

WAYNE STATE UNIVERSITY

MIKE ILITCH SCHOOL OF BUSINESS

SCHEMATIC DESIGN NARRATIVE

February 15, 2016

SMITHGROUP JJR

SCHEMATIC DESIGN NARRATIVE

ARCHITECTURAL

EXTERIOR DESIGN CRITERIA

Materials and assemblies should emphasize durability and minimize long-term maintenance. Materials selected should have a track record for acceptable long-term performance. Energy efficiency of materials strongly considered providing a minimum “U” value of 0.064. The value will need to be modified to meet LEED energy requirements.

CURTAIN WALL SYSTEM

A thermally improved aluminum curtain wall framing system will be utilized with a high performance insulating low-e glass and a three coat PVF finish. Spandrel glass with insulation will be utilized between floors.

METAL PANEL

A formed metal concealed fastener lap-seam metal wall panel secured to a sub-framing fiberglass thermal spacer with Z furring, 3” thick mineral wool insulation on air barrier, gypsum sheathing and cold formed metal framing. Metal panel to have a three coat PVF finish.

PRECAST CONCRETE PANELS

An articulated precast concrete panel system with a spray applied insulation and fireproofing adhered to the inside surface of the precast concrete. Interior finish at the precast panels will be metal studs with gypsum board.

EXTERIOR DOORS AND FRAMES

Doors and frames shall be extruded aluminum, finished with spray-applied Kynar resin finish and designed to fit into the glazing recess of curtain wall members. The door head, jambs, and meeting stiles will be weather-stripped. Glass for doors and transoms shall be clear tempered glass. Vestibules will be incorporated at the east and west main entrances as well as the entrance to the Atrium.

LOUVERS

Louvers will be extruded aluminum, continuous blade, and stationary architectural louvers. Louvers will utilize concealed blade braces and hidden vertical supports in place of intermediate jamb frame members for uninterrupted horizontal blade appearance. Louvers will have a PVF finish.

EXTERIOR SEALANTS/BARRIERS

A complete silicon sealant system including backing materials, primers, bond breakers, and drain tubes will be provided. All joints between similar and dissimilar materials will be sealed to provide a complete water and air-tight enclosure. The elevator pits will be coated with metal oxide waterproofing. Basement walls will be coated with a membrane waterproofing system. A continuous vapor retarder will be provided at non-glazed exterior walls. The vapor retarder will be on the warm side of the insulation and sealed at all joints and terminations. The vapor retarder perm rating will be 0.045 perms. A continuous air barrier will be provided.

EXTERIOR STAIRS/RAMPS

Abrasive nosings for exterior concrete stairs will be provided. Nosings will be cast aluminum with aluminum oxide or silicon carbide abrasive and crosshatched surfaces. Exterior Handrails, Guardrails, and Posts will be provided at both sides of exterior stairs and ramps complete with galvanized sleeves, flanges, and wall brackets.

ROOF SYSTEMS

The roofing material shall be a single ply membrane thermoplastic system on rigid insulation with ¼” per foot slope (with tapered insulation provided as necessary to accomplish required slope). The system will include a vapor retarder. A minimum

"U" value of 0.05 will be provided with the value modified to meet LEED energy requirements. Roofing color will be white to provide solar reflectance and LEED Sustainability Credits.

Roof expansion joints, flashings, cants, curbs, insulation and counter flashings will be installed in accordance with the recommendation of the National Roofing Contractors Association (NCRA). Exposed metal flashings and counter flashings will be stainless steel. All terminations into counter flashing will be two-piece. Roof access will be via stairs and roof scuttles, minimum size of (2 ft. x 8 ft.) Roof walking pads to all mechanical equipment and doorways will be provided from all roof access points. Roof parapets will extend 3'-6" above the finished roof membrane surface.

INTERIOR CONSTRUCTION AT OFFICES AND INTERACTION SPACES

PARTITIONS

Partitions will be 5/8-inch gypsum wallboard on 3-5/8 inch metal studs. Partitions for corridor walls and between offices will extend full height to underside of floor or roof deck. All other wall heights will be determined upon functional areas and building systems requirements. For areas requiring sound attenuation partitions shall have sound attenuation batts installed within entire stud cavity, including area above the ceiling finish. Selected office areas will have full wall glass partitions at the corridor side with translucent glass at floor and ceiling. Supplemental metal or wood backing or heavy gauge studs will be provided in walls supporting shelving, or accessories.

INTERIOR DOORS AND WINDOWS

Interior doors in offices, conference rooms and interaction areas will be primarily solid-core, wood flush doors, with a wood veneer faced finish, in hollow metal frames with 24 inch wide sidelight at selected locations. Interior doors requiring a fire resistive rating will be wood, with the appropriate Underwriters Laboratory rating label. Interior windows (borrowed lights) will be ¼-inch thick clear heat strengthened, or tempered glass in hollow metal frames. Door hardware will be lever handle or push type, except where panic hardware is required. Security hardware will be provided at a suite and/or floor level.

FINISHES

In offices, conference rooms and interaction areas, floor finishes will be carpeting, with a rubber base. In coffee and vending areas, solid vinyl tile with a rubber base.

Ceiling finishes for the office and interaction areas shall be accessible 2' x 2' acoustical ceiling tile with selected areas having gypsum wallboard soffits.

Manually operated roll-up shades will be provided through with motorized shades at the Board Room.

INTERIOR CONSTRUCTION AT LOBBY AND ATRIUM SPACE

PARTITIONS

Partitions will be veneer wood paneling on gypsum board and metal studs. Partitions for corridor walls will extend full height to underside of floor or roof deck. All other wall height will be determined upon functional areas and building systems requirements. For areas requiring sound attenuation, partitions shall have sound attenuation batts installed between entire stud cavity, including area above the ceiling finish. Supplemental wood or metal backing will be provided in lobby/gallery space.

INTERIOR DOORS AND WINDOWS

Interior doors will be primarily solid-core, wood flush doors, with a wood veneer faced finish, in hollow metal frames. Interior doors requiring a fire resistive rating will be wood, with the appropriate Underwriters Laboratory rating label. Interior windows (borrowed lights) will be ¼-inch thick clear heat strengthened, or tempered glass in solid wood frames. Door hardware will be lever handle or push type, except where panic hardware is required. Security hardware will be provided at a suite and/or floor level.

FINISHES

Floor finish will be terrazzo, with a terrazzo base. Ceiling finishes for the Lobby and Atrium areas shall be a coffer, gypsum wallboard system. Motorized roll-up shades will be provided at the curtainwall.

INTERIOR CONSTRUCTION AT CLASSROOMS

PARTITIONS

Partitions will be 5/8-inch gypsum wallboard on 3-5/8 inch metal studs. Partitions for corridor walls will extend full height to underside of floor or roof deck. Wall finishes shall be painted gypsum wallboard with acoustical wall panels. Sound attenuation batts will be installed within the entire stud cavity, including area above the ceiling finish.

INTERIOR DOORS AND WINDOWS

Interior doors in classrooms, conference rooms and offices will be primarily solid-core, wood flush doors, with a wood veneer faced finish, in hollow metal frames. Interior doors requiring a fire resistive rating will be wood, with the appropriate Underwriters Laboratory rating label. Interior windows (borrowed lights) will be ¼-inch thick clear heat strengthened, or tempered glass in hollow metal frames. Door hardware will be lever handle or push type, except where panic hardware is required. Overhead motorized operable partitions at selected classrooms

FINISHES

Floor finishes will be carpet with a rubber base. Carpet on 3/4" plywood on cold formed framing with ½" homasote board will be provided at stepped classrooms.

Ceiling finishes for the classroom areas shall be accessible 2' x 2' acoustical ceiling tile. Selected areas will have both acoustical ceiling tiles and gypsum wallboard soffits.

Motorized shades will be provided at classrooms.

INTERIOR CONSTRUCTION MISCELLANEOUS

Floors in mechanical rooms above grade will be concrete with a deck waterproofing system.

Toilet room accessories will be stainless steel and meet the requirements of handicapped accessibility. Toilet partitions will be floor mounted and overhead braced phenolic toilet compartments with stainless steel shoes. Drinking fountains will be dual level barrier free, self-contained wall hung

Floors at IDF Room will be sealed concrete. Ceilings will be open to deck above and painted. Walls will be covered with ¾" plywood panels, 8'-0" high.

ELEVATORS

Elevators will be machine room-Less, gearless AC permanent magnet traction machines.

ACOUSTICS

Each space in this project shall be designed to provide optimal mitigation of sound within the space, with consideration given to the preclusion of unwanted sounds from entering the space. This includes sound generated from equipment and users in adjacent rooms as well as the building mechanical systems.

Spaces that contain noise generating sources shall be away from spaces requiring quiet, or shall be adequately isolated acoustically. Consideration shall be given to sound transmission through ceilings floors, closed doorways, the mechanical system, ductwork, and walls and partition systems that do not extend to the underside of structure.

Materials used for internal duct insulation exposed to airstream shall be limited to minimum applications necessary to achieve programmatic noise criteria. Surfaces shall be cleanable and demonstrated as durable when rated per UL 181 or ASTM C 1071

erosion tests. [ASHRAE 62-1989; 5.6.7]

Acoustical treatment to the metal deck below will be provided below roof top equipment and mechanical penthouse equipment as required.

Activity spaces such as lobby and gallery spaces require special care, particularly when considering reverberation. Consideration should be given to special finishes, non-parallel walls and other techniques that will avoid the necessity of adding sound absorbing materials once the facility is completed. The following are recommended Noise Criteria (NC) and Sound Transmission Class (STC) guidelines:

Room Type	NC	STC
Conference Rooms	30	50
Enclosed Offices	40	40
Classrooms	30	50
Lobbies and Corridors	40	50
Toilets	40	40
Mechanical Rooms	35	50
Electrical and IDF Rooms	40	40

Special consideration must be given to each activity area, including the impact of sound to the room as well as adjacent spaces.

SITE

GENERAL

The Mike Ilitch School of Business will be located on an urban site at the southwest corner of Woodward Avenue and Temple Avenue in Detroit, Michigan. Just one block north of the new Red Wings Arena, it will provide venues for community and business events and draw on the neighborhood assets provided by the District Detroit's new development. The site currently contains existing buildings and deteriorating pavement. The buildings will be removed by others prior to construction.

