Ian Bower

Technical Report 1

The Concordia Hotel

9/21/2012

Contents

Executive Summary

This Technical report's purpose is to provide the reader with a thorough analysis of the Concordia project. The analysis includes a project schedule summary, a building systems summary, a project cost evaluation, site plans, an analysis of local conditions, client information, the project's delivery system, and the staffing plan of the Concordia project. The project schedule has been completed in order to meet the required start and finish dates of November 2011-December 2012. A detailed breakdown of 25 activities were done and found that the project can be compressed in order to meet the owner's deadline requirements. The sequence of work will generally follow a two team design with one team beginning at the penthouse level while the second team starts soon after, simultaneously completing the work from the 4th floor down to the cellar level. The schedule is followed by detailed descriptions of the building systems beginning with the extensive demolition on the several floors of the structure, followed by the curtain wall description and details. The demolition will include slabs and interior walls on almost all of the floors. The slabs will require assessments for height prior to demolition which requires very specific finish heights. Portions of the eastern side will be demolished in order to prepare for the new canopy and curtain wall system. The curtain wall system will include several different wall types, the main curtain wall design will be on the eastern side facing the road. The extent of this curtain wall will consist of 6" Batt insulation, 5/8" thick exterior sheathing, liquid applied air barrier, 2" rigid insulation, aluminum clip, sealant with backer rod and shims where required. The last layer to make up the wall is the aluminum composite material panel as shown in figure 13. Located on the penthouse level and the roof level will be aluminum trellis' to provide aesthetic appeal. The mechanical system location and sizing was described next showing the extensive amount of details associated with the system. The mechanical systems are located predominantly in the cellar level and penthouse mechanical rooms and distribution goes up through the main core of the structure branching off floor by floor. Air Handling Unit (AHU-01) and Make-up Air Unit (MAU-1) service the lower floors while the upper floors are serviced by Air Handling Unit (AHU-02). The mechanical section provides a brief description of the fire suppression system which is a wet-pipe system except for the loading dock location which is a dry-pipe system connected to the wet-pipe system. The building system description will go onto provide a thorough analysis of the green building project features which will include improved and updated MEP systems. The electrical systems were analyzed similar to the mechanical system finding that the utilities enter from the eastern side of the structure and enter into the Main Switchboard (MS-1) located in the cellar level electric room. There is a redundant system located in the building with the back-up generator composing the Uninterruptable Power Supply (UPS) system. The building has several transformers that range from 3-750 KVA. Next, a project cost evaluation was completed, however, many of the financial details and estimates were not provided by the Turner Construction Company. The project cost of $23,000,000.00 was provided resulting in a TC/SF=$23,000,000/96,200SF=$239.08/SF. I completed an assemblies and square footage estimate and discovered that the square foot estimate is $22,336,000 which is ($22,336,000/$23,000,000) or 97% accurate. An assemblies estimate was completed of the major MEP equipment finding a cost of $1,223,399.84. Further analysis of the assemblies estimate shows that, ($1,223,399.84/$23,000,000) is equal to 5.3%. Based on the fact that the major MEP systems can account for 30-50% of the total cost of the building this shows that the completed assemblies estimate is only partial and does not accurately reflect the true cost of these substantial MEP systems. A site logistics plan was created assessing the existing conditions as well as three key phases of construction. Local conditions were assessed and nothing stands out in this section other than the failure to find sufficient subsurface information. Based on

the fact that there is not an extensive excavation there is little to no concern with the soil conditions below the surface. Specific client information was not provided based on the owner's desires to remain anonymous in this transaction. An organization chart was compiled for both the entire project organization as well as a specific organization chart of the project team. The staffing plan for the project is only partial and is still awaiting more details from the Turner Construction Company. This project has many aspects involved with its' design, planning, controlling and construction. This report will provide the reader with specific details of the project that will give them a better understanding of its opportunity to be successfully completed. I have several recommendations which I believe will help expedite the process and provide the owner with a much leaner, green structure. This analysis will be completed throughout the duration of my thesis and I can see the contractual arrangements, construction schedule, and budget potentially affecting my analysis. The contractual arrangements may result in contractors that are not open to a prefabrications push in order to reduce waste and improve quality. I would imagine that this would not be a serious issue, however, it very well could be. The schedule could very well effect the long lead time of prefabrication of major MEP systems, this can be prevented through thorough planning and consistent designs. The last concern for my thesis analysis will be the budget which may result in the lack of availability of funds to contract a prefabrication company to step in and help support this desire to go with a fully prefabricated system. I would imagine with all of these concerns solutions can easily be found with proper planning and arrangement of information.

Project Schedule Summary-see attachments

The project start date will be the first of November 11/1/2011 which will require extensive planning prior to that start date in order to compensate for lead times for the prefabrication and production of equipment for the structure. The design phase will begin March 3/21/2011 which will be followed by the submittal review and approval stage of the building. Submissions of materials and systems will have to be expedited and completed as designs become available. The procurement of construction services will occur prior to the submittal process being completed. This may cause some required change orders by subcontractors, being that they will not have a full scope of work prior to their bid application for the project. This will require thorough contractor bids which will need to be critically analyzed for any shortcomings or missing portions of their bid. The fabrication and delivery time has been given a window of 6 months. Staging will be followed by the demolition of the slabs and the main walls located in the core of the building. Teams will start in the penthouse and work their way down to the 5th floor while another team will start shortly after working their way down from the 4th floor to the cellar-level. This is how many of the other tasks will progress and flow through the building. Prior to demolitions' completion, 100% construction documents accompanied by any changes or addendums will be provided. Once the demolition of the floors is underway the temporary building enclosure will progress along with the demolition of the floors and the curtain wall. Finishes will begin to be completed on the upper floors following the flow of demolition on the upper floors. This progression will happen simultaneously on the lower floors similar to how the demolition was completed. Mechanical equipment installation will begin with the rooftop units and then finish with the units located in the cellar. The mechanical equipment installation will be followed by the install of the windows and curtain walls beginning with the penthouse and then progressing down to the floors below. Once the building has become enclosed and the building has been deemed watertight the MEP rough-in can begin along with the finishes. The interior fit-out will begin and progress along with the MEP rough-in moving along with the completion of the MEP system

rough-in. Commissioning will begin simultaneously with the start of the finishes on the 4th floor. The building inspection will occur and move along as soon as the demolition has been completed in order to assess the current status of the slabs, the installation of the major mechanical units, the MEP rough-in and the finishes. Prior to the project completion testing adjustments and balancing will be completed on the major systems to assure the proper functionality of the major MEP systems. The project finish date is scheduled for December 12/2/2012

Building Systems Summary

The Concordia Hotel's renovation will involve an extensive replacement of the MEP systems throughout the structure. The renovation has set the goal of achieving a LEED gold certification. This certification will be dependent on the successful interaction between the many plumbing, electrical and mechanical systems. There will also be unique green building project features which will be covered in this extensive report.

1. **Demolition**-The demolition will involve the demolition of many slabs and walls located throughout the building. This demolition is primarily the removal of outdate MEP systems as well as the removal of multiple slabs and walls located throughout the structure. There are no concerns with asbestos or any potentially hazardous or harmful materials. This description will predominantly focus on the exorbitant amount of concrete slabs that need to be assessed and demolished based on their required finish heights for new façade designs and new layouts. We will start with the description of the cellar level demolition and work our way up and through the building's floors. The demolition will involve two teams, one progressing from the penthouse down to the 5th floor while another team will start soon after and work from the 4th floor down to the cellar-level.
    a) **Cellar Level**-The black areas shown in figure 1 show the locations of extensive demolition of the existing slabs located on the cellar level. Located throughout the floor and other areas of the structure are Existing Floor Drains (EFD) all of which have removal and capping requirements. There are also several wall locations that will be demolished to make way for the new curtain wall and space on the cellar level. These locations are highlighted in green in figure 1. Figure 2 shows a zoom in of the critical slab locations that require assessment and demolition in order to meet finishing height requirements and new system installations. Figure 3 shows the demolition of interior walls with in the core of the structure.

Figure 1 shows the slabs and walls that require extensive demolition located on the cellar level. Highlighted in green are locations of which existing walls need to be demolished

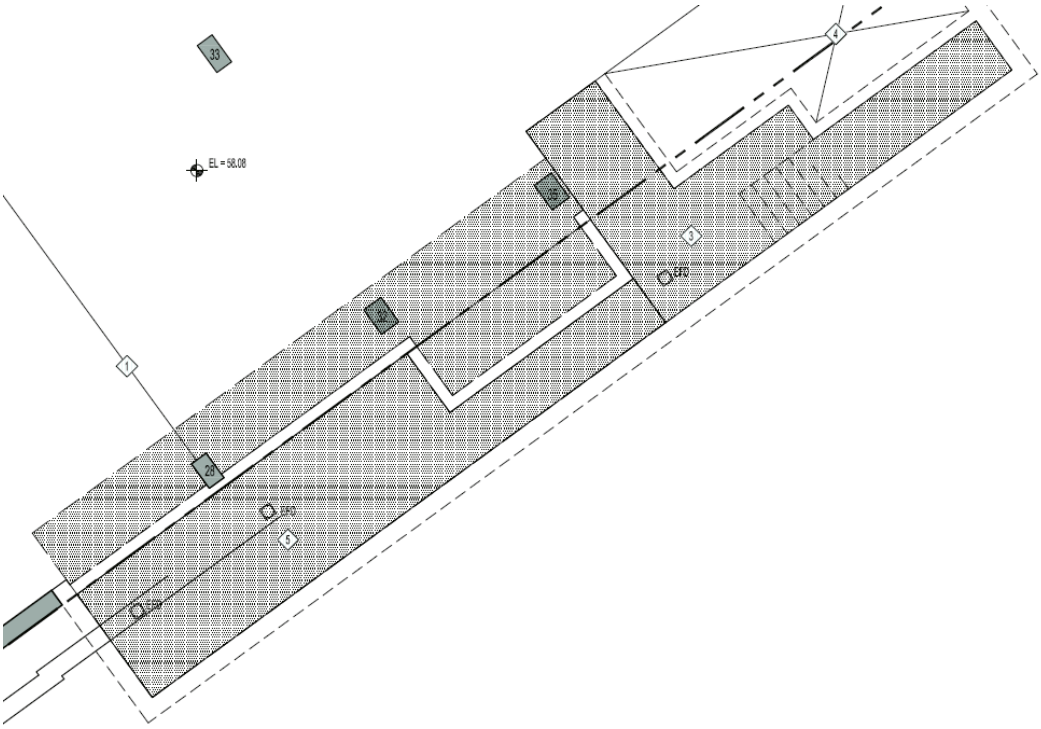


Figure 2 shows the location of the demolition of exterior walls to make way for the new facade design

Figure 3 shows the required demo of walls located in the interior of the structure on the cellar level

b) **Ground Level**-As I stated previously the black areas show the locations of extensive demolition of the existing slabs located on the cellar level. Located throughout the floor are Existing Floor Drains (EFD) all of which have removal and capping requirements. There are also several wall locations that will be demolished; these locations are highlighted in green in figure 4. Figure 5 shows the demolition requirements for the ground level that call for demolition of slabs in order to meet specified finish heights.

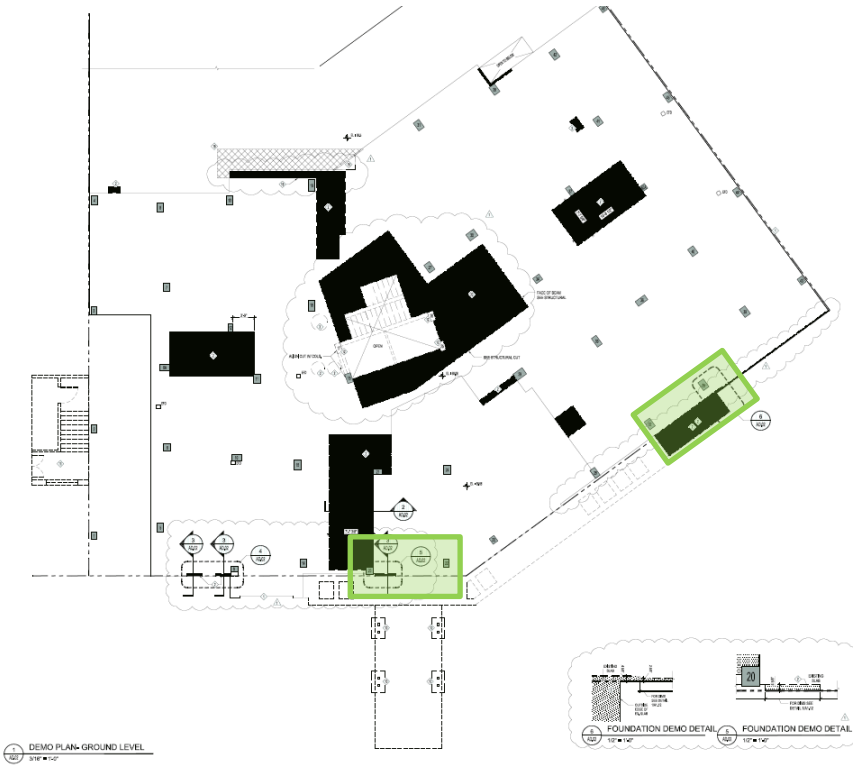


Figure 4 shows the demolition plan for the ground level

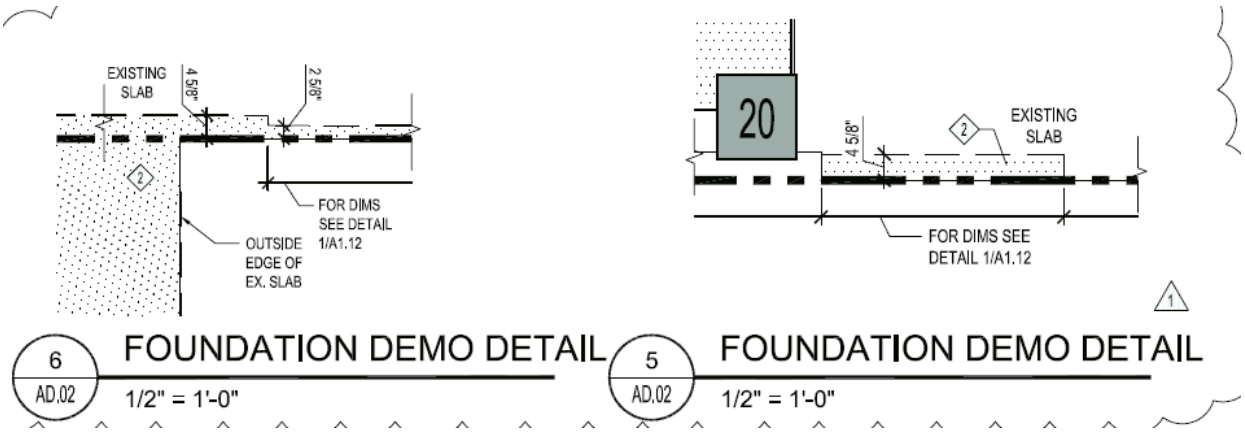


Figure 5 shows details for the demolition of the

c) **Second, fourth, sixth and eighth level**-on the even floors there is significantly less required demolition of slabs that need to be demolished however they are shown in black and once again the walls in the interior of the building where the stairs are located require demolition (highlighted in green) in figure 6. The most significant demolition on the second floor will be of the existing canopy located on the east side of the structure on the second level. Figure 8 shows a zoom in of the area that requires demolition for the new canopy/façade system.

Figure 6 shows the demo plan for the even levels with the typical slab and interior wall demolition

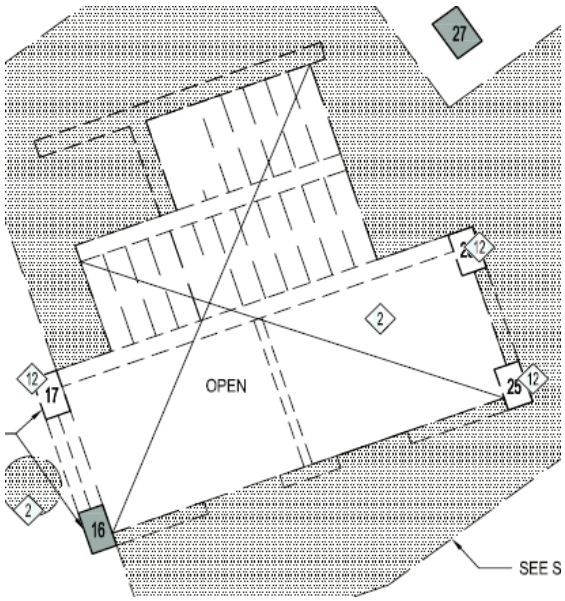


Figure 7 shows the interior walls which require demolition located at the core next to the stairs

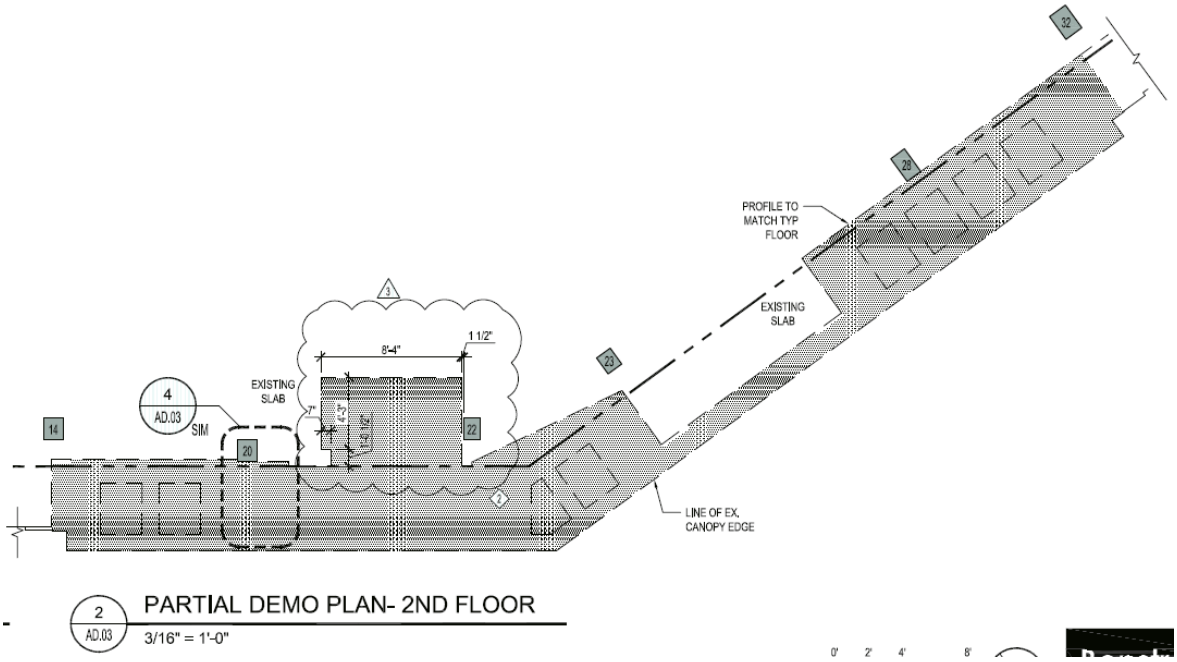


Figure 8 shows the previously mentioned canopy located on the second level

d) **Third, fifth, seventh and ninth level**-the hatched areas, shown in figure 9, are the locations of required demolition of the slabs. One can also note that the wall demolition is located in the core of the building near the stairwell similar to all the previous mentioned floors. Highlighted in green shows the location of demolition sensitive areas which are shown below in the details for demolition in figure 10.

