



**WEST TORONTO COMMUNITY HEALTH SERVICES (WTCHS)**

**West Toronto Community Health Centre (WTCHC) – 209 Mavety St.  
HDR Architecture Associates Inc. Project No.: 10355669  
WSP Project No.: 221-11662-00**

**ISSUED FOR MECHANICAL ADDENDUM, ADD-M01**

**October 7th, 2024**

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**INCLUDE IN YOUR BID AMOUNT FOR THE FOLLOWING ITEMS OF ADDITION, DELETION OR CLARIFICATION. INDICATE IN THE SPACE PROVIDED ON THE BID FORM THAT YOU HAVE RECEIVED AND INCLUDED FOR THE REQUIREMENTS OF THIS ADDENDUM.**

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**1. ISSUED SPECIFICATIONS**

**1.1 SECTION 20 05 10 BASIC MECHANICAL MATERIALS AND METHODS**

1.1.1 Refer to attached Spec 20 05 10 for changes.

**2. ISSUED DRAWINGS**

Following drawings are issued with and form part of this addendum (include for additional work and/or revisions as shown/noted):

**2.1 M-001 DRAWING LIST, SYMBOL LIST& GENERAL NOTES**

2.1.1 Update legends for Plumbing Systems.

**2.2 M-201 LEVEL B01 - PLUMBING**

2.2.1 Added balancing valves set points and revised piping.

**2.3 M-202 LEVEL 01 - PLUMBING**

2.3.1 Added balancing valves set points and revised notes.

**2.4 M-203 LEVEL 02 – PLUMBING**

2.4.1 Added balancing valves set points, tag.

2.4.2 Revised vent piping route.

**2.5 M-400 LEVEL B01 - HVAC**

2.5.1 Replaced FD with FSD at applicable locations.



**2.6 M-401 LEVEL 01 - HVAC**

2.6.1 Added return ductwork.

2.6.2 Replaced FD with FSD at applicable locations.

2.6.3 Revised note for kitchen exhaust.

**2.7 M-402 LEVEL 02 - HVAC**

2.7.1 Replaced FD with FSD at applicable locations.

**2.8 M-450 LEVEL B01 – HYDRONIC PIPING**

2.8.1 Revised General Note 3.

**2.9 M-451 LEVEL 01 – HYDRONIC PIPING**

2.9.1 Revised General Note 3.

**2.10 M-451 LEVEL 01 – HYDRONIC PIPING**

2.10.1 Added labels to equipment.

**2.11 E-402 LEVEL 02 - COMMUNICATIONS**

2.11.1 Revised Detail New Work Note 1 in Data/Server Room 201 to Note 2.

**2.12 M-501 MECHANICAL CONTROLS I**

2.12.1 Revised Control sequence note 2 for DCW Recirc. Pump DHWR-1 control diagram.

**2.13 M-601 DOMESTIC WATER SCHEMATIC**

2.13.1 Clarification on schematic diagram.

2.13.2 Removed piping associated with the standpipe.

**2.14 M-607 STORM WATER SCHEMATIC**

2.14.1 Refer to Removed cleanouts as indicated.

**2.15 M-701 MECHANICAL SCHEDULES I**

2.15.1 Added information for RTU-4 and 5.

**2.16 M-702 MECHANICAL SCHEDULES 2**

2.16.1 Removed fire protection heading from pumps from schedule.

2.16.2 Revised Schedule of Motorized Heaters.

**2.17 M-704 MECHANICAL SCHEDULES 4**

2.17.1 Removed plumbing fixture schedule.



**2.18 M-801 MECHANICAL DETAILS 1**

2.18.1 Removed details 5 (Emergency shower and eyewash) and 6 (island counter sink).

2.18.2 Added detail for wall mounted eye wash.

**2.19 M-805 MECHANICAL DETAILS 5**

2.19.1 Revised detail 2 (washer connection detail).

**END OF ADD-M01**

**SECTION 20 05 10**  
**BASIC MECHANICAL MATERIALS AND METHODS**

**PART 1 - GENERAL**

**1.1 APPLICATION**

- A. This Section specifies products, criteria and characteristics, and methods and execution that are common to one or more Sections of Mechanical Divisions. It is intended as a supplement to each Section and is to be read accordingly.
- B. Advise product vendors of requirements of this Section.

**1.2 SUBMITTALS**

- A. Submit shop drawings/product data sheets for:
  - 1. pressure gauges and thermometers;
  - 2. electric motors (submit with equipment they are associated with).
- B. Submit weight loads for selected equipment (upon request).
- C. Submit copy of architectural reflected ceiling plan drawings and elevation drawings to indicate proposed access door locations.
- D. Submit sample of each proposed type of access door if supplied under work of this Division.
- E. Submit samples of materials and any other items as specified in Sections of Mechanical Divisions.
- F. Submit list of equipment identification nameplates indicating proposed wording and sizes.
- G. Submit list of pipe and duct identification colour coding and wording.
- H. Submit proposed valve tag chart and a list of proposed valve tag numbering and identification wording.
- I. Submit drawings indicating size and location of required sleeves, recesses and formed openings in poured or precast concrete work.
- J. As specified in Part 2 of this Section, submit spare belt set, tagged and identified, for each belt driven piece of equipment.
- K. Submit any other submittals specified in this Section or other Sections of Mechanical Divisions.

**1.3 EQUIPMENT WITHSTAND RATINGS**

- A. Coordinate with Electrical Divisions Contractor with regards to obtaining calculations of short circuit current ratings (SCCR) and available fault currents at each level of electrical distribution system that serves major mechanical equipment.
- B. Select mechanical equipment able to withstand and labeled with required appropriate SCCR sufficient for voltage employed and fault current at terminals of equipment.
- C. Where SCCR are not identified, assume for pricing minimum 35 kA for small equipment and 65 kA for larger HVAC units.
- D. Review with Consultant and Division 26 Electrical Contractor, prior to ordering equipment, and identify required SCCR on shop drawings.

**1.4 PRE-TENDERED EQUIPMENT**

- A. Refer to Appendix for complete information regarding scope of work for pre-tendered equipment. Equipment have been pre-tendered, ordered, and paid for by Owner. Associated work to be included as part of Work of Mechanical Division of this Project, that is to include for, but not be limited to, provision of following:

1. coordination with respective equipment manufacturers with regards to delivery, unloading and acceptance on site;
  2. inspection upon delivery and acceptance;
  3. unloading, transporting and moving/hoisting into installation position;
  4. installation, connection, testing, and certification.
- B. Take over order and coordinate with various manufacturers/suppliers of pre-ordered equipment and associated Work. During inspection of pre-ordered equipment and associated components at site, report deficiencies to respective supplier and to Owner and be responsible for resolving such deficiencies directly with respective supplier(s).
- C. Be available for and attend factory testing at supplier's offices of pre-ordered equipment and associated Work, as requested by Consultant.
- D. Coordinate final installation requirements with manufacturers/suppliers of pre-ordered equipment and associated Work.
- E. For reference purposes, copy of shop drawing may be obtained from Consultant after order has been made.
- F. Review installation schematics and diagrams, control system schematics, and wiring diagrams supplied by manufacturers/suppliers of pre-ordered equipment and associated Work. Coordinate interconnections with related various building systems.
- G. Refer to respective equipment Section - Part 3 for additional installation requirements.
- H. Refer also to Appendix for further details and requirements of pre-tendered equipment. Be responsible for review of issued documents and request further information from Consultant, if required. Include and incorporate required provisions and associated costs required for a complete installation.
- I. Install equipment in accordance with drawing notes, specifications, and manufacturer's instructions and to comply with Owner's on-site standards and regulations.
- J. Under Electrical Divisions scope of Work, electrical equipment was also pre-tendered. Mechanical Division Contractor to coordinate interconnections and integrations with Electrical Division Contractor.
- K. Obtain following from suppliers of per-tendered equipment and submit to Owner:
1. operating and maintenance materials, testing and commissioning reports, and inspection certificates/ULC approvals/local governing inspection authority approvals, warranties and other supplied documents; organize and combine documents into manuals as specified in Division 01;
  2. spare parts, maintenance tools and kits, and loose accessories.
- L. Review and coordinate with each respective vendor of pre-tendered equipment, exact pre-tendered equipment, and accessories that are being supplied and/or installed, and services being performed by pre-tendered equipment vendor. With each respective pre-tender equipment vendor, determine installation products and services which are not included as part of pre-tender packages but which need to be supplied by respective pre-tender equipment vendor in order to complete onsite installation of equipment. Obtain costs for supply of these items and include in Bid along with respective installation costs. Identify items as an itemized price included in Bid. Attach list of detailed items and itemized prices with Bid Form submission.

## **PART 2 - PRODUCTS**

### **2.1 PIPE SLEEVES**

- A. Galvanized Sheet Steel: Minimum #16 gauge galvanized steel with an integral flange at one end to secure sleeve to formwork construction.
- B. Polyethylene: Factory fabricated, flanged, high density polyethylene sleeves with reinforced nail bosses.
- C. Waterproof Galvanized Steel Pipe: Schedule 40 mild galvanized steel pipe with a welded-on square steel anchor and water stop plate at sleeve midpoint.

- D. Galvanized Steel or Cast Iron Pipe: Schedule 40 mild galvanized steel, or Class 4000 cast iron.

## **2.2 FIRESTOPPING AND SMOKE SEAL MATERIALS**

- A. Firestopping and smoke seal system materials for mechanical penetrations through fire rated construction are specified in Division 07 and work will be included as part of work of Division 07.
- B. Firestopping and smoke seal system materials for mechanical penetrations through fire rated construction are specified in Section entitled Firestopping and Smoke Seal Systems and work is to be included as part of mechanical work.

## **2.3 WATERPROOFING SEAL MATERIALS**

- A. Modular, mechanical seal assemblies consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and pipe sleeve or wall opening, assembled with stainless steel bolts and pressure plates and designed so when bolts are tightened the links expand to seal the opening watertight. Select seal assemblies to suit pipe size and sleeve size or wall opening size.
- B. Acceptable products are:
1. Thunderline Corp. (Power Plant Supply Co.) "LINK SEAL" Model S-316;
  2. The Metraflex Co. "MetraSeal" type ES.

## **2.4 PIPE ESCUTCHEON PLATES**

- A. One-piece chrome plated brass or #4 finish type 302 stainless steel plates with matching screws for attachment to building surface, each plate sized to completely cover pipe sleeve or building surface opening, and to fit tightly around pipe or pipe insulation.

## **2.5 PIPING HANGERS AND SUPPORTS**

- A. Pipe hanger and support materials, including accessories, are to be, unless otherwise specified, in accordance with Manufacturers Standardization Society (MSS) Standard Practice Manual SP-58, Pipe hangers and Supports-Materials, Design and Manufacture, and where possible, MSS designations are indicated with each product specified below. Conform to following requirements:
1. unless otherwise specified, ferrous hanger and support products are to be electro-galvanized;
  2. hangers and supports for insulated piping are to be sized to fit around insulation and insulation jacket.
- B. Hangers and supports for horizontal suspended piping as follows:
1. adjustable steel clevis hanger – MSS Type 1;
  2. adjustable swivel ring band hanger – MSS Type 10;
  3. adjustable roller hanger – MSS Types 41, 43, and/or 45, with MSS Type 39 steel protection saddle.
- C. Supports for horizontal pipe on vertical surfaces as follows:
1. steel offset pipe clamp – Anvil Fig. 103 or Myatt Fig. 170;
  2. heavy-duty steel pipe clip – MSS Type 26;
  3. single steel pipe hook – Myatt Fig. 156;
  4. epoxy coated steel pipe stays are not permitted.
- D. Floor supports for vertical risers as follows:
1. copper tubing riser clamp – MSS Type 8;
  2. heavy-duty steel riser clamp – MSS Type 8.
- E. Supports for vertical piping on vertical surfaces as follows:
1. steel offset pipe clamp – Anvil Fig. 103 or Myatt Fig. 170;
  2. heavy-duty steel pipe bracket or soil pipe bracket – MSS Type 26;
  3. extension split pipe clamp – MSS Type 12;
  4. epoxy coated steel pipe stays are not permitted.
- F. Base support for vertical risers in excess of 6 m (20') high extending out from base mounted equipment is to consist of a base elbow support with flange.

- G. For horizontal pipe on racks, Unistrut or approved equal galvanized steel pipe racks with pipe securing hardware as follows:
  - 1. standard galvanized steel U-bolts/clamps supplied by rack manufacturer;
  - 2. adjustable roller chair – MSS Type 44 with MSS Type 39 steel protection saddle.
- H. Special hangers and supports for various applications as follows:
  - 1. vibration isolated riser supports – black steel riser clamps as specified above, complete with neoprene–steel–neoprene sandwich type vibration isolation pads between clamp and floor;
  - 2. for groups of pipes having same slope – MSS Type 32 welded steel brackets, Anvil Fig. 46 universal trapeze assemblies, or Unistrut or approved equal support assemblies, all with U-bolts, clamps, etc., to secure pipes in place;
  - 3. for sections of piping connected to vibration isolated equipment – hangers and supports as specified above but complete with MSS Type 48 spring cushions;
  - 4. for piping on existing roof – Portable Pipe Hangers (Canada) Inc. "PP" Series prefabricated portable pipe support system components to suit pipe, complete with required accessories including bases, galvanized structural steel frames, and galvanized steel pipe hangers and supports conforming to MSS SP-58;
  - 5. for plastic piping – generally as specified above but in accordance with pipe manufacturer's recommendations;
  - 6. for fire protection piping – generally as above but ULC listed and/or FM approved, and in accordance with Chapter requirements of NFPA Standard applicable to piping system;
  - 7. for bare horizontal copper piping – generally as above but factory vinyl coated to prevent direct copper/steel contact;
  - 8. for bare copper vertical piping – corrosion resistant ferrous clamps with flexible rubber gasket type material (not tape) to isolate pipe from clamp;
  - 9. insulation protection shields to and including 40 mm (1-½") dia. – MSS Type 40 galvanized steel shields with ribs to keep shield centred on hanger.
- I. Hanger rods are to be electro-galvanized carbon steel (unless otherwise specified), round, threaded, to ASTM A36, complete with captive machine nuts with washers at hangers, sized to suit loading in accordance with Table 3 in MSS SP-58, but minimum 9.5 mm (3/8") diameter.
- J. Acceptable manufacturers are:
  - 1. E. Myatt & Co. Inc.;
  - 2. Anvil International Inc.;
  - 3. Empire Industries Inc.;
  - 4. Hunt Manufacturing Ltd.;
  - 5. Unistrut Canada Ltd.;
  - 6. Nibco Inc. "Tolco";
  - 7. Taylor Pipe Supports.

## 2.6 ACCESS DOORS

- A. Access doors to be provided under work of Division 08 by General Trades Contractor.
- B. Coordinate with Mechanical Contractor and General Trades Contractor to ensure access doors on project are provided by a single manufacturer, installed as part of work of General Trades Contractor and work involving both mechanical and electrical services, where possible, be accessible from common access door. Coordinate work to ensure same common location access doors are not supplied by more than one Division.
- C. Size access doors to suit the concealed work for which they are supplied, and wherever possible they are to be of standard size for all applications, but minimum 300 mm x 300 mm (12" x 12") for hand entry and 600 mm x 600 mm (24" x 24") for body entry.
- D. Access doors in fire rated construction are to be ULC listed and labelled and of a rating to maintain fire separation integrity.

- E. Identify on reflected ceiling plans and wall elevation drawings, coordinated locations of proposed access door locations and submit to Consultant for review.

## 2.7 ACCESS DOORS

- A. Coordinate consistency of look and finish of access doors on project with each Division of Work. Coordinate exact requirements with General Trades Contractor.
- B. Access doors to be rust resistant steel door panels, with concealed hinges and positive locking and self-opening screwdriver operated lock. Wall type frame to be suitable for wall installation and have integral keys for plaster walls. Doors in tile wall to be stainless steel and in ceilings to be suitable for plaster covering with only frame joint showing. Other doors to be prime painted steel.
- C. Size access doors to suit the concealed work for which they are supplied, and wherever possible they are to be of standard size for all applications, but minimum 300 mm x 300 mm (12" x 12") for hand entry and 600 mm x 600 mm (24" x 24") for body entry.
- D. Lay-in type tiles, properly marked, may serve as access panels. Coordinate marking of ceiling tiles with Consultant. Panels in glazed tile walls to be 12 gauge, 304 alloy stainless steel, No. 4 finish, with recessed frame secured with stainless steel counter-sunk flush head screws.
- E. Panels in plaster surfaces to have dish-shaped door and welded metal lath, ready to take plaster. Provide a plastic grommet for door key access.
- F. Other access doors to be welded 12 gauge steel, flush type with concealed hinges, lock and anchor straps, complete with factory prime coat. Submit to Consultant for review, details of non-standard door construction details.
- G. Access doors in fire rated ceilings, walls, partitions, structures, etc., to be ULC listed and labelled and of a rating to maintain fire separation integrity.
- H. Where access doors are located in surfaces where special finishes are required, they are to be of a recessed door type capable of accepting finish in which they are to be installed so as to maintain final building surface appearance throughout.
- I. Acceptable manufacturers include Le Hage, SMS, Pedlar and Acudor.

## 2.8 PRESSURE GAUGES AND THERMOMETERS

- A. Pressure gauges as follows:
  - 1. adjustable, glycerine filled, 100 mm or 115 mm (4" or 4-½") diameter and each accurate to within 1% of scale range;
  - 2. type 304 stainless steel case with relief valve and polished stainless steel bayonet;
  - 3. stainless steel rotary movement with stainless steel bushings and socket;
  - 4. clear acrylic window;
  - 5. dual scale white dial with a scale range such that working pressure of system is at approximate mid-point of scale;
  - 6. black pointer.
- B. Pressure gauge accessories and additional requirements as follows:
  - 1. bronze ball type shut-off valve is to be provided in piping to each pressure gauge;
  - 2. each pressure gauge for piping and equipment with normal everyday flow is to be equipped with a brass pressure snubber;
  - 3.
  - 4. pressure gauges in fire protection piping must be ULC listed and labelled;
- C. Thermometers as follows:
  - 1. round, 125 mm (5") diameter, adjustable (90°) angle bimetal dial type thermometers, each accurate to within 1% of full scale;
  - 2. hermetically sealed stainless steel case with stainless steel ring;
  - 3. dampened bimetal coil;
  - 4. calibration adjustment screw;



5. white aluminum dual scale dial with black and blue markings and a range such that working temperature of system is approximate mid-point of the scale;
  6. black aluminum pointer;
  7. double strength glass window;
  8. 12 mm (½") NPT connection with 6.4 mm (¼") diameter stainless steel stem;
  9. suitable thermowell.
- D. Acceptable manufacturers are:
1. H.O. Trerice Co.;
  2. Weiss Instruments;
  3. Ashcroft.

## 2.9 EQUIPMENT BELT DRIVES

- A. ANSI/RMA Standard V-belt type rated at minimum 1.5 times motor nameplate rating, and in accordance with following requirements:
1. belts are to be reinforced cord and rubber, and multiple belts are to be matched sets;
  2. sheaves are to be cast iron or steel, secured to shafts with removable keys unless otherwise specified, standard adjustable pitch ( $\pm 10\%$  range) for motors under 10 HP, fixed pitch type with split tapered bushing and keyway for motors 10 HP and larger, and, if required, replaced as part of mechanical work to suit system air/water quantity testing and balancing work;
  3. motor slide rail adjustment plates are to allow for centre line adjustment.
- B. Supply a spare belt set (tagged and identified) for each belt drive as reviewed with Consultant, and turn over to Owner upon Substantial Performance of the Work.

## 2.10 EQUIPMENT DRIVE GUARDS AND ACCESSORIES

- A. For V-Belt Drives: Removable, 4-sided, fully enclosed, galvanized sheet steel guards to OHSA standards, cleaned, factory primed and painted with yellow equipment enamel, complete with a 2-piece full length hinged front panel to permit belt maintenance or replacement without removing guard, and 40 mm (1½") diameter tachometer openings at each shaft location.
- B. For Flexible Couplings: Removable "U" shaped galvanized steel guards to OHSA Standards with a 2.3 mm (3/32") thick frame and expanded mesh face.
- C. For Unprotected Fan Inlets and Outlets: Unless otherwise specified, removable 20 mm (¾") galvanized steel wire mesh with galvanized steel frames, all to OHSA Standards.

## 2.11 ELECTRIC MOTORS

- A. Unless otherwise specified, motors are to conform to NEMA Standard MG1, applicable IEEE Standards, and applicable CSA C22.2 Standards, and are to meet NEMA standards for maximum sound level ratings under full load. Confirm motor voltages prior to ordering.
- B. Vertically mounted and submersible motors are to be purposely designed for mounting in this attitude.
- C. Efficiency of 1-phase motors to 1 HP is to be in accordance with CAN/CSA C747. Efficiency of 3-phase motors 1 HP and larger is to be in accordance with CAN/CSA C390 or IEEE 112B.
- D. Unless otherwise specified, 1-phase motors smaller than ½ HP are to be 115 volt, continuous duty capacitor start type with an NEMA 48 or 56 frame size, solid base, heavy-gauge steel shell with solid die-cast end shields, dynamically balanced die-cast rotor, integral automatic reset thermal overload protection, Class "B" insulation, and a 1.15 service factor at 40°C (105°F) ambient temperature.
- E. Explosion-proof 1-phase motors are to be totally enclosed, fan cooled, 115 volt continuous duty capacitor start type in accordance with CSA C22.2 No. 145, as specified for standard 1-phase motors but suitable for use in Class 1 Group D hazardous locations and complete with a rolled steel shell and a 1.0 service factor at 40°C (105°F) ambient temperature.
- F. Unless otherwise specified, motors ½ HP and larger are to be totally enclosed, fan cooled, 3-phase, T-frame, squirrel cage continuous duty induction motors suitable for voltages indicated on Drawings, NEMA Design "B" for normal starting torque or Design "C" for high starting torque as required by the application, each

complete with Class "B" insulation, a 1.15 service factor at 40°C ambient temperature, grease lubricated open ball bearings with grease fittings to permit re-lubrication without dismantling motor, a cast iron frame with cast iron feet where required, cast iron end bracket and precision machined bearing fit, and balanced carbon steel shaft assembly with die-cast aluminum rotor windings.

- G. Explosion-proof 3-phase motors are to be totally enclosed fan cooled motors in accordance with CSA C22.2 No. 145, generally as specified above for standard 3-phase motors but suitable for use in Class 1 Group D hazardous locations and with a 1.0 service factor at 40°C (105°F) ambient temperature.
- H. Motor(s) for 2-speed fan(s) are to be as above but 2-speed double winding type.
- I. Unless otherwise indicated, motors 30 HP and larger are to be complete with a heat sensing PTC thermistor in the end turn of stator winding for each phase and connected in series inside motor with 2 marked leads brought out to motor conduit box.
- J. Motors for equipment with variable frequency drives are to be generally as specified above but inverter duty type to NEMA Standard MG-1 Part 31, quantified by CSA for operation from a variable frequency drive of type specified, and complete with Class "H" insulation. Motors are to be equipped with AEGIS, or approved equal, shaft grounding ring system to protect bearings from damage by diverting harmful shaft voltages and bearing currents to ground.
- K. Motors for equipment which is scheduled or specified with a corrosion resistant coating or constructed from corrosion resistant materials are to be factory coated with a primer and epoxy paint finish.
- L. Acceptable manufacturers are:
  - 1. TECO-Westinghouse Motors (Canada) Inc.;
  - 2. Canadian General Electric;
  - 3. Baldor Electric Co.;
  - 4. U.S. Electrical Motors;
  - 5. WEG Electric Corp.;
  - 6. Marathon Electric;
  - 7. Toshiba Corp.;
  - 8. Leeson Canada.

## 2.12 MOTOR STARTERS AND ACCESSORIES

- A. Motor starters to be capable of starting associated motors under imposed loads. Confirm starter voltage matches motor prior to ordering.
- B. Unless otherwise specified, starters for 1-phase motors are to be 115 volt, thermal overload protected manual starting switches with neon pilot light, surface or recessed enclosure to suit application, and, where automatic operation is required, separate H-O-A switch in enclosure to match starter enclosure.
- C. Unless otherwise specified, starters for 3-phase motors less than 50 HP are to be combination "quick-make" and "quick-break" fused disconnects and full voltage non-reversing across-the-line starters, each complete with overload relay per phase, enclosure to suit application, and accessories in accordance with motor starter schedule.
- D. Unless otherwise specified, starters for 3-phase motors 50 HP to 150 HP are to be reduced voltage, non-reversing, auto-transformer type starters complete with one overload relay per phase, enclosure to suit application, and accessories in accordance with motor starter schedule.
- E. Unless otherwise specified, starters for 3-phase motors 150 HP and larger are to be reduced voltage, non-reversing, closed transition "wye-delta" starters complete with one overload relay per phase, enclosure to suit application, and accessories in accordance with motor starter schedule.
- F. Starters for 2-speed double winding motors are to be generally as specified above but suitable for motor and equipped with 45 second time delay to permit equipment to coast down to low speed before it is operated at low speed.

