
**MONACO PLACE
RENOVATIONS AND ADDITIONS
PROJECT NO. 0431**

**ADDENDUM NO. 2
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2009 -04-23**

**ADDENDUM NUMBER TWO
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Sustainable Edge Mechanical Addendum Number One 070007-00 33 pages

Jo-Anne Love

From: Shashi Anand
Sent: Thursday, April 23, 2009 12:53 PM
To: Jo-Anne Love
Subject: FW: 0431 Monaco Place Addendum #2
Attachments: 0431 Add. 2 Cover.pdf; Ossington Mechanical Addendum 1- 23.04.2009(2).pdf

From: JAMES SMITH [mailto:fussion@sympatico.ca]
Sent: Thursday, April 23, 2009 12:40 PM
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Subject: 0431 Monaco Place Addendum #2

Attached you shall find Addendum Number Two/Mechanical for our project 0431 Monaco Place.

If you have any questions regarding the attached files, please do not hesitate to contact me.

Regards,

EVA Architect
James Smith
416-703-0866



Sustainable EDGE Ltd.

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Date: 23.04.2009

To: Ellen Vera Allen Architect
51 Wolsley St., 4th Floor
Toronto, ON, M5T 1A4
Attention: Ellen Allen

Project: **1120 Ossington
Addendum No. 1
OUR FILE NO: 07007-00**

Mechanical Addendum No. 1

The following information, amendments and revisions shall constitute **Addendum No. 1**, and shall form an integral part of the Tender Documents and where applicable, shall supersede requirements of other Tender Documents. Updated, changed or deleted parts of the specification and schedules are highlighted and attached with this addendum. Refer to Appendix.

The Contractor shall bring this Addendum to the attention of all sub-trades and suppliers from whom they may be receiving quotations.

1.0 DRAWINGS

1.1 REFER TO DRAWINGS: DRAWINGS P01, P02, P03, AND P04, SUPPLY WATER DRAWINGS

- .1 Tables for plumbing stack sizes are not easily read on drawings P01, P02, P03, and P04. Refer to drawings P05, P06, P07, and P08 for identical tables.

1.2 REFER TO DRAWINGS: DRAWING M07, SECOND LEVEL VENTILATION

- .1 Remove dropped ceiling in corridor at grid line C3. There are no ducts running through this area. Refer to Appendix.

1.3 REFER TO DRAWINGS: DRAWING M09 AND M10, ROOF PLAN AND SCHEMATIC

- .1 Add drawings M09 and M10 to mechanical drawing set. Drawings M09 and M10 are attached. Refer to Appendix.

MONACO PLACE - 1120 Ossington Ave
Job No. 07007-00



MECHANICAL ADDENDUM 1

2.0 SPECIFICATIONS

2.1 REFER TO SPECIFICATIONS: SECTION

- .1 Add Article 7.9.2: All non-accessible suites shall be outfitted with the following plumbing fixtures, as shown on Drawings A200, A201, A202, and A203:
 - S-1
 - L-1
 - WC-1
 - B-1

- .2 Add Article 7.9.3: All accessible suites shall be outfitted with the following plumbing fixtures:
 - S-2
 - L-2
 - WC-2
 - B-2

- .3 Add Article 7.9.4: Laundry Room 002 shall be outfitted with the following plumbing fixtures, as shown on Drawing A200:
 - L-3

- .4 Add Article 7.9.5: Amenity Area 009 shall be outfitted with the following plumbing fixtures, as shown on Drawing A200:
 - S-3

- .5 Add Article 7.9.6: Accessible WC 007 shall be outfitted with the following plumbing fixtures, as shown on Drawing A200:
 - WC-2
 - L-2

- .6 Add Article 4.10.11

Provide zone temperature and humidity sensor in each suite (including amenities room and office) and temperature sensors at fancoil and fan locations (stairwells, basement mechanical room and elevator mechanical room).

- .6 Add Article 9.6.4.c

Zone humidistat prevents zone radiant panel valves to open if zone humidity is above 80% RH (adjustable)

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MECHANICAL ADDENDUM 1

- .7 Add Article 9.13a**
Each suite and zone thermostat/temperature-sensor and humidistat/humidity-sensor shall be adjustable at its suite or zone. Sensor locations should be accessible and locations shall be approved by Engineer and Architect.
- .8 Add Section 9.2 and associated Articles**
- Installation Requirements**
- All wiring shall be properly supported and run in a neat manner that is satisfactory to the Engineer. All wiring exposed and in equipment rooms shall run parallel to or at right angles to the building structure.
- Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.
- All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.
- Sensors shall be readily accessible and adaptable to each type of application in such a manner as to allow for quick, easy replacement and servicing without special tools or skills.
- Outdoor installation shall be weatherproof construction in NEMA 12 enclosures. These installations shall be protected from solar radiation and wind effects by stainless steel shields.
- Wells for temperature sensing devices shall be installed in the piping at elbows to promote proper liquid flow across the entire surface of the well. Well shall not restrict flow area to less than 70% of normal line size flow area.
- All DDC panels, transducers and relays shall be installed in CSA approved enclosures.
- All field devices shall be properly calibrated and tested for performance and accuracy.
- All hardware, interface and junction boxes shall be installed so they are easily accessible for maintenance by the Engineer. Hardware etc. that is installed in locations deemed to be unsafe or inaccessible (e.g., beyond the reach of a person standing on an eight foot step ladder) by the Engineer shall be relocated at the Contractor's expense.

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MECHANICAL ADDENDUM 1

.8 Add Article 9.8.3

Smoke detector located in the exhaust air stream as shown on drawing M10 shall shut down the HRV if smoke is detected. Refer to the Ontario Fire Code.

.9 Modify Article 7.3.1

Rainwater is collected from various sloped flat roofs and conducted via east trough to the exterior rain barrels as per Drawing M09 and architectural drawings.

.10 Equipment Schedules Update

The fancoil schedule and the heat recovery ventilator schedule was updated with additional information and changes. Refer to attached schedules.

End of Addendum

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MECHANICAL ADDENDUM 1

Appendix:

Project: 1120 OSSINGTON SOCIAL HOUSING
Location: TORONTO, ON
Engineer: SUSTAINABLE EDGE LTD.
Date: APRIL 16, 2009

WC-1 TOILET - FLOOR MOUNTED TANK (RESIDENTIAL)



American Standard #2832.513 'CADET 3™ FloWise™ ELONGATED' High Efficiency Tank Toilet, floor mounted, vitreous china, with EverClean™ antimicrobial surface which inhibits the growth of stain and odor causing bacteria, mold and mildew, elongated front syphon jetted action bowl, 2-1/8" (54mm) fully glazed internal trapway, 9" x 8" (229mm x 203mm) large water surface, and 'Speed Connect' lined tank complete with oversized 3" (75mm) flush valve with flapper, 'Pilot Valve' water control (without float) for quiet refill, 4.8 L (1.28 gal.) per flush, with sanitary dam on bowl, four point tank stabilization and bolt caps. (Minimum MaP Test Rating: 1000 grams.)
Centoco #600 Toilet Seat, residential solid plastic closed front with cover for elongated bowl (private use). Provide **Toilet Supply, C.P.** with metal angle stop, escutcheon and metal flexible riser. Provide **Floor Flange**, flange bolts and gasket.