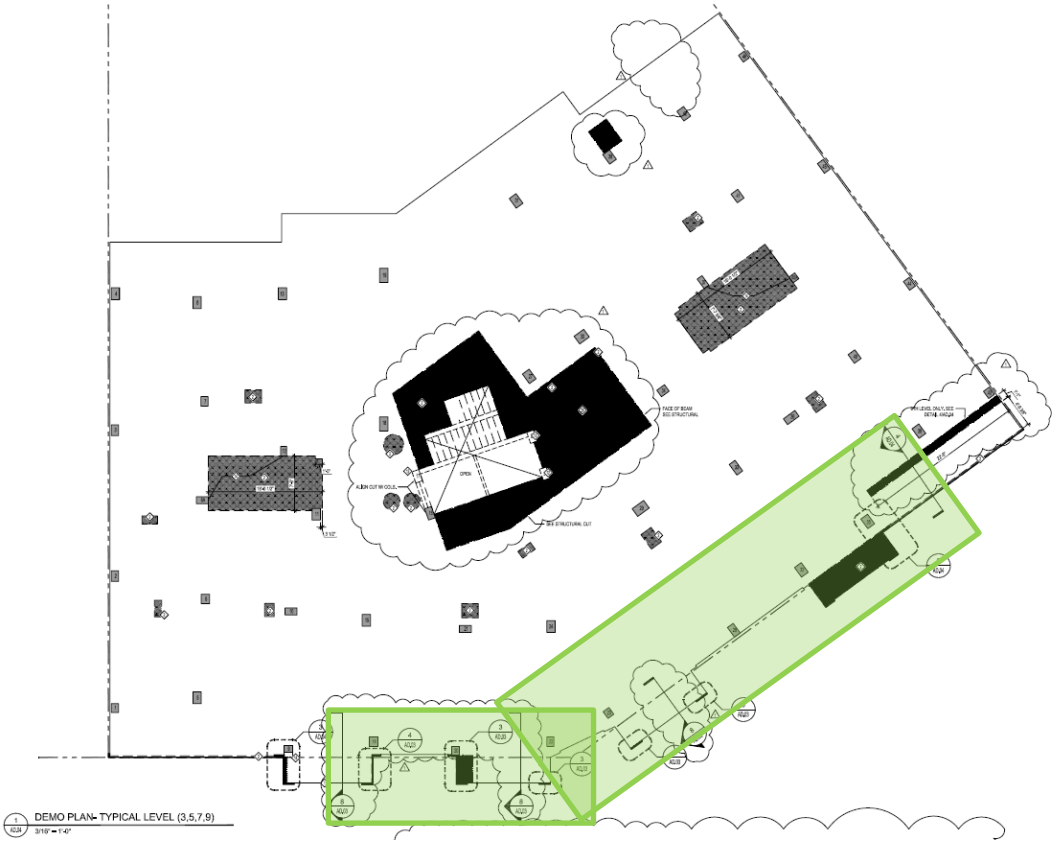


Figure 9 shows the areas of the slab that require demolition along with the walls once again in the core of the building near the stairwell

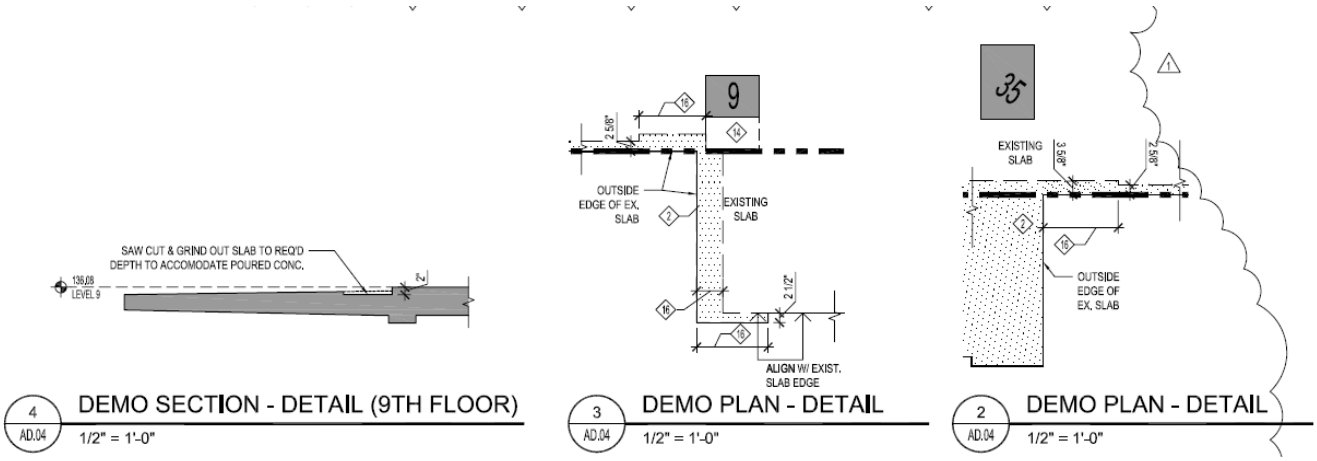


Figure 10 shows details of demo sensitive areas located on the eastern and southeastern wall

e) **Tenth level**-in figure 11 the demolitions of the slabs are once again shown in black. Similar to the floors below the extent of the demolition required for the walls is isolated to the main stairwell.

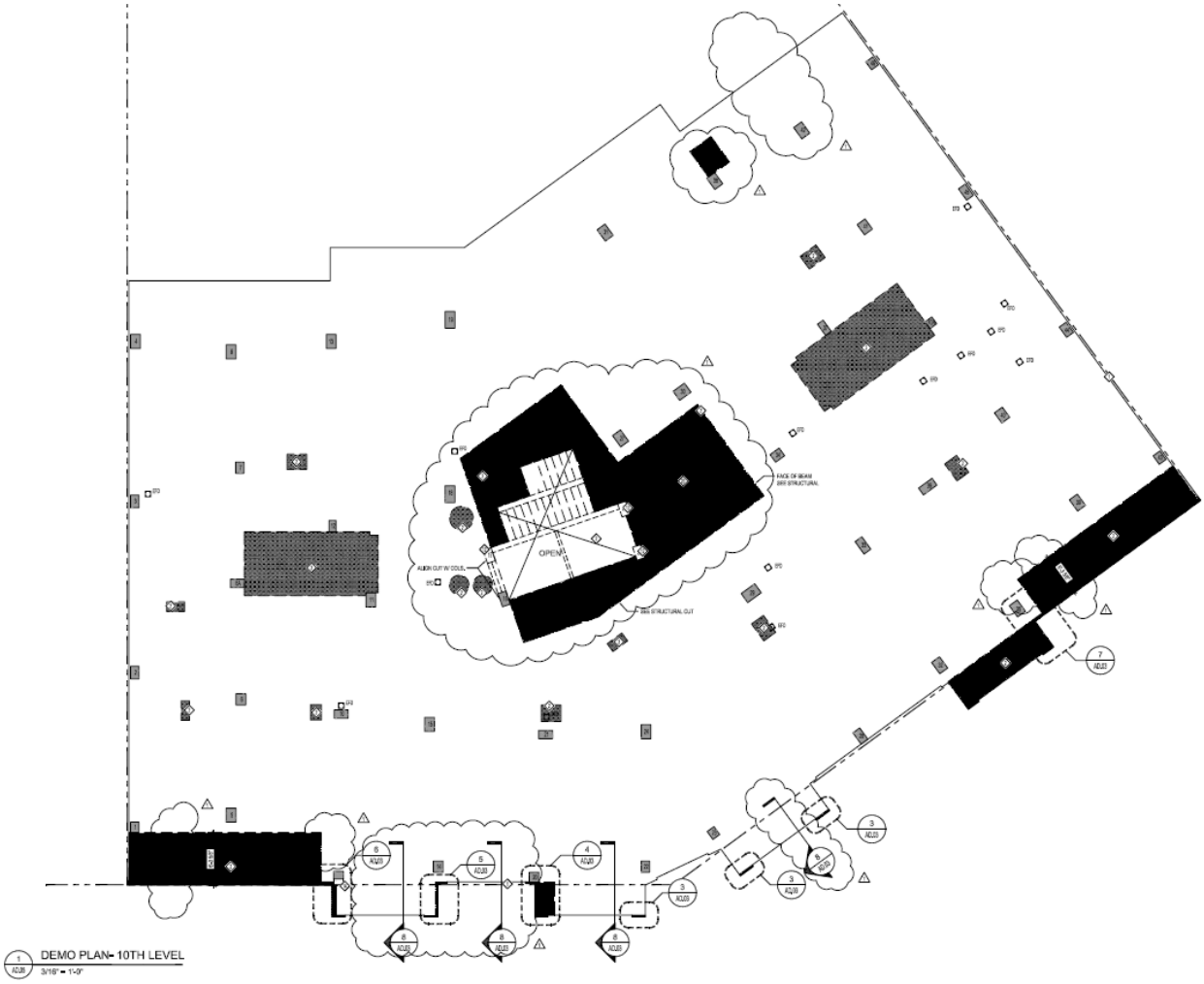


Figure 11 shows the demolition of the slabs and the walls located in the core of the structure

f) **Roof level**-The demolition plan below shows the slabs and walls located on the roof level which require demolition.

Figure 12 shows the demolition of the slabs and the walls located in the core of the structure

2. **Curtain wall**-The curtain wall system is composed of decorative aluminum paneling and trellises. I have also included the many other wall types for review and understanding of the building's entire faced system. The curtain wall will be installed utilizing a scaffolding lift system which will advance from the top floor penthouse down to the lower levels. The design and construction responsibility of the contractor installing the curtain wall is to construct a water tight building envelope. The construction team will need to create a building mock-up in order to show the quality and appearance of the building envelope for owner approval. The building envelope will require testing and quality assurance in order to meet the stringent quality standards required for this type of construction project. This project is planning to achieve LEED Gold certification and in order to achieve this certification the building envelope construction will be inspected and expected to meet the requirements of top quality construction.

a) **Exterior wall type # 12** consists of 6" Batt insulation, 5/8" thick exterior sheathing, liquid applied air barrier, 2" rigid insulation, aluminum clip, sealant with backer rod and shims where required. The last layer to make up the wall is the aluminum composite material panel as shown in figure 13.

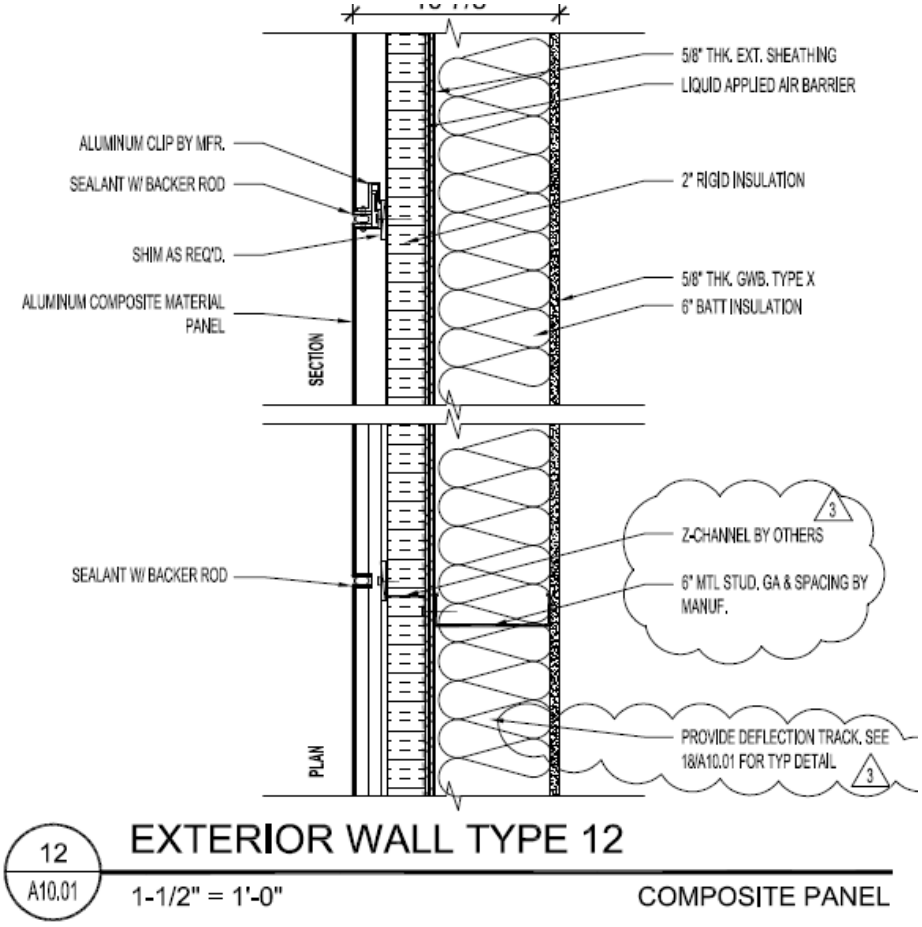


Figure 13 Exterior wall type # 12

b) **Exterior wall type # 14** will be composed of 7-5/8" thick Concrete Masonry Units (CMU) with a liquid applied air barrier, Z-channel fasteners @ 16" O.C., 2" moisture resistant rigid insulation, required shim to separate aluminum channel from Z-channel, max shims ¾" thick, weeped calcium silicate channel, and finally a calcium silicate masonry unit as shown in figure 14.

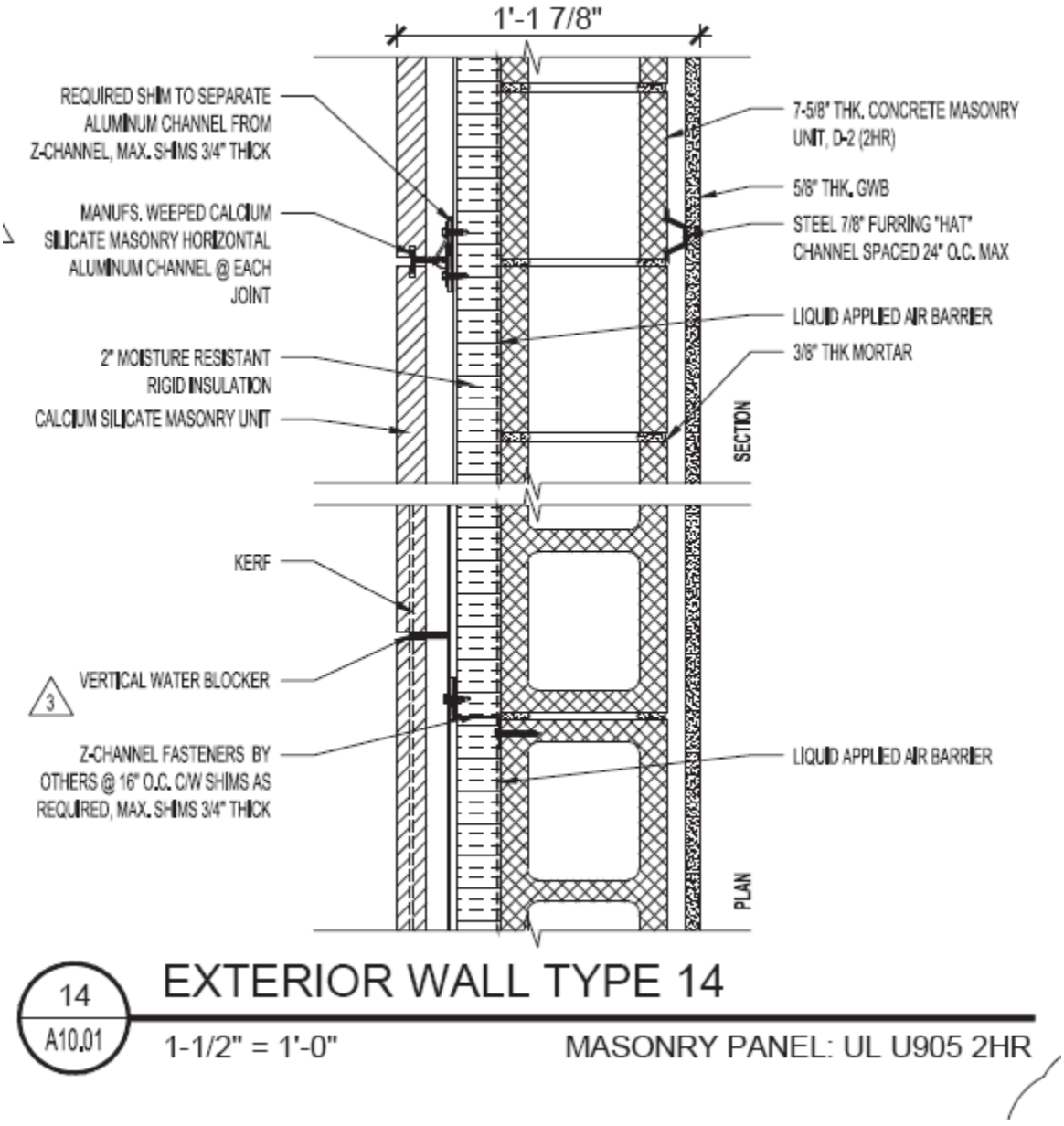


Figure 14 Exterior wall type # 14

c) **Exterior wall type # 15** has 7-5/8" thick CMUs while wall type 15a has 11-5/8" thick CMUs. They have essentially matching components which include liquid applied air barriers, 2" rigid insulation, aluminum clip, sealant with backer rod and shims where required. The last layer to make up the wall is the aluminum composite material panel as shown in figure 15.

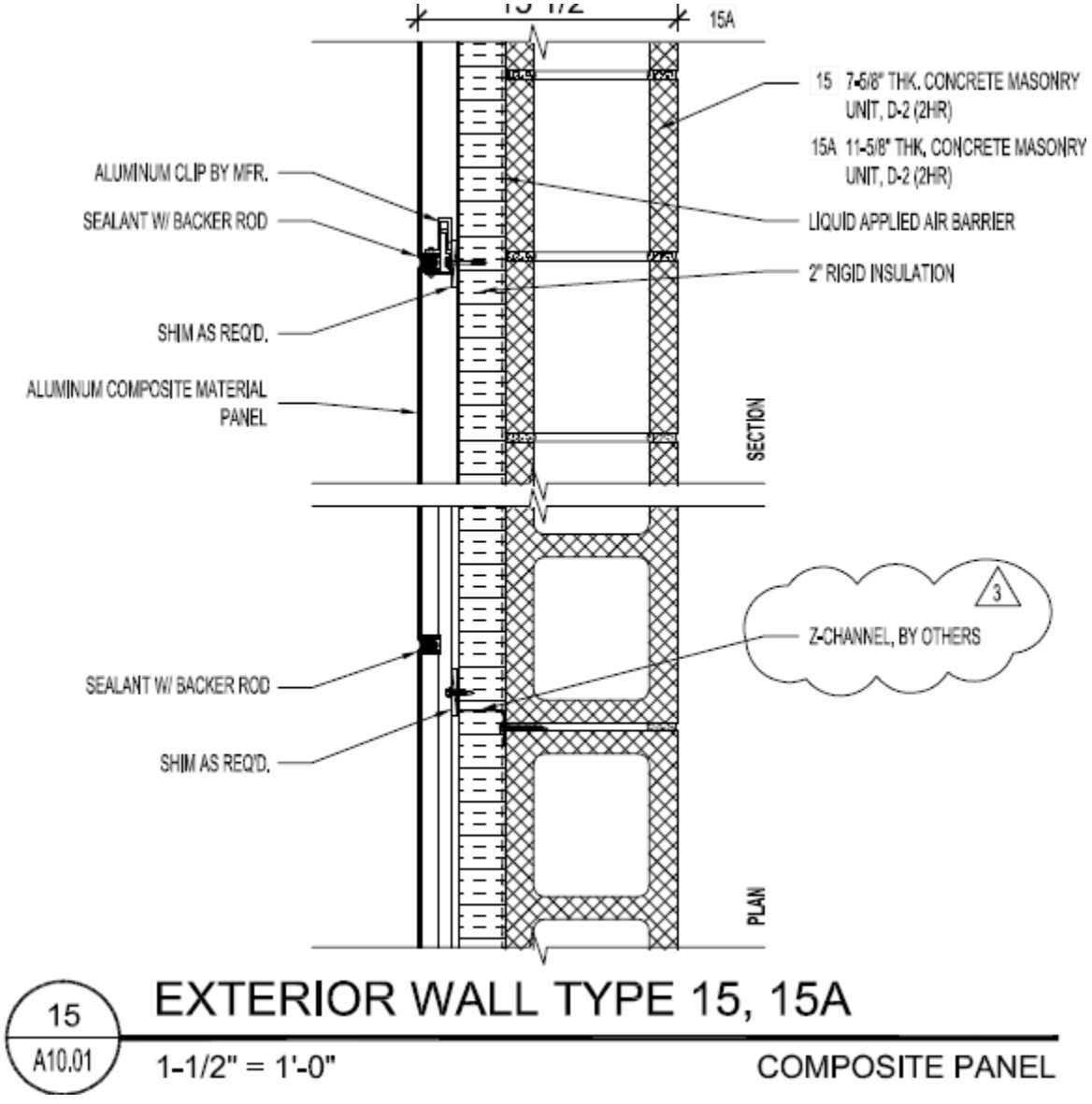


Figure 15 Exterior wall type # 15

d) **Exterior wall type # 16** has 5-5/8" CMUs, liquid applied air barrier, 2" rigid insulation, 3-5/8" CMU, and lastly metal anchors as shown in figure 16.