- G. Starters for 2-speed single winding motors are to be generally as specified above but suitable for motor and equipped with 45 second time delay to permit equipment to coast down to low speed before it is operated at low speed.
- H. Starters for reversible motors for cooling towers are to be generally as specified above but suitable for motor and equipped with 45 second time delay to allow fan(s) to coast down to stop before being operated in reverse rotation.
- I. Unless otherwise specified, motor starter enclosures are to be in accordance with following NEMA ratings:
  - 1. enclosures located in sprinklered areas – Type 2;
  - 2. enclosures exposed to the elements – Type 3R, constructed of stainless steel;
  - 3. enclosures inside the building in wet areas – Type 3R, constructed of stainless steel;
  - 4. enclosures in explosion rated area – Type 7 with exact requirements to suit the area and application;
  - 5. enclosures except as noted above – Type 1;
  - 6. enclosures located in finished areas – as above but recess type with brushed stainless steel faceplate.
- J. Motor control centres are to be multi-unit, 2.28 m (9') high, NEMA Class 1, type "B", factory assembled, dead front, floor mounted, free-standing motor control centre with tin plated copper bus and NEMA Type 1 or Type 2 enclosure as for loose starters specified above. Each motor control centre is to be complete with starters as specified above, load and control wiring terminal boards, and required facilities for line and load side power wiring connections.
- K. Disconnect switches for motor control centres are to be heavy-duty, CSA certified, front operated switches as per motor starter schedule, each complete with a handle suitable for padlocking in "off" position and arranged so that door cannot be opened with handle in "on" position and an NEMA enclosure as specified for loose starters. Fusible units are to be complete with fuse clips to suit fuse types specified below.
- L. Fuses are to be, unless otherwise scheduled or specified, English Electric Ltd. HRC fuses, Form I Class "J" for constant running equipment and Form II Class "C" for equipment that cycles on and off.
- M. Acceptable manufacturers are:
  - 1. Rockwell Automation Inc. - Allen-Bradley;
  - 2. Eaton;
  - 3. Siemens Canada;
  - 4. Schneider Electric.

## 2.13 MECHANICAL WORK IDENTIFICATION MATERIALS

- A. Equipment nameplates are to be minimum 1.6 mm (1/16") thick 2-ply laminated coloured plastic plates, minimum 12 mm x 50 mm (½" x 2") for smaller items such as damper motors and control valves, minimum 25 mm x 65 mm (1" x 2-½") for equipment, and minimum 50 mm x 100 mm (2" x 4") for control panels and similar items. Additional requirements are as follows:
  - 1. unless otherwise specified or required, each nameplate is to be white, complete with bevelled edges and black engraved wording to completely identify equipment and its use with no abbreviations;
  - 2. wording is generally to be as per drawings, i.e. Fan EF-1, and is to include equipment service and building area/zone served, but must be reviewed with Consultant prior to engraving;
  - 3. supply stainless steel screws for securing nameplates in place;
  - 4. nameplates for equipment suspended above floor level or generally not within easy viewing from floor level are to be increased in size so as to be easily readable from floor level.
- B. Valve tags are to be coloured, 40 mm (1-½") square, 2-ply laminated plastic with bevelled edges, red-white, green-white, yellow-black, etc., to match piping identification colour, each complete with a 3.2 mm (1/8") diameter by 100 mm (4") long brass plated steel bead chain, and four lines of engraved maximum size identification wording, i.e.:  
VALVE V12  
200 mm (8")  
CHILL. WATER  
NORMALLY OPEN

- C. Standard pipe identification to be Smillie McAdams Summerlin Ltd., Brady or Primark Manufacturing Inc. vinyl plastic with indoor/outdoor type vinyl ink lettering and directional arrows, as follows:
1. for pipe less than or equal to 150 mm (6") diameter, coiled type snap-on markers of a length to wrap completely around pipe or pipe insulation;
  2. for pipe larger than 150 mm (6") diameter, saddle type strap-on markers with 2 opposite identification locations and complete with nylon cable ties.
- D. Identification wording and colours for pipe identification materials are to be as follows:

PIPE SERVICE	IDENTIFICATION COLOUR	LEGEND
domestic cold water	green	DOM. COLD WATER
domestic hot water supply	green	DOM. HW SUPPLY
domestic hot water recirculation	green	DOM. HW RECIRC.
tempered domestic water	green	TEMP. DOM. WATER
chilled drinking water	green	CH. DRINK WTR.
storm drainage	green	STORM
sanitary drainage	green	SAN.
plumbing vent	green	SAN. VENT
fire protection standpipe	red	F.P. STANDPIPE
natural gas	to Code	to Code, c/w pressure
natural gas vent	to Code	to Code
heating water supply	yellow	HTG. WTR. SUPPLY
heating water return	yellow	HTG. WTR. RETURN
heating water drain	yellow	HTG. WTR. DRAIN
pumped condensate	yellow	PUMPED CONDENSATE
boiler feedwater	yellow	BLR. FEEDWATER
boiler blowdown	yellow	BLR. BLOW-OFF
refrigerant suction	yellow	REFRIG. SUCTION
refrigerant liquid	yellow	REFRIG. LIQUID
refrigerant hot gas	yellow	REFRIG. HOT GAS
control air	green	CONTROL AIR

- E. Colours for pipe identification legends and directional arrows are to be as follows:

IDENTIFICATION COLOUR	LEGEND & ARROW COLOUR
yellow	black
green	white
red	white

- F. Duct identification is to be custom made Mylar stencils with 50 mm (2") high lettering to accurately describe duct service, i.e. "AHU-1 SUPPLY", complete with a directional arrow, and coloured ink with ink pads and roller applicators. Ink colour is generally to be black but must contrast with lettering background.

## **2.14 FLEXIBLE CONNECTORS**

- A. Double wall stainless steel flexible connectors for piping connections to vibration isolated equipment, each selected by manufacturer to suit the application. Shop drawings or product data sheets must indicate construction and performance requirements that suit the application. Acceptable manufacturers are:
1. Hyspan Precision Products Inc.;
  2. Senior Flexonics Ltd.;
  3. The Metraflex Co.

## **PART 3 - EXECUTION**

### **3.1 GENERAL PIPING AND DUCTWORK INSTALLATION REQUIREMENTS**

- A. Unless otherwise specified, locate and arrange horizontal pipes and ducts above or at ceiling on floors, arranged so that under consideration of all other work in area, maximum ceiling height and/or usable space is maintained. If required to maintain ceiling heights, reroute and/or resize ductwork, as reviewed with Consultant and with Owner approval.
- B. Unless otherwise specified, install work concealed in finished spaces, and concealed to degree possible in partially finished and unfinished spaces. Refer to and examine Architectural drawings and room finish schedules to determine finished, partially finished, and unfinished areas. Walls which are painted are considered finished.
- C. Install pipes and ducts parallel to building lines and to each other.
- D. Neatly group and arrange exposed work.
- E. Locate work to permit easy access for service or maintenance as required and/or applicable. Locate valves, dampers and any other equipment which will or may need maintenance or repairs and which are to be installed in accessible construction so as to be easily accessible from access doors. Where valves, dampers and similar piping or ductwork accessories occur in vertical services in shafts, pipe spaces or partitions, locate accessories at floor level.
- F. Make connections between pipes of different materials using adapters suitable for application. Provide cast brass dielectric type adapters/unions at connections between ferrous and copper pipe.
- G. Comply with equipment and material manufacturer's installation instructions unless otherwise specified herein or on drawings, and unless such instructions contradict governing codes and regulations.
- H. Carefully clean ducts, pipe and fittings prior to installation. Temporarily cap or plug ends of pipe, ducts and equipment which are open and exposed during construction.
- I. Install piping and ductwork which are to be insulated, to have sufficient clearance to permit insulation and finish to be applied continuously and unbroken around pipe or duct, except for ductwork at fire barriers, terminate insulation at each side of duct fire damper.
- J. Inspect surfaces and structure prepared by other trades before performing work. Verify surfaces or structure to receive work has no defects or discrepancies which could result in poor application or cause latent defects in installation and workmanship. Report defects in writing to Consultant. Installation of work will constitute acceptance of such surfaces as being satisfactory.
- K. Any ferrous piping that exhibits in excess of 5% surface rust, either inside or outside or both, is to be wire brush cleaned to bare metal and coated with suitable primer. Steel pipe, fittings and accessories are to be free of corrosion and dirt when work is complete or prior to being concealed from view. Where dirt is evident, clean piping prior to being concealed.

- L. Provide continuous galvanized sheet metal drip pan under drain, water and water solution piping extending through rooms with electrical equipment such as electrical, elevator equipment and transformer rooms, and other spaces provided primarily for the installation of electrical equipment. Provide drip pans with drain pipe connection and extend drain piping to closest drain.
- M. For factory applied finishes, repaint or refinish surfaces damaged during shipment and installation. Quality of repair work is to match original finish. This requirement also applies to galvanized finishes.
- N. Where mechanical work is located in high humidity areas where ferrous metal products will be subject to corrosion and protection for such products is not specified, provide finishes on products to protect against corrosion or provide products which will not corrode in the environment, i.e. aluminium ductwork, copper or stainless steel pipe, etc.
- O. Provide screwed unions or flanges in piping connections to equipment and in regular intervals in long (in excess of 12 m [40']) piping runs to permit removal of sections of piping.
- P. Unless otherwise specified and except where space limitations do not permit, piping elbows are to be long radius. Eccentric reducers are to be installed with straight side at top of piping.

### 3.2 PIPE JOINT REQUIREMENTS

- A. Do not make pipe joints in walls or slabs.
- B. Ream piping ends prior to making joints.
- C. Properly cut threads in screwed steel piping and coat male threads only with Teflon tape or paste, or an equivalent thread lubricant. After pipe has been screwed into fitting, valve, union, or piping accessory, not more than 2 pipe threads are to remain exposed.
- D. Site bevel steel pipe to be welded or supply mill bevelled pipe. Remove scale and oxide from bevels and leave smooth and clean. Use factory made welding tees or welding outlet fittings for piping branches off mains. Do not use shop or site fabricated fittings unless written approval has been obtained.
- E. Welded joints are to be made by CWB certified licensed journeyman welders qualified in accordance with CSA B51, Boiler Pressure Vessel and Pressure Piping Code, and who are in possession of a proper certificate of qualification for each procedure to be performed. Each weld is to be identified with the welder's identification symbol, and welds are not to be concealed until welder making joints has inspected them for quality assurance. Electrodes are to be in accordance with CSA W48 Series, Electrodes, and requirements of CAN/CSA W117.2, Safety in Welding, Cutting and Allied Processes are to be followed.
- F. Unless otherwise specified, make flanged joints with Garlock 5500 or approved equal gasket materials to suit the application, and bolts and nuts. Bolts are not to be longer than length necessary to screw nut up flush to end of bolt. Bolts used for flanged connections in piping with a working pressure of 690 kPa (100 psi) and greater are to be ASTM A-193 Grade B-7, with heavy hexagon nuts to ASTM A-194 CL-2H. Provide suitable washers between each bolt head and flange and between each nut and flange.
- G. A random check by Consultant at Consultant's option, of bolted flanged connections may be made to verify flanged connections are properly mated with no shear force acting on bolts. When such random check is made, supply labour to disconnect and reconnect selected flanged joints. If improperly mated joints are found, remove and reinstall affected piping so flanges mate properly. If improperly mated joints are found, additional joints may be checked, and be responsible for repair of any other improper joints discovered.
- H. Unless otherwise specified make soldered joints in copper piping using flux suitable for and compatible with type of solder being used. Clean outside of pipe end and inside of fitting, valve, or similar accessory prior to soldering.
- I. Install mechanical joint fittings and couplings in accordance with manufacturer's instructions.
- J. Grooves are to be rolled. Make arrangements with coupling and fitting manufacturer for shop and/or site instructions and demonstrations as required, and adhere to manufacturer's instructions with respect to pipe grooving, support, type of gasket required, anchoring and guiding grooved piping system.

- K. If pressure crimped couplings and fittings are used, ensure gaskets are fully compatible with piping fluid, and valves and piping accessories are suitable. Use only fitting manufacturer supplied crimping equipment. Comply with manufacturer's latest published specification, instructions, and recommendations with respect to pipe, coupling, and fitting preparation and installation, and support, anchoring and guiding of piping system.
- L. Solvent weld PVC piping in 2 parts, primer stage and cementing stage, in accordance with manufacturer's recommendations, ASTM D2855, and CSA requirements.
- M. Install PVC piping with gasketed joints in accordance with manufacturer's current published specifications, instructions and recommendations, and CSA requirements.

### 3.3 INSTALLATION OF PIPE SLEEVES

- A. Where pipes pass through concrete and/or masonry surfaces provide pipe sleeves as follows:
  - 1. in poured concrete slabs – unless otherwise specified, minimum 16 gauge flanged galvanized steel or, where permitted by governing authorities, factory fabricated plastic sleeves;
  - 2. in concrete or masonry walls – Schedule 40 galvanized steel pipe or Class 4000 cast iron pipe.
- B. Sleeves in waterproofed slabs or walls are to be lengths of Schedule 40 mild galvanized steel pipe with waterstop plate in accordance with drawing detail. Provide waterproof sleeves in following locations:
  - 1. in mechanical room floor slabs, except where on grade;
  - 2. in slabs over mechanical, fan, electrical and telephone equipment rooms or closets;
  - 3. in floors equipped with waterproof membranes;
  - 4. in roof slab;
  - 5. in waterproof walls.
- C. Size sleeves, unless otherwise specified, to leave 12 mm (½") clearance around pipes, or where pipe is insulated, 12 mm (½") clearance around pipe insulation.
- D. Pack and seal void between pipe sleeves and pipe or pipe insulation in non-fire rated construction for length of sleeves as follows:
  - 1. pack sleeves in interior construction with mineral wool and seal both ends of sleeves with non-hardening silicone base caulking compound;
  - 2. pack sleeves in exterior walls above grade with mineral wool and seal both ends of sleeves watertight with approved non-hardening silicone base caulking compound unless mechanical type seals have been specified;
  - 3. seal sleeves in exterior walls below grade (and any other wall where water leakage may be a problem) with link type mechanical seals as specified.
- E. Where sleeves are required in masonry work, accurately locate and mark sleeve location, and hand sleeves to mason for installation.
- F. Terminate piping for sleeves that will be exposed so sleeve is flush at both ends with building surface concerned so sleeve may be completely covered by an escutcheon plate, except for sleeves in waterproof floors which are to terminate 100 mm (4") above finished floor.
- G. "Gang" type sleeving will not be permitted.
- H. Where sleeves are provided in non-fire rated construction for future piping, or where piping has been removed from existing sleeves, cap and seal both ends of sleeved opening.

### 3.4 INSTALLATION OF WATERPROOF MECHANICAL SEALS

- A. Provide watertight link type mechanical seals in exterior wall openings.
- B. Assemble and install each mechanical seal in accordance with manufacturer's instructions.
- C. After installation, periodically check each mechanical seal installation for leakage and, if necessary, tighten link seal bolts until seal is completely watertight.

### 3.5 DUCT OPENINGS

- A. Duct openings, air inlet and outlet openings, fire damper and similar openings will be provided in new poured concrete work, masonry, drywall and other building surfaces by trade responsible for particular construction in which opening is required.
- B. Size openings for fire dampers to 600 mm (24") high to suit damper arrangement with folding blade out of air stream.
- C. For duct openings except where fire dampers are required, pack and seal space between duct or duct insulation and duct opening as specified above for pipe openings in non-fire rated construction.

### 3.6 SLEEVE AND FORMED OPENING LOCATION DRAWINGS

- A. Prepare and submit for review, drawings indicating size and location of required sleeves, recesses and formed openings in poured or precast concrete work.
- B. Such drawings are to be completely and accurately dimensioned and relate sleeve, recesses, and formed openings to suitable grid lines and elevation datum, and are to take into account structural items such as grade beams, column caps, and column drop slabs.
- C. Begin to prepare such drawings immediately upon notification of acceptance of bid and award of Contract.

### 3.7 INSTALLATION OF PIPE ESCUTCHEON PLATES

- A. Provide escutcheon plates suitably secured over exposed piping passing through finished building surfaces. Finished building surface is any surface with a factory finish or that receives a site applied finish.
- B. Install plates so they are tight against building surface concerned, completely covering pipe sleeves and/or openings, except where waterproof sleeves extend above floors, in which case fit plate tightly around sleeve.

### 3.8 INSTALLATION OF FASTENING AND SECURING HARDWARE

- A. Provide fastening and securing hardware required for mechanical work to maintain installations attached to structure or to finished floors, walls and ceilings in a secure and rigid manner capable of withstanding dead loads, live loads, superimposed dead loads, and any vibration of installed products.
- B. Use fasteners compatible with structural requirements, finishes and types of products to be connected. Do not use materials subject to electrolytic action or corrosion where conditions are liable to cause such action.
- C. Where floor, wall or ceiling construction is not suitable to support loads, provide additional framing or special fasteners to ensure proper securement to structure that is to support the products. Provide reinforcing or connecting supports where required to distribute loading to structural components.
- D. Obtain written consent from Owner and review with Consultant, before using explosive actuated fastening devices. If consent is obtained, comply with requirements of CAN/CSA Z166.1 and CAN/CSA Z166.2.
- E. Do not attach fasteners to steel deck without written consent from Owner and review with Consultant.

### 3.9 INSTALLATION OF PIPE HANGERS AND SUPPORTS

- A. Provide required pipe hangers and supports.
- B. Provide any additional structural steel channels, angles, inserts, beam champs and similar accessories required for hanging or supporting pipe. Unless otherwise shown or specified, hang or support pipes from structure only.
- C. For insulated pipe, size hanger or support to suit diameter of insulated pipe and install hanger or support on outside of insulation and insulation finish.
- D. Support requirements for underground piping are as follows:
  - 1. support underground pipe, unless otherwise specified, on a well compacted bed of dry, natural, undisturbed earth free from rocks or protrusions of any kind, or on compacted material as specified;
  - 2. support underground service piping penetrating building exterior walls or foundations to prevent pipe damage if minor building settlement occurs, all as per drawing detail;



3. ensure bedding and supports for underground pipes are flat and true and allowances are made for pipe hubs, couplings, or other protrusions so no voids are left between pipe and bedding.
- E. Unless otherwise shown or specified, hang and/or support horizontal pipe above ground by means of hangers and/or supports specified in Part 2 of this Section. Unless otherwise shown or specified, hangers for suspended pipe less than or equal to 25 mm (1") dia. are to be clevis type or adjustable ring type, and hangers for suspended pipe greater than or equal to 40 mm (1-1/2") dia. are to be adjustable clevis type.
- F. Space hangers and supports in accordance with following:
  1. cast iron pipe – hang or support at every joint with maximum 2.4 m (8') spacing;
  2. plastic pipe – conform to pipe manufacturer's recommended support spacing;
  3. copper and steel pipe – hang or support at spacing in accordance with following schedule:

PIPE DIA.	MAX. SPACING STEEL (meters)	MAX. SPACING COPPER (meters)
to 25 mm (1")	2.4 m (8')	1.8 m (6')
40 mm (1-1/2")	2.7 m (9')	2.4 m (8')
50 mm (2")	3.0 m (10')	2.7 m (9')
65 mm (2-1/2")	3.6 m (12')	3.0 m (10')
75 mm (3")	3.6 m (12')	3.0 m (10')
90 mm (3-1/2")	3.6 m (12')	3.6 m (12')
100 mm (4")	4.2 m (14')	3.6 m (12')
250 mm (10")	6.0 m (20')	
300 mm (12")	6.7 m (22')	

4. flexible grooved pipe/coupling joint piping – as above but with not less than one hanger or support between joints.
- G. Where pipes change direction, either horizontally or vertically, provide a hanger or support on horizontal pipe not more than 300 mm (12") from elbow, and where pipes drop from tee branches, support tees in both directions not more than 50 mm (2") on each side of tee.
- H. When pipes with same slope are grouped and a common hanger or support is used, space hanger or support to suit spacing requirement of smallest pipe in group and secure pipes in place on common hanger or support.
- I. Provide roller hangers or supports for heat transfer piping greater than or equal to 150 mm (6") diameter and conveying a material 75°C (170°F) or greater to facilitate pipe movement due to expansion and contraction, and at each hanger or support tack weld a steel protection saddle to pipe to protect piping insulation.
- J. Unless otherwise shown or specified, support vertical piping by means of supports specified in Part 2 of this Section, spaced in accordance with following:
  1. support vertical pipes at maximum 3 m (10') intervals or at every floor, whichever is lesser;
  2. for sections of vertical piping with a length less than 3 m (10'), support pipe at least once;
  3. for vertical cast iron plain end pipe (mechanical joint type), secure riser or pipe clamp around pipe under a flange integral with pipe for vertical support purposes, or provide a length of hub and spigot pipe to facilitate proper support;
  4. for vertical steel pipe risers in excess of 3 m (10'), weld shear lugs to pipe to carry load;
  5. for vibration isolated piping risers, provide rubber-steel-rubber vibration isolation pads between riser clamps and floor.
- K. Support piping on the roof as follows:

1. on existing roof – provide support members as specified in Part 2 of this Section spaced as per schedule above and of a type to suit the application, and, for each support, carefully scrape away roofing gravel, bed support in a heavy covering of roofing mastic, then scrape gravel back up around support and secure pipes to supports;
- L. Each hanger, support or securement for horizontal bare copper tubing is to be plastic coated to prevent direct contact between pipe and ferrous hanger. Each wall or floor clamp for vertical bare copper piping is to be isolated from pipe by means of strips of flexible rubber inserts. Use of painted ferrous hangers and supports, including those painted with copper coloured paint, is not acceptable. Site application of tape or other types of isolation is not acceptable.
- M. For insulated horizontal piping less than or equal to 40 mm (1-½") diameter, provide galvanized steel insulation protection shields between insulation and hanger or support. Install shields immediately after pipe is insulated.
- N. Do not support piping from steel deck without written consent from Owner and review with Consultant.

### **3.10 SUPPLY OF ACCESS DOORS**

- A. Supply access doors to give access to mechanical work which may need maintenance or repair but which is concealed in inaccessible construction, except as otherwise specified herein or on drawings.
- B. Before commencing installation of mechanical work, coordinate with other trades and prepare on a set of reflected ceiling plans and wall elevations, complete layouts of access doors. Submit these layouts for Consultant's review and show exact sizes and locations of such access doors. Locate and arrange mechanical work to suit.
- C. Access doors will be installed by trade responsible for particular type of construction in which doors are required. Supply access doors to trade installing same at proper time.
- D. Wherever possible, access doors to be of a standard size for each application. Review exact dimensions and minimum size restrictions with Consultant prior to ordering.
- E. Group piping and ductwork to ensure minimum number of access doors is required.
- F. Submit a sample of each proposed access door for review with Consultant, prior to ordering.
- G. Coordinate with Electrical Contractor and General Trades Contractor to ensure access doors on project are provided by a single manufacturer, installed as part of work of General Trades Contractor and work involving both mechanical and electrical services should, where possible, be accessible from common access door. Coordinate work to ensure common location access doors are not supplied by both Mechanical Divisions and Electrical Divisions.

### **3.11 INSTALLATION OF VALVES**

- A. Generally, valve locations are indicated or specified on drawings or specified in Sections of the Specification where valves are specified, however, regardless of locations shown or specified, following requirements apply:
  1. provide shut-off valves to isolate systems, at base of vertical risers, in branch take-offs at mains and risers on floors, to isolate equipment, to permit work phasing as required, and wherever else required for proper system operation and maintenance;
  2. install shut-off valves with handles upright or horizontal, not inverted, and located for easy access;
  3. unless otherwise specified, provide a check valve in discharge piping of each pump;
  4. valve sizes are to be same as connecting pipe size;
  5. valves are to be permanently identified with size, manufacturer's name, valve model or figure number and pressure rating, and wherever possible, valves are to be product of same manufacturer;
  6. for valves in insulated piping, design of valve stem, handle and operating mechanism is to be such that insulation does not have to be cut or altered in any manner to permit valve operation.

### **3.12 INSTALLATION OF PRESSURE GAUGES AND THERMOMETERS**

- A. Provide pressure gauges in following locations:

1. in valved tubing across suction, suction strainer (if applicable), and discharge piping of each circulating pump;
  2. in supply and return piping connections to main mechanical plant equipment such as boilers, chillers, heat exchangers, main coils, etc.;
  3. in expansion tank(s);
  4. in separate domestic hot water storage tank(s);
  5. at top most outlet in each standpipe fire protection system riser;
  6. in piping at each side of a pressure reducing valve;
  7. in potable water service piping downstream of meter;
  8. wherever else shown and/or specified.
- B. Provide thermometers in following locations:
1. in supply and return piping connections to main mechanical plant equipment such as boilers, chillers, cooling towers, heat exchangers, main coils, etc., unless temperature indication is supplied with equipment;
  2. wherever else shown and/or specified.
- C. Conform to following installation requirements:
1. for installation of thermometers in piping wells, provide a coat of metallic base heat transfer paste or grease in piping well;
  2. for pressure gauges in piping at equipment locations, install pressure gauge between equipment and first pipe fitting;
  3. locate, mount and adjust instruments so they are easily readable;
  4. where pressure gauges and/or thermometers are located at high level or in an area where they cannot be easily seen, provide remote reading instruments.

