Fire Protection Code
- NFPA 14 – Fire Protection Standpipe Code
- NFPA 20 – Fire Pump Code

Applicable Reference Guidelines

- American Heating and Refrigeration Institute (AHRI)
- American Conference of Governmental Industrial Hygienists (ACGIH)
- Air Moving and Control Association (AMCA)
- American National Standards Institute (ANSI)
- American Petroleum Institute (API)

- American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
- American Society of Mechanical Engineers (ASME)
- American Society of Sanitary Engineers (ASSE)
- American Society for Testing and Materials (ASTM)
- American Welding Society (AWS)
- American Water Works Association (AWWA)
- Code of Federal Regulations (CFR)
- Cooling Tower Institute (CTI)
- Eastern States Insulation Contractors Associations (ESICA)
- Factory Mutual Approval Guide (FM)
- Hydraulic Institute (HEI)
- Illuminating Engineering Society of North America (IES)
- Manufacturers Standardization Society of the Valve and Fittings Industry (MSS)
- National Electrical Manufacturers' Association (NEMA)
- National Fire Protection Association (NFPA)
- National Sanitation Foundation (NSF)
- North American Insulation Manufacturers Association (NAIMA)
- Occupational Safety and Health Administration (OSHA)
- Plumbing and Drainage Institute (PDI)
- Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA)
- Underwriters Laboratories Inc. (UL)

C. MECHANICAL NARRATIVE

DESIGN CONSIDERATIONS

The project has an established goal of a decarbonized fuel source. Renewable energy credits will be used to offset the carbon-based electricity. Natural gas will be provided to the site, but will only be used for the natural gas generator.

Geothermal vertical bores were investigated. Due to limited real estate and limited capacity the geothermal approach was ruled out. Unitary air-to-air heat pumps were investigated but eliminated due to preference to eliminate small wall louvers on the exterior of the building. Air and water-side VRF were investigated but eliminated due to apprehension of installing refrigerant piping throughout apartment building.

Two different central systems were selected for further investigation:

1. A two-pipe condenser water loop serving water-cooled heat pumps in each space.
2. A four-pipe water loop serving fan coil units.

The four-pipe system was elected for this building primarily due to the limited heating and cooling available in a DX AHU. The hydronic DOAS units require fewer units on the roof saving roof space as well as reducing the costs. The hydronic approach also eliminated the compressors in each apartment HVAC unit.

Controls: The HVAC controls will utilize open source ASHRAE 135 compliant BACnet with a Tridium Niagara supervisory server. The controls will be integrated with the fire alarm system for smoke control and post event smoke purge.

Humidification: There is no humidification required in the public or residential spaces of the building.

Load calculations and ventilation requirements: The load calculations will take into account a ventilation strategy with reduced outside airflow when high occupancy spaces are not occupied. These spaces include the following:

- Fitness room
- Community space
- Large conference rooms

Equipment redundancy: The primary air source heat recovery heat pumps are modular with independent module operation providing redundancy. An electric resistance boiler is provided for peak load supplemental heating.

Utilities: The utilities will be determined based on life cycle costs and the impact to the project decarbonization goals.

Phasing and equipment pre-purchase: At this time, there is not an intention to pre-purchase mechanical equipment for this project.

Commissioning: Commissioning will be part of the design philosophy and is a requirement for Enterprise Green Communities certification.

CLIMATE DESIGN CONDITIONS

Weather Data:

- Cooling Design:
 - ASHRAE 0.4%
 - Dry Bulb Temperature: 89.8 °F DB
 - Mean Coincident Wet Bulb Temperature: 73.4 °F DB
- Heating Design:
 - ASHRAE 99.6%
 - Dry Bulb Temperature: -2.1 °F DB
- Dehumidification Design:
 - ASHRAE 0.4%
 - Dew Point Temperature: 73.4 °F DB
 - Mean Coincident Dry Bulb Temperature: 81 °F DB

Inside Design Conditions:

- General spaces:
 - Dry bulb temperature: 72-75 °F year-round with unoccupied setbacks
 - Space relative humidity: DOAS supplies neutral dehumidified air. No winter minimum.
- Apartments:
 - Dry bulb temperature setpoint range: 68-75 °F +/- 3 °F year round
 - Space relative humidity: DOAS supplies neutral dehumidified air at constant minimum ventilation airflow. Actual maximum humidity dependent on activity within apartment. No minimum humidity control.
- Mechanical spaces:
 - Dry bulb temperature: 85 °F in summer / 68 °F in winter
- IT Rooms:
 - Dry bulb temperature: 72 °F
 - Relative humidity: 35% - 55% RH +/- 5%

CENTRAL COOLING AND HEATING SYSTEM

The central plant will serve a four-pipe distribution system extending to DOAS units and 4-pipe fan coil units. The central plant will be designed to operate with electricity only. Fossil based fuels will not be used for the building heating and cooling.

A modular based air-source heat recovery heat pump unit will be located on dunnage on the roof of the east wing. The heat pump unit will be divided into three independent sections, each sized to fit within the available roof footprint. The three sections will be 10, 11, and 12 modules respectively, sized for providing 100% of the heating load of the building at an ambient temperature of 30 F. The heat pumps will have technology for simultaneous heating and cooling and will have both hydronic heating piping and cooling piping connected to each section. The sections will be connected in parallel. The total cooling capacity will be a nominal 881 tons at an ambient temperature of 90 F and the total heating capacity will be a nominal 9,800 MBH at an ambient temperature of 42 F. At 0 F, the heat pumps will provide approximately 60% of the nominal capacity. The heat pumps have a limit of 0 F ambient and will stop operation below this temperature based on internal equipment safety controls. Below 0 F, the electric resistance boilers will provide the full heating. Basis of Design: Multistack model ARA.

Electric resistance boilers will be provided for supplemental heating. Two boilers will be provided, each sized for 50% of the peak building load. The boilers will be equipped with packaged controls and SCR capacity control. The boilers will initiate operation when the ambient temperature is below 30 F and the building heating demand begins to exceed the capacity of the combined heat pumps, which will be monitored via the HHWS and R temperatures. Basis of Design: Cleaver Brooks model WB-243.

The chilled water distribution and heating hot water distribution will have a 35% propylene glycol solution for freeze protection of the exterior mounted pipe and equipment during the winter heating months.

Hydronic circulation pumps, air/dirt control, and glycol feed will be located in a mechanical room located in the 18th floor. The CHW circulation pumps will lead/stand-by, each being sized for 1,200 gpm at 90 feet head. The HHW circulation pumps will be lead/stand-by, each being sized for 820 gpm at 90 feet head. Basis of Design: Bell and Gossett VSX-VSC.

Air control will be comprised of vertical bladder tanks, air eliminator/dirt separators, and glycol feed stations. Basis of Design: Spirovent VDT1000FA; Bell and Gossett Series D; Bell and Gossett model GMU.

HYDRONIC DISTRIBUTION SYSTEMS

Hydronic chilled water (CHWS/R) and heating water (HHWS/R) distribution piping will extend from the roof mounted air-source heat recovery heat pumps through the building. The central CHW and HHW will serve the DOAS units, all apartment units, and all unitary cooling and heating equipment. Vertical CHW and HHW risers will extend down and will serve the vertically stacked high-rise fan coil units. The high-rise fan coil units will be installed back-to-back where possible.

The CHW and HHW will each have a separate air control consisting of an air separator, expansion tank, and glycol feed station. Two double-suction circulation pumps, one as stand-by, will be provided for on each of the CHW and HHW.

Expansion fittings will be provided in the vertical distribution loop within the vertical risers to limit impact of pipe expansion. Anchors are not required for this hydronic system.

AIR DISTRIBUTION SYSTEMS

The air distribution system will include dedicated outside air units (DOAS) providing ventilation and make-up air. The exhaust air will be split among several different sources including apartment bathrooms, general kitchen exhaust, range hood exhaust, drier exhaust, janitor closet exhaust, heat pump water heater exhaust.

Three DOAS units will be installed on the roof supplying air to all apartment floors. Basis of Design: Aeon or Johnson Controls.

- DOAS-W1 will be sized for 12,500 cfm with a 70 F neutral supply air temperature.
- DOAS-E1 and E2 will each be sized for 20,000 cfm with a 70 F neutral supply air temperature.
- DOAS-E3 will be sized for 10,000 cfm with a 70 F neutral supply air temperature. The DOAS-E3 will supply 2,000 CFM more air than will be exhausted from the building to reduce the impacts of stack effect during the winter months.

The DOAS-W1, E1, and E2 will be packaged roof-top units with the following components:

- Outside air intake section
- MERV 8 & 13 filters
- Pre-heat coil
- Enthalpy wheel heat recovery exchanger
- Chilled water coil
- Reheat coil
- Variable speed fan array with EC motors
- Packaged BACnet compliant DDC controls providing economizer control, demand control ventilation (DCV), and variable speed supply fan control.

The roof mounted DOAS units will recover heat from the toilet and general kitchen exhaust via a fixed plate heat exchanger. Each DOAS unit will have a single supply duct riser and exhaust duct riser. Branch ductwork will extend from the risers through the corridor with individual branch ducts extending to each apartment. Ventilation air will be provided to the corridor. The corridor ventilation air will be dissipated into common rooms accessed by the corridor. Each branch duct from the riser on each floor will be equipped with an automatic control damper. The damper will remain open during normal operation and will operate based on a post event smoke purge.

DOAS-E3 will be installed in the basement supplying air to the basement, first, second, and third level public spaces. A single supply riser will extend from the DOAS. Branch duct will extend from the supply duct riser on each floor to ventilate each space. The ductwork will extend to the ducted plenum return for ceiling mounted fan coil units.

The DOAS-E3 will be packaged modular units with the following components:

- Outside air intake section
- MERV 8 & 13 filters
- Run-around energy recovery coil (connected to first floor exhaust fan)
- Pre-heat coil
- Chilled water coil
- Reheat coil
- Variable speed fan array with EC motors
- Packaged BACnet compliant DDC controls providing, demand control ventilation (DCV), and variable speed supply fan control.

High-rise style 4-pipe fan coil units will be installed in each apartment. The fan coil units will be installed in acoustically lined closets with an offset return grille to reduce unit sound transmission. Supply ductwork will extend to the living room and bedroom(s) for each respective apartment terminating at wall supply grilles. The vertical fan coil units shall have the following options: Elastomeric closed cell foam insulation, 1" pleated MERV 8 filter, single ducted outlet, coil stainless steel casing and stainless steel drain pan, SCR fan speed controller, solid state fan relays, toggle disconnect switch, condensate overflow switch, factory installed piping package including modulating control valves with P/T ports and Y-strainers, and fixed flow control devices. Basis of Design: JCI model FS

Concealed horizontal type 4-pipe fan coil units with a maximum capacity of 48,000 BTU will be installed in the ceiling plenum and in closets as required for space layout and use on the public floors and in each corridor with an envelope load. The maximum size limit is required to eliminate the economizer requirement identified in ASHRAE 90.1. Where the space load exceeds this upper limit, multiple fan coil units will be provided. Exposed ceiling mounted fan coil units will be located in mechanical rooms and other service spaces to maintain the space temperature. The units will have a ducted return with internal lining and a minimum one elbow to attenuate noise. The duct will pull air in from the ceiling plenum.

The supply duct will be externally insulated sheet metal with insulated flexible ductwork extending to ceiling diffusers and wall registers. The ceiling diffusers will vary from linear, square, and rectangular. Egg crate ceiling returns will be provided in all spaces with ceilings.

Air will be exhausted from the basement, first, second, and third floor spaces via a ducted exhaust with exhaust fan EF-E3 located in the ceiling of the trash room on the first floor.

A hydronic heat recovery circuit will be provided between the DOAS-E3 and the first floor exhaust fan to recovery heat via a run-around loop. Circulation pumps will be located in the basement. A 35% PG solution will be used for freeze protection.

UNITARY EQUIPMENT

Elevator machine rooms or elevator shafts (if machine-room-less) will be conditioned by a dedicated fan coil units. The elevators are not on standby power and thus the fan coil units will not be either.

IDF rooms will each be conditioned by a dedicated fan coil unit. The IDF rooms are not on standby power and thus the fan coil units will not be either.

The main entry vestibule will be conditioned by dedicated fan coil unit.

The fire pump room will have a fan coil unit. A ventilation fan will be provided for emergency use when the pumps are operational and the central plant is not providing cooling due to a power outage.

SPECIAL SYSTEMS

Clothes dryer exhaust: The clothes dryer in each market rate apartment (in the east wing) will be located in a similar location floor-to-floor in each apartment. Compliant with 2015 MMC, each vertical stack of driers will have a separate exhaust duct riser. The individual driers will connect into the exhaust duct riser with sub-ducts extending into the duct riser and vertically 22 inches. Each duct riser extends vertically through the building to the roof. Cleanouts will be installed at the low point of each drier vent exhaust duct and at any change in direction. The cleanouts will be accessible through wall or ceiling access doors. Any horizontal ducted offset of the exhaust duct riser will be wrapped with 2-hour fire wrap. Each ducted riser will have a respective roof mounted exhaust fan connected to emergency power.

The west wing laundry room will have a dedicated exhaust fan to operate during use of the room.

Stairwell pressurization: A dedicated fan will be provided at the top of each egress stair to provide pressurization of the stair during a fire alarm. The fans will be provided with UL 864 compliant controls and will be integrated into the fire alarm system. Each fan will be connected into the building fire alarm system. A dedicated smoke control panel will be located in the fire command center to allow fire department override control of all of the stair pressurization fans.

Elevator pressurization: A dedicated fan will be provided at the top of each elevator shaft to provide pressurization of the stair during a fire alarm. The fans will be provided with UL 864 compliant controls and will be integrated into the fire alarm system. Each fan will be connected into the building fire alarm system. A dedicated smoke control panel will be located in the fire command center to allow fire department override control of all of the stair pressurization fans.

The public toilet and janitor rooms will have a dedicated exhaust fan to operate during occupied hours. The trash room will have a dedicated exhaust fan to operate during occupied hours.

Water heater exhaust air: The domestic water heaters will have integrated heat pump with a ducted discharge. The ducted discharge will extend to a thimble exhaust branch connection to a riser duct. The riser duct will extend to a single, roof mounted exhaust fan. The exhaust duct will be insulated as the discharge air from the heat pumps may be below the ambient dew point.

Post event smoke purge: A post event smoke purge control panel will be installed in the fire alarm command center. The smoke purge control panel will operate the DOAS units, the isolation dampers in the DOAS supply ductwork at each floor level.

CONTROLS

The building controls system will be comprised of an open protocol, native, BACnet DDC system that will communicate to the centrally located command center for remote monitoring and management. A supervisor server with Tridium Niagara controls software will be provided at the building to allow for the management company to remotely monitor the building systems. All licenses associated with the Tridium Niagara software will be directly licensed to and owned by the building Owner. The server will have a minimum 5 TB storage for storage of trending and other functions of the controls system.

The following systems will be integrated into the central DDC system:

- Central hydronic CHW and HHW plant
- DOAS units
- Stairwell pressurization fans
- Elevator pressurization fans
- Retail fan coil units
- Sump pump alarm monitoring

The hydronic system is intended to operate continuously year-round. The off-hour operation is required to provide conditioning for the DOAS units and on-demand cooling and heating for apartments. The central hydronic plant will be controlled by prioritizing the operation of the air source heat pumps on the roof with supplemental heating provided by the electric resistance boilers when the air source heat pumps are no longer able to maintain the HHWS temperature setpoint. The ASHPs will continue to operate down to an ambient temperature of 0 F and will continue to maintain approximately 60% of the heating demand of the building. Below 0 F, the heat pumps will de-energize per the packaged unit internal safety devices and the electric resistance boilers will pick up the full heating demand of the building. The electric resistance boilers require a substantially higher power consumption than the heat pumps, but the full capacity operation of the boilers will only occur for

approximately 10 to 15 hours per year. The hydronic circulation pumps for the CHW and HHW will be controlled with VFDs to maintain a differential setpoint as measured at the distribution mains in the basement. Glycol feed pumps will be provided for each of the CHW and HHW distribution loops to provide make-up glycol.

Dedicated outside air units (DOAS) will operate continuously year-round to provide ventilation and building pressurization. The DOAS units will dehumidify and reheat the outside air during the summer months and heat the air in the winter months to provide neutral supply air to the apartments. The packaged energy recovery in DOAS-W1, E1, and E2 will function with the DOAS unit operation. The circulation pumps incorporated into the run-around heat recovery loop for DOAS-E3 will be enabled when heat recovery is available from the exhaust fan. No humidification will be provided during the winter months. The DOAS will maintain a constant airflow to the apartments. Dedicated ventilation air will be provided to the corridor and will be exhausted by the domestic hot water heaters, which will be located in a service room immediately accessible from the corridor.

The apartment 4-pipe fan coil units will each have a programmable thermostat. The thermostats will be stand-alone (not tied into the building DDC) providing a +/- 3 degree F temperature adjustment from the pre-programmed temperature setpoint.

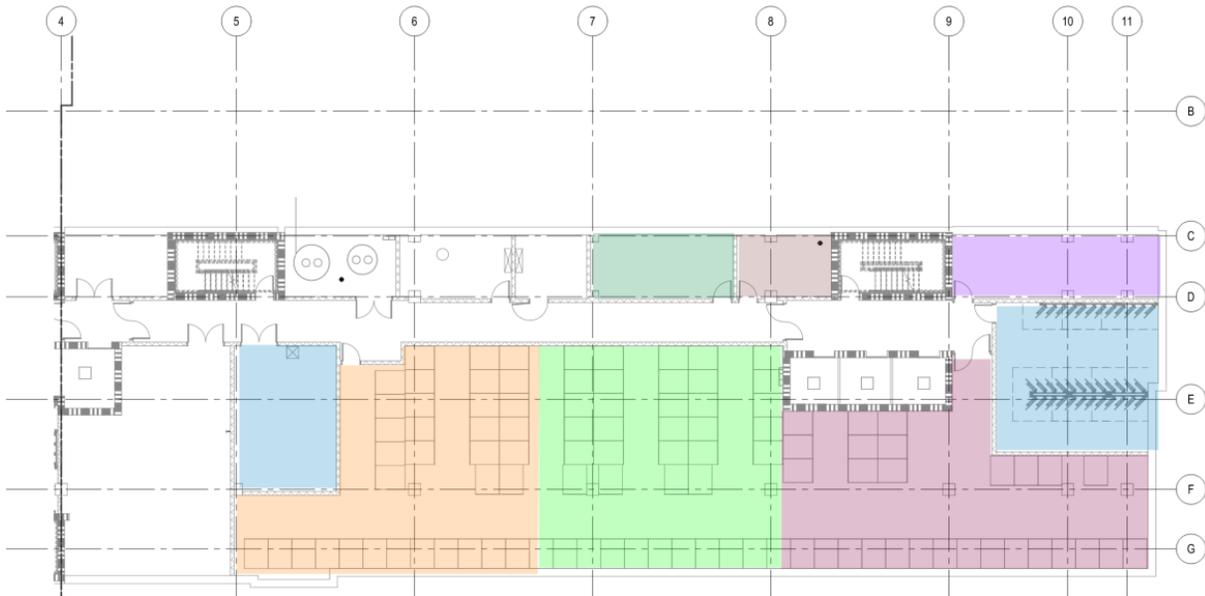
The electrical substation ventilation will operate to maintain the space temperature at a maximum setpoint of 80 degrees F and will maintain the supply air temperature at a minimum of 55 degrees F by blending room air with outside air. The fan will have a VFD drive and will operate between 30% and 100% speed to maintain the space temperature setpoint.

The generator room intake damper and relief damper will be connected to the generator to open when the generator is enabled and close when the generator is disabled. A fan coil unit located in the space will maintain the space temperature setpoint when the generator is disabled. The fan coil unit will be disabled with the generator is enabled.

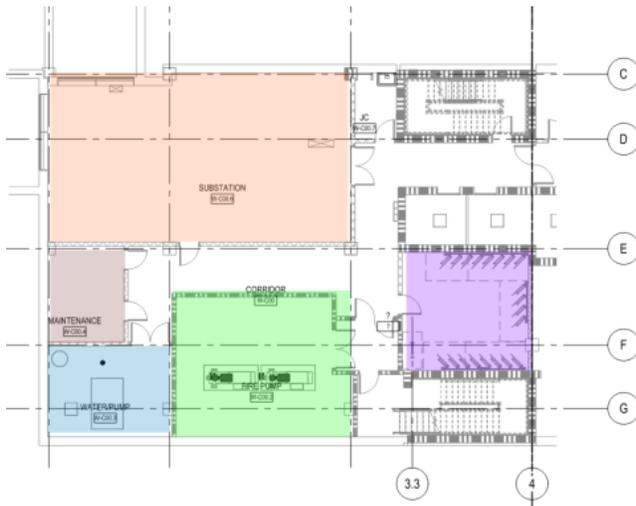
ZONING

The following diagrams indicate the design approach for zoning of the individual spaces. The zoning indicates the level of control provided for each individual space. Where an individual space is indicated by a unique color, a single controlling device provides the heating and cooling. The diagrams assist with establishing the quantity of devices required to provide this level of control for each space.

