

3.1 MECHANICAL:

3.1.1 Labour, Materials & Fees

Provide all labour and new materials for the complete installation of the systems. Ensure that complete installation meets with the approval of all authorities having jurisdiction in accordance with all codes, etc.

Arrange and pay for all permits and fees required for this installation.

Use materials that are C.S.A., U.L.C. , code approved and C.G.A. or Ontario Hydro certified for the intended application.

Comply with the intent of the base building specifications.

Comply with the requirements as outlined in the Landlord's "Design Criteria Manual".

3.1.2 Examine the Site

Examine the site and be familiar with all the conditions covered by these specifications. Extras will not be allowed for failure to properly evaluate conditions.

Take field dimensions prior to any installation.

3.1.3 Compliance With Codes

Comply with all latest relevant codes and local regulations having jurisdiction including O.B.C., N.B.C., N.F.P.A. 13, C.G.A. 149.1, C.S.A., O.W.R.A. 675/85, Canadian Plumbing Code, Ontario Hydro Code.

3.1.4 Debris & Clean Up

Keep premises clean as work progresses, avoid accumulation of debris, ensure that during construction all open vents are sealed and any controls (thermostats etc.) are covered. On completion of the work, clean up and remove from site all scrap materials resulting from the work. Clean all equipment prior to final inspection.

3.1.5 Co-ordination & Co-operation

Co-ordinate the work with all trades to ensure work may progress without delay. Arrange the schedule of all work in co-operation with the General Contractor.

Co-ordinate the work with all trades and co-operate to ensure services do not conflict with the other services and / or structure.

Make allowances for such items as offsets to accommodate actual field conditions. Refer to structural and architectural drawings (or site visit) for further building information.

Mechanical Contractor shall indicate in red ink on an extra set of white prints all changes and deviations from locations on plans as job progresses. On completion of the work

provide the landlord with two sets of completed drawings showing location of all equipment, piping, ducting etc.

3.1.6 Warranty

Guarantee all work, equipment and materials for one (1) year from substantial completion of the contract (A/C unit compressors – five (5) years).

Ensure that all equipment is properly guaranteed by the manufacturer.

3.1.7 Shop Drawings

Submit shop drawings of all fixtures and equipment (including wiring diagrams) to the Landlord for approval. Approval of shop drawings is gratuitous and does not relieve the contractor of his responsibilities.

3.1.8 Cutting and Patching

Provide cutting and patching for work. Arrange to provide for the making good to finishes and include for the cost of this work.

3.1.9 Wiring

All power wiring: Electrical Specifications
24 volt wiring only: Electrical Specifications

Include for all necessary starters, disconnects, transformers and relays etc.

Ensure co-ordination between trades to avoid gaps and overlaps and to ensure all equipment is operational.

3.1.10 Demonstration

Allow for demonstration of all equipment to the Landlord and the Landlord's operating staff.

3.1.11 Miscellaneous

Provide structural steel support members as necessary to hang equipment, fans, ductwork, and piping from the building structure. Paint all miscellaneous bare metal one coat grey oxide primer.

3.1.12 Alternatives

Assume full responsibility that the equipment offered as an alternative is suitable for the space allocated, and for any additional costs to any part of the work resulting from the use of an alternate.

No deviation from plans and specifications will be allowed unless written approval and consent is first obtained from the Landlord.

3.1.13 Maintenance & Operating Instructions

Provide two copies of manufacturers' maintenance and operating instructions for all equipment.

Present the instruction in indexed three ring hard cover binders, with spine label project indicator, and index sheet. Including all shop drawings, permits, warranty details, certificates, contractor names, and telephone number lists for all project trades in this manual.

3.1.14 Interruption of Services

Any interruptions of the base building systems shall be co-ordinated with the Landlord for the time and duration and shall strictly adhere to the Landlord's instructions in this regard.