### 3.13 INSTALLATION OF EQUIPMENT DRIVE GUARDS AND ACCESSORIES

- A. Provide OSHA guards for exposed accessible rotating parts such as belt drives, couplings, fan wheels, and shaft ends on mechanical equipment.
- B. Install belt guards to allow movement of motors for adjusting belt tension.
- C. Provide a means to permit lubrication and use of test instruments with guards in place.
- D. Secure guards to equipment or equipment base but do not bridge sound or vibration isolation.
- E. Where equipment oil level gauges, oil reservoirs, grease cups, or grease gun fittings are integral with equipment but are not easily accessible for service, extend to an accessible location using aluminium or copper tubing.

### 3.14 MECHANICAL WORK IDENTIFICATION

- A. Identify new exposed piping and ductwork as per Part 2 of this Section in locations as follows:
1. at every end of every piping or duct run;
  2. adjacent to each valve, strainer, damper and similar accessory;
  3. at each piece of connecting equipment;
  4. on both sides of every pipe and duct passing through a floor, wall or partition, unless otherwise specified;
  5. at 6 m (20') intervals on pipe and duct runs exceeding 6 m (20') in length;
  6. at least once in each room, and at least once on pipe and duct runs less than 6 m (20') in length.
- B. Unless otherwise specified identify new concealed piping and ductwork as per Part 2 of this Section in locations as follows:
1. at points where pipes or ducts enter and leave rooms, shafts, pipe chases, furred spaces, and similar areas;
  2. at maximum 6 m (20') intervals on piping and ductwork above suspended accessible ceilings, and at least once in each room;
  3. at each access door location;
  4. at each piece of connected equipment, automatic valve, etc.

- C. Provide an identification nameplate for equipment provided as part of this project, including items such as control valves, motorized dampers, instruments, and similar products. Secure nameplates in place, approximately at eye level if possible, with stainless steel screws unless such a practice is prohibitive, in which case use epoxy cement applied to cleaned surfaces. Locate nameplates in the most conspicuous and readable location.
- D. Paint new natural and/or propane gas piping with primer and 2 coats of yellow paint in accordance with local governing code requirements and requirements of Division 09. Identify piping at intervals as specified above.
- E. Provide an identification nameplate for each motor starter or disconnect switch located in a motor control centre or on a motor starter panel, and on each individually mounted starter provided as part of mechanical work, and on each disconnect switch provided as part of the electrical work for motorized equipment provided as part of mechanical work.
- F. Tag valves and prepare a valve tag chart in accordance with following requirements:
  - 1. attach a valve tag to each new valve, except for valves located immediately at equipment they control;
  - 2. prepare a computer printed valve tag chart to list tagged valves, with, for each valve, the tag number, location, valve size, piping service, and valve attitude (normally open or normally closed);
  - 3. frame and glaze one copy of chart and, unless otherwise directed, affix to a wall in each main Mechanical and/or Equipment Room;
  - 4. include a copy of valve tag chart in each copy of operating and maintenance instruction manuals;
  - 5. hand an identified CD of valve tag chart to Owner at same time O&M Manuals are submitted.
- G. Where shut-off valves, control dampers, sensors, and similar items which will or may need maintenance and/or repair are located above accessible suspended ceilings, provide round coloured ceiling tacks in ceiling panel material, or stickers equal to Brady "Quick Dot" on ceiling grid material to indicate locations of items. Unless otherwise specified, ceiling tack or sticker colours are to be as follows:
  - 1. HVAC piping valves and equipment: yellow
  - 2. fire protection valves and equipment: red
  - 3. plumbing valves and equipment: green
  - 4. HVAC ductwork dampers and equipment: blue
  - 5. control system hardware and equipment: orange

### 3.15 PIPE LEAKAGE TESTING

- A. Before piping has been insulated or concealed, and before equipment, fixtures and fittings have been connected, test piping for leakage.
- B. Tests are to be witnessed by Consultant and/or Owner's representative, and, where required, representatives of governing authorities. Give ample notice (minimum 7 working days) of tests in writing and verify attendance. Have completed test report sheets dated and signed by those present to confirm proper test results.
- C. When circumstances prevent scheduled tests from taking place, give immediate and adequate notice of cancellation to all who were scheduled to attend.
- D. Gravity Drainage and Vent Piping
  - 1. Test piping in accordance with local governing building code.
  - 2. After fixtures and fittings are set and pipes are connected to building drain or drains, turn on water into pipe, fixtures, fittings and traps in order to detect any imperfect material or workmanship. Perform smoke test if required by local governing authorities.
- E. Pumped Drainage Piping
  - 1. Test piping with cold water at a pressure of 1-½ times normal working pressure and maintain pressure for minimum of 2 hours.
- F. Domestic Water Piping
  - 1. Test piping with cold water at a pressure of 1-½ times normal working pressure and maintain pressure for minimum of 2 hours.

- G. Standpipe System Piping
  - 1. Test system piping in accordance with requirements of NFPA No. 14, "Standpipe and Hose Systems", and in accordance with any additional requirements of governing authorities.
- H. Clean Agent Fire Extinguishing System Piping
  - 1. Test system piping in accordance with requirements of NFPA No. 2001, "Standard on Clean Agent Extinguishing Systems", and in accordance with any additional requirements of governing authorities.
- I. Heat Transfer (HVAC) System Piping
  - 1. Test piping with cold water at pressure of 1035 kPa (150 psi) for minimum of 2 hours.
    - a. 0 kPa to 105 kPa (0 psi to 15 psi) low pressure piping – 690 kPa (100 psi);
    - b. 110 kPa to 690 kPa (16 psi to 100 psi) medium pressure piping – 1035 kPa (150 psi);
    - c. greater than 690 kPa (100 psi) high pressure piping – 1380 kPa (200 psi).
- J. Natural Gas Piping
  - 1. Test piping in accordance with requirements of CAN/CSA B149.1 and any additional requirements of local governing authorities.
  - 2. After completion of the verification test, locate required tag stating results of verification test at point of entry of gas main into building, affixed to pipe in secure manner.
  - 3. Check piping joints and connections for leaks with water/soap solution while piping is under pressure.
- K. Refrigerant Piping
  - 1. Test refrigerant piping for leakage and dehydrate in accordance with requirements of Chapter 18 of ASHRAE Handbook - Fundamentals.
- L. Following requirements apply to all testing:
  - 1. ensure piping has been properly flushed, cleaned and is clear of foreign matter prior to pressure testing;
  - 2. temporarily remove or valve off piping system specialties or equipment which may be damaged by test pressures prior to pressure testing systems, and flush piping to remove foreign matter;
  - 3. when testing is carried out below highest level of particular system, increase test pressure by the hydrostatic head of 7 kPa (1 psi) for every 600 mm (24") below high point;
  - 4. include for temporary piping connections required to properly complete tests;
  - 5. piping under test pressure is to have zero pressure drop for length of test period;
  - 6. make tight leaks found during tests while piping is under pressure, and if this is impossible, remove and refit piping and reapply test until satisfactory results are obtained;
  - 7. where leaks occur in threaded joints in steel piping, no caulking of these joints will be allowed under any conditions;
  - 8. perform tests in reasonably sized sections so as to minimize number of tests required;
  - 9. in addition to leakage tests specified above, demonstrate proper flow throughout systems including mains, connections and equipment, as well as proper venting and drainage, and include for any necessary system adjustments to achieve proper conditions.

### 3.16 SUPPLY OF MOTOR STARTERS AND ACCESSORIES

- A. Motor starters for mechanical equipment, except for starters integral with packaged equipment and starters factory installed in equipment power and control panels, will be provided as part of electrical work. Unless otherwise shown or specified, supply starter for each item of motorized equipment. Refer to Motor Starter Schedule..
- B. Unless otherwise shown or specified, supply starter for each item of motorized equipment.
- C. Where 3-phase starters are indicated and/or scheduled to be mounted on a motor starter panel, starters will be mounted and connected, complete with panels and splitter trough, as part of electrical work. Hand starters to electrical trade at site when they are required.

- D. Where package type equipment with integral starters, or equipment with starters integral in loose power and control panels supplied with equipment is fed from motor starter panel, disconnect switch will be provided on motor starter panel as part of electrical work.
- E. Unless otherwise specified or shown on drawings, 1-phase motor starters will be mounted adjacent to equipment they serve and connected complete as part of electrical work. Hand starters to electrical trade at site at proper time.

### 3.17 ELECTRICAL WIRING WORK FOR MECHANICAL WORK

- A. Coordinate requirements and responsibilities for electrical wiring with Electrical Division 26 Contractor. Provide low voltage control wiring not provided under work of Division 26.
- B. Unless otherwise specified or indicated, following electrical wiring work for mechanical equipment will be done as part of electrical work:
  - 1. "line" side power wiring to motor starters or disconnect switches in motor control centres and starters or disconnects on motor starter panels, and "load" side wiring from starters or disconnects to equipment;
  - 2. "line" side power wiring to individual wall mounted starters, and "load" side wiring from starters to equipment;
  - 3. "line" side power wiring to pre-wired power and control panels and variable frequency drives (VFD), and "load" side power wiring from the panels and VFD's to equipment;
  - 4. provision of receptacles for plug-in equipment;
  - 5. provision of disconnect switches for motors in excess of 9 m (30') from starter location, or cannot be seen from starter location, and associated power wiring;
  - 6. motor starter interlocking in excess of 24 volts;
  - 7. wiring from motor winding thermistors in motors 30 HP and larger to motor starter contacts;
  - 8. 120 volt power connections to electrical receptacles integral with small ceiling exhaust fans, including wiring through light switches or speed controllers;
  - 9. 120 volt wiring connections to lighting fixture/switch combinations integral with air handling units;
  - 10. 120 volt wiring connections to duplex receptacles integral with air handling unit control panels.
- C. Mechanical wiring work not listed above or specified herein or on drawings to be done as part of electrical work is to be installed in conduit and is to be done as part of mechanical work in accordance with wiring requirements specified for electrical work.

### 3.18 EQUIPMENT BASES AND SUPPORTS

- A. Unless otherwise specified or indicated on drawings, set floor mounted equipment on minimum 100 mm (4") high reinforced concrete housekeeping pads 200 mm (8") clear of equipment on each side and end, or a minimum of 200 mm (8") from centreline of equipment anchor bolts to edge of the base, whichever is larger. Conform to following requirements:
  - 1. supply dimensioned drawings and equipment base templates, and provide anchor bolts for proper setting and securing of equipment on pads;
  - 2. place anchor bolts during concrete pour and be responsible for required levelling, alignment, and grouting of equipment;
  - 3. as a minimum, use wire mesh reinforcement, however, for pads for large heavy equipment, use reinforcement as per structural drawing details.
- B. For equipment not designed for base mounting, where required, provide welded, cleaned and prime coat painted structural steel stands or supports conforming to following requirements:
  - 1. provide stands and supports, except those for small equipment, designed by a structural engineer registered in jurisdiction of the work, and submit stamped and signed design drawings with calculations as shop drawings for review;
  - 2. flange bolt steel stands to concrete housekeeping pads;
  - 3. seismically restrained stands and supports in accordance with applicable requirements.

### **3.19 MECHANICAL SERVICE REQUIREMENTS FOR FLOATING FLOOR SLABS**

- A. Where mechanical services are required to be installed in or through a vibration isolated floating slab, install such services so as not to transmit any vibration to base slab on which floating floor slab is placed.
- B. Wherever possible, arrange mechanical work to avoid penetrating a floating floor slab.

### **3.20 CONCRETE WORK FOR MECHANICAL EQUIPMENT BASES/PADS**

- A. Concrete work required for mechanical equipment bases/pads will be provided as part of concrete work of Division 03.
- B. Exactly locate bases/pads at site and be present during concrete pour to ensure anchor bolts, inserts, plates and similar hardware are not damaged or dislodged.

### **3.21 CONCRETE WORK FOR MECHANICAL EQUIPMENT BASES/PADS**

- A. Provide poured concrete work, including reinforcing and formwork, required for mechanical equipment bases/pads. Perform concrete work in accordance with requirements specified in Division 03. Coordinate work with Division 03.
- B. Concrete is to be minimum 20,700 kPa ready-mix concrete in accordance with CAN/CSA-A23.1 and the Building Code.

### **3.22 EXCAVATION AND BACKFILL WORK**

- A. Excavation, backfill and related work such as dewatering required for mechanical work will be performed as part of excavation and backfill work of Division 31, except for final hand grading work which is to be done as part of mechanical work. Mark out location and routing of excavation required for work as well as required depth. Ensure that bedding is graded to provide proper drainage for ducts as reviewed with Consultant.
- B. Inverts and locations of existing site services may have been site surveyed and approximate location may be shown on drawings. Confirm local utilities have performed locates and marking out. Ensure inverts and locations are correct, prior to commencement of work. Where discrepancies are found, immediately inform Consultant, and await a direction.
- C. Accurately mark-out location and routing of excavation required, as well as required depth.
- D. Ensure underground piping subject to freezing and located outside building has a minimum of 1.37 m (4'-½') of cover.
- E. Ensure underground piping subject to freezing and located inside building in unheated areas has a minimum of 450 mm (18") of cover.
- F. Ensure pipe bedding is proper prior to laying pipes. Hand excavate under pipe hubs, couplings, flanges and similar items to ensure even bearing along the entire barrel of each length of pipe.
- G. Ensure piping is inspected, leakage tested and approved prior to backfilling. Supervise initial backfilling operation to ensure buried work is not disturbed.
- H. Allow work to be inspected by local governing authorities and Consultant before covering and backfilling. Failure to do so prior to backfilling will require re-excavating of work and re-backfill at no additional cost to Owner.

### **3.23 EXCAVATION AND BACKFILL WORK**

- A. Before commencement of excavation for work, determine in consultation with Consultant, Owner, Municipality and utilities, presence, if any, of existing underground services at site. Engage local utilities to locate and mark out such services. Ensure trades concerned are aware of their presence.
- B. Be responsible for any damage done to underground services caused by neglect to determine and mark out location of such services prior to excavation work commences.

- C. Where Work falls under jurisdiction of local governing utility, confirm requirements and comply with utility requirements.
- D. Provide excavation, backfill and related work required for mechanical work. Perform such work in accordance with requirements of Division 31, except as modified by this Article. Obtain a copy of soil test report if available from Consultant. Depth of excavations must accommodate local governing requirements and local standard practices to compensate for local frost levels of Place of the Work.
- E. Confirm inverts and locations are correct, prior to commencing excavation and contact Utilities to accurately locate their services. Where discrepancies are found, immediately inform Consultant, and await a direction. Grade bottom of trench excavations as required.
- F. In firm, undisturbed soil, lay pipes directly on soil, unless otherwise directed.
- G. Before backfilling, arrange for inspection of work by local governing authority and Consultant. Do not backfill work unless reviewed with Consultant. Failure to do so prior to backfilling will require re-excavating work and re-backfill at no additional cost to Owner.
- H. Unless otherwise specified, backfill trenches within building with clean sharp sand in individual layers of maximum 150 mm (6") thickness compacted to a density of 100% Standard Proctor. Hand compact first layers up to a compacted level of minimum 300 mm (12") above top of pipe. Hand or machine compact the balance up to grade.
- I. Unless otherwise specified, backfill trenches outside the building (not under roads, parking lots or traffic areas), up to a compacted level of 450 mm (18") thick above the pipe, hand compacted to a density of 95% Standard Proctor, using granular "A" gravel. Backfill the balance in 150 mm (6") layers with approved excavated material, compacted to 95% Standard Proctor density.
- J. Unless otherwise specified, backfill trenches outside building under roads, parking lots or traffic areas with crushed stone or granular "A" gravel in layers not exceeding 150 mm (6") thickness, compacted to 100% Standard Proctor density up to grade level.
- K. Provide minimum 1.37 m (4.5') of cover for underground piping subject to freezing and located outside building.
- L. Provide minimum 450 mm (18") of cover for underground piping subject to freezing and located inside building.
- M. After first lift of backfill has been compacted, mark entire path of pipe using continuous 75 mm (3") wide detectable identified marking tape equal to SMS Ltd. D-UGMT.
- N. Unless otherwise directed in Division 31, store and dispose of excavated materials as follows:
  - 1. during progress of contract, place material as directed in such a manner to minimize damage or disfigurement of ground and which in no way impedes progress of work;
  - 2. separately place surplus topsoil and subsoil as directed; leave site clean and unencumbered.
- O. Perform pumping as required to keep excavations free of water.

### **3.24 CUTTING, PATCHING AND CORE DRILLING**

- A. Unless otherwise provided by General Trades, perform cutting, patching, and core drilling of existing building required for installation of Mechanical Divisions work. Perform cutting in a neat and true fashion, with proper tools and equipment to Consultant's approval. Patching is to exactly match existing finishes and be performed by tradesmen skilled in particular trade or application. Work is subject to review with Consultant and Owner approval.
- B. Criteria for cutting holes for additional services:
  - 1. cut holes through slabs only; no holes to be cut through beams;
  - 2. cut holes 150 mm (6") diameter or smaller only; obtain approval from Structural Consultant for larger holes;
  - 3. keep at least 100 mm (4") clear from beam faces;
  - 4. space at least 3 hole diameters on center;



5. for holes that are required closer than 25% of slab span from supporting beam face, use cover meter above slab to clear slab top bars;
  6. for holes that are required within 50% of slab span, use cover meter underside of slab to clear slab bottom bars;
  7. submit sleeving drawings indicating holes and their locations for Structural Consultant's review.
- C. Do not cut or drill any existing work without approval from Owner and review with Consultant. Be responsible for damage done to building and services caused by cutting or drilling.
- D. Where pipes pass through existing construction, core drill an opening. Size openings to leave 12 mm (½") clearance around pipes or pipe insulation.
- E. Prior to drilling or cutting an opening, determine, in consultation with Consultant and Owner, and by use of non-destructive radar scan (magnetic scan) of slab or wall, presence of any existing services and reinforcement bars concealed behind building surface to be cut and locate openings to suit. Coring is not permitted through concrete beams or girders.
- F. Where drilling is required in waterproof slabs, size opening to permit snug and tight installation of a pipe sleeve sized to leave 12 mm (½") clearance around pipe or pipe insulation. Provide a pipe sleeve, constructed of Schedule 40 galvanized steel pipe with a flange at one end and of a length to extend 100 mm (4") above slab, in opening. Secure flange to the underside of slab and caulk void between sleeve and slab opening with proper non-hardening silicone base caulking compound to produce a water-tight installation.
- G. Firestop and seal openings in fire rated construction in accordance with requirements of article entitled Firestopping and Smoke Seal Materials in this Section. Do not leave openings open overnight unless approved by Owner and reviewed with Consultant.

### **3.25 PACKING AND SEALING CORE DRILLED PIPE OPENINGS**

- A. Pack and seal void between pipe opening and pipe or pipe insulation for length of opening as follows:
1. non-fire rated interior construction – pack with mineral wool and seal both ends of opening with non-hardening silicone base caulking compound to produce a water-tight seal;
  2. exterior walls above grade – pack with mineral wool and seal both ends of sleeves water-tight with non-hardening silicone base caulking compound unless mechanical type seals have been specified;
  3. exterior walls below grade (and any other wall where water leakage may be a problem) – seal with link type mechanical seals as specified.

### **3.26 FLASHING FOR MECHANICAL WORK PENETRATING ROOF**

- A. Perform required flashing work, including counter-flashing, for mechanical work penetrating and/or set in roof.
- B. Perform flashing work in accordance with requirements of drawing details, and requirements specified in Division 07.

### **3.27 CLEANING MECHANICAL WORK**

- A. Refer to cleaning requirements specified in Division 01.
- B. Clean mechanical work prior to application for Substantial Performance of the Work.
- C. Include for vacuum cleaning interior of air handling units and ductwork systems.

### **3.28 CONNECTIONS TO OTHER EQUIPMENT**

- A. Carefully examine Contract Documents during bidding period and include for mechanical work piping and/or ductwork connections to equipment requiring such connections.

### **3.29 INSTALLATION OF FLEXIBLE CONNECTORS**

- A. Provide flexible connectors in piping connections to vibration isolated equipment.

### **3.30 FAN NOISE LEVELS**

- A. Submit sound power levels with fan shop drawings/product data, with levels measured to AMCA 300 and calculated to AMCA 301.

### **3.31 EQUIPMENT AND SYSTEM MANUFACTURER'S CERTIFICATION**

- A. When equipment/system installation is complete, but prior to start-up procedures, arrange and pay for equipment/system manufacturer's authorized representative to visit site to examine installation, and after any required corrective measures have been made, to certify in writing to Owner and Consultant that equipment/system installation is complete and in accordance with equipment/system manufacturer's instructions.

### **3.32 EQUIPMENT AND SYSTEM START-UP**

- A. When installation of equipment/systems is complete but prior to commissioning, perform start-up for equipment/systems as specified in mechanical work Sections and in accordance with following requirements:
  - 1. submit a copy of each equipment/system manufacturer's start-up report sheet to Consultant for review, and incorporate any comments made by Consultant, Owner or Commissioning Agent, as applicable;
  - 2. under direct on-site supervision and involvement of equipment/system manufacturer's representative, start-up equipment/systems, make any required adjustments, document procedures, leave equipment/systems in proper operating condition, and submit to Consultant complete set of start-up documentation sheets signed by manufacturer/supplier and Contractor;
  - 3. submit documents signed by equipment/system manufacturer testing technician, in both hard copy and pdf electronic copy formats.

### **3.33 INTEGRATED SYSTEMS TESTING**

- A. Perform testing of integrated systems and equipment in accordance with CAN/ULC-S1001.
- B. Engage respective systems or equipment vendors or trades to be onsite during inspection and testing work to perform adjustments or remedial work to correct issues identified by inspection and testing work.

