

The following Addendum forms part of the Contract Documents for the Canada Centre for Inland Waters (Project number R.073578.001). The following changes, additions or deletions shall be made to the following documents as indicated and all other Contract Documents shall remain the same.

This Addendum Number 01 contains 7 written pages, 7 Specification Sections (Section 01 14 00, Section 08 17 13, Section 09 67 23, Section 22 42 01, Section 23 22 13, Section 23 22 14 and Section 23 36 00) and 7 attached drawings (SKA-001, SKA-002, SKA-003, SKA-004, SKA-005, SKA-006, SKA-007, SKM-001, SKM-002).

## **ARCHITECTURAL**

### Specifications:

#### Section 01 14 00 - Work Restrictions

1. Item 1.3.1, revise to read:

1.3.1 Coordination of Hours of Work; Confine hours of Work on site from 07:00 hours to 17:00 hours, local time, Monday through Friday, and as follows:

- .1 Review hours of work with Departmental Representative.
- .2 Conduct work undertaken during normal operating hours in a manner that does disrupt Owner's operations.
- .3 Arrangements for extended hours to those stated above or for any Work required on Saturdays, Sundays or statutory holidays must be pre-arranged in writing with the Departmental Representative.

.1 Normal operating hours are as follows:

- .1 Monday to Friday: 07:00 hours to 17:00 hours
- .2 Saturday: Closed
- .3 Sunday: Closed

- .2 No additional compensation will be paid by the Departmental Representative for overtime work where scheduling requires work to be completed on weekends, evenings, or nights unless directed specifically by the Departmental Representative.

#### Section 08 17 13 - Integrated Composite Door Opening Assemblies

- 1. Section 08 17 13, Add new Section 08 17 13, dated 2015-09-04, 6 pages, attached and forms part of this Addendum.

Section 09 67 23 - Resinous Flooring

1. Section 09 67 23, Add new Section 09 67 23, dated 2015-09-04, 5 pages, attached and forms part of this Addendum.

Drawings:

Drawing A0.01 - SCHEDULES

1. Revised H158C-1 frame to fiberglass as shown in attached sketch SKA-005.

Drawing A0.02 - CASEWORK TYPICAL ELEVATIONS

1. Revised casework dimensions as shown in attached sketches SKA-001, SKA-002, & SKA-003.

Drawing A2.10 - A&L BUILDING L527/L530 DEMOLITION AND DESIGN PLANS

1. Revised annotations to identify locations of Reverse Osmosis Water supply and Emergency Eye Wash Stations, as noted.

Drawing A2.20 - HYDRAULICS WING H158 DEMOLITION AND DESIGN PLANS

1. Revised annotations to identify locations of Reverse Osmosis Water supply and Emergency Eye Wash Stations, as noted.

Drawing A6.02 - PLAN DETAILS & SECTION DETAILS

1. Revised detail 9 as shown in attached sketch SKA-004.

**MECHANICAL**

Specifications:

Section 22 42 01 - Plumbing Specialties and Accessories

1. Section 22 42 01, Replace previously issued Section 22 42 01, dated 2015-07-13 with revised Section 23 36 00, dated 2015-09-04, 10 pages, attached and forms part of this Addendum.

Section 23 22 13 - Steam and Condensate Heating Piping

1. Section 23 22 13, Add new Section 23 22 13, dated 2015-09-04, 10 pages, attached and forms part of this Addendum.

Section 23 22 14 - Steam Specialties

1. Section 23 22 14, Add new Section 23 22 14, dated 2015-09-04, 4 pages, attached and forms part of this Addendum.

Section 23 25 00 - HVAC Water Treatment Systems

1. Item 2.2.8, added new item 2.2.8 to read:

- .8 Water Softeners for Humidifiers

- .1 Floor mounted water softener and brine tank.
    - .2 Automatic metering heads to regenerate softener media automatically
    - .3 Softener unit to be complete with keypad/display
    - .4 Provide one softener to treat water for both AHU-3 and AHU-5 humidifiers

- .1 Capacity to be 47.2 kg/hr (104 lbs/hr)
      - .2 Water hardness of 8 grains

- .5 Provide water softener to treat water for AHU-1 humidifier

- .1 Capacity to be 266.7 kg/hr (580 lbs/hr)
    - .2 Water hardness of 8 grains

Section 23 34 00 - HVAC Fans

2. Item 1.1.1.5, add new item 1.1.1.5 to read:

- .5 AMCA Standard 99-0401, Classification for Spark Resistant Construction.

3. Item 2.3.6, add new item 2.3.6 to read:

- .6 Acid Resistance:

- .1 Where indicated on equipment schedules to provide acid resistant fan, fan components to be coated in hi pro polyester coating

4. Item 2.6, revise to read:

- 2.6 LAB EXHAUST FAN (EF-204)

5. Revised paragraph 2.6.4, to read:

- .4 Fan shall be designed to AMCA A spark resistant construction.

Section 23 36 00 - Air Terminal Units

1. Replace previously issued Section 23 36 00, dated 2015-07-13 with revised Section 23 36 00, dated 2015-09-04, 10 pages, attached and forms part of this Addendum.

Section 23 37 20 - Louvres, Intakes and Vents

1. Item 2.1, add new item 2.1 to read:

## 2.1 CANOPY HOODS

- .1 General: provide canopy hoods as indicated on drawings. Canopy hoods to be constructed of 304 stainless steel and fabricated in accordance with SMACNA standards and guidelines
- .2 Canopy to be 2050 mm x 750 mm, with connection to exhaust ductwork as indicated on drawings.

## Section 23 73 23 - Custom Indoor Central Station Air Handling Units

1. Paragraph 2.8, revised to read:

### 2.8 CENTRAL FUME HOOD EXHAUST FAN (FH-EF-1)

- .1 This fume hood exhaust module shall have special construction so as to be suitable for corrosive contaminants in the exhaust air stream.
- .2 All fans shall have a Lorenized coating. The fans shall be single width single inlet where the motors are outside the airstream.
- .3 Fans shall be capable of isolation from each other with fully actuated isolation dampers (backdraft dampers are not acceptable).
- .4 Fan shall be provided as specified in this section and designed to AMCA A spark resistant construction
- .5 Casing, insulation, and access doors for housing containing fans to be provided as specified in this section
- .6 Fan to be supplied complete with self-supporting stacks with heights as indicated on drawings.
- .7 Stacks to terminate complete with dilution nozzle;
  - .1 Fans shall incorporate a double concentric accelerator fiberglass reinforced plastic (FRP) induction nozzle selected for optimal performance per the plans and specifications. Nozzle shall be constructed and designed to avoid extreme variations in velocity flows across the outlet, even against wind loading. Where required, CFD shall be provided demonstrating this on submitted nozzle. Bifurcated designs shall not be allowed
  - .2 Induction nozzle shall be constructed and designed to efficiently handle up to 7000 feet per minute outlet velocity and shall have a optimally matched accelerator for the specified design conditions
  - .3 Design to withstand 125 mph winds
- .8 Fan to be complete with heat recovery coil (for future connection)