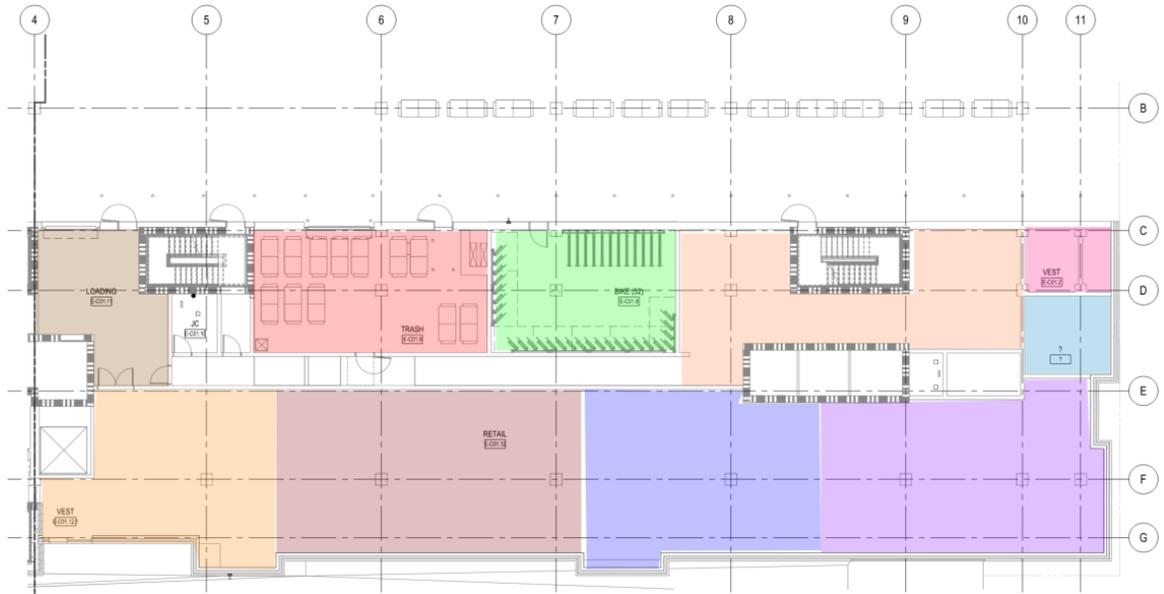
Basement - East



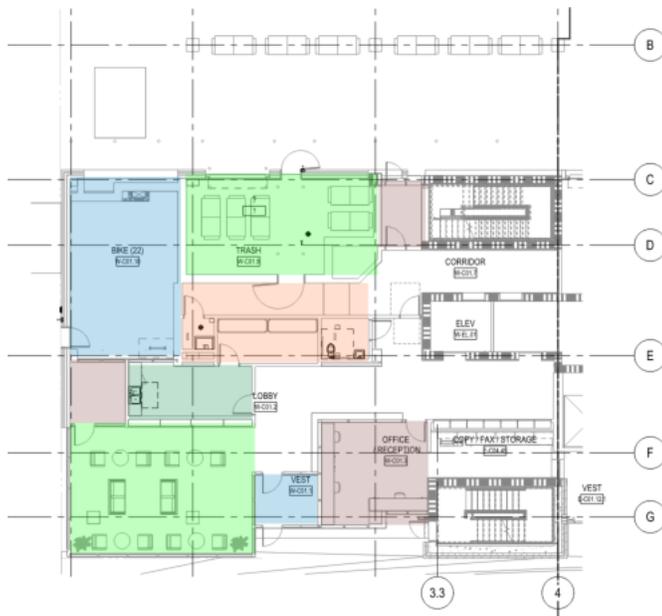
Basement - West



First Floor - East

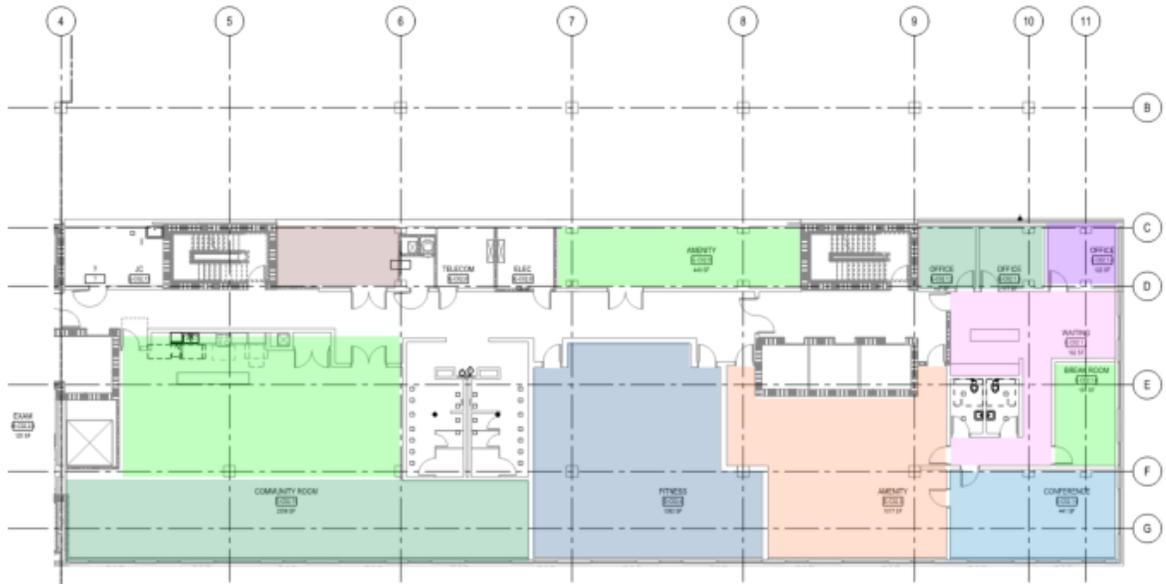


First Floor West

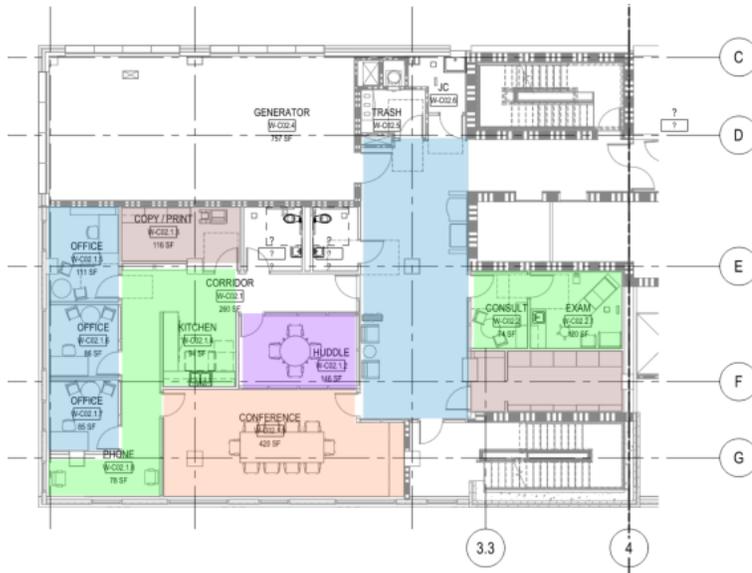


AAHC 350 S 5th AVE.
SCHEMATIC DESIGN

Second Floor - East



Second Floor - West

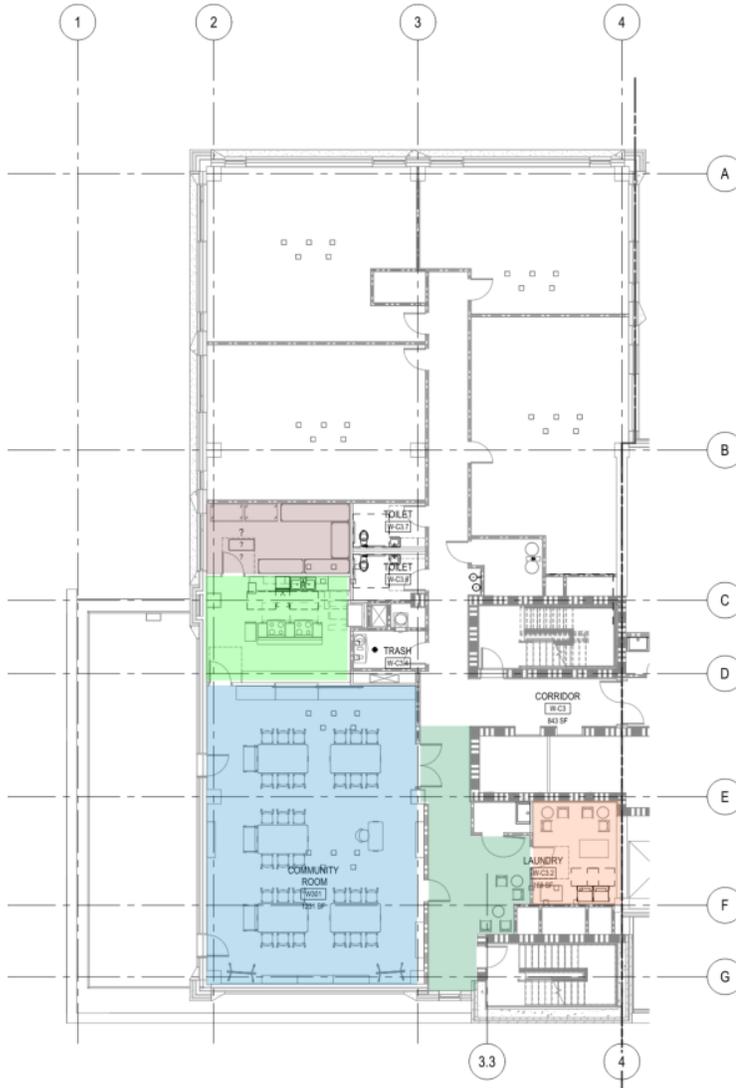


Third Floor – East

Third floor each is comprised of individual apartments. Each apartment will be a single zone.

Third Floor – West

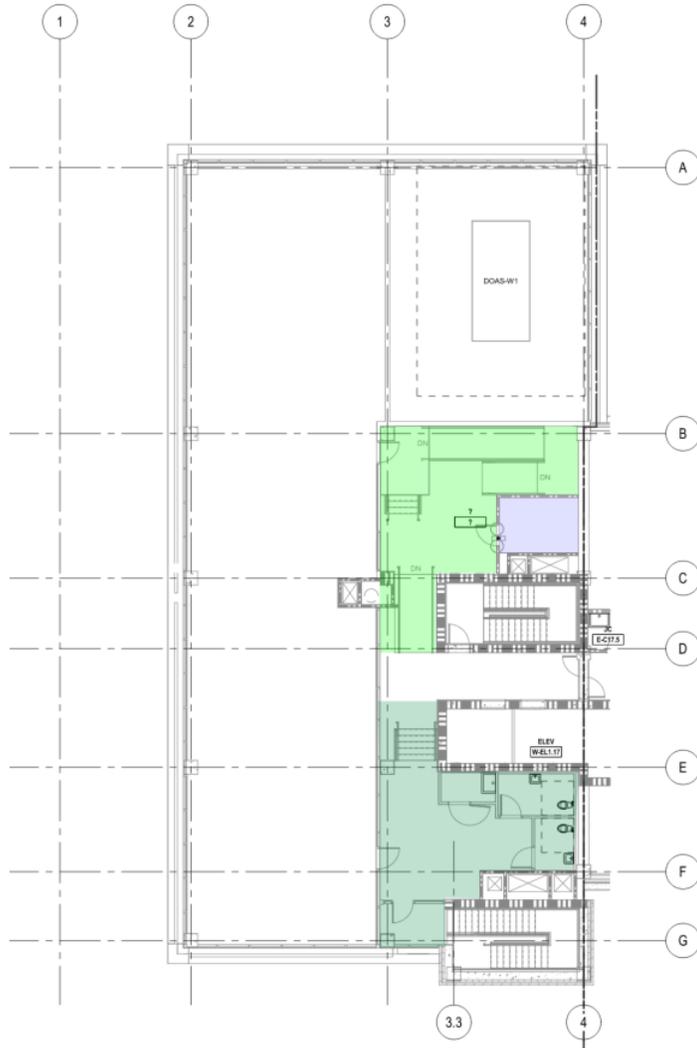
Only the public spaces are identified for zoning. Each apartment will be a single zone.



Fourth through 16th Floors - East and West; and 17th Floor - East

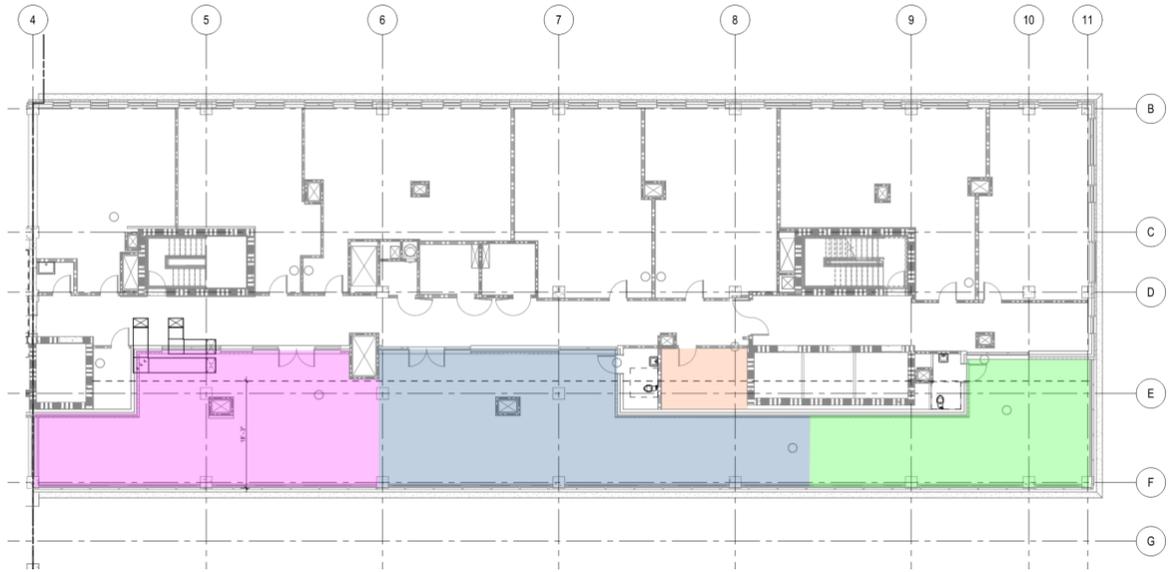
Fourth through 17th floors are each is comprised of individual apartments. Each apartment will be a single zone

17th Floor - West



AAHC 350 S 5th AVE.
SCHEMATIC DESIGN

18th Floor - East



DESIGN CRITERIA

Coils and Duct Accessories Criteria

- Louvers: Intakes will be sized for a maximum velocity of 350 FPM through the clear opening of the louver. Exhausts will be sized for a maximum velocity of 750 FPM through the clear opening of the louver. Louvers will have bird screen installed on inside face.
- Outside air plenums will be constructed of galvanized metal standing seam construction with access doors. The base of the plenum will be constructed to positively drain snow and water outside the building. Outside and exhaust air dampers will be high quality control dampers.
- Cooling coils will be constructed with stainless steel frames, 0.025" copper tubing, and aluminum fins. Heating coils will be constructed with galvanized steel frames, 0.025" copper tubing, and aluminum fins. Coils will not exceed 10 rows or ten fins per inch (FPI).
- Duct access doors will be installed at dampers, coils, and humidifiers.
- VAV (variable air volume) terminal devices will be sized to not exceed 75% of the manufacturer published maximum airflow or an NC 30. The VAV box minimum airflow will be based on the manufacturer's recommended minimum airflow value and will be based on the minimum value required for ventilation of the space. The VAV boxes will primarily be used where demand control ventilation is utilized in high occupancy spaces.
- Automatic balance dampers will be utilized for constant flow ventilation.
- Grilles, Registers, and Diffusers (GRDs) will be sized based on the application.
- Filters will be provided in accordance with the latest edition of ASHRAE Standard 52.2. MERV 8 one inch throw away filters will be used as the preliminary filtration of mixed air. MERV 13 filters will be used as the final filter for all mixed and outside air.
- Flexible duct connections will be installed at the wall penetrations and at equipment connections for ductwork on AHU-1 and AHU-2. Flexible duct connections will be installed at all equipment connections.

Mechanical Support Systems

- HVAC ductwork exposed in occupied spaces will be supported with aluminum aircraft cable.
- HVAC ductwork exposed in unoccupied spaces will be supported with strut trapeze supports.
- Suspended equipment (fan coil units, unit heaters) will be supported with threaded rod with ½ inch deflection elastomeric supports.
- Hydronic piping systems will be supported by clevis hangers sized for the outside diameter of the insulation. Calcium-silicate rigid insulation will be installed at each hanger for pipe three inches and larger. Hanger saddles will be installed at each hanger to prevent compression of the pipe insulation. Where pipe is installed by trapeze hangers, saddles and pipe straps shall be installed.

Insulation Systems

- All air side, hydronic, condensate drain, and refrigerant piping systems will be insulated to the minimum thickness requirements per the 2015 IECC.
- Ductwork and pipe below 8 feet in height will have a protective field installed PVC jacket.
- Exposed and concealed ductwork (supply, return, outside air) in mechanical rooms will be insulated with rigid mineral fiber insulation with a white kraft ASJ jacket. Ductwork between isolation dampers and penetrations of the building envelope will be insulated with 2" rigid insulation. Outside air intake and exhaust air plenums at louvers will be insulated with 2" rigid insulation.

- Exposed ductwork insulation outside mechanical rooms will be rigid mineral fiber with white kraft paper ASJ. Concealed ductwork outside mechanical rooms will be flexible mineral fiber duct wrap with FSK foil face.
- Vertical duct risers used for drier vent exhaust ductwork will have fire wrap insulation where extending horizontally in the 17th and 18th floor ceilings to align the vertical duct with the roof mounted exhaust fans.
- Ductwork exhausting the heat pump water heaters will be insulated with 1" flexible duct wrap to prevent condensation on the exterior of the ductwork when ambient temperatures are higher.
- Hydronic piping insulation will be rigid mineral fiber piping insulation with a white kraft ASJ. Refrigeration piping will be closed cell elastomeric insulation. Insulation exposed to UV radiation will have a protective covering to prevent degradation of the insulation. Condensate drain pipe insulation will be closed cell elastomeric with ½ inch thickness.

Ductwork and Piping Materials

- Ductwork shall be galvanized steel constructed in compliance with SMACNA duct construction standards. Medium pressure ductwork (in mechanical room and/or upstream of VAV boxes) will be constructed to a four-inch static pressure. Ductwork on AHU-1 and AHU-2 outside mechanical room will be constructed to four-inch static pressure. Ductwork downstream of VAV boxes will be constructed to two-inch static pressure.
- Hydronic piping in the building 2 ½" and smaller will be copper piping with brazed joints. Hydronic piping in the building 3" and larger will be black steel with grooved joint fittings. All piping and fittings will be sized to 150 psig operating pressure.

Testing and Balancing (TAB)

- All systems will be included in the TAB procedures. The TAB contractor will be involved at the beginning of construction starting with a review of the documents to assure all necessary balancing devices (dampers and valves) are included in the design.
- Preferences for this contractor will be discussed with the Owner in the Design Development and Construction Document phases.

Redundancy and Reliability

- The building will be resilient with the primary HVAC equipment being located on the roof. The basement will house a ventilation unit with outside air intake at third level above the street level.
- During sudden loss of utility power, the following equipment will be connected to the on-site generator.
 - HVAC Controls
 - CWP-1 and CWP-2
 - Elevator room unitary cooling unit (if elevator on emergency power)

IX. PLUMBING

A. DOMESTIC COLD WATER

1. A 6-inch domestic cold water service will enter the building at the Southwest corner of the Lower Level, along South face of building. Water service will be metered by the city (4-inch meter size) and provided with duplex backflow preventers both sized for full flow (both BFP's 6-inch line size).
2. Additional sub-meters will be provided for each tenant, one per apartment.
3. Additional local backflow preventers will be provided where required by code (typically vacuum breaker at individual mop sinks and hose outlets; reduced pressure zone backflow preventers at HVAC make-up water connections).
4. Hose bibbs will be provided in each mechanical room and public toilet room.
5. Wall hydrants will be provided every 50 to 100 feet along the exterior of building for general maintenance.
6. Wall hydrants and or roof hydrants will be provided at outdoor terraces for general maintenance.
7. Domestic water will be separated into three zones:
 - a. Zone 1 – Street Pressure
 - i. Zone 1 will serve the Lower Level, Level 1, and Level 2 fixtures.
 - ii. Street pressure is assumed to be adequate to serve multiple floors and pressure will be confirmed via a flow test.
 - iii. Domestic cold water in Zone 1 will be horizontal distribution piping in the Lower Level ceiling with vertical risers at every other column extending up to Level 2. Riser will serve planned fixtures and a tap with valve and cap will be provided for future fit out space.
 - iv. A triplex domestic water packaged booster pump will provide high pressure domestic cold water to Zone 2 & 3. Pump skid will consist of 3 pumps at 200 GPM each pump, with a reserve pump (N+1) 4 pump total, controls, and hydropneumatic tank located at the bottom of system.
 - v. Booster pump will deliver high pressure domestic cold water to upper floors with a main PRV (pressure reducing valve) to separate Zone 2 and 3.
 - vi. Alternate approach would be to provide two booster pump skids, one to serve Zone 2, and one to serve Zone 3.
 - b. Zone 2 will serve Level 3 through Level 11.
 - i. Domestic cold water in Zone 2 will be horizontal distribution piping in the Level 3 ceiling with vertical risers extending up at each group of apartments.
 - c. Zone 3 will serve Level 12 through Level 18/Terrace:
 - i. Domestic cold water in Zone 2 will be horizontal distribution piping in the Level 11 ceiling with vertical risers extending up at each group of apartments.
8. Domestic Hot Water
 - a. Water heaters split up between base building and apartments:
 - b. Base Building (Lower Level, Level 1 & 2)
 - c. Domestic hot water for base building fixtures will be provided by point of use electric instantaneous water heaters.
 - d. Public and private lavatories: 0.5 GPM flow rate, 105F outlet temperature, 5 kW heating input

- e. Multiple public lavatories: 2.0 GPM flow rate, 105F outlet temperature, 15 kW heating input
 - f. Pantry sink with dishwasher: 2.0 GPM flow rate, 120F outlet temperature, 15 kW heating input
 - g. Mop sink: 2.5 GPM flow rate, 120F outlet temperature, 20 kW heating input
 - h. Apartments split up between West Tower and East Tower:
9. West Tower
- a. Domestic hot water for West Tower apartments will be provided by two 80-gallon electric 4.5 kW heating input storage type water heaters on each floor. A master mixing valve and small 5 GPM circulation pump will be provided.
 - b. Domestic hot water and return will circulate to serve the seven apartments and an individual laundry room on each floor.
10. East Tower
- a. Domestic hot water for East Tower apartments will be provided by individual 40-gallon 3.5 kW heating input electric storage type water heaters, one in each apartment.
 - b. Alternate approach would be to mirror the West Tower design to provide two 80-gallon electric water heaters.
11. Sanitary and Vent
- a. Two 8-inch sanitary building drains will extend from the site sewer to serve the building. The sanitary building drains will drain by gravity to the site sewer and enter along the south face of the Lower Level.
 - b. Multiple 4-inch sanitary and vent stacks will be provided for each group of base building fixtures on Level 1 & 2.
 - c. Multiple 4-inch sanitary and vent stacks will be provided for each group of apartments.
 - d. Elevator threshold trench drains will be provided on each floor of the East Tower fire service access elevator.
 - e. All floor drains, floor sinks, and trench drains will be equipped with trap seal guards in lieu of trap primers for water savings.
 - f. A duplex submersible sump pump sized for 100 gallons per minute, with prefabricated basin and controls, will be provided to serve drainage for the Lower Level.
 - g. Elevators will be provided with submersible sump pumps sized for 50 gallons per minute each, which will discharge to indirect waste receptors (typically hub drain with standpipe and water type trap primer). Oil smart system/oil storage drum will be provided for hydraulic type elevators.
 - h. Alternate approach would be to provide one main sump pump for each bank of 3 elevators, 150 gallons per minute each, and discharge to grade (pending AHJ approval).
12. Storm Water
- a. A primary storm drainage and secondary overflow system will be provided for the flat roof systems. All storm and overflow drainage piping will be sloped a minimum 1/8-inch per foot.
 - b. Roof and overflow drains will be piped down via roof conductors located at the interior columns. Overflow drains will pipe down to grade level and discharge outside.
 - c. Outdoor terrace areas will be provided with primary and secondary drains below the pavers and piped to roof conductors.
 - d. Duplex submersible sump pumps sized for 100 gallons per minute each, with prefabricated basin and controls, will be provided to serve dewatering for the foundation of the Lower Level. Perimeter and network of underslab subsurface drains will be provided. Subsurface water conditions will be further evaluated pending geotechnical report.
13. Natural Gas

- a. An elevated pressure service (assume 5 PSI delivery pressure) will be provided by the utility company to serve the emergency generator. Approximate gas load for generator (based on 1,000 kW gen set) – 13,000 CFH.
- b. The utility meter and PRV will be located at the Northwest corner of the building, along the exterior of building, adjacent to S. Fourth Ave.
- c. Gas service will enter the building above grade and route up to the generator which will be located on Level 2. Gas pipe will route in an independent chase.
- d. A local gas regulator will be provided at the generator to reduce pressure and be vented to the building exterior.

14. Fixtures

- a. Base building (Lower Level, Levels 1 & 2):
 - i. Water closets, public and private: Automatic, hardwired power, exposed, sensor type, flush valve, 1.28 gpf, vitreous china wall hung water closets.
 - ii. Urinals, public: Automatic, hardwired power, exposed, sensor type, flush valve, 0.125 gpf, vitreous china wall hung urinals.
 - iii. Lavatories, public and private: Automatic, hardwired power, 0.50 gpm sensor faucets with manual temperature control override, vitreous china undermount or wall hung lavatories.
 - iv. ASSE 1070 compliant point-of-use mixing valves installed at all handwashing stations.
 - v. Pantry Sinks: Manual single lever, 1.5 gpm gooseneck pull down faucets, undermount stainless steel sink bowl (single or double bowl).
 - vi. Mop Sink Basins: 2.5 gpm, manual, two lever faucet, with vacuum breaker and threaded hose connection, vitreous china rectangular mop basin and stainless-steel rim guard.
 - vii. With 3 foot hose and mop bracket.
 - viii. Electric water coolers: Recessed electric water coolers, hi-low dual unit, with integral bottle filler station.
 - ix. With filter and access panel.
- b. Apartments:
 - i. Water closets, private: Flush tank type, 1.28 gpf, vitreous china floor mount water closets.
 - ii. Lavatories, private: Manual, 0.50 gpm, single lever faucets, vitreous china undermount sink bowl.
 - iii. ASSE 1070 compliant point-of-use mixing valves installed at all handwashing stations.
 - iv. Pantry Sinks: Manual single lever, 1.5 gpm gooseneck pull down faucets, undermount stainless steel sink bowl (single or double bowl), with garbage disposal.
 - v. Showers/tub, private: 1.5gpm shower head with ADA handheld wand, flexible stainless-steel hose, and slide bar with pressure and temperature balance valves.
- c. Materials
 - i. Domestic Water (Distribution): 2" and less: Type L copper tubing with soldered or press fittings; 2-1/2" and larger: Type L copper tubing with brazed or grooved fittings.
 - ii. Domestic Water (Apartments): Copper or PEX-A distribution system with PEX-A tube and metal insert crimp fittings.
 - iii. San/Vent:
 1. Above Ground (Mains/stacks): Cast iron no-hub with heavy duty couplings.

2. Below Ground: Cast iron no-hub with heavy duty couplings or Schedule 40 PVC/dwv fittings.
- iv. San/Vent (Apartments): Schedule 40 PVC pipe and DWV fittings.
- v. Storm:
 1. Above Ground: Cast iron no-hub with extra heavy-duty couplings.
 2. Below Ground: Cast iron no-hub with heavy duty couplings or Schedule 40 PVC/dwv fittings.
- vi. Natural Gas: Schedule 40 black steel pipe with welded fittings.