## **END OF SECTION**

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B

A



C

HYDRONIC SYSTEMS	
SYMBOL	DESCRIPTION
	CHILLED WATER RETURN
	CHILLED WATER SUPPLY
	COMPRESSED AIR
	CONDENSATE DRAIN
	PUMPED CONDENSATE DRAIN
	CONDENSER WATER RETURN
	CONDENSER WATER SUPPLY
	HEATING WATER RETURN
	HEATING WATER SUPPLY
	REFRIGERANT GAS
	REFRIGERANT LIQUID
	HIGH PRESSURE STEAM
	HIGH PRESSURE CONDENSATE
	MEDIUM PRESSURE STEAM
	MEDIUM PRESSURE CONDENSATE
	LOW PRESSURE STEAM
	LOW PRESSURE CONDENSATE
	SUB-COOLED CONDENSATE

VENTILATION SYSTEMS	
SYMBOL	DESCRIPTION
	COMBUSTION AIR
	EXHAUST AIR
	KITCHEN EXHAUST AIR
	OUTSIDE SUPPLY AIR
	RETURN AIR
	SUPPLY AIR

EQUIPMENT TAGS	
SYMBOL	DESCRIPTION
	DIFFUSER TAG
	GRILLE TAG

HVAC SYMBOLS	
SYMBOL	DESCRIPTION
	AIR DIFFUSER
	SUPPLY AIR GRILLE
	RETURN AIR GRILLE
	EXHAUST AIR GRILLE
	TRANSFER AIR GRILLE
	AIRFLOW ARROW
	BACKDRAFT DAMPER
	BALANCING DAMPER
	COMBINATION SMOKE & FIRE DAMPER
	FIRE DAMPER
	SMOKE DAMPER
	MOTORIZED DAMPER
	COOLING COIL
	HEATING COIL
	PREHEAT COIL
	REHEAT COIL
	CARBON DIOXIDE SENSOR
	CARBON MONOXIDE SENSOR
	DIFFERENTIAL PRESSURE SENSOR
	GAS DETECTOR
	HUMIDISTAT
	HUMIDITY HIGH LEVEL SENSOR
	NITRIC OXIDE SENSOR
	OCCUPANCY SENSOR
	PRESSURE SENSOR
	RELATIVE HUMIDITY SENSOR
	THERMOSTAT
	HUMIDIFIER DISTRIBUTOR
	TURNING VANES

HVAC SYMBOLS	
SYMBOL	DESCRIPTION
	EXTERNALLY LINED DUCT
	ACOUSTICALLY LINED DUCT
	FLEXIBLE DUCT CONNECTION
	VIBRATION ISOLATION CANVAS JOINT
	SILENCER
	DUCT TRANSITION FROM RECTANGULAR TO ROUND
	RECTANGULAR SUPPLY AIR DUCT RISE
	RECTANGULAR RETURN AIR DUCT RISE
	RECTANGULAR EXHAUST AIR DUCT RISE
	ROUND SUPPLY AIR DUCT RISE
	ROUND RETURN AIR DUCT RISE
	ROUND EXHAUST AIR DUCT RISE

PIPING SYMBOLS	
SYMBOL	DESCRIPTION
	BALL VALVE
	BUTTERFLY VALVE
	CHECK VALVE
	GATE VALVE
	GLOBE VALVE
	LOCKSHIELD GLOBE VALVE
	TWO-WAY MOTORIZED VALVE
	THREE-WAY MOTORIZED VALVE
	PRESSURE REDUCING VALVE
	PRESSURE RELIEF VALVE
	DUAL PURPOSE RELIEF VALVE
	TWO-WAY SOLENOID CONTROL VALVE
	THREE-WAY VALVE
	Y STRAINER
	AUTO-FLOW BALANCING VALVE
	CIRCUIT BALANCING VALVE
	NEEDLE VALVE
	PLUG VALVE
	PUMP DISCHARGE CONTROL VALVE
	FLEXIBLE PIPE CONNECTION
	PLUG
	IN-LINE SIGHT GLASS
	AUTOMATIC AIR VENT
	PRESSURE GAUGE
	PRESSURE INDICATOR
	AUTOMATIC DRAIN TRAP (COMPRESSED AIR)
	PUMP
	STEAM TRAP

PIPE FITTING SYMBOLS	
SYMBOL	DESCRIPTION
	45° ELBOW
	90° ELBOW
	CONCENTRIC REDUCER
	ECCENTRIC REDUCER
	FLANGE
	ELBOW DOWN
	ELBOW UP
	END CAP
	QUICK CONNECTOR
	SANITARY TEE
	TEE
	UNION
	PIPE CONTINUATION

FIRE PROTECTION SYSTEMS	
SYMBOL	DESCRIPTION
	FIRE MAIN
	FIRE STANDPIPE WET
	FIRE STANDPIPE DRY
	FIRE DEPARTMENT CONNECTION
	FIRE EXTINGUISHER (WALL HUNG WITH BRACKET)
	RECESSED FIRE CABINET (w/ EXTINGUISHER)
	FIRE DEPARTMENT CONNECTION
	FIRE HOSE CABINET
	FIRE PUMP TEST CONNECTION
	SPRINKLER VALVE CABINET
	CHECK VALVE
	FIRE HOSE VALVE
	OS&Y GATE VALVE
	PUMP

PLUMBING SYSTEMS	
SYMBOL	DESCRIPTION
	DOMESTIC COLD WATER
	DOMESTIC HOT WATER
	DOMESTIC HOT WATER RECIRCULATION
	NON POTABLE WATER
	TEMPERED WATER
	FOUNDATION DRAIN
	GREASE VENT
	GREASE WASTE
	INDIRECT DRAIN
	PROPANE GAS
	METHANE VENT
	NATURAL GAS
	NATURAL GAS VENT
	PUMP DISCHARGE
	SANITARY DRAIN
	PUMPED SANITARY DRAIN
	SANITARY VENT
	STORM DRAIN
	PUMPED STORM DRAIN
	UNDERGROUND SANITARY DRAIN
	UNDERGROUND STORM DRAIN
	FROM BELOW

PLUMBING SYMBOLS	
SYMBOL	DESCRIPTION
	FLOOR DRAIN ROUND STRAINER
	FLOOR DRAIN SQUARE STRAINER
	AREA DRAIN ROUND STRAINER
	AREA DRAIN SQUARE STRAINER
	FUNNEL FLOOR DRAIN
	HUB DRAIN
	ROOF DRAIN
	SCUPPER DRAIN
	TRENCH DRAIN
	CATCH BASIN
	CLEANOUT (CEILING / WALL ACCESS)
	CLEANOUT (FLOOR MOUNTED)
	HOSE BIBB
	NON-FREEZE HOSE BIBB
	DISTILLED WATER OUTLET
	RAIN WATER LEADER
	RUNNING TRAP
	P TRAP
	BACKFLOW PREVENTER
	BACKWATER VALVE
	VENT THROUGH ROOF
	ENERGY METER
	GAS METER
	WATER METER
	PUMP
	TRAP SEAL PRIMER

MECHANICAL DRAWING LIST	
SHEET No.	SHEET NAME
M-001	DRAWING LIST, SYMBOL LIST & GENERAL NOTES
M-101	SITE PLAN - MECHANICAL
M-200	UNDERGROUND - PLUMBING
M-201	LEVEL B01 - PLUMBING
M-202	LEVEL 01 - PLUMBING
M-203	LEVEL 02 - PLUMBING
M-204	ROOF - PLUMBING
M-300	LEVEL B01 - FIRE PROTECTION
M-301	LEVEL 01 - FIRE PROTECTION
M-302	LEVEL 02 - FIRE PROTECTION
M-400	LEVEL B01 - HVAC
M-401	LEVEL 01 - HVAC
M-402	LEVEL 02 - HVAC
M-403	ROOF - HVAC
MD-400	LEVEL B01 - MECHANICAL - DEMOLITION PLAN
MD-401	LEVEL 01 - MECHANICAL - DEMOLITION PLAN
MD-402	LEVEL 02 - MECHANICAL - DEMOLITION PLAN
MD-403	ROOF - MECHANICAL - DEMOLITION PLAN
M-450	LEVEL B01 - HYDRONIC PIPING
M-451	LEVEL 01 - HYDRONIC PIPING
M-452	LEVEL 02 - HYDRONIC
M-453	ROOF - HYDRONIC PIPING
M-501	MECHANICAL CONTROLS I
M-502	MECHANICAL CONTROLS II
M-503	MECHANICAL CONTROLS III
M-601	DOMESTIC WATER SCHEMATIC
M-603-A	VENTILATION SCHEMATIC - SUPPLY/RETURN
M-603-B	VENTILATION SCHEMATIC - EXHAUST
M-604	HEATING SCHEMATIC
M-605	NATURAL GAS SCHEMATIC
M-606	SANITARY SCHEMATIC
M-607	STORM WATER SCHEMATIC
M-701	MECHANICAL SCHEDULES 1
M-702	MECHANICAL SCHEDULES 2
M-703	MECHANICAL SCHEDULES 3
M-704	MECHANICAL SCHEDULES 4
M-801	MECHANICAL DETAILS 1
M-802	MECHANICAL DETAILS 2
M-803	MECHANICAL DETAILS 3
M-804	MECHANICAL DETAILS 4
M-805	MECHANICAL DETAILS 5

Sheet Name

DRAWING LIST,  
SYMBOL LIST &  
GENERAL NOTES

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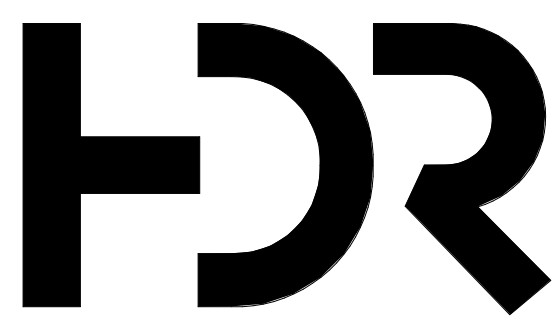
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Project Status

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Structural Engineer  
Mechanical Engineer  
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Plumbing Engineer  
Interior Designer  
Equipment Planner  
Wayfinding

Approver  
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Interior Designer  
Equipment Planner

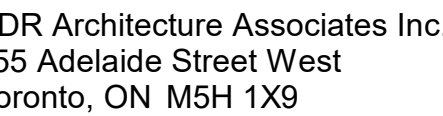
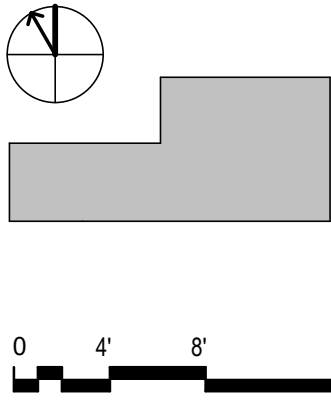
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2	2023-05-05	ISSUED FOR STAGE 3.2 COSTING
3	2023-07-05	ISSUED FOR MOH STAGE 3.2
4	2023-11-24	ISSUED FOR STAGE 3.3 COSTING
5	2024-02-12	ISSUED FOR MOH STAGE 3.3
6	2024-03-22	ISSUED FOR BUILDING PERMIT
7	2024-06-07	ISSUED FOR BUILDING PERMIT R1
8	2024-08-29	RE-ISSUED FOR PERMIT
9	2024-09-18	ISSUED FOR TENDER
10	2024-10-07	ISSUED FOR ADDENDUM M01

Project Number  
Original Issue

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12/08/22



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Electrical Engineer	WSP
Plumbing Engineer	WSP
Interior Designer	Interior Designer
Equipment Planner	Equipment Planner
Wayfinding	

Sheet Reviewer	Checker
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MARK	DATE	DESCRIPTION
1	2023-05-05	ISSUED FOR STAGE 3.2 COSTING
2	2023-07-05	ISSUED FOR MOH STAGE 3.2
3	2023-11-24	ISSUED FOR STAGE 3.3 COSTING
4	2024-02-12	ISSUED FOR MOH STAGE 3.3
5	2024-03-22	ISSUED FOR BUILDING PERMIT
6	2024-06-07	ISSUED FOR BUILDING PERMIT R1
7	2024-09-18	ISSUED FOR TENDER
8	2024-10-07	ISSUED FOR ADDENDUM M01

Project Number	221-11662-00
Original Issue	02/23/21

Sheet Name

## LEVEL B01 - PLUMBING

### Scale

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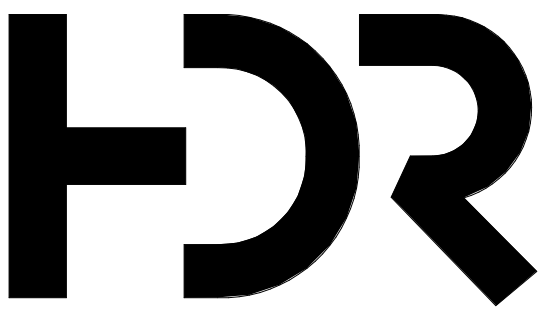
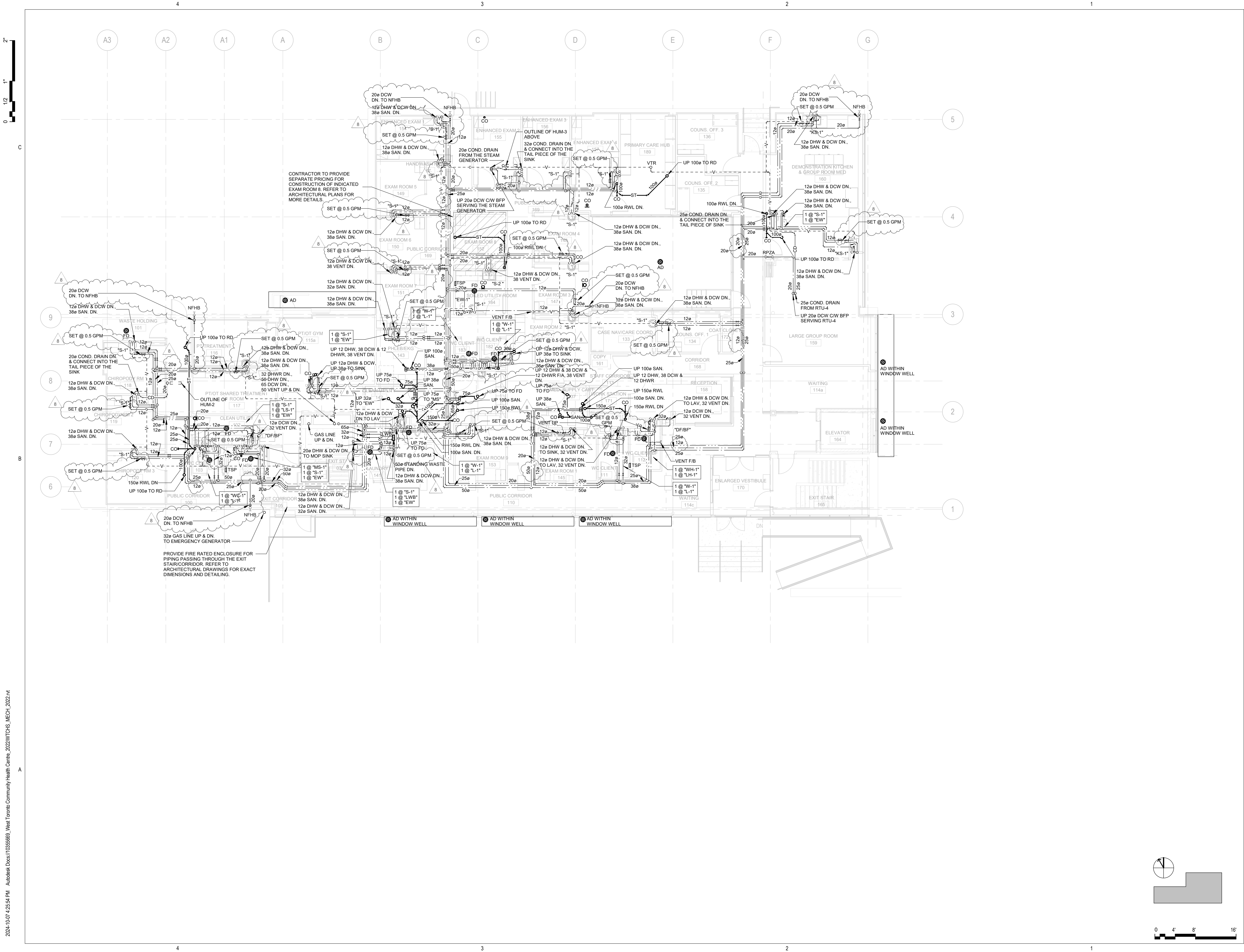
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Mechanical Engineer	WSP
Electrical Engineer	WSP
Plumbing Engineer	WSP
Interior Designer	Interior Designer
Equipment Planner	Equipment Planner
Wayfinding	

Sheet Reviewer	Checker
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MARK	DATE	DESCRIPTION
1	2023-05-05	ISSUED FOR STAGE 3.2 COSTING
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3	2023-11-24	ISSUED FOR STAGE 3.3 COSTING
4	2024-02-12	ISSUED FOR MOH STAGE 3.3
5	2024-03-22	ISSUED FOR BUILDING PERMIT
6	2024-06-07	ISSUED FOR BUILDING PERMIT R1
7	2024-09-18	ISSUED FOR TENDER
8	2024-10-07	ISSUED FOR ADDENDUM M01

Project Number	221-11662-00
Original Issue	02/23/21

Sheet Name

LEVEL 01 - PLUMBING

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Sheet Number

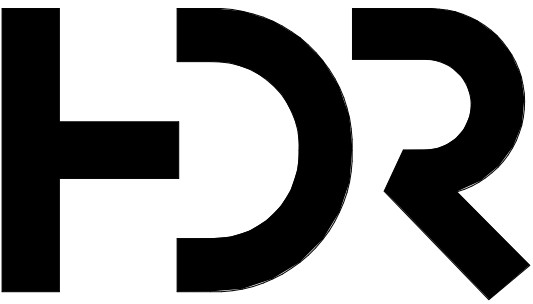
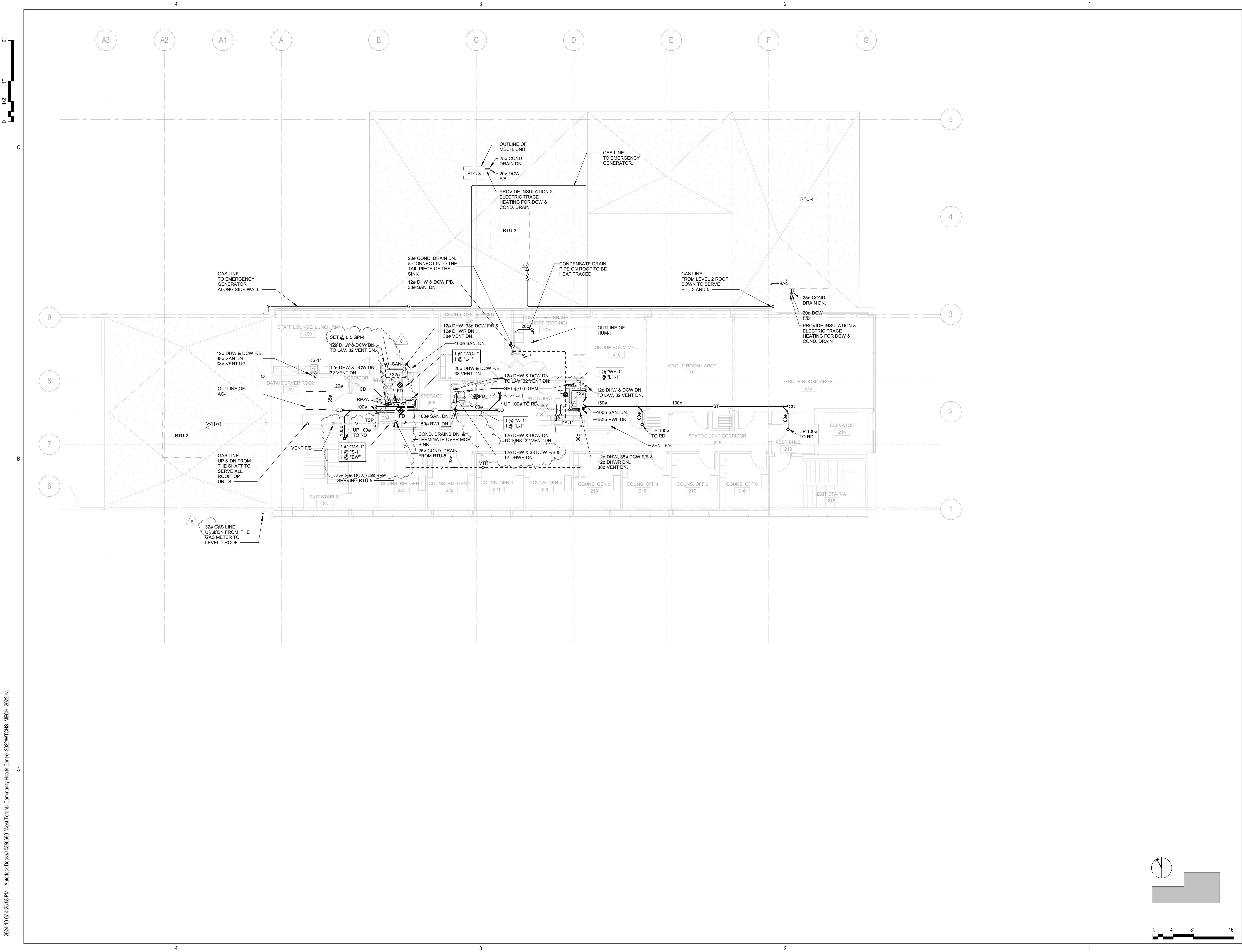
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Mechanical Engineer	WSP
Plumbing Engineer	WSP
Interior Designer	Interior Designer
Equipment Planner	Equipment Planner
Wayfinding	

Sheet Reviewer	Checker
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MARK	DATE	DESCRIPTION
1	2023-05-05	ISSUED FOR STAGE 3.2 COSTING
2	2023-07-05	ISSUED FOR MOH STAGE 3.2
3	2023-11-24	ISSUED FOR STAGE 3.3 COSTING
4	2024-02-12	ISSUED FOR MOH STAGE 3.3
5	2024-03-22	ISSUED FOR BUILDING PERMIT
6	2024-06-07	ISSUED FOR BUILDING PERMIT R1
7	2024-09-18	ISSUED FOR TENDER
8	2024-10-07	ISSUED FOR ADDENDUM M01

Project Number	221-11662-00
Original Issue	02/23/21

Sheet Name

LEVEL 02 - PLUMBING

Scale

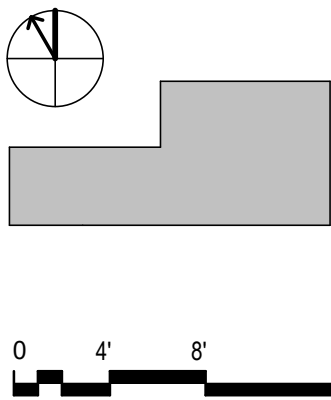
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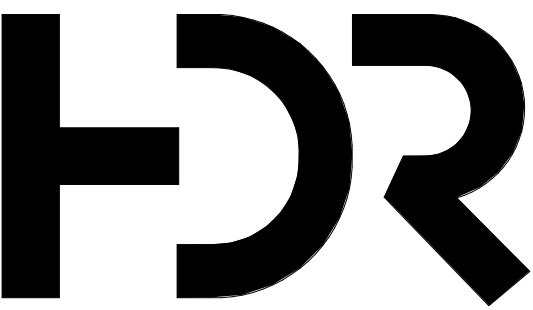
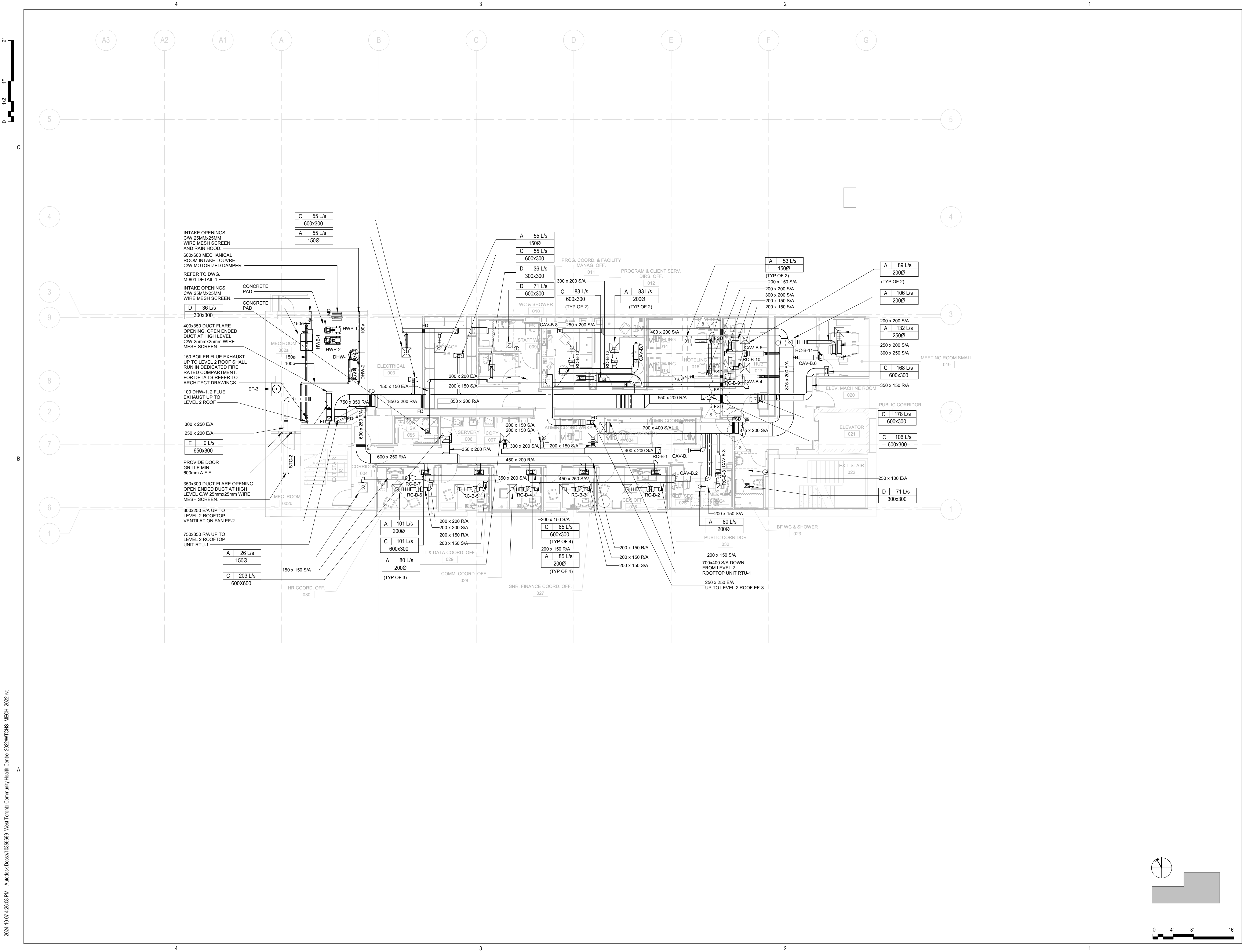
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Project Status

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Civil Engineer	WSP
Structural Engineer	WSP
Mechanical Engineer	WSP
Electrical Engineer	WSP
Plumbing Engineer	WSP
Interior Designer	Interior Designer
Equipment Planner	Equipment Planner
Wayfinding	

Sheet Reviewer	Checker
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MARK	DATE	DESCRIPTION
1	2023-05-05	ISSUED FOR STAGE 3.2 COSTING
2	2023-05-19	ISSUED FOR STAGE 3.2 COSTING-R1
3	2023-07-05	ISSUED FOR MOH STAGE 3.2
4	2023-11-24	ISSUED FOR STAGE 3.3 COSTING
5	2024-02-12	ISSUED FOR MOH STAGE 3.3
6	2024-03-22	ISSUED FOR BUILDING PERMIT
7	2024-09-18	ISSUED FOR TENDER
8	2024-10-07	ISSUED FOR ADDENDUM M01

