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MECHANICAL DESIGN BRIEF

FOR

88 NORTH

RESIDENTIAL CONDOMINIUM BUILDING

88 QUEEN ST E., TORONTO, ONTARIO

OUR PROJECT NUMBER:

15428.000.M.001

DATE:

2015-12-15 (ISSUED FOR SITE PLAN APPROVAL) – REV 1

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1. INTRODUCTION

1.1. DESCRIPTION

1.1.1. It is expected the building will be a Group C construction located in Toronto, Ontario.

1.1.2. The building is considered a “High Building” by the definitions of the applicable building code (e.g. Ontario Building Code (OBC)).

1.1.3. The facility will be developed by Queen Developments Inc.

1.1.4. The building will be approximately 26,500 square metres (SM) or 285,000 square feet (SF) above grade and 29 stories tall with 4 stories below grade. Approximate building height is 94.5 metres (310 feet) from average grade to the floor of the roof level.

1.1.5. There will be approximately 420 suites in the building.

2. DESIGN STANDARDS

2.1. GENERAL

2.1.1. Mechanical systems shall be designed and installed to maximize usable space within the building while maintaining optimum service clearances for maintenance and repair.

2.1.2. All equipment and materials shall be designed and installed in a neat and orderly fashion. In finished areas all mechanical systems shall be concealed.

2.2. LEED/ENERGY CONSERVATION

2.2.1. The project shall not follow LEED process.

2.2.2. Design energy consumption to at least 19.3% below ASHRAE 90.1 model building or 36.3% below MNECB model building. This is a minimum goal and shall be evaluated in terms of the “Integrated Design Approach” to meet the City of Toronto Green Standard Tier 1.

2.3. CODES AND STANDARDS

2.3.1. Mechanical systems shall be in accordance with applicable codes and standards including, but not limited to:

- .1 Authorities Having Jurisdiction (local building department requirements, local fire department requirements, local by-laws)
- .2 National:
  - .1 Air Conditioning and Refrigeration Institute (ARI)
  - .2 American National Standards Institute (ANSI)
  - .3 American Standard for Testing and Materials (ASTM)
  - .4 American Society of Mechanical Engineers (ASME)
  - .5 American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE):
  - .6 Canadian/American Air Balance Council (CAABC)
  - .7 Canadian Standards Association (CSA):

.8 Model National Energy Code for Buildings (MNECB)

.9 Natural Gas Utilization Code

.10 National Fire Protection Association (NFPA)

.11 Sheet Metal and Air Conditioning Contractors National Association (SMACNA)

.3 Ontario

.1 Ontario Building Code (OBC)

.2 Ontario Fire Code (OFC)

.3 Ontario Electrical Safety Code

.4 Operating Engineers Act

2.4. OUTDOOR DESIGN CONDITIONS

2.4.1. The sizing of mechanical systems shall be based on the outdoor air conditions shown in the following table:

	Dry Bulb Deg.C (Deg.F)	Wet Bulb Deg.C (Deg.F)	
Cooling	31 (87.8)	23 (73.4)	OBC 2.5% [Toronto]
Heating	-20 (-4.0)		OBC 1% [Toronto]

2.5. VENTILATION FOR ACCEPTABLE INDOOR AIR QUALITY

2.5.1. Ventilation to meet acceptable indoor air quality shall be in accordance with ASHRAE Standard 62 and the applicable building code.

2.5.2. Specific minimum outdoor air (OA) ventilation rates are identified in the following table and are equal to the sum of per person value and per SM (SF) value:

	L/s (CFM) Per Person	L/s-SM (CFM/SF)	Minimum OA - ACH	Comment
Residential Suites (Condo)	2.4 (5)	0.3 (0.06)		See Note 1,2
General Amenity Spaces	2.4 (5)	0.3 (0.06)		
Gymnasium		1.5 (0.3)		
Lobby/Circulation		0.3 (0.06)		
Shipping		0.6 (0.12)		
Enclosed Parking		3.7 (0.75)		
Storage		0.6 (0.12)		

Note 1: Additional outside air shall be introduced at appropriate volumes to offset stack effect, and miscellaneous exhaust systems within suites at an approximate diversity factor of 30% on washroom exhaust fans.