L-1 BASIN - WALL HUNG



American Standard #0355.012 'LUCERNE' Basin, 4" (102mm) centers, 20-1/2" x 18-1/4" x 8-1/8" (521mm x 464mm x 206mm) deep, wall hung, vitreous china, integral back splash, self-draining deck area with contoured back and side splash shields, 'D' shaped bowl, contoured back and side splash shields for concealed arm carrier. **Chicago Faucets #797-XK/E34 Faucet, C.P.** 4" (102mm) C.C., solid cast brass lead-free body, 1/4 turn ceramic disc valve cartridges, with 5.7 LPM (1.5 GPM) flow P.C. aerator outlet, cast brass lever handles and mechanical metal pop-up drain. **McGuire #155A Basin Drain, C.P.**, cast brass 1 pc. top, open grid with 17ga. (1.5mm), 1-1/4" (32mm) tailpiece. **McGuire #H170BV Supplies, C.P.**, polished brass, rigid horizontal integral copper sweat tube nipple, 1/2" (12mm) I.D. x 5" (127mm) long, all brass 1/4 turn ball valves angle stops with combination V.P. loose key and handle, escutcheons and flexible copper risers. **McGuire #8872C-17T 'p' Trap, C.P.** brass adjustable body, 17 gauge (1.5mm), 1-1/4" (32mm) and escutcheon. **Jay R. Smith #0700-Z Basin Carrier**, with concealed arms and steel pipe legs, welded to block base feet support. (For narrow wall installation provide 'Z' type sleeve for arms).

B-1 BATH - RECESSED (ENAMELLED STEEL)



American Standard #0172.000.S00 'COLONY II' Bath, RIGHT OR LEFT hand, for alcove built-in installation, 60" x 30" x 15-1/2" (1524mm x 762mm x 394mm) deep, one piece porcelain on steel with integral front apron, three sided tiling flange and slip resistant bottom. **Chicago Faucets #1762-ISCP-1.5 Shower Valve, C.P.** pressure balancing controller, cast brass body,

washerless, ceramic drip-free disc valve cartridge, maximum temperature limit stop, volume control, service stops, brass escutcheon plate and single control metal lever handle, 5.7 LPM (1.5 GPM) flow, '620A' shower head with arm and flange. **Chicago Faucets #749-S Tub Spout**, C.P., Cast Brass body with Diverter. **American Standard #1583.470.002 Universal Bath Drain**, C.P. 1-1/2" (38mm) cast brass fittings with 17 ga. (1.3mm) brass tubing and rotary pop-up assembly. Provide 'p' Trap.

S-1

SINGLE BOWL SINK - STAINLESS STEEL - BACK LEDGE

Kindred 'STEEL QUEEN' QSL2020/8/3 S.S. Sink, 3 hole 8" (203mm) centers, 20-1/2" x 20" x 8" (521mm x 508mm x 203mm) deep, counter mounted, back ledge, grade 18-8 type 302 stainless steel, single compartment, mirror finished rim, satin finished bowl, self rimming with crumb cup strainer, 1-1/2" (38mm) tailpiece, sound deadening and mounting kit. **Chicago Faucets #1100-L9-XK/E35 Faucet**, C.P. 8" (203mm) C.C., deck mounted, solid cast brass lead-free body, 1/4 turn ceramic disc valve cartridges, 9" (229mm) long swing spout, 5.7 LPM (1.5 GPM) flow P.C. aerator outlet and cast brass hooded lever handles. Provide **Supplies**, C.P. with metal angle stops, adaptors, escutcheons and metal flexible risers. Provide 'p' Trap, cast brass 1-1/2" (38mm) with cleanout, union and escutcheon.

WC-2

TOILET - FLOOR MOUNTED TANK (BARRIER FREE DESIGN) (RESIDENTIAL)

American Standard #2835.513 'CADET 3™ FloWise™ RIGHT HEIGHT™ ELONGATED 16-1/2" (420mm) HIGH' 'High Efficiency' Tank Toilet, floor mounted, vitreous china with EverClean™ antimicrobial surface which inhibits the growth of stain and odor causing bacteria, mold and mildew, elongated front syphon jetted action bowl, 2-1/8" (54mm) fully glazed internal trapway, 9" x 8" (229mm x 203mm) large water surface, and 'Speed Connect' **Lined Tank** complete with oversized 3" (75mm) flush valve with flapper, 'Pilot Valve' water control (without float) for quiet refill, 4.8L (1.28 gal.) per flush, with sanitary dam on bowl, four point tank stabilization and bolt caps. (Minimum MaP Test Rating: 1000 grams.) **Centoco #800STS Toilet Seat**, heavy duty solid plastic closed front with cover, reinforced stainless steel check hinge, posts, washers and nuts for elongated bowl (private use). Provide **Toilet Supply**, C.P. with metal angle stop, escutcheon and metal flexible riser. Provide **Floor Flange**, flange bolts and gasket. Provide bolted tank cover and/or right hand trip lever if required - to meet local codes.

L-2

BASIN - WALL HUNG (BARRIER FREE DESIGN)

American Standard #0954.000 'MURRO' Basin, 4" (102mm) centers with semi-china pedestal, 21-1/4" x 22" x 5 - 6-1/2" (540mm x 559mm x 127-165mm) deep, 10" (254mm) high, wall hung, vitreous china, rear overflow, for



concealed arm carrier and pedestal supporting plate. **American Standard #0059.020 Semi-China Pedestal**, to cover exposed piping as per local codes. **Chicago Faucets #802-V-317-XK/E34 Faucet**, C.P. 4" (102mm) C.C., solid cast brass lead-free body, 1/4 turn ceramic disc valve cartridges, with 5.7 LPM (1.5 GPM) flow P.C. aerator outlet and cast brass 4" (102mm) blade handles. **McGuire #155A Basin Drain**, C.P., cast brass 1 pc. top, open grid with 17ga. (1.5mm), 1-1/4" (32mm) tailpiece. **McGuire #H170BVRB Supplies**, C.P., polished brass, rigid short horizontal integral copper sweat tube nipples, 1/2" (12mm) I.D. x 5" (127mm) long, all brass 1/4 turn ball valve angle stops with combination V.P. loose key and handles, escutcheons and S.S. braided flexible risers. **McGuire #8872C-17T 'p' Trap**, C.P. brass adjustable body, 17 gauge (1.5mm), 1-1/4" (32mm) and escutcheon. **Jay R. Smith #0700-Z-M Basin Carrier**, steel pipe legs, welded to block base feet support with concealed arms and pedestal plate. (For narrow wall installation provide 'Z' type sleeve for arms.)