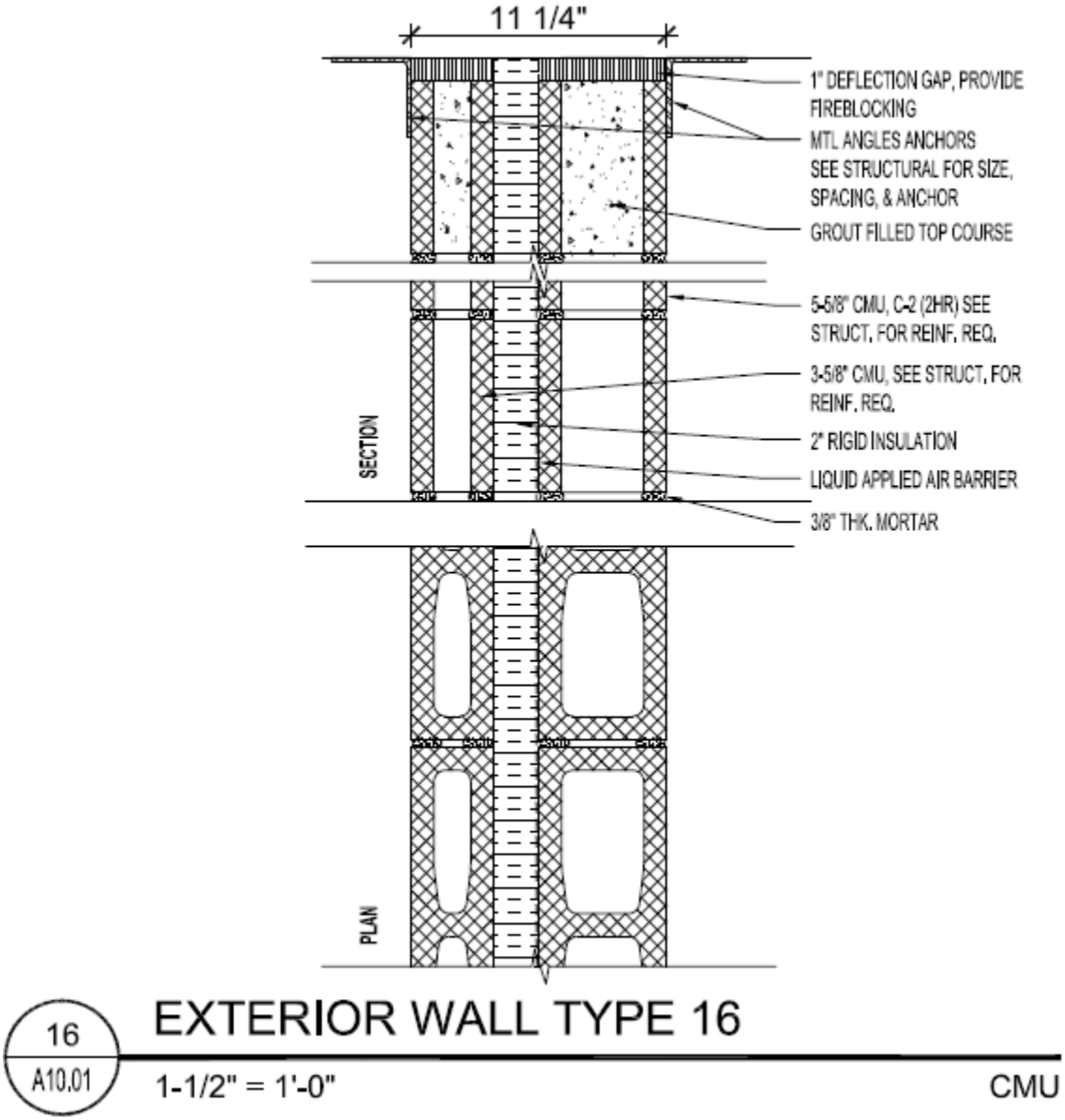


Figure 16 Exterior wall type # 16

e) **Screen/Coping**-The building façade has an Aluminum Trellis and aluminum panels with aluminum coping as shown in figure 17.

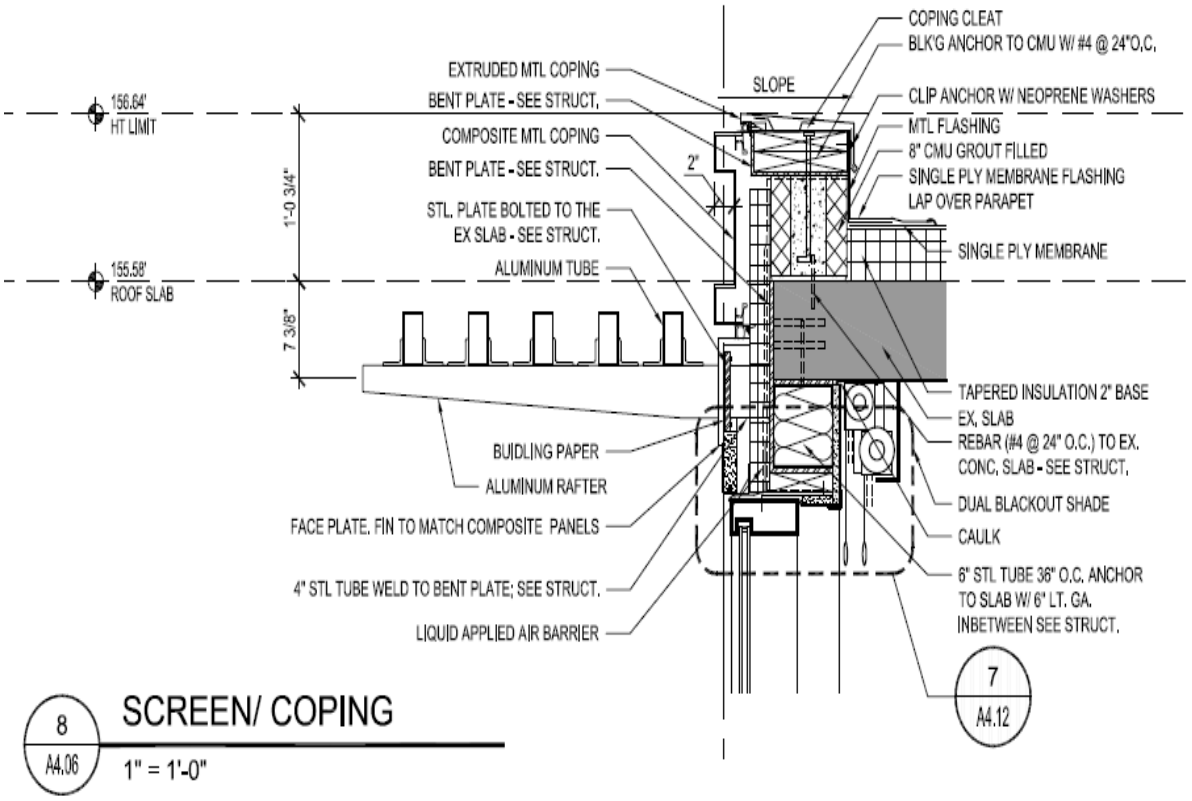


Figure 17 Screen/Coping Detail

3. **Mechanical**-the mechanical system will consist of two (2) Air Handling Units (AHU) to condition and circulate air for the entire building and one Makeup Air Unit (MAU) for providing supply air for the building. AHU-01 will be a 100 % outside air packaged energy recovery AHU which will be electric heat. In figure 18 the AHU-01 is highlighted in blue, it will be located in the mechanical room cellar and it will service the ground level. The detail and location of AHU-01 is shown in figure 19. AHU-02 will also be a 100 % outside air packaged energy recovery AHU; however, it will be gas heat. AHU-02 will be located on the rooftop and will be responsible for servicing the guestrooms its location is shown highlighted in yellow in figure 22 and the mechanical section is shown highlighted in yellow in figure 23 as well. MAU-1 will be a 100% outside air MAU which will be indirect gas-fired and it will be located in the cellar level in the same location as AHU-01 shown highlighted in red in figure 18. The MAU mechanical section is shown in figure 19 with the MAU highlighted in red. I have attached product information for the AHU-01, AHU-02 and the MAU-1 below in figures 20, 21 & 24. The building will have nine (9) fans for the many areas requiring ventilation which will be five (5) supplies, one (1) exhaust, one (1) return and two (2) exhaust/returns. As I stated in my Building Statistics there will be new Variable Refrigerant Volume (VRV) systems installed into the structure as well as eleven (11) VRV air cooled condenser outdoor units located on every floor, and three (3) air cooled split system located in the fire control room the IT/telecom room and the elevator control room. Lastly, there will be two (2) electric unit heaters and one (1) relief hood.

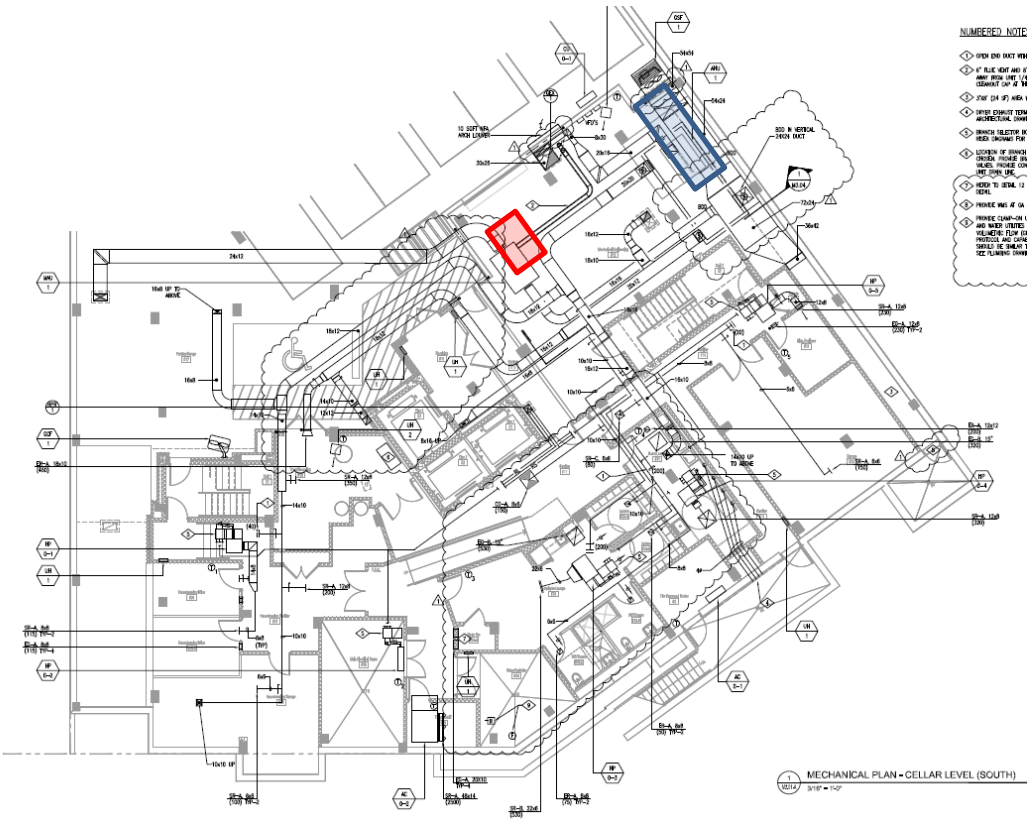
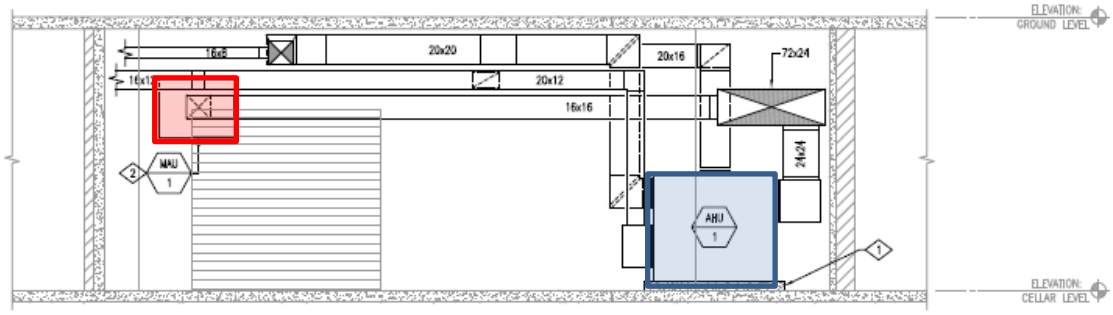


Figure 18 shows the location of the air handling unit AHU-1 outlined in blue as well as the make-up air unit MAU-1 outlined in red



1 MECHANICAL SECTION
M0.04 1/4" = 1'-0"

Figure 19 shows a section view of the mechanical room where the AHU-01 and MAU-1 are located

AHU-01

DryCool™ ERV

Product Description

FEATURES

The Munters DryCool™ ERV product provides 100% outdoor air to the space that will be drier than the typical make-up air unit (MAU) while at the same time using less energy than the standard MAU. The DryCool™ ERV achieves this by combining the lower supply air dew points of desiccant dehumidification technology with the energy efficiency of total energy recovery. The DryCool™ ERV unit not only provides the required ASHRAE ventilation volumes but also monitors and controls the space at design moisture levels via a space humidistat.

Product information
Dedicated Outdoor Air Systems

Advantages
- Energy efficient
- Delivers low dew point
- Energy recovery in winter
- Provides make-up air
- Avoids cool – reheat
- Dry, healthy duct work
- Increases your cooling COP
- Independent temperature & humidity control

Downloads
DryCool ERV Engineering Catalog.pdf
Product Guide- DryCool ERV.pdf

The DryCool™ unit is a complete single point power DX system that achieves the lowest energy consumption on the market by utilizing free condenser heat to reactivate the desiccant dehumidification cycle. This technology eliminates the inefficient over cool/reheat process utilized by the vast majority of MAUs. It also allows for the cooling coil to operate at higher temperatures, increasing refrigeration efficiency and eliminating coil freezing concerns. The overall effect can be shown by achieving equivalent EERs in the 20s.

The addition of enthalpy wheel energy recovery to this system provides for reduced heating and cooling requirements of outside air prior to hitting the DX coil or the optional gas or electric heater or hot water post heat coil.

Figure 20 AHU-01 Product Description

http://www.munters.us/en/us/Products--Services/Dehumidification/Energy-Recovery/Packaged-Energy-Recovery1/?Product=9B4168F8-61B0-4013-AF4F-BF7F0BCBE6B8

MAU-1

Model IGX

Model IGX is ideally suited for gas-fired make-up air applications where a direct gas-fired system is not appropriate. The IGX has a modular design for broad configuration flexibility. In addition to 100% outdoor air operation, recirculation and variable volume airflow options are available. Airflow volumes range from 800 to 15,000 cfm with heating capacities up to 1,200,000 BTU/hr (input).
Cooling options: Evaporative cooling up to 14,000 cfm
Chilled water or DX up to 11,000 cfm

Figure 21 MAU-1 Product Description

http://www.greenheck.com/products/detail/55

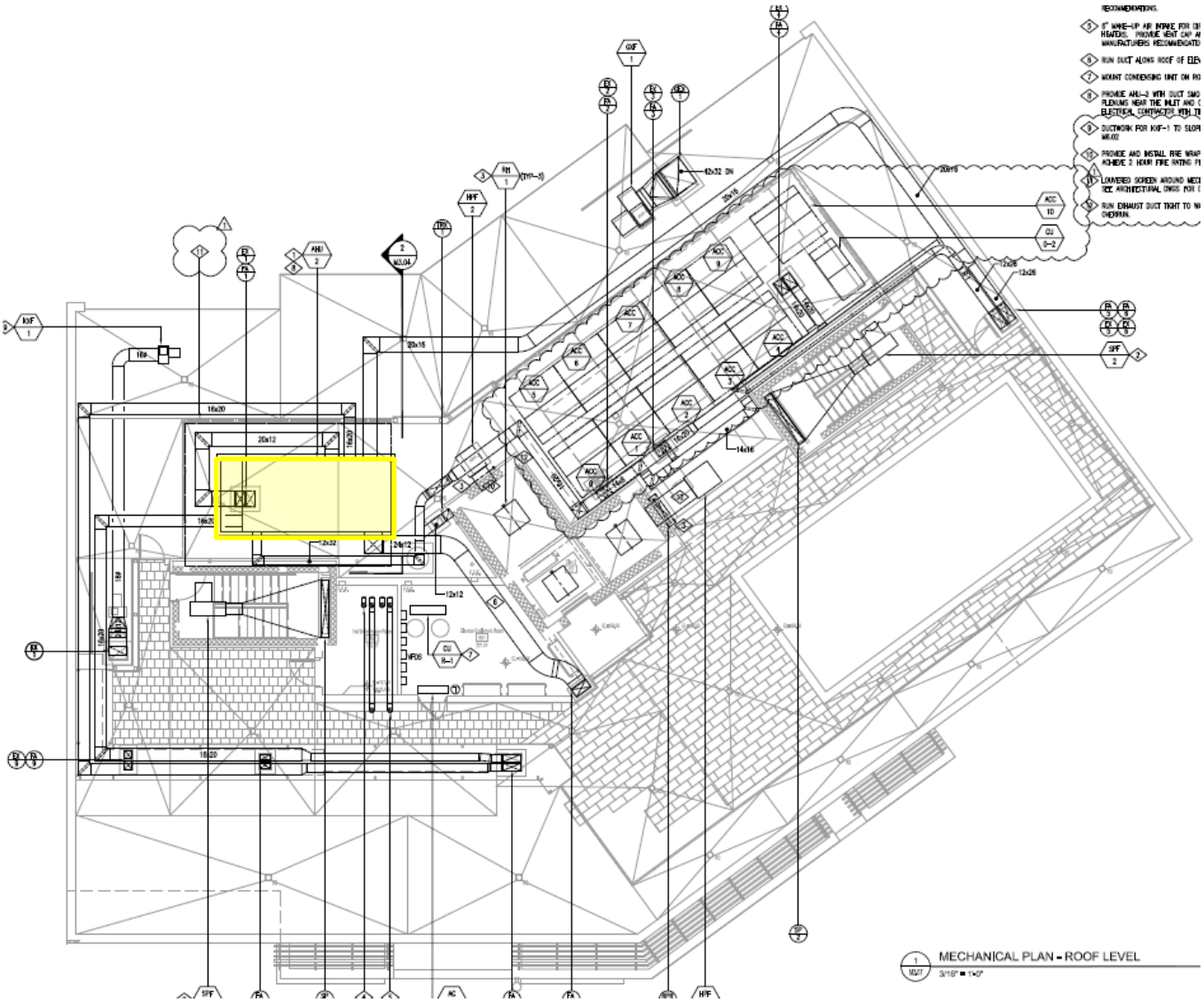
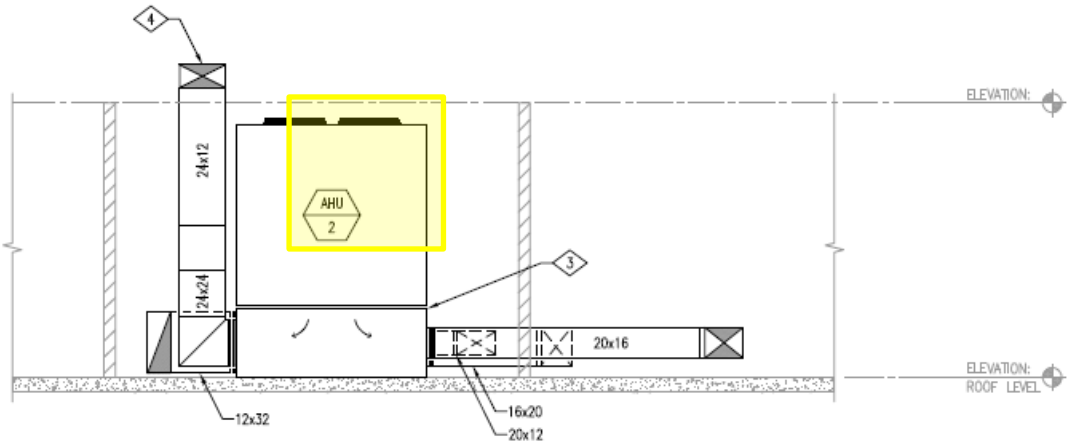
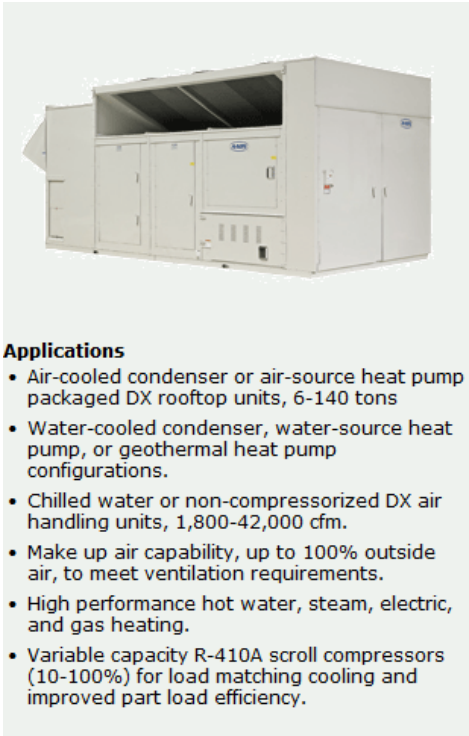


Figure 22 shows the location of the AHU-2 on a floor plan of the roof level of the structure



2 M3.04 MECHANICAL SECTION
1/4" = 1'-0"

Figure 23 shows AHU-2 located on the roof of the structure and responsible for servicing



Applications

- Air-cooled condenser or air-source heat pump packaged DX rooftop units, 6-140 tons
- Water-cooled condenser, water-source heat pump, or geothermal heat pump configurations.
- Chilled water or non-compressorized DX air handling units, 1,800-42,000 cfm.
- Make up air capability, up to 100% outside air, to meet ventilation requirements.
- High performance hot water, steam, electric, and gas heating.
- Variable capacity R-410A scroll compressors (10-100%) for load matching cooling and improved part load efficiency.