Note 2: For condo suites, follow ASHRAE 62.1 Appendix E. For hotel suites follow ASHRAE 62.1

2.6. INDOOR DESIGN CONDITIONS

2.6.1. The indoor space conditions shall be in accordance with the following table:

	Summer	Winter

	Temperature Deg.C. (Deg.F.)	Relative Humidity	Temperature Deg.C. (Deg.F.)	Relative Humidity
Amenity areas, general circulation spaces	23.9 (75) +/-1 Deg.C.	50% +/-5%	22.2 (72) +/-1 Deg.C.	Note 1
Residential Suites	23.9 (75) +/-1 Deg.C.	50% +/-5%	22.2 (72) +/-1 Deg.C.	Note 1
Parking and all locker/storage/service rooms in parking areas	See Note 2	See Note 2	See Note 2	See Note 2
Loading dock, mechanical & electrical service spaces	See Note 3	See Note 3	18.4 (65) +/-1 Deg.C.	See Note 3

Note 1: No humidification.

Note 2: Ventilation only. No heating, cooling, or humidification.

Note 3: Ventilation and heating only. No cooling or humidification.

2.6.2. During the programming stage, the equipment provided for each space shall be reviewed in order to establish required cooling. In the event that insufficient equipment information is available the design shall assume the following minimums loads:

	Lighting W/SM (W/SF)	Equipment W/SM (W/SF)	Comments
Residential Suites	0 (0)	0 (0)	
General Amenity Spaces	15 (1.4)	22 (2.0)	
Lobby/Circulation	5.4 (0.5)	5.4 (0.5)	

2.7. BUILDING ENVELOPE

2.7.1. The following assumptions have been made to base the load calculations. These values need to be confirmed.

.1 Walls: R-18.3 (U-Value: 0.055 btu/sqft/degF)

.2 Roof: R-30 (U-Value: 0.033 btu/sqft/degF)

.3 Spandrel: R-4.5 (U-Value: 0.222 btu/sqft/degF)

.4 Glass: U-Value: 0.35 btu/sqft/degF; SC: 0.40, no internal shading

Note: Values above are for the overall assembly.

2.8. AIR FILTRATION DESIGN

2.8.1. The following air filtration levels are proposed for the new HVAC air handling systems indicated:

.1 Exhaust air systems: None

.2 Exhaust air systems c/w Heat Recovery MERV 7 (Formerly 30%)

.3 Supply air systems (Pre Filters): MERV 7 (Formerly 30%)

.4 Supply air systems (Final Filters): MERV 14 (Formerly 95%)

2.8.2. Environmental discharges (i.e. exhausts) are regulated by Authorities having Jurisdiction (e.g. in Ontario under the Ministry of the Environment). The owner shall be required to apply for the appropriate approval. In Ontario, for example, such approvals

include “Environmental Activity and Sector Registry” (EASR) or “Environmental Compliance Approval (ECA)”. An ECA requires a study of discharges. The User must provide a list of chemicals that are being exhausted to the Environmental Consultant in order to complete such a study.

2.9. NOISE DESIGN CRITERIA

2.9.1. All mechanical systems and components shall be designed and installed with attention to reducing sound and vibration levels to meet noise criteria and provide a space that is comfortable, acoustically, for the occupants.

2.9.2. Noise levels due to mechanical equipment, ductwork, grilles, registers, terminal devices, and diffusers shall be designed not to exceed the recommended ASHRAE limit listed below for the areas indicated:

	NC (low)	NC (high)	Comments
Residential Suites	30	35	
General Amenity Spaces	35	40	
Lobby/Circulation	40	45	
Property Line		45	

2.9.3. The identified noise criteria resulting from the operation of mechanical systems assumes a finished room with all the final architectural finishes (e.g. ceilings and floor finishes) and furniture in place.

2.9.4. The acoustic performance of the project including mechanical systems shall be reviewed by the acoustical consultant.

2.10. SYSTEM REDUNDANCY

2.10.1. There shall be N+1 redundancy (Components - N - have at least one independent backup component +1) applied to the following systems:

.1 Heating water pump system;

.2 Storm sump pumps;

.3 Sanitary sump pumps;

.4 Diesel fuel pumps;

2.11. TENANT AREAS

2.11.1. Areas that will be fit-up under separate contract are referred to as “Tenant Areas” and include:

.1 Ground Floor Retail.

2.11.2. The building includes provisions for future Tenant Areas for the following base building services:

.1 Valve/capped connection to domestic cold water.

.2 Capped connection to sanitary drain and vent.

.3 Valve/capped connection to natural gas.

.4 Valve/capped connection to heating water.

.5 Valve/capped connection to chilled water.

.6 Capped connection for outdoor ventilation air.