X. ELECTRICAL

A. AGENERAL

Emphasis in the electrical systems design will be made toward life safety, quality of power service, reliability, efficiency, ease of maintenance, flexibility, and functionality. Overall, the approach is to provide a balanced economical and high-quality electrical systems design. The electrical design is based on mixed use residential building with two connected towers with a gross square footage of 310,000. The East tower will have (154) 1-bedroom and (47) 2-bedroom market rate apartment units. The west tower will have (95) 1-bedroom non-metered affordable rate apartments. The first two floors will include amenities for the apartment tenants and have space for future commercial/retail/office tenants. The project will be an all-electric building. It will be targeting a National Green Building Standard (NGBS) certification and will be designed to be Net Zero ready.

CODES AND STANDARDS

Electrical systems for the 350 S. Fifth Ave will be designed in compliance with the following applicable codes, regulations, and standards.

Authority Having Jurisdiction: City of Ann Arbor, Michigan

STATE OF MICHIGAN

- Michigan Building Code, MBC 2015
- Michigan Part 9A Mechanical Code, MMC 2015
- Michigan Plumbing Code, MPC 2018
- 2017 Michigan Department of Labor Construction Code – Part 8 Electrical Code
- Michigan Energy Code 2015 (ANSI / ASHRAE 90.1 - 2013)
- International Fire Code, IFC 2015
- International Fuel Gas Code, IFGC 2015

NATIONAL FIRE PROTECTION ASSOCIATION

- NFPA 20 Standard for the Installation of Stationary Pumps for Fire Protection
- NFPA 70 National Electrical Code 2017
- NFPA 72 National Fire Alarm and Signaling Code 2013
- NFPA 101 Life Safety Code
- NFPA 110 Standard for Emergency and Standby Power Systems

ACCESSIBILITY GUIDELINES

- ADA ABA Standards for Accessible Design by the U.S. Department of Justice
- ICC/ANSI A117.1- 2009 Accessible and Usable Buildings and Facilities

ASHRAE STANDARDS

- ASHRAE 90.1 2013 – Energy Standard for Buildings Except Low-Rise Residential Buildings

ELECTRICAL LOAD ANALYSIS

A load analysis was completed for the building. It was based on a volt-amperes (VA) per square foot calculation utilizing the gross square footage (GSF) of building areas and preliminary equipment loads. A load summary follows with average density values and demand factors.

Building (Non-Dwelling) Loads		
Load Type	Power Density Values (VA/GSF)	Demand Factor
Lighting	.7	100%
General Power	1.0	60%

Dwelling Units Loads		
Load Type	Power Density Values (kVA/Unit)	Demand Factor
Average Single Bedroom Affordable Rate	23.0*	23%**
Average Single Bedroom Market Rate	31.2*	23%**
Average Two Bedroom Market Rate	33.2*	23%**

* NEC 220.84 calculated connected loads

** NEC 220.84 demand factor for “62 and over” total number of dwelling units

ELECTRICAL LOAD ANALYSIS (CONTINUED)

Equipment Loads		
Load Type	Calculated Total Load (kVA)	Demand Factor
[ASHP] Air Source Heat Pump (3)	1347	100
Boilers (2)	2400	50*
DOAS (3)	220	100
Fans (Pressure and Exhaust)	165	100
Elevators (6 at 40HP)	260	100
Pumps (Domestic, Sanitary, Jockey, Sump)	100	100
2 Fire Pumps (200HP and 125HP)	329	100
Dwelling unit Fan Coil Units	Included in Dwelling loads	
Water Heaters	Included in Dwelling loads	

*Boilers to turn on in steps up to 50% at 0°F. Below 0° and the ASHP will shut off.

Area Summary

Total Building:	310,000 GSF
Non-Tenant Building:	117370 GSF
Commercial Tenant:	7155 GSF
Affordable Rate Dwelling Units:	57475 GSF
Market Rate Dwelling Units:	128,000 GSF
Affordable Single Bedroom Units:	95
Market Single Bedroom Units:	154
Market two Bedroom Units:	47

Building Load Summary

Non-Dwelling Building Loads

Load Type	Connected kVA	Demand kVA
Lighting	82.4	82.4
General Power	127.1	68.5
HVAC	4208	3008
Equipment Loads	360	360

2 Fire Pumps (200HP and 125HP)	329	329
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Dwelling Unit Loads

95 Affordable Rate Dwelling units	2178	501
201 Market Rate Dwelling units	6373	1466

Total connected load kVA	13658
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Average demand load kVA	5874
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Recommended transformer kVA ratings:

Two triple-rated 2500kVA and one 500kVA fire pump transformer

DEMOLITION

The existing site is a public parking lot with existing lighting poles. Demolition will consist of the removal of all lighting poles and associated utility service, electrical equipment, and all conduit and wiring, back to the source. The existing service equipment may be used as temporary construction power.

There is a DTE easement located along the north edge of the property with two existing pad mount transformers and a pad mount primary switch cabinet. Relocating the existing equipment to the west half of the existing DTE easement to be priced by DTE as an alternate.

INCOMING SERVICES

POWER

Refer to one-line and riser diagrams in supplemental drawings.

BASIS OF DESIGN – INDOOR UNIT SUBSTATIONS

A primary electrical service will be provided by DTE Energy at 13,200 volts, 3 phase, 3 wire. The service will come from an existing manhole off 4th street to terminate in a 15 kV switch compartment with an adjacent utility metering compartment. The equipment will be located outdoors in an existing DTE easement on the property's northwest corner.

The incoming primary cable will be 15 kV, in accordance with Utility Co. standards. The medium voltage service will be single-conductor, MV-90 copper cross-linked polyethylene concentric cables in an underground conduit duct bank. The incoming duct bank will consist of (4) 5-inch schedule 40 PVC conduits encased in concrete and includes spare conduits.

Client owned cabling will be run from the utility metering compartment into the basement substation room. Conduit will end at the exterior wall, will be sloped away from the building, and made watertight using a sleeve seal system. A 24-inch wide by 4-inch deep ladder type cable tray will carry the medium voltage cables to the primary switch at unit substation 1 and also to the primary switch at unit substation 2.

ALTERNATE – OUTDOOR PAD MOUNTED TRANSFORMERS AND INDOOR SWITCHBOARDS

In lieu of indoor unit substations, the primary service shall consist of an outdoor primary switchgear lineup serving two (2) outdoor pad-mounted, oil-filled transformers. Client owned 480V cabling will be run from the pad mounted transformers into the basement switchboard room.

POWER DISTRIBUTION

BASIS OF DESIGN – INDOOR UNIT SUBSTATIONS

Two single-ended unit substations will be provided and will be located in the basement. The substations will be placed on a 4-inch concrete housekeeping pad.

Each substation will have 15 kV primary, 600 amps fused load-break switches. The substation will be arranged to form a radial power distribution system. The primary switches shall be manual operation.

The substation transformers will have a base rating of 2,500 kVA, aluminum windings, and will be 115 degree temperature rise with fans (2500/2875/3824kVA AA/AA/FA), ventilated, dry-type. The transformer secondary voltage will be 480Y/277 volt, 3-phase, 4-wire. The FA 115-degree temperature rise and forced air cooling will allow an additional capacity during peak demand conditions.

The secondary distribution section of the substation will consist of metal-enclosed draw-out 5,000A power circuit breakers for the secondary main and fixed, group-mounted feeder breakers arranged in switchboard construction. The main draw-out breaker compartment will contain the needed CTs, and PTs to facilitate customer 480V metering. All breakers will be fully adjustable, solid state trip unit devices. All breakers rated 1200A or greater shall include an arc energy reduction maintenance switch.

The substation shall include a tap section ahead of the main breaker to serve the fire pumps via a free standing 15 kV, 600A fused load-break switch and a 500 kVA pad mounted dry-type step-down transformer with a 480 volt, 3-phase, 3 wire secondary. The two fire pump feeders shall be tapped from the transformer secondary with underground conduit and wire to the fire pump controllers in the building.

ALTERNATE – OUTDOOR PAD MOUNTED TRANSFORMERS AND INDOOR SWITCHBOARDS

The outdoor primary switchgear shall be weather-rated, metal-enclosed, 15 kV rated with an incoming section, fire pump tap section and 600A fused load-break switches mounted on a six-inch concrete housekeeping pad.

The outdoor primary switchgear shall include a tap section ahead of the main switches to serve the fire pumps via a free standing 15 kV, 600A fused load-break switch and a 500 kVA pad mounted dry-type step-down transformer with a 480 volt, 3-phase, 3 wire secondary. The two fire pump feeders shall be tapped from the transformer secondary with underground feeders to the fire pump controllers in the building.

The pad mounted transformers will have a rating of 2500 KVA, 55/65/75 degree C rise (2500/2800/3052 kVA) and biodegradable oil filled. The transformer secondary voltage will be 480Y/277-volt, 3-phase, 4-wire and will be mounted on six-inch concrete housekeeping pads. The 55-degree temperature rise will allow an additional capacity during peak demand conditions.

Free standing, metal enclosed, service entrance switchboards will be provided. The switchboard will be circuit breaker type and will consist of a 5,000A compartmentalized draw-out main breaker and fixed

group-mounted feeder breakers. The main draw-out breaker compartment will contain the needed CTs, and PTs to facilitate customer 480V metering. All breakers will be fully adjustable, solid state trip unit devices. All breakers rated 1200A or greater shall include an arc energy reduction maintenance switch.

METERING

Revenue grade meters will be installed on the main breakers. A tenant sub-metering system shall be provided for individual housing unit metering. The metering system will be a digital, multi-point, scalable system with built-in communications capabilities for real-time monitoring, report generation and revenue billing via the Owner's Ethernet-based telecom system.

INTERIOR POWER DISTRIBUTION

The interior power distribution system will be designed to support building (house) power, commercial tenants, and dwelling unit loads including lighting loads, mechanical equipment loads, and general power loads.

Typically, two (east and west) electrical rooms will be located on each floor to house all electrical equipment such as distribution panels, panelboards, and stepdown transformers, and control equipment. Two 1600A vertical bus ducts within the stacked east electrical rooms and one 1200A vertical bus duct within the stacked west electrical rooms to feed the electrical equipment.

Electric heat, water heaters, and other mechanical loads, per floor, will be powered by a panel board on each floor. Mechanical loads on the roof, in the penthouse, and in the basement will be served by dedicated local power distribution panels.

For 208Y/120-volt service to each floor, a step-down transformer will be provided in each electrical room for all general power requirements and distribution to the dwelling unit panels. All distribution panel boards serving dwelling unit panels will have surge protection devices. All panelboards and power panels will be bolt-on circuit breaker type with main breaker or main lugs only as required. Receptacles panelboards will be 42 circuits, 208Y/120-volt, 3-phase, 4-wire, with 1-pole, 2-pole, and 3-pole branch breakers as required. East tower panel boards to have electronic metering as indicated on the riser diagram.

Lighting panelboards will be 30 circuits, 480Y/277-volt, 3-phase, 4-wire, 125A frame with 100A main breaker, and 1-pole, 2-pole, and 3-pole branch breakers as required.

Each market rate (east tower) dwelling unit will have a 208/120-volt, 1-phase, 3-wire, 125A frame with a 125A main breaker, flushed mounted load center. These load centers will have 24 circuits with 1-pole and 2-pole branch breakers as required.

Each affordable rate (west tower) dwelling unit will have a 208/120-volt, 1-phase, 3-wire, 100A frame with a 100A main breaker, flushed mounted load center. These load centers will have 16 circuits with 1-pole and 2-pole branch breakers as required.

Surge protective devices (SPD) will be provided at the service entrance.

Conductors will be copper. Aluminum conductors will be permitted for feeders rated greater than 100 amps. The minimum conductor size for power and lighting circuits will be #12 AWG. Conductor

insulation will be THHN unless special conditions warrant another insulation type. All branch circuits will have a separate neutral conductor.

The minimum power and control conduit size will be ¾-inch. Conduit will be metallic; RMC, IMC or EMT with each application to be determined. Refer to Convergent Technologies Design Group's narrative for telecommunications conduit size. Branch circuits will be permitted to utilize type MC cable when concealed in walls and partitions. Type MC cable will not be permitted for circuit home runs, above ceilings or where exposed. Liquid-tight flexible metal conduit will be used for final connections to motors, transformers, and equipment in wet locations. Galvanized rigid steel sleeves will be provided for conduit penetrations through walls, floors, and ceilings.

Power for small motors (½ HP or less) will be 120-volt, single phase. Motors greater than ½ HP will be 480- volt, 3-phase, 3-wire.

Most motors will be provided with variable frequency drives (VFD). Local safety non-fused disconnect switches will be provided if motor starters or variable frequency drives are not within line-of-sight of the motor. Safety switches used with VFD's will be equipped with pre-break (auxiliary) control contacts.

High efficiency transformers, premium efficiency motors and VFDs will be deployed throughout the building to improve energy efficiency.

General branch circuiting will be designed with a maximum of 6 general use duplex receptacles on one 20-amp circuit. Branch circuiting for computer workstations will be designed with a maximum of four workstations on one 20-amp circuit. Each office will include a minimum of one duplex receptacle on each wall and a quad receptacle at the location of the workstation. Corridors will have general duplex receptacles located not more than 30'-0" apart.

Copiers, printers, appliances, and special equipment will be served from a dedicated circuit. Ground fault circuit interrupter receptacles will be provided for locations within 6 feet of sinks or other water sources and outdoors. Poke-thrus will be provided in selected rooms such as conference/meeting spaces. Meeting rooms and conference rooms quantity of wall and floor 120-volt receptacle outlets will be provided per NEC 2017 Article 210.71 requirements.

General dwelling receptacles shall be listed as tamper resistant and will be spaced no more than 12 feet apart along a wall. All 120-volt, single phase, 15 and 20 ampere branch circuits supplying outlets or devices installed in dwelling unit kitchens, family rooms, dining rooms, living rooms, bedrooms, closets, hallways, and similar rooms shall have listed arc-fault circuit interrupter (AFCI) protection per NEC 210.12. Dwelling unit receptacles adjacent to beds and above select countertops will have USB ports. Special purpose, 250-volt NEMA-type receptacles will be provided for electrical ranges for all dwelling units and dryers in market rate (west tower) dwelling units.

EMERGENCY ELECTRICAL POWER SERVICE

The emergency electrical power system will consist of one natural gas generator, approximately 1000 KW, 480Y/277-volt, 3-phase, 4-wire. The engine-generator will be fan-cooled, located indoors on the second level in a 2-hour rated, dedicated generator emergency room, complete with batteries, charger, jacket water heater, lube oil heater, control panel, etc. An 18-pole, 60 amp load center type panelboard will be mounted inside the generator room to serve the auxiliary loads. The generator will be mounted

on vibration isolators with sound attenuation in the room, louvers, and ductwork to reduce sound levels.

The generator will be provided with output circuit breakers to feed a generator switchboard. The switchboard will feed two automatic transfer switches (ATS) and two fire pump controllers from separate barriered vertical sections. The loads connected to each ATS will be segregated into emergency and standby. The ATSs will be 4-pole, open transition. The ATS serving the elevators will be provided with a pre-transfer and re-transfer signal to notify the elevator controllers of an impending transfer or re-transfer.

A 1600A, 480Y/277-volt, 3-phase, 4-wire exterior rated docking station with load bank and temporary generator cam lock connections will be provided below the generator room on grade at the north face of the building. Provide with custom color, coordinating with architecture.

The emergency loads will consist of means of egress lighting, exit signage, 2 electric fire pumps, fire detection and alarm systems, emergency communications systems, emergency responder radio coverage, elevator lighting and generator auxiliary loads.

Emergency lighting will be served by 277-volt, single phase, 2-wire, from emergency lighting panels typically located every third floor in the west tower electrical rooms.

Surge protective devices (SPD) will be provided at all NEC Article 700 panelboards.

The standby loads will consist of one elevator per bank (selectable via the elevator controller), elevator equipment and pumps, elevator shaft pressurization fans, domestic water booster pump, sanitary waste sump pumps, foundation drain sump pumps, stair pressurization fans, smoke control systems exhaust fans, smoke/fire dampers, fire command center receptacles, and other loads to assist first responders in rescue operations.

The fire pump controllers will be dual fed; one feed from the generator; the other from a secondary tap from the generator transformer. The normal feeders to the fire pumps will be routed underground and the generator feeder shall be 2-hour rated. The fire pump controller will include an integral automatic transfer switch.

LIGHTING SYSTEMS

LIGHTING CONTROL SYSTEM

Lighting controls within dwelling units are exempt from code requirements but per Enterprise green Certifications qualifying light fixture locations will include automatic controls with motion sensors. Qualifying locations within the contiguous area include kitchens, dining rooms, living rooms, family rooms/dens, bathrooms, Bedrooms, and home offices. This excludes plug-in lamps, and closets.

All common (non-dwelling) spaces will have some form of automatic control via motion sensors, manual switches, dimming capabilities, and daylight sensors as needed except for spaces exempt from automatic control per Code.

Wall mounted vacancy sensors with dual technology (passive infra-red and ultrasonic/sound) shall be utilized in rooms sized 120 square feet and less.

Public restrooms to be controlled automatically on and off by occupancy sensor.

Stairs and corridors will be controlled via occupancy sensors to automatically step-up lighting to 100 percent when occupied and automatically step-down lighting to 10-30 percent when un-occupied.

Utility areas such as Electrical, Mechanical, Telecom, and Elevator Machine Rooms shall be controlled by conventional wall mounted toggle switches. Automatic controls are exempted for safety reasons.

Exterior lighting to be control via time clock, daylight sensing, time clock, daylight sensing, and Building Management system.

EMERGENCY LIGHTING

The emergency lighting will consist of selected fixtures along the path of egress, exterior exit doors, elevator control/machine rooms, elevator pits and elevator landings connected to the emergency generator. Emergency lighting will also be installed in the substation room, electrical rooms, fire command center, telecommunications rooms and mechanical rooms. Switched emergency lighting fixtures will utilize emergency load transfer devices to enable emergency lighting during loss of normal power regardless of previous lighting level, such as conference rooms. The emergency illuminance values listed below are horizontal foot-candles measured at the finished floor, unless otherwise noted:

Area	Illuminance Levels
Elevator control room	19 FC minimum
Elevator pit	10 FC minimum
Elevator landing sill	10 FC minimum (with elevator doors closed)]
Defined path of egress	3.0 FC minimum, 40:1 uniformity ratio
Exits and 10 feet on the exterior	3.0 FC minimum

Illuminated exit signs will also be used along the path of egress, allowing two signs to be seen at any one time. Exit signs will be LED and UL listed with green lettering and an operating voltage of 277-volts.

INTERIOR LIGHTING

All new lighting fixtures will utilize light emitting diode (LED) sources. Light source correlated color temperature (CCT) will be tailored to the appropriate space type. Public interior spaces will utilize 3500K and 4000K CCT for ambient lighting and 80 color rendering index (CRI) minimum, while accent lighting of wood tones will utilize warmer CCT and 90 CRI min. Residential units will utilize 2700K and 3000K CCT with 90 CRI. Lighting fixtures will be serviceable with replaceable parts.

INTERIOR LIGHTING CRITERIA

Interior lighting levels are based on Illuminating Engineering Society (IES) Handbook 10th edition Lighting Library, ANSI/IES/ALA RP-11-20 "Recommended Practice: Lighting for Interior and Exterior Residential Environments," and ANSI/IES RP-10-20 "Recommended Practice: Lighting Common Applications." These illuminance values listed below will be average maintained horizontal foot-candles measured at the work plane unless otherwise noted:

Building Entries

Vestibules, Medium Activity - Eh @ floor: 50, Ev @ 5' AFG: 30

Lobbies

General /Elevator (At building entries – night) – Eh @ floor: 50, Ev @ 5' AFF: 20

Security Screening – Eh @ 3' AFF: 200, Ev @ 5' AFF: 100

Reception desk – Eh @ 3'6" AFF: 150, Ev @ 5' AFF: 50

Lounge – Eh @ task plane: 100, Ev @ 5' AFF: 20

Mailboxes – Eh @ task plane: 100, Ev @ 5' AFF: 20

Office – Eh @floor: 50+task, Ev @ 2'6": 100

Circulation Corridors

Adjacency passageways – Eh @ floor: 5X task, Ev @ 5' AFF: 30, avg:min-3:1

Independent passageways – Eh @ floor: 30, Ev @ 5' AFF: 30 Avg, avg:min-3:1

TYPICAL RESIDENTIAL UNIT :

- Foyer –
 - Day – Eh @floor: 100, Ev @4': 40
 - Night – Eh @floor: 30, Ev @4': 10
- Family room – Eh @ floor: 100, Ev @ 4' AFF: 40
- Living Room – Eh @ floor: 30, Ev @ 4' AFF: 30
- Bedroom –
- General – Eh @ 2': 50, Ev @ 4' AFF: 30
- Television viewing – Eh @ 4': 30, Ev @ 4' AFF: 15
- Kitchen –
 - Breakfast area – Eh: 300, Ev: 200
 - General – Eh@2'6": 200, Ev@4': 50
 - Preparation counters– Eh@2'6": 500, Ev@ 2'6": 7.5
 - Sinks – Eh @ 2'6" AFF: 200, Ev @ 4' AFF: 100
- Dining (casual) – Eh @ 2'6" AFF: 100, Ev @ 4' AFF: 40
- Dining (formal) – Eh @ 2'6" AFF: 500, Ev @ 4' AFF: 20
- Closets – Eh @ 4' AFF: 100, Ev @ 4' AFF: 40
- Storage – Eh @ floor: 10, Ev @ 4' AFF: 20
- Restrooms –
 - Fixtures – Eh @ top of fixture: 100, Ev @ 3" AFF: 30
- Vanities – Eh @ floor: 50, Ev @ 3'-5' AFF: 30
- Community room
- Meeting/conference – Eh @ 2'6" AFF: 400, Ev @ 4' AFF: 150
- Multipurpose – Eh @ task plane: 100, Ev @ 5' AFF: 20
- Support spaces
- Laundry –
 - Wash and Dry – Eh @ 3' AFF: 200, Ev @ 3' AFF: 50
 - Ironing – Eh @ 3' AFF: 200, Ev @ 3' AFF: 50
- Electrical, mechanical rooms – Eh @ 2'6" AFF: 300, Ev @ 5' AFF: 300

INTERIOR LIGHTING - DESIGN BY SPACE TYPE

The following sections describe specific space lighting design, systems, and control strategies.

Transition Corridors

- Lighting will be efficient and layered, with use of strategic accenting to highlight signage and provide wayfinding throughout the space. The following design strategies will be explored –
 - Glare-free general recessed ambient lighting system
- Basis of design: Acuity – Aculux (downlight and wall washers)
 - Perimeter wall slots and/or wall washers to highlight prominent wall surfaces, elevator core conditions, and / or signage.
- Basis of design: Finelite “HPWS” Wall slot
- Basis of design: Vode “Wingrail” Linear wall washer
 - Occupancy and vacancy sensors integrated within the space.

Elevator Lobby

Lighting will be efficient and glare-free, highlighting feature walls and architectural forms as well as important signage and wayfinding guides. Where feature ceilings are utilized, lighting will integrate within specialty ceiling panels and framing. The following design strategies will be explored –

- Glare-free general recessed ambient lighting system
- Basis of design: Acuity – Aculux (downlight and wall washers)
- Basis of design (slatted ceiling) – USAI “Micro Multi-cell”
- Perimeter recessed cove lighting at elevator doors, to enhance brightness and entry as well as guide transition on floor.
- Basis of design: Basis of design: Finelite “HPWS” Wall slot
- Vertical wall wash accent of feature wall material and/or environmental graphic/artwork.
- Basis of design: Vode “Wingrail” Linear wall washer
- Integrated cove and/or downlighting within feature ceiling.
- Basis of design: Vode “Zipwave” Linear cove

Lobby

Concealed lighting will highlight and enhance the architectural forms in the space, accentuating reflective, refractive, and color qualities of materials. Decorative lighting will be act as a feature and stimulate the space. In the west tower, mullion mounted lighting along the perimeter curtainwall provides uplight accent to the space and the exterior overhang (see diagram and exterior narrative). The following design strategies will be explored –

Vertical wall wash accent of feature wall material and/or environmental graphic/artwork.

Basis of design: Vode “Wingrail” Linear wall washer

Integrated cove and/or downlighting within feature ceiling.