B-2

BATH/SHOWER STALL - ONE PIECE (ACRYLIC) 62" (1575MM) (HAND SHOWER SPRAY) (SPECIAL CARE)

FIAT #MTS-6200H-RH 'CUSTOM COMFORT' Bath/Shower Stall, 61-3/4" x 30-1/2" x 87-3/4" (1568mm x 775mm x 2229mm) high, RIGHT OR LEFT hand, built-in as required, gloss acrylic, seamless one piece unit, thermoformed from continuous cast cross linked sheet, built-in lumber support, full textured bottom built-in towel bars, integral molded soap dish and shelves, fiberglass reinforcing backing, two 16" (406mm) vertical, one 36" (914mm) horizontal 1-1/4" (32mm) diameter S.S. Grab Bars and S.S. Curtain Rod, 1" (25mm) diameter. **Chicago Faucets #1762-ISVOC Bath and Shower Valve only**, C.P. pressure balancing valve, all bronze body, maximum temperature limit stop, on/off thru cold cycle, service stops, brass escutcheon plate and single control metal lever handle. **Chicago Faucets #151-VB-WS-1.5 'Hand Shower'**, S.F. adjustable with soft spray head, 5.7 LPM (1.5 GPM) flow, one piece wall supply with escutcheon, vacuum breaker, slide bar 24" (610mm), and 60" (1525mm) flexible hose. **Chicago Faucets #749-S Tub Spout**, C.P., Cast Brass body with Diverter. **American Standard #1583.470.002 Universal Bath Drain**, C.P. 1-1/2" (38mm) cast brass fittings with 17 ga. (1.3mm) brass tubing and rotary pop-up assembly. Provide 'p' Trap.

S-2



SINGLE BOWL SINK - STAINLESS STEEL - BACK LEDGE - SINGLE BOWL - UNIVERSAL ACCESS

Franke Commercial ALBS6805-1/3 S.S. Sink, 3 hole, 8" (203mm) centers, 20-9/16"x 20-1/8" x 5" (522mm x 511mm x 127mm) deep, counter mounted, back ledge, grade 18-8 type 302 stainless steel, single compartment, satin finished rim and bowl, self rimming, with rear corner crumb cup strainer, 1-1/2" (38mm) tailpiece, located in left hand back corner, sound deadening and mounting kit, 3-1/2" (89mm) crumb cup strainer. **Chicago Faucets #1100-L9-317-XK/E35 Faucet**, C.P. 8" (203mm) C.C., deck mounted, solid cast brass lead-free body, 1/4 turn ceramic disc valve cartridges, 9" (229mm) long swing spout with 5.7 LPM (1.5 GPM) flow P.C. aerator outlet and cast brass

4" (102mm) blade handles. Provide **Supplies, C.P.** with metal angle stops, adaptors, escutcheons and metal flexible risers. Provide **'p' Trap**, cast brass 1-1/2" (38mm) with cleanout, union and escutcheon. **ATS SPEC #BF-2 'Sanitary Safti-Covers'** of PVC, vandal-resistant flexible seamless construction, anti-microbial, to exposed piping (to protect against contusions) as per local codes.(Colour:). Provide covering to exposed piping per Local Codes.

S-3

DOUBLE BOWL SINK - STAINLESS STEEL - BACK LEDGE

Franke Commercial LBD6408-1/3 S.S. Sink, 3 hole, 8" (203mm) centers, 20-1/2" x 31-1/4" x 8" (521mm x 794mm x 203mm) deep, counter mounted, back ledge, grade 18-8 type 302 stainless steel, double compartment, satin finished rim and bowl, with spillway, self rimming, with crumb cup strainers, 1 1/2" (38mm) tail pieces, sound deadening and mounting kit, 3-1/2" (89mm) crumb cup strainer. **Chicago Faucets #1100-L9-XK/E35VP Faucet, C.P.** 8" (203mm) C.C., deck mounted, solid cast brass lead-free body, 1/4 turn ceramic disc valve cartridges, 9" (229mm) long swing spout, vandal-resistant 5.7 LPM (1.5 GPM) flow aerator outlet and cast brass hooded lever handles. Provide **Supplies, C.P.** with metal angle stops, adaptors, escutcheons and metal flexible risers. Provide **'p' Trap**, cast brass 1-1/2" (38mm) with cleanout, union and escutcheon.

L-3

LAUNDRY TUB SINK - MOULDED PLASTIC - SINGLE - FREE STANDING

FIAT FL-1 'LAUNDRY TUB', 2 hole, 4" (102mm) centers, 21-1/2" x 23" x 13-7/16" (549mm x 584mm x 341mm) deep, molded plastic composite, single bowl, **Supporting legs**, waste plug with rubber stopper and 1-1/2" (38mm) tailpiece. **Chicago Faucets #891-XK/E35VP Faucet, C.P.** 4" (102mm) C.C., deck mounted, solid cast brass lead-free body, 1/4 turn ceramic disc valve cartridges, swing spout with vandal-resistant 5.7 LPM (1.5 GPM) flow aerator outlet and cast brass lever handles. **McGuire #H170BV Supplies, C.P.**, polished brass, rigid horizontal integral copper sweat tube nipple, 1/2" (12mm) I.D. x 5" (127mm) long, all brass 1/4 turn ball valves angle stops with combination V.P. loose key and handle, escutcheons and flexible copper risers. **Jay R. Smith #8714 Sediment Interceptor**, all duco coated steel, (located next to sink), 1-1/2" (38mm) drain, and escutcheon. Provide 4-1/2" (114mm) clearance above interceptor for basket removal. Check local codes for usage in lieu of p-trap. Interceptor is also used as a sink 'p' trap (check local codes).

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flows at registers and grilles, fluid flow at all pumps, temperatures at storage water heater, heat pump, buffer tank temperature, heat exchanger temperatures, and space temperatures. Report to include As-Built System Schematic showing results of TAB.

1.13.8 Lock and permanently mark settings as required by reference standard.

2 CENTRAL SPACE HEATING

2.1 General

- 2.1.1 Work in this section covers installation of a gas-fired, high-efficiency condensing water boiler B1 and buffer tank BT1.
- 2.1.2 All work in this section shall conform to the appropriate plumbing codes.
- 2.1.3 All piping to be Type M copper unless specified elsewhere.
- 2.1.4 Use dielectric couplings where dissimilar metal piping materials join.
- 2.1.5 Refer to Drawing M01 to M04 and schedules.