Building users will park in a new structure just west of the building, or in other parking areas throughout the District. They may also arrive via bike lanes on Cass and Second Avenue, M1 Rail station on Woodward one block south, by foot from Woodward Avenue or Temple or be dropped off curbside on Temple Avenue.

ENTRY COURT

The entrance at the northwest corner will serve as a primary entrance for regular building users. A plaza with seating, shade trees and landscape areas will accommodate informal use for individuals or small groups. For special events, it can serve as a vehicular drop off/valet court. Landscape beds, a small lawn area, and low seatwalls will accommodate flexibility while creating a comfortable user experience. An 8-foot tall masonry wall, covered in landscape trellis, will create a backdrop to the space, screening the adjacent service area to the south.

SERVICE COURT

Trash and recycling, a space for loading and deliveries, and four parking spaces will be provided in the service court, along with an electrical generator (see Electrical Narrative). Access to the service area will be provided via new alleys to the west and south.

COURTYARD

Nestled into the south side of the building is a flexible courtyard with strong visual and physical connections to the interior atrium. The courtyard will be a popular student space and will provide desirable views from interior offices. In addition, the School of Business envisions programming the space and offering it up for community events. It will accommodate temporary installation of a 30'x60' rented tent, as well as a patio space for atrium events to spill out into the courtyard. Low seatwalls and movable site furniture provide seating opportunities at the edge of walkways, adjacent to an open lawn area, and on the patio. At the edge of the lawn, a wood deck overhangs a green bioswale, allowing users to engage with the sustainable stormwater management approaches being incorporated.

STREETSCAPE

The frontage on Woodward Avenue will be an extension of the streetscape character being implemented at the arena, with large trees in curbed planters with understory shrubs, perennials, and groundcovers. Street lights are existing and will remain. Sidewalks will meet City of Detroit Standards and will be 6" thick concrete with decorative scoring. Alleys located to the west and south will be constructed by others.

MATERIALS

Site materials will be selected for their durability, ease of maintenance, and considerations for local/regional materials, recycled content, properties for heat gain.

Hardscape – the entry court and courtyard will include locally manufactured, high SRI rated concrete unit pavers installed over a concrete base. Concrete pavement will complement the unit pavers and will be primarily located in the streetscape, service area, and secondary building entrances. Vehicular pavement will be 8" reinforced concrete while pedestrian pavement will be 6" non-reinforced. Seatwalls will be precast concrete set on a cast-in-place concrete foundation.

Landscape – Plant materials will be selected for efficient water use, hardiness, and growth habit, to ensure longevity and maintain safe viewing heights (3' max ht. for shrubs and perennials). Irrigation will be provided for all landscape areas, but can be disabled after an 18-month plant establishment period. Drip irrigation will be provided wherever possible to minimize water usage. Underdrainage will be provided in all landscape areas.



Furnishings – External areas will include fixed seating, with aluminum, and wood materials (such as Landscape Forms –FGP Bench). Trash and recycling receptacles will be provided at building entrances (such as Forms+Surfaces – Dispatch Receptacle). A large precast concrete sculptural seating element (such as Landscape Forms – Escofet



Lungo Mare) will be included in the courtyard as a focal point and lounging element. Bike racks will be provided near building entrances (such as Landscape forms – Ride Bike Rack).

Lighting – Street lighting will utilize existing poles and fixtures. Internal site lighting will meet IESNA standards and will provide a safe and comfortable pedestrian environment on all sides of the building. Fixtures will all be full cut off and will include a combination of pedestrian scaled poles, wall-mounted fixtures, and low level bollard lights.

CIVIL

SITE SOILS

Preliminary soil investigation and environmental reports for the MISB site indicate the presence of rubble fill and contaminated soil. NTH, the environmental consultant, has confirmed that any soil removed from site will require disposal at a Type II landfill as defined by the Michigan Department of Environmental Quality. There is not an obligation to remove all contaminated soil from the site, but any contaminated soil that is left on site must be covered up with pavement, building, or landscape topsoil and plantings as appropriate, meaning no surface exposure of contaminated soil will be allowed. NTH will be providing a Baseline Environmental Assessment and a Due Care Plan in accordance with requirements for sites with soils such as at the MISB site. These reports will contain additional information for contaminated soil and groundwater handling. Previous environmental investigations are from the 2007 timeframe and were based on residential cleanup criteria. Updated reports will reference commercial cleanup criteria. The supplemental soils investigation being prepared by TEC will provide guidance on soil preparation for site pavement areas in addition to building foundation considerations. It is expected that a minimum of two feet of fill soils will be required to be removed in zones that are slated to have site pavement. The two foot removal will be filled with the pavement section, including a sand and aggregate pavement support system.

LIMITS OF WORK

Improvements will extend to curb lines of Woodward and Temple on the east and north sides of the project. On the west, the limit of work will be the east edge of the future private alley. The alley location was established by District Detroit master planning efforts. Along the south side of the site, the limit of work will be the north edge of the future private alley. The south alley was established from District Detroit master planning efforts and the old Alfred Street ROW.

SITE GRADING

The site generally drains from north to south, with the lowest points of the site located along the future private alley south of the site. The northeast corner of the site has an existing accessible sidewalk crossing at Temple, and this area is also relatively low. The building is intended to have a single floor elevation, including the same elevation for all site exit doors. Sidewalks will be graded to meet accessibility requirements. Grades along Temple are generally higher than along Woodward, so some site elevation will be taken up in planter areas along the Woodward curb. Some doors exit from stairwells, and there is an opportunity to have an outside exit elevation at the stairs that differs slightly from the finished floor elevation. This will be done if necessary to more efficiently match existing grades. The site has an approximate one foot elevation difference from high to low elevation points.

STORM WATER MANAGEMENT

The storm water runoff management system will be designed to meet the guidelines noted the “City of Detroit Storm Water Program Plan”. The on-site collection system will be designed in accordance with the City of Detroit Buildings and Safety Engineering Department. Connections to City of Detroit infrastructure will be coordinated with the Detroit Water and Sewerage Department and the District Detroit. The site storm drainage collection system is expected to operate by gravity.

Collection System – Site storm water runoff will be collected by a system of precast concrete catch basins and manholes connected by reinforced concrete pipes. The discharge point for collected storm water is the City of Detroit combined sewer system. In accordance with best management practices and City guidelines, storm water will be collected in an on-site system that is separate from sanitary sewage. The two systems will be combined in a manhole near the property line adjacent to the connection point to City infrastructure. The terminal manhole structure prior to the City connection will require a “trap” to prevent sanitary sewer gases from backing up into the storm sewer system.

City Infrastructure – A DWSD sewer exists in the former public alley located south of the site. However, this sewer is slated for abandonment because it traverses real estate west of the MISB that will be occupied by a future District Detroit parking deck. A public sewer connection for the MISB will be determined with the DWSD and the District Detroit engineering team. It is expected that a new public sewer will occupy a similar location south of the MISB site because of the prevailing surface grades and sewer flows.

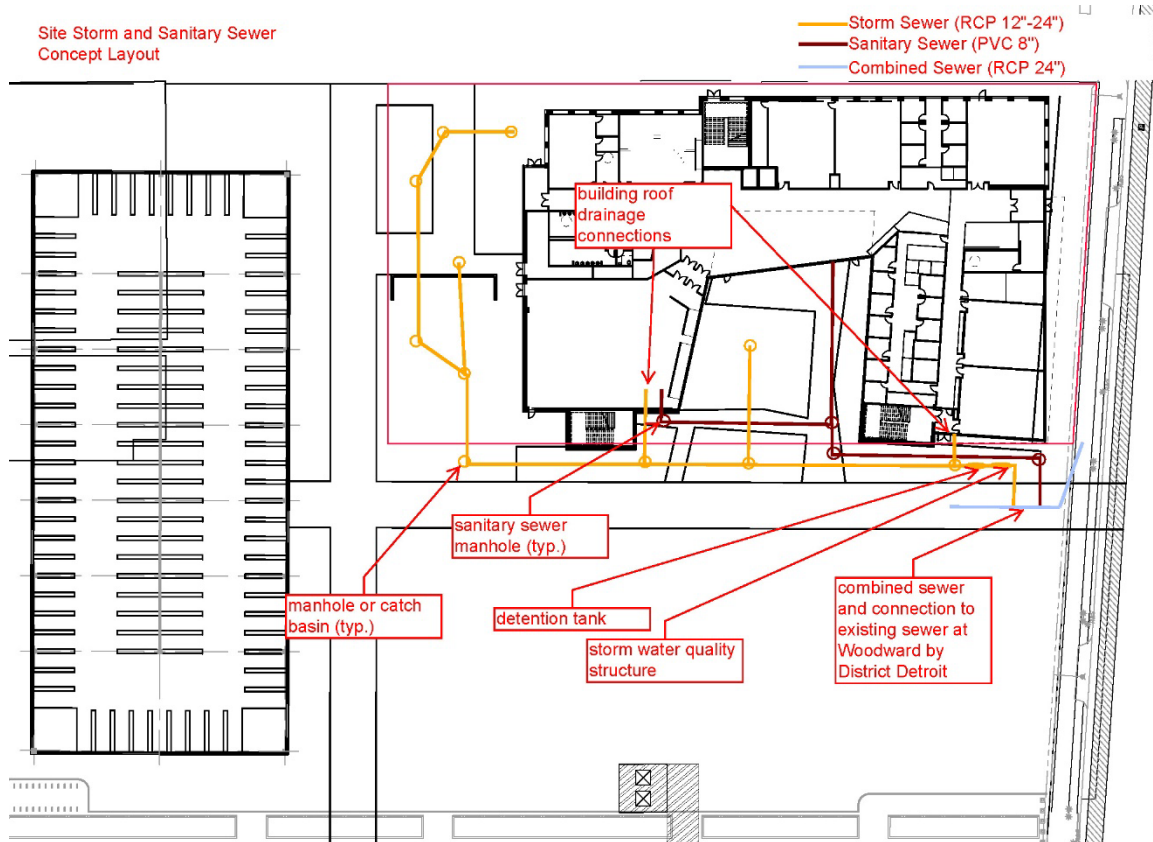
Roof Drainage - Runoff of roof drainage will be directed to underground storm water collection pipes and will connect with the site storm sewer system. If possible, some roof runoff will be directed to vegetated on-site natural areas and bioswales. Ground cover over pipes may limit the extent to which roof water can be routed to vegetated surface areas.