- .1 Fan to be complete with 6 row heat extraction coil
- .2 Provide four coils, each at 900 mm x 2500 mm (36" x 100")
- .3 Maximum velocity across coil not to exceed 2.54 m/s (500 fpm)
- .4 Unit to be complete with piping vestibule to enclose heat recovery piping
- .9 Fan to be complete with filter section
  - .1 Provide 50 mm (2") MERV 8 filters
  - .2 Provide 21 filters at 600mm x 600mm, and 10 filters at 600mm x 300mm
  - .3 Filters to be installed within filter rack as shown on drawings
- .10 Fan to be suited for installation on structural support base as indicated on drawings
- .11 Provide maintenance platform and steps attached to fan unit as indicated on drawings

2. Added Paragraph 2.14 to read:

2.14 DEHUMIDIFIER HEAT PIPE

- .1 Unit shall be equipped with Dehumidifier Heat Pipes supplied to precool the return/outside air and reheat the supply air in a wrap-around configuration as indicated on equipment schedules. The precool Heat Pipe module shall be located immediately before the cooling coil and the reheat module of the Heat Pipe shall be located immediately after the cooling coil. Heat pipe circuits shall be made up of multiple tubes feeding one common liquid and one common gas line for maximum performance. Single tube circuits where gas and liquid travel in the same tube in opposite directions are not acceptable. Both Heat Pipe modules shall be inside the equipment cabinet. The interconnecting piping between the Heat Pipe modules shall be located within the assembled access/coil/access sections. All interconnecting piping shall be located at the end of the cooling coil opposite from the coil header and piping connections.
- .2 The tubes shall be copper, of specific design for Heat Pipe application, permanently expanded into the fin collars to form firm, rigid, and complete pressure contacts at all operating conditions. Aluminum tubes will not be allowed.
- .3 The fin surface shall be continuous plate type aluminum (copper) fins of specific design to produce maximum heat transfer effectiveness for Heat Pipe applications. Airside pressure loss shall be as given on the schedule. Fin density and the number of rows of tubes shall be as specified.

- .4 Heat transfer fluid shall be selected on the basis of operating temperature and compatibility with tube material and shall be classified as Safety Group A1 in ASHRAE Standard 34-1992. Do not use HCFC based refrigerants.
- .5 Heat Pipe capacities, entering and leaving dry and wet bulb temperatures and face velocity shall be as specified.
- .6 The frames and mounting structure shall be minimum 20 gauge galvanized steel. The supply and exhaust air streams shall be isolated from each other by a single separating partition (a double separating partition) (a foam filled double separating partition). Cross contamination between the air streams is not acceptable.
- .7 Heat Pipe interconnecting piping and circuitry shall be as specified by manufacturer. Each circuit shall be individually processed, charged, and hermetically sealed
- .8 All of the Dehumidifier Heat Pipe circuits shall be equipped with solenoid operated control valves to control the operation of the Heat Pipe circuits. The solenoid valves shall be wired back to the air handling unit control panel Closing of a valve shall inactivate the Heat Pipe circuit in which it is installed. The valves shall be normally open. The control valves shall be grouped such that each group of valves shall control a designated fraction of the Heat Pipe circuits. With all control valves open, the Dehumidifier Heat Pipe assembly shall operate at full capacity. If all the circuits are equipped with control valves, then closing all the valves will stop all Heat Pipe operation

Drawings:

Drawing M2.02 -HYDRAULICS WING-LAB H158 -GROUND FLOOR-HVAC & HVAC PIPING PLAN

- 1. Revised general note to read "COORDINATE WITH DEPARTMENTAL REPRESENTATIVE FOR SHUTDOWN OF AHU AND EXHAUST FAN TO MINIMIZE DISRUPTION IN ADJACENT LAB. CONTRACTOR TO REBALANCE AIRFLOWS AS INDICATED"
- 2. Added general note to read "ALL DUCTWORK ASSOCIATED WITH FUME HOOD AND GENERAL EXHAUST TO BE STAINLESS STEEL"

Drawing M2.12 - A&L BUILDING-LAB L527 & L530-FIFTH FLOOR-HVAC PLAN

- 1. Add General Note 13, to read "ALL DUCTWORK ASSOCIATED WITH FUME HOOD AND GENERAL EXHAUST TO BE STAINLESS STEEL"
- 2. Clarification: new induction unit enclosures to be wall-to-wall
- 3. Clarification: Keynote 6 to read "NEW THERMOSTATS CONNECT TO NEW INDUCTION UNITS"

Drawing M2.13 - A&L BUILDING-EXHAUST UPGRADE-SIXTH FLOOR-HVAC & PLUMBING PLAN

1. Add General Note 6, to read "ALL DUCTWORK ASSOCIATED WITH FUME HOOD AND GENERAL EXHAUST TO BE STAINLESS STEEL"

Drawing M2.14 - A&L BUILDING-EXHAUST UPGRADE-SEVENTH FLOOR-HVAC & PLUMBING PLAN

1. Add General Note 6, to read "ALL DUCTWORK ASSOCIATED WITH FUME HOOD AND GENERAL EXHAUST TO BE STAINLESS STEEL"

Drawing M2.15 - A&L BUILDING-EXHAUST UPGRADE-PENTHOUSE ROOF-HVAC PLAN

1. Clarification: central exhaust ductwork to be stainless steel

Drawing M2.21 - R & D BUILDING-AHU-1, 3, & 5 -PENTHOUSE-HVAC PLAN

1. Clarification: central exhaust ductwork to be stainless steel
2. Clarification: note to read condensate cooler is to be provided with steam PRV's and safety valves
3. Clarification: sizing of steam pipes as follows:
  - inlet of PRV-1, 12 mm diameter
  - outlet of PRV-1, 18 mm diameter
  - inlet of PRV-2, 18 mm diameter
  - outlet of PRV-2, 25 mm diameter
  - inlet of PRV-3, 63 mm diameter
  - inlet of PRV-1, 38 mm diameter
  - Deleted condensate pump at AHU-1

Drawing M5.01 - MECHANICAL DETAILS - SHEET 1

1. Added wooden sleeper detail 22 as shown in attached sketch SKM-001
2. Clarified steam humidifier connection detail 20 as shown in attached sketch SKM-001

Drawing M7.02 - MECHANICAL SCHEDULES - SHEET 2

1. Added schedule for steam pressure reducing valves as shown in attached sketch SKM-002
2. Added schedule for steam pressure safety valve as shown in attached sketch SKM-002
3. Added note to induction unit schedule to provide wall-to-wall enclosure as shown in attached sketch SKM-002

**ELECTRICAL**

Drawing E2.30 - WTC BUILDING TUNNEL ELECTRICAL PLAN

1. Revise circuit for FFH-1 from 120/208V panel PH-C1 to 600V panel DP-C1. Provide 600V/3Ph/15A breaker and wiring/conduit as required. Delete tag for Keynote '1' shown at FFH-1 connection. Adjust Panel Schedules and Single Line Diagram to suit.