Include cost of premium time in tender price for the work outside normal working hours to maintain all mechanical services in operation without disruption to existing Tenants.

3.1.15 Workmanship

Employ a responsible foreman to supervise the work and retain for duration of construction period.

Employ only skilled plumbers, steam fitters, sheet metal workers for the execution of the work. Workmanship shall be first class as regards to durability, efficiency, safety, and neatness of detail.

3.2 PLUMBING:

3.2.1 Piping Materials

Condensate drain piping:

Type 'M' copper.

Heat pump supply and return piping:

Steel pipe 50mm and smaller - schedule 40 electric weld or seamless ASTM specification A-53, 65mm and larger - schedule 40 as above ASTM specification A-53 with butt welding ends. With steel pipe fittings up to and including 50 mm shall be threaded joints malleable iron, 65mm and larger shall be forged steel butt weld.

Copper pipe 50mm and smaller type 'L' hard drawn copper with wrought copper solder type fittings.

All elbows shall be long radius type.

Victaulic and Gustin-Bacon systems are acceptable equals.

- a) Gate valves up to 50mm: Crane 428, Jenking 810, RW/Toyo 293, Newman Hattersley T605.
- b) Globe Valves up to 50mm: Crane 7, Jenking 1068 RW/Toyo 221, Newman Hattersley 13.
- c) Ball valves up to 50mm: Crane 915, Jenking 33, RW/Toyo 5044A, Watts B6000, Newman Hattersley 1969AT.
- d) Flow balancing valves: Armstrong CBV.
- Domestic water piping: Type 'L' copper. Exposed piping in finished areas shall be chrome plated.
- Drain and vent lines: copper DWV or aluminum DWV pipe
- Condensate drain piping: Type 'M' copper.
- Domestic water valves: Crane 438 and 1320
Jenking 310 and 313
RW/TOYO 280A and 281A.
- Shock absorbers: Ancon shok-gard
Enpoco - HT series
Zurn - Shok Trol.

When using solder on portable water piping, use 0.2% maximum lead solder or alternatively use 90/5/5 (tin/silver/antimony) lead free solder.

3.2.2 Piping Supports

Support all piping using Clevis type hangers and riser clamps. Use hangers of the same material as pipe, or insulating inserts between hanger and pipe. Grinnell, Myatt, Economec or equal.

Provide pipe covering protection saddle at each hanger where pipes are insulated.

3.2.3 Escutcheon Plates

Provide escutcheon plates at all walls where pipes are exposed to view.

3.2.4 Unions

Provide unions to connect all piping to equipment to facilitate ease of maintenance.

3.2.5 Pipe Insulation

Insulate all domestic cold water piping and horizontal condensate drain lines with 1" thick fibreglass heavy density pipe insulation with all service jacket (ASJ). Adhere a factory applied vapour barrier jacket lap smoothly and securely at the longitudinal seams with

vapour barrier adhesive. Adhere 3" butt joint strips over all end joints to ensure a continuous vapour barrier.

Insulate domestic hot water piping with 1" thick fibreglass heavy density pipe insulation with full service jacket.

Finish all exposed insulation with 6 oz fire retarding canvas.

Clearly label pipe contents on pipe surface (i.e. D.H.W. or D.C.W.) and identify flow direction.

Piping shall be concealed in finished areas and grouped so that valves etc. are accessible through as few access panels as possible.

Run piping parallel to building lines with crossing over kept to a minimum.

Identify all visible piping fully exposed or in accessible spaces (i.e. lay-in ceilings) with legend lettering, direction of flow and field colour band.