Quantity Control - The system will be designed such that site storm water runoff volume and peak flow rate for the two-year, 24-hour storm will be at or below existing levels, with "existing" defined as the land use just prior to the planned development. The peak flow of storm water runoff will be reduced by reducing the overall percentage of impervious area as compared to the existing site. The existing site is 90% impervious while the proposed site will be approximately 84% impervious. This reduction in impervious surface will help meet storm water management objectives for both quantity and quality. Storm water detention, if necessary as the design continues to develop, will be achieved through the use of an underground pre-manufactured detention system. The detention system will be placed at the downstream end of the storm sewer system and will be manufactured of reinforced concrete or high-density polyethylene.

Quality Control - Storm water quality objectives are noted in the LEED Sustainable Sites credit 6.2 and in the City of Detroit Storm Water Program Plan. Both standards suggest that the 90% average annual rainfall should be treated for development sites. For southeast Michigan, the 90% average annual rainfall equates to approximately 1" of rainfall. Best management practices will be implemented with the intent of treating storm water runoff such that 80% of total suspended solids will be removed from the design rainfall. The treatment will be achieved through routing storm water runoff into areas planted with vegetation that is deep-rooted and promotes water uptake and evapotranspiration. The vegetated natural areas will be designed to allow water to collect and infiltrate within the planting soil. Because of the site's impermeable underlying soils, storm water infiltration beyond the depth of the planting soil is not expected. Additional storm water runoff treatment, if necessary to meet requirements, will be achieved through the use of a pre-manufactured storm water quality structure. Structures such as this are designed to create a hydrodynamic separation effect for incoming storm water in order to remove sediments and the pollutants attached to sediments. Storm water quality structures require periodic maintenance by a vacuum truck, similar to catch basins. The storm water quality structure will be placed as close to the most-downstream end of the storm sewer system as possible.

SANITARY SEWER

Building sanitary sewer will be collected at discharge points at the building and conveyed to the existing public City of Detroit combined sewer system. Similar to the storm sewer collection system, the site sanitary sewer is expected to be gravity-driven. Building connections from the south side of the building are currently envisioned because it is expected that a new public sewer will be constructed south of the site. The sanitary sewer system will be routed separate from the storm sewer system while on the MISB site. The two systems will be combined just prior to connection to City infrastructure in accordance with DWSD standards. Manholes are expected to be precast concrete while piping is expected to be PVC.

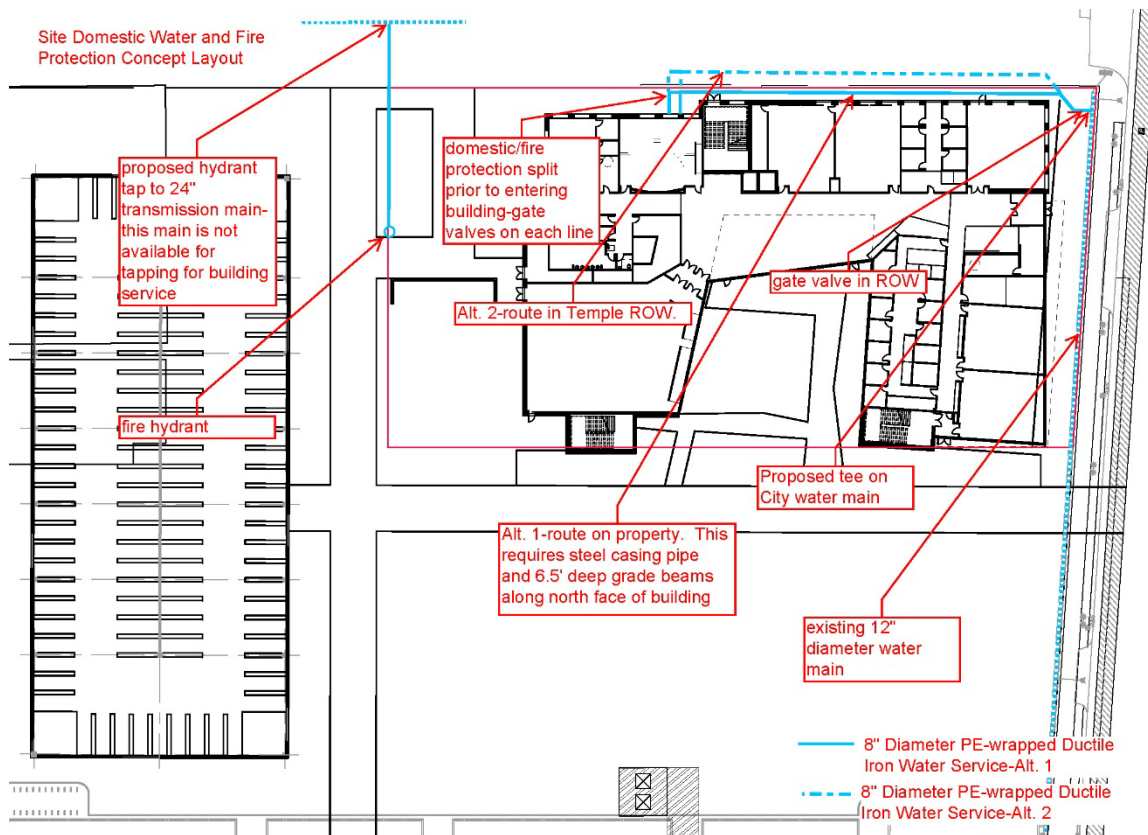


Storm and Sanitary Sewer Routing Concept

DOMESTIC WATER AND SITE FIRE PROTECTION

CITY INFRASTRUCTURE – The DWSD and the District Detroit are in the process of replacing the existing 12" diameter water main that exists on the west side of Woodward Avenue. The new 12" diameter water main will be located approximately two feet west of the existing east MISB property line at Woodward. An 8" tee will be placed on the new main in anticipation of the new MISB water service. At this point of the project, the combined fire protection and domestic water service line is envisioned to have a maximum size of 8" in diameter. The MISB team has explored the possibility of making a service connection to the 24" diameter main located in Temple. A service connection to this large diameter main is not allowed by DWSD, but it is anticipated that a fire hydrant may be connected to this line as a part of the MISB project.

SERVICE LINE – An 8" diameter service line for MISB will be routed from the tee on the 12" diameter main near the Woodward-Temple intersection to the mechanical room. The total distance is approximately 200'. As the project develops, it is possible that calculations will confirm that a smaller service line (such as 6" diameter service) is acceptable. If this is the case, the 8" tee at the Woodward main will still be used, but a reducer will be placed on the service line downstream of the tee. The service is expected to be ductile iron with polyethylene encasement to address corrosion protection. The horizontal position of the service line will be discussed with DWSD. It is possible that the service line will be routed within the 6' corridor between the north face of the building and the Temple right-of-way line. This location may necessitate deeper grade beams along the north face of the building and a casing pipe for the water service due to its close proximity to the building. An alternate location for the service is within the Temple Avenue right-of-way. DWSD has indicated a willingness to discuss this as an option given that existing infrastructure is not available for the service line connection within Temple Street. Prior to entering the mechanical room, the service line will split into the domestic service and the fire protection service. The fire protection service will be 6" in diameter as it enters the building and the domestic water service will be 4" as it enters. Gate valves will be placed on each service line outside of the building. Water metering will take place within the mechanical room.

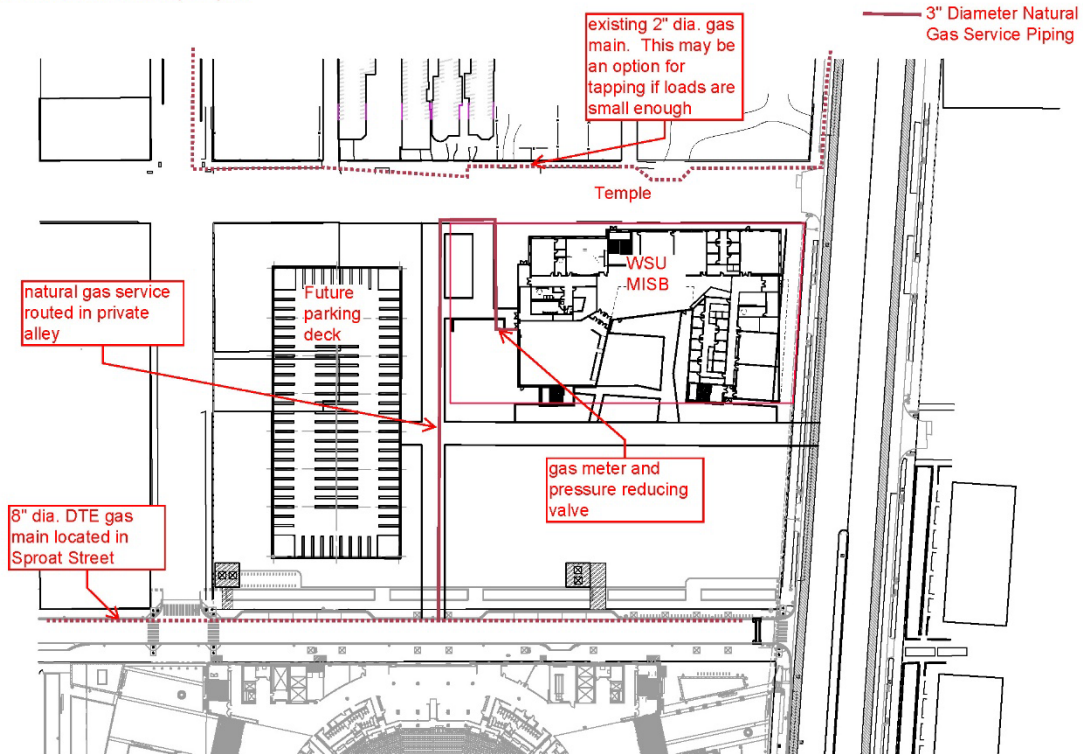


Water Service Routing Concept

NATURAL GAS SERVICE

Local natural gas infrastructure is owned by DTE. Adjacent facilities include a 2" diameter, 10 psi main located in Temple Avenue and a proposed 8" diameter, 60 psi main in Sproat Street. If possible, a connection will be made in Temple, but preliminary discussions indicate that this line may not have adequate capacity. If capacity is a problem, a connection to the main in Sproat Street will be necessary. DTE has preliminarily indicated that a Sproat Street connection for the MISB may be routed through the future private alley planned for the west side of the MISB site. DTE prefers to avoid the Woodward right-of-way, which is currently congested with other utilities and site constraints.