Project Number	221-11662-00
Original Issue	11/02/21

Sheet Name

LEVEL B01 - HVAC

Scale

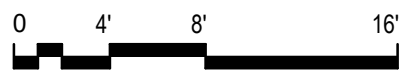
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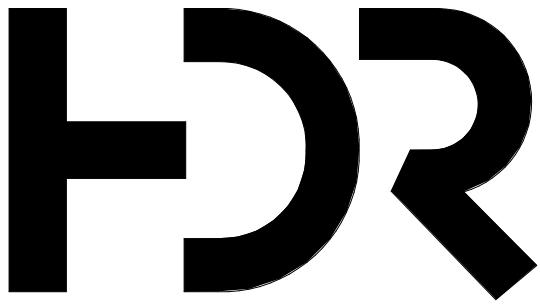
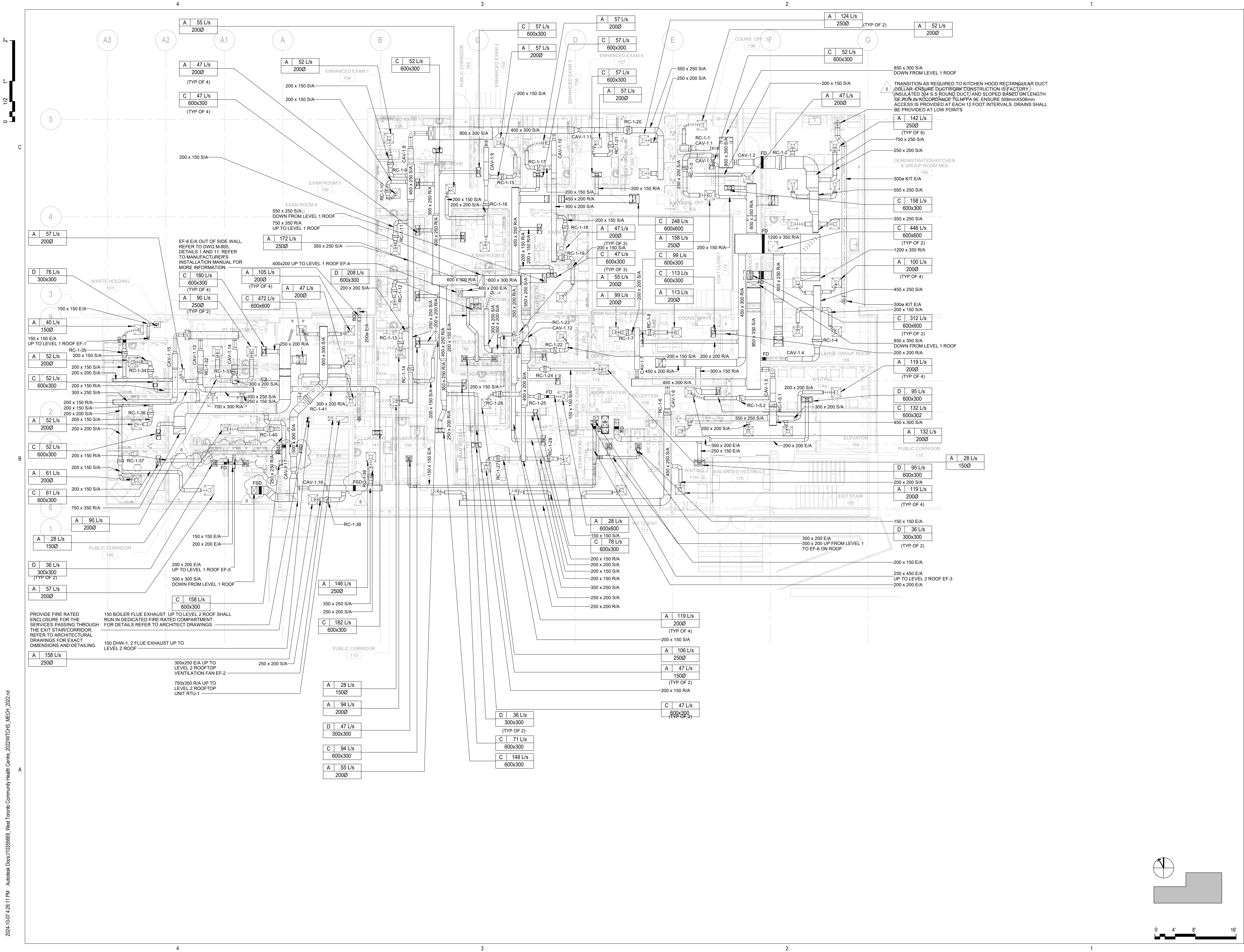
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M-400

Project Status

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Mechanical Engineer	WSP
Electrical Engineer	WSP
Plumbing Engineer	WSP
Interior Designer	Interior Designer
Equipment Planner	Equipment Planner
Wayfinding	

Sheet Reviewer	Checker
----------------	---------

MARK	DATE	DESCRIPTION
1	2023-05-05	ISSUED FOR STAGE 3.2 COSTING
2	2023-05-19	ISSUED FOR STAGE 3.2 COSTING-R1
3	2023-07-05	ISSUED FOR MOH STAGE 3.2
4	2023-11-24	ISSUED FOR STAGE 3.3 COSTING
5	2024-02-12	ISSUED FOR MOH STAGE 3.3
6	2024-03-22	ISSUED FOR BUILDING PERMIT
7	2024-09-18	ISSUED FOR TENDER
8	2024-10-07	ISSUED FOR ADDENDUM M01

Project Number	221-11662-00
Original Issue	11/02/21

Sheet Name

LEVEL 01 - HVAC

Scale

1 : 100

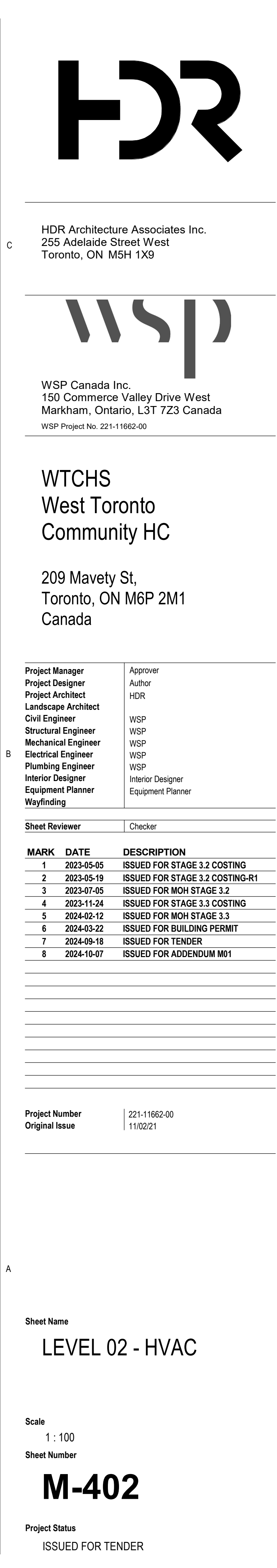
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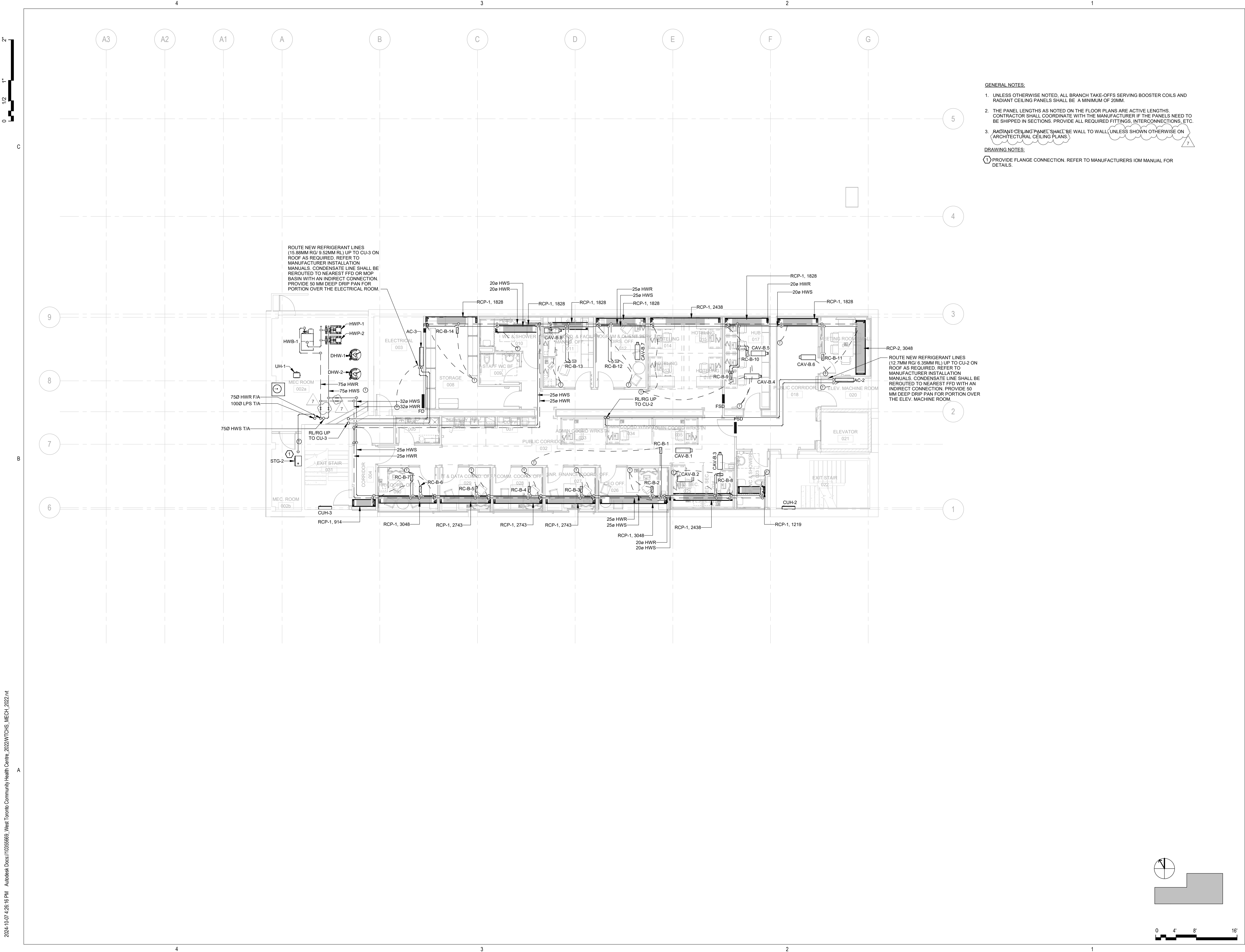
Project Status

ISSUED FOR TENDER





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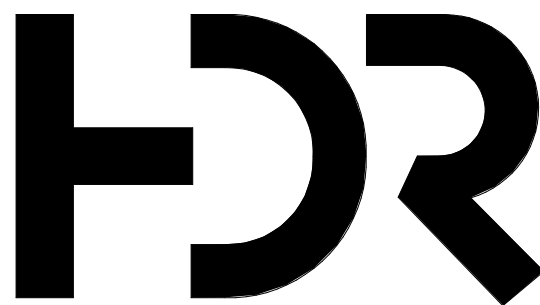


GENERAL NOTES:

- UNLESS OTHERWISE NOTED, ALL BRANCH TAKE-OFFS SERVING BOOSTER COILS AND RADIANT CEILING PANELS SHALL BE A MINIMUM OF 20MM.
- THE PANEL LENGTHS AS NOTED ON THE FLOOR PLANS ARE ACTIVE LENGTHS. CONTRACTOR SHALL COORDINATE WITH THE MANUFACTURER IF THE PANELS NEED TO BE SHIPPED IN SECTIONS. PROVIDE ALL REQUIRED FITTINGS, INTERCONNECTIONS, ETC.
- RADIANT CEILING PANEL SHALL BE WALL TO WALL, UNLESS SHOWN OTHERWISE ON (ARCHITECTURAL CEILING PLANS).

DRAWING NOTES:

- PROVIDE FLANGE CONNECTION. REFER TO MANUFACTURERS IOM MANUAL FOR DETAILS.



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Mechanical Engineer	WSP
Electrical Engineer	WSP
Plumbing Engineer	WSP
Interior Designer	Interior Designer
Equipment Planner	Equipment Planner
Wayfinding	

Sheet Reviewer	Checker
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MARK	DATE	DESCRIPTION
1	2023-05-05	ISSUED FOR STAGE 3.2 COSTING
2	2023-07-05	ISSUED FOR MOH STAGE 3.2
3	2023-11-24	ISSUED FOR STAGE 3.3 COSTING
4	2024-02-12	ISSUED FOR MOH STAGE 3.3
5	2024-03-22	ISSUED FOR BUILDING PERMIT
6	2024-09-18	ISSUED FOR TENDER
7	2024-10-07	ISSUED FOR ADDENDUM M01

Project Number	221-11662-00
Original Issue	02/23/21

Sheet Name

LEVEL B01 -  
HYDRONIC PIPING

Scale

1 : 100

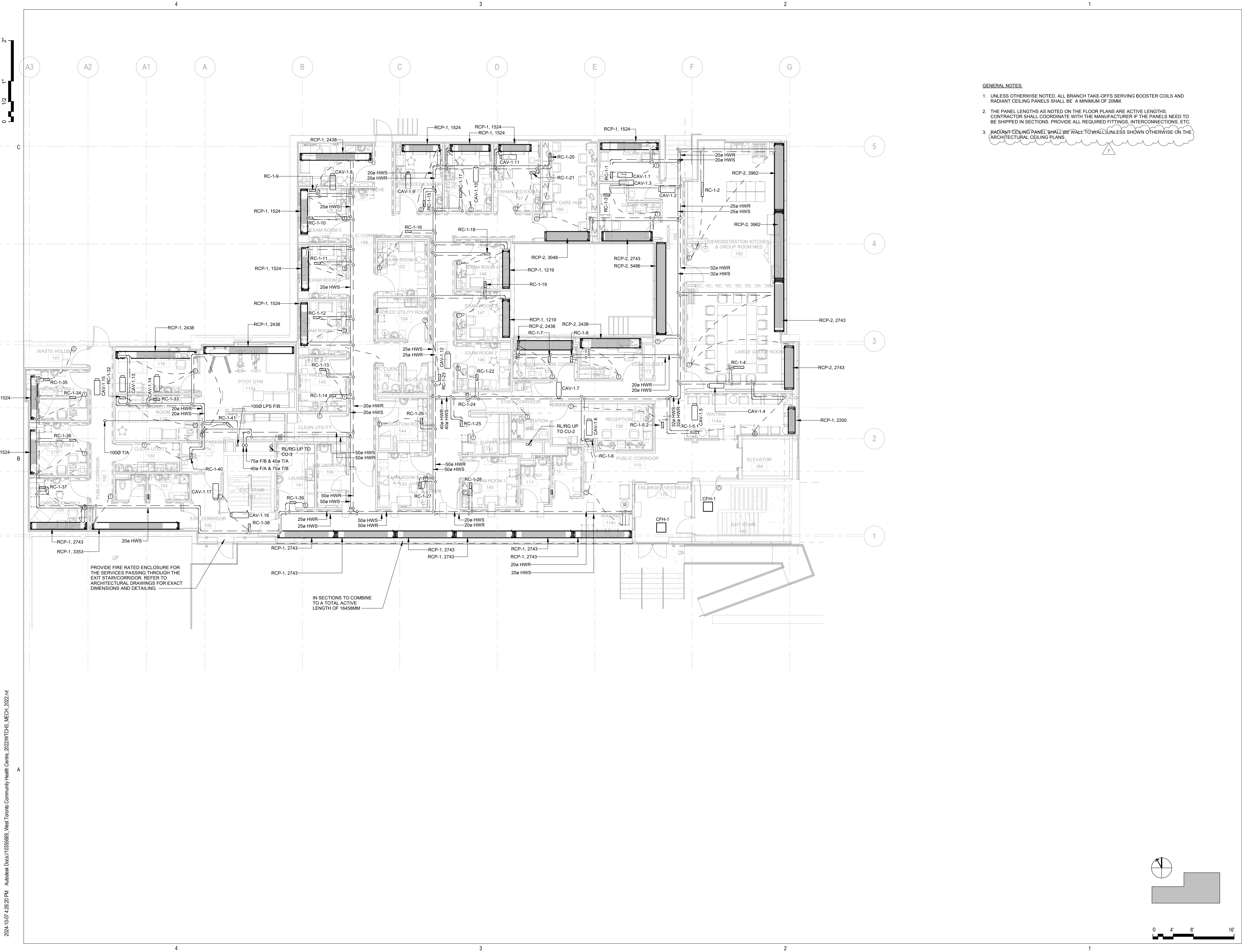
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M-450

Project Status

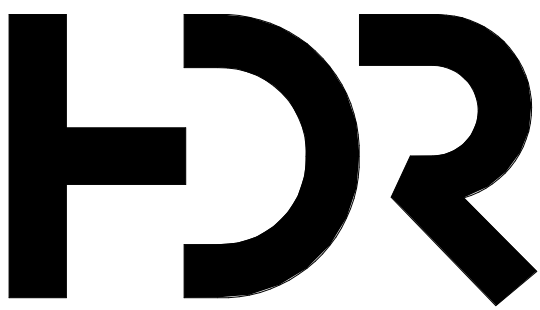
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GENERAL NOTES:

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Wayfinding	

Sheet Reviewer	Checker
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MARK	DATE	DESCRIPTION
1	2023-05-05	ISSUED FOR STAGE 3.2 COSTING
2	2023-07-05	ISSUED FOR MOH STAGE 3.2
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6	2024-09-18	ISSUED FOR TENDER
7	2024-10-07	ISSUED FOR ADDENDUM M01

Project Number	221-11662-00
Original Issue	02/23/21

Sheet Name

LEVEL 01 - HYDRONIC  
PIPING

Scale

1 : 100

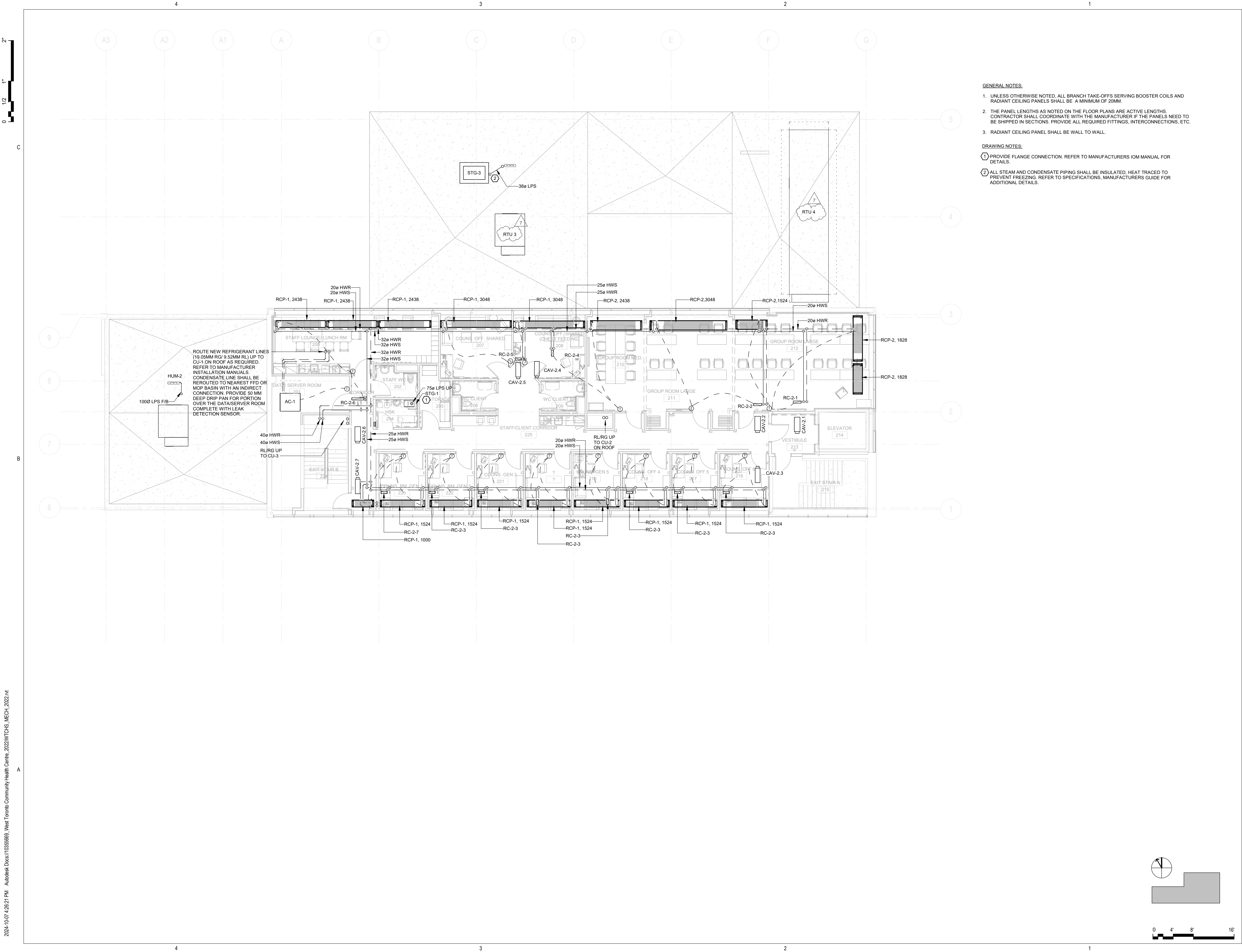
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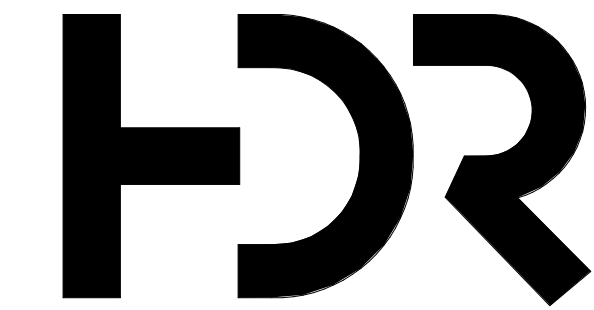
Project Status

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- GENERAL NOTES:
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  - RADIANT CEILING PANEL SHALL BE WALL TO WALL.
- DRAWING NOTES:
- PROVIDE FLANGE CONNECTION. REFER TO MANUFACTURERS IOM MANUAL FOR DETAILS.
  - ALL STEAM AND CONDENSATE PIPING SHALL BE INSULATED. HEAT TRACED TO PREVENT FREEZING. REFER TO SPECIFICATIONS, MANUFACTURERS GUIDE FOR ADDITIONAL DETAILS.