<u>Medium</u>	<u>Legend</u>	<u>Legend & Flow Arrow Colour</u>	<u>Field Colour Band</u>
Heat Pump Water Supply	H.P.W.S.	Black	Light Green
Heat Pump Water Return	H.P.W.R.	Black	Light Green
Condensate	Cond.	Black	Black
Cold Water	C.W.	Black	Light Blue
Domestic Hot Water	D.H.W.	Black	Dark Blue
Sanitary Sewer	San.	White	Black
Plumbing Vent Line	Vent	Black	Black
Radiation Heat Supply	HWS	White	Purple
Radiant Heat Return HWR		White	Purple
Condenser Water Supply	CWS	White	Dark Green
Condenser Water Return	CWR	White	Dark Green

3.2.6 Valve Tagging

All valves shall have securely affixed to them a brass plate tag with embossed black numbers.

Prepare for the Landlord a list of valve numbers indicating location and function.

3.2.7 Access Doors

Provide approved access doors to all valves, and etc.

3.2.8 Radiant Panels

Do not cut , disturb or relocate existing base building radiant panels on typical floors

Refer to original base building specification for maintenance, flushing, installation, etc., radiant panels

3.2.9 Drains

Provide Enpoco E-1000-R5-CI-PB-TSP floor drains where shown or as approved by base building mechanical engineer.

All interior floor drains shall be piped and connected to trap seal primers TSP-2.

3.2.10 Cleanouts

Install all floor cleanouts with standard TY branch or Y branch and blend using Enpoco 3000-CI cleanouts with cover to suit floor finish.

3.2.11 Plumbing Alternatives

Enpoco numbers used in drains and cleanouts. Equivalent alternates by Zurn, Ancon or Rototech Smith are acceptable.

3.2.12 Plumbing Vents

Plumbing vents are not necessarily shown on drawings. However, install vent system in accordance with O.W.R.A. 675/85.

3.3 H.V.A.C.

3.3.1 Ductwork

Provide ductwork as indicated on drawings.

Provide all ductwork to "SMACNA" standards. Fabricate all ductwork from galvanized steel to the clear inside dimensions as noted on the drawings, with all flat surfaces cross broken.

Install all ducts free from leaks and seal all holes with 3M #474 tape

Duct thickness as follows:

<i>Maximum Size</i>	<i>Gauge</i>
up to 12"	26
13" to 30"	24
31" and over	22

Where any construction impediment or requirement renders the dimensions impossible, alter ductwork so as to give an effective cross sectional area equal to that originally shown without exceeding an aspect ratio of 4:1. Make changes at no additional cost to the Landlord.

Use bends where possible. Use square elbows c/w turning vanes wherever bends are impractical. Duro Dyne "Durovane Rail" or Hart & Cooley "Ducturn" or equal.

Brace ducts so they do not vibrate or sag. Support horizontal ducts up to 20" wide with 1" x14 ga. galvanised straps passing under ducts, on 8'0" centres. Use angle iron support for ducts over 20" wide or deep.

Provide approved access doors to all balancing and fire dampers, and etc.

Supply and install splitter dampers at all supply air branch take-offs. Dur-Dyne SRP or equal hardware.

Paint inside ductwork black where visible through grilles, etc.

Flexible ducting to be class 1 air duct connectors as listed and labelled by Underwriter's Laboratories of Canada, with flame spread of not more than 25 and smoke development classification of not more than 50.

All round duct through 24" diameter shall be United Sheet Metal spiral lock-seam Uni-seal duct manufactured from galvanized steel meeting ASTM A-527-71 in the following gauges:

<u>Diameter</u>	<u>Metal Thickness</u>
3" - 8"	28 Ga.
9" - 14"	28 Ga.
15" - 24"	26 Ga.

All fittings shall be United Sheet Metal standard, or equal, uniform fittings manufactured from galvanized steel meeting ASTM A-527-71 with continuous weld or standing seam construction in the following gauges:

<u>Diameter</u>	<u>Metal Thickness</u>
3" - 8"	24 Ga.
9" - 14"	24 Ga.
15" - 24"	22 Ga.

3.3.2 Duct Insulation

Insulate ductwork with 1" thick internal neoprene coated fibreglass ductliner where indicated. Adhere with minimum 50 % covering of fire retarding adhesive and supplement with welding pins.