Site Natural Gas Concept Layout

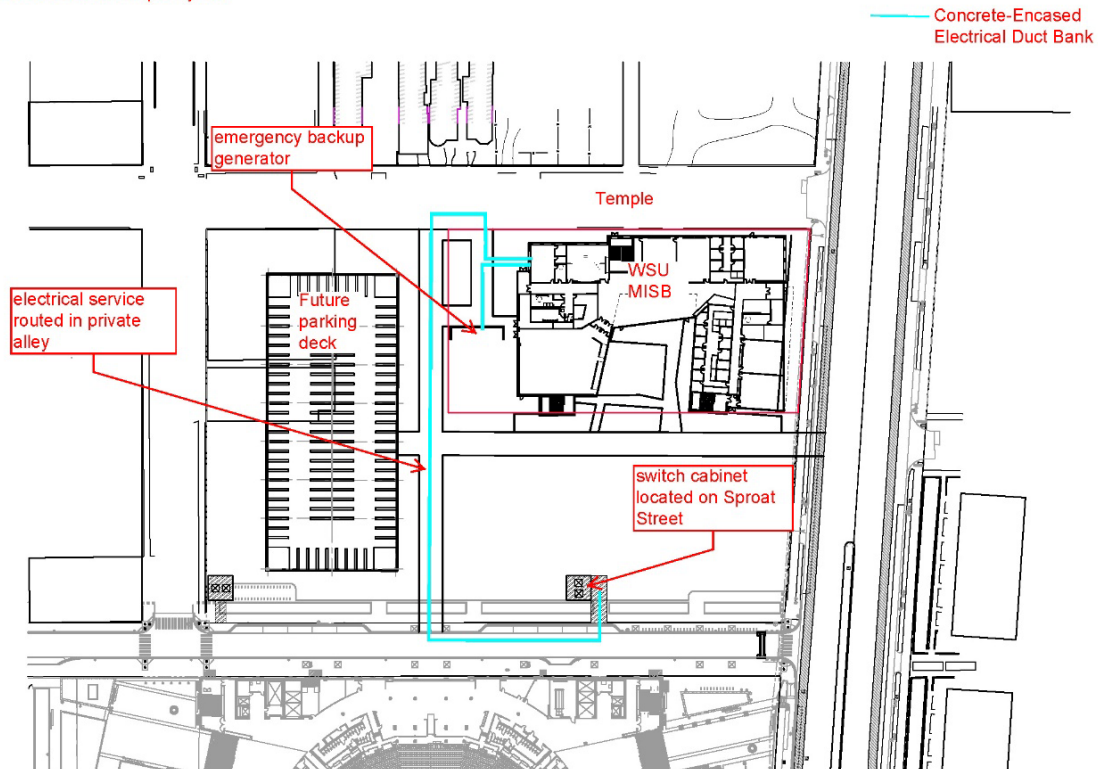


Natrual Gas Service Routing Concept

ELECTRICAL SERVICE

DTE is the electrical service provider for the MISB site. Options for site service are currently being explored, including the option of getting power from DTE infrastructure located in Sproat Street. This scenario is represented on the attached electrical utility concept diagram. Similar to gas service routings in this area, DTE electrical service routings will avoid the Woodward corridor. Aside from a Sproat Street connection, another electrical service option is providing space on site for electrical switch equipment and obtaining service from DTE infrastructure in Temple Avenue. DTE and the MISB design team will meet to discuss routing options after the completion of schematic design. The site service is expected to be a concrete encased duct bank as it traverses the MISB site and adjacent alleys and streets.

Site Electrical Concept Layout



Electrical Service Routing Concept

STRUCTURAL

The structural systems shall be designed for efficiency, flexibility and constructability. New structural systems shall be provided for the new Mike Ilitch School of Business at Wayne State University consisting of a three- and four-story classroom building. The building shall be designed for Risk Category III as defined by the 2012 Michigan Building Code (MBC).

It is anticipated that the building shall be configured in a "U" shape with a somewhat irregular column grid system that varies from 20'-10" to 45'-0" spacing. The floor to floor height of Level 1 is anticipated to be approximately 18'-0", all other levels shall be approximately 15'-0".

FOUNDATIONS

Based on a preliminary letter from NTH, geotechnical investigations from nearby properties, and knowledge of the soils in the Detroit area it is anticipated that the foundation system shall consist of deep foundations. Further geotechnical investigation is being performed by TEC to confirm the appropriate foundation systems and capacities.

The deep foundations are expected to be drilled piers extending 130'-0" to hard pan. At the building perimeter the column and wall foundations shall bear a minimum of 4'-0" below the lowest grade for frost protections; foundations where frost is not a concern will be located such that the tops of foundations shall 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 shall be constructed of cast-in-place reinforced concrete.

There shall be a partial basement for the purpose of housing mechanical equipment. Due to the site constraints and adjacent properties the amount of basement shall be limited in order to limit the amount of earth retention required. Concrete basement walls shall be a minimum of 15" wide cast-in-place concrete basement wall with a foundation that shall be insulated and waterproofed with a perimeter drainage system. The basement walls shall 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 shall have a concrete grade beam spanning between drilled pier foundations.

SUPERSTRUCTURE

The structural systems for the superstructure of the buildings shall be constructed of structural steel spaced no more than 10'-6" on center. Levels 2, 3, and 4 shall consist of a structural steel framing system comprised of w-shape steel columns that support composite steel girders and beams. All structural steel girders and beams shall have headed shear studs welded to their top flange.

The floor slabs shall be composite slabs consisting of composite steel deck that is 18 gauge with lightweight concrete topping. At a minimum the composite slab shall be reinforced with W2.9xW2.9 – 6 x 6 welded wire fabric. Additional steel reinforcing shall be provided as required to control cracking at slab edges, penetrations, corners and over top of girders. Steel bent plates with headed shear studs shall provide a pour stop around the entire building perimeter and at all of the openings.

The roofs shall consist of structural steel beams and girders supporting 1 1/2" metal roof deck that is a minimum of 20 gauge thick. The roof beams shall be spaced at a maximum spacing 6'-6" on center and the deck shall be welded to meet factory mutual requirements. In addition to the recommended live loads, the roof shall be designed to support roof-mounted mechanical and electrical and communications equipment. The roof shall also have a partial penthouse to house elevator equipment and any rooftop mechanical equipment shall be surrounded by a screen wall enclosure supported by structural steel framing.

It is anticipated that there will be a steel-framed monumental stair in the atrium. Exterior roof canopies likely will be constructed of exposed steel framing that shall be galvanized and AESS. Any exterior plaza construction shall require fireproofing.

The structure shall be constructed of non-combustible material. The majority of the structural framing shall receive spray applied fire-proofing. The unprotected composite slab shall provide a 2-hour fire rating per UL.

All framing that is exposed to weather shall 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 shall be AESS; this may include gravity, lateral and stair framing in the Atrium and canopy framing.

The floor and roof framing shall 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 office usage floors shall also be designed to limit vibration per AISC recommendations to provide human comfort. As a minimum, the peak acceleration due to walking excitation shall be limited to 0.5% of the acceleration due to gravity. Typical bay framing is shown below for standard office building use.

LATERAL BRACING

The proposed lateral force resisting system to withstand the wind and seismic lateral forces on the building shall be constructed of ordinary braced frames not specifically detailed for seismic resistance. The site class for the building is classified at a seismic site class E which results in a Seismic Design Category (SDC) of "B" for the building. This does not require that non-structural architectural, mechanical, electrical and plumbing components be restrained for seismic per ASCE 7.

EXTERIOR WALLS

Exterior walls shall be constructed of a variety of materials including a glass curtainwall system, precast concrete, metal panel with a cold formed steel framed back-up wall and some reinforced masonry walls. Design of the curtainwall and precast connections shall be signed and sealed by a registered professional engineer. Design of the cold formed metal framing shall be signed and sealed by a registered professional engineer.

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

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

Masonry walls shall have vertical reinforcing as required and a minimum of 9 gage ladder type horizontal reinforcing at 16" on center. Additional steel lintels, girts and wind posts shall be provided as required to support the exterior wall system above openings and wall system transitions.

The cold formed steel back-up walls supporting metal panel shall likely require supplemental structural steel supports in the form of wind posts, girts, or intermediate framing at 4'-0" on center to stiffen cantilevered walls.

TIER/LONG-SPAN CONSTRUCTION

The Level 2 framing above the large auditorium shall include a large plate girder to provide a long-span transfer to support where columns shall be removed within the auditorium space below.

The tiered floor slab in the Auditorium and Level 1 classrooms shall be achieved by sloped/steeped slab on grade. Tiered floor slab in classrooms on the supported floors, Levels 2, 3, and 4 shall be constructed of cold formed metal framing supporting a

cement board, plywood, and homasote system as required for acoustic performance. Design of the cold formed metal framing shall be signed and sealed by a registered professional engineer.

TYPICAL MATERIALS

Concrete

Drilled pier foundations	$f'_c = 3000$ psi, normal weight
Grade walls, basement walls, and grade beams*	$f'_c = 4500$ psi, normal weight
Slab on grade	$f'_c = 4000$ psi, normal weight
Supported floor slabs (concrete on metal deck)	$f'_c = 4000$ psi, light weight

*All concrete exposed to freeze/thaw shall be $f'_c = 4500$ psi, shall have a water to cement ratio of 0.45 or less, and 6% entrained air.