Basis of design: Vode “Zipwave” Linear cove

- Pendant lights with unique optics that add sparkle and intrigue.
- Basis of design: Nelson Bubble lamps – Medium Saucer Bubble pendant or equivalent decorative lights

Main Office/general Office

Lighting will be efficient and glare-free for optimal computer driven work environment, with added task illumination at desk for ease of control. The following design strategies will be explored –

Glare-free general recessed/surface mounted ambient lighting system

Basis of design: Finelite – HP2

- Task lighting as required.
- Basis of design: Flos “Oblique table lamp”

Typical Residential unit

General illumination from building lighting will be diffuse and visually comfortable. Surface mounted flat panel LED fixtures provide ambient light in the entryways and kitchens. Undercabinet lighting provides task illumination in kitchens. Fans with integrated lighting in living room and bedrooms. Wall mount vanity light sconces illuminate the bathrooms and shower-trimmed downlights light the showers. See exterior lighting for units with walk-out balcony access.

- Flat panel led surface mount in entryway, kitchen, hallways, etc.
- Basis of design: Tech Lighting “Vance LED flushmount”
- Undercabinet lighting in kitchen (market rate)
- Basis of design: WAC Lighting “Line 2.0”
- Vanity light and shower rated downlight in bathrooms
- Basis of design: Halo 6” ML56 series
- Basis of design: Tech Lighting “Banda LED Vanity Light”
- Ceiling fan and light
- Basis of design: Modern Forms – Nirvana

Reception/Waiting

Concealed lighting will highlight and enhance the architectural forms in the space, accentuating materiality, signage, and guiding wayfinding efforts. Reception desks and signage will be delineated with added accent lighting details, showcasing visual hierarchy. The following design strategies will be explored –

- Glare-free general recessed/surface mounted ambient lighting system
- Basis of design: Acuity – Aculux (downlight and wall washers)
- Cove lighting integrated into desks or architectural features and/or decorative pendants in featured ceiling
- Basis of design: Moda Light – Minicove
- Nelson Bubble lamps – Medium Saucer Bubble pendant or equivalent decorative lights
- Perimeter accent for vertical brightness and wayfinding.
- Basis of design: Finelite – HPWS (Wall slot)

Community room

Lighting will accentuate architecture, highlight feature materials, create scale, and allow multiple flexible uses. A layered approach will be incorporated: recessed downlights provide general lighting. Perimeter cove lighting highlights the feature ceiling elements, while recessed wall washers/adjustable accent lighting spotlight artwork/feature graphics. Decorative pendants provide scale over high-top counters/casework. Undercabinet lighting in the kitchenette area contribute task lighting.

- Glare-free general recessed/surface mounted ambient lighting system
- Basis of design: Acuity – Aculux (downlight and wall washers)
- Cove lighting
- Basis of design: Modalight “Nanocove” – linear cove
- Basis of design: Finelite “HPWS” – perimeter wall slot
- Decorative pendants
- Basis of design: Nelson Bubble lamps
- Undercabinet lighting
- Basis of design: Tech Lighting “Unilume slimline”

- Controls utilize pre-set dimming for multi-space lighting targets

Fitness

Lighting will be efficient and glare-free, with strategic vertical accents to highlight feature graphics. The following design strategies will be explored –

- Glare-free general pendant mounted ambient lighting system
- Basis of design: Finelite “HP2” Direct/indirect linear pendants
- Vertical wall wash accent of feature wall material and/or environmental graphic/artwork.
- Basis of design: Finelite “HPWS” perimeter slot
- Basis of design: Vode “Wingrail”
- Daylighting, occupancy, and vacancy control to refine output and intensity during non-peak usage hours.

Huddle Rooms

- Recessed linear lighting provides general diffuse ambient light
- Basis of design: Finelite “HP4”

Kitchen

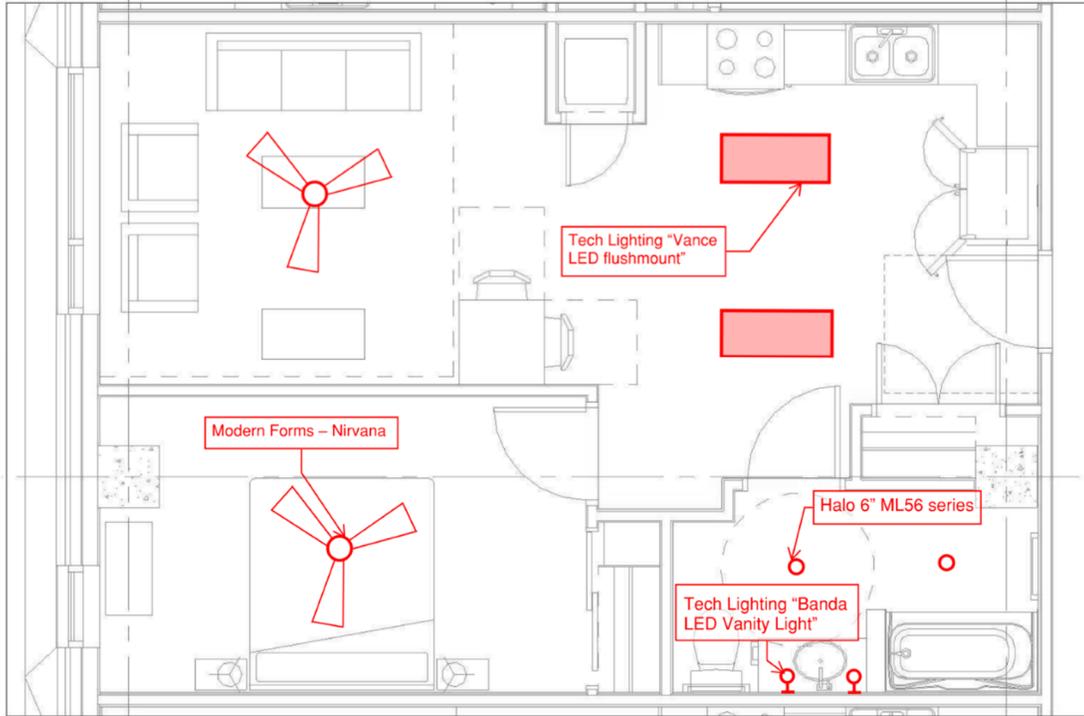
- Lighting will be clean and glare-free.
- Architectural troffers will provide general illumination.
- Basis of design: Lithonia Lighting - LED Saturn Linear

Support spaces (Bike parking, Loading, Trash, Laundry, storage)

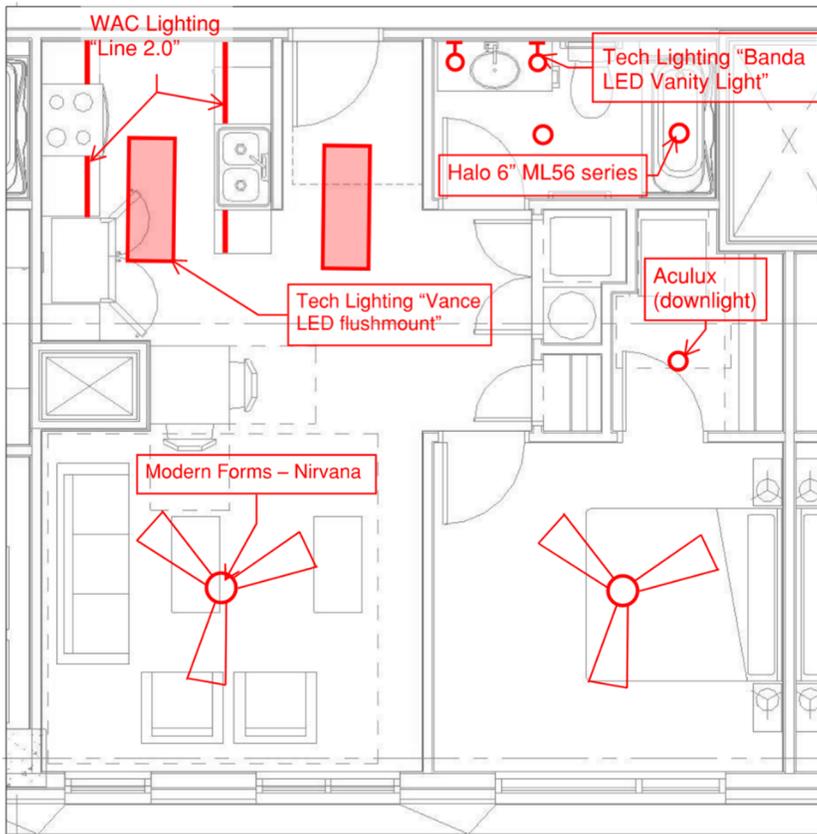
- Lighting will be efficient and glare-free with strategic vertical accents to highlight feature walls. The following design strategies will be explored –
- Architectural troffers will provide general illumination.
- Basis of design: Lithonia “WHSPR”

Mechanical/Electrical/Utility rooms

- Industrial grade strip linear LED fixtures chain or surface mounted will provide safe, uniform general lighting
- Basis of design: Lithonia “CLX”



West tower residence plan



East tower residence plan

EXTERIOR LIGHTING

Exterior lighting will be designed to balance the sustainable goals for the project with the desired nighttime character of the building. Consideration will be given to the brightness context around the site and its relationship to the surrounding context of adjacent buildings. Light pollution reduction will be addressed via controls and a curfew based on programmatic requirements. Light levels will be in accordance with city safety requirements and egress lighting per NFPA 101 Life Safety Code. Exterior lighting criteria is based on Illuminating Engineering Society (IES) Lighting Library, ANSI/IES/ALA RP-11-20 "Recommended Practice: Lighting for Interior and Exterior Residential Environments," and ANSI/IES RP-42-22 "Recommended Practice: Lighting Exterior Applications."

LED 3000K wall packs above exterior exit doors connected to emergency power circuit.

LED 2700K bollard and/or step light fixtures for terrace walkway lighting.

City standard "Globe-style" LED 3000K lighting fixtures and city standard poles, for adjacent city sidewalks.

LED 3000K maximum façade accent lighting.

EXTERIOR LIGHTING DESIGN CRITERIA

The lighting design will incorporate the Illumination Levels (Maintained lux levels) as identified below:

Building Entries

- Canopied Entries/exits, Moderately High Activity: LZ3 - Eh @ grade: 15, Ev @ 5' AFG: 8
- Non-covered Entries/exits, Medium Activity: LZ3 - Eh @ grade at threshold: 10, Ev @ 5' AFG within 3' of threshold in direction of security
- LZ3 - Lower limit (avg.): Eh @ 0' AFG: 20 lx. Upper limit (avg.): Eh 0' @ AFG: 40 lx.

Drop-off, Pick-up

- Curbside drop-off, pick-up Moderately High Activity - LZ3 - Lower limit (avg.): Eh @ 0' AFG: 20 lx. Upper limit (avg.): Eh 0' @ AFG: 40 lx. Avg:Min = 5:1, Max. glare rating =G2, Max. Uplight Rating U3.

Landscape

- Garden area Moderately High Activity LZ3 - Lower limit (avg.): Eh @ 0' AFG: 1 lx. Upper limit (avg.): Eh @ 0' AFG: 8 lx. Avg:Min ratio =8:1
- Lower limit (avg.): Ev @ 1'6" AFG: 2 lx. Upper limit (avg.): Ev @ 1'6" AFG: 20 lx. Max. glare rating =G2, Max. Uplight Rating U3.

Exterior Walkways

Walking Surfaces (adjacent to architecture/exits/hardscape) Moderately High Activity: LZ3 - Lower limit (avg.): Eh @ 0' AFG: 10 lx. Upper limit (avg.): Eh @ 0' AFG: 30 lx. in direction of path of travel. Avg:Min ratio= 10:1. Max. glare rating =G2, Max Uplight Rating U3.

Facades

- Façades with medium reflectance materials (≥ 0.3 and ≤ 0.6): LZ3 - Lower limit (avg.): Ev @ 0' AFG: 2 lx. Upper limit (avg.): Ev @ 0' AFG: 15 lx.
- Façades with low reflectance materials (≤ 0.3): LZ3 - Lower limit (avg.): Ev @ AFG: 4 lx. Upper limit (avg.): Ev @ AFG: 30 lx.

Accent elements/decorative lighting

- Façades with medium reflectance materials (≥ 0.3 and ≤ 0.6): LZ3 - Lower limit (avg.): Ev @ 0' AFG: 2 lx. Upper limit (avg.): Ev @ 0' AFG: 15 lx.
- Façades with low reflectance materials (≤ 0.3): LZ3 - Lower limit (avg.): Ev @ AFG: 4 lx. Upper limit (avg.): Ev @ AFG: 30 lx.

Exterior Egress Lighting

- levels to meet minimum of 3FC in all building spaces to define a path of egress to all required exits and to a distance of 10feet on the exterior.

EXTERIOR LIGHTING – DESIGN BY SPACE TYPE

Exterior lighting plan will include exterior entrances, exits, pathways including public and service areas. Exterior lighting to be control via time clock and daylight sensing. All façade accent lighting to comply with Ann Arbor curfew shutoff requirements.

Site lighting

Refer to figure L1 below

Pedestrian post-mounted luminaires will provide ambient illumination. Pedestrian post/fixture to follow typical city standards at sidewalks and crosswalks, including arm brackets, banner arms, GFCI receptacles, etc. Site landscaping adjacent to the bus station incorporate stainless steel cable festoon lighting mounted to aluminum poles, and in-grade recessed uplights with color-changing technology in tree grates highlight featured landscaping.

- Pedestrian Post top fixtures
- Basis of design: City standard Lumecon AA Globe and pole.
- Festoon lighting poles and fixtures
- Basis of design: Hapco straight round aluminum poles - 14' tall.
- Basis of design: Tivoli "Litesphere" system
- In-grade tree accent lighting
- Basis of design: We-ef "ETC100-GB CC"

Service drive and bus station entrance -

Refer to figure L2 below

The service drive will divide the garbage collection and loading from the bus drop off via structural columns and decorative, ornamental screening structures. Those screening structures will incorporate integrated color changing linear lighting to backlight and/or highlight the features at top and bottom, creating a visual veil of the service side of the building. Lensed and gasketed fixtures recessed into the metal panel ceiling will provide ambient lighting below, while column mounted

uplights provide indirect diffuse light and highlight the ceiling. Façade mounted area lights provide ambient lighting to bus drop off.

- Ambient recessed linear lighting
- Basis of design: Selux “M60 LED WET”
- Screen wall linear lighting
- Basis of design: Modalight “Graze Exterior RGBW”
- Column mounted uplighting
- Basis of design: Bega “33361”
- Bus area lighting
- Basis of design: Bega “24351”

Canopy at West Tower Entrance

Uplighting to highlight the entrance canopy provides wayfinding and supplements required illumination. Surface downlights at exterior canopy above pathway for exterior illumination. The following design strategies will be explored -

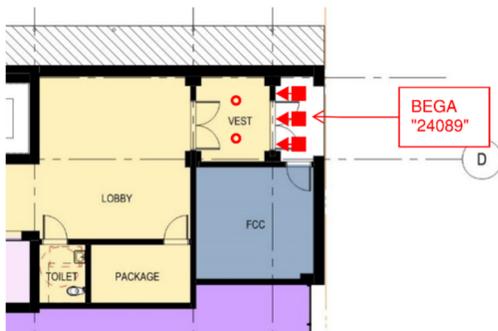
- Surface mounted ambient lighting system.
- Basis of design: Bega 24409
- Indirect lighting for supplementary illumination.
- Basis of design: Alight “ACCOLED ACL4” mullion mount (See diagram below)

East Tower Entrance

Surface mounted wall washers provide vertical illumination for wayfinding and supplements required illumination.

Surface wall washers

Basis of design: Bega 24089



Terrace (levels 3, 17 and 18) -

Refer to figures L3, L4, and L5 below

Public terraces will incorporate the following lighting layers: Where trellis and/or shade structures are present, integrated small-profile cylinder downlighting provides general lighting while accent flood

lights highlight slatted walls and greenery. Perimeter guardrails will integrate micro-led puck lighting subtle edge path lighting. Private terraces with awnings and façade accent panels will incorporate a linear wall mounted fixture at accent panels to highlight the panel and provide subtle functional lighting.

- Surface mounted ambient lighting system.
- Basis of design: Bega “24409”
- Trellis accent lighting
- Basis of design: BK “Artistar Mini-Micro”
- Guardrail/post perimeter lighting
- Basis of design: Wagner “Lumenpod” (rails) or “Bantam” (posts)
- Accent panel sconce
- Basis of design: Bega “77152”

Façade

See figures L4, L5

Accent lighting to provide opportunities of interest at strategic locations on all visible façades. Lighting will be controlled via timeclock and photocells. The south stair tower will explore the flood lighting of a large-scale mural or art piece. Outriggers with asymmetric flood lights at top and bottom of the stair tower façade will provide vertical highlight.

- Accent panel lighting
- Basis of design: Bega “77152”
- Stair tower art flood lighting
- Basis of design: Bega “84100”