Figure 24 AHU-02 Product Description

http://www.aaon.com/product.aspx?id=1

a) **Fire Suppression**-The fire suppression system that will be used is a combination of a wet-pipe system and a dry-pipe system in areas where the freeze thaw cycle is likely to occur. A Peerless model T41 jockey pump combined with a Peerless Model 6AEF10 Horizontal Splite Case Fire Pump. The pump and jockey pump will distribute water to the sprinkler system and maintain water pressure throughout the building. The loading dock will have a dry pendant fire sprinkler system (based on winter freezing conditions) connected to the wet-pipe system located in the heated ceiling space. Details are provided below of typical pendant style sprinkler heads as well as the

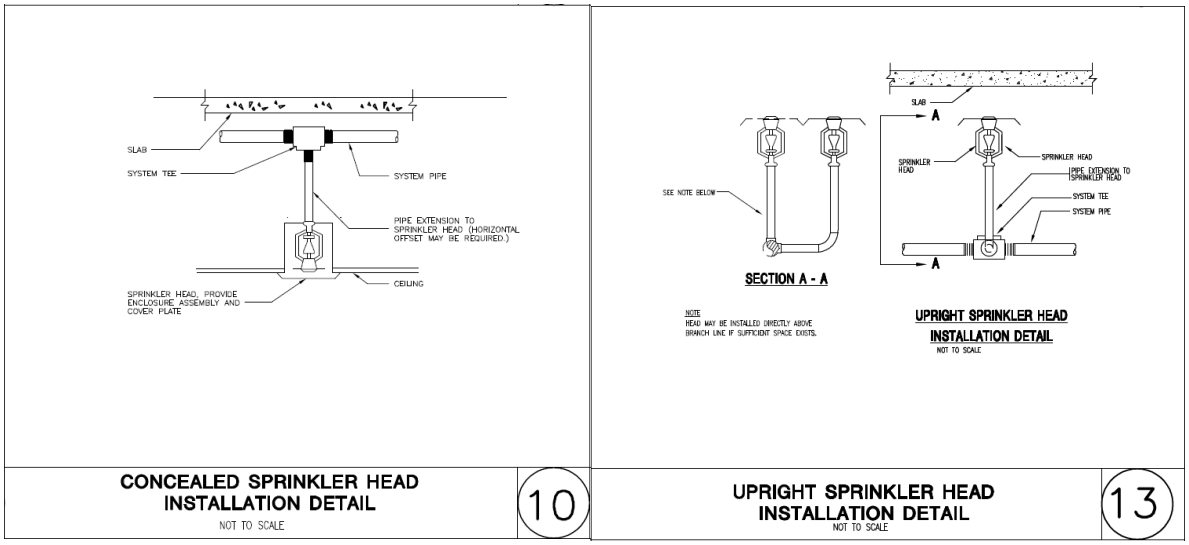


Figure 25 Details 10 & 13 show the required sprinkler head concealment and installation

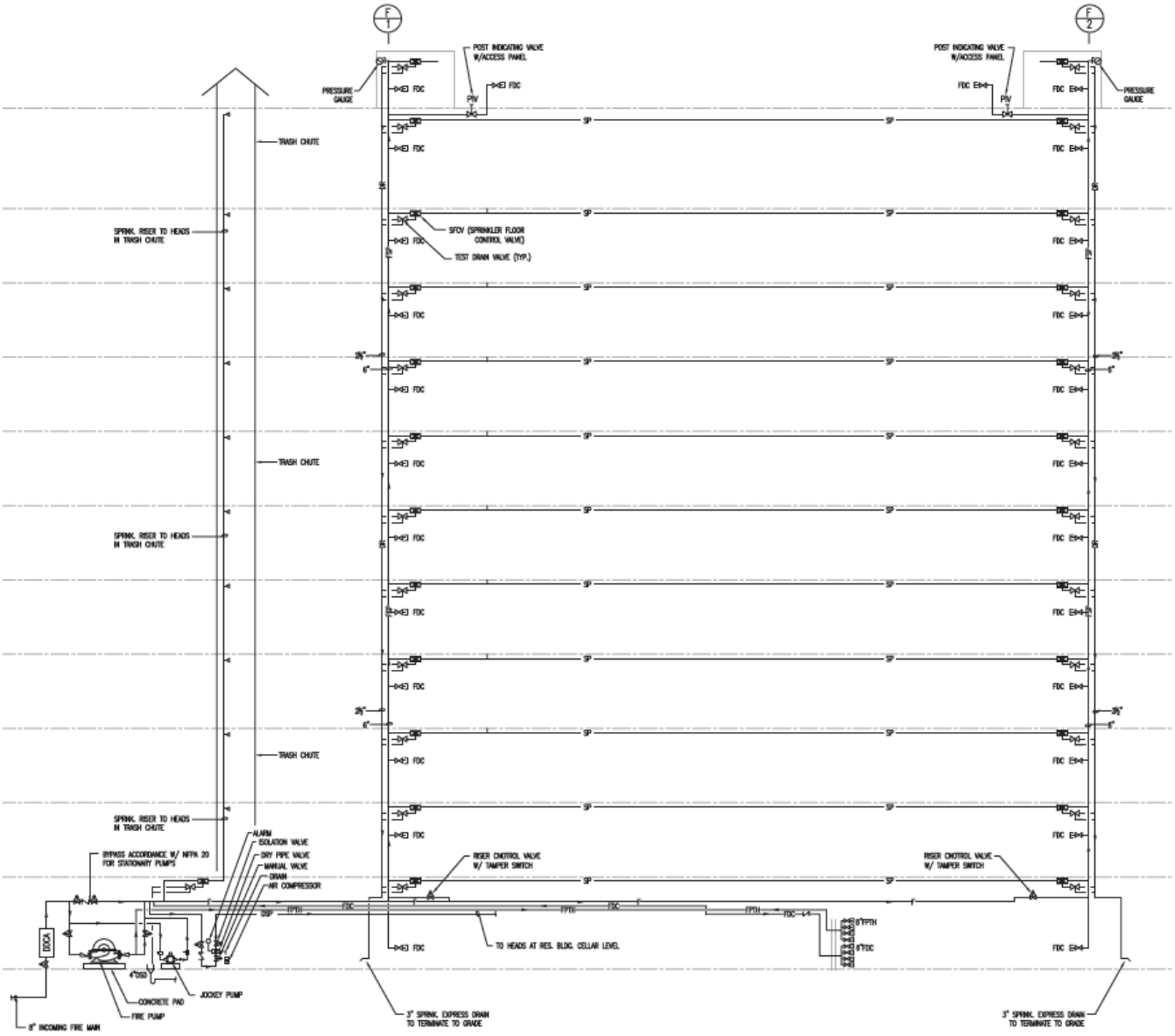


Figure 26 shows the riser diagram for the fire suppression system of the structure

4. **Green Building Project Features**-Due to the outdated inefficient systems which were installed when the building was completed this renovation will gut and renovate all the major MEP systems. The renovation of the IMF Concordia is planning to achieve a LEED Gold certification. The goal of achieving this certification will be dependent on the many systems of the structure coming together to produce an efficient building.
   a) **Plumbing**
      i. IMF Concordia's renovation will include the installation of Domestic Booster Pumps in order to help produce a more efficient, energy saving plumbing system.
   b) **Electrical**
      i. Turner's renovation of the Concordia will include the installation of LED down lights in many of the corridors as well as many other LED fixtures throughout the building.
   c) **Mechanical**
      i. This renovation will make the building's mechanical system more efficient by installing 100% outside air packaged energy recovery air handling units and 100% outside air makeup air units
      ii. The mechanical system will be improved drastically by installing Variable Refrigerant Volume (VRV) systems. (http://www.mechanicalservicesfiji.com/vrv_aircon.html)
   d) **Roofing**
      i. The live planter roofing will consist of a liquid applied air barrier installed on top of the existing slab which will be followed by much thicker tapered insulation, a single ply membrane and lastly live roof planter beds.

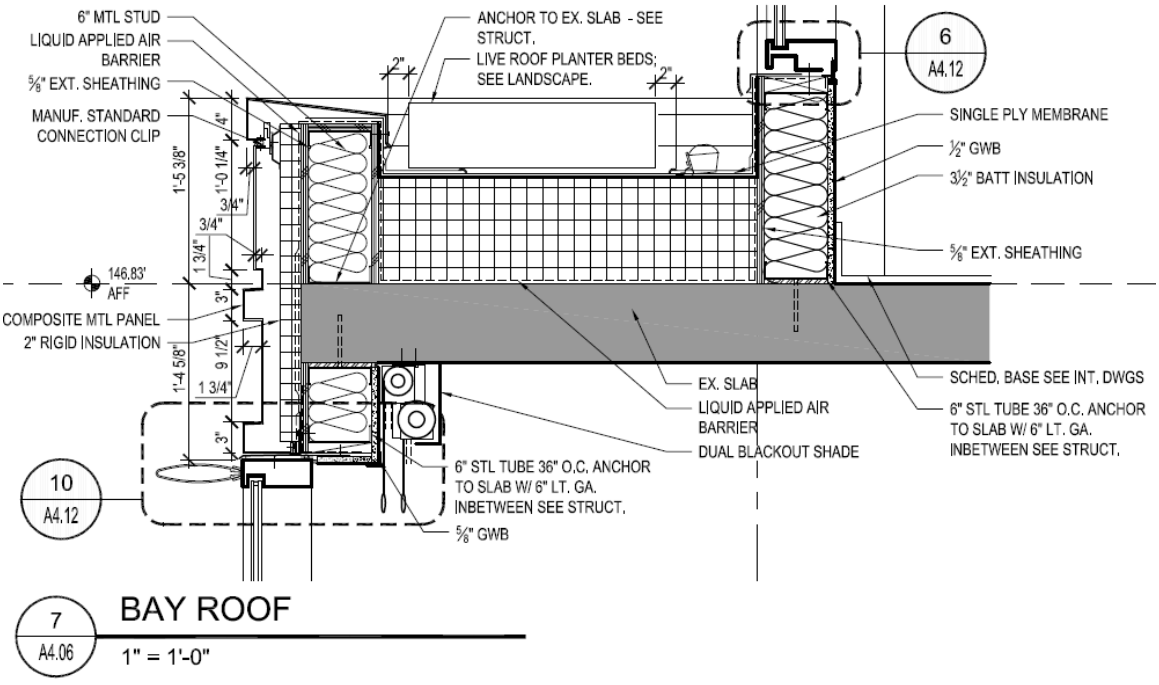


Figure 27 live planter for bay area of roofing detail

5. **Electrical**-The electrical system will consist of 13 transformers. The sizes of these transformers are a 3, 6, 9, 15, 30, 45, 75, 112.5, 150, 225, 300, 500 and 750 KVA transformers. There will be 28 panel boards located throughout the building faced with the task of providing power to equipment and systems located on each floor in different regions of the structure. The main utility electric will come in from the eastern side of the structure and travel into the main electrical room located in the cellar of the structure. In the main electrical room (located in the cellar) the electric will be fed into the Main switchboard (MS-1), a 4000A 208/120V-3phase 4W 100KAIC system which will distribute electric to the remainder of the building. MS-1 will then provide power to DPR-1 which will provide service to the LPR-1 and the LP-POOL for the major pool equipment. MS-1 will also service DPC-1, DPL-3, SLPC-1ELPC-1 and AHU-2 located on the roof of the structure. The electrical system will have a 15 KVA Uninterruptable Power Supply (UPS) system utilizing an Automatic Transfer Switch (ATS) and a generator located in the garage level of the structure.

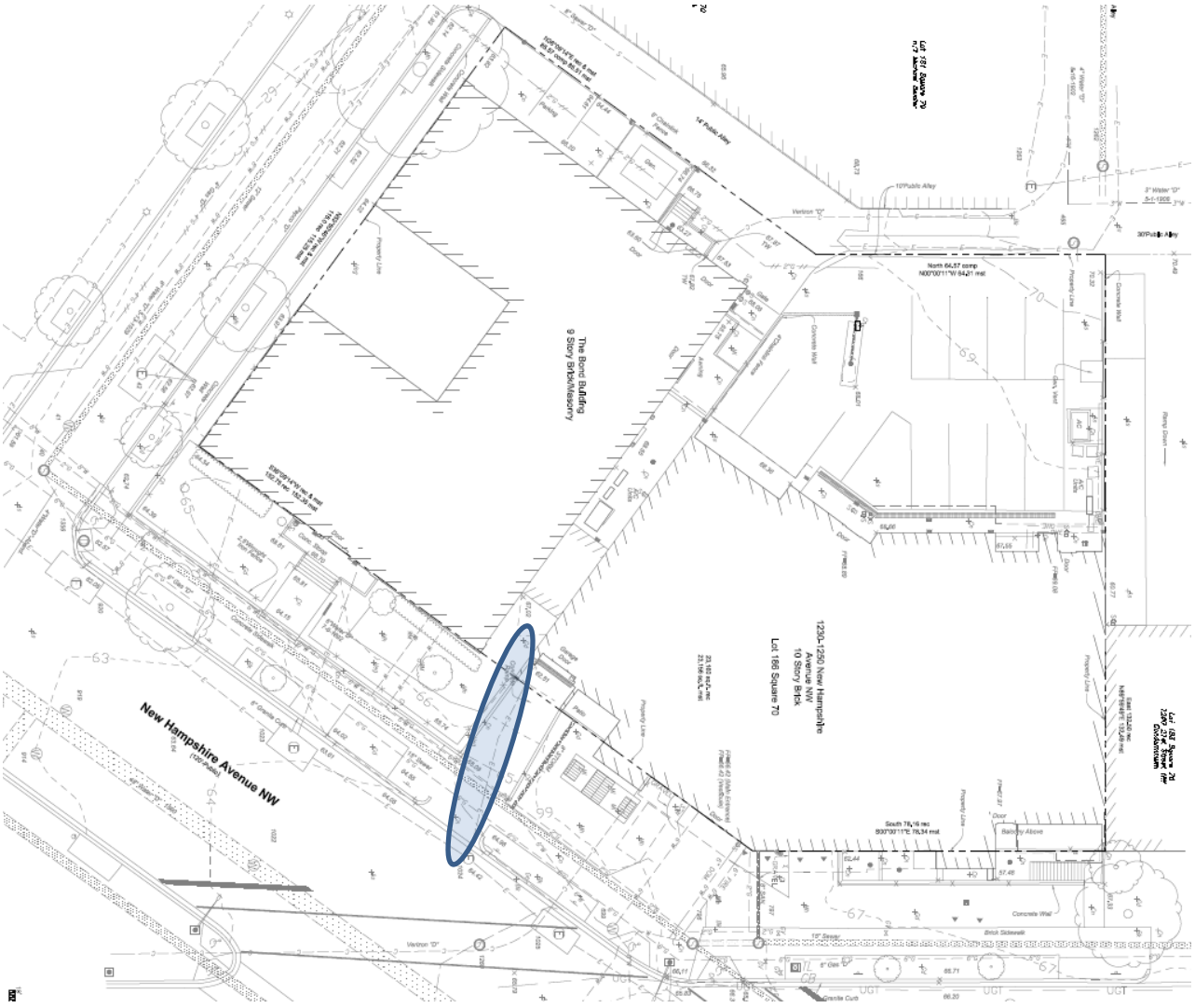


Figure 28 shows the electric utility, outlined in blue, entering the structure from the eastern side

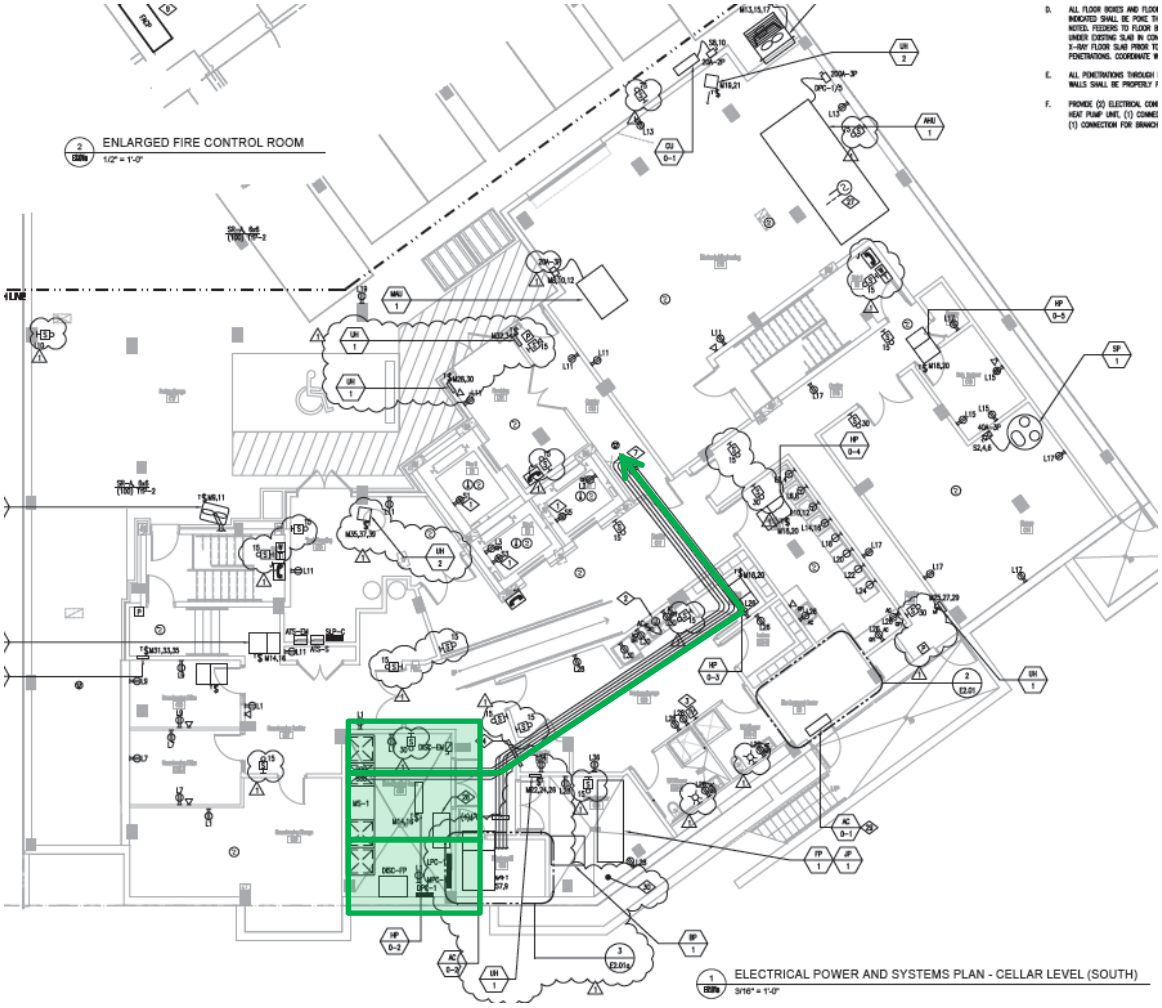


Figure 29 shows the electric utility coming into the main switchgear MS-1 located in the main electrical room, highlighted in green, in the cellar level. Green arrows show the direction of power traveling to floor penetrations where it continues up to the second