Reinforcing

Reinforcing bars	ASTM A615, Grade 60
Welded wire fabric	ASTM 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
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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

TYPICAL DESIGN LOADS

Live Loads

	Surface	Concentrated
Roof		
Ordinary flat or pitched	20 psf	300 lbs
Floors		
Lobby & first-floor corridors	100 psf	2000 lbs
Corridors above first floor	80 psf	1000 lbs
Offices with partitions*	80 psf	2000 lbs
Conference rooms	100 psf	
Retail and dining	100 psf	
Classrooms	100 psf	1000 lbs
Stairs and exits	100 psf	300 lbs
MEP spaces and penthouse	150 psf	2000 lbs
Light storage	125 psf	
Other areas	100 psf	

Live loads will be reduced as allowed by the MBC 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	15 psf
Built-up floor in tiered classrooms	30 psf

Wind Loads

As per the MBC and ASCE 7.

Basic wind speed	120 mph
Exposure	B
Internal pressure coefficient	± 0.18

Snow Loads

As per the MBC and ASCE 7.

Ground snow load, p_g	25 psf
Exposure category	B
Exposure factor, C_E	1.0
Thermal factor, C_T	1.0
Importance factor, I	1.1
Flat roof snow load, p_f	22 psf

Snow loads shall 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	0.100g
Spectral response acceleration, 1-sec periods	0.050g
Seismic importance factor	1.25
Site class (to be confirmed by Geotech)	E
F_a	2.50
F_v	3.50
S_{DS}	0.167 g
S_{D1}	0.117 g
Seismic design category	B
Seismic LFRS	Ordinary steel braced frames not specifically detailed for seismic
Response modification factor	3.0

DEFLECTION AND DRIFT 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"
Maximum live load deflection when supporting curtainwall	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

Lateral Drift of Building

Wind loads; designed for serviceability of finish materials	H/400
Seismic loads	As required by MBC and 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 shall 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

The steel and concrete materials used for construction shall contain recycled content and be regional materials to the extent possible. Fly ash 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.

SPECIAL INSPECTIONS

Special inspections of fabrications and on-site construction required by the IBC 2006 include:

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

MECHANICAL SYSTEMS

Mechanical systems for the Wayne State University School of Business Administration will be designed in accordance with applicable codes, regulations, and standards as indicated in the Project Code Narrative.

DESIGN CRITERIA

Mechanical systems will be designed to maintain the indoor temperatures at given ambient conditions indicated below:

Summer:	90.7°F DB / 73.4°F WB – Outdoor ambient
	76°F WB – for Cooling Towers
	76°F DB – General Indoor
Winter:	0°F DB – Outdoor ambient
	70°F DB – General Indoor

Note: Building humidification will not be provided.

FIRE PROTECTION SYSTEMS

FIRE PUMP AND SPRINKLER SYSTEM

Water supply for the fire protection system will come from a dedicated water service. A reduced-pressure zone backflow preventer will be provided at the inlet to the fire pump. The electric motor driven fire pump and associated equipment will be located in the Fire Pump Room which will have fire department access. Fire pump shall be on emergency power system. Standpipes shall be Class I manual type and will require fire department pumper truck to deliver necessary water pressure. Standpipes shall have 2 ½" hose connections and will be located at the main floor landing in each of the three exit stairs.

A sprinkler system will be provided throughout the building. Service areas, storage spaces, electrical and mechanical equipment rooms will be designed for ordinary hazard occupancy. Office, instructional areas, lobbies, and corridors will be designed for light hazard occupancy. All parts of the system will be designed and installed in accordance with State of Michigan Office of Fire Safety requirements, NFPA 13 and NFPA 14. Sprinkler heads shall include swing-joints to meet center of ceiling tile and avoid draining a zone's piping in the event of one head being disrupted.

Fire protection piping shall Schedule 40 black steel with screwed (small diameter) or mechanical (large diameter) fittings.

PLUMBING SYSTEMS

PLUMBING FIXTURES

Low flow fixtures will be used throughout the building to reduce water usage.

- Toilets – 1.2 gal/flush (or dual flush)
- Urinals – 0.125 gal/flush (waterless/no flow shall not be used)
- Lavs – 0.5 gpm
- Sinks – 1.5 gpm

STORM SYSTEM

The roof drainage system will consist of roof sumps and indoor rain conductors designed to flow by gravity into the site storm system. A storm overflow drainage system will be provided to back-up the primary system and will discharge above grade as required per code.

A drain tile system will be provided around the basement foundation walls and elevator pits. The drain tile system will be routed by gravity to a duplex submersible sump pump unit, which will discharge into the site storm system. Sump pump unit shall be on standby power.

Storm piping shall be Hub-less cast iron type with heavy duty couplings.

SANITARY SYSTEMS

A complete system of sanitary drainage and vent piping will be provided to serve plumbing fixtures and floor drains throughout the building. The system will typically be gravity flow and extended to the site sanitary system.

A basement drainage system shall be provided including floor drains throughout the basement and duplex submersible sump pumps discharging the water to the sanitary system. The duplex pumps shall be on emergency power.

The elevator pit will have a simplex sump pump with oil separator.

Sanitary piping shall be Hub-less cast iron type with heavy duty couplings.

DOMESTIC WATER SYSTEM

Water for the domestic system will come from a new line extended from city mains. A new water meter will be provided inside the building and piping extended from the meter to all building fixtures and equipment.

A domestic water pressure boosting system consisting of a variable speed duplex pump will boost water pressure for floors three and above.

A duplex set of domestic backflow preventers will be provided downstream of the water meter.

Domestic hot water will be provided to necessary fixtures by means of point of use instantaneous or small local storage electric water heaters.

Domestic water piping shall be hard copper type with soldered/pressed (small diameter) or brazed/flanged/grooved (large diameter) fittings.

NATURAL GAS SYSTEM

The utility company (DTE) will provide the natural gas service up to and including the gas meters. A gas meter will be for building heat while another will be dedicated to the emergency generator. Downstream of each meter, there will be a gas pressure regulator. The gas will be distributed to the building heat or emergency generator respectively.

Natural gas piping shall be Schedule 40 black steel with screwed (small diameter) or welded (large diameter) joints.

HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS

A water source heat pump system will be used to condition the building. The system will consist of boilers, cooling towers, a dedicated outside air unit and numerous water source heat pump units which will be located in or near the zone they serve.

WATER SOURCE SYSTEM

Heating source: two high efficiency, natural gas boilers will be provided to add heat to the building water loop. The boilers will be located in the mechanical penthouse. Boilers shall be water-tube, medium mass, condensing type.

Cooling source: two cell closed loop cooling tower, located on the roof of the building, will be used to reject heat from the building water loop. The tower will have VFD fans, cottonwood screens and an automatic condenser water/chemical water treatment system. The piping design shall allow for a cooling tower bypass which will allow the cooling tower to shut down during winter operation. During cool weather, the tower will operate "dry"; the evaporative cooling system will be drained.

Source water distribution will be achieved by duplex, variable speed pumps.

Source water piping shall be Schedule 40 black steel with welded/flanged/grooved fittings for pipe 2 1/2" and larger. Piping shall be hard copper with soldered/press joints for pipe 2" and smaller.

SUPPLEMENTAL HEATING SYSTEM

A supplemental high efficiency, natural gas boiler will be provided to serve the DOAS heating coils, entryway cabinet unit heaters, mechanical room unit heaters and atrium perimeter finned-tube heaters. The boiler will be located in the mechanical penthouse. Boiler shall be water-tube, medium mass, condensing type.

The heating hot water distribution will be achieved using duplex variable speed pumps.

VENTILATION

The necessary ventilation required for each room will be provided by a Dedicated Outside Air System (DOAS). The DOAS will condition the outside air before delivering to the space. All ventilation air into the building and exhaust air (including toilet rooms) out of the building will go through an energy recovery wheel located in the dedicated outside air unit. The energy recovery wheel will reduce the load on the unit by using the exhaust air in the building to heat or cool the incoming outside air. This method will be used to condition the outside air during normal operation. A heating coil will also be installed to provide supplemental heat during peak conditions. The DOAS will be two, equally sized units operating in parallel to each other. Each unit will consist of an outside air measuring station, side access filters, energy recovery wheel, direct drive variable speed plenum fans (supply and exhaust), and hot water heating coil.

The ventilation air will be distributed to the space via a ductwork distribution system. Variable air volume terminal units (blade damper with integral airflow measuring station) will be provided to control the amount of ventilation air to each zone the heat pump is serving.

AIR HANDLING SYSTEMS – CLASSROOM FUNCTION

Classrooms and higher density areas will be served by a high efficiency water source heat pump with two speed compressors. Heat pump units will be furnished with ECM fans, integrated controls and insulated enclosures. The number of heat pumps per room will vary depending on the size/load of each space. The heat pumps will be located in the plenum of accessible corridors outside of the rooms then ducted to the area served.

AIR HANDLING SYSTEMS – OFFICE/ADMIN FUNCTIONS

Offices, Admin areas and smaller zones will be served by a high efficiency water source heat pump with a single or two stage compressor. Heat pump units will be furnished with ECM fans, integrated controls and insulated enclosures. Typically, 3 or 4 offices that share similar heating/cooling loads will be grouped into one zone. One heat pump will be provided per zone. The heat pumps will be located in plenum of accessible corridors outside of the rooms then ducted to the areas served.

AIR HANDLING SYSTEMS – ELEVATOR CONTROL ROOMS, TELECOMMUNICATION/ELECTRICAL CLOSETS

All electrical rooms, Telecommunication rooms and Elevator rooms will be served by a dedicated water cooled, packaged air conditioning unit. The space temperature will be monitored and alarmed if outside acceptable limits.

AIR HANDLING SYSTEMS – ENTRANCES

All entryways will be served by a hot water cabinet unit heater.

AIR HANDLING SYSTEMS – STAIRS

All stairways will be served by a hot water cabinet unit heater.

AIR HANDLING SYSTEMS – ELECTRICAL SUBSTATION

The substation will be ventilated by a variable speed supply fan with inlet filters. A variable speed exhaust will track the supply.

AIR HANDLING SYSTEMS – BASEMENT MECHANICAL ROOM AND PENTHOUSE

The basement mechanical room and penthouse will be heated and ventilated. Ventilation will be provided via exhaust fans. Heating will be provided via hot water unit heaters.

AIR HANDLING SYSTEMS - CAFE

The café located on the 1st floor will be served by a dedicated heat pump unit. There is currently no equipment requiring kitchen exhaust in this space. However, provisions will be made to provide an additional shaft in order to accommodate future cafe equipment exhaust.