Figure L1: Site lighting diagram

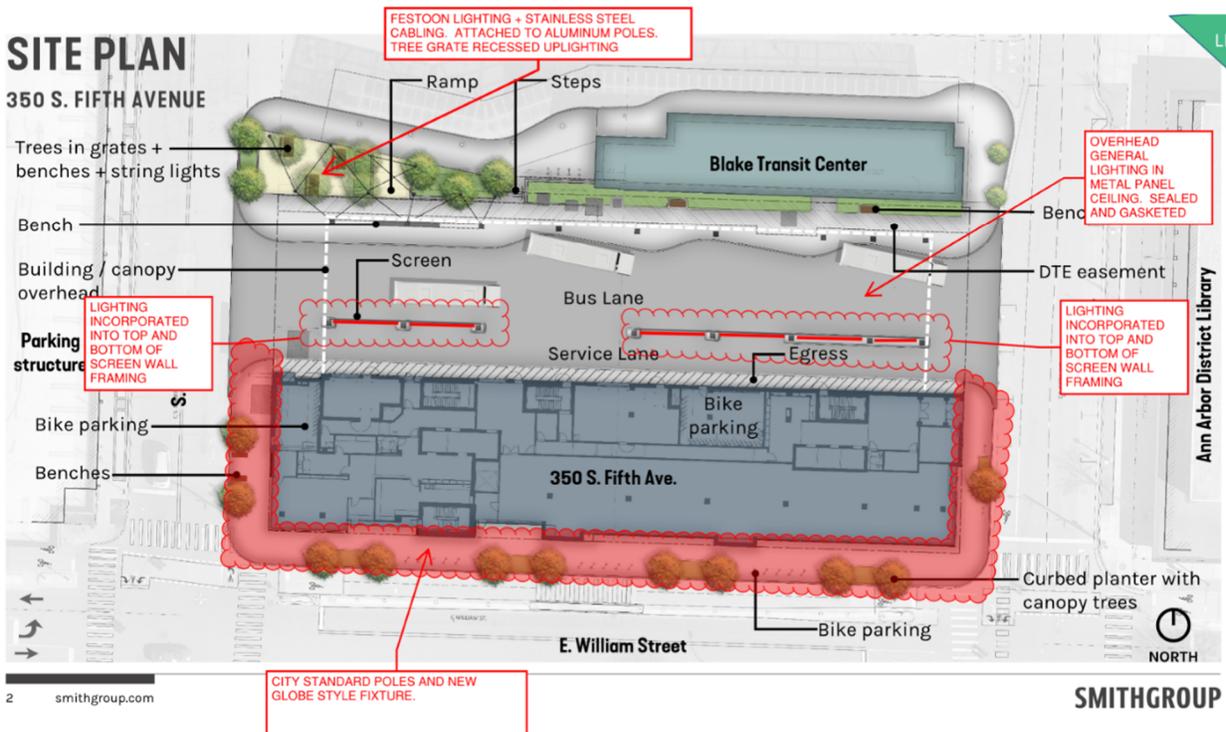


Figure L2: Service canopy and bus loading lighting

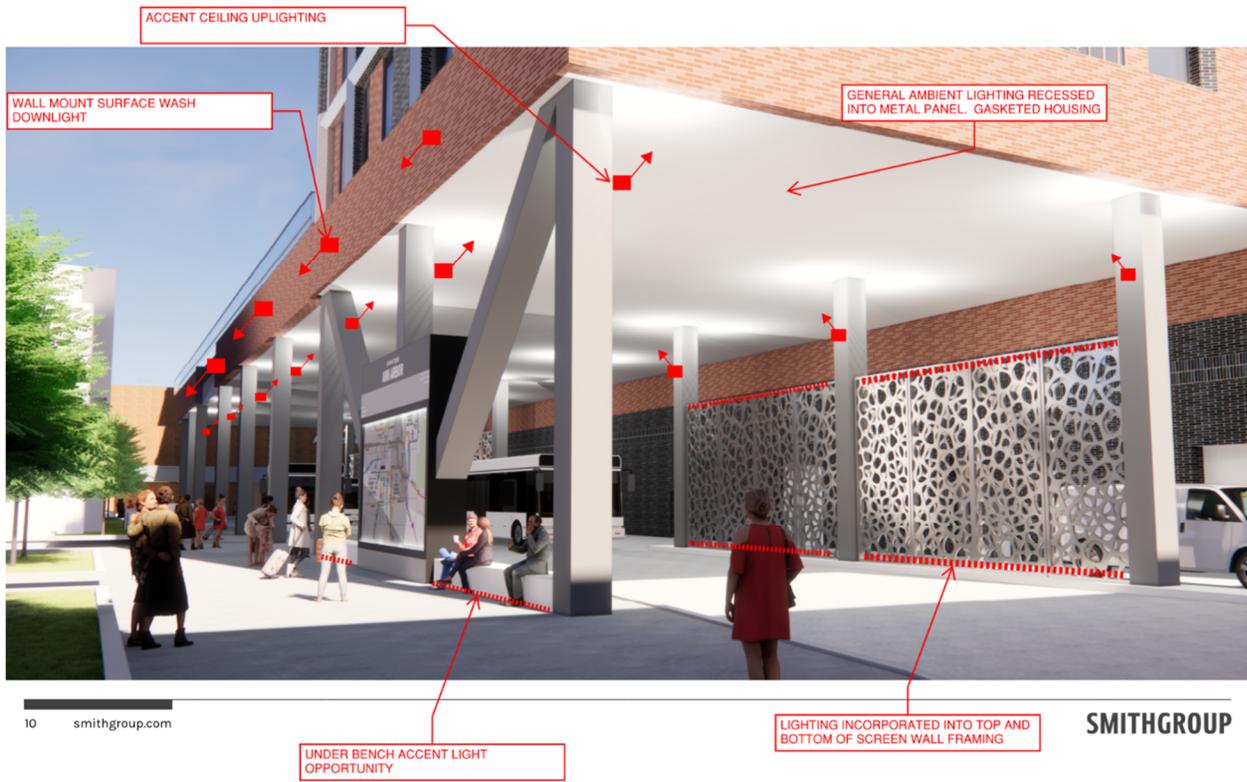


Figure L3: West tower terrace lighting

Figure L4: Level 3 balcony and façade lighting

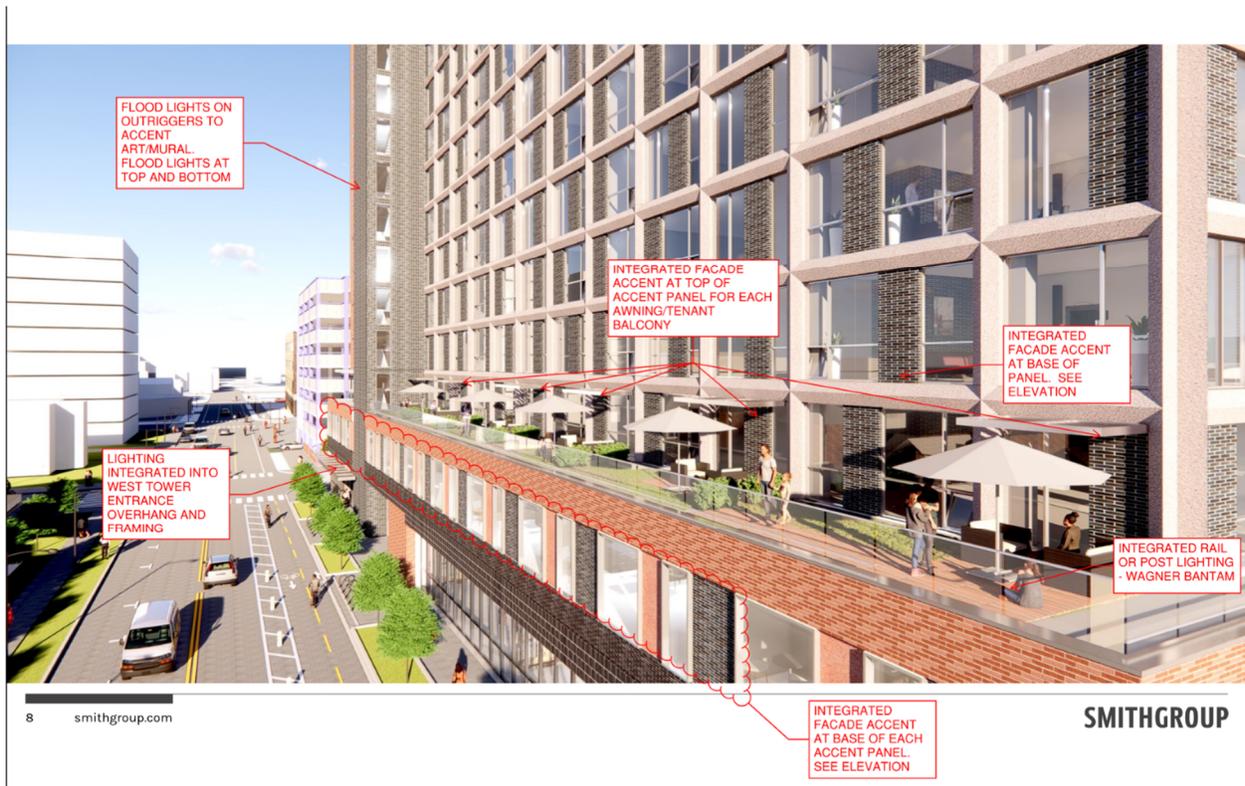
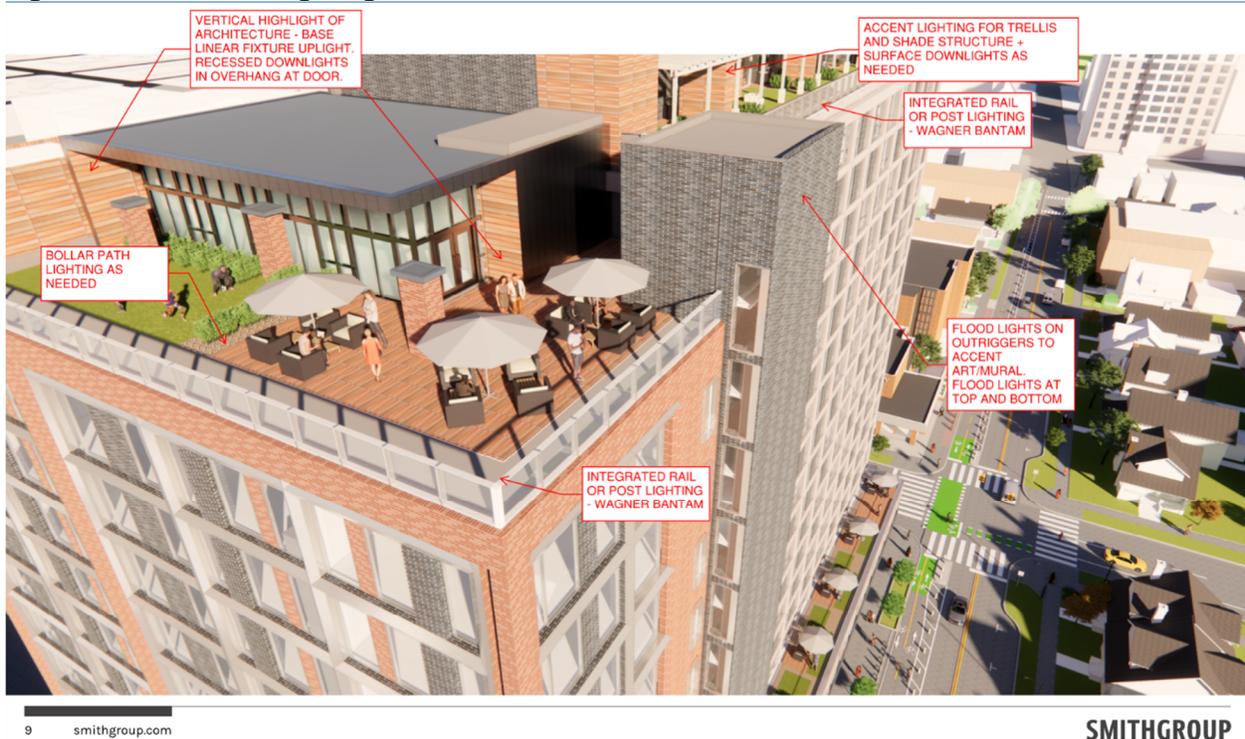


Figure L5: Roof terrace lighting



Massing Sketch

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GROUNDING SYSTEM

Interconnection of the service ground, system neutral and equipment ground conductors will be made within the service equipment. The power system ground will serve as a reference point for equipment grounding for all building systems.

Building structural steel columns will be grounded at every other perimeter column via copper cabling and ground rods to form a grounding ring. The ground rods will be copper clad and will be interconnected with copper grounding cables to form a ground ring around the building.

A ground mat will be provided for substation grounding located outside. The main ground bar will be installed on one or more walls of the main substation/electrical room.

A bonding jumper will be provided to all underground piping services.

A dedicated grounding riser will be provided for electrical and telecommunication system. Refer to Convergent Technologies Design Group's narrative for grounding and bonding requirements for the telecommunication rooms (TR). The ground bus bar in telecommunication will be connected to electrical system ground in the substation room.

An insulated ground conductor will be provided with all power feeders and branch circuits for equipment grounding purposes.

All lighting fixtures, enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, and other conductive items for personnel safety will be grounded to provide a low impedance path for possible ground fault currents.

LIGHTNING PROTECTION SYSTEM

A lightning risk assessment was complete per 2017 NFPA 780 Standard. A lightning protection system should be considered optional for 350S Fifth building.

A passive lightning protection system will be provided for the building consisting of roof-mounted air terminals, copper down conductors and a counterpoise ground ring. It will be designed for Class II service in accordance with NFPA 780 and UL 96A.

SHORT CIRCUIT, DEVICE COORDINATION, AND ARC-FLASH STUDIES

The Contractor will provide a complete report for short circuit, coordination, and arc-flash studies, for all new equipment installed per the requirements of NFPA 70E, IEEE 1584. The Contractor to provide and install arc-flash labels per the results of the study.

ELECTRICAL TESTING AND COMMISSIONING

The Contractor will provide electrical testing and commissioning for all major equipment including but not limited to the following (where applicable):

Substation primary switches, transformers, secondary switchgear. Primary and secondary feeders. Emergency generator. Distribution and lighting & receptacle panelboards. Low voltage transformers. Grounding system. Lighting control system. Fire alarm system. Two-way emergency communications system. Emergency responder radio coverage system.

SUSTAINABILITY

ENTERPRISE GREEN CERTIFICATION REQUIREMENTS

A goal of Enterprise Green Certification has been identified for the 350S Fifth building. Strategies and technologies will be implemented to promote electrical sustainability, reduce energy consumption, and provide on-site energy production.

- EGR 5.3 through 5.4: Smith Group recommends pursuing [5.3b] with photovoltaic (PV) systems on the adjacent parking deck along with procuring renewable energy credits (RECs) to achieve 8 points for “Option 1” – 40% of total project energy consumption provided by renewable energy.
- EGR 5.5b: Building will be all electric. No combustion equipment used as part of the building project; apart from emergency backup power.
- EGR 5.8: Follow EGR guidance for light fixtures, lighting controls, lighting power density, and exterior lighting.
- EGR 5.10: Adequate emergency power to serve at least three of EGR defined critical energy loads for at least four consecutive days 24 hours per day. Emergency power will be served by an efficient, reliable, natural gas generator. Critical loads recommended to be served by emergency are as follows:
 - Operation of water pumps if needed to make potable water available to occupants.
 - Lighting level a minimum of 3 footcandles in all building spaces to define a path of egress to all required exits and to a distance of 10 feet on the exterior.
 - Operation of one elevator in building (NFPA Code requires 1 per bank).
 - EGR 8.5: Client to be able to collect and report project energy performance data. Uploading project energy performance data in an online utility benchmarking platform annually for at least five years from time of construction completion per one of the four methods provided. Enterprise must have view access for that period.

XI. LOW VOLTAGE

A. INTRODUCTION

This preliminary design narrative has been prepared for City of Ann Arbor. Described within this report are the system summaries for various low-voltage systems to be specified for the 350 S. 5th Ave Development PUD located in Ann Arbor, MI. The project consists of three parts; an affordable housing tower, a market rate mixed-income tower, and a bus parking area. Low Voltage systems to be specified include Telecommunications structured cabling systems, Electronics Security Systems, and Audiovisual Systems . The proposed design criteria are based on the current architectural floor plans, initial discussions with the Owner and Design team, industry best practices and our experience on similar projects.

B. OWNER FURNISHED EQUIPMENT

The facility will include various systems to be procured and installed separately of the base-building package. Infrastructure will be included within the building to support these systems. Examples of Owner Furnished Equipment (OFE) include, but are not limited to the following:

- Computers
- Copier/Printer/Fax Machines
- Telephone Handsets
- Personal Communications Devices (Wireless phones, Tablets, etc.)
- Network Electronics
- Wireless Access Points
- Distributed Antenna System

C. TELECOMMUNICATIONS STRUCTURED CABLING SYSTEM

The following outlines design and performance features for the data network, Voice over Internet Protocol (VOIP), and terrestrial video (CATV) telecommunications Structured Cabling System (SCS) to be specified for the 350 S. 5th Ave Development PUD. Wherever possible, existing standards for the telecommunications SCS will be incorporated into the design of the new facility. This narrative also describes the Telecommunications Rooms (TRs) required to support the SCS. These rooms require coordination with the architect, as well as the electrical, mechanical and structural engineers.

The SCS shall be installed in to support the majority of the Information Technology (IT) systems requirements, building management systems, security and access control systems. The Structured Cabling System solution will be specified to achieve a minimum Twenty-five (25) year warranty.

CTDG will use the following specifications as the basis of design for the 350 S. 5th Ave Development PUD SCS and TRs.

1. Outside Plant Cabling Connection

Internet Service Provider (ISP) connections shall be provided by the following three providers: The City, AT&T, and Comcast. The City provided connection shall include two (2) 4” conduits stubbed out from

the building to a handhold located outside of the building. One (1) 48 strand single mode optical fiber cable shall be provided by the city. AT&T and Comcast will have separate pathway into the building. Service provider connections will need to be further coordinated throughout the design process.

2. Intra-Building Vertical Riser Cable System

The Intra-Building Vertical Riser cabling will be installed to connect the telecom distribution room on each floor to the buildings main cross connect. Suggested cable types and quantities are as follows:

- One (1) 50 pair copper cable
- One (1) 0.500" Coaxial cable
- One (1) 24 Strand Multi Mode Optical Fiber cable
- One (1) 12 Strand Single Mode Optical Fiber cable

3. Communications Horizontal Cabling

All network cables will be terminated onto Category 6 48-port patch panels in each TR. There will be horizontal wire management above and below each patch panel. At the station locations the Category 6 cables will be terminated onto 8-position 8-conductor colored to match the faceplate modules, which will be single gang and colored to match the electrical faceplates. The coax cables will be terminated with F style connectors at each end and a 90 degree coupler will be specified at the station side.

Tenant spaces will be connected to the telecom distribution rooms with optical fiber, category 6, or coaxial cables. These will be used to distributed service provider connections to each tenant individually. AT&T Connected Communities will put equipment in every resident unit in the East Tower. In the West Tower everything is provided by the city for connectivity to the internet.

4. Communications Cable Pathway

The primary intra-building horizontal pathway systems pathway for telecommunications cabling throughout the interior of building will be via non-continuous cable supports (NCCS) "J-hooks". For any cable tray that passes through a rated wall, fire stop sleeves will be utilized that match the walls rating will be placed in the wall space. The NCCS will be installed between 1.2m and 1.5m centers.

The outlet pathway will include EMT conduit stubbed to accessible above finished ceiling space or cable tray. The EMT fill ratio is not to exceed 40% with 3 or more cables.

5. TR Room Categories

The Telecommunication Room (TR) is an enclosed architectural space for housing telecommunications equipment, cable terminations, and cross-connect cabling. The following sub-categories describe the different requirements for each TR.

- 1) Horizontal cross-connect (HC): A group of connectors (e.g., patch panel or punch-down block) that allows equipment and backbone cabling to be cross-connected with patch cords or jumpers. Floor distributor is the international equivalent term for horizontal cross-connect.

2) Intermediate cross-connect (IC): The connection point between a backbone cable that extends from the main cross-connect (campus distributor [first-level backbone]) and the backbone cable from the horizontal cross-connect (floor distributor [second-level backbone]). Building distributor is the international equivalent term for intermediate cross-connect.

3) Main cross-connect (MC): The cross-connect normally located in the (main) equipment room for cross-connection and interconnection of entrance cables, first-level backbone cables, and equipment cables. Campus distributor is the international equivalent term for main cross-connect. (MDF or BDF)

4) Entrance facility (EF): An entrance to a building for both public and private network service cables (as well as wireless) including the entrance point at the building wall and continuing to the entrance room or space.

The maximum cable length distance between the TR room and the end user outlet should not exceed 290'. There shall be one (1) telecom enclosure located within each residence to allow for the use of service provider connections and equipment. The main TR room will be used for the CATV head end. The TR is to be sized minimum 10' X 12' housing the following systems: Telecommunications Hardwired and Wireless Infrastructure, LAN equipment, Access Control, CCTV, Building Automation Systems, and Public Address & Paging Systems.

6. Architectural Room Design

The TR walls shall extend from the finished floor to the structural ceiling (slab), be covered with two coats of fire-retardant white paint (or other light-colored finish), and be fire-rated as required by the applicable codes and regulations. Three of the TR walls shall be covered with a 19mm (3/4 trade size) A-C graded plywood backboard, securely fastened to the supporting walls with the A grade surface face out and painted with at least two coats of fire-retardant paint which matches interior room color. There shall be one (1) 8' x 10' TR per floor that will be centrally located. The main distribution room (MDR) shall be located in the basement.

The TR ceiling recommended height from the finished floor to the finished ceiling is at least 8.5 feet. Any ceiling protrusions (e.g., sprinkler heads) must be placed to assure a minimum clear height of 8 feet that is clear of obstructions. This is to provide space over the equipment frames for cables and suspended cable/ladder trays. The ceiling finish should minimize dust and be light colored to enhance the room lighting.

The TR floor shall be a concrete surface coated with a static dissipative and nonconductive porous surface sealant designed for high-technology environments or if floor tile is used then the floor tile shall be Electrostatic Discharge type that is bonded to the TR busbar with a measured resistance between of < 1 Ohm.

The TR doorways that are planned for use during equipment delivery must have fully opening, lockable doors that are at least 3 feet wide and 7 feet tall. Wherever possible, the doors to all TR's should open outward. All TR doors shall be securable with restricted card access.

7. Environmental Control (HVAC)

Telecommunications equipment can be sensitive to environmental conditions and typically has strict requirements for its operating environment. Each TR requires the HVAC system to function properly at all times (24 hours per day, 365 days per year). If a building's HVAC system cannot ensure continuous operation (including weekends and holidays), provide a stand-alone HVAC unit with independent controls for each space.

The HVAC system that serves the TR should be tuned to maintain a positive air pressure differential with respect to surrounding areas. If environmental conditions warrant, provide equipment to control humidity and air quality.

The standard for environmental control systems in each TR is to maintain a temperature of 64°F to 75°F (18°C to 24°C) with a relative humidity of 30% to 55%. HVAC sensors and controls must be located in the equipment closet. Ideally, the sensors are placed 5 feet above the finished floor, and should be IP addressable.

Every TR should be designed to provide two complete changes of air per hour as a minimum, or meet the below listed BTU requirements, whichever is greater. Each full height telecommunications equipment rack may require heat dissipation of up to 15,000 BTU per hour per and server equipment rack may require heat dissipation up to 32,000 BTU per hour per.

8. Electrical Service

Provide each TR with a power supply circuits that serve only the one room and terminates in its own electrical panel. The feeders that supply the power for telecommunications equipment should be dedicated only to supplying that equipment (see NEC Article 215 and CEC Section 26). Power required for other equipment in the room (e.g., fluorescent lighting, motors, air conditioning equipment) should be supplied by a separate feeder, conduit, and distribution panel. Also each TR power feeder for telecommunications equipment should be served with emergency generator power.

Each floor standing telecommunications rack should have four (4) dedicated 110VAC 20amp circuits with duplex receptables. The TR should also have convenience duplex receptacles on a 20amp Circuit, located at 18" AFF and placed at 6' intervals around perimeter walls. All telecommunications equipment with dual power supply shall be fed from different circuits.

The TR should be served by an UPS capable of providing 5 minutes of uninterrupted emergency backup power to each equipment rack. This will serve to maintain equipment status during switchover to emergency generator power.

9. Lighting

The lighting for the TR's should be adequate and uniform that provides a minimum equivalent of 500 lux (50 footcandles) when measured 3 feet above the finished floor level. The light fixtures shall be located a minimum of 8.5 feet above the finished floor. The light switches shall be located near the entrance and dimmers are not recommended. The lighting layout needs to be coordinated with the equipment layout—especially overhead cable trays/ladder racks—to ensure that the light is not obstructed. The power for the lighting should not come from the same circuits as power for the telecommunications equipment. Also utilize a light-colored finish to enhance room lighting and provide any emergency lighting as required by applicable building codes.

10. Bonding And Grounding

TR bonding/grounding is to conform to the following codes, standards, and practices: NFPA 70 of NEC, ANSI J-STD-607-D, IEEE, latest edition of BICSI method manual and all applicable National, State and Local building codes. Each TR space requires a telecommunications Secondary Bonding Busbar (SBB) connected to a telecommunications Primary Bonding Busbar (PBB) and bonded to approved building ground. All TR space connections are to be bonded with a minimum 6 AWG conductor with compression crimp style connectors with a double lug pattern for busbar connections and for all other connections. The use of stainless-steel hardware for connection is required. Each equipment rack should have its own telecommunications equipment bonding conductor (TEBC) sized at 6AWG wire run to the SBB. The ladder tray bonding may be daisy chained. Consideration should also be given to a Telecommunications Bonding Backbone (TBB) size of up to 750 kcmil. The TBB is to be connected to the Electrical Service Ground.

If the environment requires communications copper cabling entrance protection in the TR then all copper entrance cable to be terminated in a protected entrance terminal and protected by 240VDC solid state type modules that are UL497 listed.

D. ELECTRONIC SECURITY - ACCESS CONTROL SYSTEM

The Access Control System will provide restriction of entrance to facilities, rooms and zones of each of the buildings to authorized personnel via locks, keys, and card access system. Door access shall be accomplished via a proximity fob reader and strike or mortise electrified lockset provided in the door hardware. Auto doors motors, specified in the door hardware documents, will need to be controllable and lockable and be able to interface with access control systems. Doors shall unlock automatically at successful fob authentication, and authorization will be controlled via a central database/computer in any authorized security system workstation.

Key Fob Door Entry System for resident doors, wired Access Controlled Doors for facilities spaces. There shall be access controlled doors located at each stairwell door on each floor, every elevator entrance, and every community room. Connectivity requires Low voltage cabling from each door/access location to nearest TR location.

Card communication between TR's and to central database/computer will be via IP network cards in each TR. The system requires one standard telecom outlet in each TR for card connectivity to network and one standard outlet at the Central security monitoring station.

Security Call Buttons are to be located in public corridors. An emergency phone will also be provided, one outside building entrance and one inside the lobby.

Wall mounted proximity reader and strike or mortise electrified lockset or magnetic lock will be provided in the door hardware schedule and specification. Door conduit routing to be as shown on communications drawings set and coordinated with architectural design, with cabling run in conduit from each access control location back to respective TR. A single duplex power receptacle at each termination equipment cabinet is required.

E. ELECTRONIC SECURITY – VIDEO SURVEILLANCE SYSTEM

The Video Surveillance System will be used for Surveillance of exterior spaces, entrance/exits to the buildings, and common area spaces via hard wired IP video cameras. The proposed system will include remote video cameras located at strategic locations throughout the facilities and associated parking areas. The camera locations will be determined in conjunction with security representatives. All cameras will be IP type. Software, storage requirements and monitoring policies are to be further outlined in the DD phase of the project. At a minimum the recording policy archives to be 30 days in duration.

Each camera location requires one category 6 cable with white 8-position 8-conductor 568B termination outlets at mount location. Category 6 cable terminations in a single gang dual position white faceplate. TR termination category 6 cable terminations onto 48 port rack mounted patch panel. Proposed monitoring location will be at a lobby security desk where multiple desktop monitors will be integrated into the millwork for camera monitoring. The head end equipment rack for this monitoring system will be in the MDR located in the basement. The system will also require conduits and cable tray for routing of cables above finished ceiling.

F. AUDIOVISUAL SYSTEMS

The spaces to receive Audiovisual Systems include the first and second floor lobbies, the office space, and community rooms. Included in the audiovisual systems will be a public address system. This system will allow for important announcements to be made throughout the building.

The overall design intent for the AV systems and supporting infrastructure is to provide the Owner with cutting edge multimedia systems that will enhance presentation, collaboration, and information sharing. AV systems must be easy to operate and maintain

LOBBIES

The AV systems to be located in the Lobbies will be used for digital signage and presentations. Each Lobby will contain one (1) wall-mounted Flat Panel Display with the ability to display television channels (if a CATV feed is provided) and shall have an auxiliary input plate for owner-furnished AV devices, including laptops.

DISPLAY TECHNOLOGY

- Large LCD Flat Panel Display with integrated loudspeakers

AV SOURCES

- Digital Signage Player
- Cable Television Tuner
- Owner Furnished Laptop Computer

OFFICE SPACE

Conference Rooms will serve as a platform for multimedia presentations and collaboration. The space will feature a wall mounted flat panel sized based appropriately to fit the room and number of occupants. This will allow the room to be used for local presentations as well as for web conferencing applications. This will allow for both local collaboration and the ability to attend and/or present for

distance learning applications. Additionally, conference rooms will require an AV floorbox under the table to facilitate connections into the system while reducing tripping hazards.

Sound reinforcement in the space will be via in ceiling loudspeakers. For teleconferencing, the space will feature wall mounted teleconferencing cameras as well as ceiling mounted microphone arrays. Smaller conference rooms will utilize all-in-one USB enabled conference soundbars complete with integral loudspeakers, microphone array, and teleconferencing camera.

Unique infrastructure requirements for this space include a multi-service floor box to be located under the meeting room table.

DISPLAY TECHNOLOGY

- Large LCD Flat Panel Display

AV SOURCES

- User Devices
- Owner Furnished Host Computer
- Wireless Presentation Gateway
- HD USB Video Camera
- Cable Television Tuner
- Owner Furnished Laptop Computer

AUDIO REINFORCEMENT

- USB Enabled Conferencing Sound Bar for small Conference Rooms
- Ceiling microphones for use with video conferencing in large Conference Rooms
- Distributed Ceiling Mounted Loudspeakers for large Conference Rooms
- Ceiling Suspended Microphone Arrays for large Conference Rooms

SYSTEM CONTROL

- Integrated Control Processor
- Remote control Touch Panel

COMMUNITY ROOMS

Community Rooms will function as presentation spaces enhanced by audiovisual technology systems. Each room shall have a wall mounted flat panel display with overhead audio reinforcement. The system will feature control and inputs located at the presentation wall.

The systems will contain the following key elements:

DISPLAY TECHNOLOGY

- Extra Large LCD Flat Panel Display

AUDIO REINFORCEMENT

- Ceiling Recessed Loudspeakers

AV SOURCES

- User Devices
- Owner Furnished Host Computer
- Cable Television Tuner
- Owner Furnished Laptop Computer

SYSTEM CONTROL

- Integrated Control Processor
- Remote control Touch Panel

PUBLIC ADDRESS SYSTEM

The Public Address and Paging Systems will provide distributed overhead paging/announcements throughout the common areas of the building. Separate paging zones will allow pages to be delivered to specific areas. For instance each floor could be a separate zone. Individual volume controls for each closed door environment shall be planned. Amplification in low voltage equipment rooms and mechanical rooms will be provided as needed for required output level at speaker locations. The system shall have an interface to the existing phone distribution device. Each floor will contain paging speakers in all areas. The system requires a single duplex power receptacle at each termination equipment cabinet.