**END OF ADDENDUM 01**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 01 56 00 – Temporary Barriers and Enclosures: Coordination and provision of temporary

**1.2 ACCESS AND EGRESS**

- .1 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways and ramps, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.

**1.3 USE OF SITE AND FACILITIES**

- .1 Coordination of Hours of Work: Confine hours of Work on site from 07:00 hours to 17:00 hours, local time, Monday through Friday, and as follows:
  - .1 Review hours of work with Departmental Representative.
  - .2 Conduct work undertaken during normal operating hours in a manner that does not disrupt Owner's operations.
  - .3 Arrangements for extended hours to those stated above or for any Work required on Saturdays, Sundays or statutory holidays must be pre-arranged in writing with the Departmental Representative.
    - .1 Normal operating hours are as follows:
      - .1 Monday to Friday: 07:00 hours to 17:00 hours
      - .2 Saturday: Closed
      - .3 Sunday: Closed
    - .2 No additional compensation will be paid by the Departmental Representative for overtime work where scheduling requires work to be completed on weekends, evenings, or nights unless directed specifically by the Departmental Representative.
- .2 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.
- .3 Maintain existing services to building and provide for personnel and vehicle access.
- .4 Where security is reduced by work provide temporary means to maintain security.
- .5 Departmental Representative will assign sanitary facilities for use by Contractor's personnel. Keep facilities clean.
- .6 Use only elevators existing in building for moving workers and material.
  - .1 Protect walls of passenger elevators, to approval of Departmental Representative prior to use.
  - .2 Accept liability for damage, safety of equipment and overloading of existing equipment.
- .7 Closures: protect work temporarily until permanent enclosures are completed.



**1.4 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING**

- .1 Execute work with least possible interference or disturbance to building operations, occupants, public and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.

**1.5 EXISTING SERVICES**

- .1 Notify, Departmental Representative and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, confirm service interruption identified in Shutdown Schedule with Departmental Representative 1 week and again 48 hours in advance of scheduled shutdown or interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimal. Carry out interruptions after normal working hours of occupants, preferably on weekends.
- .3 Provide for personnel, pedestrian and vehicular traffic.
- .4 Construct barriers in accordance with Section 01 56 00 – Temporary Barriers and Enclosures.

**1.6 SPECIAL REQUIREMENTS**

- .1 Paint public occupied areas Monday to Friday from 18:00 to 07:00 hours only and on Saturdays, Sundays, and statutory holidays.
  - .2 Carry out noise generating Work Monday to Friday from 18:00 to 07:00 hours and on Saturdays, Sundays, and statutory holidays.
  - .3 Work within Corridors 541 and 552 on fifth floor must be coordinated and approved by Departmental Representative prior to any floor or ceiling work commencing in that area as Monitoring & Surveys L520, C.E.C.I.L.I.A ST522, GCMS Instrument Lab L525 and Trace Metals Clean Lab L533 will be shut down during this work. Provide 4 weeks notice to Departmental Representative of commencement of work in this area for coordination of shutdown.
  - .4 Submit schedule in accordance with Section 01 32 16 - Construction Progress Schedule - Bar (GANTT) Chart.
  - .5 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
  - .6 Keep within limits of work and avenues of ingress and egress.
  - .7 Ingress and egress of Contractor vehicles, personnel and visitors at site is limited to locations shown on Drawing A1.00.
  - .8 Deliver materials outside of peak traffic hours 09:30 to 15:00 unless otherwise approved by Departmental Representative. Deliveries to site or removals from site involving occupation of City of Toronto streets shall not take place without a valid Street Occupancy Permit.
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- .9 Prior to cutting or drilling horizontal or vertical surfaces including concrete, concrete block or other structural substrate, determine location of reinforcing, service lines, pipes, conduits or other items by x-ray, ground penetrating radar or other appropriate method. Submit findings to Departmental Representative prior to cutting or drilling.

## 1.7 SECURITY

- .1 Where security has been reduced by Work of Contract, provide temporary means to maintain security.
- .2 Security clearances:
  - .1 Personnel employed on this project will be subject to security check. Obtain clearance, as instructed, for each individual who will require to enter premises.
  - .2 Obtain requisite clearance, as instructed, for each individual required to enter premises.
  - .3 Personnel and visitors will be checked daily at main Security Control Desk in the A&L Building at start of work shift or visit and provided with pass which must be worn at all times. Pass must be returned at end of work shift and personnel checked out.
    - .1 When signed in, workers and visitors will be allowed unescorted access to A&L Building, Hydraulics Wing, R&D and WTC in accordance with the Security Status of the General Conditions of the Contract.
  - .4 Contractor's personnel will require satisfactory Environment Canada initiated security screening in order to complete Work in premises and on site.
- .3 Security escort:
  - .1 Personnel employed on this project must be escorted when executing work after normal working hours.
  - .2 Submit an escort request to Departmental Representative at least 14 days before service is needed. Costs of security escort will be Contractor's responsibility.
  - .3 Any escort request may be cancelled free of charge if notification of cancellation is given at least 4 hours before scheduled time of escort. Cost incurred by late request will be Contractor's responsibility.
  - .4 Calculation of costs will be based on average hourly rate of security officer for minimum of 8 hours per day for late service request and of 4 hours for late cancellations.

## 1.8 BUILDING SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions. Smoking is not permitted.

## Part 2 PRODUCTS

### 2.1 NOT USED

- .1 Not Used.

**Part 3 EXECUTION**

**3.1 NOT USED**

.1 Not Used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 American Architectural Manufacturers Association (AAMA):
  - .1 AAMA 1304-02, Voluntary Specification for Forced Entry Resistance of Side-Hinged Door Systems
- .2 American Society for Testing and Materials International (ASTM):
  - .1 ASTM D256-10, Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics
  - .2 ASTM D570-98 (2010)e1, Standard Test Method for Water Absorption of Plastics
  - .3 ASTM D638-14, Standard Test Method for Tensile Properties of Plastics
  - .4 ASTM D790-10, Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
  - .5 ASTM D1761-12, Standard Test Methods for Mechanical Fasteners in Wood.
  - .6 ASTM D2583-13a, Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
  - .7 ASTM D5420-10, Standard Test Method for Impact Resistance of Flat Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact)
  - .8 ASTM D6670-13, Standard Practice for Full-Scale Chamber Determination of Volatile Organic Emissions from Indoor Materials/Products
  - .9 ASTM E84-15a, Standard Method of Test for Surface Burning Characteristics of Building Materials

**1.2 SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Provide product data, including description of materials, components, fabrication, finishes, and installation.
- .3 Provide shop drawings: in accordance with Section 01 33 00.
  - .1 Indicate each type of door, material, core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, glazed, arrangement of hardware and fire rating and finishes.
  - .2 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings and reinforcing fire rating finishes.
  - .3 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.