Make provisions for duct liner so that sizes shown on drawings are clear inside dimensions inside the insulation.

Maintain and repair any base building HVAC duct insulation wrap damaged or disturbed during fit-up operations.

3.3.3 Fire Dampers

Provide Ruskin or controlled air ULC rated Type B fire dampers.

Install in accordance with N.F.P.A. 90A rated to suit fire rating of membrane to be protected.

3.3.4 Fans

Provide fans as scheduled on the drawings.

Adjust fans and motors to operate quietly, and make dampers tight to prevent vibration.

Provide fans with spring isolation to give a minimum 95% efficiency.

Provide flexible connections at each fan 24 oz. per yard tensile strength of not less than 500 lbs. with metal to 3" fabric to metal "Grip-Loc" duct connections.

3.3.5 Balancing

Engage the service of the Landlord's balancing contractor to balance and test all air handling systems under this section.

This contractor shall:

Review drawings, specifications, and installed work to ensure that systems may be properly balanced in accordance with drawings. Advise installing contractor of any additional requirements for effective balancing.

Ensure that air handling systems are free from obstructions, that dampers are positioned correctly, that moving equipment is lubricated in accordance with manufacturer's recommendations, and that filters are clean.

Demonstrate that the air handling system's performance is as specified and adjust variable speed pulley's and volume control dampers where necessary. Each diffuser and grille shall supply or exhaust specified quantity with +/-5%.

Tabulate and certify test results on suitable forms and submit to the Landlord for approval record.

Perform this work in accordance with procedures and standards described in SMACNA "Balancing and Adjusting Manual".

3.3.6 Control Dampers

Dampers shall be opposed or parallel blade low leakage type.

Frames to be reinforced extruded aluminum with vinyl jamb and blade seals. Blades to be 6" maximum on centres. Damper actuators shall be oil submerged, spring return, two position 120/1/60 electric type. Bearings to be non-corrosive nylon.

Damper seal shall be designed for minimum air leakage by means of overlapping seals. Dampers to be Nailor Hart, Ruskin or approved equal.

3.3.7 Variable (Constant) Air Volume Valves (V.A.V.)

Refer to schedules for type, capacity and size of variable volume air valves. Install in locations shown on plans. All controls to match existing valves (TAC).

3.3.8 Controls

Provide for new and relocation of existing control components as indicated on drawings.

Controls are to be supplied by TAC controls and installed by the base building contractor.

3.4 ELECTRICAL:

3.4.1 General

All work shall be in accordance with the latest edition of the Ontario Hydro Code, Local Inspection, Ontario Building Code, and any other ordinance.

Examine the site and all drawings and specifications of all trades and be familiar with the work of this trade. No allowances will be made for the failure to do so.

All electrical work shall comply with C.S.A. electrical bulletins applicable to tender close. Where specific bulletins are not named they are still considered an integral part of this specification.

Grounding shall be in accordance with the requirements of the Ontario Electrical Code. Provide all grounding required regardless if not shown on the drawings.

Provide all new materials having C.S.A. approval. All workmanship shall be first class in regard to standard practices, safety, accessibility, durability and neatness of detail for acceptance by the Landlord's representative.

Arrange and pay for all permits and inspection fees required for the work of this trade. It is the responsibility of this contractor to submit to the Electrical Inspection Department and/or supply authority any and all drawings and specifications required for permits, fees, approvals, examinations and services.

Provide all cutting and patching required for the work of this trade. All shop painted equipment damaged in transit shall be touched-up to match existing finish.

Avoid accumulation of debris as the work progresses. On completion of the work, clean up and remove from the site all scrap materials resulting from the work of this trade.

Co-ordinate the work of this trade with all other trades on the job so that the work may progress without delay.

Prior to final inspection, clean all electrical equipment. Clean all construction dust and dirt from installed equipment at the conclusion of the job.