AUDIO REINFORCEMENT

- Distributed Ceiling Recessed Loudspeakers
- Background Music Player
- Paging microphone

EMERGENCY RESPONDER RADIO COVERAGE SYSTEM (ERRCS)

A public safety emergency responder radio coverage system (ERRCS) will be provided for wireless service for emergency responder radio coverage in accordance with all applicable codes. The ERRCS will provide radio coverage in all building areas within the 700/800 MHz frequency range. All component enclosures will be rated NEMA 4 or 4X. A secondary power supply will be provided with a 24-hour battery back-up system supplied from the emergency power system. The system will include automatic supervisory and trouble signals that are annunciated by the fire alarm system. The system will be FCC-compliant and capable of upgrades and frequency changes in the future. System testing, proof of compliance and AHJ approval will be required of the supplier/installer. The head-end equipment and vertical riser cable will be in 2-hour rated construction.

TWO-WAY EMERGENCY COMMUNICATION SYSTEM (ECS)

A two-way communication system will be provided in all elevator lobbies except the first floor. All associated signage will be provided in accordance with NFPA requirements. The two-way communication system will provide both an audible and visual alert at the building security desk communication point. When local security personnel are not present, the communication line will contact an off-site emergency responder as approved by the authority having jurisdiction. Interconnecting cabling will be rated for two hours. The two-way communication system will be equipped with a 24-hour battery backup system and will be monitored by the fire alarm system. The head-end equipment and cabling will be in 2-hour rated construction.

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SECTION 261219 - PAD-MOUNTED, LIQUID-FILLED, MEDIUM-VOLTAGE TRANSFORMERS
SECTION 261323 - MEDIUM-VOLTAGE, METAL-ENCLOSED SWITCHGEAR
SECTION 262213 - LOW-VOLTAGE DISTRIBUTION TRANSFORMERS
SECTION 262413 - SWITCHBOARDS
SECTION 262416 - PANELBOARDS
SECTION 262500 - ENCLOSED BUS ASSEMBLIES
SECTION 262713 - ELECTRICITY METERING
SECTION 262726 - WIRING DEVICES
SECTION 262813 - FUSES
SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS
SECTION 262913.03 - MANUAL AND MAGNETIC MOTOR CONTROLLERS
SECTION 262923 - VARIABLE-FREQUENCY MOTOR CONTROLLERS
SECTION 263100 - PHOTOVOLTAIC ENERGY SYSTEMS
SECTION 263213 - ENGINE GENERATORS
SECTION 263600 - TRANSFER SWITCHES
SECTION 263650 - GENERATOR DOCKING STATIONS
SECTION 264113 - LIGHTNING PROTECTION FOR STRUCTURES
SECTION 264313 - SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER
CIRCUITS
SECTION 265100 - INTERIOR LIGHTING
SECTION 265600 - EXTERIOR LIGHTING

DIVISION 27 - COMMUNICATIONS

SECTION 270526 - GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS
SECTION 270528 - PATHWAYS FOR COMMUNICATIONS SYSTEMS
SECTION 270536 - CABLE TRAYS FOR COMMUNICATIONS SYSTEMS
SECTION 270544 - SLEEVES AND SLEEVE SEALS FOR COMMUNICATIONS PATHWAYS AND
CABLING
SECTION 271100 - COMMUNICATIONS EQUIPMENT ROOM FITTINGS
SECTION 271300 - COMMUNICATIONS BACKBONE CABLING
SECTION 271500 - COMMUNICATIONS HORIZONTAL CABLING
SECTION 273000 - EMERGENCY TWO WAY COMMUNICATIONS SYSTEM

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

SECTION 280526 - GROUNDING AND BONDING FOR ELECTRONIC SAFETY AND SECURITY
SECTION 280528 - PATHWAYS FOR ELECTRONIC SAFETY AND SECURITY
SECTION 280544 - SLEEVES AND SLEEVE SEALS FOR ELECTRONIC SAFETY AND

SECURITY PATHWAYS AND CABLING
SECTION 281300 - ACCESS CONTROL
SECTION 282300 - VIDEO SURVEILLANCE
SECTION 283111 - DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM
SECTION 283113 - EMERGENCY RESPONDER RADIO COVERAGE (ERRC) SYSTEM

DIVISION 31 - EARTHWORK

SECTION 311000 - SITE CLEARING
SECTION 312000 - EARTH MOVING

DIVISION 32 - EXTERIOR IMPROVEMENTS

SECTION 321313 - CONCRETE PAVING
SECTION 321726 - TACTILE WARNING SURFACING
SECTION 323300 - SITE FURNISHINGS
SECTION 329200 - LAWNS
SECTION 329300 - EXTERIOR PLANTINGS

DIVISION 33 - UTILITIES

SECTION 333100 - SANITARY SEWERS (GRAVITY)
SECTION 334100 - STORM DRAINAGE PIPING

DIVISION 34 - TRANSPORTATION

NOT APPLICABLE

DIVISION 35 - WATERWAY AND MARINE CONSTRUCTION

NOT APPLICABLE

DIVISION 40 - PROCESS INTEGRATION

NOT APPLICABLE

DIVISION 41 - MATERIAL PROCESSING AND HANDLING EQUIPMENT

NOT APPLICABLE

DIVISION 42 - PROCESS HEATING, COOLING, AND DRYING EQUIPMENT

NOT APPLICABLE

DIVISION 43 - PROCESS GAS AND LIQUID HANDLING, PURIFICATION AND STORAGE EQUIPMENT

NOT APPLICABLE

DIVISION 44 - POLLUTION CONTROL EQUIPMENT

NOT APPLICABLE

DIVISION 45 - INDUSTRY-SPECIFIC MANUFACTURING EQUIPMENT

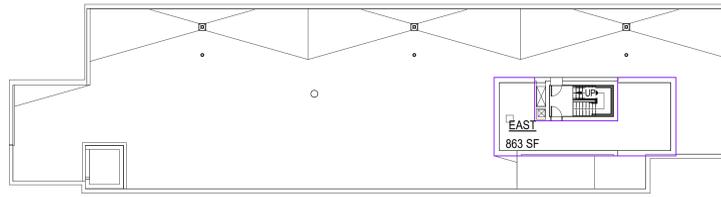
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DIVISION 46 - WATER AND WASTEWATER EQUIPMENT

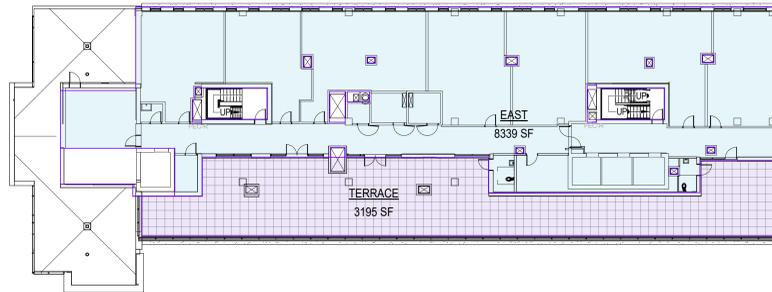
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DIVISION 48 - ELECTRICAL POWER GENERATION

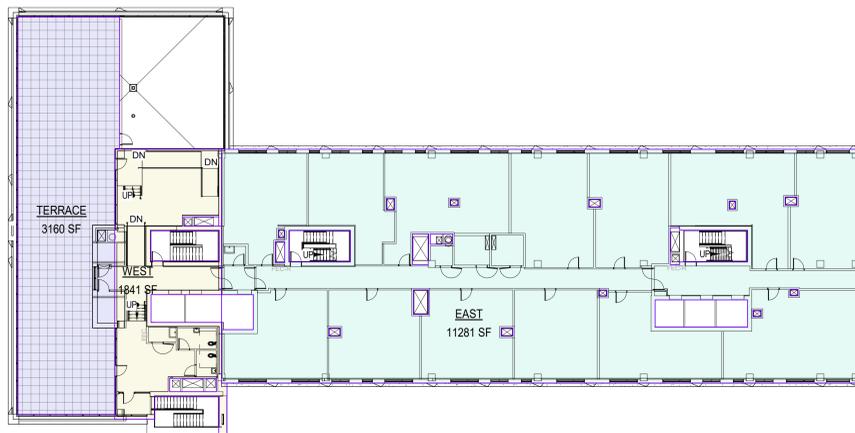
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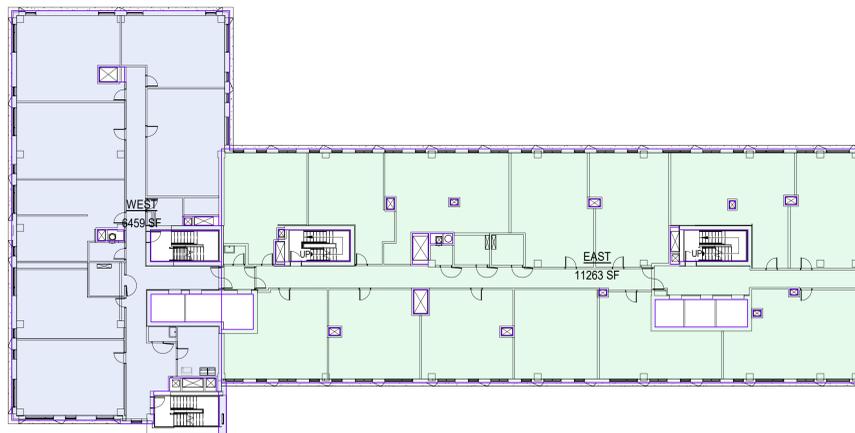
ROOF - EAST



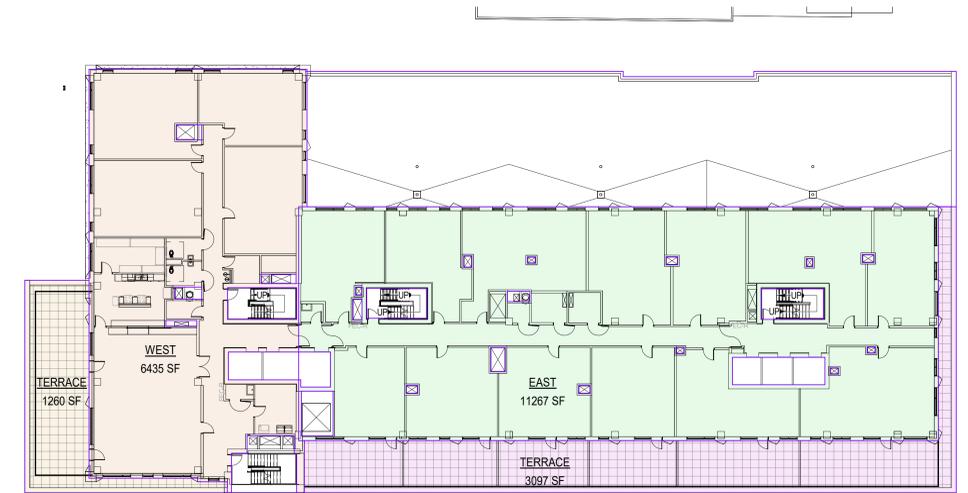
LEVEL 18/TERRACE



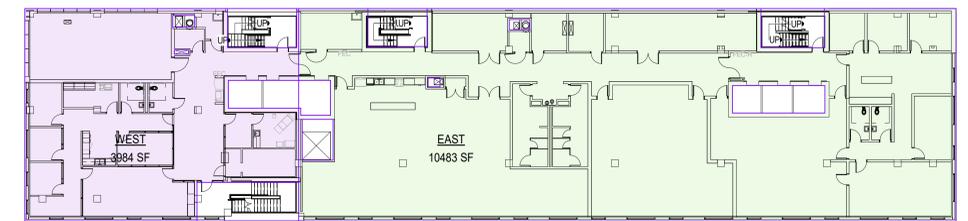
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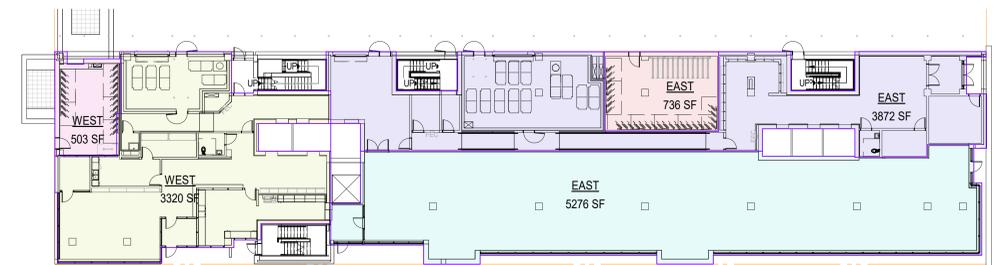
LEVEL 4



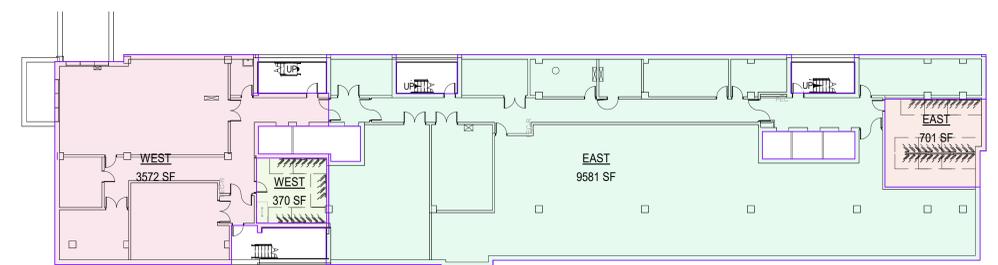
LEVEL 3



LEVEL 2

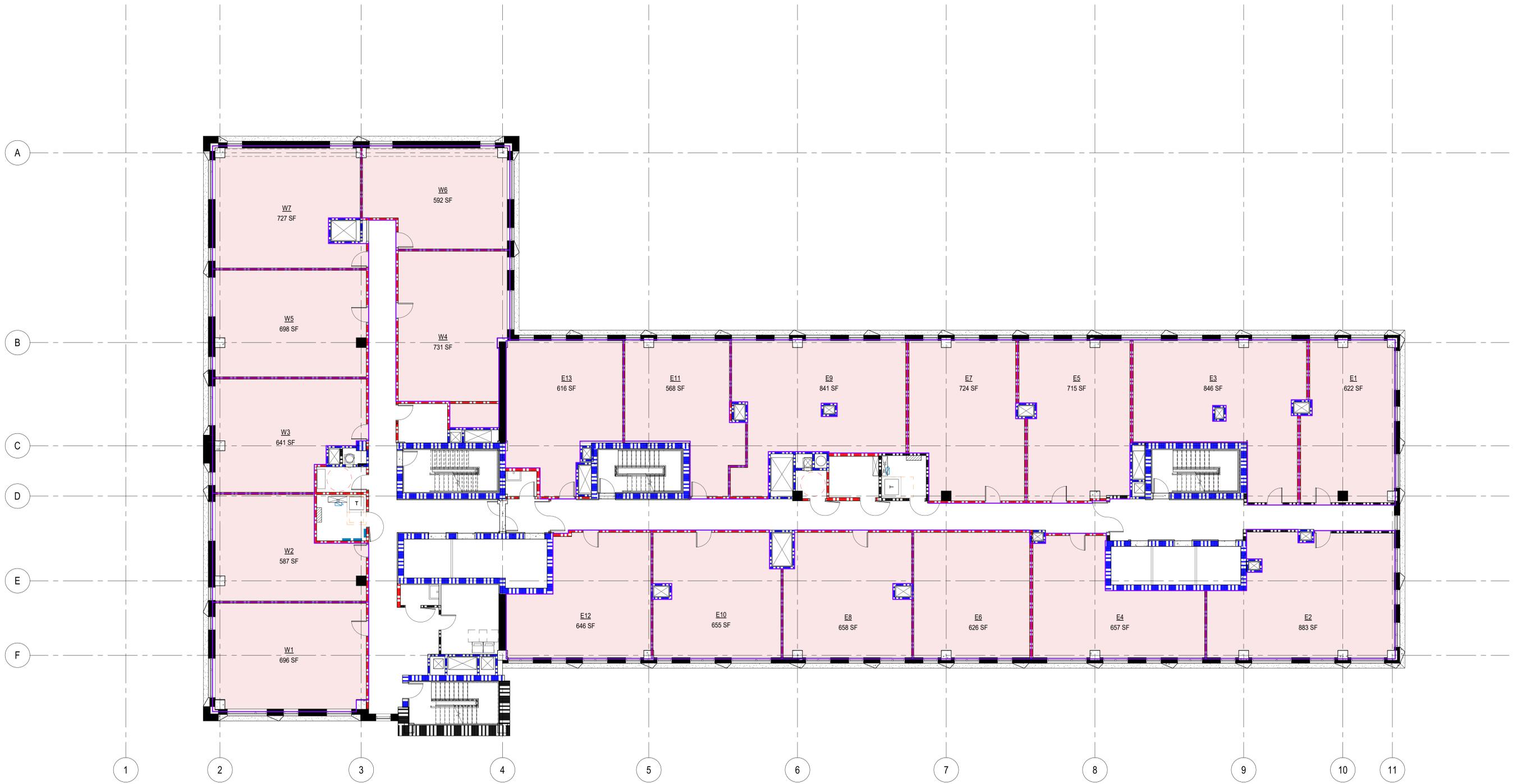


LEVEL 1 - WEST



BASEMENT

FLOOR AREA		
Name	Number	Area
EAST	00 E	9581 SF
EAST	00 E BIKE	701 SF
EAST	01 E	3572 SF
EAST	01 E RETAIL	5276 SF
EAST	01 E BIKE	736 SF
EAST	02 E	10483 SF
EAST	03E	11267 SF
EAST	04 E	11263 SF
EAST	17 E	11281 SF
EAST	18 E	8339 SF
EAST	19E	863 SF
WEST	00 W	3372 SF
WEST	00 W BIKE	Not Placed
WEST	00 W BIKE	370 SF
WEST	01 W	3320 SF
WEST	01 W BIKE	503 SF
WEST	02 W	3584 SF
WEST	03W	6435 SF
WEST	04 W	Not Placed
WEST	04W	6459 SF
WEST	17 W	1841 SF



REPORT

To: Sandy Laux
SmithGroup
201 Depot Street
Second Floor
Ann Arbor, MI 48104

CC: Justin Fiema, SG

From: Mike Courtney, LEE
Nick Trotto, LEE

Date: December 22, 2022

Subject: 350 S. Fifth Avenue
Development PUD
Elevator Traffic Analysis
Liberty Project No.: 22098



Liberty Elevator Experts, LLC
113 Barksdale Professional Center
Newark, DE 19711
Phone: 844-LIB-ELEV
www.LibertyElevatorExperts.com

A. INTRODUCTION

As requested by SmithGroup (SG), Liberty Elevator Experts (LEE) has performed updated elevator traffic analyses for the 350 S. Fifth Avenue - Development PUD project. The purpose of this subsequent analyses is to present our findings based on updated SG preliminary Schematic Design plans to have a group of two passenger elevators serve the West Tower (Floors B through 17) and a group of two or three passenger elevators serve the East Tower (Floors B through 18). The towers adjoin forming a “L” shape, but are divided by restricted access corridor doors at each floor.

The building entrances for both towers are located at Floor 1, which also consists of building operation areas, bike storage and retail space. Floor B is allocated for mechanical, electrical and tenant storage. Floor 2 is primarily for tenant amenities and building management/operation offices. The West Tower dwelling units are located on Floors 3 through 16 with a small tenant terrace and community room on Floor 3 and a large tenant terrace and mechanical area on Floor 17. The East Tower dwelling units are located on Floors 3 through 18 with a small tenant terrace and amenity room on Floor 3 and a large tenant terrace area on Floor 18. There is one service elevator located on the west end of the East Tower adjacent to the West Tower that will serve all floors for both towers. The service elevator is not considered in the elevator traffic analyses as directed by SG. The East Tower elevators will serve as the Fire Service Access Elevators for both towers as directed by SG.

The updated elevator traffic analyses are based on a range of 1.5-to-1.75 occupants per bedroom, instead of the previous analyses which used a range of 1.5-to-2.0 occupants per bedroom. The updated range is in keeping with “The Vertical Transportation Handbook” as mentioned in the “Methodology” section of the report.

The “Elevator Traffic Analysis Performance Results” charts include elevator service performance results when one of the elevators in a group suffers a breakdown or is out of service for an extended period of time (hours to days to perhaps weeks). This is an important dynamic for the Owner to consider when contemplating whether or not an extra elevator for redundancy is justifiable to maintain quality elevator service for the tenants during this unfortunate, but realistic scenario.

Refer to Appendices A-1, A-2 and A-3 for preliminary elevator hoistway and elevator control room plans.

B. METHODOLOGY

All results of this report are based upon LEE’s collective experience, project documents provided by SmithGroup, The Vertical Transportation Handbook (VTHB), Fourth Edition, edited by Strakosch and Caporale, and the

ELEVATE Traffic Analysis and Simulation Software. Liberty reserves the right to change or modify our opinion if additional information is presented.

The elevator traffic analysis performance results indicated in the report are contingent upon SmithGroup confirming the floors served, floor heights, tenant floor use, number of bedrooms per floor and the estimated number of occupants per bedroom (range from 1.5 to 1.75, rounded to the nearest whole number) per floor, all of which are indicated in the "Elevator Traffic Analysis Criteria" charts below

LEE uses simulation software method to determine the Average Waiting Time (AWT) and Average Time to Destination (ATTD) to measure performance. This method is established and recognized in the elevator industry for measuring the quality of elevator service. The "Recommended Performance Values" and the "Elevator Traffic Analysis Performance Results" for the AWT and ATTD are indicated in the charts below.

C. RECOMMENDED PERFORMANCE VALUES

Performance Type	Generally Recommended	Neutral	Generally Not Recommended
Average Waiting Time	40 Sec. or less	Between 40 – 50 Sec.	More than 50 Sec.
Average Time To Destination	100 Sec. or less	Between 100 – 110 Sec.	More than 110 Sec.

D. ELEVATOR TRAFFIC ANALYSIS CRITERIA - WEST TOWER

Floor Name	Floor Height	Tenant Floor Use		Number of Bedrooms Per Floor	Population @ 1.5 Occupants Per Bedroom Per Floor	Population @ 1.75 Occupants Per Bedroom Per Floor
B	15'-4"	Storage		0	0	0
1	20'-8"	Lobby/Retail		0	0	0
2	15'-0"	Amenities		0	0	0
3	11'-0"	Dwellings/ Terrace/ Amenities		4	6	7
4 Thru 16	11'-0" Each	Dwellings		7	11	13
17	14'-0"	Terrace		0		
Total	208'-0" Travel	–		95	149	176
Stair Factor: 0% (See Explanation of Terms)						
Elevator Data						
Capacity		Speed		Door Width		Door Type
3,500 lbs.		350 fpm		3'-6"		Single Speed Side Opening

E. ELEVATOR TRAFFIC ANALYSIS PERFORMANCE RESULTS - WEST TOWER

	Population @ 1.5 Occupants per Unit		Population @ 1.75 Occupants per Unit	
	AWT	ATTD	AWT	ATTD
2-Car Group Operation	17.8	55.0	17.8	57.2
1-Car Operation	59.8	104.9	63.6	112.5

F. ELEVATOR TRAFFIC ANALYSIS CRITERIA - EAST TOWER

Floor Name	Floor Height	Floor Use		Number of Bedrooms Per Floor	Population @ 1.5 Occupants Per Bedroom Per Floor	Population @ 1.75 Occupants Per Bedroom Per Floor
B	20'-0"	Storage		0	0	0
1	16'-0"	Lobby/Retail		0	0	0
2	15'-0"	Amenities		0	0	0
3	11'-0"	Dwellings		15	23	26
4 Thru 17	11'-0" Each	Dwellings		16	24	28
18	13'-0"	Dwellings & Terrace		9	14	16
Total	218'-0" Travel	_		248	373	434
Stair Factor: 0% (See Explanation of Terms)						
Elevator Data						
Capacity		Speed		Door Width		Door Type
3,500 lbs.		350 fpm / 500 fpm		3'-6"		Single Speed Side Opening
4,000 lbs.		350 fpm / 500 fpm		4'-0"		Single Speed Center Opening

G. ELEVATOR TRAFFIC ANALYSIS PERFORMANCE RESULTS - EAST TOWER

	Population @ 1.5 Occupants per Unit				Population @ 1.75 Occupants per Unit			
	AWT		ATTD		AWT		ATTD	
	350 fpm	500 fpm	350 fpm	500 fpm	350 fpm	500 fpm	350 fpm	500 fpm
3-Car Group Operation (3,500 lbs. Capacity)	14.9	13.6	60.0	56.2	19.4	15.1	72.0	61.0
2-Car Group Operation (3,500 lbs. Capacity)	37.6	30.4	98.3	82.9	45.2	36.5	110.9	96.5
1-Car Operation (3,500 lbs. Capacity)	241.8	211.8	329.6	296.4	365.5	325.2	458.5	414.1
2-Car Group Operation (4,000 lbs. Capacity)	31.5	26.4	83.8	70.9	37.9	31.5	95.6	82.0
1-Car Operation (4,000 lbs. Capacity)	147.7	123.7	232.7	203.0	229.1	196.4	318.9	281.8

H. RECOMMENDATIONS

	WEST TOWER ELEVATORS	EAST TOWER ELEVATORS
Quantity	Two (2)	Three (3)
Class Loading	Passenger Class A Loading	Passenger Class A Loading
Type	Heavy-Duty Over-slung MRL	Heavy-Duty Over-slung MRL
Machine	Gearless	Gearless
Controller Location	In a control room located at the top floor served by the elevators.	In a control room located at the top floor served by the elevators.
Capacity	3,500#	3,500#
Speed	350 FPM	350 FPM
Clear Inside Cab	6'-8" Wide x 5'-5" Deep	6'-8" Wide x 5'-5" Deep
Door Size	3'-6" Wide x 7'-0"	3'-6" Wide x 7'-0"
Door Type	Single Speed Side Opening	Single Speed Side Opening

I. EXPLANATION OF TERMS

Average Waiting Time (AWT)

The actual average time a prospective passenger waits after registering a hall call (or entering the waiting queue if a call has already been registered) until the responding elevator doors begin to open. If the responding elevator doors are already open when a passenger arrives, the waiting time for this passenger is taken as zero

Average Time to Destination (ATTD)

The Average Waiting Time plus the Average Transit Time (ATT).