2.2 Natural Gas Equipment

- 2.2.1 Provide one wall-hung, condensing water boiler, B1, with AFUE not less than 95%, with an output of 114 kW (390 MBH) according to Drawing M09 M10, manufacturer's instruction, and Can/CGA 149.1 M86 Standard.
- 2.2.2 B1 to be able to perform both direct domestic hot water heating and direct hydronic water heating
- 2.2.3 Refer to equipment schedule
- 2.2.4 Shop drawing to be supplied for approval by Engineer prior to ordering and installation.

3 CENTRAL COOLING

3.1 General

- 3.1.1 Work in this section covers the installation of an air-cooled, water supply chiller, buffer tank BT2 and heat exchanger HX1.
- 3.1.2 All piping to be Type M copper unless specified elsewhere.
- 3.1.3 Pipes are to be insulated and vapour barrier protected for condensation control.
- 3.1.4 Refer to Drawing M09 M10 and schedules.
- 3.1.5 Use dielectric couplings where dissimilar metal piping materials join.

3.2 Air-Cooled Chiller

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- 3.2.1 Provide one 45 kW (13 ton) air-cooled chiller that meets or exceeds the requirements of ASHRAE 90.1 – 2004.
- 3.2.2 Chiller refrigerant fluid shall be R410A or R-407C.
- 3.2.3 Valves shall be compatible with copper plumbing. Manual shut off valves shall be gate type. Acceptable manufacturers: Jenkins, Crane, Toyo.
- 3.2.4 All piping and equipment in this section shall be suitable for a closed system.
- 3.2.5 Acceptable manufacturers: McQuay, other.
- 3.2.6 Chiller unit is located on the flat roof, refer to drawing M40 M09.
- 3.2.7 Shop drawing to be supplied for approval by Engineer prior to ordering and installation.

3.3 Heat Exchangers

- 3.3.1 Heat exchanger HX1 is a brazed plate type; Refer to Equipment Schedules.
- 3.3.2 Heat exchanger acceptable manufacturers: Armstrong, Alfa Laval, APV.
- 3.3.3 Shop drawing to be supplied for approval by Engineer prior to ordering and installation.

4 HYDRONIC HEATING AND COOLING SYSTEM

4.1 General

- 4.1.1 Work in this section covers hydronic space heating and cooling and associated heat exchangers, piping, pumps and distribution.
- 4.1.2 All work in this section shall conform to the appropriate plumbing codes and to CAN/CSA B214 – “Installation code for hydronic heating systems”.
- 4.1.3 All piping and equipment in this section shall be suitable for closed systems.
- 4.1.4 Provide appropriate filling, drain and purging valves.
- 4.1.5 All hydronic plumbing in the mechanical room shall be insulated with RSI 0.7 (R4) [25.4 mm (1”)] of closed cell foam insulation.
- 4.1.6 All hydronic plumbing leaving the mechanical room and or travelling through different thermal zones shall be insulated with RSI 0.529 (R3) [19 mm (3/4”)] of closed cell foam insulation unless otherwise specified.
- 4.1.7 Radiant panel hydronic piping leaders to the radiant panel shall be insulated with RSI 0.35 (R2) [12.7 mm (1/2”)] of closed cell foam insulation.
- 4.1.8 Properly size pipes for minimum pressure drop and pump capacity due to site conditions. Submit shop-drawings to Engineers for approval prior to ordering material.

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4.2 Hydronic Piping and Specialties

- 4.2.1 Warmboard radiant panels are installed in the ceilings as indicated on Drawings M02 to M04.
- 4.2.2 Embedded radiant loops are installed in the floor as indicated on Drawings M01.
- 4.2.3 The hydronic piping to the manifolds shall be Type M copper.
- 4.2.4 The hydronic piping for the ceiling and floor loops shall be PEX (cross-linked polyethylene) with integral oxygen barrier as recommended by manufacturer. Acceptable manufacturer: Wirsbo, Infloor, Rehau, Kitec.
- 4.2.5 Use dielectric couplings where dissimilar metal piping materials join.
- 4.2.6 Provide valves, fittings and specialties as indicated on Drawing M09 M10, as specified in other clauses of this document and according to manufacturer specification and good practice.
- 4.2.7 Provide automatic air vents at all high points.
- 4.2.8 Provide expansion tanks. Refer to equipment schedules and install as shown on Drawing M09 M10 and according to manufacturer's instructions.
- 4.2.9 Provide an automatic water make-up valve connection to mains water complete with backflow prevention and manual shutoff valve.
- 4.2.10 Valves and manifolds shall be compatible with copper plumbing. Manual shut-off valves shall be gate type. Acceptable manufacturers: Jenkins, Crane, Toyo.
- 4.2.11 Refer to Equipment Schedule for 2-way and 3-way valves V01-V09. Acceptable Manufacturers: Watts, and Belimo.
- 4.2.12 Pressurise hydronic water system and hydronic glycol system to a pressure of 104 kPa (15 psig).

4.3 Radiant Ceiling Heating and Cooling Distribution Supply

- 4.3.1 Radiant ceiling shall provide heating and cooling supply, as noted in section 4.2, Hydronic Piping Speciality.
- 4.3.2 Radiant ceiling will change to heating or cooling by manual switchover.
- 4.3.3 Hydronic ceiling system is to be Warmboard panels.
- 4.3.4 Warmboard shall be installed by other trades. Coordinate hydronic piping and Warmboard layout supplied by manufacturer with project manager, electrical contractor and other trades as appropriate. Warmboard areas to match those indicated on Drawings M02 to M04. Coordinate with general contractor regarding lighting and other requirements.
- 4.3.5 Drawings M02 to M04 show the radiant areas for each room and location of manifolds.

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4.3.6 Supply water is circulated to hydronic zone control manifolds with variable speed pump P1. Refer to pump schedule.

4.4 Radiant Floor Heating Distribution Supply

4.4.1 Radiant floor heating will be installed in the basement level.

4.4.2 Drawings M1 show the radiant floor areas for each room and location of each manifold.

4.4.3 Provide hydronic floor system piping as 12.7 mm (1/2") PEX pipe to be embedded at a spacing of 200 mm (8") in concrete unless otherwise noted.

4.4.4 Supply water is circulated to hydronic zone control manifolds with pump P1. Refer to pump schedule.

4.4.5 Heating supply water temperature, about 32.5°C (90.5°F), is maintained by the operation of modulating valve V1.

4.4.6 Radiant floors are heating only and will only operate in system heating mode.

4.5 Stairwell Fancoil Heating and Cooling Distribution Supply

4.5.1 Stairwell fancoils will be installed in the stairwells as shown on Drawings M07 M05 to M09 M07.

4.5.2 The hydronic piping to the radiators shall be Type M copper.

4.5.3 Supply water is circulated to fancoils by pump P5. Refer to pump schedule.

4.6 Ventilation Air Conditioning and Preheating

4.6.1 Provide preheat coil PH1 attached to HX1 heat exchanger loop and install upstream of HRV1 according to Drawing M09 M10.