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Equipment Planner	Equipment Planner
Wayfinding	

Sheet Reviewer	Checker
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MARK	DATE	DESCRIPTION
1	2023-05-05	ISSUED FOR STAGE 3.2 COSTING
2	2023-07-05	ISSUED FOR MOH STAGE 3.2
3	2023-11-24	ISSUED FOR STAGE 3.3 COSTING
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6	2024-09-18	ISSUED FOR TENDER
7	2024-10-07	ISSUED FOR ADDENDUM M01

Project Number	221-11662-00
Original Issue	02/23/21

Sheet Name

LEVEL 02 - HYDRONIC

Scale

1 : 100

Sheet Number

M-452

Project Status

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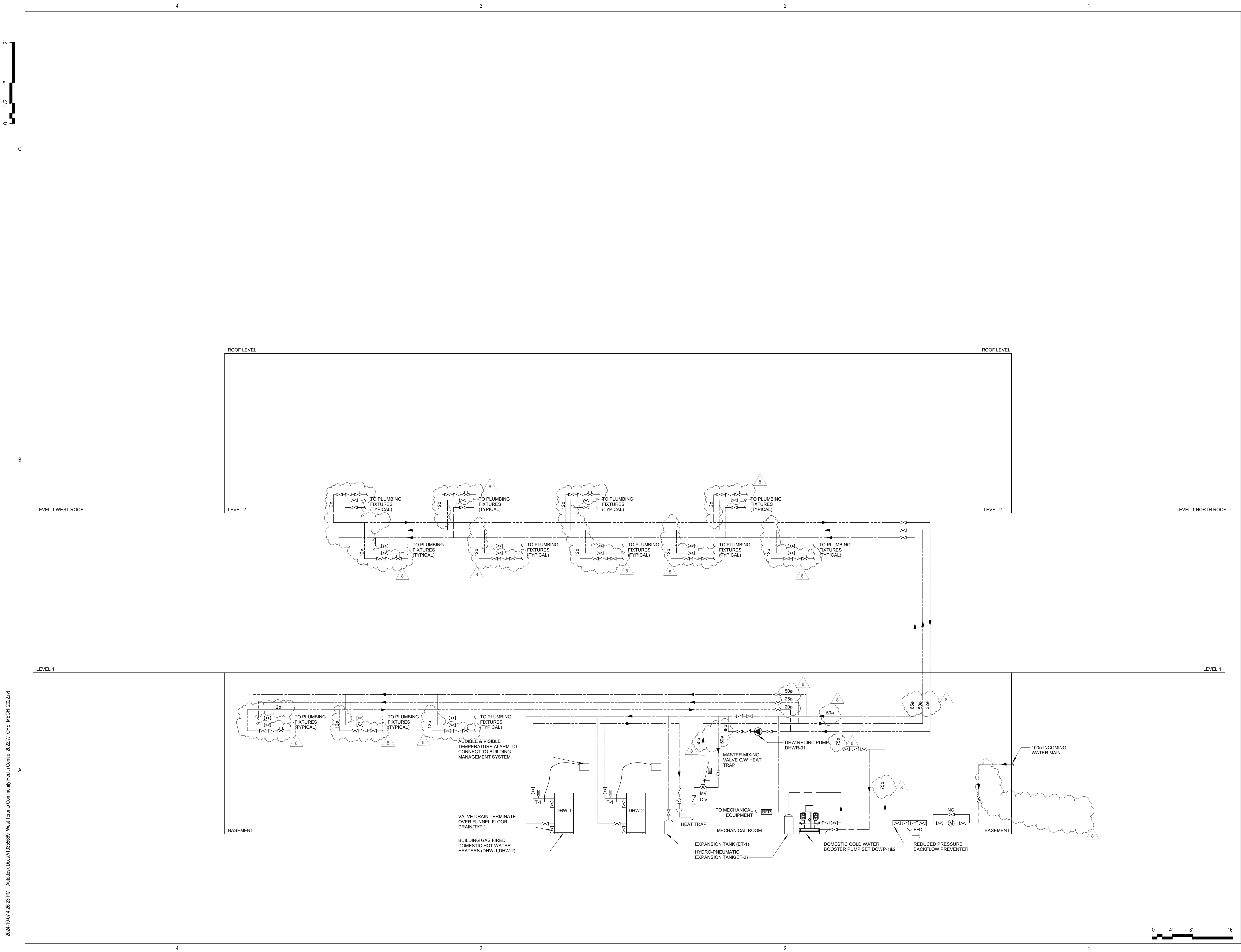
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## DOMESTIC WATER SCHEMATIC

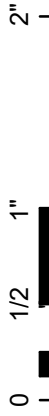
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# M-601

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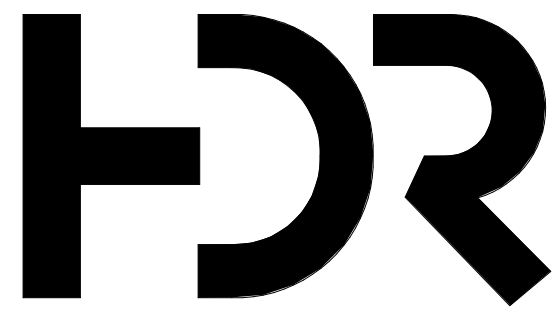
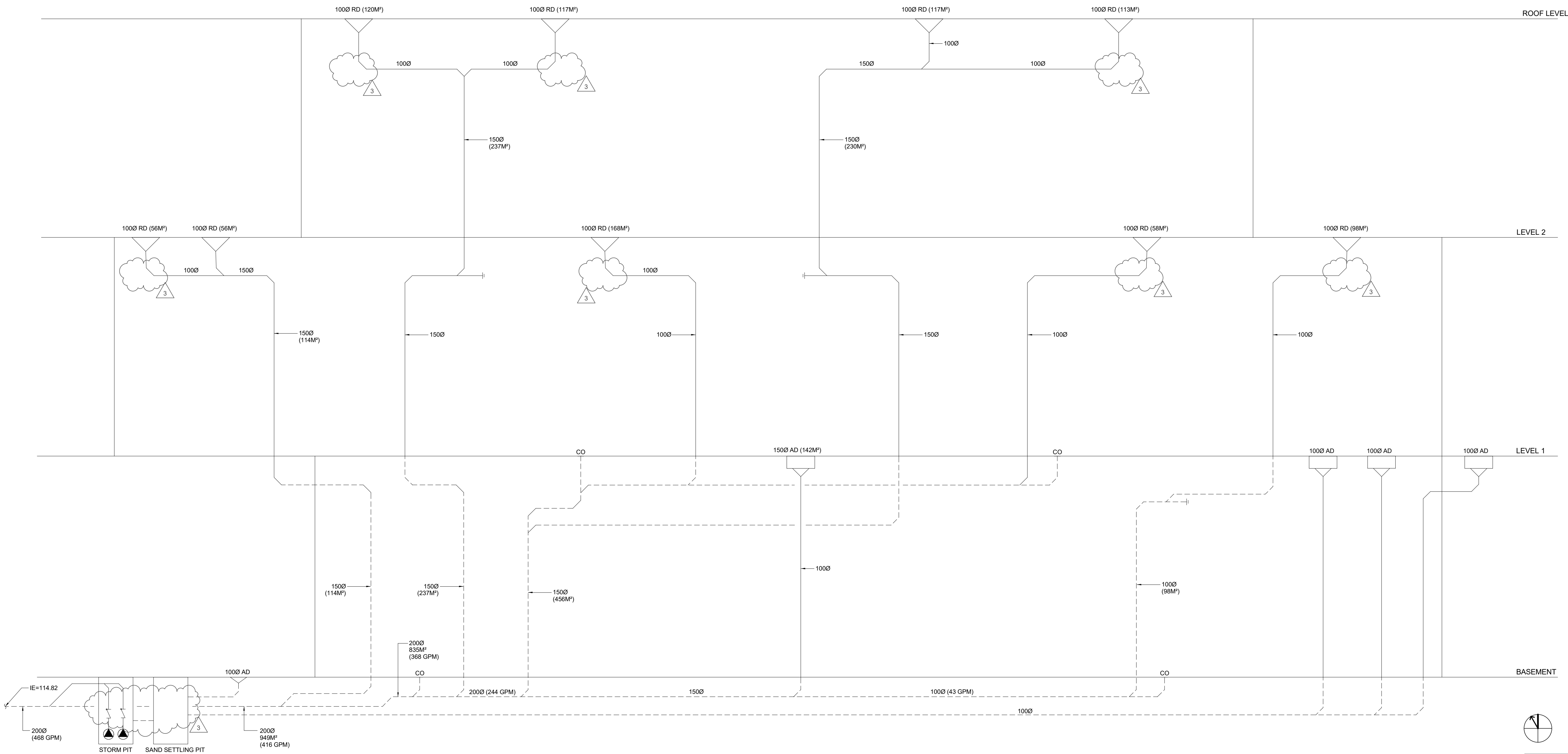
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C

B

A



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Electrical Engineer	WSP
Plumbing Engineer	WSP
Interior Designer	Interior Designer
Equipment Planner	Equipment Planner
Wayfinding	

Sheet Reviewer	Checker
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MARK	DATE	DESCRIPTION
1	2024-06-07	ISSUED FOR BUILDING PERMIT
2	2024-09-18	ISSUED FOR TENDER
3	2024-10-07	ISSUED FOR ADDENDUM M01

Project Number	221-11662-00
Original Issue	06/06/24

Sheet Name

## STORM WATER SCHEMATIC

Scale

N.T.S.

Sheet Number

# M-607

Project Status

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NOTES:

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C

B

A



### SCHEDULE OF H.V.A.C. PUMPS

TAG	SYSTEM	LOCATION	MANUFACTURER	MODEL	QTY	MEDIUM	FLOW RATE (L/s)	HEAD (kPa)	MOTOR				VFD	EMERGENCY POWER	REMARKS
									RPM	BHP	HP	V/PH/Hz			
HWP-1.2	HEATING WATER PUMPS	BASEMENT MECHANICAL ROOM	BELL & GOSSETT	E-90 1AAB	2	WATER	2.6	257	3600	1.69	3.0	575/3/60	YES	NO	DUTY/DUTY

NOTES:  
1. ALL PUMPS WITH VFD CONTROLLERS SHALL BE SUPPLIED WITH INVERTER DUTY MOTORS SUITABLE FOR USE WITH VFD OPERATION. ALLOW LOOSE VFD INSTALLATION IN MECHANICAL ROOM WALL.

### SCHEDULE OF PLUMBING PUMPS

TAG	SYSTEM	LOCATION	MANUFACTURER	MODEL	FLOW RATE (L/s)	HEAD (kPa)	MOTOR			EMERGENCY POWER	REMARKS
							RPM	HP	V/PH/Hz		
STP-1&2	DUPLEX STORM PUMPS	BASEMENT MECHANICAL ROOM	SCARBORO PUMP	-	3	105	3450	1(each)	208/3/60	YES	
DCWP-1&2	DUPLEX DOMESTIC COLD WATER BOOSTER PUMPS	BASEMENT MECHANICAL ROOM	S.A. ARMSTRONG	-	6 (each)	310	3600	5 (each)	575/3/60	NO	DUTY / STANDBY.
DHWR-1	DOMESTIC HOT WATER RECIR. PUMP	BASEMENT MECHANICAL ROOM	S.A. ARMSTRONG	-	1.0	138	3000	0.33	120/1/60	NO	
ESP-3&4	DUPLEX ELEVATOR SUMP PUMPS	EL MACHINE ROOM	SCARBORO PUMP	-	3 (each)	60	3450	1 (each)	208/3/60	YES	DUTY / STANDBY.

NOTES:  
PROVIDE DCWP-1&2 SCOPE AS A SEPARATE PRICE

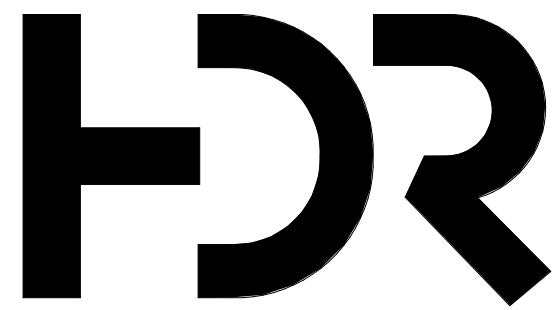
### SCHEDULE OF MOTORIZED HEATERS

TAG	LOCATION	MANUFACTURER	MODEL NO.	CAPACITY (KW)	MEDIUM	POWER SUPPLY (V/PH/Hz)	MOTOR		REMARKS
							HP	RPM	
UH-1	MECHANICAL ROOM 117	OUELLET	OASU07538AM	7.5	ELECTRIC	208/1/60	0.033	1550	SUSPENDED/CEILING MOUNTED UNIT.
CFH-1	ENLARGED VESTIBULE 170, EXIT STAIR 165	OUELLET	ODSR05008	5	ELECTRIC	208/1/60	0.020	1550	RECESSED CEILING MOUNTED UNIT.
CUH-2	EXIT STAIR 022 - BASEMENT	OUELLET	OAC08008-T	8	ELECTRIC	208/1/60	-	-	EXPOSED WALL MOUNTED UNIT.
CUH-3	EXIT STAIR 031 - BASEMENT	OUELLET	OAC08008-T	8	ELECTRIC	208/1/60	-	-	EXPOSED WALL MOUNTED UNIT.

NOTES:  
1. AIR FLOW SPECIFIED IS AT LOW SPEED UNLESS NOTED OTHERWISE.

### SCHEDULE OF EXPANSION TANK (S.A. ARMSTRONG)

TAG	SYSTEM	MODEL NO.	TYPE	DIAMETER (mm) x HEIGHT (mm)	TANK CAPACITY (L)	ACCEPTANCE VOLUME (L)	REMARKS
ET-1	DOMESTIC COLD WATER SYSTEM	ST-100CL	BLADDER	406 x 991	100	-	
ET-2	DOMESTIC HOT WATER SYSTEM	ST-100CL	BLADDER	406 x 991	100	-	
ET-3	HEATING WATER SYSTEM	AX-100V	BLADDER	508x1245	227.1	87.8	



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Wayfinding	

Sheet Reviewer	Checker
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MARK	DATE	DESCRIPTION
1	2023-05-05	ISSUED FOR STAGE 3.2 COSTING
2	2023-07-05	ISSUED FOR MOH STAGE 3.2
3	2023-11-24	ISSUED FOR STAGE 3.3 COSTING
4	2024-02-12	ISSUED FOR MOH STAGE 3.3
5	2024-03-22	ISSUED FOR BUILDING PERMIT
6	2024-09-18	ISSUED FOR TENDER
7	2024-10-07	ISSUED FOR ADDENDUM M01

Project Number	221-11662-00
Original Issue	02/23/21

Sheet Name

MECHANICAL  
SCHEDULES 2

Scale

N.T.S.

Sheet Number

M-702

Project Status

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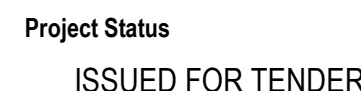


SCHEDULE OF HYDRONIC REHEAT COILS

TAG	MANUFACTURER	MODEL	SIZE (HEIGHT X WIDTH)	AIR SIDE						WATER SIDE					REMARKS
				AIRFLOW (L/S)	FACE VELOCITY (M/S)	EAT (°C)	LAT (°C)	TOTAL CAPACITY (KW)	P.D. (Pa)	MEDIUM	EWI (°C)	LWT (°C)	FLOW (L/S)	P.D. (kPa)	
BASEMENT															
RC-B-1	EH PRICE	WC-9-STD	312.5x350	240	2.13	12.8	23.9	6.35	37.3	WATER	60.0	48.9	0.139	3.89	
RC-B-2	EH PRICE	WC-4-STD	200x300	85	1.37	12.8	23.9	1.2	10.0	WATER	60.0	48.9	0.026	0.45	
RC-B-3	EH PRICE	WC-4-STD	200x300	85	1.37	12.8	23.9	1.2	10.0	WATER	60.0	48.9	0.026	0.45	
RC-B-4	EH PRICE	WC-4-STD	200x300	85	1.37	12.8	23.9	1.2	10.0	WATER	60.0	48.9	0.026	0.45	
RC-B-5	EH PRICE	WC-4-STD	200x300	85	1.37	12.8	23.9	1.2	10.0	WATER	60.0	48.9	0.026	0.45	
RC-B-6	EH PRICE	WC-4-HC	200x300	101	1.63	12.8	23.9	1.55	14.9	WATER	60.0	48.9	0.034	0.72	
RC-B-7	EH PRICE	WC-4-HC	200x300	26	1.0	12.8	23.9			WATER	60.0	48.9			
RC-B-8	EH PRICE	WC-4-STD	200x300	80	1.29	12.8	23.9	1.17	10.0	WATER	60.0	48.9	0.026	0.45	
RC-B-9	EH PRICE	WC-4-HC	200x300	106	1.71	12.8	23.9	1.61	14.9	WATER	60.0	48.9	0.035	0.78	
RC-B-10	EH PRICE	WC-7-HC	250x300	178	2.30	12.8	23.9	2.49	32.3	WATER	60.0	48.9	0.054	2.39	
RC-B-11	EH PRICE	WC-9-STD	312.5x350	238	2.11	12.8	23.9	6.3	37.3	WATER	60.0	48.9	0.138	3.83	
RC-B-12	EH PRICE	WC-4-STD	200x300	83	1.34	12.8	23.9	1.17	10.0	WATER	60.0	48.9	0.026	0.45	
RC-B-13	EH PRICE	WC-4-STD	200x300	83	1.34	12.8	23.9	1.17	10.0	WATER	60.0	48.9	0.026	0.45	
RC-B-14	EH PRICE	WC-4-HC	200x300	110	1.78	12.8	23.9	1.64	17.4	WATER	60.0	48.9	0.037	0.81	
LEVEL 1															
RC-1-1	EH PRICE	WC-4-STD	200x300	52	0.84	12.8	23.9	0.88	5.0	WATER	60.0	48.9	0.019	0.27	
RC-1-2	EH PRICE	WC-24x16-STD	450x600	852	1.93	12.8	23.9	12.77	19.9	WATER	60.0	48.9	0.279	14.23	
RC-1-3	EH PRICE	WC-9-STD	312.5x350	205	1.82	12.8	23.9	5.71	29.9	WATER	60.0	48.9	0.125	3.20	
RC-1-4	EH PRICE	WC-14-STD	437.5x500	400	1.77	12.8	23.9	5.65	14.9	WATER	60.0	48.9	0.124	2.54	
RC-1-5.1	EH PRICE	WC-16-STD	450x600	528	1.89	12.8	23.9	7.29	17.4	WATER	60.0	48.9	0.160	4.30	
RC-1-5.2	EH PRICE	WC-4-HC	200x300	132	2.13	12.8	23.9	1.82	22.4	WATER	60.0	48.9	0.040	0.96	
RC-1-6	EH PRICE	WC-16-STD	450x600	476	1.71	12.8	23.9	6.88	14.9	WATER	60.0	48.9	0.151	3.86	
RC-1-7	EH PRICE	WC-4-HC	200x300	99	1.60	12.8	23.9	1.55	14.9	WATER	60.0	48.9	0.034	0.72	
RC-1-8	EH PRICE	WC-4-HC	200x300	113	1.82	12.8	23.9	1.67	17.4	WATER	60.0	48.9	0.037	0.87	
RC-1-9	EH PRICE	WC-4-STD	200x300	57	0.92	12.8	23.9	0.94	5.0	WATER	60.0	48.9	0.020	0.30	
RC-1-10	EH PRICE	WC-4-STD	200x300	47	0.76	12.8	23.9	0.82	5.0	WATER	60.0	48.9	0.018	0.24	
RC-1-11	EH PRICE	WC-4-STD	200x300	47	0.76	12.8	23.9	0.82	5.0	WATER	60.0	48.9	0.018	0.24	
RC-1-12	EH PRICE	WC-4-STD	200x300	47	0.76	12.8	23.9	0.82	5.0	WATER	60.0	48.9	0.018	0.24	
RC-1-13	EH PRICE	WC-4-HC	200x300	94	1.52	12.8	23.9	1.49	12.4	WATER	60.0	48.9	0.033	0.69	
RC-1-14	EH PRICE	WC-4-STD	200x300	83	1.34	12.8	23.9	1.17	10.0	WATER	60.0	48.9	0.026	0.45	
RC-1-15	EH PRICE	WC-4-STD	200x300	57	0.92	12.8	23.9	0.94	5.0	WATER	60.0	48.9	0.020	0.30	
RC-1-16	EH PRICE	WC-4-HC	200x300	102	1.65	12.8	23.9	1.58	14.9	WATER	60.0	48.9	0.034	0.72	
RC-1-17	EH PRICE	WC-4-STD	200x300	57	0.92	12.8	23.9	0.94	5.0	WATER	60.0	48.9	0.020	0.30	
RC-1-18	EH PRICE	WC-4-STD	200x300	47	0.76	12.8	23.9	0.82	5.0	WATER	60.0	48.9	0.018	0.24	
RC-1-19	EH PRICE	WC-4-STD	200x300	47	0.76	12.8	23.9	0.82	5.0	WATER	60.0	48.9	0.018	0.24	
RC-1-20	EH PRICE	WC-9-STD	312.5x350	248	2.20	12.8	23.9	6.47	39.8	WATER	60.0	48.9	0.143	4.07	
RC-1-21	EH PRICE	WC-4-STD	200x300	57	0.92	12.8	23.9	0.94	5.0	WATER	60.0	48.9	0.020	0.30	
RC-1-22	EH PRICE	WC-4-STD	200x300	47	0.76	12.8	23.9	0.82	5.0	WATER	60.0	48.9	0.018	0.24	
RC-1-23	EH PRICE	WC-9-STD	312.5x350	227	2.01	12.8	23.9	6.12	34.8	WATER	60.0	48.9	0.134	3.65	
RC-1-24	EH PRICE	WC-4-STD	200x300	28	0.45	12.8	23.9	0.59	2.5	WATER	60.0	48.9	0.013	0.15	
RC-1-25	EH PRICE	WC-4-STD	200x300	28	0.45	12.8	23.9	0.59	2.5	WATER	60.0	48.9	0.013	0.15	
RC-1-26	EH PRICE	WC-4-HC	200x300	106	1.71	12.8	23.9	1.61	14.9	WATER	60.0	48.9	0.035	0.78	
RC-1-27	EH PRICE	WC-4-STD	200x300	47	0.76	12.8	23.9	0.82	5.0	WATER	60.0	48.9	0.018	0.24	
RC-1-28	EH PRICE	WC-4-STD	200x300	47	0.76	12.8	23.9	0.82	5.0	WATER	60.0	48.9	0.018	0.24	
RC-1-32	EH PRICE	WC-9-STD	312.5x350	237	2.10	12.8	23.9	6.30	37.3	WATER	60.0	48.9	0.138	3.83	
RC-1-33	EH PRICE	WC-7-HC	250x300	180	2.33	12.8	23.9	2.49	32.3	WATER	60.0	48.9	0.055	2.48	
RC-1-34	EH PRICE	WC-4-STD	200x300	52	0.84	12.8	23.9	0.88	5.0	WATER	60.0	48.9	0.019	0.27	
RC-1-35	EH PRICE	WC-4-STD	200x300	40	0.65	12.8	23.9	0.73	5.0	WATER	60.0	48.9	0.016	0.21	
RC-1-36	EH PRICE	WC-4-STD	200x300	52	0.84	12.8	23.9	0.88	5.0	WATER	60.0	48.9	0.019	0.27	
RC-1-37	EH PRICE	WC-4-HC	200x300	118	1.91	12.8	23.9	1.73	17.4	WATER	60.0	48.9	0.037	0.87	
RC-1-38	EH PRICE	WC-7-HC	250x300	158	2.04	12.8	23.9	2.31	27.4	WATER	60.0	48.9	0.050	2.12	
RC-1-39	EH PRICE	WC-7-HC	250x300	146	1.89	12.8	23.9	2.20	22.4	WATER	60.0	48.9	0.048	1.94	
RC-1-40	EH PRICE	WC-4-STD	200x300	28	0.45	12.8	23.9	0.59	2.5	WATER	60.0	48.9	0.013	0.15	
RC-1-41	EH PRICE	WC-16-STD	450x600	467	1.68	12.8	23.9	6.79	14.9	WATER	60.0	48.9	0.148	3.74	
LEVEL 2															
RC-2-1	GREENHECK	HW58S01A10-12x24	300x600	484	2.6	12.8	23.9	6.97	29.9	WATER	60.0	48.9	0.151	6.28	
RC-2-2	GREENHECK	HW58S01A10-12x24	300x600	491	2.64	12.8	23.9	7.03	29.9	WATER	60.0	48.9	0.151	6.28	
RC-2-3	EH PRICE	WC-4-STD	200x300	78	1.26	12.8	23.9	1.14	7.5	WATER	60.0	48.9	0.025	0.42	
RC-2-4	GREENHECK	HW58S01A11-12x12	300x300	224	2.41	12.8	23.9	3.19	29.9	WATER	60.0	48.9	0.069	1.49	
RC-2-5	GREENHECK	HW58S01A11-12x16	200x400	345	2.79	12.8	23.9	4.95	37.3	WATER	60.0	48.9	0.107	3.59	
RC-2-6	GREENHECK	HW58S01A10-12x28	300x700	637	2.94	12.8	23.9	8.90	37.3	WATER	60.0	48.9	0.196	10.46	
RC-2-7	EH PRICE	WC-4-HC	200x300	140	2.26	12.8	23.9	1.87	22.4	WATER	60.0	48.9	0.041	1.02	
NOTES:															
1. BASEMENT LEVEL COILS SHALL NOT BE TALLER THAN 400mm															
2. LEVEL 1 COILS SHALL NOT BE TALLER THAN 500mm															
3. LEVEL 2 COILS SHALL NOT BE TALLER THAN 300mm															
4. REFER TO FLOOR PLANS FOR COIL COUNTS															

SCHEDULE OF CONSTANT AIR VOLUME TERMINAL UNITS (EH PRICE)