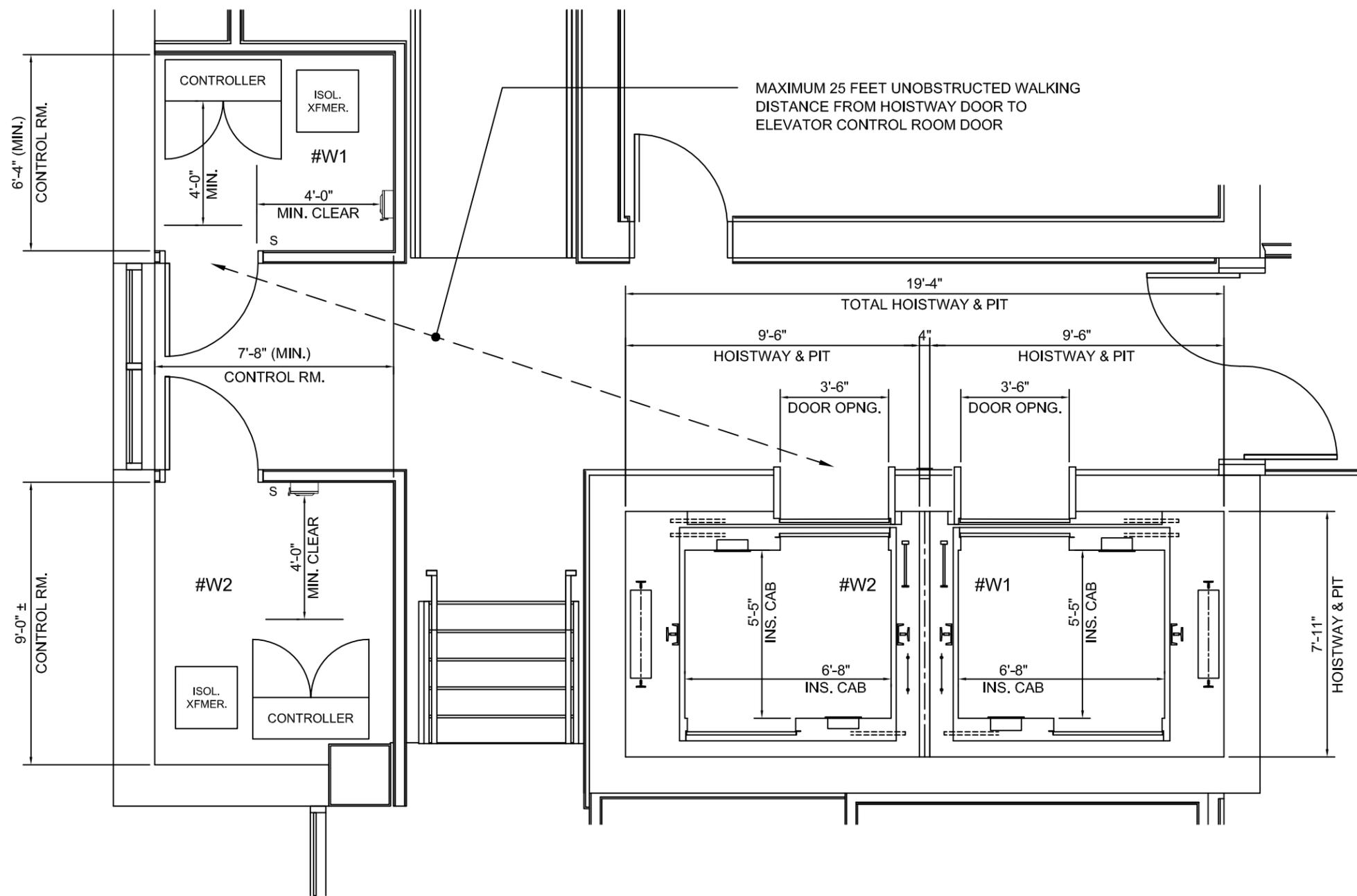
Stair Factor

Stair Factor is an estimated allowance for stair usage.

If using a Stair Factor of x, Elevate assumes that x% of the passengers will walk when travelling one floor, (x% of x%) will walk when travelling two floors, and (x% of x% of x%) will walk when travelling three floors. For example if you enter a Stair Factor of 40%, Elevate will assume the following split of passengers between the stairs and the elevators:

Number of floors to be travelled	% passengers using stairs	% passengers using elevators
1	40	60
2	16	84
3	6	94
4	3	97
5	1	99
6	0	100

END OF REPORT



NOTES:

1. HOISTWAY & CONTROL ROOM DIMENSIONS INDICATED ARE FOR REFERENCE ONLY AND ARE BASED ON LARGEST DIMENSIONS REQUIRED FOR OTIS, TKE, KONE & SCHINDLER MRL OVERSLUNG ELEVATOR SYSTEMS. FINAL HOISTWAY & CONTROL ROOM DIMENSIONS SHALL BE COORDINATE BETWEEN THE CM, A/E & THE SELECTED ELEVATOR CONTRACTOR.
2. THE MRL ELEVATOR CONTROL ROOM SHALL BE LOCATED AT THE TOP LANDING SERVED BY THE ELEVATORS.

PRELIMINARY

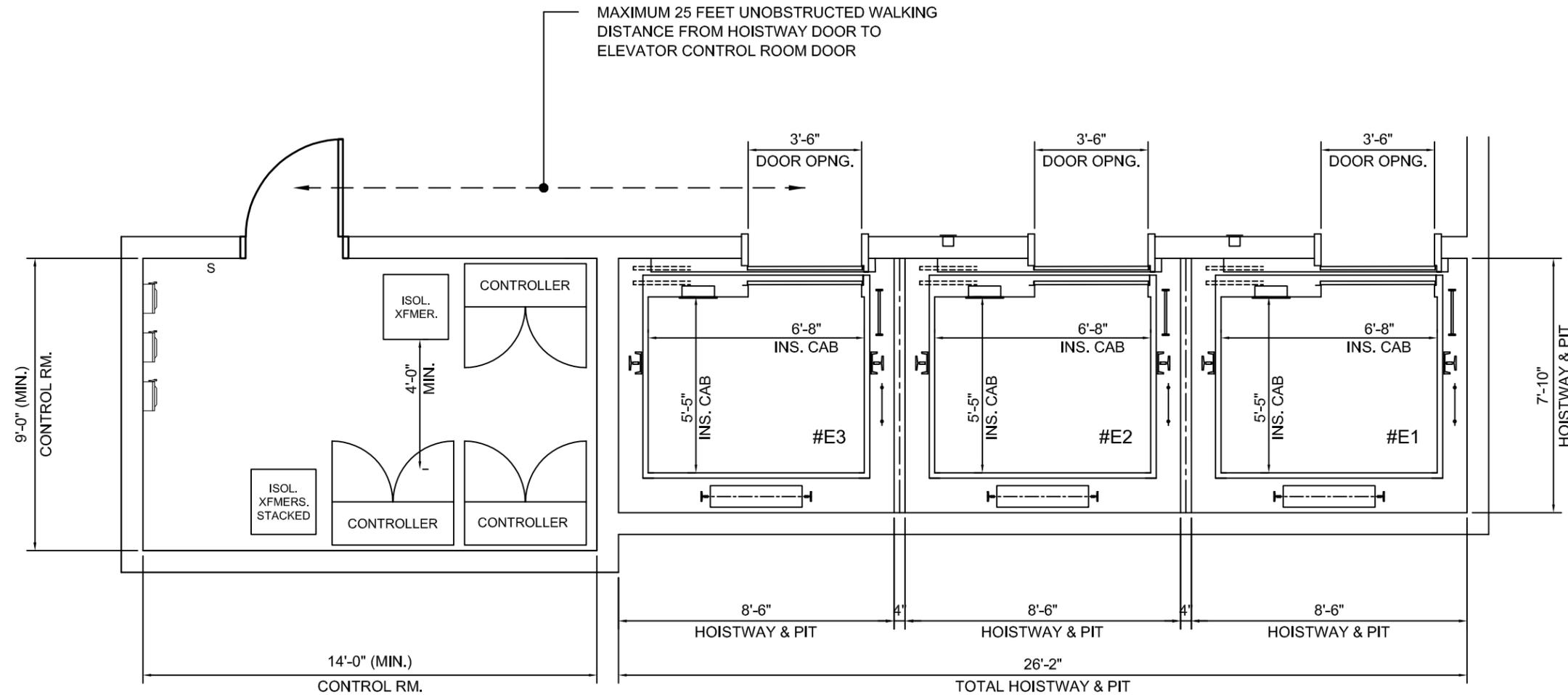
APPENDIX A-1

WEST TOWER PASSENGER ELEVATORS

(2) 3,500# CAPACITY @ 350 FPM MRL OVERSLUNG ELEVATORS
WITH FRONT & REAR OPENING DOORS
SERVES FLOORS B-17

NOTES:

1. HOISTWAY & CONTROL ROOM DIMENSIONS INDICATED ARE FOR REFERENCE ONLY AND ARE BASED ON LARGEST DIMENSIONS REQUIRED FOR OTIS, TKE, KONE & SCHINDLER MRL OVERSLUNG ELEVATOR SYSTEMS. FINAL HOISTWAY & CONTROL ROOM DIMENSIONS SHALL BE COORDINATE BETWEEN THE CM, A/E & THE SELECTED ELEVATOR CONTRACTOR.
2. THE MRL ELEVATOR CONTROL ROOM SHALL BE LOCATED AT THE TOP LANDING SERVED BY THE ELEVATORS.



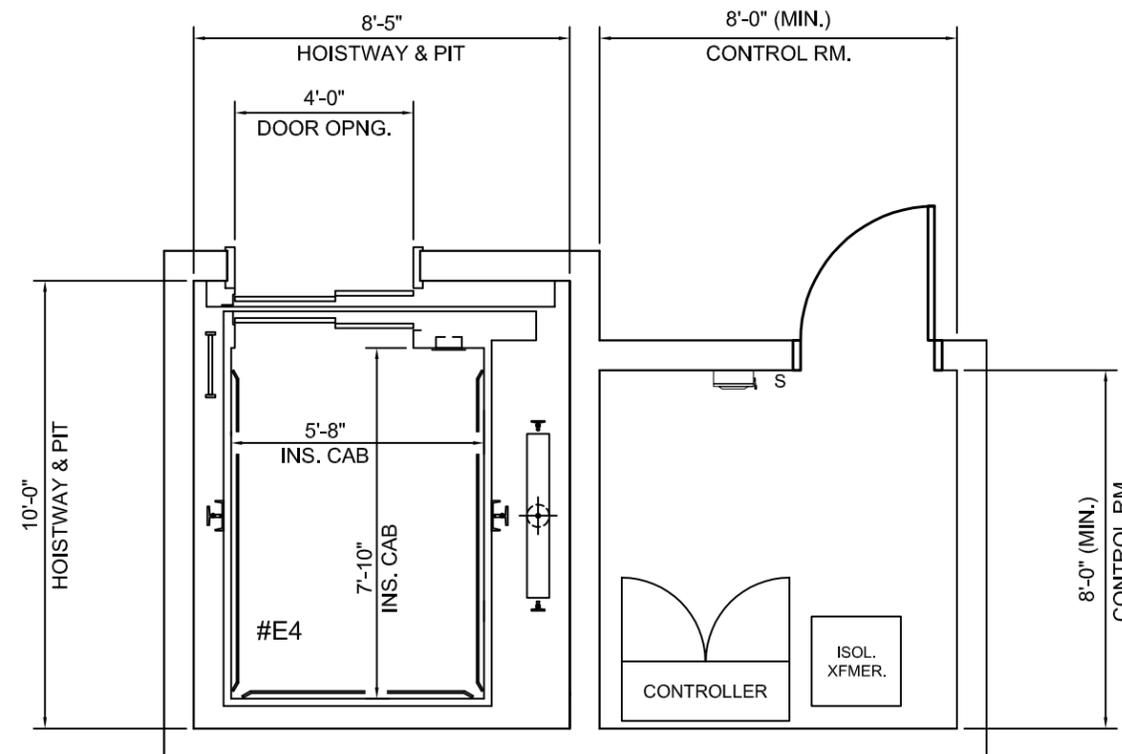
PRELIMINARY

APPENDIX A-2

EAST TOWER PASSENGER ELEVATORS
 (3) 3,500# CAPACITY @ 350 FPM MRL OVERSLUNG ELEVATORS
 WITH FRONT OPENING DOORS
 SERVES FLOORS B-18

NOTES:

1. HOISTWAY & CONTROL ROOM DIMENSIONS INDICATED ARE FOR REFERENCE ONLY AND ARE BASED ON LARGEST DIMENSIONS REQUIRED FOR OTIS, TKE, KONE & SCHINDLER MRL OVERSLUNG ELEVATOR SYSTEMS. FINAL HOISTWAY & CONTROL ROOM DIMENSIONS SHALL BE COORDINATE BETWEEN THE CM, A/E & THE SELECTED ELEVATOR CONTRACTOR.
2. THE MRL ELEVATOR CONTROL ROOM SHALL BE LOCATED AT THE TOP LANDING SERVED BY THE ELEVATORS.



PRELIMINARY

APPENDIX A-3

SERVICE ELEVATOR

(1) 4,500# CAPACITY @ 350 FPM MRL OVERSLUNG ELEVATOR
WITH FRONT OPENING DOORS
SERVES FLOORS B-18



2020 ENTERPRISE GREEN COMMUNITIES CRITERIA CHECKLIST

CRITERIA CHECKLIST

This checklist provides an overview of the technical requirements within the Enterprise Green Communities Criteria.

To achieve Enterprise Green Communities Certification, all projects must achieve compliance with the Criteria mandatory measures applicable to that construction type.

New Construction projects must also achieve at least 40 optional points, and Substantial and Moderate Rehab projects must also achieve at least 35 optional points.

These projects that also comply with Criterion 5.2b or Criterion 5.4 will be recognized with Enterprise Green Communities Certification Plus.

YES / NO	OPTIONAL POINTS	
<input type="checkbox"/> Yes		M
<input type="checkbox"/>		12 or 15
<input type="checkbox"/>		10
<input type="checkbox"/>		8
CRITERIA 1 SUBTOTAL		
4 of 4 Mandatory Criteria		
0 Optional Points		

1. INTEGRATIVE DESIGN

1.1 Integrative Design: Project Priorities Survey

Complete the Project Priorities Survey, which can be found in the Appendix.

1.2 Integrative Design: Charrettes and Coordination Meetings

Develop an integrative design process that moves the outputs of the Project Priorities Survey into action through a series of collaborative meetings. Prioritize multi-benefit strategies. Assign responsibility within your design and development teams for accountability.

1.3 Integrative Design: Documentation

Include Enterprise Green Communities Criteria information in your contract documents and construction specifications (Division 1 Section 01 81 13 Sustainable Design Requirements) as necessary for the construction team to understand the requirements and how they will be verified. Ensure, and indicate, that the drawings and specifications have been generated to be compliant and meet the certification goals.

1.4 Integrative Design: Construction Management

Create, implement, and document your contractor/subcontractor education plan to ensure that all persons working on-site fully understand their role in achieving the project objectives. Include a summary of the Project Priorities Survey (Criterion 1.1), the sustainability goals, and anticipated roles of each party in regards to the performance expected of the project. Attach and reference this training plan to Division 1 Section 01 81 13 Sustainable Design Requirements. Include timeline estimates for performance testing and verification schedules in the overall construction schedule. As relevant, review requirements for Criteria 8.1, 8.2, and 8.3, and begin populating these documents with relevant information from design and construction.

1.5 Design for Health and Well-Being: Health Action Plan

Follow Steps 1-6 of the Health Action Plan framework per the full criterion. *[12 points with extra 3 points for Step 7]* This includes: 1) Commit to embedding health into the project lifecycle; 2) Partner with a project health professional; 3) Collect and analyze community health data; 4) Engage with community stakeholders to prioritize health data and strategies; 5) Identify strategies to address those health issues; 6) Create an implementation plan; and 7) Create a monitoring plan.

1.6 Resilient Communities: Multi-Hazard Risk/Vulnerability Assessment

Conduct a four-part assessment (social, physical, functional, strategy) to identify critical risk factors of your property and implement at least two sets of strategies to enable the project to adapt to, and mitigate, climate related or seismic risks. See full criterion for more guidance.

1.7 Resilient Communities: Strengthening Cultural Resilience

Integrate community and resident participation in the development processes so that the built environment honors cultural identities, resident voices, and community histories.

Option 1: Complete a Cultural Resilience Assessment

OR

Option 2: Convene a Cultural Advisory Group

YES / NO	OPTIONAL POINTS	2. LOCATION + NEIGHBORHOOD FABRIC
Yes	M	<p>2.1 Sensitive Site Protection All projects must:</p> <ol style="list-style-type: none"> 1. Protect floodplain functions (e.g., storage, habitat, water quality) by limiting new development within the 100-year floodplain of all types of watercourses. 2. Conserve and protect aquatic ecosystems, including wetlands and deepwater habitats, that provide critical ecosystem functions for fish, other wildlife, and people. 3. Protect ecosystem function by avoiding the development of areas that contain habitat for plant and animal species identified as threatened or endangered. 4. Conserve the most productive agricultural soils by protecting prime farmland, unique farmland, and farmland of statewide or local importance. <p>If your site contains any of these ecologically sensitive features, follow the specific Requirements under that subheading.</p>
Yes	M	<p>2.2 Connections to Existing Development and Infrastructure <i>(Mandatory for New Construction projects that do not qualify as Rural/Tribal/Small Town)</i> Locate the project on a site with access to existing roads, water, sewers, and other infrastructure and within or contiguous to (having at least 25% of the perimeter bordering) existing development. Connect the project to the existing pedestrian network. For sites over 5 acres, provide connections to the adjacent street network at least every 800 feet. Tie all planned bike paths to existing bike paths.</p>
Yes	M	<p>2.3 Compact Development <i>(Mandatory for New Construction)</i> At a minimum, build to the residential density (dwelling units/acre) of the census block group where the project is located. In Rural/Tribal/Small Town locations that do not have zoning requirements: Build to a minimum net density of 5 units per acre for single-family houses; 10 units per acre for multifamily buildings, single and two-story; and 15 units per acre for multifamily buildings greater than two-stories.</p>
7	5 or 7	<p>2.4 Increased Compact Development Exceed the residential density (dwelling units/acre) of the census block group in which your project is located. Exceed by 2x for <i>[5 points]</i>; exceed by 3x for <i>[7 points]</i>. In Rural/Tribal/Small Towns that do not have zoning requirements, build to a minimum net density of 7.5 units per acre for single-family houses; 12 units per acre for multifamily buildings, single and two-story; and 20 units per acre for multifamily buildings greater than two stories. <i>[5 points]</i></p>
Yes	M	<p>2.5 Proximity to Services and Community Resources <i>(Mandatory for New Construction)</i> Locate the project within a 0.5-mile walk distance of at least four, or a 1-mile walk distance of at least seven, of the listed services. For projects that qualify as Rural/Tribal/Small Town, locate the project within 5 miles of at least four of the listed services.</p>
No	M	<p>2.6 Preservation of and Access to Open Space for Rural/Tribal/Small Town <i>(Mandatory for New Construction Rural/Tribal/Small Town)</i> Option 1: Locate the project within a 0.25-mile walk distance of dedicated public open space that is a minimum of 0.75 acres; at least 80% of which unpaved. OR Option 2: Set aside a minimum of 10% (minimum of 0.25 acres) of the total project acreage as open and accessible to all residents; at least 80% of which unpaved.</p>
6 max	6 max	<p>2.7 Preservation of and Access to Open Space Option 1: Locate the project within a 0.25-mile walk distance of dedicated open space that is a minimum of 0.75 acres; at least 80% of which unpaved. OR Option 2: Set aside a percentage of permanent open space for use by all residents; at least 80% of which unpaved. 25% <i>[2 points]</i>; 35% <i>[4 points]</i>; 45% + written statement of preservation/ conservation policy <i>[6 points]</i>.</p>

Yes	6		<p>2.8 Access to Transit <i>(Mandatory for New Construction projects that do not qualify as Rural/Tribal/Small Town; Optional for all other project types)</i></p> <p>Mandatory: New Construction, not Rural/Tribal/Small Town Locate projects within a 0.5-mile walk distance of transit services (bus, rail and/or ferry), constituting at least 45 or more transit rides per weekday, with some type of weekend service.</p> <p>Optional: New Construction, not Rural/Tribal/Small Town Locate the project along dedicated bike trails or lanes (Class I, II, or IV) that lead to high-quality transit services (100 trips per day) within 3 miles. [2 points]</p> <p>Optional: Rehabilitation, not Rural/Tribal/Small Town Locate projects within a 0.5-mile walk distance of public transit services (bus, rail and/or ferry), constituting at least 45 or more transit rides per weekday, with some type of weekend service. [6 points] Locate the project along dedicated bike trails or lanes (Class I, II, or IV) that lead to high-quality transit services (100 trips per day) within 3 miles. [2 points]</p> <p>Optional: New Construction and Rehabilitation, Rural/Tribal/Small Town Locate the project within 0.5 mile walk distance of public transit services with at least 45 rides per weekday and some weekend service. OR, Install at least two charging stations for electric vehicles. OR, Locate the project with 5 miles of one of the following transit options: 1) vehicle share program; 2) dial-a-ride program; 3) employer vanpool; 4) park-and-ride; 5) public/private regional transportation.</p>
	3	M	<p>2.9 Improving Connectivity to the Community Improve access to community amenities through at least one of the options incentivizing biking mobility or improving access to transit.</p>
		2	<p>2.10 Passive Solar Heating/Cooling Design and build with passive solar design, orientation, and shading that meet the guidelines specified.</p>
		2, 6, 8	<p>2.11 Adaptive Reuse of Buildings Rehabilitate and adapt an existing structure that was not previously used as housing. Design the project to adapt, renovate, or reuse at least 50% of the existing structure and envelope.</p>
		6	<p>2.12 Access to Fresh, Local Foods Provide residents and staff with access to fresh, local foods through one of the following options: Option 1: Neighborhood Farms and Gardens Option 2: Community-Supported Agriculture Option 3: Proximity to Farmers Market</p>
		6	<p>2.13 Advanced Certification: Site Planning, Design and Management Locate building(s) within a community that is certified in LEED for Neighborhood Development, LEED for Cities and Communities, Living Community Challenge, or SITES.</p>
		2-8	<p>2.14 Local Economic Development and Community Wealth Creation Demonstrate that local preference for construction employment and subcontractor hiring was part of your bidding process, and how it functioned during construction. OR Demonstrate that you achieved at least 20% local employment. OR Provide physical space for small business, nonprofits, and/or skills and workforce education.</p>
		5 max	<p>2.15a Access to Broadband: Broadband Ready <i>(Mandatory for New Construction and Substantial Rehab Projects in Rural/Tribal/Small Town Locations)</i> Incorporate broadband infrastructure so that when broadband service comes to a community, the property can be easily connected. Include a network of mini-ducts or conduit throughout the building, extending from the expected communications access point to each network termination point in the building.</p>
		6	<p>2.15b Access to Broadband: Connectivity Ensure all units and common spaces in the property have broadband internet access with at least a speed of 25/3 mbs.</p>
No		6	