**1.3 QUALITY ASSURANCE**

- .1 Continuously engaged in manufacturing of doors of similar type to that specified, with a minimum of ten (10) years successful experience.
- .2 Door and frame components from same manufacturer.
- .3 Evidence of a compliant documented quality management system.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00.
- .2 Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying opening door mark and manufacturer.
- .3 Storage: Store materials in clean, dry area indoors in accordance with manufacturer's instructions.
- .4 Handling: Protect materials and finish from damage during handling and installation.
- .5 Waste Management and Disposal:
  - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 11.

**Part 2 PRODUCTS**

**2.1 SYSTEM DESCRIPTION**

- .1 Performance Requirements:
  - .1 General: Provide door assemblies that have been designed and fabricated to comply with specified performance requirements, as demonstrated by testing manufacturer's corresponding standard systems.
  - .2 Forced Entry Resistance in accordance with AAMA1304: Pass
  - .3 Indoor air quality testing per ASTM D6670: GREENGUARD Environmental Institute Certified including GREENGUARD for Children and Schools Certification
  - .4 Screw Pullout in accordance with ASTM D1761-06, Minimum 420 kg.
  - .5 Surface Burning Characteristics, Class A Option both faces of FRP Interior Panels in accordance with ASTM E84:
    - .1 Flame Spread: Maximum of 25.
    - .2 Smoke Developed: Maximum of 450.
  - .6 FRP Face Sheet Properties:
    - .1 Izod Impact Strength, ASTM D256, Minimum 373 J/m notched.
    - .2 Tensile Strength, ASTM D638, Minimum 124 MPa.
    - .3 Tensile Modulus, ASTM D638, Minimum 124 GPa.
    - .4 Water Absorption, ASTM D570, Maximum 0.16% / 24 hours at 25°C.
    - .5 Flexural Strength, ASTM D790, Minimum 186 MPa.
    - .6 Flexural Modulus, ASTM D790, Minimum .4.8 GPa.

- .7 Barcol Hardness, ASTM D2583, Minimum 40.
- .8 Gardner Impact Strength, ASTM D5420, Minimum 3.3 N-m.

## **2.2 DOORS**

- .1 Construction:
  - .1 Door Thickness: 45 mm.
  - .2 Construction: Fabricate using insulated pultruded stiles and rails with 2.3 mm fiberglass reinforced plastic (FRP) face sheets. Secure stiles and rails at corners with pultruded corner clip.
  - .3 Reinforcement: Solid high-density urethane shapes to be chemically welded at factory.
  - .4 Top Rail: Pultruded FRP insulated stile material.
  - .5 Bottom Rail: Pultruded FRP insulated stile material.
- .2 Core: Polypropylene Honeycomb.
- .3 Cutouts:
  - .1 Manufacture doors with cutouts for required vision lites, louvers, and panels.
  - .2 Factory install vision lite kits, louvers, and panels.
- .4 Door Hardware: Pre-machine doors in accordance with templates from specified hardware manufacturers and hardware schedule.
- .5 Fasteners:
  - .1 Material: Aluminum, 18-8 stainless steel, or other noncorrosive metal.
  - .2 Compatibility: Compatible with items to be fastened.

## **2.3 FRAMING SYSTEMS**

- .1 Size and Type: As indicated on Drawings.
  - .2 Materials: 6 mm thick solid pultruded FRP profiles having no corrosive components or reinforcement.
  - .3 Width: 51 mm face.
  - .4 Depth: To suit wall construction.
  - .5 Assembly: Knock down (KD) for field assembly.
  - .6 Door Stop: 16 mm x 57 mm.
  - .7 Corner Construction: Mitered with 51 mm x 51 mm x 10 mm pultruded FRP angle reinforcement with interlocking pultruded FRP brackets.
  - .8 Reinforcing: 6 mm pultruded FRP chemically welded at all hinge, strike and closer locations.
  - .9 Anchors: Furnished with type as recommended by manufacturer for wall construction.
  - .10 Fasteners for reinforcing: 18-8 Stainless Steel.
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**2.4 VISION LITES**

- .1 Factory Applied Stops for Glazing Aluminum, FRP: 6 mm glass.
- .2 Lite Size:
  - .1 Size: Half lite.

**2.5 ACCESSORIES**

- .1 Door silencers: single stud rubber/neoprene type.
- .2 Sealant: As specified in Section 07 92 00.
- .3 Glazing: As specified in Section 08 80 50.

**2.6 FABRICATION**

- .1 Sizes and Profiles: Required sizes for door and frame units, and profile requirements shall be as indicated on Drawings.
- .2 Assembly: Complete cutting, fitting, forming, drilling, and chemically welding of FRP before assembly.
- .3 Fit:
  - .1 Maintain continuity of line and accurate relation of planes and angles.
  - .2 Secure attachments and support at mechanical joints with hairline fit at contacting members.
- .4 Hardware Preparation:
  - .1 Pre-machine doors in accordance with templates from specified hardware manufacturers and hardware schedule. Reinforce for specific hardware locations.
  - .2 Hardware Schedule: As specified in Section 08 71 11.

**2.7 FRAME ANCHORAGE**

- .1 Provide appropriate anchorage to floor and wall construction.
  - .2 Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb.
  - .3 Provide 2 anchors for rebate opening heights up to 1520 mm and 1 additional anchor for each additional 760 mm of height or fraction thereof.
  - .4 Locate anchors for frames in existing openings not more than 150 mm from top and bottom of each jambs and intermediate at 660 mm on centre maximum.
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**2.8 FINISH**

- .1 Finish for Door Edges and Frames: Primer Only.
- .2 Finish for Face Sheet: Finish color throughout.

**Part 3 EXECUTION**

**3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

**3.2 EXAMINATION**

- .1 Examine areas to receive doors. Notify Departmental Representative of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

**3.3 PREPARATION**

- .1 Ensure openings to receive frames are plumb, level, square, and in tolerance.

**3.4 INSTALLATION**

- .1 Install doors and frames to CSDMA Installation Guide.
- .2 Install doors in accordance with manufacturer's instructions.
- .3 Install doors plumb, level, square, true to line, and without warp or rack.
- .4 Anchor frames securely in place.
- .5 Set thresholds in bed of mastic and backseal.
- .6 Install exterior doors to be weathertight in closed position.
- .7 Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Departmental Representative.
- .8 Remove and replace damaged components that cannot be successfully repaired as determined by Departmental Representative.

**3.5 FRAME INSTALLATION**

- .1 Set frames plumb, square, level and at correct elevation.
  - .2 Secure anchorages and connections to adjacent construction.
  - .3 Brace frames rigidly in position while building-in.
  - .4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.
  - .5 Caulk perimeter of frames between frame and adjacent material.
  - .6 Maintain continuity of air barrier and vapour retarder where required.
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### **3.6 DOOR INSTALLATION**

- .1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 11.
- .2 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows.
  - .1 Hinge side: 1.0 mm.
  - .2 Latchside and head: 1.5 mm.
  - .3 Finished floor, noncombustible sill, and thresholds: 13 mm.
- .3 Adjust operable parts for correct function.
- .4 Install louvres.