INSTRUMENTATION AND CONTROLS

A Siemens control system will control and monitor all functions of the building mechanical systems. The control system will be provided with a local operator workstation. Appropriate software to contact HVAC maintenance services to control and diagnose system operation will be provided.

Each mechanical system will have a local control panel and readout to allow HVAC maintenance personnel to scroll through the operating and alarm conditions for the equipment.

Dual technology (passive infrared/ultrasonic) occupancy sensing will be used to reduce the required outside ventilation air provided to typical spaces. High-density occupancy areas, such as conference rooms and classrooms, will contain CO2 sensors to control ventilation air.

PRELIMINARY BASIS OF DESIGN MANUFACTURERS

- Fire Pump - AC
- Domestic Water Booster – Bell and Gossett
- Boilers – Cleaver Brooks
- Cooling Towers – Baltimore Air Coil (BAC)
- Central Air Handling Units – York/Johnson Controls
- Heat Pump Units – York/Johnson Controls
- Water Cooled Air Conditioning Units – York/Johnson Controls
- Pumps – Bell and Gossett
- Fans – Greenheck
- Unit Heaters – Sterling
- Fin Tube Heaters – Sterling
- Controls – Siemens

ELECTRICAL

Emphasis in the electrical systems design will be made toward safety, quality of power, reliability, maintenance, flexibility, functionality and energy efficiency. Electrical systems for the project will be designed in compliance with the applicable codes, standards and regulations listed in the appendix.

ELECTRICAL LOAD ANALYSIS

A detailed load analysis was completed for the building. It is based on a volt-amperes (VA) per square foot (SF) calculation utilizing the gross square footage (GSF) of building areas for lighting, general power, equipment and mechanical equipment. The electrical load summary includes the base building GSF and the future load growth:

LOAD ESTIMATE - BASED ON 120,000 GSF				
<i>Load Type</i>	<i>Load Density (VA / SF)</i>	<i>Connected Load (kVA)</i>	<i>Demand Factor</i>	<i>Demand Load (kVA)</i>
Lighting	1.00	120	1.00	120
General receptacles	2.00	240	0.50	120
Miscellaneous equipment	2.00	240	0.50	120
Mechanical equipment	6.00	720	0.80	576
Total	11.00	1320	7.80	936
Future growth – 25%	-	1650	-	1170
Total connected load for the building	1650			
Total connected amperes	1985			
Average demand load for the building	1170			
Average demand amperes	1407			
Substation transformer kVA base rating	1000			
80°C temp rise kVA rating	1330			
Forced air kVA rating	1800			

INCOMING SERVICES - ELECTRICAL

The primary electrical service will be 13,200 volts, 3-phase, 3-wire, delta-connected, 60-hertz and will be provided by the local electric utility company (DTE Energy). Two new medium voltage circuits will be provided from the utility. However, options are still being explored for the exact service to the building. Refer to the civil narrative for additional information.

The service conductors will be routed underground to the basement main electrical room in a concrete-encased duct bank consisting of (4) 4-inch schedule 40 PVC conduits 48-inches below grade. Schedule 80 PVC conduit shall be used under roadways or area where vehicular traffic may be present. A continuous conductive warning tape run above the duct bank 12-

inches below finished grade shall be provided. Primary cables will be rated 15 kV, single conductor, 133% EPR insulation with a #4/0 American Wire Gauge (AWG) bare copper ground conductor embedded in the concrete encasement. Electrical conduits penetrating the building foundation wall below grade shall be made water tight to prevent water infiltration or flooding into the building. The underground duct bank shall be sloped away from the building. The underground conduits shall end at the exterior wall and cable tray shall be utilized to carry the service conductors to the unit substation.

POWER DISTRIBUTION

SERVICE EQUIPMENT

One 480Y/277 volt, 3-phase, 4-wire single-ended secondary unit substation will be provided. The substation will receive two 15 kV feeders from the utility. The primary feeders will terminate in 15 kV rated load interrupter fusible switches forming a primary selective, radial secondary distribution system. The transfer scheme shall be manual operation. The load break switches shall be furnished with key interlocking to prevent parallel operation (i.e. both switches being closed at the same time).

The transformer section of the substation will consist of a dry-type power transformers. The transformers will be rated at 80°C rise which allows an additional 33% capacity above the base rating. Each transformer will also be provided with external fans which provide an additional 33% overload capacity. Transformers shall be 1000/1330/1800 kVA (AA/AA/FA), 13,200-480Y/277 volt, 3-phase, 4-wire, 60-hertz with copper windings. Transformers will be sized for full redundancy in the event of a transformer failure.

The secondary distribution section of the substation will consist of metal-enclosed switchgear with air power draw-out circuit breakers for the main and feeder breakers plus ancillary metering and control devices. A fire pump tap section shall be included in the switchgear line-up ahead of the main breaker to serve the building fire pump. The substation main bus shall be copper and rated 3200 A. The main breaker shall be 3200 A and the feeder breakers shall be 800 A. All substation breakers shall be individually compartmentalized and will include fully-adjustable solid state trip units and arc energy-reducing maintenance switches to reduce the arc hazard when servicing the substation while energized. Surge protection will be provided at the service entrance.

The unit substation shall be installed on leveling channels in a 4-inch concrete housekeeping pad with angle iron or channel nosing. The pad shall extend approximately 4-inches beyond the equipment footprint in all directions. A 6-inch concrete curb shall be provided across the doorways of the substation room to prevent flooding.

INTERIOR POWER DISTRIBUTION

The interior power distribution system will be designed to support lighting, general receptacle, miscellaneous equipment and mechanical equipment loads. Two electrical closets will be located on each floor to house electrical equipment (e.g. panelboards, transformers, etc). The closets will be stacked and located to limit circuit length and total voltage drop. The closets will be served from the main electrical room via conduit and insulated copper conductors.

The minimum conductor size for power and lighting circuits shall be #12 AWG. The minimum conduit size shall be ¾-inch. Color-coded conduit shall be utilized for the various systems for easy identification. All branch circuits will have a separate neutral conductor. Branch circuits shall be permitted to utilize type MC cable when concealed in walls and partitions. Type MC cable shall not be permitted for circuit home runs, above ceilings or where exposed.

In general, power for heating, ventilating, air-conditioning and plumbing systems will be 480 volt, 3-phase, 3-wire. Power for small motors (less than ½ HP) will be 120 volt, single phase. Motors ½ HP and larger will be 480 volt, 3-phase, 3-wire. Areas densely populated with motors will be provided with a motor control center to house the motor starters and power factor

correction capacitors. Motors larger than 7.5 HP will be provided with power factor correction. Motors larger than 20 HP will be provided with a soft start.

Power for lighting loads will be 277 volt, single phase. Lighting panelboards will be equipped with door-in-door covers; bolt-on molded case circuit breakers and shall be designed with at least 25% spare capacity. Lighting panelboards will be fed from a lighting distribution panel. Power for receptacles and miscellaneous loads will be 208 or 120 volt, single or 3-phase. Receptacle panelboards will be equipped with door-in-door covers; bolt-on molded case circuit breakers and shall be designed with at least 25% spare capacity. All panelboards shall have copper bus bars. Low voltage distribution transformers shall have copper windings. Floor mounted equipment shall be mounted on a 4-inch high concrete housekeeping pad. Surge protection devices shall be provided for all receptacle panelboards serving areas with sensitive electronic loads.

General branch circuiting shall be designed with a maximum of 6 general use duplex receptacles on one 20 amp circuit. Branch circuiting for computer workstations shall be designed with a maximum of four workstations on one 20 amp circuit. Each office shall include a minimum of one duplex receptacle on each wall and a quad receptacle shall be provided at the location of the workstation. Copiers, printers, appliances and special equipment shall be served from a dedicated circuit. Corridors shall have general duplex receptacles located not more than 30'-0" apart. Receptacles shall be neatly marked with the panelboard name and circuit number.

EMERGENCY POWER

The emergency electrical power system will consist of an outdoor 350 kW natural gas engine generator. The generator will supply emergency, legally required and optional standby loads via an emergency switchboard with separate vertical sections to segregate each branch of emergency and standby power. Each switchboard section will supply an automatic maintenance bypass-isolation closed transfer switch. The generators shall be equipped with auxiliary equipment (e.g. batteries, charger, annunciator panel, etc) and shall be monitored by the fire alarm and building management system (BMS). The generator shall be mounted on vibration isolators and housed in an outdoor-rated, level two sound attenuating enclosure. A generator annunciator panel shall be located near the fire alarm control panel.

The emergency loads will consist of exit signs and means of egress lighting, elevator car lighting, emergency voice/alarm communication systems, the fire alarm system and a small fire pump. As previously mentioned, the fire pump will also be fed with normal power from the substation. The fire pump controller shall be equipped with an integral automatic transfer switch to select either the normal source or emergency generator source. The fire pump controller shall be equipped with a soft starter to limit inrush starting current. Fire pump feeders will be protected by a UL listed fire-rated assembly.

The legally required standby loads will consist of an elevator and auxiliary elevator equipment. The optional standby loads will consist of sump pumps, telecommunications equipment, telecommunications room cooling equipment and other loads deemed necessary by the building occupants. A 100 kVA central uninterruptible power supply (UPS) will be provided for powering telecommunications room equipment via local panelboards. The UPS will be fed from the generator.