.7 Capped connection for washroom exhaust air.

.8 Capped connection for general exhaust air.

3. HVAC

3.1. GENERAL

3.1.1. The heating, ventilation and air conditioning (HVAC) design and installation shall conform to current applicable codes and standards and shall be sized by recognized computation procedures referenced in ASHRAE.

3.1.2. Distribution pumps shall be duplex, lead/lag systems (two pumps sized at 100% of the peak design circulation rate) to provide redundancy during times of service. Pumps shall be base mounted or vertical inline centrifugal type with mechanical seals and complete with cyclone separators and sight glass for all pumps over 7-1/2 hp.

3.1.3. Variable flow distribution systems shall utilize variable frequency drives (VFD) on the distribution pumps and two-way control valves at the terminal devices. Minimum system flow rates shall be maintained either by including three-way control valves at a sufficient number of terminal devices or by installing a two-way (bypass) control valve across the supply and return mains modulated by a differential pressure controller.

3.1.4. All piping except for residential fan coil unit risers shall be Schedule 40 black steel pipe to ASTM-A53. Pipe 2-1/2 in. and larger shall be welded. Pipe 2 in. and smaller shall be screwed. Groove lock (Victaulic) piping will be an acceptable alternative where joints are accessible such as mechanical rooms or above acoustic tile ceilings.

3.1.5. Fan coil unit risers shall be type L copper.

3.2. HEATING SYSTEM

3.2.1. The heating plant shall consist of four (4) high efficiency, gas-fired, condensing type forced draft boilers each sized for approximately 25% of the total heating water requirement. Each boiler shall be sized for approximately 1,025 kW (3,500 MBH) input. Boilers shall be equal to Aerco, Viessmann, Cleaver Brooks, Lochinvar, or Buderus.

3.2.2. The heating plant shall be sized to serve:

.1 Perimeter envelope losses.

.2 Building air handling unit heating coils.

.3 Pool heating.

.4 Snow melting.

.5 Entrance heating and other miscellaneous heating elements.

3.2.3. The heating water pumping system shall be primary/secondary.

.1 The primary system shall consist of one pump dedicated to each boiler.

.2 The secondary pumping system shall consist of two variable speed pumps in a run/standby configuration. Secondary systems shall be provided for:

.1 Suite fan coil units, perimeter heating in the common areas, pool water heating, snow melting, misc. heating loads, and air handling unit heat exchangers. Heating control shall be through the use of two-way valves.

3.2.4. The heating plant including boilers and all distribution pumps shall be on **emergency power**.

3.2.5. Heating coils not subjected to below freezing conditions shall be serviced by the heating water system.

3.2.6. Heating coils subjected to below freezing conditions shall be serviced by a glycol heating system complete with plate and frame heat exchanger and glycol distribution pumps. Glycol shall be 40% propylene glycol by volume.

3.2.7. Perimeter heating in the lobby and amenity spaces shall be provided through sill or pedestal mounted heating where air handling systems (fan coil units, etc.) cannot handle the load in the space.

3.2.8. Entrances and service spaces shall be heated by hydronic force flow heating cabinets or unit heaters.

3.2.9. Snow melting systems shall consist of high density cross-linked polyethylene tubing embedded into the structure/system. System shall be complete with distribution manifolds, circuit isolation and balancing valves, and controls. Tubing shall be rated for not less than 82.2 deg. C. (180 deg. F.) working temperature and 150 psig working pressure. Glycol shall be 40% propylene glycol by volume.

3.2.10. Chemical treatment systems including pipe line filters shall be provided for all heating water systems.

3.3. COOLING SYSTEM

3.3.1. A central chiller plant located in the mechanical penthouse shall produce chilled water for cooling.

3.3.2. The chiller plant shall be located over a floating floor. Floating floor is not by Division 15

3.3.3. The chilled water plant shall be decoupled into a primary and secondary pumping system.

3.3.4. The chilled water plant shall be a variable primary flow pumping system.

3.3.5. The chiller plant shall consist of:

.1 Magnetic Bearing Centrifugal compressors;

.2 Chiller-1 shall be able to produce 3,816 L/min (1,008 USgpm) of chilled water from 13.9 to 5.6 deg.C. (57 to 42 deg.F.) for a nominal capacity is 2,214 kW (630 tons). Chiller shall have 100% load performance efficiency of no greater than 0.635 kw/ton and an IPLV of ## kW/ ton.