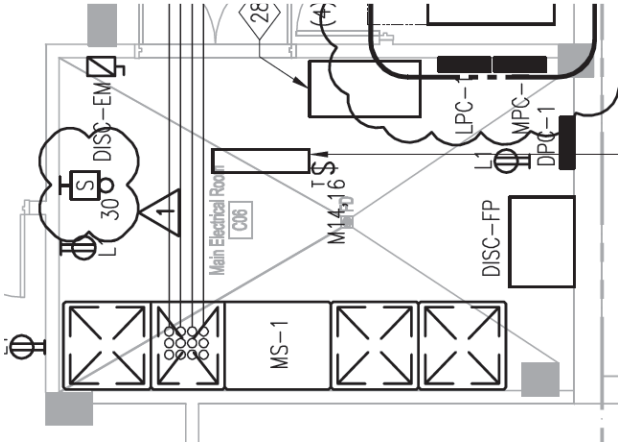


Figure 30 shows a zoom in on the main electrical room showing the main switchboard MS-1

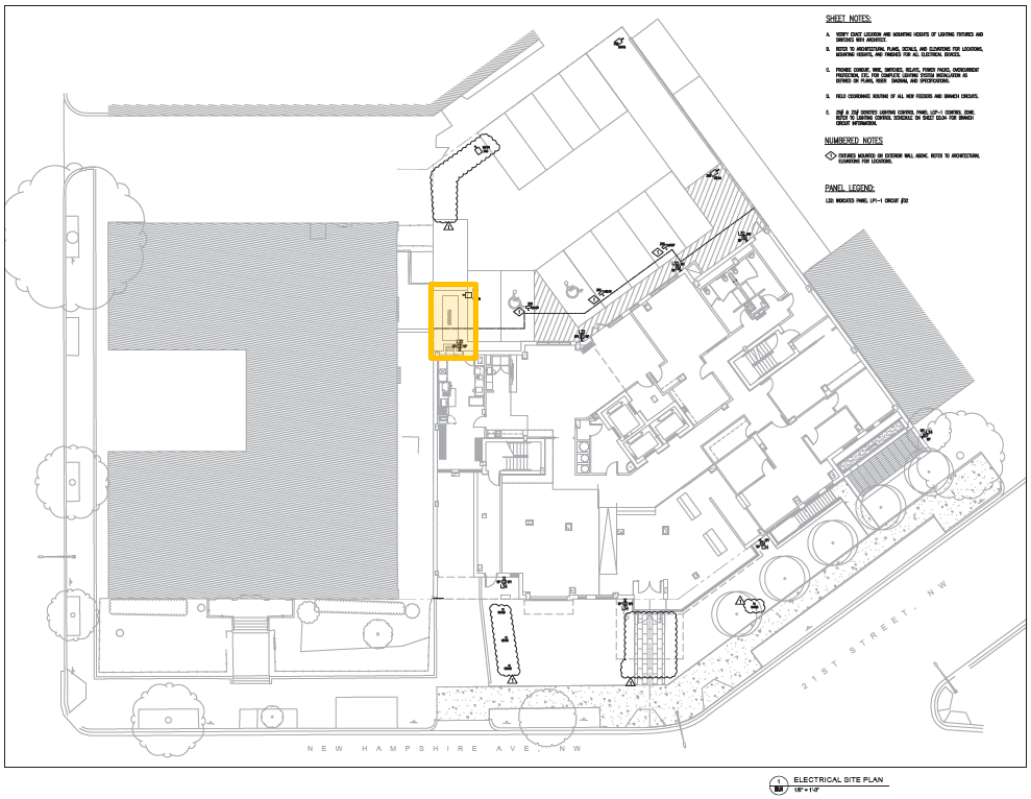


Figure 31 shows the generator's location in the parking garage, which is outlined in orange

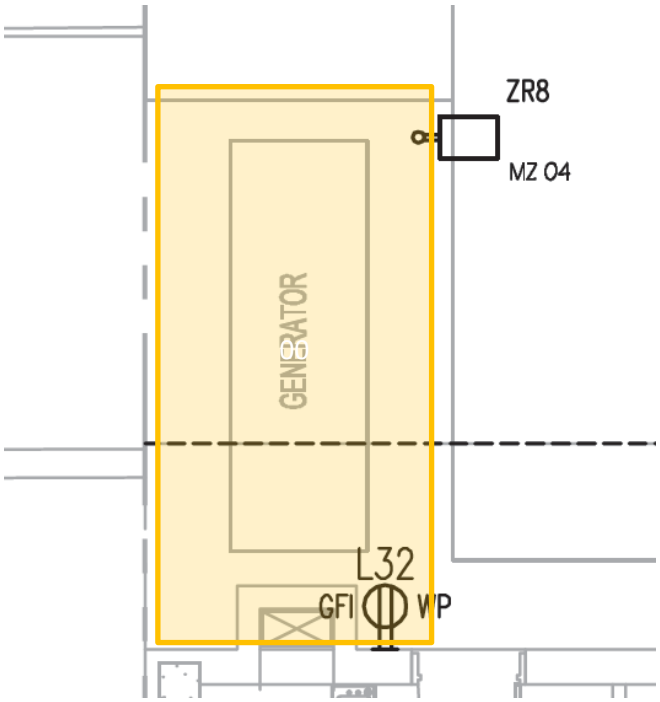


Figure 32 shows a zoom in on the generator used for the 15 KVA UPS system

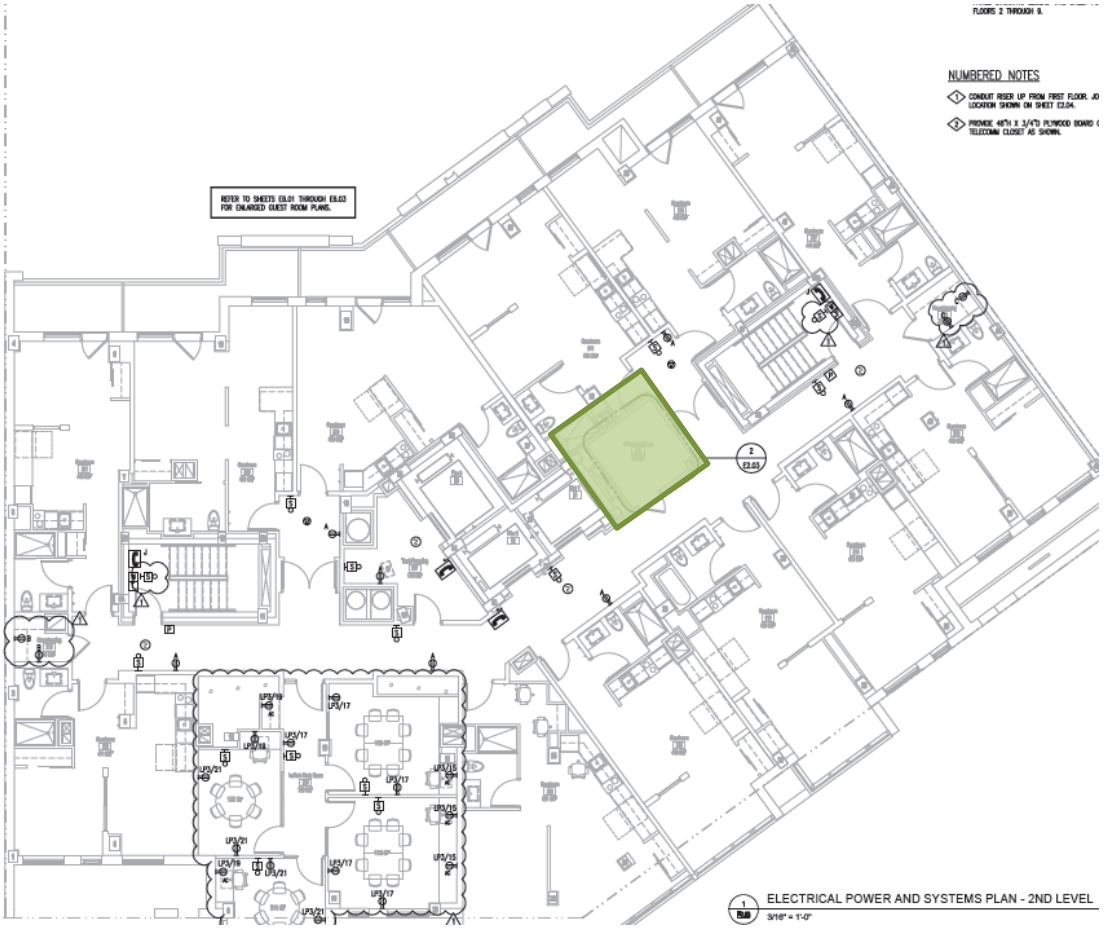


Figure 33 shows the location of the electric room on the second floor, which is repeated on each consecutive floor above

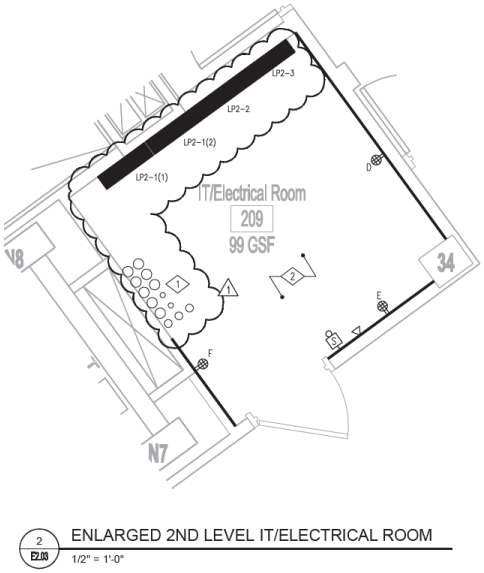


Figure 34 shows a zoom in of the electrical room located on the second floor

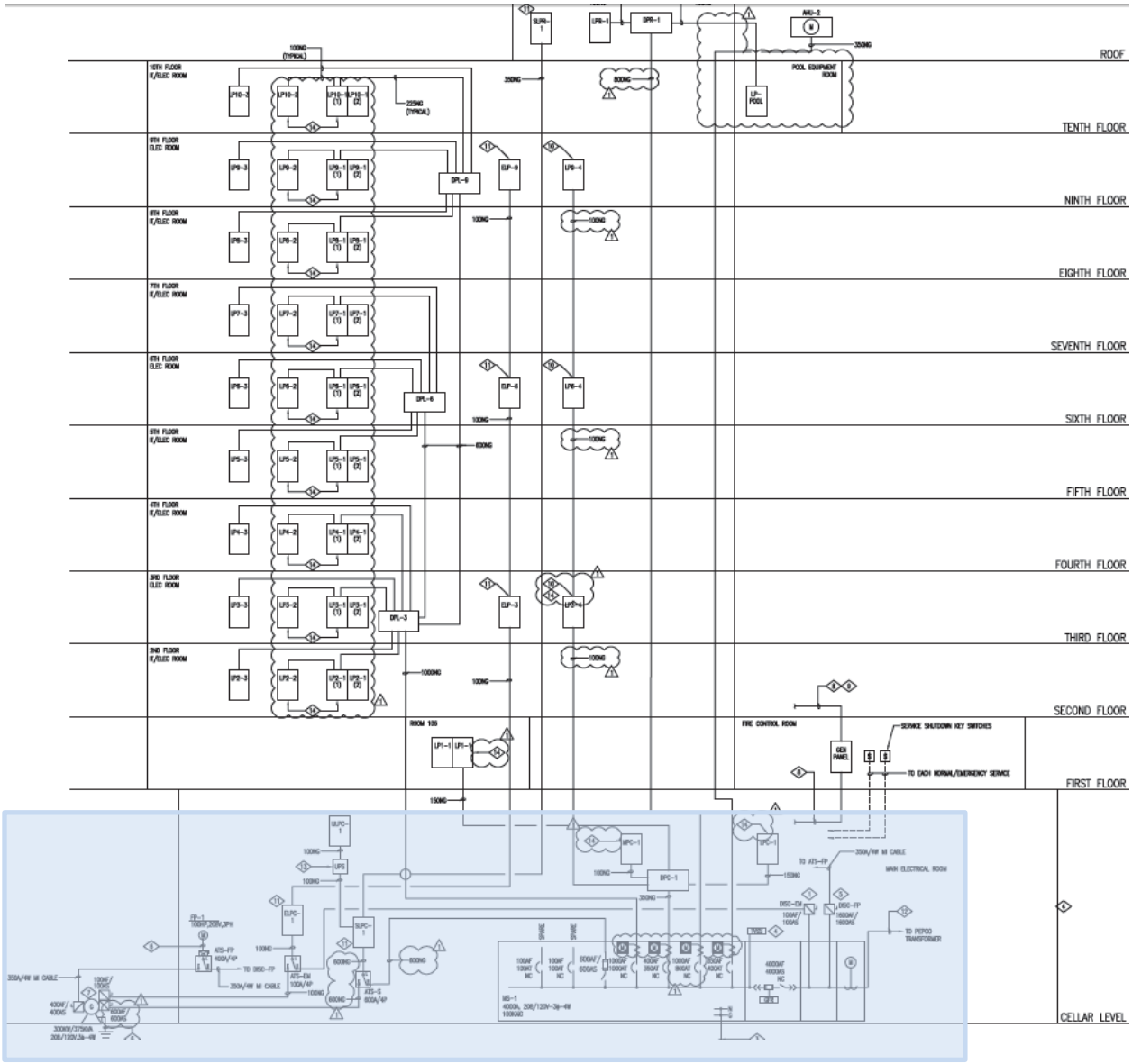


Figure 35 shows the riser diagram for the electrical system of the structure, outlined in blue is the redundant system as well as the Main Switchboard (MS-1)

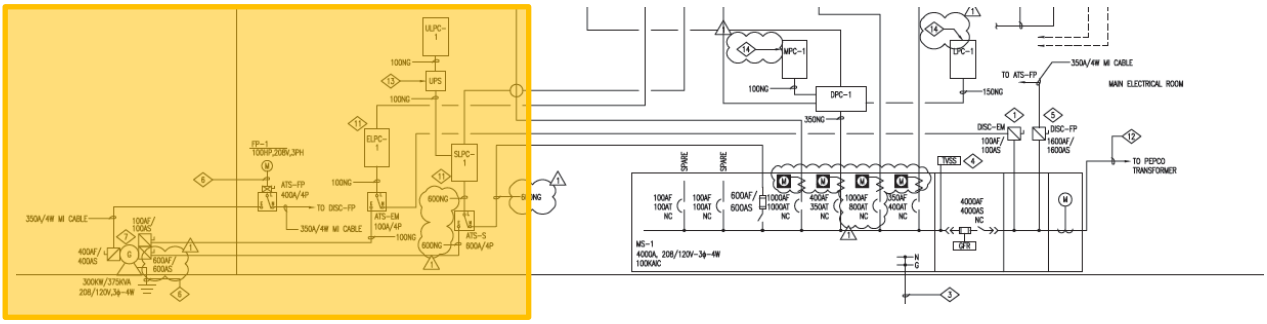


Figure 36 shows the riser diagram of the electrical system focusing on the redundant system and MS-1

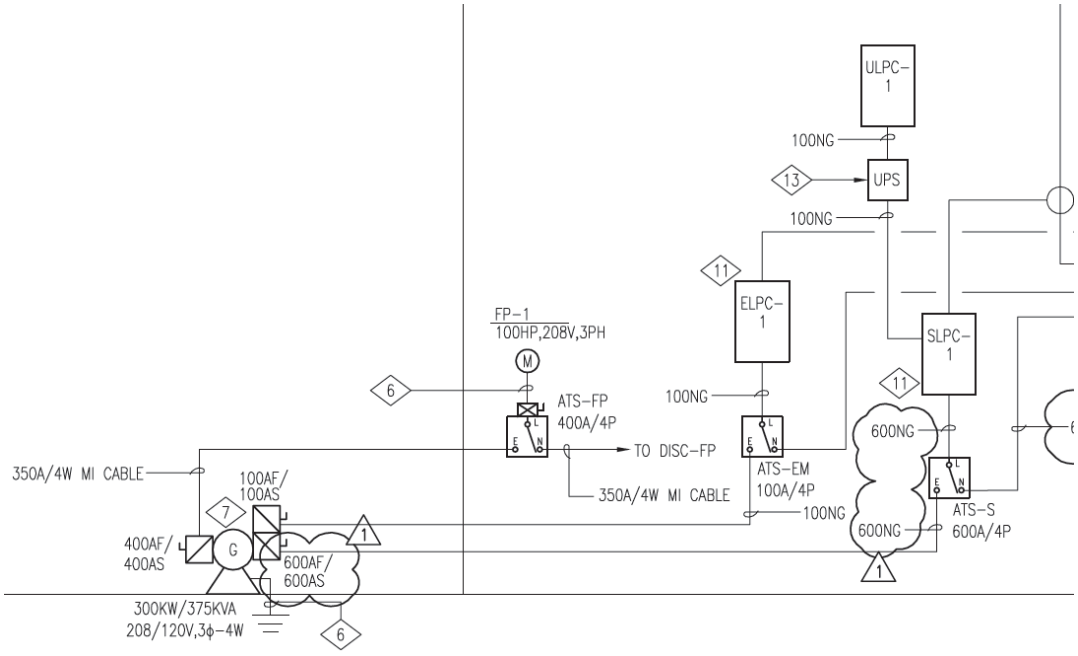


Figure 37 shows a zoom in of the redundant system located in the cellar level of the structure

Project Cost Evaluation

1. **Construction Cost (CC)**-this information was not provided by Turner Construction. Turner Construction Company has yet to release the details of their estimates. Details of the estimate will be provided upon receipt of such information.
2. **Total Project Cost (TC)**-the total project cost was provided by the Turner Construction Company which was $23,000,000
    a. TC/SF=$23,000,000/96,200SF=$239.08/SF
3. **Major Building Systems Costs**-this information was not provided by Turner Construction. Turner Construction Company has yet to release the details of their estimates. Details of the estimate will be provided upon receipt of such information.
4. **Square Foot Estimate**-a square foot estimate utilizing R.S. Means CostWorks Square Foot Cost Estimate Report has been completed. The square foot estimate is extremely close to the actual building total cost which is $23,000,000. The square foot estimate is $22,336,000 which is ($22,336,000/$23,000,000)*100=97.11) 97% accurate. This square foot estimate is extremely close to the building estimate and may be off only due to precision and accuracy of the unit costs used. The square foot estimate detail and breakdown can be evaluated on the following pages of this technical report.

Square Foot Cost Estimate Report

Estimate Name:	**Untitled**
Building Type:	**Hotel, 8-24 Story with Glass and Metal Curtain Walls / R/Conc. Frame**
Location:	**National Average**
Story Count:	**10**
Story Height (L.F.):	**9**
Floor Area (S.F.):	**96200**
Labor Type:	**Union**
Basement Included:	**No**
Data Release:	**Year 2012**
Cost Per Square Foot:	**$232.18**
Building Cost:	**$22,336,000**

Costs are derived from a building model with basic components.
Scope differences and market conditions can cause costs to vary significantly.
Parameters are not within the ranges recommended by RSMeans.