### **3.7 ADJUSTING**

- .1 Adjust doors, hinges, and locksets for smooth operation without binding.

### **3.8 CLEANING**

- .1 Clean doors promptly after installation in accordance with manufacturer's instructions.
- .2 Do not use harsh cleaning materials or methods that would damage finish.

### **3.9 PROTECTION**

- .1 Protect installed doors to ensure that, except for normal weathering, doors will be without damage or deterioration at time of Substantial Performance of the Work.

### **3.10 GLAZING**

- .1 Install glazing for doors and frames in accordance with Section 08 80 50.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 RELATED SECTIONS**

- .1 Section 02 41 99 –Demolition: Removal of existing floor finishes ready for work of this Section
- .2 Division 22 – Mechanical: Floor Drains.
- .3 Division 26 – Electrical: Floor mounted accessories.

**1.2 REFERENCE STANDARDS**

- .1 American Society for Testing and Materials (ASTM)
  - .1 ASTM D570-98(2010) e1, Standard Test Method for Water Absorption of Plastics
  - .2 ASTM D638-10, Standard Test Method for Tensile Properties of Plastics.
  - .3 ASTM D648-07, Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.
  - .4 ASTM D790-10, Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
  - .5 ASTM D2369-10e1, Standard Test Method for Volatile Content of Coatings.
  - .6 ASTM D4060-10, Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
  - .7 ASTM D4541-09e1, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
- .2 International Concrete Repair Institute (ICRI)
  - .1 ICRI Guideline No. 310.2R-2013, Selecting and Specifying Concrete Surface Preparation for Sealers, coatings and Polymer Overlays.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- .1 Coordination: Close spaces to traffic during flooring installation and until time period after installation recommended in writing by manufacturer:
  - .1 Work of this Section includes floor levelling and patching required to meet resinous flooring manufacturer's installation requirements; Coordinate where differences occur between manufacturer's requirements and actual conditions.
  - .2 Coordinate installation of cove bases with resinous flooring installation.
  - .3 Install flooring before surface mounted fixtures are installed.

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
  - .2 Product Data:
-

- .1 Submit manufacturer's instructions, printed product literature and data sheets for resilient sheet flooring and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
  - .1 Submit duplicate 400 x 200 mm samples of each colour and finish coating applied to hardboard.

## **1.5 QUALIFICATIONS**

- .1 Applied by applicator trained and licensed by epoxy material manufacturer for application of its products.
- .2 Manufacturer's representative:
  - .1 Inspect substrate prior to commencement of work, during application of materials and upon completion of work.
  - .2 Provide technical assistance to the applicator and assist where required in correct installation of expansion joint filler, floor base cove mortar and floor epoxy resinous flooring system.

## **1.6 ENVIRONMENTAL REQUIREMENTS**

- .1 Do not apply epoxy systems unless uniform minimum 16°C air temperature at installation area for 24 hours prior to and after application.
- .2 Provide adequate ventilation or isolation measures to protect against toxic fumes.
  - .1 Ventilate area 24 hours per day, during installation and for 7 days after installation is completed with minimum 30% outside air.
  - .2 Ventilate at a rate sufficient to produce a negative pressure in the work area [and exhaust direct to the outside of the building. Do not recirculate contaminants within the building.

## **1.7 MAINTENANCE DATA**

- .1 Provide maintenance data for coatings for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
  - .1 Submit manufacturer's printed maintenance instructions for repair, cleaning and maintenance procedures; include name of original installer and contact information.

## **Part 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Ensure compatibility for all epoxy materials including primers, resins, hardening agents, finish coats and sealer coats.
  - .2 All epoxy materials from same manufacturer.
-

## 2.2 EXPANSION AND CONTROL JOINT FILLER

- .1 Joint filler: self leveling, two-component sealant based on a flexible epoxy resin and a blended polyamide curing agent, 100% solids as recommended by manufacturer.

## 2.3 FLOOR SYSTEM NOVALAC EPOXY WITH EPOXY MORTAR COVE BASE

- .1 Floor system: Two-component, high solids, epoxy-Novolac coating with integral epoxy coves.
  - .1 VOC Content:  $\leq 45$  g/L in accordance with ASTM D2369.
  - .2 System Thickness: minimum 1.0 mm (40 mils)
- .2 Floor Base (Cove) Mortar: three-component, solid colour, low VOC, vertical grade coving and detailing mortar with primer as recommended by manufacturer.
  - .1 Acceptable material: Sikafloor Morritex Epoxy Cove Mortar manufactured by Sika Canada Inc., (514) 697-2610 www.sika.ca.
- .3 Primer: Two component, clear, high solids, low VOC, moisture-tolerant epoxy primer and binder as recommended by manufacturer.
  - .1 Acceptable material: Sikagard WDE Primer manufactured by Sika Canada Inc., (514) 697-2610 www.sika.ca
- .4 Body (First) coat: 2 part Novalac epoxy, 95% solids, solid colour, colour selected by Departmental Representative to match floor base coat mortar.
  - .1 Acceptable material: Sikagard Duochem 7500 manufactured by Sika Canada Inc., (514) 697-2610 www.sika.ca.
- .5 Top (Second) coat: 2 part Novalac epoxy, 95% solids, solid colour, colour selected by Departmental Representative to match floor base coat mortar.
  - .1 Compressive strength: 57.8 MPa (8,380 psi) at 28 days in accordance with ASTM D695.
  - .2 Tensile strength: 20.4 MPa (2,960 psi) in accordance with ASTM D638 Type IV.
  - .3 Elongation at Break: 28% in accordance with ASTM D638 Type IV.
  - .4 Water Absorption: 24hrs-0.42%, 7 days-1.02% in accordance with ASTM D570.
  - .5 Water Vapour Transmission: 0.19 g/hr/m<sup>2</sup> (30 mils) (water method) in accordance with ASTM E 96.
  - .6 Abrasion Resistance: 170 mg in accordance with ASTM D4060. (CS17/1000cycles/1000g)
  - .7 Acceptable material: Sikagard Duochem 7500 manufactured by Sika Canada Inc., (514) 697-2610 www.sika.ca.

## 2.4 MIXES

- .1 Mix expansion joint filler, floor base coat mortar and top coat sealer in accordance with manufacturer's written instructions.