.3 Acceptable products: McQuay, York, or Carrier

3.3.6. The chilled water pumping system shall be primary/secondary and consist of one primary pump per chiller.

3.3.7. A secondary chilled water pump set shall vary flow in response to building requirements through the use of variable speed drives. Maximum system **flow is ## L/min (**## USgpm). Approximate system head for secondary pumps is ## kPa (## ft.H2O).

3.3.8. The chilled water pumps shall vary flow in response to the building requirements through the use of variable speed drives. The water pumping system shall be primary and consist of one pump per chiller complete with an automatic isolation valve at each

chiller. A differential pressure controlled bypass shall maintain a minimum flow in the chiller plant.

3.3.9. The condenser water system shall consist of:

.1 One (1) two-cell cross-flow induced forced draft cooling tower with each cell designed for ## L/min (## USgpm) of condenser water from 35.6 to 28.9 deg.C. (96 deg.F. to 84 deg.F.) with a design wet bulb temperature of 24.4 deg.C. (76 deg.F.).

.1 The total capacity of the cooling tower is 630 tons.

.2 The cooling tower motors shall be equipped with variable frequency drives. Each cell is equipped with one ## kW (## Hp) fan.

.3 The cooling tower shall be winterized with electric sump heaters to allow for winter operation.

.4 Acceptable products: Baltimore Aircoil (BAC), Marley, or Evapco.

3.3.10. Cooling tower sump heaters shall be on **emergency power**.

3.3.11. One condenser water pump shall be provided for each cell and shall be sized for ## L/min (## USgpm). Approximate system head for primary pumps is ## kPa (## ft.H2O).

3.3.12. Chemical treatment system including pipe line filters shall be provided for the chilled water and condenser water systems.

3.3.13. A side stream solids separator with separate circulation pump shall be provided for condenser water circuit to extract and filter 5% of the peak flow rate. A basin sweeping filtration system complete with solids separator with separate pump shall be provided for the condenser water system.

3.4. HUMIDIFICATION

3.4.1. Humidification will not be provided for the residential suites or common areas.

3.5. AIR HANDLING SYSTEMS

3.5.1. <u>Suite Fan Coil Units</u>

.1 Suites shall be provided with high-rise vertical, floor mounted, four pipe fan coil units with a full access panel in front of the units complete with supply and return grilles. Acoustically lined return opening shall be included;

.2 Loft units shall be provided with horizontal, slab-hung fan coil units recessed into ceiling bulkheads complete with full access panels beneath units.

.3 With the exception of larger suites, one fan coil unit shall be provided per suite and ducted (within ceiling space or bulkheads) to each bedroom/living area. A transfer fan may be used to ventilate interior dens and bedrooms.

.4 Units shall be pressure-rated for high-rise application, 1,723 kPa (250 psig), and complete with pre-piping packages (including drain riser) that allow for quick installation;

.5 Thermostat shall be remote mounted.

3.5.2. <u>Suite Exhaust with Enthalpy Recovery Ventilators</u>

.1 The primary bathroom exhaust for each suite shall be collected and ducted via a local enthalpy recovery ventilator (ERV) to the perimeter. Outdoor air be pre-heated (ERV) and introduced into the intake of the fan coil unit.

.2 The primary bathroom exhaust for each suite shall run continuously on low speed and shall switch to high speed via a local switch. If a suite has more than one bathroom, those additional (secondary) bathroom exhausts shall be individually ducted to the perimeter and exhausted.

.3 Kitchen range exhaust shall be individually ducted to the perimeter and exhausted.

.4 Laundry exhaust shall be individually ducted to the perimeter and exhausted complete with booster fan and lint trap. A current sensing relay shall be provided to start/stop the exhaust fan.

3.5.3. Amenity Spaces

.1 Suite style vertical and/or horizontal fan coil units will be provided in all amenity spaces and connected to the central chilled water system.

3.5.4. Residential Corridor Ventilation

.1 Tempered (heated and partly cooled) ventilation/outdoor air shall be supplied to the corridors by a 100% outdoor air, constant air volume indoor air handling unit.

.2 Unit shall be self-contained cooling connected to the chilled water system.

.3 Unit shall consist of dampers, filters, chilled water cooling coil, glycol heating coil, and supply fan.

.4 Commercial units shall be equal to McQuay, Trane, York, or Engineered Air.