		% of Total	Cost Per S.F.	Cost
A Substructure		**10.20%**	**$17.79**	**$1,711,000**
A1010	**Standard Foundations**		**$0.78**	**$75,000**
	Pile caps, 12 piles, 11' - 6" x 8' - 6" x 49", 40 ton capacity, 19" column size, 900 K column			
	Pile caps, 14 piles, 11' - 6" x 10' - 9" x 55", 80 ton capacity, 29"column size, 2155 K column			
A1020	**Special Foundations**		**$16.07**	**$1,546,000**
	Steel H piles, 100' long, 800K load, end bearing, 12 pile cluster			
	Steel H piles, 100' long, 1600K load, end bearing, 14 pile cluster			
	Grade beam, 30' span, 52" deep, 14" wide, 12 KLF load			
A1030	**Slab on Grade**		**$0.51**	**$49,000**
	Slab on grade, 4" thick, non industrial, reinforced			
A2010	**Basement Excavation**		**$0.02**	**$1,500**
	Excavate and fill, 30,000 SF, 4' deep, sand, gravel, or common earth, on site storage			
A2020	**Basement Walls**		**$0.41**	**$39,500**
	Foundation wall, CIP, 4' wall height, direct chute, .099 CY/LF, 4.8 PLF, 8" thick			
	Foundation wall, CIP, 4' wall height, direct chute, .148 CY/LF, 7.2 PLF, 12" thick			
B Shell		**22.10%**	**$38.77**	**$3,730,000**
B1010	**Floor Construction**		**$16.10**	**$1,548,500**

	Cast-in-place concrete column, 18" square, tied, 500K load, 10' story height, 315 lbs/LF, 4000PSI Flat plate, concrete, 9" slab, 20" column, 20'x25' bay, 75 PSF superimposed load, 188 PSF total load		
B1020	**Roof Construction** Floor, concrete, beam and slab, 20'x25' bay, 40 PSF superimposed load, 18" deep beam, 8.5" slab, 146 PSF total load	**$1.44**	**$138,500**
B2020	**Exterior Windows** Aluminum flush tube frame, for insulating glass, 2" x 4-1/2", 5'x6' opening, no intermediate horizontals Glazing panel, insulating, 5/8" thick units, 2 lites 3/16" float glass, tinted	**$20.36**	**$1,958,500**
B2030	**Exterior Doors** Door, aluminum & glass, without transom, narrow stile, with panic hardware, 3'-0"x 7'-0"opening Door, aluminum & glass, without transom, narrow stile, double door, hardware, 6'-0" x 7'-0" opening Door, steel 18 gauge, hollow metal, 1 door with frame, no label, 3'-0" x 7'-0" opening	**$0.23**	**$22,000**
B3010	**Roof Coverings** Roofing, asphalt flood coat, gravel, base sheet, 3 plies 15# asphalt felt, mopped Insulation, rigid, roof deck, composite with 2" EPS, 1" perlite Roof edges, aluminum, duranodic, .050" thick, 6" face Flashing, aluminum, no backing sides, .019" Gravel stop, aluminum, extruded, 4", mill finish, .050" thick	**$0.62**	**$59,500**
B3020	**Roof Openings** Roof hatch, with curb, 1" fiberglass insulation, 2'-6" x 3'-0", galvanized steel, 165 lbs	**$0.03**	**$3,000**
C Interiors		**19.90%**	**$34.94**	**$3,361,000**
C1010	**Partitions** Metal partition, 5/8"fire rated gypsum board face, 5/8"fire rated gypsum board base, 3-5/8" @ 24", 5/8"fire ratedopposite face, 3.5" fiberglas insulation 5/8" gypsum board, taped & finished, painted on metal furring	**$6.18**	**$594,500**
C1020	**Interior Doors** Door, single leaf, kd steel frame, hollow metal, commercial quality, flush, 3'-0" x 7'-0" x 1-3/8"	**$13.27**	**$1,276,500**
C2010	**Stair Construction** Stairs, steel, cement filled metal pan & picket rail, 16 risers, with landing	**$2.77**	**$266,500**
C3010	**Wall Finishes** Painting, interior on plaster and drywall, walls & ceilings, roller work, primer & 2 coats Vinyl wall covering, fabric back, medium weight	**$3.50**	**$336,500**

	Ceramic tile, thin set, 4-1/4" x 4-1/4"			
C3020	**Floor Finishes**		**$5.26**	**$506,000**
	Carpet tile, nylon, fusion bonded, 18" x 18" or 24" x 24", 35 oz			
	Vinyl, composition tile, maximum			
	Tile, ceramic natural clay			
C3030	**Ceiling Finishes**		**$3.96**	**$381,000**
	Gypsum board ceilings, 1/2" fire rated gypsum board, painted and textured finish, 7/8"resilient channel furring, 24" OC support			
D Services		**47.80%**	**$83.73**	**$8,055,000**
D1010	**Elevators and Lifts**		**$7.03**	**$676,500**
	Traction geared freight, 4000 lb., 15 floors, 10' story height, 200FPM			
	Traction, geared passenger, 3500 lb,15 floors, 10' story height, 2 car group, 350 FPM			
D2010	**Plumbing Fixtures**		**$16.69**	**$1,606,000**
	Water closet, vitreous china, bowl only with flush valve, wall hung			
	Water closets, battery mount, wall hung, back to back, first pair of closets			
	Water closets, battery mount, wall hung, each additional pair of closets, back to back			
	Urinal, vitreous china, wall hung			
	Lavatory w/trim, vanity top, PE on CI, 20" x 18"			
	Kitchen sink w/trim, countertop, stainless steel, 33" x 22" double bowl			
	Service sink w/trim, PE on CI,wall hung w/rim guard, 22" x 18"			
	Bathtub, recessed, PE on CI, mat bottom, 5' long			
	Shower, stall, baked enamel, terrazzo receptor, 36" square			
	Water cooler, electric, wall hung, wheelchair type, 7.5 GPH			
	Water cooler, elec, floor mounted, refrigerated compartment type, 1.5 GPH			
	Bathroom, three fixture, 1 wall plumbing, lavatory, water closet & bathtub share common plumbing wall *			
D2020	**Domestic Water Distribution**		**$14.37**	**$1,382,000**
	Electric water heater, commercial, 100< F rise, 1000 gal, 480 KW 1970 GPH			
	Gas fired water heater, commercial, 100< F rise, 500 MBH input, 480 GPH			
D2040	**Rain Water Drainage**		**$0.14**	**$13,500**
	Roof drain, CI, soil,single hub, 5" diam, 10' high			
	Roof drain, CI, soil,single hub, 5" diam, for each additional foot add			
D3010	**Energy Supply**		**$2.73**	**$262,500**
	Commercial building heating system, fin tube radiation, forced			

	hot water, 1mil SF, 10 mil CF, total 5 floors		
D3030	**Cooling Generating Systems** Packaged chiller, water cooled, with fan coil unit, medical centers, 60,000 SF, 140.00 ton	**$13.95**	**$1,342,000**
D4010	**Sprinklers** Wet pipe sprinkler systems, steel, light hazard, 1 floor, 50,000 SF Wet pipe sprinkler systems, steel, light hazard, each additional floor, 50,000 SF Standard High Rise Accessory Package 16 story	**$4.34**	**$417,500**
D4020	**Standpipes** Wet standpipe risers, class III, steel, black, sch 40, 6" diam pipe, 1 floor Wet standpipe risers, class III, steel, black, sch 40, 6" diam pipe, additional floors Fire pump, electric, with controller, 5" pump, 100 HP, 1000 GPM Fire pump, electric, for jockey pump system, add	**$3.80**	**$366,000**
D5010	**Electrical Service/Distribution** Service installation, includes breakers, metering, 20' conduit & wire, 3 phase, 4 wire, 120/208 V, 2000 A Feeder installation 600 V, including RGS conduit and XHHW wire, 60 A Feeder installation 600 V, including RGS conduit and XHHW wire, 200 A Feeder installation 600 V, including RGS conduit and XHHW wire, 2000 A Switchgear installation, incl switchboard, panels & circuit breaker, 2000 A	**$7.32**	**$704,000**
D5020	**Lighting and Branch Wiring** Receptacles incl plate, box, conduit, wire, 10 per 1000 SF, 1.2 W per SF, with transformer Wall switches, 5.0 per 1000 SF Miscellaneous power, to .5 watts Central air conditioning power, 4 watts Motor installation, three phase, 460 V, 15 HP motor size Motor feeder systems, three phase, feed to 200 V 5 HP, 230 V 7.5 HP, 460 V 15 HP, 575 V 20 HP Motor connections, three phase, 200/230/460/575 V, up to 5 HP Motor connections, three phase, 200/230/460/575 V, up to 100 HP Fluorescent fixtures recess mounted in ceiling, 0.8 watt per SF, 20 FC, 5 fixtures @32 watt per 1000 SF	**$8.81**	**$848,000**
D5030	**Communications and Security** Communication and alarm systems, fire detection, addressable, 100 detectors, includes outlets, boxes, conduit and wire	**$4.13**	**$397,000**

	Fire alarm command center, addressable with voice, excl. wire & conduit			
	Communication and alarm systems, includes outlets, boxes, conduit and wire, intercom systems, 100 stations			
	Communication and alarm systems, includes outlets, boxes, conduit and wire, master TV antenna systems,100 outlets			
	Internet wiring, 2 data/voice outlets per 1000 S.F.			
D5090	**Other Electrical Systems**		**$0.42**	**$40,000**
	Generator sets, w/battery, charger, muffler and transfer switch, diesel engine with fuel tank, 500 kW			
E Equipment & Furnishings		**0.00%**	**$0.00**	**$0**
E1090	**Other Equipment**		**$0.00**	**$0**
F Special Construction		**0.00%**	**$0.00**	**$0**
G Building Sitework		**0.00%**	**$0.00**	**$0**

SubTotal	**100%**	**$175.23**	**$16,857,000**
Contractor Fees (General Conditions,Overhead,Profit)	**25.00%**	**$43.81**	**$4,214,500**
Architectural Fees	**6.00%**	**$13.14**	**$1,264,500**
User Fees	**0.00%**	**$0.00**	**$0**
Total Building Cost		**$232.18**	**$22,336,000**

5. **Assemblies Cost Estimate**-an assembly estimate of the major MEP systems such as AHU systems, Pump systems and major switchgear materials has been completed.
   a. Many of the major MEP systems are not listed in R.S. Means CostWorks database which has resulted in finding the nearest possible match to the MEP systems estimated. With this said, there will be a slight discrepancy with the assemblies and the assemblies cost. Unfortunately, being that the assemblies estimate has not been provided by the general contractor, Turner Construction Company, a proper assessment and comparison cannot be made. Concerning the assemblies estimate completed; many of the items associated with the MEP systems were not included. Items not included in the estimate are the Make-up Air Unit, all the transformers for the building, copper conductors, a cost for air cooled condensers, and many other systems that are simply not included in RS Means CostWorks. In order to achieve a more accurate assemblies estimate it will be optimal to price out specific equipment with vendors and to look back into historical data for previous projects. Below one will find the partial assemblies estimate which includes several items; AHU, pumps, several different motor types, electric water heater, and lastly packaged chiller which brings the total estimate of assemblies to $1,223,399.84. Further analysis of the assemblies estimate shows that, ($1,223,399.84/$23,000,000)*100=5.3%, the assemblies account for only 5.3% of the total building cost. Based on the fact that the major MEP systems can account for 30-50% of the total cost of the building this shows that the completed assemblies estimate is only partial and does not accurately reflect the true cost of these substantial MEP systems.

Cost Estimate Report
CostWorks® RSMeans

1250 New Hampshire st. NW
washington,
d.c., 20036
Year 2012

Date: 19-Sep-12

Assembly Detail Report

concordia

Prepared By:
ian b
penn state

Assembly Number	Description	Quantity	Unit	Total Incl. O&P	Ext. Total Incl. O&P
D Services					
D20202402340	Electric water heater, commercial, 100< F rise, 700 gal, 300 KW 1230 GPH	1.00	Ea.	$45,646.50	$45,646.50
D30203301010	Pump, base mounted with motor, end-suction, 2-1/2" size, 3 HP, to 150 GPM	6.00	Ea.	$15,475.75	$92,854.50
D30203301020	Pump, base mounted with motor, end-suction, 3" size, 5 HP, to 225 GPM	36.00	Ea.	$17,501.35	$630,048.60
D30203301050	Pump, base mounted with motor, end-suction, 6" size, 25 HP, to 1550 GPM	1.00	Ea.	$36,301.40	$36,301.40
D30301101120	Chilled water, air cooled condenser systems	10.00			$0.00
D30301101200	Packaged chiller, air cooled, with fan coil unit, apartment corridors, 3,000 SF, 5.50 ton	10.00	S.F.	$17.64	$176.40
D30401101020	AHU, central station, cool/heat coils, constant volume, filters, 5,000 CFM	2.00	Ea.	$30,775.95	$61,551.90
D30401141040	AHU, rooftop, cool/heat coils, constant volume, filters, 15,000 CFM	1.00	Ea.	$111,697.40	$111,697.40
D50201450240	Motor installation, single phase, 115 V, 1 HP motor size	3.00	Ea.	$1,697.88	$5,093.64
D50201450280	Motor installation, single phase, 115 V, 2 HP motor size	2.00	Ea.	$1,805.58	$3,611.16
D50201450320	Motor installation, single phase, 115 V, 3 HP motor size	1.00	Ea.	$1,921.36	$1,921.36
D50201450600	Motor installation, three phase, 200 V,5 HP motor size	1.00	Ea.	$2,280.22	$2,280.22
D50201450640	Motor installation, three phase, 200 V, 7-1/2 HP motor size	1.00	Ea.	$2,336.36	$2,336.36
D50201450680	Motor installation, three phase, 200 V, 10 HP motor size	1.00	Ea.	$3,253.90	$3,253.90
D50201450720	Motor installation, three phase, 200 V, 15 HP motor size	1.00	Ea.	$3,859.30	$3,859.30
D50201450760	Motor installation, three phase, 200 V,20 HP motor size	1.00	Ea.	$4,718.90	$4,718.90
D50201450800	Motor installation, three phase, 200 V, 25 HP motor size	1.00	Ea.	$4,768.30	$4,768.30
D50201450840	Motor installation, three phase, 200 V,30 HP motor size	1.00	Ea.	$6,573.70	$6,573.70
D50201450880	Motor installation, three phase, 200 V, 40 HP motor size	1.00	Ea.	$8,236.30	$8,236.30
D50201450920	Motor installation, three phase, 200 V, 50 HP motor size	1.00	Ea.	$12,099.00	$12,099.00
D50201450960	Motor installation, three phase, 200 V, 60 HP motor size	1.00	Ea.	$12,780.30	$12,780.30
D50201451000	Motor installation, three phase, 200 V,75 HP motor size	1.00	Ea.	$16,202.00	$16,202.00
D50201451040	Motor installation, three phase, 200 V,100 HP motor size	1.00	Ea.	$34,161.70	$34,161.70
D50201451080	Motor installation, three phase, 200 V, 125 HP motor size	1.00	Ea.	$36,048.40	$36,048.40
D50201451120	Motor installation, three phase, 200 V,150 HP motor size	1.00	Ea.	$42,535.20	$42,535.20
D50201451160	Motor installation, three phase, 200 V, 200 HP motor size	1.00	Ea.	$44,643.40	$44,643.40
D Services Subtotal					**$1,223,399.84**

Site plans

The traffic flow will not be disrupted except for material/equipment deliveries and trash/recyclable removal in which case flaggers will be present to ensure safe transport into and out of the site perimeter. We will require that all deliveries and pickups be made prior to 6:00 am unless otherwise restricted or special permission is provided. Adjacent building heights have been listed and the specific address has not been disclosed in accordance with the owner's requests. Materials will be hoisted into location by a crane or through the freight elevator located in the center of the building. The freight elevator will be faced with the main task of transporting personnel to and from each floor. due to the congestion of the site perimeter fences have been placed and pedestrian traffic has been rerouted this eliminating the requirement of overhead protection. The existing conditions and utilities are shown on the site plan drawing labeled existing conditions. These utilities are very congested and may cause logistical issues with assessments of the current status and their locations. Workforce considerations and key safety features will include a site fence in order to prevent pedestrians from entering the site. One way traffic will pass through the site in order to ease flow of traffic and reduce congestion or required turnaround areas. Flaggers utilizing the proper Personal Protective Equipment will be required anytime there are deliveries or pickups of trash or recyclables.

1. **Existing Conditions-see attachments**
2. **Site Layout Planning (Renovations)**
    a) **Staging of equipment and materials-see attachments**