4.6.2 Ventilation supply air is preheated by preheat coil PH1 prior to entering HRV1 for frost control.

4.6.3 Provide cooling coil CC1 and install downstream of HRV1 according to Drawing M09 M10.

4.6.4 Ventilation supply air is cooled and dehumidified by the dehumidification/cooling coil CC1 after HRV1.

4.6.5 Refer to Drawings M05 to M10, ventilation unit schedule, and coil schedule.

4.6.6 Each coil is to be located in a galvanized sheet metal box complete with drain pan. Insulate with RSI 0.7 (R4) [25 mm (1")] insulation with vapour barrier to avoid surface condensation.

4.6.7 See schedule for details of dehumidification/cooling coil. Submit shop drawing complete with performance and enclosure data to Engineer for approval.

4.6.8 Provide building condensate drains at coil locations.

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4.7 Coils Drip Tray and Drain Pan

- 4.7.1 Provide a drip tray to each and every coil. Drip tray to be sufficient sized to collect all condensate from the coil. It shall be designed for all condensate to be collected into a single low point with a drainage nipple.
- 4.7.2 A drain line with a trap shall be connected from the drip tray nipple to the building drain.
- 4.7.3 Provide a drain pan under all hydronic equipment inside the mechanical room. Drip tray to be sufficient sized to collect and contain possible release by hydronic equipment e.g. pressure blow out. It shall be designed for all liquid to be collected into a single low point to a building drain with a trap.
- 4.7.4 Shop drawing to be supplied for approval by Engineer prior to ordering and installation.

4.8 Concurrent Space Heating and Cooling

- 4.8.1 There shall be no concurrent space heating and cooling in the building.

4.9 Hydronic Circulation

- 4.9.1 Provide ventilation preheat/cooling circulation pump P4, rated for chilled water.
- 4.9.2 Provide main circulation pump P2, rated for chilled water.
- 4.9.3 Provide heating/cooling to/from heat exchanger circulation pump P6.
- 4.9.4 Refer to equipment schedules.
- 4.9.5 Install as shown in Drawing M09 M10 and manufacturer's instructions. Refer to pump schedule.
- 4.9.6 Selection of pump to be confirmed upon submittal of pump shop drawings and As-Built Drawings for radiant loop layout to Engineer.
- 4.9.7 Provide pressure taps, dial gauges and isolation valves, in appropriate pressure ranges, on both side of pumps and heat exchangers.

4.10 Hydronic Heating and Cooling Distribution

- 4.10.1 Provide heating/cooling distribution system as delineated on Drawings M1 and M4. Maintain individual loop length within maximums recommended by manufacturers. There shall be no joints within the subloop.
- 4.10.2 Each suite is an individual zone, radiant loops shall not cross over zones. Loops inside a zone, shall operate as one and shall be independent of other zones.
- 4.10.3 Size loop layouts according to upward heating output noted on drawings M1 and M4. For slab insulation, drop ceilings, concrete topping and carpet refer to architectural drawings.

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- 4.10.4 The third floor radiant ceiling manifold is located in the third floor mechanical room above the third floor finished ceiling. The ground and second floor radiant ceiling manifold are located in the attic mechanical room.
- 4.10.5 Coordinate piping layout with control joints as required by Structural Engineer.
- 4.10.6 Provide loop layouts in the form of shop drawings from supplier. Pipe shall have integral oxygen barrier. Acceptable manufacturers: Wirsbo, Infloor, Rehau, Kitec.
- 4.10.7 Provide zone control manifolds with integral zone valves and temperature control as shown on Drawings. M5, M6 and M10. Acceptable manufacturer: Wirsbo, Infloor, Rehau, Kitec.
- 4.10.8 Join loops to manifold. See drawing M6 for second floor thermostat locations.
- 4.10.9 Ensure ability for flow balancing with appropriate balancing valves or proprietary manifold feature.
- 4.10.10 Review the specification of pumps P5 and P6 and confirm or notify Engineer of change in writing at the time of shop drawing submission.
- 4.10.11 Provide zone temperature and humidity sensor in each suite (including amenities room and office) and temperature sensors at fancoil and fan locations (stairwells, basement mechanical room and elevator mechanical room).
 - a) Humidity sensor may be mounted in the exhaust duct in each suite.

5 DUCTED SYSTEMS: VENTILATION WITH HEAT RECOVERY AND COOLING SUPPLY

5.1 General

- 5.1.1 Work in this section shall include installation of heat recovery ventilator HRV1, and associated ventilation ductwork, grilles and diffusers. To be supplied by project manager.
- 5.1.2 HRV1 is located on the third floor in the utility room.
- 5.1.3 Provide a condensate drain near HRV1.
- 5.1.4 Selection of registers is to be acceptable by Architect.
- 5.1.5 Supply and install all ductwork as indicated on Drawings M05 to M08.

5.2 Heat Recovery Ventilator (HRV)

- 5.2.1 Provide heat recovery ventilator HRV1 according to the schedules.
- 5.2.2 HRV1 to be protected from frost by preheat coil PH1 and electric resistance heater ERH1.
- 5.2.3 Selection of HRV to be confirmed upon submittal of shop drawings to Engineer.

- c) Double wye and eighth bend fittings shall not be installed in horizontal drain lines.
- d) Slope drainage lines uniformly at 20 mm per meter (1/4" per foot). Maintain gradients through each joint of pipe and throughout system.
- e) The size of drainage piping shall not be reduced in size in the direction of flow. Drainage and vent piping shall conform to the sizes indicated on Drawings P05-P09.
- f) Unburied horizontal cast iron soil piping shall be supported at least at every other joint except that when the developed length between supports exceeds four feet, they shall be provided at each joint. Supports shall also be provided at each horizontal branch connection and at the base of each vertical rise.

7.2.2 Cleanouts

- a) Provide cleanouts within sanitary waste systems at the base of each vertical stack, at the base of each waste stack, at intervals not exceeding 27 m (90 ft) in horizontal runs, and at all locations required by the Ontario Building Code.
- b) A removable sink or lavatory p-trap with a cleanout plug shall be considered an approved cleanout for 50 mm (2 in.) diameter pipe.
- c) All interior cleanouts shall be accessible from walls or floors. Provide wall cleanouts in lieu of floor cleanouts wherever possible.
- d) Coordinate the location of all cleanouts with the architectural features of the building and obtain approval of locations from the Project Architect.
- e) Capped waste and vent connections for future extensions shall be located accessibly and not extend more than 600 mm (24 in.) from the active main. Waste connections and vent connections shall be located at elevations that will allow future installation of properly sloped piping without the need to dismantle or relocate installed ductwork, piping, conduit, light fixtures, etc.
- f) Locate all sanitary vent terminals at a minimum of 7.6m (25 ft) horizontally from or 1 m (3 ft) vertically above all air intakes, operable windows, doors and any other building openings.