.5 System capacities shall be as follows:

	Airflow L/S (CFM)	Cooling kW (Ton)	Heating kW (Btu/hr)	Comments
AHU	1,416 (3,000)	33.3 (9)	75.3 (257,145)	Loft units
AHU	5,189 (11,000)	122.0 (35)	276.1 (942,865)	Tower units – upper
AHU	5,189 (11,000)	122.0 (35)	276.1 (942,865)	Tower units - lower

.6 Acoustical concerns shall be addressed as described in the Noise and Vibration Control Section.

3.5.5. Parking Ventilation

.1 A ventilation system consisting of supply and exhaust fans shall be supplied for the parking area. The ventilation rate shall be the minimum identified Building Code rate. Parking exhaust fans shall be on **emergency power**.

.2 The parking ventilation system shall be started and stopped by a carbon monoxide (CO) detection system. Exhaust fans shall be interlocked with the supply fan. When any CO sensor detects 50 ppm the lead exhaust fan shall start and the supply fan shall operate at low speed. When any CO sensor detects 100 ppm, the lag exhaust fan shall start and the supply fan shall operate at high speed.CO system shall be equal to BW Technologies DC-420. Sensors shall be located 1,500 mm (60 inches) above the finish floor. Sensors shall have an accuracy of 1 ppm and shall have a 0-100 ppm range.

.3 Heated spaces in the parking level shall be equipped with electric unit heaters to maintain space temperature above freezing.

.4 Parking elevator lobbies shall be pressurized with ventilation air fed from heating only glycol outdoor air make-up units.

3.5.6. Loading Dock Ventilation

.1 A ventilation system consisting of supply and exhaust fans shall be supplied for the loading dock areas. The ventilation rate shall be the minimum identified Building Code rate.

.2 The ventilation system shall be started and stopped by a carbon monoxide (CO) detection and/or nitric oxide (NO) system. Exhaust fans shall be interlocked with the supply fan. When any CO/NO sensor detects 50 ppm the lead exhaust fan shall start and the supply fan shall operate at low speed. When any CO/NO sensor detects 100 ppm, the lag exhaust fan shall start and the supply fan shall operate at high speed. CO/NO system shall be equal to BW Technologies DC-420. Sensors shall be located 1,500 mm (60 inches) above the finish floor. Sensors shall have an accuracy of 1 ppm and shall have a 0-100 ppm range.

3.5.7. Miscellaneous Systems

.1 Elevator machine and controller rooms shall be provided with split system cooling units capable of operation at low ambient temperatures. Hydraulic and machine-less elevator machine rooms shall be exhausted to maintain at a negative pressure to maintain ventilation air into the room.

.2 Separate washroom exhaust systems shall be provided for the washroom groups if they are not attached to heat recovery systems. The make-up shall be transferred from the adjacent corridors.

.3 Ventilation systems, comprising outdoor and an exhaust air fan, shall be provided for the mechanical and electrical rooms. Each system shall cycle the fan to maintain a space temperature.

.4 Below grade stairs (from parking to exit to outdoors) shall be provided with stair pressurization fans in accordance with Code. Fans shall start on a fire alarm condition. Below grade stair pressurization fans shall be sized for 470 L/s (1,000 cfm) per floor at 248 pa. (1 in.WC) external static pressure. Fan and duct system shall be contained in a fire-rated enclosure from outdoor intake to discharge near or at the bottom of the stair.

3.6. NOISE AND VIBRATION CONTROL

3.6.1. All mechanical equipment shall be equipped with vibration isolation control measures to reduce the transfer of vibration generated noise into the building structure.

3.6.2. All supply, return and exhaust air system shall be equipped with silencers to reduce the duct borne equipment noise in the occupied spaces to acceptable NC levels. Attenuators are acceptable on variable air volume (VAV) boxes and fan powered VAV boxes provided acceptable to the acoustic consultant.

3.7. INSULATION

3.7.1. Insulation for HVAC systems shall be in accordance with ASHRAE 90.1.

4. PLUMBING

4.1. GENERAL

4.1.1. The Plumbing System shall conform to the applicable building code (e.g. Ontario Building Code (OBC)).

4.1.2. All exterior site services including external cisterns shall be provided under the “Site Works” contract. Scope of work for this Division shall end at 1,500 mm (60 inch) outside building perimeter.

4.1.3. Above floor storm drains, sanitary drains and vents, 65 mm (2-1/2 inch) and larger shall be cast iron.

4.1.4. Above floor sanitary drains and vents, 50 mm (2 inch) and smaller shall be hard temper DWV copper drainage tubing.