## Part 3 EXECUTION

### **3.1 EXAMINATION**

- .1 Examine substrates and conditions under which high performance coatings will be applied for acceptability in accordance with coating manufacturer's application requirements, and as follows:
  - .1 Apply coatings only after unsatisfactory conditions have been corrected and surfaces to receive coatings are thoroughly dry.
  - .2 Start of application is construed as Applicator's acceptance of surfaces within that particular area.
- .2 Coordinate requirements of substrates to which primers or other coatings are being applied to ensure compatibility of total systems; provide information on characteristics of specified finish materials to indicate compatibility when requested:
  - .1 Obtain the following primer information before proceeding if a potential incompatibility exists:
    - .1 Confirmation of primer's suitability for expected service conditions.
    - .2 Confirmation of primer's ability being top coated with materials specified.
  - .2 Notify Consultant about anticipated problems before using the coatings specified over substrates primed by others.

### **3.2 SITE VERIFICATION OF CONDITIONS**

- .1 Ensure concrete floors are clean and dry by using test methods recommended by flooring manufacturer.

### **3.3 PREPARATION OF SURFACES**

- .1 Prepare surfaces in accordance with manufacturer's instructions.
- .2 Clean substrates of substances that could impair bond of coatings before applying high performance coatings; remove oil and grease before cleaning.
- .3 Schedule cleaning and coating application so dust and other contaminants from cleaning process will not fall on wet, newly coated surfaces.
- .4 Clean and prepare surfaces being coated in accordance with manufacturer's written instructions for each substrate condition and as specified and as follows:
  - .1 Provide barrier coats over incompatible primers or remove primers and re-prime substrate.
  - .2 Prepare concrete being coated; remove efflorescence, chalk, dust, dirt, grease, oils, and release agents; roughen as required to remove glaze; use mechanical methods to prepare surfaces if hardeners or sealers have been used to improve curing, and as follows:
    - .1 Provide CSP level in accordance with ICRI Guideline No. 310-2R and manufacturer's written recommendation.
    - .2 Use abrasive blast cleaning methods recommended by coating manufacturer.

- .3 Determine alkalinity and moisture content of surfaces by performing appropriate tests; correct this condition before application if surfaces are sufficiently alkaline to cause the finish paint to blister and burn; do not coat surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
- .5 Mask surrounding surfaces to provide neat, clean juncture lines.
- .6 Protect adjacent surfaces and equipment from damage by overspray.
- .7 Complete work penetrating substrate before installing coating.

### **3.4 FLOOR SYSTEM APPLICATION**

- .1 Mix in accordance with material manufacturer's instructions.
- .2 Trowel apply epoxy cove in accordance with manufacturer's written instructions.
- .3 Apply primer to concrete and epoxy mortar in accordance with manufacturer's written instructions.
- .4 Apply body and top coat in accordance with manufacturer's written instructions.
- .5 Apply to floors in Rooms H 158.
- .6 Co-ordinate with room finish schedule.

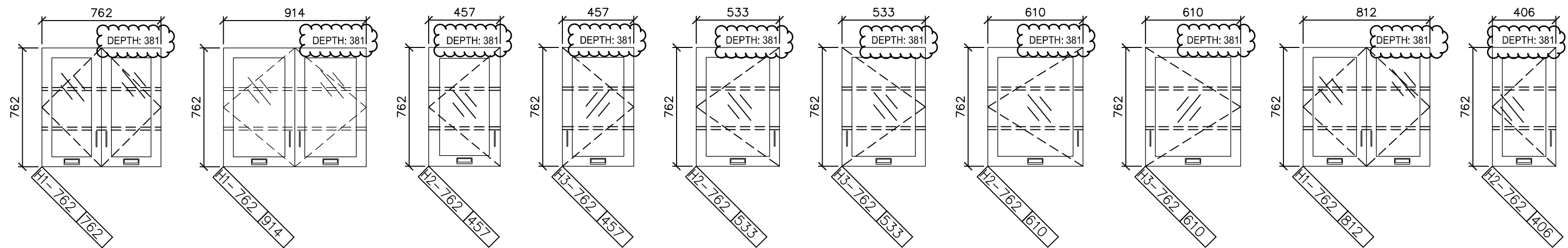
### **3.5 TESTING**

- .1 Perform two pull-off strength adhesion tests per floor area.
- .2 Do pull-off strength adhesion tests in accordance with ASTM D4541-09e1.
- .3 Patch floors where pull-off strength adhesion tests are performed. Patch shall not be visible when viewed 600 mm above finished floor.

**END OF SECTION**

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UPPER CABINETS W/ SLIDING GLASS DOORS - 381mm DEEP

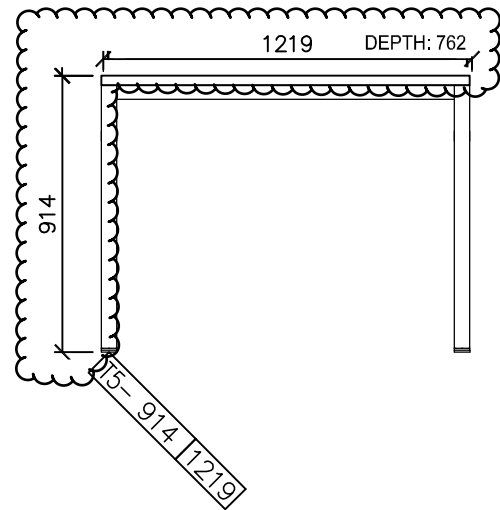
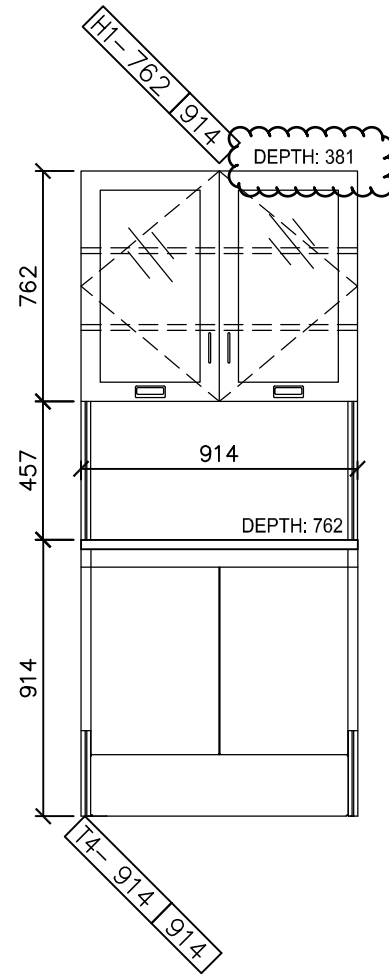
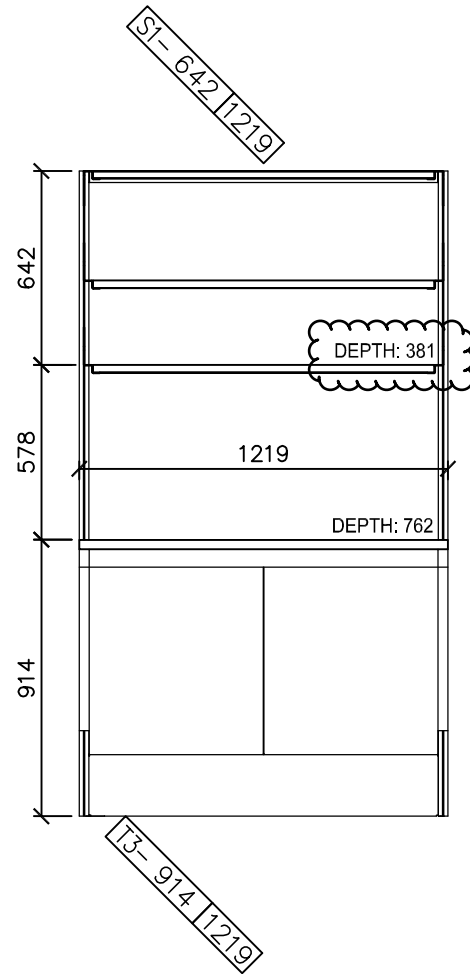