Upon completion of the work, provide the final unconditional certificate of acceptance from Ontario Hydro Inspection Department to the Landlord.

Provide a one year guarantee on all materials, and labour from the date of acceptance by the owner.

The Electrical Contractor shall adjust phase loading, such as not to exceed a 10% phase imbalance.

The electrical contractor shall submit shop drawings for power distribution equipment, fire alarm equipment, and all luminaries with associated equipment, i.e. poles, brackets etc. to the Landlord.

The shop drawings shall bear the name of the manufacturer, the manufacturer's catalogue number, and the engineer's designation, along with all pertinent information on each piece of equipment.

All equipment shall be mounted, plumbed true.

The electrical contractor shall obtain one set of blueprints, for 'as built' purposes, and make all necessary revisions on these blueprints to reflect actual on-site changes.

At the end of construction, prior to final inspection by the engineer, the electrical contractor shall submit the as built drawings for review. Final inspection will not be carried out until these drawings are submitted.

The base building specifications shall form an integral part of this specification and shall be strictly adhered to.

The interior design drawings are to be consulted for all locations of devices and mounting instructions. Where device styles, colour, or orientation are specified on the interior design drawings these shall be strictly followed. Where requests by the designer are in conflict with the applicable codes, the Landlord's engineer shall be contacted for a decision.

The Tenants electrical contractor shall be responsible for the installation and certification of any metered service. The fees and deposits for such metered service shall be the sole responsibility of the Tenant / Contractor.

3.4.2 Conduits and Raceways

Use TWH or R90 copper conductors C.S.A. approved for the application. Size conductors so that maximum branch circuit voltage drop does not exceed 3%. Minimum conductor size is #12 AWG unless otherwise indicated. Design is based on copper conductors.

All conductors are to be installed in raceways as described below;

- a) Interior exposed surface raceways, branch circuit wiring from panel, concealed in accessible ceilings and walls or in concrete block construction: E.M.T. Raceways.
- b) In metal stud partition walls, branch circuit wiring from panels in suite or tenant occupancies, in concrete block walls for final drops and for final drops to fixtures in ceiling spaces. (Length not to exceed 3 M in this application); Armoured Cable (Bx).

All conduit and wiring is to be concealed in all finished areas.

Minimum raceway size for telephone and communication conductors is 19 mm (3/4 ").

3.5 DEVICES:

3.5.1 Switches

- a) Specification grade rated 15A, 125VAC, single pole, single throw. (3-way or 4-way as noted on drawings).
- b) Spec grade, rated 15A, 240VAC, single pole single throw. (3-way or 4-way as noted on drawings).

Manufacturers: Smith & Stone, Harvey Hubbell, Leviton, Pass & Seymour, Eagle or equal 4.

3.5.2 Receptacles

- a) Spec grade, duplex, rated 15A, 125VAC, EEMAC 5-15R configuration, U-ground.
- b) Isolated ground, duplex, rated 15A, 125VAC, EEMAC 5-15R configuration, insulated, isolated U-ground.
- c) Ground fault interrupting Class A duplex, rated 15A, 125VAC, EEMAC 5-15R configuration, trip at 4-6 MA fault current. C/W push to test and reset buttons.

3.5.3 Cover Plates

- a) Smoothline bakelite, colour to match switches and receptacles. Coverplates to be of the same manufacturer as the devices.

3.5.4 Dimmers

Lutron Nova "T" Series. Wattage as indicated. Provide appropriate wall boxes for corresponding dimmer size. Do not gang dimmers in one outlet box.

Manufacturers: Smith & Stone, Levito, Ideal, Prescolite or equal.