4.1.5. Buried storm piping within the building shall be PVC.

4.1.6. Buried sanitary piping within the building shall be PVC.

4.1.7. Domestic water piping shall be copper type L.

4.1.8. Domestic water within suites shall be distributed from a common suite manifold, through the slab with PEX piping to the fixtures. All PEX piping within the slabs shall be complete with conduit to permit removal and future replacement. At each manifold, provide a domestic hot water and domestic cold water meter.

4.1.9. Valves shall be Crane or equal of type and construction to suit service and working pressures.

4.1.10. For all services 50 mm (2 inch) and smaller 4,136 kPa (600 psig) WOG ball valves shall be used.

4.2. STORM SYSTEMS

4.2.1. A complete system of roof drains and storm drainage piping shall be provided.

4.2.2. New above grade drains shall be collected and drained by gravity to site storm sewers.

4.2.3. Weeping tile shall be collected in settling sumps and transferred to sump pits complete with duplex submersible pumps. Pits shall be pumped into site services storm drainage system. Sump pumps shall be on **emergency power** (if available).

4.2.4. To accurately and appropriately size the sump pits and pumps, the geotechnical consultant should provide flow rates based on the soil tests/borehole results.

4.2.5. The civil consultant shall prepare the storm water management (SWM) approach for the site, which may determine that a retention storm cistern is required.

4.3. SANITARY SYSTEMS

4.3.1. A complete system of plumbing fixtures and sanitary drainage and vent piping shall be provided.

4.3.2. New above grade drains shall be collected and drained by gravity to site sanitary sewers. Drains below the municipal services invert elevations shall be collected in sump pits complete with duplex submersible pumps. Pits shall be pumped into the gravity drainage piping. Sump pumps shall be on **emergency power** (if available).

4.4. PLUMBING FIXTURES

4.4.1. The plumbing fixtures shall be selected by interior design.

4.4.2. Plumbing fixtures shall be water conserving type. Minimum (Refer to LEED/ENERGY CONSERVATION) baseline requirements:

	Metric	Imperial	Comments
Water Closets	6.0 Litres per flush	1.6 Gallons per flush	
Urinals	3.8 Litres per flush	1.0 Gallons per flush	
Lavatories (Public)	3.8 LPM @ 414 kPa	1.0 GPM @ 60 psig	
Lavatories (Private)	3.8 LPM @ 414 kPa	1.0 GPM @ 60 psig	
Showerheads	5.7 LPM	1.5 GPM	

4.5. DOMESTIC COLD WATER

4.5.1. A 150 mm (6 inch) domestic water service shall be brought into the building for domestic water and fire services. The domestic water and fire services shall be isolated from the municipal water supply by approved backflow prevention devices.

4.5.2. A domestic cold water booster system shall be provided to maintain a minimum pressure of 310 kPa (45 psig) in the mechanical penthouse. Booster system shall consist of three pumps sized for 35% of the peak flow and equipped with variable speed drives. The domestic cold water booster system shall be on **emergency power.**

4.5.3. A replaceable bladder expansion tank suitable for domestic cold water shall be installed on the highest point of the domestic cold water system to reduce potential of water hammer and pump cycling on low load.

4.5.4. Pressure independent loops shall be provided for every ten floors to ensure the pressure does not exceed 80psi at any fixture. This shall be achieved via 1/3 – 2/3 PRV station assembly located in the electrical closets on selected floors.

4.6. DOMESTIC HOT WATER

4.6.1. Domestic hot water shall be generated by two gas-fired storage water heaters connected to two ## Litre (## USgallon) storage tanks each sized for 50% of the building load and located in the mechanical room.

.1 A recirculation loop and recirculation pump shall maintain flow in the domestic hot water system to maintain hot water at the fixtures at all times.

4.6.2. A replaceable bladder expansion tank suitable for domestic hot water shall be installed on the domestic hot water system to accommodate thermal expansion.

4.6.3. Domestic hot water in the retail spaces shall be generated by local tenant supplied electric domestic hot water heaters.

4.7. RECLAIMED RAIN WATER SYSTEM

4.7.1. Rainwater from new roof drains shall be collected in a storm water management tank (by Division 2) where it is then strained, filtered, and pumped for reuse as required by the Toronto Green Development Standards.

4.8. A tank mounted pressure sensor shall monitor the rainwater level in the cistern.

4.9. NATURAL GAS

4.9.1. Natural gas shall be distributed to the boiler room and BBQs in the amenity spaces. All gas piping shall be schedule 40. Piping 65 mm (2-1/2 inch) and larger shall be welded. All gas piping shall be painted yellow in its entirety including concealed areas.