7.3 Roof Drainage

7.3.1 Rainwater is collected from various sloped flat roofs and conducted via east trough to the exterior rain barrels as per Drawing M40 M09 and architectural drawings.

7.3.2 All piping, fittings and equipment shall be cast iron, suitable for rainwater collection.

7.4 Backflow Preventors

7.4.1 Provide backflow preventors where required by the Ontario Building Code and good practice. Back-siphonage protection shall include provision to admit air directly into the reduced pressure zone via a separate channel from the water discharge channel.

7.5 Sanitary Sewerage Pumps

- c) Copper piping shall be supported at no greater than 1.8m (6 ft) intervals for piping 38 mm (1½ in.) and smaller and 3 m (10 ft) intervals for piping 25 mm (2 in.) and larger in diameter.
- d) Install all water piping to allow all piping within the system to be drained at low points.
- e) Install union type fitting downstream of isolation valves at equipment connections.

7.7.3 Valves

- a) Provide valves as per Drawing ~~M09~~ M10 and install as per manufacturer's instruction.
- b) Provide shut-off valves that have the same diameter of the upstream pipe in which they are installed. Ensure shut-off valves are installed with stems upright or horizontal, not inverted.
- c) Domestic water shut-off valves shall be installed in accessible locations, at each fixture and piece of equipment, at each branch take-off from mains, at the base of each riser, and at each battery of fixtures.
- d) Provide domestic hot water return circuit balancing valves to allow for hot water recirculation to all fixtures. Locate valves where accessible, at a minimum of 5 pipe diameters downstream and 3 pipe diameters upstream of all fittings and/or line shut-off valves.
- e) Provide a temperature gauge, strainer, union and line shut-off valve upstream of each hot water return circuit balancing valve.

7.7.4 Domestic Water Pressure Boosting System

- a) Perform flow test on mains water supply to ensure a supply pressure of no less than 60 psi.
- b) If system pressure is less than the requisite 60 psi, provide a complete, factory packaged and tested, domestic water pressure boosting system. Install as per manufacturer's instructions. The system shall be capable of automatically maintaining a constant system pressure, at the required flow.

7.8 Domestic Water Heating

7.8.1 General

- a) This section covers the installation of a condensing boiler, storage tank, and expansion tank for the purpose of domestic hot water heating with integrated space heating.

7.8.2 Domestic Water Heater (Natural Gas Fired)

- a) Provide one 114 kW, (390 Btu/h), natural gas-fired condensing boiler B1, according to Drawing M09 M10, manufacturer's instruction, and Can/CGA 149.1 M86 Standard. Refer to Section E - Equipment Schedule. Acceptable Manufacturers include: Camus and Viessmann.

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- b) Provide one 908 L (240 USGAL), domestic water storage tank ST1 according to Drawing M09 M10. Install as per manufacturer's instruction. Refer to Section E - Equipment Schedule. Acceptable Manufacturers include: A.O. Smith and Bradford White.
- c) Install a shut off valve in cold water inlet and hot water outlet close to each heater.
- d) Pipe relief valve discharge and all equipment drains are to be directed to the appropriate floor drain.
- e) Provide an expansion tank as per Drawing M09 M10. Install expansion tank in accordance with manufacture's recommendations. Refer to Section E - Equipment Schedule.

7.9 Plumbing Fixtures

7.9.1 General

This section covers the installation of plumbing fixtures.

Fixtures shall comply with CSA B125.1, CSA B125.2 and CSA B125.3 standard.

7.9.2 Suites: 003, 004, 005, 101, 102, 103, 104, 105, 106, 107, 201, 202, 203, 204, 205, 206, 207, 208

- a) All suites except accessible suites shall be outfitted with the following plumbing fixtures, as shown on Drawings A200, A201, A202, and A203:

Name	Function
S-1	Single Bowl Sink Unit
L-1	Wall Hung Basin Unit
WC-1	Water Closet Unit
B-1	Bath Tub Unit

- a) Refer to Equipment Schedules and Appendix: Plumbing Specification Information.

7.9.3 Accessibility Suites: 001, 006

- a) All accessible suites shall be outfitted with the following plumbing fixtures, as shown on Drawings A200, A201, A202, and A203:

Name	Function
S-2	Single Bowl Sink Unit
L-2	Wall Hung Basin Unit
WC-2	Water Closet Unit

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B-2	Bath Tub Unit
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- b) Refer to Equipment Schedules and Appendix: Plumbing Specification Information.

7.9.4 Laundry Room 002

- a) Laundry room 002 shall be outfitted with basin unit L-3.
- b) Refer to Equipment Schedules and Appendix: Plumbing Specification Information.

7.9.5 Amenity Room 009

- a) Amenity room 009 shall be outfitted with stainless steel sink unit S-3.
- b) Refer to Equipment Schedules and Appendix: Plumbing Specification Information.

7.9.6 Accessible Washroom WC007

- a) Accessible washroom WC007 shall be outfitted with lavatory unit WC-2.
- b) Accessible washroom WC007 shall be outfitted with basin unit L-2.
- c) Refer to Equipment Schedules and Appendix: Plumbing Specification Information.

8 GAS PIPING

8.1 General

- 8.1.1 All work in this section shall conform to the Ontario Building Code and other appropriate gas piping codes.
- 8.1.2 Provide gas piping to boiler in mechanical room and fireplace on main floor.

9 HVAC CONTROLS

9.1 General

- 9.1.1 This section covers control work relating to space thermostats, boiler operation, domestic water heating, space heating, space cooling, ventilation cooling, ventilation preheat and ventilation speed switching.
- 9.1.2 Provide a control logic and wiring diagram for approval by the Engineer prior to installation of controls.

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- 9.1.3 Each suite and zone thermostat/temperature-sensor and humidistat/humidity-sensor shall be adjustable at its suite or zone. Sensor locations should be accessible and locations shall be approved by Engineer and Architect.