ID	DESCRIPTION	MANUFACTURER	MODEL NO.	REQUIRED AIRFLOW L/S	INLET SIZE (mm)	OUTLET SIZE (mm x mm)	REMARKS
BASEMENT							
CAV-B.1	CONSTANT AIR VOLUME TERMINAL	EH PRICE	SDV-8	241	200	305 x 254	ALLOW FOR 900mm INTEGRAL SILENCER. SILENCER SCOPE SHALL BE CONFIRMED BY ACOUSTICAL REPORT SUBMITTED DURING SHOP DRAWINGS BY GC.
CAV-B.2	CONSTANT AIR VOLUME TERMINAL	EH PRICE	SDV-10	467	250	356 x 318	ALLOW FOR 900mm INTEGRAL SILENCER. SILENCER SCOPE SHALL BE CONFIRMED BY ACOUSTICAL REPORT SUBMITTED DURING SHOP DRAWINGS BY GC.
CAV-B.3	CONSTANT AIR VOLUME TERMINAL	EH PRICE	SDV-5	80	125	305 x 203	ALLOW FOR 900mm INTEGRAL SILENCER. SILENCER SCOPE SHALL BE CONFIRMED BY ACOUSTICAL REPORT SUBMITTED DURING SHOP DRAWINGS BY GC.
CAV-B.4	CONSTANT AIR VOLUME TERMINAL	EH PRICE	SDV-5	106	125	305 x 203	ALLOW FOR 900mm INTEGRAL SILENCER. SILENCER SCOPE SHALL BE CONFIRMED BY ACOUSTICAL REPORT SUBMITTED DURING SHOP DRAWINGS BY GC.
CAV-B.5	CONSTANT AIR VOLUME TERMINAL	EH PRICE	SDV-5	179	125	305 x 203	ALLOW FOR 900mm INTEGRAL SILENCER. SILENCER SCOPE SHALL BE CONFIRMED BY ACOUSTICAL REPORT SUBMITTED DURING SHOP DRAWINGS BY GC.
CAV-B.6	CONSTANT AIR VOLUME TERMINAL	EH PRICE	SDV-7	238	175	305 x 254	ALLOW FOR 900mm INTEGRAL SILENCER. SILENCER SCOPE SHALL BE CONFIRMED BY ACOUSTICAL REPORT SUBMITTED DURING SHOP DRAWINGS BY GC.
CAV-B.7	CONSTANT AIR VOLUME TERMINAL	EH PRICE	SDV-5	165	125	305 x 203	ALLOW FOR 900mm INTEGRAL SILENCER. SILENCER SCOPE SHALL BE CONFIRMED BY ACOUSTICAL REPORT SUBMITTED DURING SHOP DRAWINGS BY GC.
CAV-B.8	CONSTANT AIR VOLUME TERMINAL	EH PRICE	SDV-5	104	125	305 x 203	ALLOW FOR 900mm INTEGRAL SILENCER. SILENCER SCOPE SHALL BE CONFIRMED BY ACOUSTICAL REPORT SUBMITTED DURING SHOP DRAWINGS BY GC.
LEVEL 1							
CAV-1.1	CONSTANT AIR VOLUME TERMINAL	EH PRICE	SDV-5	52	125	305 x 203	ALLOW FOR 900mm INTEGRAL SILENCER. SILENCER SCOPE SHALL BE CONFIRMED BY ACOUSTICAL REPORT SUBMITTED DURING SHOP DRAWINGS BY GC.
CAV-1.2	CONSTANT AIR VOLUME TERMINAL	EH PRICE	SDV-12	849	300	406 x 381	ALLOW FOR 900mm INTEGRAL SILENCER. SILENCER SCOPE SHALL BE CONFIRMED BY ACOUSTICAL REPORT SUBMITTED DURING SHOP DRAWINGS BY GC.
CAV-1.3	CONSTANT AIR VOLUME TERMINAL	EH PRICE	SDV-7	205	175	305 x 254	ALLOW FOR 900mm INTEGRAL SILENCER. SILENCER SCOPE SHALL BE CONFIRMED BY ACOUSTICAL REPORT SUBMITTED DURING SHOP DRAWINGS BY GC.
CAV-1.4	CONSTANT AIR VOLUME TERMINAL	EH PRICE	SDV-8	400	305 x 254		ALLOW FOR 900mm INTEGRAL SILENCER. SILENCER SCOPE SHALL BE CONFIRMED BY ACOUSTICAL REPORT SUBMITTED DURING SHOP DRAWINGS BY GC.
CAV-1.5	CONSTANT AIR VOLUME TERMINAL	EH PRICE	SDV-10	595	250	356 x 318	ALLOW FOR 900mm INTEGRAL SILENCER. SILENCER SCOPE SHALL BE CONFIRMED BY ACOUSTICAL REPORT SUBMITTED DURING SHOP DRAWINGS BY GC.
CAV-1.6	CONSTANT AIR VOLUME TERMINAL	EH PRICE	SDV-10	476	250	356 x 318	ALLOW FOR 900mm INTEGRAL SILENCER. SILENCER SCOPE SHALL BE CONFIRMED BY ACOUSTICAL REPORT SUBMITTED DURING SHOP DRAWINGS BY GC.
CAV-1.7	CONSTANT AIR VOLUME TERMINAL	EH PRICE	SDV-7	212	175	305 x 254	ALLOW FOR 900mm INTEGRAL SILENCER. SILENCER SCOPE SHALL BE CONFIRMED BY ACOUSTICAL REPORT SUBMITTED DURING SHOP DRAWINGS BY GC.
CAV-1.8	CONSTANT AIR VOLUME TERMINAL	EH PRICE	SDV-8	371	200	305 x 254	ALLOW FOR 900mm INTEGRAL SILENCER. SILENCER SCOPE SHALL BE CONFIRMED BY ACOUSTICAL REPORT SUBMITTED DURING SHOP DRAWINGS BY GC.
CAV-1.9	CONSTANT AIR VOLUME TERMINAL	EH PRICE	SDV-5	156	125	305 x 203	ALLOW FOR 900mm INTEGRAL SILENCER. SILENCER SCOPE SHALL BE CONFIRMED BY ACOUSTICAL REPORT SUBMITTED DURING SHOP DRAWINGS BY GC.
CAV-1.10	CONSTANT AIR VOLUME TERMINAL	EH PRICE	SDV-5	151	125	305 x 203	ALLOW FOR 900mm INTEGRAL SILENCER. SILENCER SCOPE SHALL BE CONFIRMED BY ACOUSTICAL REPORT SUBMITTED DURING SHOP DRAWINGS BY GC.
CAV-1.11	CONSTANT AIR VOLUME TERMINAL	EH PRICE	SDV-8	305	200	305 x 254	ALLOW FOR 900mm INTEGRAL SILENCER. SILENCER SCOPE SHALL BE CONFIRMED BY ACOUSTICAL REPORT SUBMITTED DURING SHOP DRAWINGS BY GC.
CAV-1.12	CONSTANT AIR VOLUME TERMINAL	EH PRICE	SDV-10	534	250	356 x 318	ALLOW FOR 900mm INTEGRAL SILENCER. SILENCER SCOPE SHALL BE CONFIRMED BY ACOUSTICAL REPORT SUBMITTED DURING SHOP DRAWINGS BY GC.
CAV-1.13	CONSTANT AIR VOLUME TERMINAL	EH PRICE	SDV-8	227	200	305 x 254	ALLOW FOR 900mm INTEGRAL SILENCER. SILENCER SCOPE SHALL BE CONFIRMED BY ACOUSTICAL REPORT SUBMITTED DURING SHOP DRAWINGS BY GC.
CAV-1.14	CONSTANT AIR VOLUME TERMINAL	EH PRICE	SDV-5	180	125	305 x 203	ALLOW FOR 900mm INTEGRAL SILENCER. SILENCER SCOPE SHALL BE CONFIRMED BY ACOUSTICAL REPORT SUBMITTED DURING SHOP DRAWINGS BY GC.
CAV-1.15	CONSTANT AIR VOLUME TERMINAL	EH PRICE	SDV-8	262	200	305 x 254	ALLOW FOR 900mm INTEGRAL SILENCER. SILENCER SCOPE SHALL BE CONFIRMED BY ACOUSTICAL REPORT SUBMITTED DURING SHOP DRAWINGS BY GC.
CAV-1.16	CONSTANT AIR VOLUME TERMINAL	EH PRICE	SDV-8	304	200	305 x 254	ALLOW FOR 900mm INTEGRAL SILENCER. SILENCER SCOPE SHALL BE CONFIRMED BY ACOUSTICAL REPORT SUBMITTED DURING SHOP DRAWINGS BY GC.
CAV-1.17	CONSTANT AIR VOLUME TERMINAL	EH PRICE	SDV-10	500	250	356 x 318	ALLOW FOR 900mm INTEGRAL SILENCER. SILENCER SCOPE SHALL BE CONFIRMED BY ACOUSTICAL REPORT SUBMITTED DURING SHOP DRAWINGS BY GC.
LEVEL 2							
CAV-2.1	CONSTANT AIR VOLUME TERMINAL	EH PRICE	SDV-10	484	250	356 x 318	ALLOW FOR 900mm INTEGRAL SILENCER. SILENCER SCOPE SHALL BE CONFIRMED BY ACOUSTICAL REPORT SUBMITTED DURING SHOP DRAWINGS BY GC.
CAV-2.2	CONSTANT AIR VOLUME TERMINAL	EH PRICE	SDV-10	491	250	356 x 318	ALLOW FOR 900mm INTEGRAL SILENCER. SILENCER SCOPE SHALL BE CONFIRMED BY ACOUSTICAL REPORT SUBMITTED DURING SHOP DRAWINGS BY GC.
CAV-2.3	CONSTANT AIR VOLUME TERMINAL	EH PRICE	SDV-8	312	200	305 x 254	ALLOW FOR 900mm INTEGRAL SILENCER. SILENCER SCOPE SHALL BE CONFIRMED BY ACOUSTICAL REPORT SUBMITTED DURING SHOP DRAWINGS BY GC.
CAV-2.4	CONSTANT AIR VOLUME TERMINAL	EH PRICE	SDV-8	339	200	305 x 254	ALLOW FOR 900mm INTEGRAL SILENCER. SILENCER SCOPE SHALL BE CONFIRMED BY ACOUSTICAL REPORT SUBMITTED DURING SHOP DRAWINGS BY GC.
CAV-2.5	CONSTANT AIR VOLUME TERMINAL	EH PRICE	SDV-8	345	200	305 x 254	ALLOW FOR 900mm INTEGRAL SILENCER. SILENCER SCOPE SHALL BE CONFIRMED BY ACOUSTICAL REPORT SUBMITTED DURING SHOP DRAWINGS BY GC.
CAV-2.6	CONSTANT AIR VOLUME TERMINAL	EH PRICE	SDV-10	521	250	356 x 318	ALLOW FOR 900mm INTEGRAL SILENCER. SILENCER SCOPE SHALL BE CONFIRMED BY ACOUSTICAL REPORT SUBMITTED DURING SHOP DRAWINGS BY GC.
CAV-2.7	CONSTANT AIR VOLUME TERMINAL	EH PRICE	SDV-8	374	200	305 x 254	ALLOW FOR 900mm INTEGRAL SILENCER. SILENCER SCOPE SHALL BE CONFIRMED BY ACOUSTICAL REPORT SUBMITTED DURING SHOP DRAWINGS BY GC.

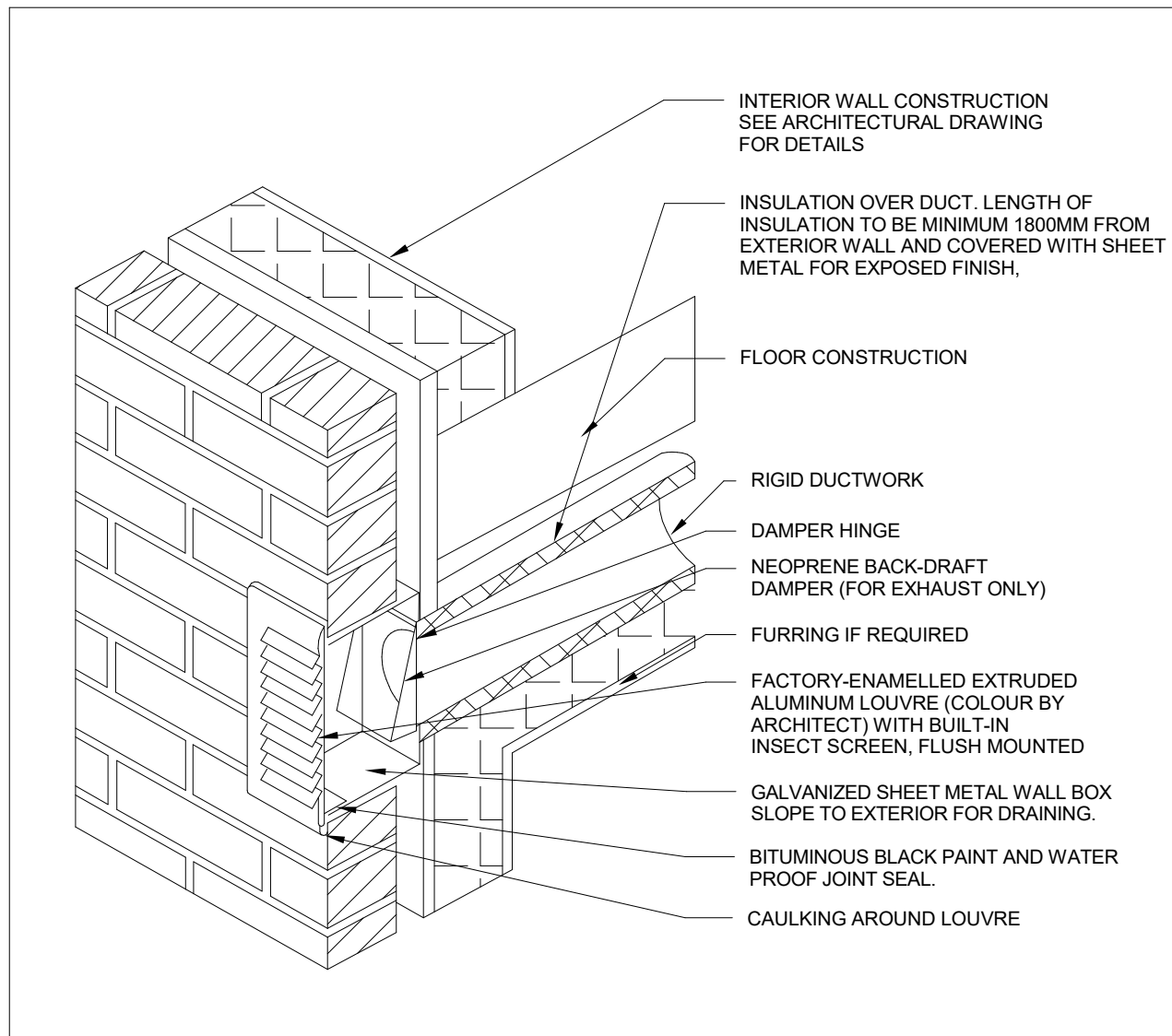


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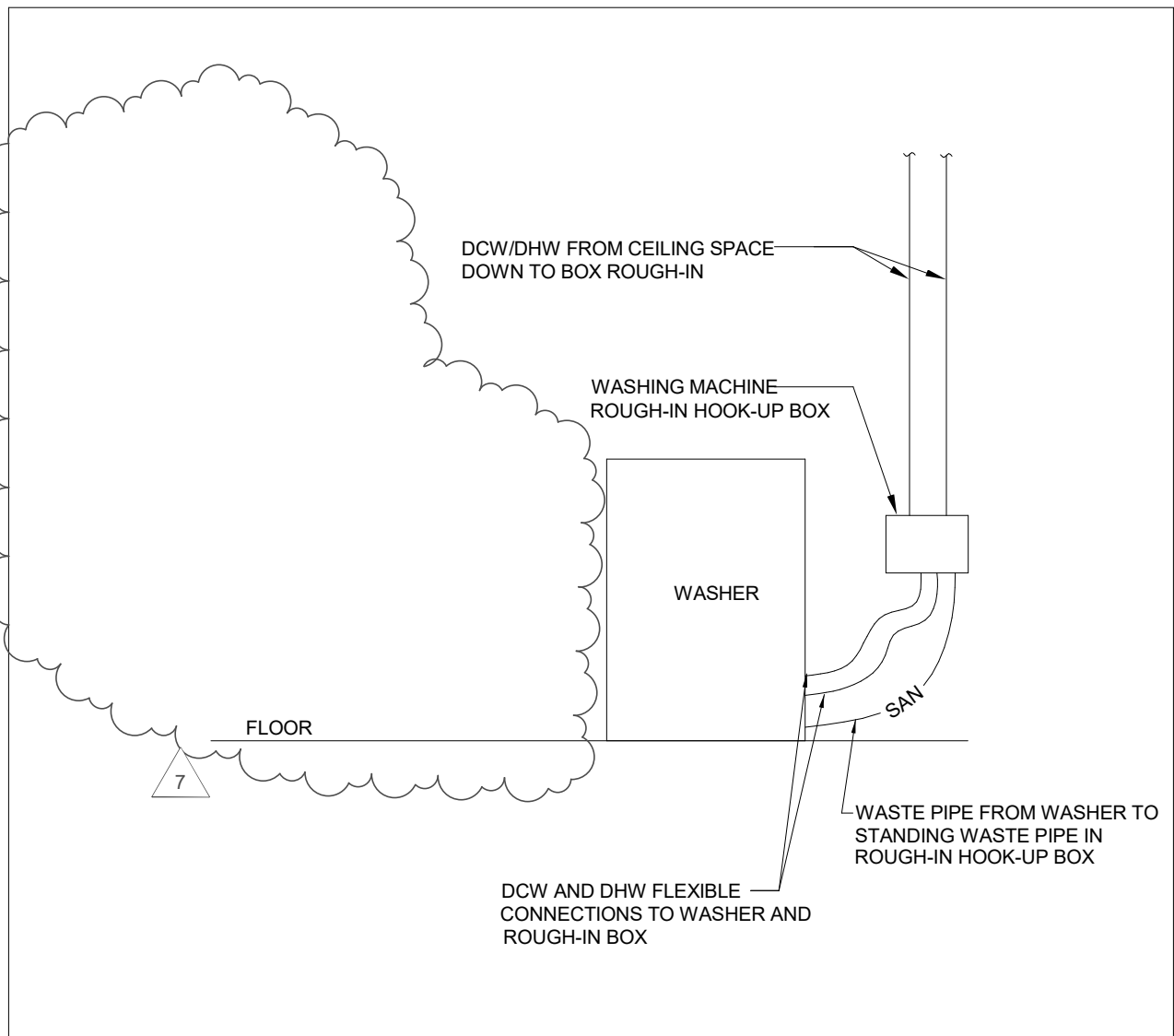
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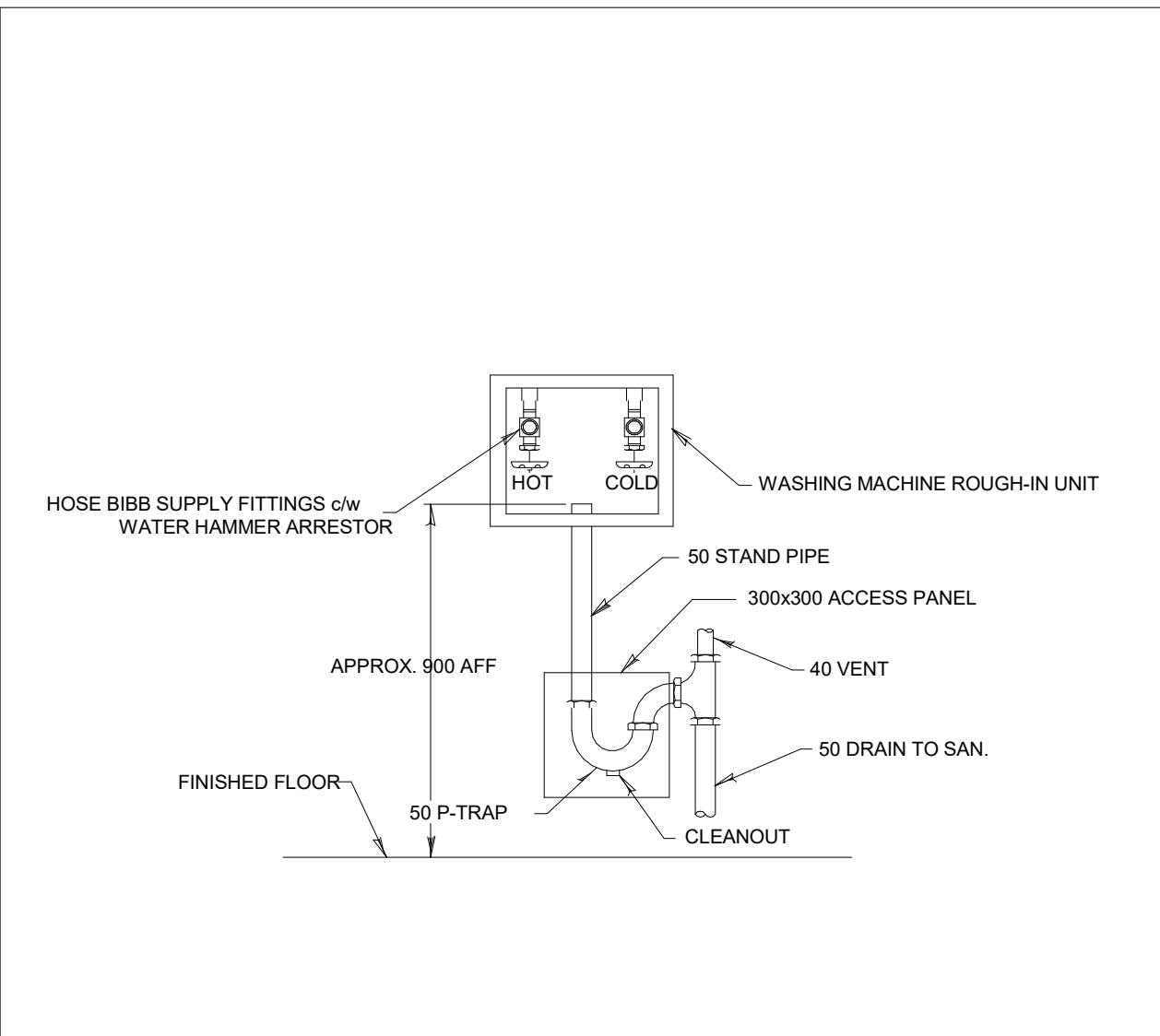
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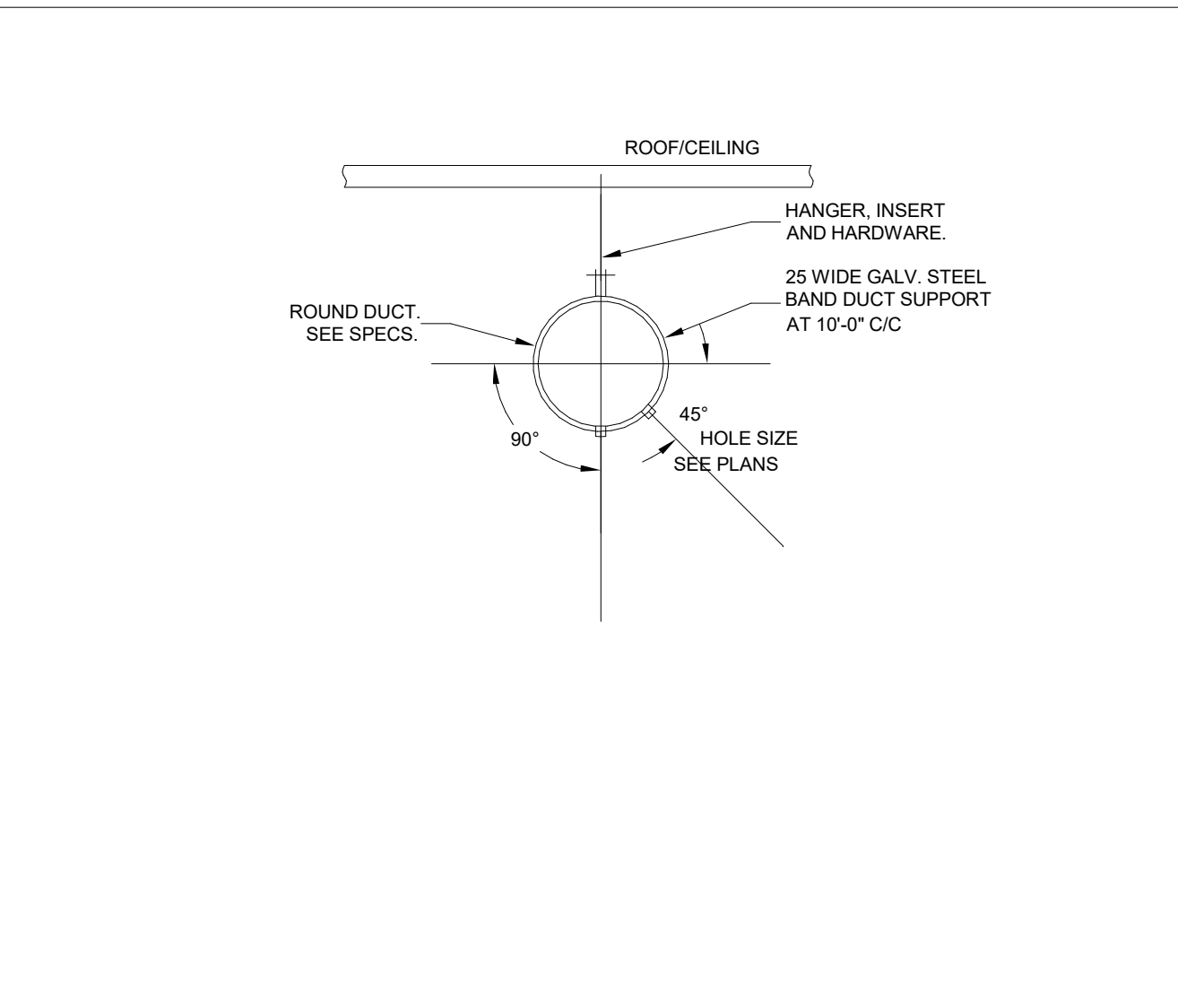
1 TYPICAL WALL BOX DETAIL FOR EF-8  
SCALE: N.T.S.