4.9.2. A high pressure riser 34.5 kPa (5 psig) shall serve the mechanical penthouse. A low pressure PRV station at approximately 1,744 to 2,740 Pa (7 to 11 in.WC.) shall be provided to serve the amenity spaces.

4.10. INSULATION

4.10.1. Insulation for plumbing systems shall be in accordance with ASHRAE 90.1.

4.10.2. All exposed insulation shall be complete with PVC jacket or canvas lagging suitable for painting.

5. POOL WATER SYSTEMS

5.1. Pool water systems shall be designed by the pool consultant. Heating may be provided from a titanium plate and frame heat exchanger fed from the boiler heating water system.

6. FIRE PROTECTION AND LIFE SAFETY SYSTEMS

6.1. GENERAL

6.1.1. The Fire Protection System shall conform to the applicable building code (e.g. Ontario Building Code (OBC)).

6.2. SPRINKLER

6.2.1. A wet pipe, hydraulically sized sprinkler system shall be installed for the building. Sprinkler design shall be to NFPA 13.

Discussion:
The owner has confirmed with their insurer that other standards such as Factory Mutual (FM) or Insurance Advisory Organization (IAO) are not required. [TO BE CONFIRMED]

6.2.2. Sprinkler heads shall be:

.1 Upright brass type where no ceiling exists.

.2 Concealed type where ceilings occur.

.3 Sidewall or concealed in suites.

6.2.3. All piping 65 mm (2-1/2 inch) and larger shall be schedule 40 with Victaulic fittings.

6.2.4. All piping 50 mm (2 inch) and smaller shall be screwed.

6.2.5. The following sprinkler zones and coverage is anticipated.

Area	Type	Hazard	Remarks
Indoor parking garage	Dry	Ordinary GR2	
Amenity Spaces and Suites	Wet	Light	
Gymnasium	Wet	Light	

Mechanical Rooms, Storage Rooms	Wet	Ordinary GR1	

6.2.6. All supervised valves shall have end switches. Division 16 shall wire valves and switches into the main fire alarm panel.

6.2.7. Retail and/or Tenant areas shall be provided with upright sprinklers on a “grid” pattern to meet occupancy requirements.

6.3. STANDPIPE SYSTEMS

6.3.1. The building exceeds the area restrictions of the applicable building code (e.g. Ontario Building Code (OBC)), and as such, requires a fire standpipe system complete with fire hose cabinets equipped with 38mm (1-1/2”) hose reels and 65mm (2-1/2”) hose connections.

Note:

For residential occupancy (e.g. condominium, hotel), consideration may be given to have the code consultant shall prepare and submit an Alternative Compliance Permit to locate the fire standpipe and hose within the stairwell in order to eliminate the fire hose cabinets on the hotel suite floors. Standpipe risers in “Scissor Stairs” must be fire-rated as it passes through fire separation between the stairs. [TO BE CONFIRMED]

6.3.2. Listed pressure reducing devices shall be installed where pressure exceeds 689 kPa (100 psig) at 38mm (1-1/2”) hose reels and exceeds 1,206 kPa (175 psig) at 65mm (2-1/2”) hose connections.

6.3.3. All fire hose cabinets on the ground floor (excluding when in service areas) shall have a brushed 304 stainless steel finish. Fire hose cabinets in other areas shall have prime painted steel doors. Fire hose cabinets shall be equipped with a fire extinguisher.

6.3.4. The parking garage shall be equipped with a dry standpipe system. An air dryer shall be installed on the compressed air supply to reduce moisture within the system. Drum drips on the standpipe system shall be electrically traced.

6.3.5. Vertical and horizontal standpipe piping shall be enclosed in 2hr fire rated enclosure. Where accepted by local authority having jurisdiction (e.g. Ontario), vertical standpipe does not require a fire rating provided it is located within a stairwell or service area having 2hr fire separate from the remainder of the floor.

6.4. SPRINKLER AND STANDPIPE WATER SERVICE

6.4.1. A ULC listed, combined sprinkler/standpipe pump shall boost incoming service water to the required pressure level for fire protection.

6.4.2. Fire pumps shall be complete with jockey pump, bypass, and test header piped to a street location.

6.4.3. Fire department siamese connections shall be provided for the sprinkler and standpipe system and shall be located near the main fire department entrance and not to exceed 45 metre (150 feet) from a fire hydrant.