9.2 Installation Requirements

- 9.2.1 All wiring shall be properly supported and run in a neat manner that is satisfactory to the Engineer. All wiring exposed and in equipment rooms shall run parallel to or at right angles to the building structure.
- 9.2.2 Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.
- 9.2.3 All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.
- 9.2.4 Sensors shall be readily accessible and adaptable to each type of application in such a manner as to allow for quick, easy replacement and servicing without special tools or skills.
- 9.2.5 Outdoor installation shall be weatherproof construction in NEMA 12 enclosures. These installations shall be protected from solar radiation and wind effects by stainless steel shields.
- 9.2.6 Wells for temperature sensing devices shall be installed in the piping at elbows to promote proper liquid flow across the entire surface of the well. Well shall not restrict flow area to less than 70% of normal line size flow area.
- 9.2.7 All DDC panels, transducers and relays shall be installed in CSA approved enclosures.
- 9.2.8 All field devices shall be properly calibrated and tested for performance and accuracy.
- 9.2.9 All hardware, interface and junction boxes shall be installed so they are easily accessible for maintenance by the Engineer. Hardware etc. that is installed in locations deemed to be unsafe or inaccessible (e.g., beyond the reach of a person standing on an eight foot step ladder) by the Engineer shall be relocated at the Contractor's expense.

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- 9.6.2 Buffer tank BT2 is maintained at 8°C (46.5°F) by operating pump P7 and roof top chiller.
- 9.6.3 Buffer tank BT1 temperature at 12°C (54°F) (Adjustable) by operating pump P3 and P6.

9.7 Cooling Distribution

- 9.7.1 Cooling is distributed into the building via fancoils and radiant ceiling panels.
- 9.7.2 On first call of cooling pump P2 operate.
- 9.7.3 Zone thermostat initiates zone fancoil and fancoil pump P5 when temperature in zone rises above setpoint temperature of 26°C (79°F) (adjustable).
- 9.7.4 Zone thermostat initiates radiant panel loop by opening loop valves and engaging variable speed pump P1 when temperature in zone drops below setpoint temperature of 26°C (79°F) (adjustable).
 - a) P1 operates with Dp-T mode, pump is to maintain 5°C (9°F) (adjustable).
 - b) Valve V1 modulates to maintain radiant supply temperature at 15°C (60°F) (adjustable).
 - c) Zone humidistat prevents zone radiant panel valves to open if zone humidity is above 80% RH (adjustable)
- 9.7.5 Leaving temperature sensor downstream of cooling coil CC1 shall initiate CC1 operation when temperature rises above 15°C (59°F) (adjustable) by defaulting V2 port between X-Z and initiating pump P4
- 9.7.6 Exhaust fan EXF1 and EXF2 operates if zone temperature exceeds 30°C (86°F) (adjustable), minimum fan run time is 5 minutes (adjustable).

9.8 Ventilation System and Ventilation Speed Switching

- 9.8.1 There will not be ventilation speed switching, HRV1 operates on continuous high speed.
- 9.8.2 Exhaust fan EXF3 is linked to the operation of the lighting fixtures in the basement amenities room. EXF3 operates when the lights are switched on and shuts off when the lights are off.
- 9.8.3 Smoke detector located in the exhaust air stream as shown on drawing M10 shall shut down the HRV if smoke is detected. Refer to the Ontario Fire Code.

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2.0 HEAT RECOVERY VENTILATORS

2.1 Imperial Table

ID	Airflow (cfm)	External Static P.D. (in. w.g.)	Entering Supply DBT/WBT (F)		Heat Recovery Efficiency	Model (Enerboss Nu-Air)
HRV1	1200	0.80	23	23	65%	Nu-Air 1600

2.2 Metric Table

ID	Airflow (L/s)	External Static P.D. (Pa)	Entering Supply DBT/WBT (°C)		Heat Recovery Efficiency	Model (Enerboss Nu-Air)
HRV1	566	199	-5	-5	65%	Nu-Air 1600

*without coils

**Dampers may be required to adjust exhaust flow

3.0 MOTORIZED VALVES AND DAMPERS

3.1 Imperial Table

ID	Function	Fluid	Type	Pipe Dia(in)	Normal position	Model (Belimo)	Flow (GPM)
V1	Radiant Tempering	Service Water	3 way	2	X-Z Open	B350VS	23.0
V2	Diverting from HC1 to CC1	50% Prop. Glycol	3 way	1.25	X-Z (Cool), Y-Z (Heat)	B332VS	10.0
V3	Motorized Shut-Off for FC1	Service Water	2 way	0.75	Open	B220VS	1.6
V4	Motorized Shut-Off for FC2	Service Water	2 way	0.75	Open	B220VS	1.9
V5	Motorized Shut-Off for FC3	Service Water	2 way	0.75	Open	B220VS	2.1
V6	Motorized Shut-Off for FC4	Service Water	2 way	0.75	Open	B220VS	3.5
V7	Motorized Shut-Off for B1 to BT1	Service Water	2 way	2	Open (Heating)	B250VS	40.0
V8	Motorized Shut-Off for HX1 to Coils	50% Prop. Glycol	2 way	1.25	Open (Heating)	B232VS	10.0
V9	Motorized Shut-Off for BT2 to Coils	50% Prop. Glycol	2 way	1.25	Open (Cooling)	B232VS	10.0

3.2 Metric Table

ID	Function	Fluid	Type	Pipe Dia(mm)	Normal position	Model (Belimo)	Flow (L/s)
V1	Radiant Tempering	Service Water	3 way	50.8	X-Z Open	B350VS	1.49
V2	Diverting from HC1 to CC1	50% Prop. Glycol	3 way	31.8	X-Z (Cool), Y-Z (Heat)	B332VS	0.65
V3	Motorized Shut-Off for FC1	Service Water	2 way	19.1	Open	B220VS	0.10
V4	Motorized Shut-Off for FC2	Service Water	2 way	19.1	Open	B220VS	0.12
V5	Motorized Shut-Off for FC3	Service Water	2 way	19.1	Open	B220VS	0.14
V6	Motorized Shut-Off for FC4	Service Water	2 way	19.1	Open	B220VS	0.23

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6.0 FANCOILS

6.1 Imperial Table

Cooling:	Heating:
Entering Water Temp: 45F (7°C)	Entering Water Temp: 113F (45°C)
Entering Air Temp DB: 79F (26°C)	Entering Air Temp DB: 72F (22°C)
Entering Air Temp WB: 65F (18°C)	

Fan Coil	Space Served	Heating Capacity (BTU/h)	Total Cooling Capacity (BTU/h)	Water Flow (USGPM)	Water P.D. (FT W.G)	Airflow (CFM)	Model (AERMEC)
FC1	North East Stairwell	17,019	7,560	1.88	4.764589	264	FCX_AS32
FC2	South Stairwell	17,019	7,560	1.88	4.764589	264	FCX_AS32
FC3	Common Room	20,013	9,579	2.125	3.01981	264	FCX_P34
FC4	Elevator Stairwell	44,199	16,626	3.68	3.9	540	FCX_AS62