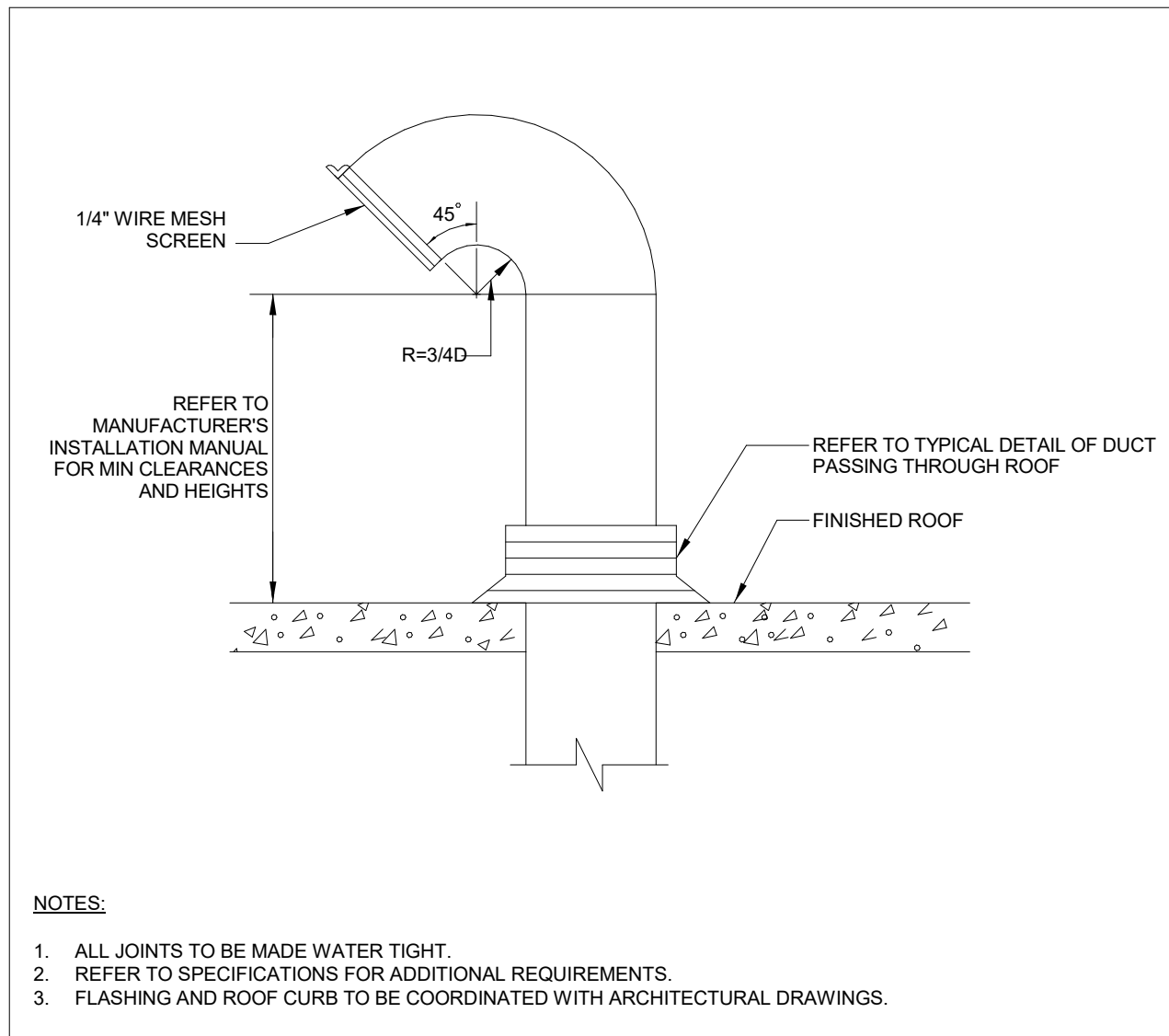
2 WASHER CONNECTION DETAILS  
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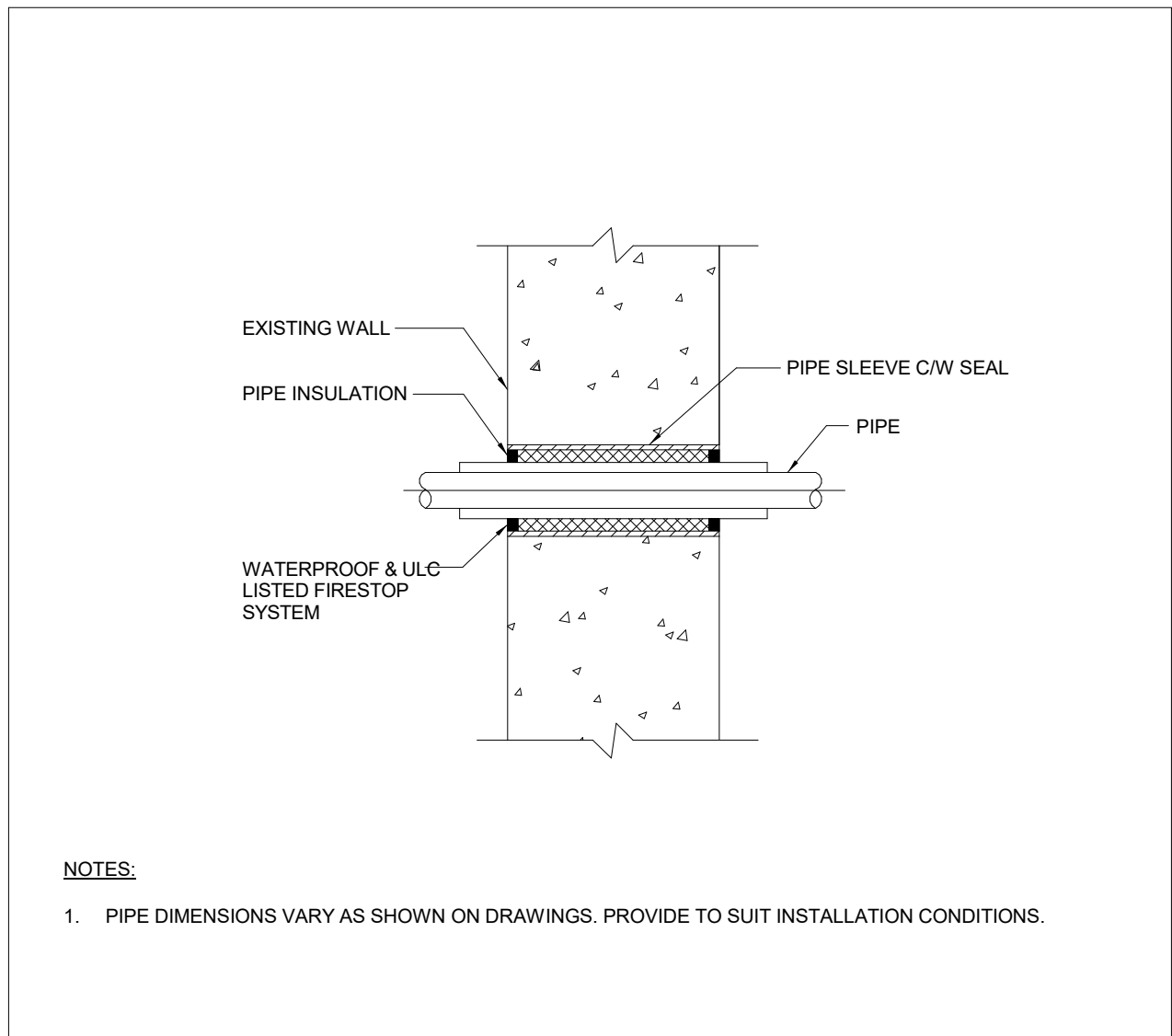
3 WASHING MACHINE ROUGH-IN HOOK-UP BOX DETAIL  
SCALE: N.T.S.



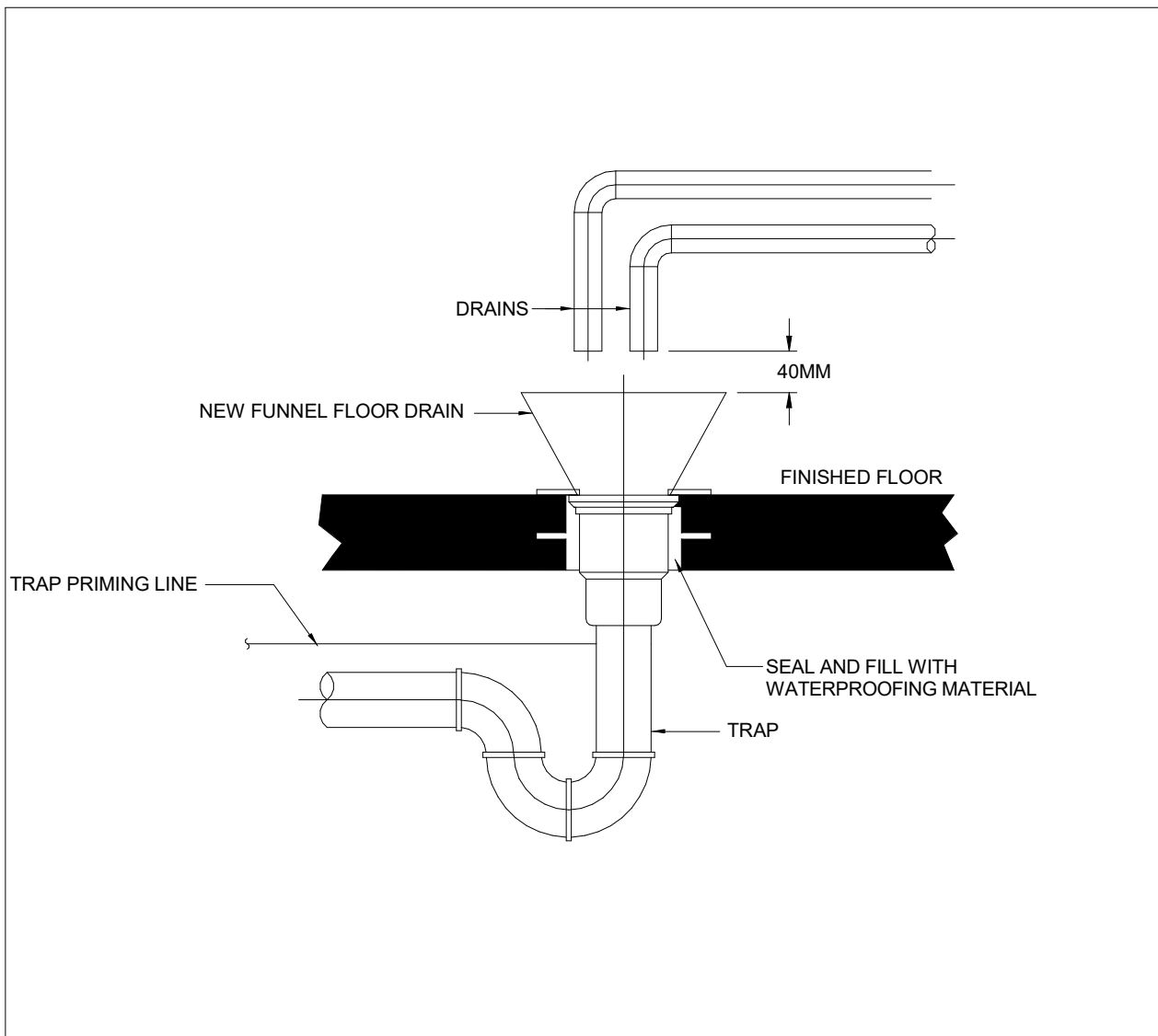
4 ROUND DUCT DETAIL  
SCALE: N.T.S.



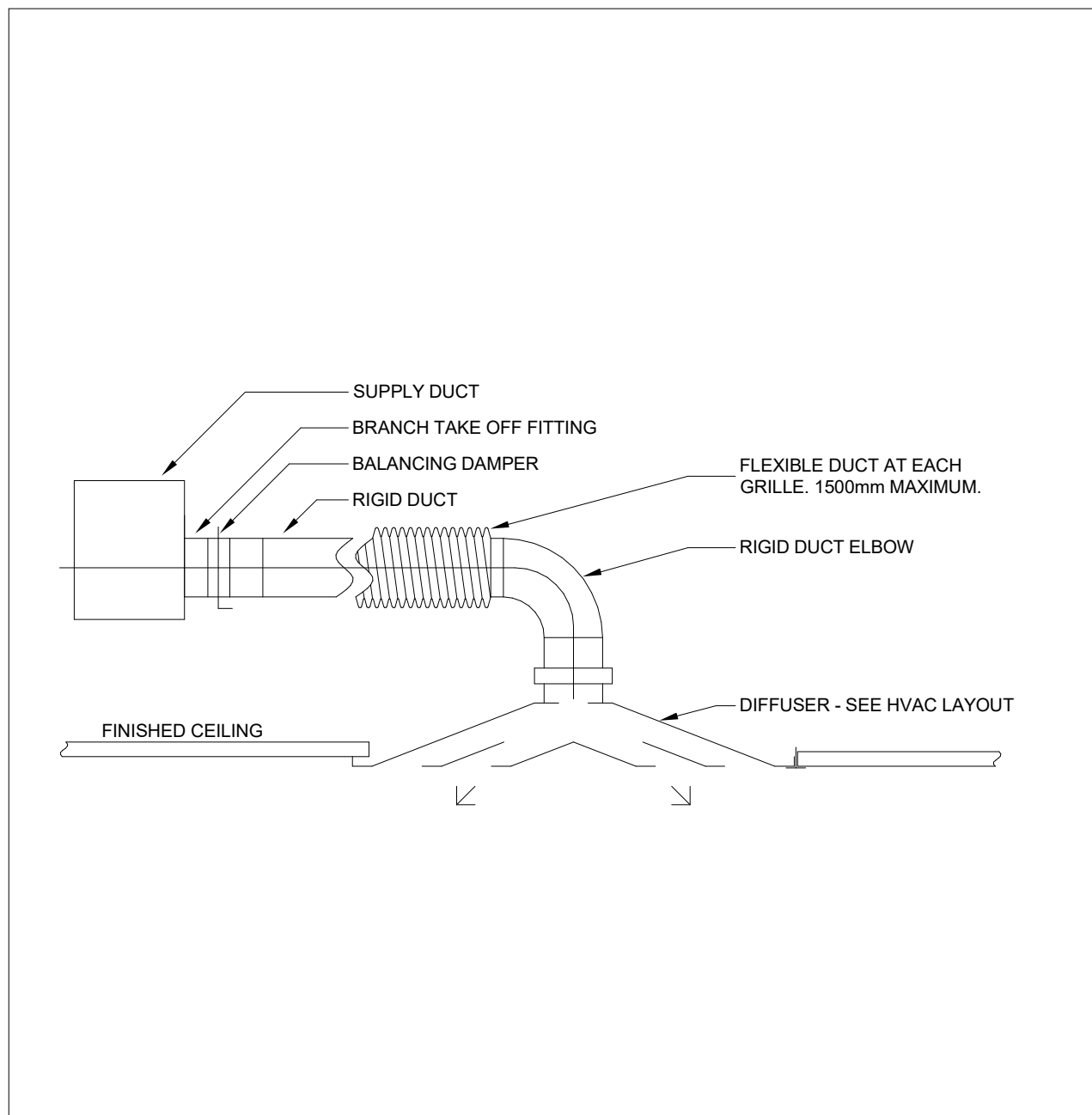
5 TYPICAL DETAIL OF GOOSENECK EXHAUST  
SCALE: N.T.S.



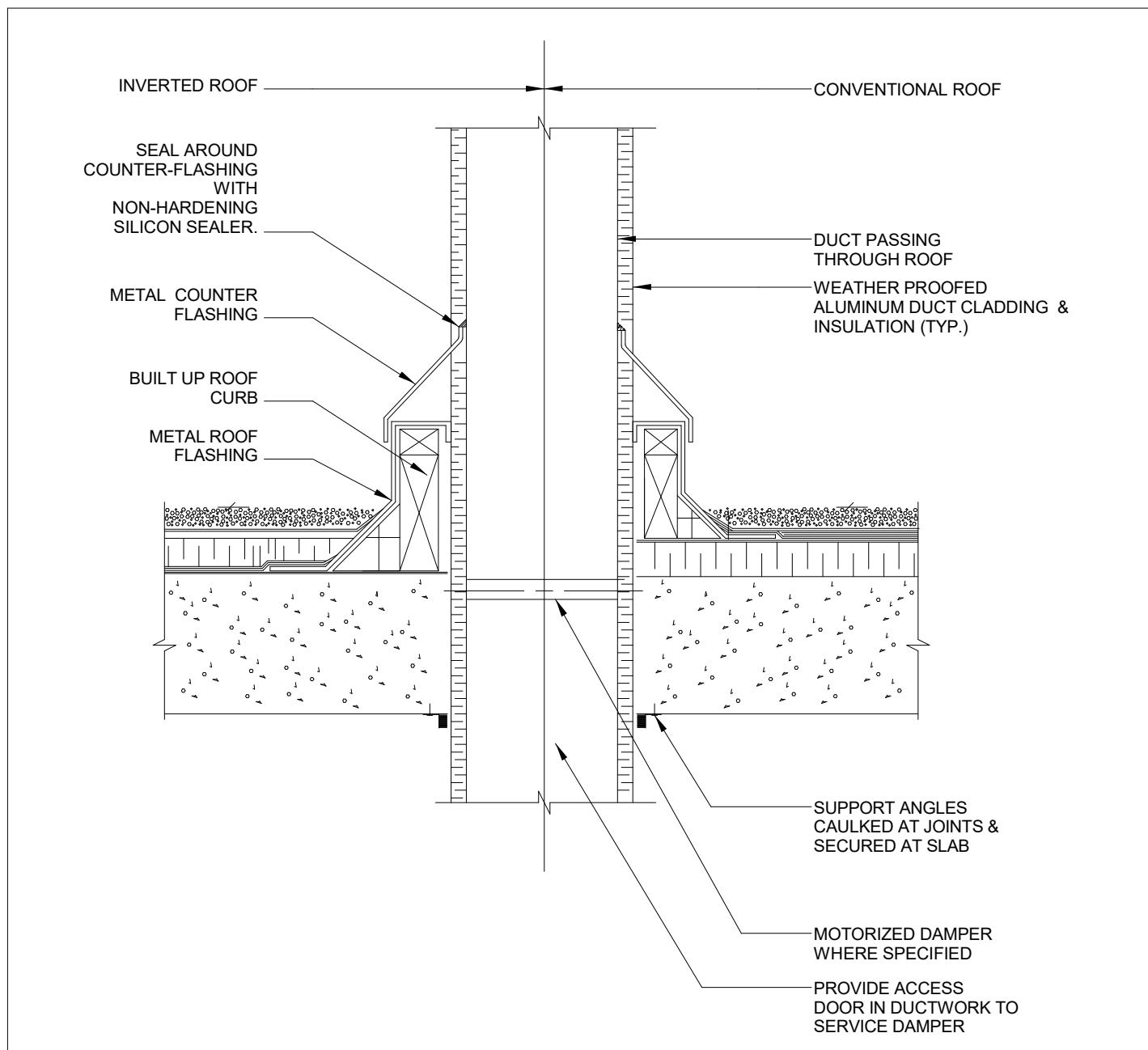
6 PIPING PASSING THROUGH FIRE-RATED WALL DETAIL  
SCALE: N.T.S.



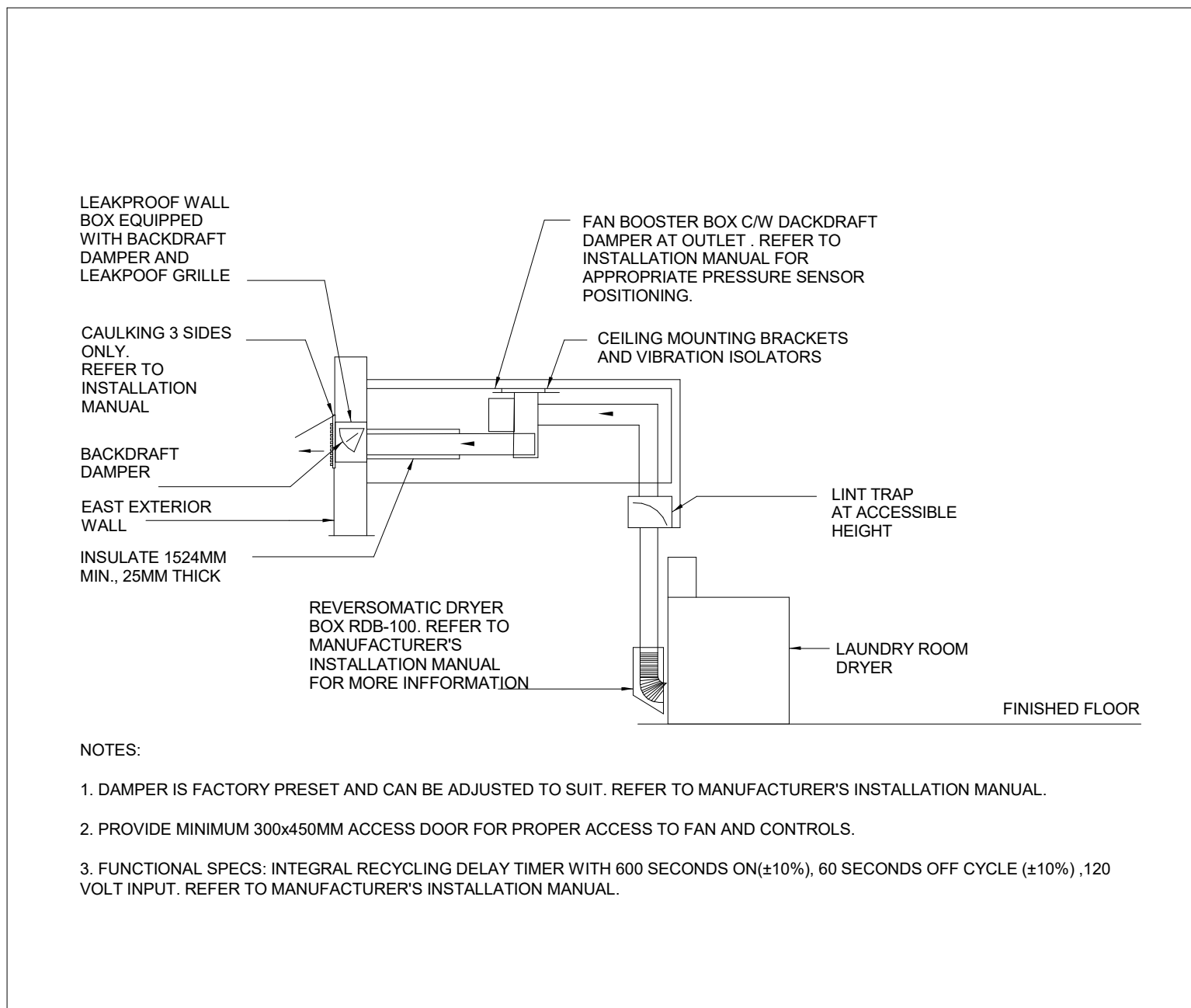
7 TYPICAL FLOOR DRAIN DETAIL  
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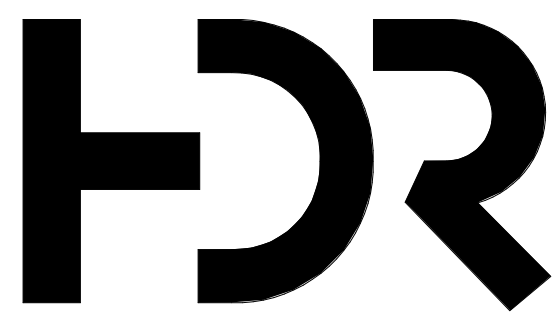
8 TYPICAL DIFFUSER CONNECTION DETAIL  
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9 TYPICAL DETAIL OF DUCT PASSING THROUGH ROOF  
SCALE: N.T.S.



10 LAUNDRY BOOSTER FAN DETAIL EF-8  
SCALE: N.T.S.



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Civil Engineer	WSP
Structural Engineer	WSP
Mechanical Engineer	WSP
Electrical Engineer	WSP
Plumbing Engineer	WSP
Interior Designer	Interior Designer
Equipment Designer	Equipment Planner
Wayfinding	

Sheet Reviewer	Checker
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MARK	DATE	DESCRIPTION
1	2023-05-05	ISSUED FOR STAGE 3.2 COSTING
2	2023-07-05	ISSUED FOR MOH STAGE 3.2
3	2023-11-24	ISSUED FOR STAGE 3.3 COSTING
4	2024-02-12	ISSUED FOR MOH STAGE 3.3
5	2024-03-22	ISSUED FOR BUILDING PERMIT
6	2024-09-18	ISSUED FOR TENDER
7	2024-10-07	ISSUED FOR ADDENDUM M01

Project Number	221-11662-00
Original Issue	02/23/21

Sheet Name

MECHANICAL DETAILS  
5

Scale

N.T.S.

Sheet Number

M-805

Project Status

ISSUED FOR TENDER