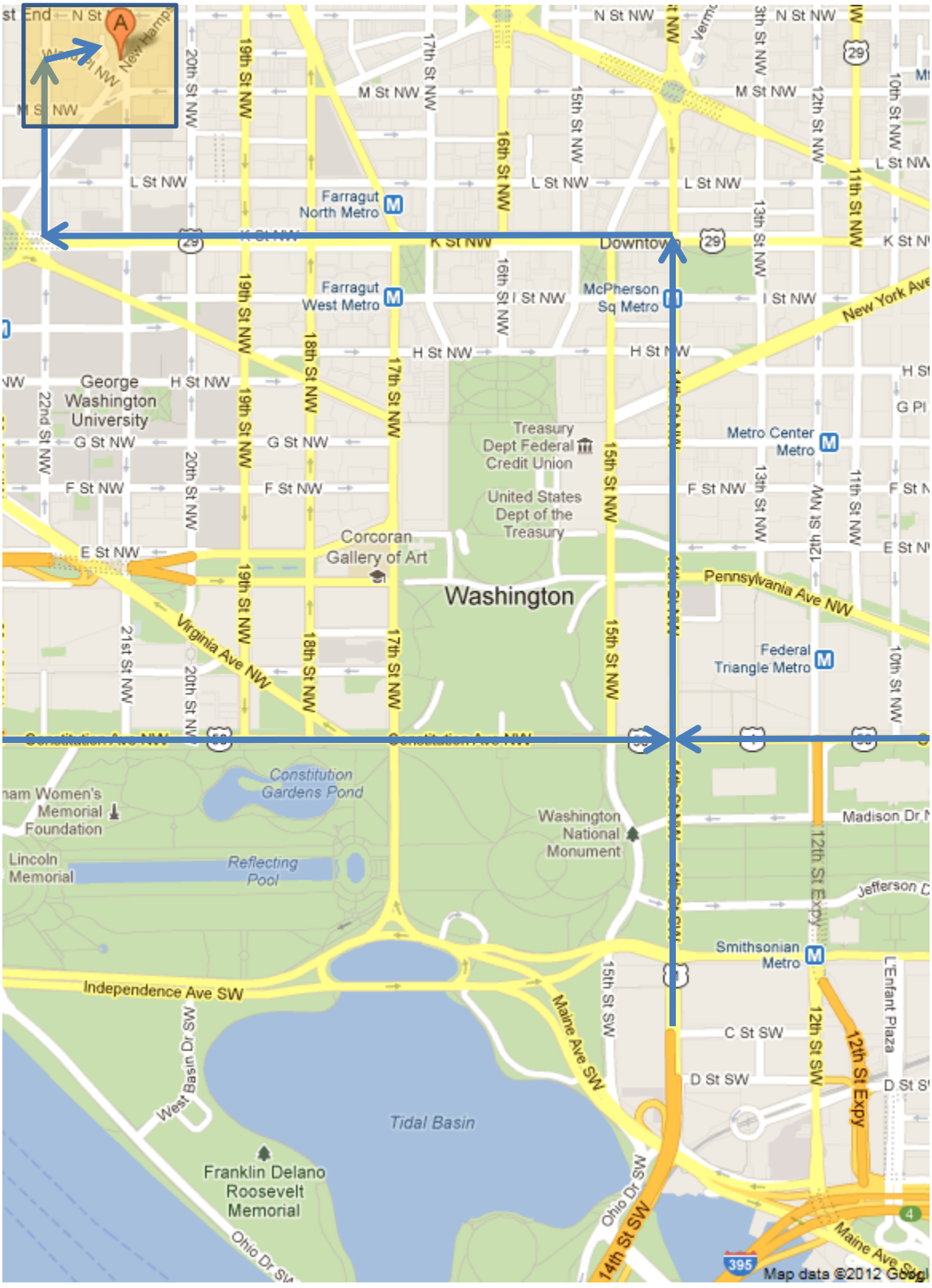


Figure 38 shows the main route suggested for material and equipment deliveries

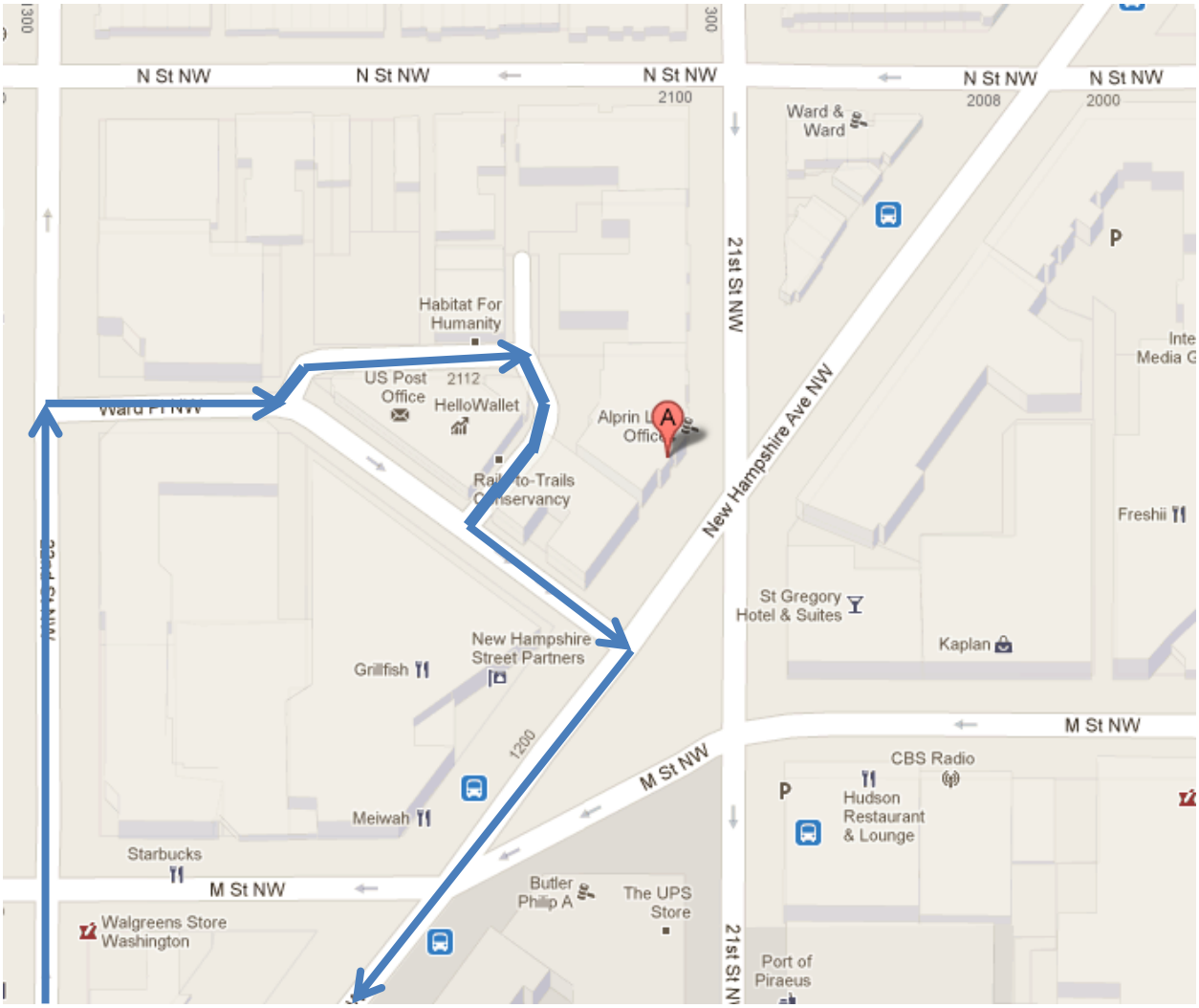


Figure 39 shows the suggested route for delivery of materials and equipment

b) **Demolition-see attachments**

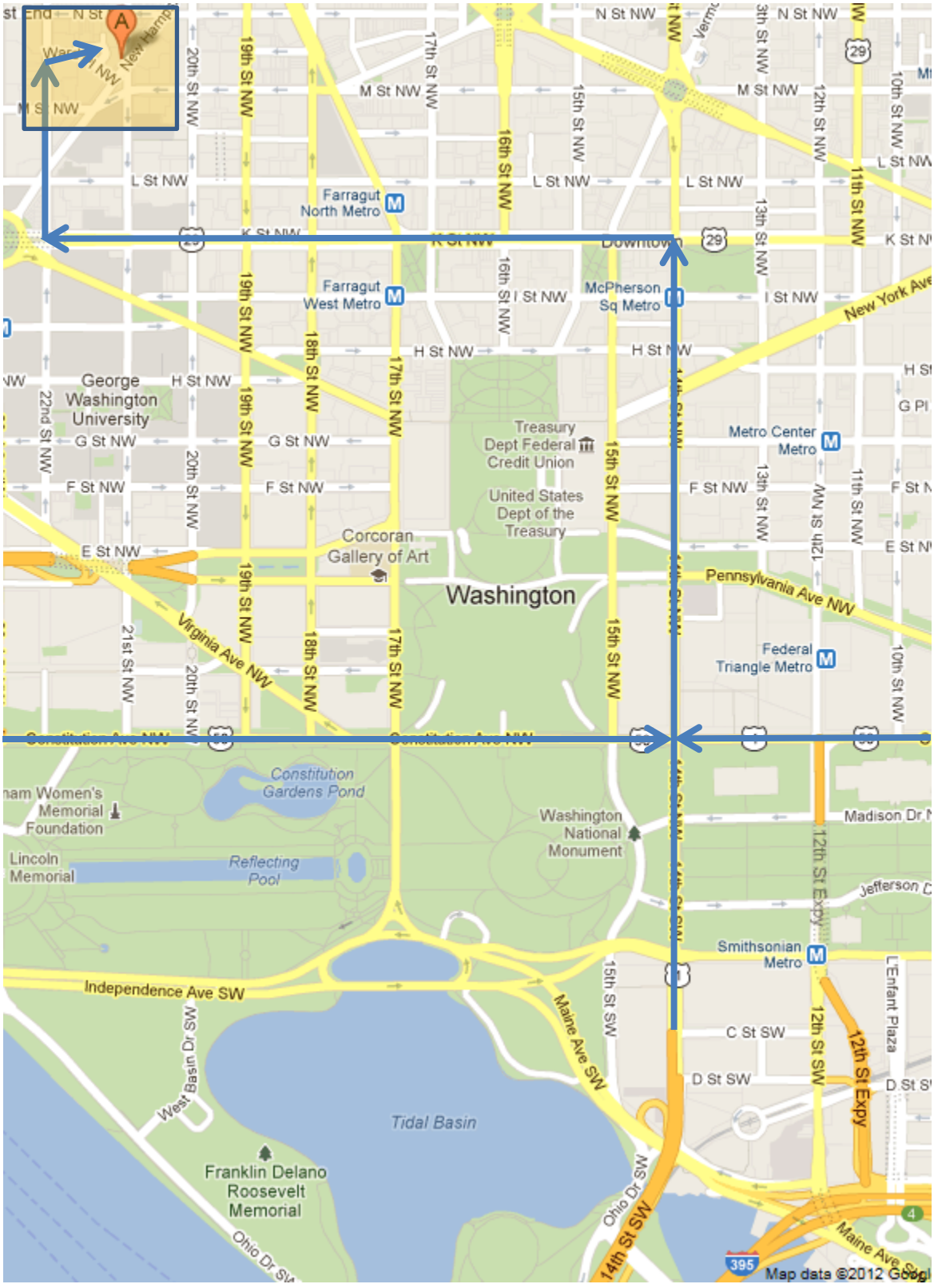


Figure 40 shows the suggested route for trash and recycled material removal

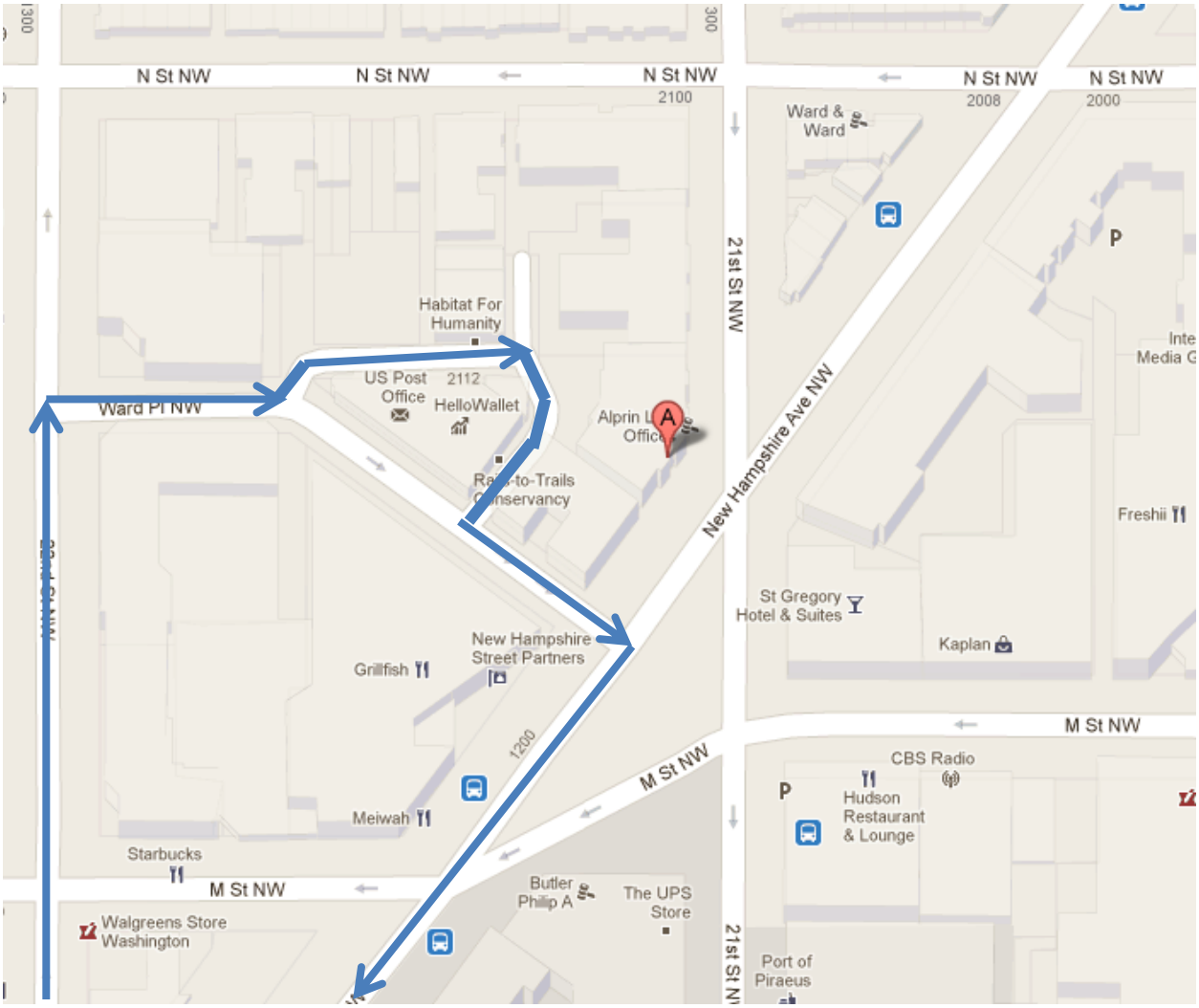


Figure 41 shows the suggested route for trash and recycled material removal

c) **Renovations-see attachments**

Local Conditions

1. **Subsurface conditions**-unable to locate this information based on inefficient maps and programs that do not show the soil conditions in the areas. Faculty provided website that was, unfortunately, not operating or capable of providing such information. Will provide details and more information as it becomes available.
2. **Water issues**-Since there is hardly any excavation and that this project is predominantly a renovation there is no real threat to the project cost or schedule due to water related issues.
3. **Tipping fees and recycling**-the plan is to employ a system of having the mixed garbage hauled off site where it is then sorted and recycled for an extra fee. This process will be beneficial to the site in order to ease congestion.

4. **Parking**-parking spaces will be provided on site for the project team and major foremen. Contractor parking will be off-site and employees will carpool or bus into the construction site.
5. **Preferred methods of construction**-since there are height restrictions in D.C. most structures are erected utilizing concrete.
6. **Hauling permits exceptions**-The "District of Columbia law prohibits a carrier from exceeding 25,000 pounds of Gross Vehicle Weight (GVW) on public space. Exceptions to the 25,000 pound gross vehicle weight limit can be provided by application to DDOT, the DC Department of Transportation. A petitioner is required to submit a formal application and pay a fee for exceptions to the 25,000 pound weight limit. The DDOT permitting office is located at 941 North Capitol Street, NW, Suite, 2300. (http://dmv.dc.gov/serv/dlicense/irp/IRP6.shtm)
7. **Zoning**-the building lot is located in DC/R-5-E Overlay

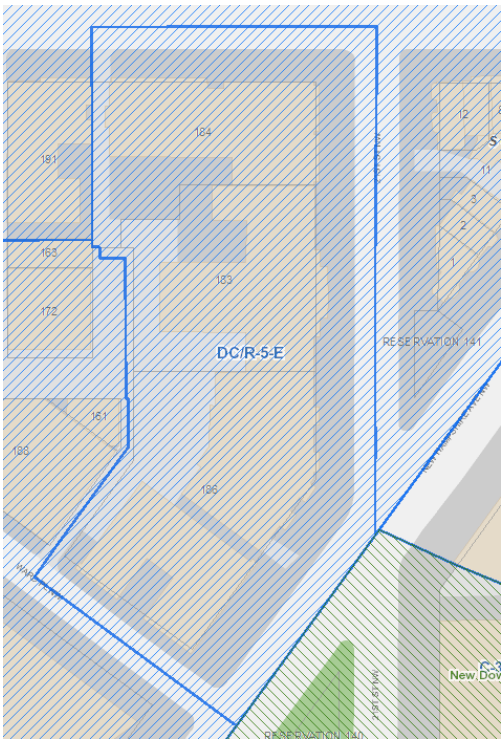


Figure 42 zoning map of the site

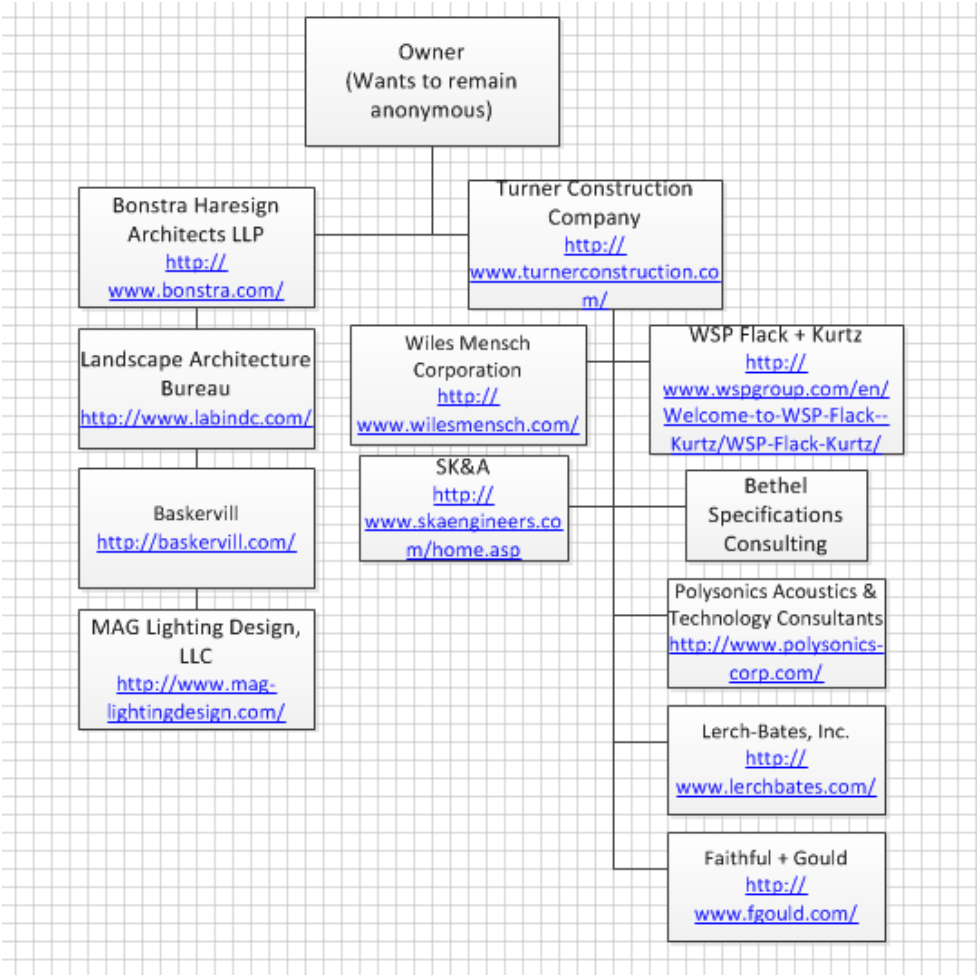
Client Information

The owner has requested that they not be mentioned or any other information be divulged concerning them, their company or their intentions concerning this renovation. They have requested early on that they do not wish to be exposed or mentioned in any reports for the thesis project. Based on the acceptance of this project for review I have agreed to a strict requirement of not providing any information in this matter. Information can be provided upon faculties' request. The owner is expecting a high-quality and efficient building with an extended life cycle and the capabilities of achieving LEED gold certification. They are expecting that the project be turned over on-time with little or no defects in order to optimize profits for the month of December and the New Year. The owner has expressed strong desires to

eliminate any delays in turnover or phasing of completion that might result in construction contractors or other employees completing substantial projects during the month of December when guests are expected to be housed. In order to meet owner's expectations contractors will need to follow the strict schedule in place and be willing to work 5-10 hour days and weekends if necessary in order to assure consistent progress and schedule of the project.

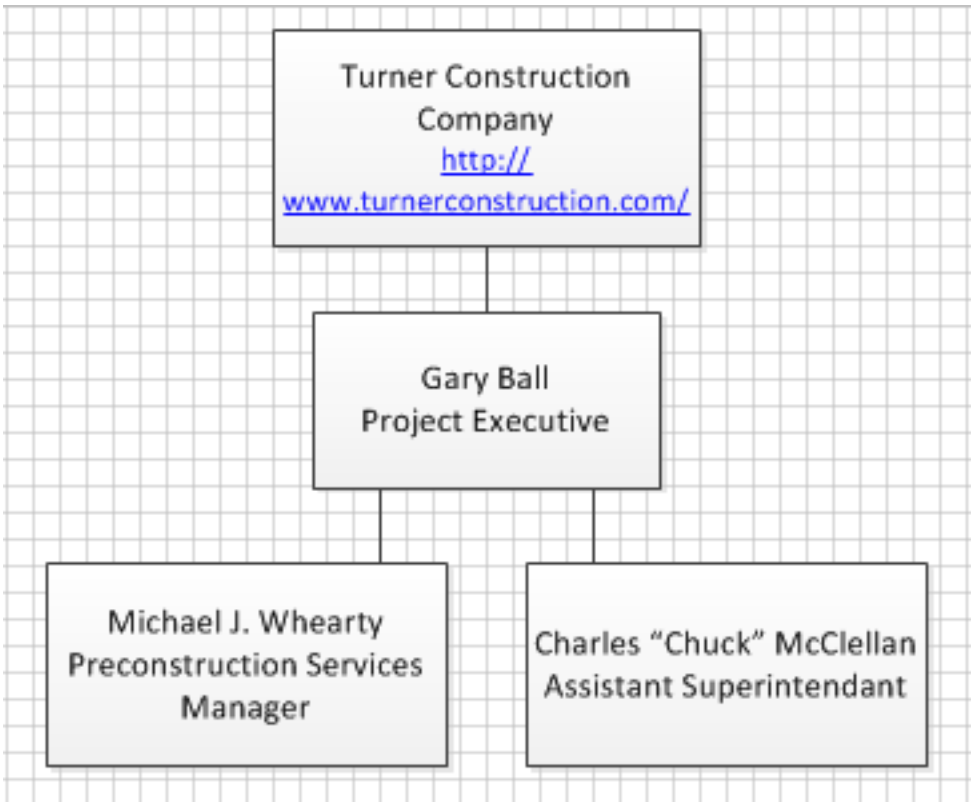
Project Delivery System

The project delivery system is a hybrid system of CM @ risk and CM agency with Turner holding many of the contracts associated with the construction of the building. They have a desire to eliminate any concern that owners might have by absorbing a great deal of risk in the construction process. The contractor selection method was done so using the lowest bid that met the full scope of work requirements with proper financial capabilities. And contractors that did not meet these requirements were immediately turned away. Contractor companies contracted for this project will be include 50 percent women, or minority owned companies and union labor contractors will also be responsible for the construction of this project.



Staffing Plan

The project executive Gary Ball will oversee the Assistant Superintendent Charles "Chuck" McClellan and the Preconstruction Services Manager Michael J. Whearty. This is only a partial staffing plan which is missing the Project Manager, and the Superintendent. Requests for the full information have been made previously and have not yet to be provided. Further details and information will be provided upon receipt of this information from the Turner Construction Company.