 <div>Public Works and Government Services Canada</div> <div>Ontario Region</div>	<div>Travaux publics et Services gouvernementaux Canada</div> <div>Région de l'Ontario</div>	<div>Project title: CANADA CENTRE FOR INLAND WATERS 867 LAKESHORE ROAD BURLINGTON, ONTARIO, L7R 4A6 LABS, AHUs, AND HEATING UPGRADE</div>	<div>Drawing title:</div> <div>CASEWORK TYPICAL ELEVATION</div>	Designed by : GG	Tender:	Drawing no.: A0.02
				Drawn by : JC	Sketch No: SKA- 001	Project no.: R.073578.001
				Approved by : RN	Plot scale : N.T.S.	Project date : 2015- 09- 04

The image displays three technical drawings of shelving units, each with dimensions and part numbers.

- Unit 1 (Left):** A 3-shelf unit. Dimensions: Total height 914, Shelf height 642, Shelf spacing 578, Shelf depth 381, Shelf width 1219, Leg height 610. Part numbers: SI-642 (shelves), TI-914 (legs).
- Unit 2 (Middle):** A 4-shelf unit. Dimensions: Total height 914, Shelf height 642, Shelf spacing 578, Shelf depth 381, Shelf width 1524, Leg height 610. Part numbers: SI-642 (shelves), TI-914 (legs).
- Unit 3 (Right):** A 4-shelf unit with glass doors. Dimensions: Total height 914, Shelf height 762, Shelf spacing 457, Shelf depth 381, Shelf width 1524, Leg height 762. Part numbers: HI-762 (shelves), TI-914 (legs).





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Région de l'Ontario

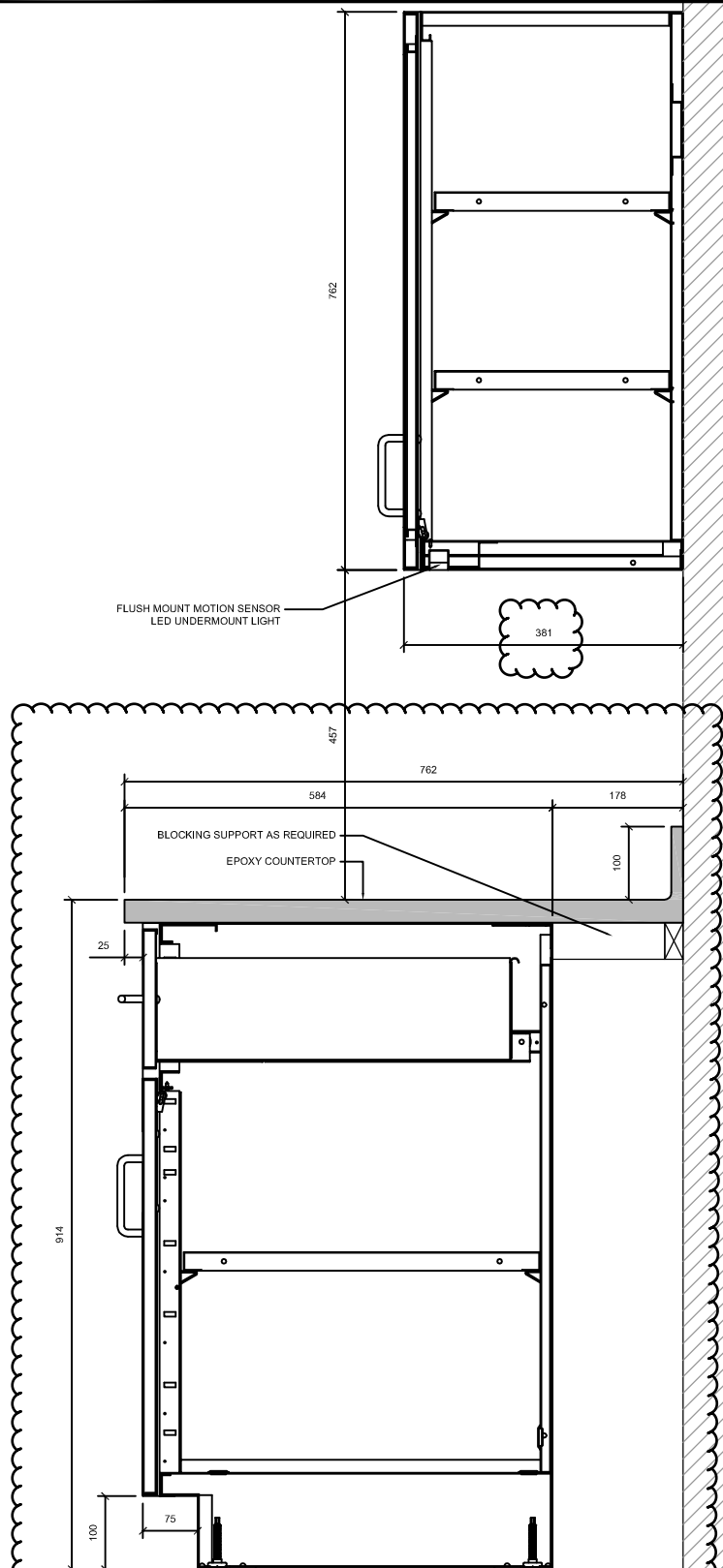
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INLAND WATERS  
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Drawing title:  
CASEWORK TYPICAL ELEVATION

Designed by : GG  
Drawn by : JC  
Approved by : RN

Tender:  
Sketch No: SKA- 003  
Plot scale : N.T.S.