6.4.4. Combined Sprinkler/Standpipe risers shall be complete with 75 mm (3 inch) drain risers to permit testing of pressure reducing devices, flow switches and annunciation.

6.4.5. Fire department Siamese connection shall be provided for the sprinkler system.

6.5. PORTABLE FIRE EXTINGUISHERS

6.5.1. General areas including offices shall be covered by water type extinguishers. Mechanical rooms, electrical rooms and similar spaces shall be provided with chemical fire extinguishers.

6.6. ADDITIONAL MEASURES FOR BUILDING FIRE SAFETY

6.6.1. High Buildings

.1 As a fully sprinklered building, under Measure A of SB-4 Fire Safety in High Buildings, the following additional requirement shall be implemented:

.1 Venting to aid fire-fighting system is required.

.2 Below grade exits shall be separate from above grade exits and shall be pressurized.

.3 Air moving fans (serving more than two levels) shall be stopped during a fire event.

6.6.2. Interconnected Floor Spaces/Smoke Control

.1 The building is not expected to require a smoke control system typically related to interconnected floor spaces. An independent code review shall confirm this at a later date.

6.7. DIESEL GENERATOR SYSTEMS

6.7.1. A complete, looped diesel fuel storage system shall be provided for the emergency diesel generators.

6.7.2. The fuel system shall consist of:

.1 Above ground, interior storage tank located the lowest parking level;

.2 Supply and return piping;

.3 A set of duplex pumps for each generator. Pumps shall be on **emergency power**;

.4 Supply and return piping to the auxiliary day tank;

.5 Day tank located adjacent to the diesel generator;

.6 High-Low level pump controls and alarm;

.7 Over-Flow alarms.

.8 Ventilation, combustion intake and relief air ductwork complete with dampers shall be provided for the indoor diesel generator.

6.7.3. Main storage tank shall be sized for minimum 12 hour generator run-time [TO BE CONFIRMED] at maximum power.

6.7.4. There shall be an explosion proof (Class 1 Division 1) electric unit heater located in the fuel storage room and the diesel generator room.

6.7.5. The mechanical division shall install the diesel muffler and discharge (using Schedule 40 black steel piping) to exterior. Termination shall be away from building intakes.

6.7.6. The mechanical division shall install ventilation system consisting of exhaust plenum (complete with silencers, exhaust dampers, and return dampers), outdoor air plenum (complete with combustion damper and ventilation damper. Return dampers shall be

normally open. Combustion damper shall open on generator start. Room temperature sensor shall modulate ventilation, exhaust and return air dampers to maintain generator room temperature at set point, initially set at 26.7 deg.C. (80 deg.F.).

6.7.7. The diesel generators shall be located over a floating floor. Floating floor is not by Division 15.

6.8. SEISMIC REQUIREMENTS

6.8.1. The building is not expected to have seismic requirements. Confirmation from the structural engineer is required.

7. SYSTEM CONTROLS

7.1. Building Automation System (BAS)

7.1.1. A microprocessor system incorporating direct digital control shall be installed to control and monitor the mechanical systems. The controller shall be interconnected together (i.e. local control within each mechanical room etc., shall be connected to a central server located in the mechanical room).

7.1.2. All mechanical equipment located within the residential suites will NOT be connected to the Building Automation System (BAS).

8. AIR AND WATER BALANCING

8.1.1. All air and water systems shall be balanced prior to building turn-over. Balancing reports shall be submitted for review by the consultant and owner.

9. COMMISSIONING

9.1. CONTRACTOR COMMISSIONING

9.1.1. Contractor shall perform equipment testing (piping, ductwork) and obtain sign-offs, equipment start-up and check sheet (with manufacturers), arrange for training on equipment (provided to owner) and coordinate with independent commissioning agent.

9.2. INDEPENDENT COMMISSIONING

9.2.1. To be determined.

10. MECHANICAL AND ELECTRICAL CO-ORDINATION

10.1. Motor starters shall be supplied and installed by Division 16. Starters shall be grouped into motor control centres or starter racks where feasible. Power wiring (line side and load side) shall be by Division 16.

10.2. Variable speed drives shall be supplied and installed by Division 15. Power wiring (load and line) shall be by Division 16.

10.3. Control wiring shall be by Division 15.

10.4. All fire alarm wiring shall be by Division 16. All smoke detectors including duct-mounted smoke detectors, integral with the fire alarm system, shall be supplied and installed by Division 16.

END OF MECHANICAL DESIGN BRIEF