6.2 Metric Table

Fan Coil	Space Served	Heating Capacity (kW)	Total Cooling Capacity (kW)	Water Flow (L/s)	Water P.D. (kPa)	Airflow (L/s)	Model (AERMEC)
FC1	North East Stairwell	5.0	2.2	0.12	14.2	124	FCX_AS32
FC2	South Stairwell	5.0	2.2	0.12	14.2	124	FCX_AS32
FC3	Common Room	5.9	2.8	0.13	9.0	124	FCX_P34
FC4	Elevator Stairwell	13.0	4.9	0.23	11.6	254	FCX_AS62

7.0 HEATING AND COOLING EQUIPMENT

7.1 Imperial Table

ID	Equipment	Supplier	Model	Nominal Output (Btu/h)	Inlet Flow (USGPM)
B1	Condensing Boiler	Camus	Dynamax 0391	387,000	40
C1	Chiller	McQuay	AGZ 17B (R-407)	180,000	40

7.2 Metric Table

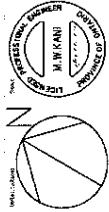
ID	Equipment	Supplier	Model	Nominal Output (kW)	Inlet Flow (L/s)
B1	Condensing Boiler	Camus	Dynamax 0391	113.4	1.6
C1	Chiller	McQuay	AGZ 17B (R-407)	52.8	2.5

GENERAL NOTES:

CONCRETE SHALL BE CAST BY PUMPING TO ALL LEVELS AND COURED IN ACCORDANCE WITH THE CANADIAN CONCRETE INSTITUTE (CCI) STANDARD C310.1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE LOCAL MUNICIPALITY AND THE PROVINCE OF ONTARIO. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE LOCAL MUNICIPALITY AND THE PROVINCE OF ONTARIO. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE LOCAL MUNICIPALITY AND THE PROVINCE OF ONTARIO.

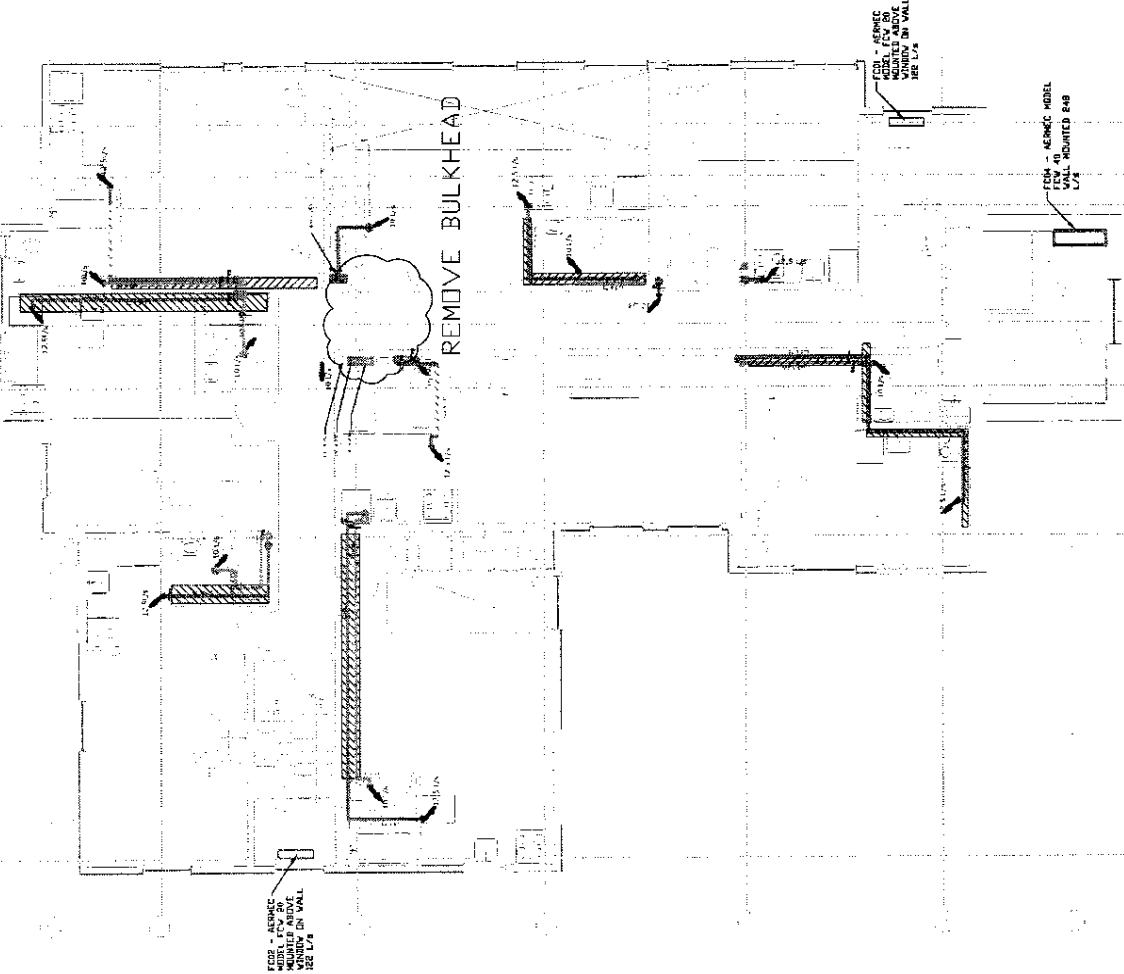
DATE	DESCRIPTION
1998.03.20	ISSUED FOR TENDER
1998.04.08	REVISED FOR PERMITS
1998.04.20	REVISED FOR CONSTRUCTION
1998.05.20	REVISED FOR PERMITS

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Drawn By	Checked By	Project No.
Designed By	Reviewed By	Job No.
Approved By	Notes	

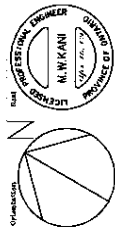


GENERAL NOTES:

CONTRACTOR SHALL VERIFY ALL INFORMATION IS RESPONSIBLE FOR ALL...
...AND CONSTRUCTION ACCORDING TO THE PERMITS...
...THE EXISTING AND APPROVED RECORD DRAWINGS...
...AND SHALL NOT BE RESPONSIBLE FOR ANY...
...THESE SHALL BE APPROVED BY THE ENGINEER...
...AND SHALL BE APPROVED BY THE ENGINEER...
...AND SHALL BE APPROVED BY THE ENGINEER...
...AND SHALL BE APPROVED BY THE ENGINEER...

NO.	REVISION	DATE	BY	CHKD.
1	ISSUED FOR PERMITS	APR 23 2009		
2	ISSUED FOR CONSTRUCTION	APR 23 2009		
3	ISSUED FOR CONSTRUCTION	APR 23 2009		
4	ISSUED FOR CONSTRUCTION	APR 23 2009		

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Drawing Title

Drawn By: _____ Date: _____
 Designed By: _____ Program No: _____
ROOF MECHANICAL LAYOUT
 Approved By: _____ Reason: _____