CRITERIA 2 SUBTOTAL
5 of 7 Mandatory Criteria
28 Optional Points

YES / NO	OPTIONAL POINTS	3. SITE IMPROVEMENT	
<input type="checkbox"/> Yes		M	3.1 Environmental Remediation Determine whether there are any hazardous materials present on the site through one of the four methods listed. Mitigate any contaminants found.
<input type="checkbox"/> Yes		M	3.2 Minimization of Disturbance during Staging and Construction For sites >1 acre, implement EPA's National Pollutant Discharge Elimination System Stormwater Discharges from Construction Activities guidance, or local requirements, whichever is more stringent. For sites with an area <= 1, follow guidance in full criterion.
<input type="checkbox"/> Yes		M	3.3 Ecosystem Services/Landscape <i>(Mandatory, if providing landscaping)</i> If providing plantings, all must be native or climate-appropriate (adapted) to the region and appropriate to the site's soil and microclimate. Do not introduce any invasive plant species. Plant, seed, or xeriscape all disturbed areas.
<input type="checkbox"/> Yes		M	3.4 Surface Stormwater Management <i>(Mandatory for New Construction; Mandatory for Substantial and Moderate Rehab projects if land disturbed is >= 5,000 sq.ft.)</i> Treat or retain on-site precipitation equivalent to the 60th percentile precipitation event. Where not feasible due to geotechnical issues, soil conditions, or the size of the site, treat or retain the maximum volume possible.
	<input type="text"/>	10 max	3.5 Surface Stormwater Management Through on-site infiltration, evapotranspiration, and rainwater harvesting, retain precipitation volume from 70% precipitation event [6 points], 80% precipitation event [8 points], or 90% precipitation event [10 points].
<input type="checkbox"/> Yes		M	3.6 Efficient Irrigation and Water Reuse <i>(Mandatory, if permanent irrigation is utilized)</i> If irrigation is utilized, install an efficient irrigation system per the requirements listed.
	<input type="text"/>	4 or 6	3.7 Efficient Irrigation and Water Reuse <i>(Optional, if irrigation is utilized,</i> Meet the requirements of Criterion 3.6 AND: Option 1: Install an efficient irrigation system equipped with a WaterSense labeled weather- based irrigation controller (WBIC) OR Option 2: At least 50% of the site's irrigation satisfied by water use from the sources listed.
		CRITERIA 3 SUBTOTAL	
		5 of 5 Mandatory Criteria	
		0 Optional Points	

YES / NO	OPTIONAL POINTS	4. WATER	
<input type="checkbox"/> Yes		M	4.1 Water-Conserving Fixtures Reduce total indoor water consumption by at least 20% compared to baseline indoor water consumption chart. Any new toilet, showerhead, and/or lavatory faucet must be WaterSense certified. For all single-family homes and all dwelling units in buildings three stories or fewer, the supply pressure may not exceed 60 psi.
	<input type="text" value="6"/>	6 max	4.2 Advanced Water Conservation Reduce total indoor water consumption by at least 30% compared to baseline indoor water consumption chart. Any new toilet, showerhead, and/or lavatory faucet must be WaterSense certified.
<input type="checkbox"/> Yes	<input type="text" value="3"/>	M, 3	4.3 Water Quality Mandatory/Optional: Mandatory for Substantial Rehabs of buildings built before 1986; Optional for all other building types: Replace lead service lines [3 points]
		M	Mandatory: For multifamily buildings with either a cooling tower, a centralized hot water system, or 10+ stories: Develop a Legionella water management program
		8	Optional: Test and remediate as indicated for lead, nitrates, arsenic, and coliform bacteria

4	4
0	4
0	6 max
0	8

4.4 Monitoring Water Consumption and Leaks

Conduct pressure-loss tests and visual inspections to determine if there are leaks; fix leaks.
AND

Install an advanced water monitoring and leak detection system capable of identifying and shutting water off during anomalous water events.

OR

Install a device to separately monitor water consumption of each cold branch off the apartment line riser for each dwelling unit or each cold water riser and the domestic hot water cold water feed for each building or each toilet that allows remote monitor readings; common laundry facilities; boiler makeup water; outdoor water consumption; and water consumption in any non- residential space.

4.5 Efficient Plumbing Layout and Design

Store no more than 0.5 gallon of water in any piping/manifold between the fixture and the water heating source or recirculation line. No more than 0.6 gallon of water shall be collected from the fixture before a 10-degree Fahrenheit rise in temperature is observed. Recirculation systems must be demand-initiated.

4.6 Non-Potable Water Reuse

Harvest, treat, and reuse rainwater and/or greywater to meet a portion of the project, Æs non-potable water needs: 10% reuse [3 points]; 20% reuse [4 points]; 30% reuse [5 points]; 40% reuse [6 points].

4.7 Access to Potable Water During Emergencies

Provide residents with ready access to potable water in the event of an emergency that disrupts normal access to potable water, including disruptions related to power outages that prevent pumping water to upper floors of multifamily buildings or pumping of water from on-site wells, per one of the three options listed.

CRITERIA 4 SUBTOTAL

2 of 2 Mandatory Criteria
13 Optional Points

5. OPERATING ENERGY

YES / NO
OPTIONAL POINTS

Yes

M

5.1a Building Performance Standard

(Mandatory for New Construction)

Certify all buildings with residential units in the project through either ENERGY STAR Multifamily New Construction, ENERGY STAR Manufactured Homes, and/or ENERGY STAR Certified Homes as relevant.
AND

Provide projected operating energy use intensity and projected operating building emissions intensity.

No

M

5.1b Building Performance Standard

(Mandatory for Rehab)

Provide projected operating energy use intensity and projected operating building emissions intensity.
AND

Conduct commissioning for compartmentalization, insulation installation, and HVAC systems as indicated.

AND one of the following options:

- ERI Option: <= HERS 80 for each dwelling unit. Exception for some Rehabs built before 1980.

- ASHRAE Option: Energy performance of the completed building equivalent to, or better than, ASHRAE 90.1-2013 using an energy model created by a qualified energy services provider according to Appendix G 90.1-2016.

12 max

5.2a Moving to Zero Energy: Additional Reductions in Energy Use

(Not available for projects using prescriptive path for Criterion 5.1a or for projects following Criterion 5.2b or 5.4.)

Projects in CZ 1-4A following this criterion must also comply with Criterion 7.8.

Design and construct a building that is projected to be more efficient than what is required by Criteria 5.1a/b. Achieve HERS score of 5 lower than required by 5.1a/b if following ERI path for compliance OR 5% greater efficiency than required if following ASHRAE path for 5.1a/b compliance [5 points].

Additional 1 point for each additional 2-point decrease in HERS score required by Criteria 5.1a/b if following ERI path for compliance OR for 1% greater efficiency if following ASHRAE path for Criteria 5.1a/b, up to a maximum of 12 optional points.

		12-15	<p>5.2b Moving to Zero Energy: Near Zero Certification [Automatic Qualification for Enterprise Green Communities Certification Plus] <i>(Not available for projects following Criterion 5.2a or 5.4.)</i> Projects in CZ 1-4A following this criterion must also comply with Criterion 7.8. Certify the project in a program that requires advanced levels of building envelope performance such as DOE ZERH [12 points] and/or PHI Classic or PHIUS+ [15 points].</p>
		3-6	<p>5.3a Moving to Zero Energy: Photovoltaic/Solar Hot Water Ready <i>(Not available for projects following Criterion 5.3b or 5.4.)</i> Orient, design, engineer, wire, and/or plumb the development through the Photovoltaic Ready pathway or Solar Hot Water Ready Pathway to accommodate installation of photovoltaic (PV) or solar hot water system in the future.</p>
		8 max	<p>5.3b Moving to Zero Energy: Renewable Energy</p> <p><i>(Not available for projects following Criterion 5.3a or 5.4)</i> Install renewable energy source to provide a specified percentage of the project's estimated source energy demand. See full criterion for allowable sources. Option 1: For percentage of total project energy consumption provided by renewable energy. OR Option 2: For percentage of common area meter energy consumption provided by renewable energy.</p>
		4-8	
		1-5	
		24	<p>5.4 Achieving Zero Energy [Automatic Qualification for Enterprise Green Communities Certification Plus] <i>(Not available for projects following Criterion 5.2a, 5.2b, 5.3a, or 5.3b.)</i> Projects in CZ 1-4A following this criterion must also comply with Criterion 7.8. Achieve Zero Energy performance through one of the following options: Option 1: Certify each building in the project to DOE Zero Energy Ready Home program or PHI Plus AND Either install renewables and/or procure renewable energy, which in sum will produce as much, or more, energy in a given year than the project is modeled to consume. OR Option 2: Certify each building in the project in a program that requires zero energy performance such as PHIUS+ Source Zero, PHI Plus, PHI Premium, ILFI, Åds Zero Energy Petal, Zero Carbon Petal, or Living Building Certification.</p>
	0	5 max	<p>5.5a Moving to Zero Carbon: All-Electric Ready <i>(Not available for projects following Criterion 5.5b)</i> Ensure the project has adequate electric service and has been designed and wired to allow for a seamless switch to electricity as a fuel source in the future for the following uses: space heating [1 point], space cooling [1 point], water heating (DHW) [1 point], clothes dryers [1 point], equipment for cooking [1 point].</p>
	15	15	<p>5.5b Moving to Zero Carbon: All Electric <i>(Not available for projects following Criterion 5.5a)</i> No combustion equipment used as part of the building project; the project is all-electric.</p>
No		M	<p>5.6 Sizing of Heating and Cooling Equipment <i>(Mandatory for Substantial and Moderate Rehabs that include replacement of heating and cooling equipment. Not relevant for projects following 5.1a, 5.2b, or 5.4.)</i> Size and select heating and cooling equipment in accordance with ACCA manuals J and S OR in accordance with the ASHRAE Handbook of Fundamentals</p>
No		M	<p>5.7 ENERGY STAR Appliances <i>(Mandatory for Substantial and Moderate Rehabs providing appliances. Not relevant for projects following 5.1a, 5.2b, or 5.4.)</i> Install ENERGY STAR clothes washers, dishwashers, and refrigerators. If appliances will not be installed or replaced at this time, specify that at the time of installation or replacement, ENERGY STAR models must be used via Criterion 8.1 and Criterion 8.4.</p>
Yes		M	<p>5.8 Lighting (Mandatory for all lighting within New Construction and Substantial Rehab projects. Mandatory for new lighting in Moderate Rehab projects.) Follow the guidance for high-efficacy permanently installed lighting and other characteristics for recessed light fixtures, lighting controls, lighting power density, and exterior lighting.</p>
		8	<p>5.9 Resilient Energy Systems: Floodproofing <i>(Not relevant for Rehab projects in Special Flood Hazard Areas)</i> Conduct floodproofing of lower floors, including perimeter floodproofing (barriers/shields). Design and install building systems as specified by the full criterion so that the operation of those systems will not be grossly affected in case of a flood.</p>
	8	8	<p>5.10 Resilient Energy Systems: Critical Loads Loads Provide emergency power to serve at least three critical energy loads as described by the full criterion. Option 1: Islandable PV system OR Option 2: Efficient generator</p>

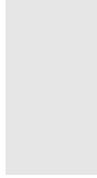
CRITERIA 5 SUBTOTAL



2 of 5 Mandatory Criteria
23 Optional Points

YES / NO	OPTIONAL POINTS		6. MATERIALS
	<input type="text" value="4"/>	8 max	<p>6.1 Ingredient Transparency for Material Health Install products that have publicly disclosed inventories characterized and screened to 1,000 ppm or better:</p> <ul style="list-style-type: none"> • 1 point per 5 installed Declare or HPD products from at least three different product categories • 1 point per 2 installed Declare or HPD products in any of these categories: adhesives, sealants, windows • 1 point per each product with third-party verified HPD or third-party verified Declare label • 2 points per each product with third-party verified HPD or third-party verified Declare label in any of these categories: adhesives, sealants, windows
	<input type="text"/>	3 max	<p>6.2 Recycled Content and Ingredient Transparency Use building products that feature, and disclose, their recycled content. The building product must make up 75% by weight or cost of a project category for the project and be composed of at least 25% post-consumer recycled content.</p>
	<input type="text" value="4"/>	8 max	<p>6.3 Chemical Hazard Optimization Install products that have third-party verification of optimization to 100 ppm or better per the options listed within the full criterion.</p>
<input type="text" value="Yes"/>	<input type="text"/>	M	<p>6.4 Healthier Material Selection Select all interior paints, coatings, primers, and wallpaper; interior adhesives and sealants; flooring; insulation; and composite wood as specified. Optional points also available.</p>
	<input type="text" value="3"/>	15 max 12 max	<p>6.5 Environmentally Responsible Material Selection Select concrete, steel, or insulation with a publicly disclosed EPD [3 points], Install a green or cool roof [3 points], use reflective paving [3 points], and/or use FSC certified wood [3 points]. Refer to criterion for specifics.</p>
<input type="text" value="Yes"/>	<input type="text"/>	M	<p>6.6 Bath, Kitchen, Laundry Surfaces <i>(Mandatory for New Construction and Substantial Rehab. Moderate Rehabs that do not include work in the shower and tub areas are exempt from the shower and tub enclosure requirement.)</i> Use materials that have durable, cleanable surfaces throughout bathrooms, kitchens, and laundry rooms. Use moisture-resistant backing materials per ASTM # D 6329 or 3273 behind tub/shower enclosures, apart from one-piece fiberglass enclosures which are exempt.</p>
	<input type="text"/>	4 max	<p>6.7 Regional Materials Use products that were extracted, processed, and manufactured within 500 miles of the project for a minimum of 90%, based on weight or on cost, of the amount of the product category installed. Select any or all of these options (every two compliant materials can qualify for 1 point):</p> <ul style="list-style-type: none"> • Framing Cladding (e.g. siding, masonry, roofing) • Flooring Concrete/cement and aggregate • Drywall/interior sheathing
<input type="text" value="Yes"/>	<input type="text"/>	M	<p>6.8 Managing Moisture: Foundations <i>(Mandatory for all New Construction projects and all Rehab projects with either basement and/or crawl space foundations)</i> Install capillary breaks and vapor retarders that meet specified criteria appropriate for the foundation type.</p>
<input type="text" value="No"/>	<input type="text"/>	M	<p>6.9 Managing Moisture: Roofing and Wall Systems <i>(Mandatory for all Rehab projects that include deficiencies in or include replacing particular assemblies called out below. New Construction projects are considered compliant per Criterion 5.1.)</i> Provide water drainage away from walls, window, and roofs by implementing the list of techniques.</p>
<input type="text" value="Yes"/>	<input type="text"/>	M	<p>6.10 Construction Waste Management (6 max) Develop and implement a waste management plan that reduces non-hazardous construction and demolition waste through recycling, salvaging, or diversion strategies through one of the three options. Achieve optional points by going above and beyond the requirement.</p>
	<input type="text"/>	6 max 2	<p>6.11 Recycling Storage For projects with municipal recycling infrastructure and/or haulers, provide separate bins for the collection of trash and recycling for each dwelling unit and all shared community rooms. OR For projects without that infrastructure, advocate to the local waste hauler or municipality for regular collection of recyclables.</p>
CRITERIA 6 SUBTOTAL			
4 of 5 Mandatory Criteria			
11 Optional Points			

YES / NO	OPTIONAL POINTS	7. HEALTHY LIVING ENVIRONMENT	
<input type="checkbox"/> Yes		M	7.1 Radon Mitigation <i>(Mandatory for New Construction and Substantial Rehab)</i> For New Construction in EPA Zone 1 areas, install passive radon-resistant features below the slab and a vertical vent pipe with junction box within 10 feet of an electrical outlet in case an active system should prove necessary in the future. For Substantial Rehab projects in EPA Zone 1, test before and after the retrofit and mitigate per the specified protocols.
<input type="checkbox"/> No		M	7.2 Reduce Lead Hazards in Pre-1978 Buildings <i>(Mandatory for Substantial Rehab of Buildings Constructed Before 1978)</i> Conduct lead risk assessment or inspection to identify lead hazards. Control identified lead hazards using lead abatement or interim controls, using lead-safe work practices that minimize and contain dust.
<input type="checkbox"/> Yes		M	7.3 Combustion Equipment For New Construction and Rehab projects: Specify power-vented or direct-vent equipment when installing any new combustion appliance for space or water heating that will be located within the conditioned space. If there are any combustion appliances within the conditioned space, install one hard wired carbon monoxide (CO) alarm with battery backup function for each sleeping zone, placed per National Fire Protection Association (NFPA) 72.
<input type="checkbox"/> No		M	For Rehabs: If there is any combustion equipment located within the conditioned space for space or water heating that is not power-vented or direct-vent and that is not scheduled for replacement, conduct combustion safety testing prior to and after the retrofit; remediate as indicated.
<input type="checkbox"/> Yes		M	7.4 Garage Isolation <ul style="list-style-type: none"> • Provide a continuous air barrier between the conditioned space and any garage space to prevent the migration of any contaminants into the living space. Visually inspect common walls and ceilings between attached garages and living spaces to ensure that they are air-sealed before insulation is installed. • Do not install ductwork or air handling equipment for the conditioned space in a garage. • Fix all connecting doors between conditioned space and garage with gaskets or make airtight. • Install one hard-wired CO alarm with battery backup function for each sleeping zone of the project, placed per NFPA 72 unless the garage is mechanically ventilated or an open parking structure.
<input type="checkbox"/> Yes		M	7.5 Integrated Pest Management Seal all wall, floor, and joint penetrations with low-VOC caulking or other appropriate nontoxic sealing methods to prevent pest entry.
<input type="checkbox"/> Yes		M	7.6 Smoke-Free Policy <i>(Mandatory and Optional)</i> Mandatory: Implement and enforce a smoke-free policy in all common areas and within a 25-foot perimeter around the exterior of all residential buildings. Lease language must prohibit smoking in these locations and provide a graduated enforcement policy. Make the smoke-free policy readily available.
<input type="checkbox"/> Yes	12	10 M	Optional: Expand the policy above to include all indoor spaces in the property.
<input type="checkbox"/> Yes		M	7.7 Ventilation <i>(Mandatory for New Construction and Substantial Rehab; Optional for Moderate Rehab)</i> For each dwelling unit in full accordance with ASHRAE 62.2-2010, install: <ul style="list-style-type: none"> • A local mechanical exhaust system in each bathroom [3 points if Moderate Rehab] • A local mechanical exhaust system in each kitchen [3 points if Moderate Rehab] • A whole-house mechanical ventilation system [3 points if Moderate Rehab] Verify these flow rates are either within +/- 15 CFM or +/- 15% of design value.
<input type="checkbox"/> Yes		M or 5	For each multifamily building of four or more stories, in full accordance with ASHRAE-162.1-2010, install: <ul style="list-style-type: none"> • A mechanical ventilation system for all hallways and common spaces [3 points if Moderate Rehab] For all project types, in addition to the above requirements: <ul style="list-style-type: none"> • All systems and ductwork must be installed per manufacturer's recommendations • All bathroom fans must be ENERGY STAR-labeled and wired for adequate run-time. • If using central ventilation systems with rooftop fans, each fan must be direct-drive and variable-speed with speed controller mounted near the fan. Fans with design CFM 300-2000 must also have an ECM motor.
<input type="checkbox"/> Yes		M	7.8 Dehumidification



(Mandatory for properties in Climate Zones 1A, 2A, 3A, and 4A following Criterion 5.2a, 5.2b, or 5.4. Optional for all other properties.)

Option 1: Design, select, and install supplemental dehumidification equipment to keep relative humidity

OR

Option 2: Equip all dwelling units with dedicated space, drain, and electrical hook-ups for permanent supplemental dehumidification systems to be installed if needed and install interior RH monitoring equipment as described.

	3
	3
8	8
8	8
4	8

7.9 Construction Pollution Management

Option 1: Earn the EPA Indoor airPlus label
OR

Option 2: In all dwelling units, seal all heating, cooling, and ventilation return and supply floor ducts and returns throughout construction to prevent construction debris from entering. Flush all dwelling units after completion of construction and prior to occupancy for either 48 hours or with at least 14,000 ft3 per ft2 of floor area, then replace all air handling equipment filters.

7.10 Noise Reduction

Option 1: Test and demonstrate that noise levels in bedrooms meet 30 dB LAeq (continuous) and 45 dB LMax, (single sound).

OR

Option 2: Provide a noise abatement plan specific to the site covering general noise mitigation techniques in accordance with 24 CFR 51B. OR **Option 3:** Ensure all exterior wall and party wall penetrations are sealed with acoustical sealant, all party walls and floor/ceiling assemblies have an STC rating of at least 55, and exterior windows and doors in projects near a significant exterior noise source have an STC rating of at least 35

7.11 Active Design: Promoting Physical Activity

(All projects must comply with at least one of either Criterion 7.11, 7.12, or 7.13. Points are not available for that criterion, but, are available for projects that meet two or three of these criteria.)

Option 1: Encouraging Everyday Stair Usage (buildings that include stairs as the only means to travel from one floor to another are not eligible for this option.) Provide a staircase that is accessible and visible from the main lobby and is visible within a 25-foot walking distance from any point in the lobby per the specifications listed. Place point-of-decision signage.

OR

Option 2: Activity Spaces. Provide on-site dedicated recreation space with exercise or play opportunities for adults and/or children that is open and accessible to all residents; see criterion for specifics.

7.12 Beyond ADA: Universal Design

(All projects must comply with at least one of either Criterion 7.11, 7.12, or 7.13. Points are not available for that criterion, but, are available for projects that meet two or three of these criteria.)

Select and implement at least one of the Options with at least three different strategies in at least 75% units.

Option 1: Create welcoming and accessible spaces that encourage equitable use and social connections.

Option 2: Create spaces that are easy and intuitive to use and navigate.

Option 3: Promote safety and create spaces that allow for human error.

Option 4: Create spaces that can be accessed and used with minimal physical effort.

Option 5: Create spaces with the appropriate size and space to allow for use, whatever the user's form of mobility, size, or posture.

7.13 Healing-Centered Design

(All projects must comply with at least one of either Criterion 7.11, 7.12, or 7.13. Points are not available for that criterion, but, are available for projects that meet two or three of these criteria.)

Select and implement at least two of the Options with at least two different strategies listed in at least 75% units.

Option 1: Provide an environment that promotes feelings of real and perceived safety.

Option 2: Create flexible spaces that allow for personalization and/or manipulation to meet individual and community needs.

Option 3: Connect residents and staff to a living landscape and the natural environment.

Option 4: Utilize art and culture in project design and programming and promote social connectedness.

CRITERIA 7 SUBTOTAL

6 of 8 Mandatory Criteria

32 Optional Points

8. OPERATIONS, MAINTENANCE + RESIDENT ENGAGEMENT

YES / NO

OPTIONAL POINTS

Yes

M

8.1 Building Operations & Maintenance Manual and Plan

(For all Multifamily projects)

Develop a manual with thorough building operations and maintenance (O&M) guidance and a complementary plan. The manual and plan should be developed over the course of the project design, development, and construction stages, and should include sections/chapters addressing the list of topics.

Yes	M	<p>8.2 Emergency Management Manual <i>(For all Multifamily projects)</i></p> <p>Provide a manual on emergency operations targeted toward operations and maintenance staff and other building-level personnel. The manual should address responses to various types of emergencies, leading with those that have the greatest probability of negatively affecting the project. The manual should provide guidance as to how to sustain the delivery of adequate housing throughout an emergency and cover a range of topics, including but not limited to:</p> <ul style="list-style-type: none"> • communication plans for staff and residents • useful contact information for public utility and other service providers • infrastructure and building, "shutdown" procedures • plan for regular testing of backup energy systems, if these exist
Yes	M	<p>8.3 Resident Manual</p> <p>Provide a guide for homeowners and renters that explains the intent, benefits, use, and maintenance of their home's green features and practices. The Resident Manual should encourage green and healthy activities per the list of topics.</p>
Yes	M	<p>8.4 Walk-Throughs and Orientations to Property Operation</p> <p>Provide a comprehensive walk-through and orientation for all residents, property manager(s), and buildings operations staff.</p>
Yes	M	<p>8.5 Energy and Water Data Collection and Monitoring</p> <p>For rental properties, upload project energy and water performance data in an online utility benchmarking platform annually for at least five years from time of construction completion per one of the four methods provided; grant Enterprise view access for that period. For owner-occupied units, collect and monitor utility data in a manner that allows for easy access and review.</p>
<hr/>		<p>CRITERIA 8 SUBTOTAL</p> <p>5 of 5 Mandatory Criteria 0 Optional Points</p>
<hr/>		<p>TOTAL</p> <p>33 of 40 Mandatory Criteria 107 Optional Points</p>