LIGHTING AND CONTROLS

INTERIOR LIGHTING

Interior lighting levels are based on Illuminating Engineering Society (IES) recommendations and WSU standards for construction. The illuminance values listed below are average maintained horizontal foot-candles measured at the work plane, unless otherwise noted:

Classrooms	25 - 35	FC	(with bi-level switching)
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Conference rooms	25 - 35	FC	(with dimming)
Offices	25 - 35	FC	(with task lighting)
Common areas	10 - 20	FC	
Lobbies	10 - 15	FC	
Corridors	10 - 15	FC	(at finished floor)
Stairs	10 - 15	FC	(at finished floor)
Storage	10 - 15	FC	
Toilet rooms	10 - 15	FC	
Services areas	20 - 25	FC	
Mechanical/electrical	20 - 25	FC	
Telecommunications	40 - 50	FC	

All lighting fixtures will utilize light emitting diode (LED) sources with integral drivers operating at 277 volts. Recessed lighting fixtures will provide volumetric lighting in all public spaces, lobbies and corridors. Illumination shall be provided along key vertical surfaces to assist with way finding. Accent lighting shall be used to highlight architectural features, where applicable. Undercabinet or desktop task lighting will provide additional illumination at the work surface. Decorative, wall mounted lighting fixtures will be provided at the sinks in toilet rooms for vanity lighting. Down lighting will provide lighting for other toilet room areas. Chain hung industrial linear lighting fixtures with wire guards will provide functional lighting for safety and maintenance in and around equipment in mechanical, electrical and telecommunications rooms

EMERGENCY LIGHTING

The emergency lighting will consist of selected fixtures connected to the emergency generator along the path of egress, in elevator machine rooms, elevator pits and elevator landings. Emergency lighting will also be installed in electrical rooms, telecommunications rooms, and mechanical rooms. Switched emergency lighting fixtures shall utilize emergency load transfer devices to enable emergency operation during loss of normal power. Continuously illuminated acrylic LED exit signs with green lettering will be provided along the path of egress, allowing two signs to be seen at any one time. Exit signs shall be UL listed with an operating voltage of 277 volts. The emergency illuminance values listed below are horizontal foot-candles measured at the finished floor, unless otherwise noted:

Elevator control rooms	19	FC	(minimum)
Elevator pit	10	FC	(minimum)
Elevator landings	10	FC	(minimum)
Means of egress	1.0	FC	(average)
	0.1	FC	(minimum)
	40:1	FC	(uniformity ratio)

EXTERIOR LIGHTING

The site lighting will consist of building-mounted exterior lighting and pedestrian pole-mounted lighting or lighted bollards throughout the site. City owned roadway lighting will provide illumination along Temple Street and Woodward Ave. Exterior lighting fixtures will have full cutoff optics to mitigate light pollution and shall be suitable for wet locations and cold weather installations. Exterior exits shall have illumination supplied from the emergency generator near the exit to provide egress illumination to the public way. Average, maintained, horizontal illuminance levels (FC), measured at ground level, will be as follows:

Building entrances	1.0	FC	
Walkways	0.6	FC	(6:1 uniformity ratio)

LIGHTING CONTROLS

The building shall include a programmable, digital, addressable, network-based lighting control system with local switching via low voltage switches and occupancy sensors. Public areas shall utilize a time-of-day schedule. The lighting control system shall have the ability to be accessed and programmed via the internet. The basis of design lighting control system is the Lutron "Quantum" system.

Occupancy sensors located in enclosed spaces (e.g. offices, storage rooms, janitor closets, etc) shall be manual on//auto off operation. Occupancy sensors in public areas (e.g. corridors, stairwells, lobbies, etc) shall be auto on/auto off operation. Occupancy sensors located in enclosed spaces (e.g. offices, storage rooms, janitor closets, etc) shall be manual on//auto off operation. Occupancy sensors in public areas (e.g. corridors, stairwells, lobbies, etc) shall be auto on/auto off operation. Occupancy sensors will include photocells and auxiliary contacts for integration with daylight harvesting controls and HVAC equipment.

The lighting control system shall have the ability to interface with the motorized window shades, audio-visual system and the BMS. Individual lighting controls and/or bi-level switching will be provided for all occupants and spaces. Conference room, large classrooms and auditoriums shall have programmable scene controllers to interface with audio/visual systems and motorized window shades. Site lighting and exterior building lighting will be controlled by a photocell and astronomical time clock via the digital lighting control system.

GROUNDING

Interconnection of the service ground, system neutral and equipment ground conductors will be made within the service equipment. A perimeter counterpoise ground system (ground ring) will serve as a reference point for equipment grounding for all building systems. Ground rods will be copper clad or stainless steel and will be inter-connected with copper grounding cables. The grounding cables will connect to the building steel, building foundations and underground main water service. A grounding bus bar will be provided in the main electrical room. Ground bus bars shall be provided in all electrical rooms. Separately derived systems (i.e. transformers and the generator) will be grounded in accordance with the NEC.

An insulated equipment ground conductor will be provided with all power feeders and branch circuits for equipment grounding purposes. Metallic raceways shall not be permitted to serve as equipment grounding conductors. Metal conduits, cable trays, raceways, boxes and enclosures shall be grounded and bonded in accordance with the NEC.

An insulated, non-looping, single-point ground system will be provided and made available in all communication closets for signal ground referencing purposes. The ground will be connected to the main electrical room ground bus. A 48-inch long x 2-inches wide x ¼-inch thick telecommunications main grounding bus bar (TMGB) will be provided in the main communications rooms and will be connected to the main building grounding system with not less than a #6 AWG copper ground wire. A 24-inch long x 2-inches wide x ¼-inch thick telecommunications grounding bus bar (TGB) will be provided in each building communication rooms and will be connected to the main building grounding system will not less than a #6 AWG copper ground wire.

Note: A lightning protection system shall not be provided for the building.

FIRE ALARM

The fire alarm system will be a UL approved, addressable and multiplexed fire detection and alarm system. The system will consist of a fire alarm control unit, alarm initiating devices, alarm notification appliances, control devices, supervisory devices, door holders, battery power supply, wiring and necessary accessories for interface and control functions with the building sprinkler system and HVAC systems. The system will be capable of transmitting and receiving addresses and data between the fire alarm control units and the addressable devices. The audible/alarm communication speaker system will provide automatic pre-recorded sound.

The system shall include a building-wide mass notification system. Provide a sufficient quantity of speakers to meet NFPA 72 voice intelligibility requirements. Provide combination amber lens (for alert) and clear lens (for fire alarm) strobe lights for visual notification appliances. The fire alarm control unit(s) shall each have emergency voice/alarm communications and a microphone for both pre-recorded and live voice announcements. A remote microphone cabinet shall be provided in the facility manager's office.

The fire alarm control panel (FACP) will be located in the building main lobby. The system will be provided with a 24-hour battery-backup power for the fire alarm control panels. The system will also be connected to the emergency power system served by the emergency generator. Addressable manual pull stations will be provided at all exits and as required by code and the authority having jurisdiction. Audible and visual notification appliances will comply with the applicable codes. Strobes will be located adjacent to each exit sign, 15 feet from ends of corridors, and 100 feet on center in corridors. Strobes will be synchronized if 3 or more are visible at a time. Strobe intensity will be determined by NFPA.

Addressable smoke detectors will be provided in air handling units to initiate fan shut-down. Fire alarm monitor modules (FAM) will be used to provide an addressable circuit for alarm and supervisory devices that do not have integral addressable electronics, such as water flow switches and supervisory switches. Fire alarm control modules (FAC) will be used to provide addressable relay control for magnetic door holder release, electric strike release for exit doors and smoke/fire shutter release. Supplementary initiating devices (detectors) shall be provided in electrical rooms, mechanical rooms, telecommunications rooms, recycling/trash rooms and elevator spaces.

The system will be designed to operate in a stand-alone mode. The system will transmit alarm, trouble, water flow and first smoke to public safety and the BMS. All fire alarm wiring shall be separate from other building wiring. Fire alarm wiring will be installed in red conduit. The max loading on initiating and signaling line circuits shall be 50 percent.

ELECTRICAL SUSTAINABILITY

The building is targeting LEED Gold certification. Strategies and technologies will be implemented to not only assist in achieving the project LEED goals, but also to increase energy efficiency and reduce annual energy costs. Electric vehicle charging stations shall be provided in parking areas for at least 3 percent of the site parking capacity (1 charging station) in accordance with SS credit 4.3 Alternative Transportation – Low Emitting and Fuel-efficient vehicles. The exterior lighting will be designed in accordance with LEED SS credit 8 Light Pollution Reduction. Individual lighting controls and/or bi-level switching will be provided for all occupants and spaces in accordance with LEED IEC credit 6.1 Controllability of Systems – Lighting.

Efficient LED lighting shall be used throughout the facility with the goal of decreasing the installed lighting power density (LPD) by 30 percent as compared to a baseline building. The power distribution system will be designed in accordance with EA credit 5 Measurement and Verification to accommodate future sub-metering. Additionally, high efficiency transformers, premium efficiency motors and variable frequency drives (VFD) shall be deployed throughout the building to improve energy efficiency.

AUDIOVISUAL

Audiovisual technology for the Wayne State Ilitch School of Business will incorporate state-of-the-art wired and wireless presentation and collaborative tools. Initial conversations with Wayne State faculty and AV-IT staff have produced information as to the preferred room layouts and functionality.

This information has been translated onto Preliminary AV Equipment plans which are included in the SD package for review, comment and coordination.

Future conversations will allow the design team to fine tune the room designs and associated audiovisual hardware.

Audiovisual systems will include:

- Flex Classrooms and Trading Room – Trading Room Technologies designed with flexibility and adaptability towards multiple configurations and current/future technologies.
- Tiered Case Rooms and Auditorium Technologies designed to take maximum advantage of didactic instructional methods while allowing some degree of interaction where possible.
 - Room layouts will be reviewed and infrastructure will be designed to accommodate preferred lay-outs as well as future needs.
 - We will assist the Design Team in properly orientation and geometry of the spaces.
- Collaborative meeting, conference, and outside of the classroom gathering spaces. An emphasis will be on both wired and wireless sharing and collaboration solutions.
- Lecture/Content capture as well as duplex video conferencing capability will be designed into appropriate spaces.
- Audiovisual support and equipment rooms will be planned with appropriate adjacency to served spaces.
- All audiovisual transport will be via Digital Media over Shielded Twisted Pair structured cabling per campus standards to allow for future adaptability.
- Coordination of lighting requirements and sightlines with Design Team.