3.5.5 Equipment isolating disconnects

Disconnecting devices to be sized for the current carrying capacities of the equipment to be isolated. Provide number of poles as required by the equipment to be isolated. Type of enclosure as indicated below;

- 1) Dust free or standard - EEMAC Type 1.
- 2) Outdoor or damp location -EEMAC Type 3R.
- 3) for direct exposure to water under pressure - EEMAC Type 4.
- 4) For high dust concentration of non-ignitable dust - EEMAC Type

Manufacturers: Commander, Arrow-Hart, Scepter, F.P.L.. Square D, Westinghouse, or equal.

All devices of the same type, size and rating are to be of the same manufacturer throughout the project.

3.5.6 Service and Distribution

Acceptable manufacturers for the distribution equipment include:
Commander, Federal Pioneer Limited, ITE (Seimens), Square D, Westinghouse.

Label all disconnect switches, starters, and panels to clearly indicated equipment controlled or area serviced. Indicate fuse size and type on all fused disconnects.

Provide circuit breaker panels of the type, with ampere capacity, number of poles, branch breaker capacity etc., as specified in panel schedule. Mounting to be as indicated.

Provide a typed directory card on the inside of the panel door in a metal frame with clear plastic cover.

All branch breakers shall be thermal-magnetic trip indicated, ambient temperature compensated and bolted to the bus-bar.

All surface mounted equipment shall be mounted on 19 mm (3/4") plywood backboard.

3.5.7 Lighting

Provide fixtures complete with all accessories and mounting hardware, and lamps as approved by the Landlord as an equal fixture. Products of equal quality by alternate suppliers are to be approved by the base building engineer.

Extra base building fixtures are available from the Landlord.

3.5.8 Emergency Power

An emergency lighting circuit at 347V, 15A, is provided by the Landlord to power emergency lighting fixtures in the open plan office area, and are located in the ceiling space.

Emergency fixtures are direct wired to the typical floor emergency lighting circuit.

Emergency lighting circuit is fed from an emergency generator. When the generator engages it has a starting time of approximately 8 to 13 seconds.

Exit Fixtures

Provide exit fixtures to match base building exit fixtures style and voltage, each fixture is to be LED illuminated. Acceptable manufacturers are Emergi-Lite or alternates. Extend base building exit fixture circuit from existing exit locations to new locations.

Exit fixture circuit is connected to the building emergency distribution system.

3.5.10 Fire Alarm System

The building fire alarm system is existing and operating. Before performing any changes to the system, alert the Landlord 24 hours in advance to allow the zone to be isolated.

All devices which are disconnected and reconnected to the fire alarm system are to be verified for the operation prior to final inspection. Verification and testing must be performed by the Base Building Fire Alarm Contractor.

All new devices to match existing.

Provide certification of verification on project completion.

Installation to ULC CAN4-5524-M82.

Verification ULC CAN4-5537.

Sequence of operation shall be as designed for the base building.

3.5.11 Telephone / Data / Communications Raceway Systems

Complete system shall consist of outlet box, plaster ring as required, Raceway from outlet box to terminal board in equipment room, pull wire, and coverplates on all outlets not wired by the Tenant. All wire must be FT6 rated.

Arrange required communications service infrastructure risers and equipment with selected telecommunications Vendor. (The base building is serviced by Bell Canada)

Minimum Raceway size is 19 mm (3/4"). Minimum pull wire size is 3 mm (1/8") braided nylon.

3.5.12 Wiring for Other Trades

Provide power wiring for the mechanical trades unless noted otherwise. Provide all starters and disconnect switches as required. L.V. Controls and control wiring is provided by the mechanical contractor.

Verify size, location, and electrical requirements of all mechanical equipment prior to the installation of the related electrical equipment. Maintain all clearances as required for mechanical equipment servicing.

The electrical contractor shall provide all line voltage wiring and terminations of time clocks, controls, transformers etc. required by the mechanical contractor.

3.5.13 General

The Landlord reserves the right, from time to time, to add to or to amend the foregoing information, procedures and regulations.

Regulations and procedures as amended from time to time will affect any Tenant work undertaken after the amendment is issued.