Work cited

https://maps.google.com/maps?hl=en&q=1230-1250+new+hampshire+NW&ie=UTF-8
http://www.dcoz.dc.gov/info/reg.shtm

http://www.southcapitoleis.com/pdfs/eis/final/04_technical_reports/05_Preliminary_Geotechnical_Subsurface_Conditions_Assessment_Tecnnical_Report.pdf

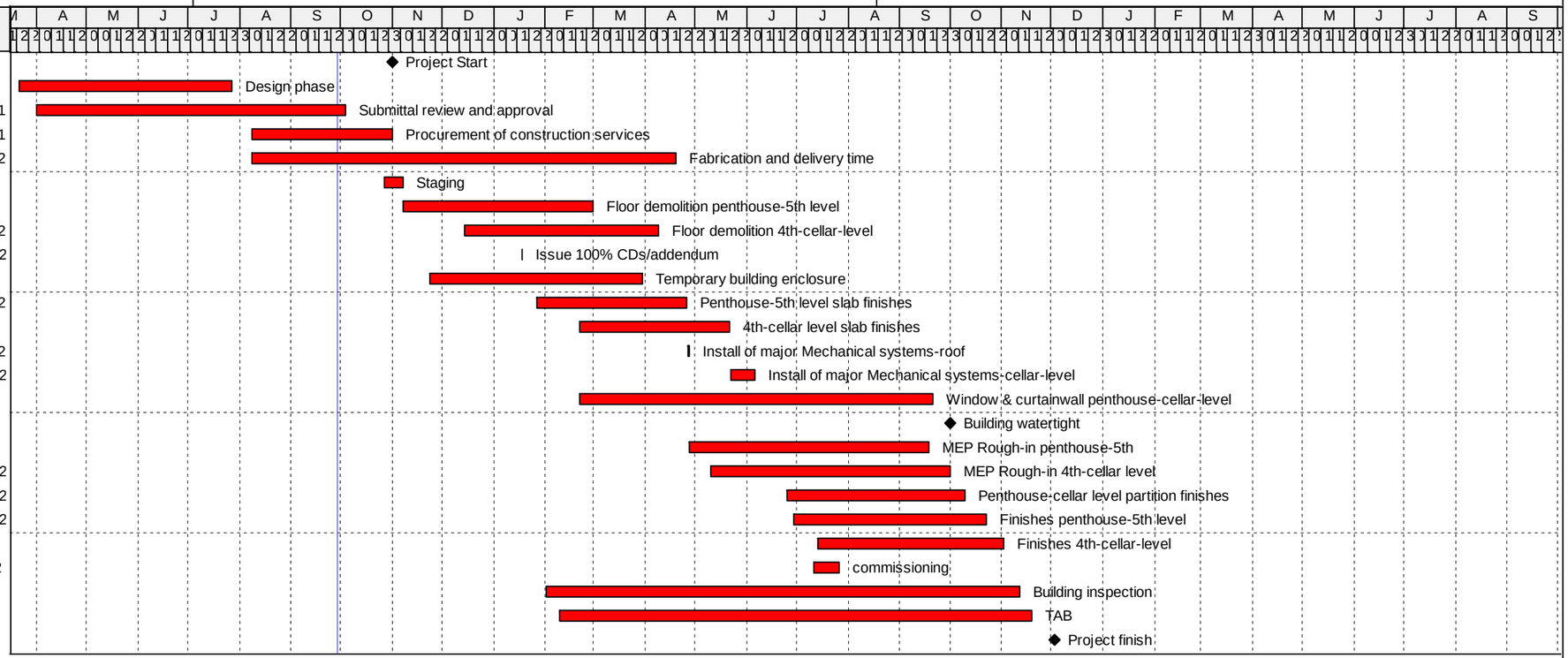
http://dmv.dc.gov/serv/dlicense/irp/IRP6.shtm

http://www.aaon.com/product.aspx?id=1

http://www.greenheck.com/products/detail/55

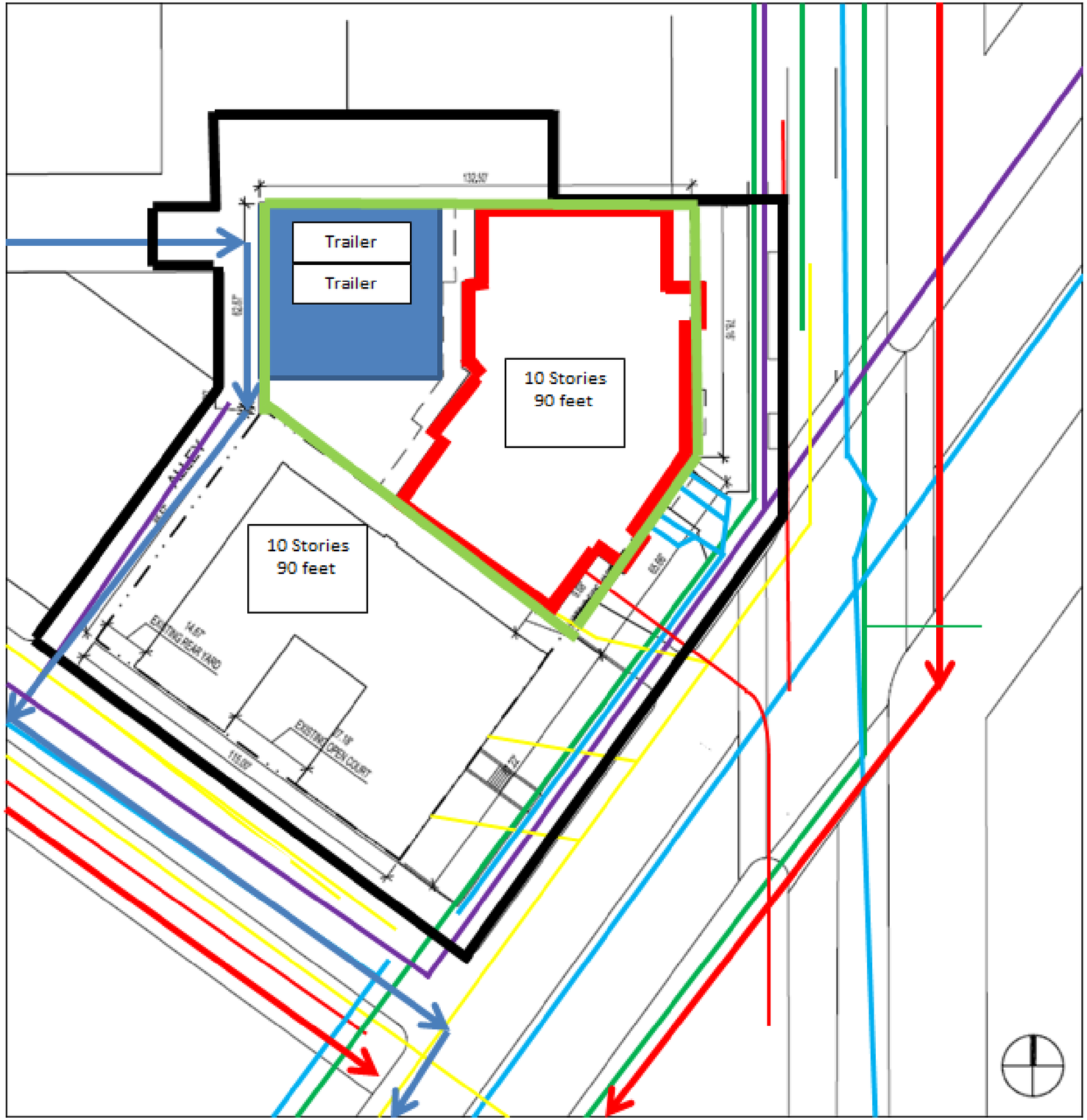
http://www.munters.us/en/us/Products--Services/Dehumidification/Energy-Recovery/Packaged-Energy-Recovery1/?Product=9B4168F8-61B0-4013-AF4F-BF7F0BCBE6B8

Activity Name	Original Duration	Start	Finish
Project Start	0	01-Nov-11	
Design phase	90	21-Mar-11*	27-Jul-11
Submittal review and approval	129	01-Apr-11*	03-Oct-11
Procurement of construction services	60	08-Aug-11*	31-Oct-11
Fabrication and delivery time	180	08-Aug-11*	19-Apr-12
Staging	7	27-Oct-11*	07-Nov-
Floor demolition penthouse-5th level	80	07-Nov-11*	29-Feb-
Floor demolition 4th-cellar-level	80	14-Dec-11*	09-Apr-12
Issue 100% CDs/addendum	0	18-Jan-12*	18-Jan-12
Temporary building enclosure	90	23-Nov-11*	30-Mar-
Penthouse-5th level slab finishes	65	26-Jan-12*	25-Apr-12
4th-cellar level slab finishes	65	21-Feb-12*	21-May-
Install of major Mechanical systems-	2	26-Apr-12*	27-Apr-12
Install of major Mechanical systems-	10	22-May-12*	05-Jun-12
Window & curtainwall penthouse-cel	150	21-Feb-12*	20-Sep-
Building watertight	0	01-Oct-12*	
MEP Rough-in penthouse-5th	100	27-Apr-12*	18-Sep-
MEP Rough-in 4th-cellar level	100	10-May-12*	01-Oct-12
Penthouse-cellar level partition finish	75	25-Jun-12*	10-Oct-12
Finishes penthouse-5th level	80	29-Jun-12*	22-Oct-12
Finishes 4th-cellar-level	80	13-Jul-12*	02-Nov-
commissioning	12	11-Jul-12	26-Jul-12
Building inspection	200	01-Feb-12*	12-Nov-
TAB	200	09-Feb-12*	19-Nov-
Project finish	0	03-Dec-12*	



Actual Work | Critical Remaining Work | Summary
Remaining Work | Milestone

TASK filter: All Activities
Resource Profile Filter:foreman.bob the builder



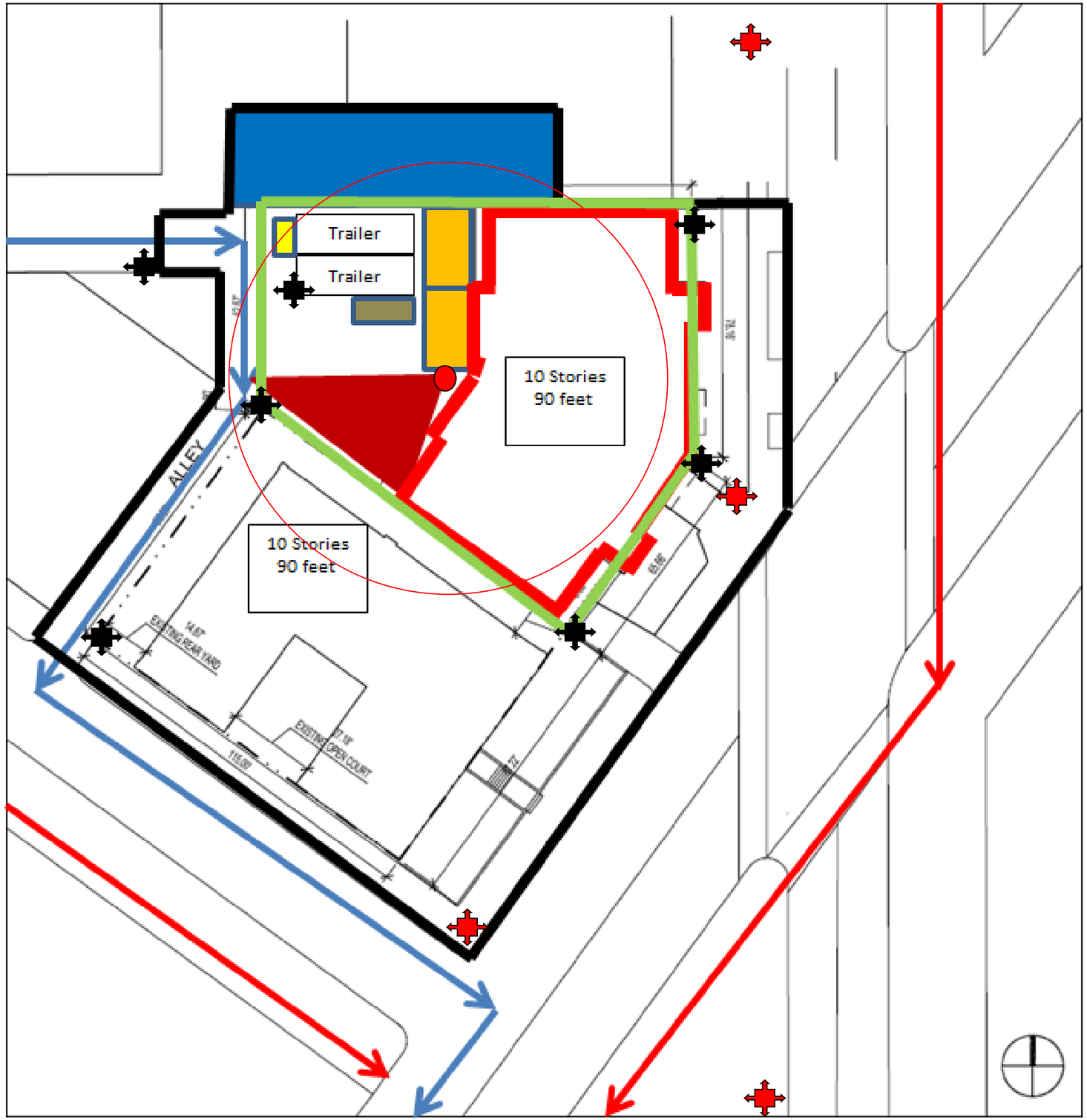
Existing Conditions

Ian Bower-Tech 1

9/20/2012

Legend

- Parking
- Gas
- Sewer
- Communications
- Water
- Electric
- Access roads
- Pedestrian Traffic
- Building Perimeter
- Fencing
- Property Line



Equipment/Material Staging

Ian Bower-Tech 1

9/20/2012

Legend

Parking

Access roads

Pedestrian Traffic

Building Perimeter

Fencing

Property Line

Porta Johns

Transformers

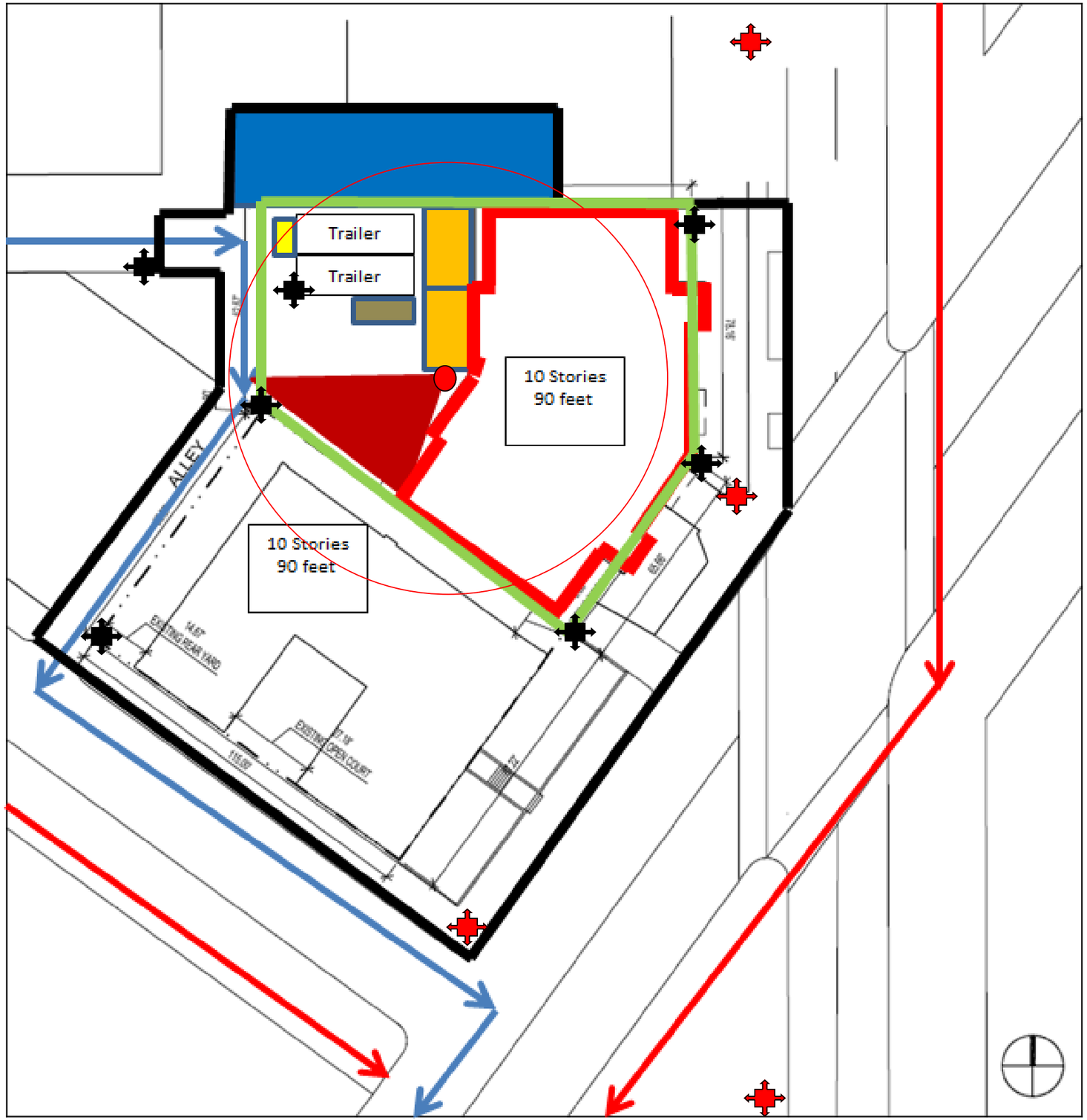
Dumpster/Recyclables

Material Storage

Temporary Lighting

Fire Hydrants

Crane



Demolition

Ian Bower-Tech 1

9/20/2012

Legend

Parking

Access roads

Pedestrian Traffic

Building Perimeter

Fencing

Property Line

Porta Johns

Transformers

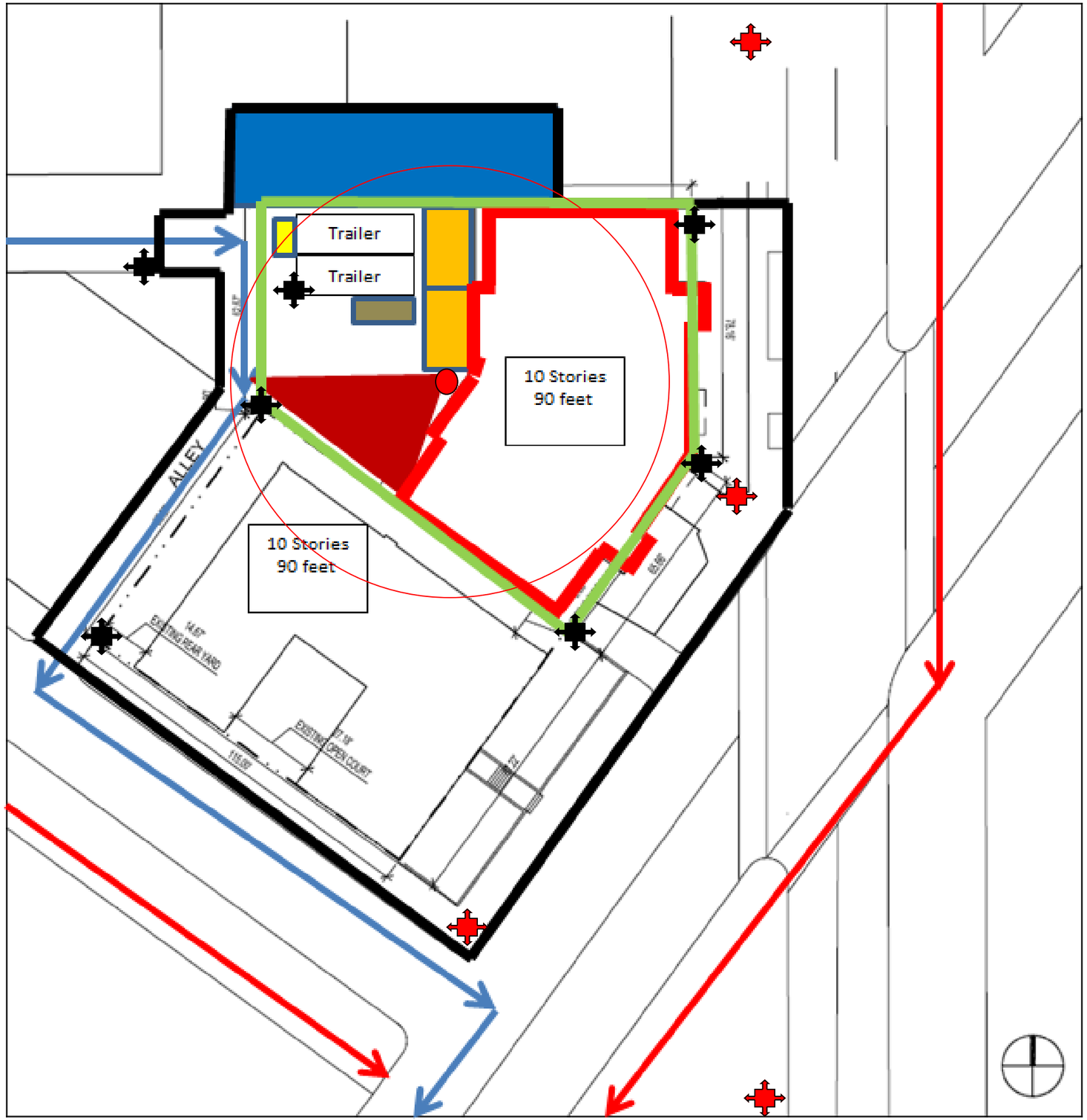
Dumpster/Recyclables

Material Storage

Temporary Lighting

Fire Hydrants

Crane



Renovations

Ian Bower-Tech 1

9/20/2012

Legend

Parking

Access roads

Pedestrian Traffic

Building Perimeter

Fencing

Property Line

Porta Johns

Transformers

Dumpster/Recyclables

Material Storage

Temporary Lighting

Fire Hydrants

Crane