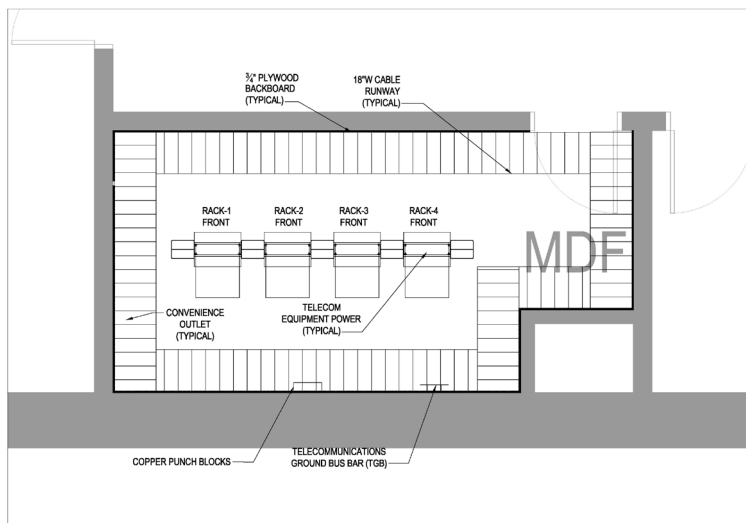
STRUCTURED CABLING INFRASTRUCTURE AND SYSTEMS

Complete structured cabling systems will be designed to meet Wayne State University Technology Infrastructure and cabling standards and conventions.

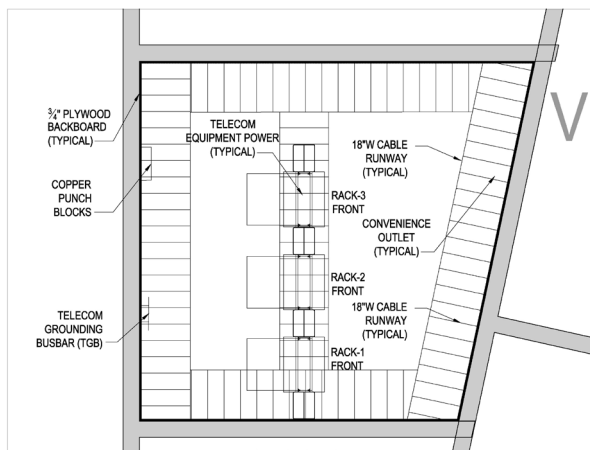
Structured cabling systems will include:

- Outside Plant (OSP) tie-in to the nearest connection point including required duct banks, vaults, manholes, and conduit.
- Telecom rooms required for Entry Facilities (EF), Equipment Rooms (ER), and Telecom Rooms (TR) will meet Wayne State standards and be design in close coordination with Wayne State IT staff.
 - The Basement ER/MDF will serve as Entry Facility, MDF and West level 1 IDF.
 - Appropriately sized TR/IDF facilities will be located in both east and west wings of the building to accommodate cable length restrictions.
 - Copper category 6e Structured cabling will be the minimum standard.
 - The minimum MDF size shall be 10.0' X 12.0' – 10' X 16' desired for wall field accessibility.
 - The minimum IDF size shall be 8.0' X 10.0' per Wayne State Standards.
 - All Telecom Room entry doors shall swing to the outside of the room to maximize wall termination field space.
 - Telecom Room finishes shall be per Wayne State University Building Standards.
 - Service provider Copper and Fiber cabling is initially assumed to be available just to the Northwest of the construction site and will be served to the building via duct bank or Direct Burial Conduit to the building at the Northwest sector. OSP – Indoor cabling conversion will occur at the Basement MDF room.
 - A minimum of (4) 4.0" conduits will be served to the building each containing interdict per Wayne State Standards.

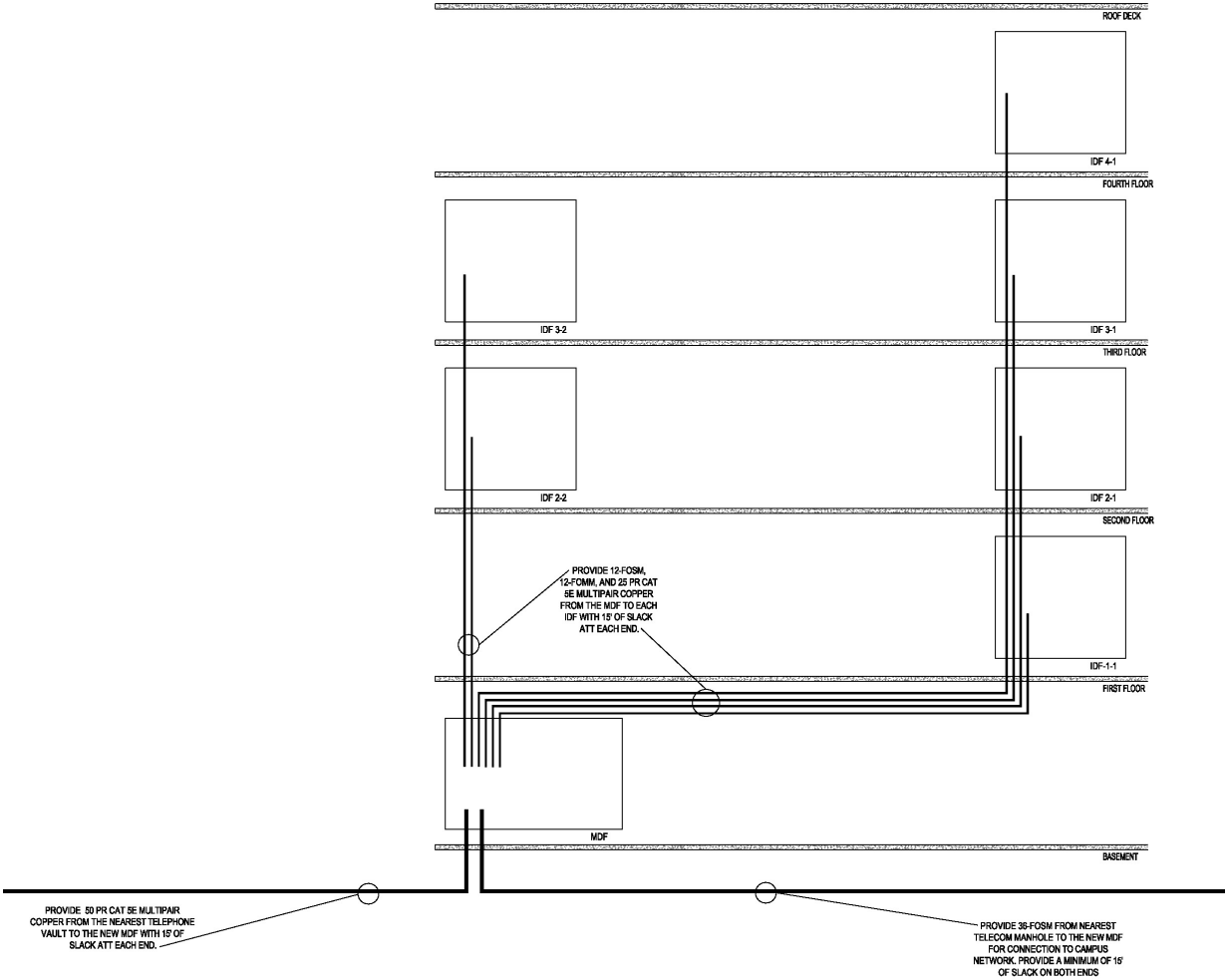
- Additional OSP infrastructure will be designed for redundant pathway and will be coordinated with Wayne State IT.
- High density wireless access will be designed and coordinated with Wayne State IT and will include high density coverage both inside and outside of classrooms, labs and meeting facilities.
- Designs shall allow for future expansion by providing additional/extra sleeving, conduit and pathway as necessary.
- CATV cabling will be incorporated into the structured cabling designs based on Wayne State standards and project requirements.



MDF Room Layout



Typical IDF Room Layout



PRELIMINARY TELECOM BACKBONE RISER DIAGRAM

SECURITY

The security system at the will be a robust system that takes into consideration both the remote location of the Business School relative to campus and the valuable personnel and equipment within the building. The building will be monitored at the WSU Police Station on the main campus. Fiber optic connectivity will be provided from the MISB to the WSU Police via campus-wide fiber optic backbone. Equipment shall be located in the MDF Room in the basement. Ethernet connectivity will be provided from the fiber converter to local PACP (access control panels) in the 1st floor IDF closet.

ACCESS CONTROL

Perimeter Access Control Panels (PACP) will be provided through JCI access control panels, intrusion alarm panels, power supplies, terminal cabinets and associated equipment located in the 1st and 4th floor IDF closets. The 1st floor closet will support basement, 1st and 2nd floor card readers and alarm devices and the 4th floor closet will support 3rd and 4th floor perimeter access control, perimeter and interior intrusion alarm monitoring.

Perimeter access control will be provided as follows:

- Card reader access control, door monitoring, ADA interface and audio communication will be provided at the main entries at the east, northwest and one atrium entry.
- Time controlled locking and door monitoring will be provided at the south east double door entrance.
- Remote controlled unlocking, door monitoring and audio communication will be provided at the west loading / staging double doors.
- Time delayed egress hardware and door monitoring will be provided at all exit doors.
- Card reader access control, door monitoring, ADA interface and audio communication will be provide at the north terrace entrance.
- Time controlled locking and door monitoring will be provided at the south terrace entrance.

Interior access control will be provided through the WSU One Card CBORD access control panels, intrusion alarm panels, power supplies, terminal cabinets and associated equipment located in the 1st floor and 4th floor IDF closets. The 1st floor closet will support interior card readers at the basement, 1st and 2nd floor doors. The 4th floor closet will support interior card readers at the 3rd and 4th floor doors. The specific doors requiring card readers are yet to be determined with WSU and Business School representatives.

INTRUSION DETECTION

Perimeter intrusion detection will be provided through perimeter glass-break detectors at 1st floor window and door locations. Glass-break detectors will also be provided at the 4th floor terrace windows and doors.

Interior intrusion detection will consist of A/V component monitoring of devices in classrooms, auditorium and trading room. Devices including A/V controllers, Equipment carts, display monitors, projectors and A/V cameras will be monitored.

ENVIRONMENTAL MONITORING

Environmental monitoring will consist of water detection monitoring provided in two locations of the basement.

SECURITY CAMERAS

The CCTV system in the MISB will consist of:

- Exterior static cameras on the building exterior viewing the complete perimeter of the building and the 4th floor terrace.
- Interior static IP cameras viewing the perimeter doors and both the east and west end of the atrium.
- Interior static IP cameras viewing the elevator lobby and stair doors on each floor.

Video Recorder and camera licenses will be provided by WSU.