Drawing no.: A0.02  
Project no.: R.073578.001  
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LABS, AHUs, AND HEATING  
UPGRADE

Drawing title:  
PLAN DETAILS & SECTION DETAILS

Designed by :

GG

Tender:

Drawn by :

JC

Sketch No: SKA- 004

Approved by :

RN

Plot scale : PLSCALE

Drawing no.: A6.02

Project no.: R.073578.001

Project date : 2015- 09- 04

Date plotted : PLOT

Cadd file : DWG



DOOR SCHEDULE:

DESCRIPTION		DOORS					FRAMES/GLAZING			OTHER		GENERAL
DOOR NO.	LOCATION	NOMINAL SIZE (HXW)	TYPE	MATERIAL	GLASS	FINISH	TYPE	MATERIAL	FINISH	FIRE RATING	HARDWARE GROUP	COMMENTS
LAB H158												
H158-1	H158	1830 x 2286	D	HM	TG	PT	1	HM	PT	45 MIN	1	
H158-2	H158	1830 x 2286	D	HM	TG	PT	1	HM	PT	-	2	
H158-3	H158	1830 x 2286	D	HM	TG	EP	1	HM	EP	-	2	
H158C-1	H158C	914 x 2286	B	FG	TG	EP	1	FG	EP	-	3	
H158D-1	H158D	1016 x 2286	B	HM	TG	EP	1	HM	EP	-	4	
H158E-1	H158E	914 x 2286	B	HM	TG	PT	1	HM	PT	-	5	
H158F-1	H158F	914 x 2286	C	HM	-	PT	1	HM	PT	-	6	
TRACE METALS STORAGE & STAGING ROOM												
D-107	TRACE METAL S&S	1830 x 2286	D	HM	TG	PT	1	HM	PT	-	7	
LAB L527												
L527-1	L527	1016 x 2440	A	AL	TG	ANO	2	AL	ANO	-	8	
LAB L530												
L530-1	L530	1016 x 2440	A	AL	TG	ANO	2	AL	ANO	-	8	
ST530-1	L530	1016 x 2286	B	HM	TG	PT	1	HM	PT	-	9	
L530A-1	L530	914 x 2286	A	AL	TG	ANO	2	AL	ANO	-	10	
WTC												
D-101	PENTHOUSE	914 x 2286	C	HM	-	PT	1	HM	PT	-	11	
D-102	PENTHOUSE	914 x 2286	C	HM	-	PT	1	HM	PT	-		
O526												
O526-1	O526	1016 x 2438	E	AL	TG	ANO	-	-	-	-	12	SLIDING DOOR
O528												
O528-1	O528	1016 x 2438	E	AL	TG	ANO	-	-	-	-	12	SLIDING DOOR
O532												
O532-1	O532	1016 x 2438	E	AL	TG	ANO	-	-	-	-	12	SLIDING DOOR
O532A-1	O532A	1016 x 2438	E	AL	TG	ANO	-	-	-	-	12	SLIDING DOOR

SCHEDULE ABBREVIATIONS:

HM	HOLLOW METAL	HCW	HOLLOW CORE WOOD	EP	EPOXY PAINT
HMI	HOLLOW METAL INSULATED	PT	PAINT	FRR	FIRE RESISTANCE RATING
AL	ALUMINUM	ANO	ANODIZED	FG	FIBRE GLASS
TG	TEMPERED GLASS				

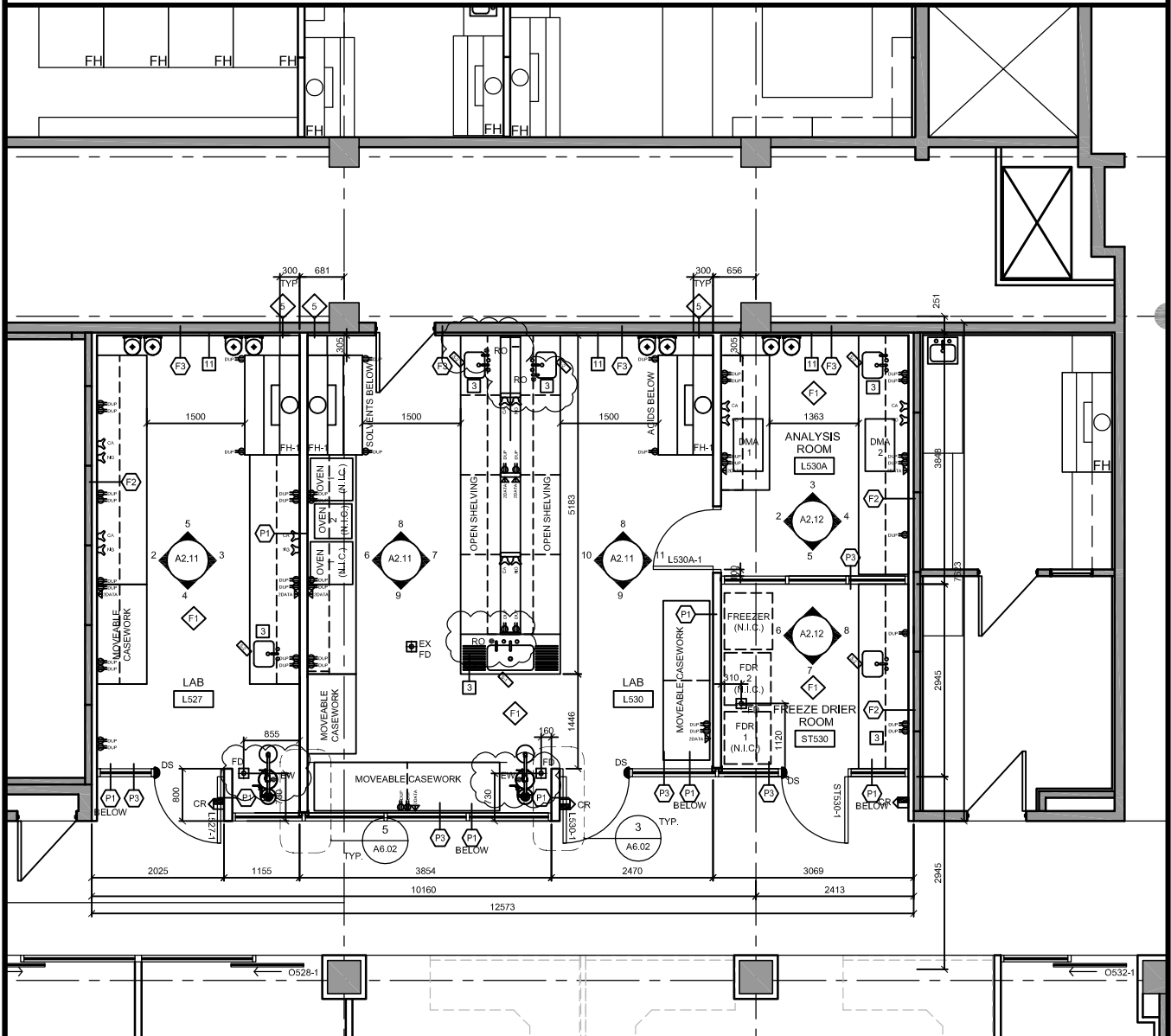
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UPGRADE

Drawing title:  
DOOR SCHEDULE

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Drawn by : JC  
Approved by : RN

Tender:  
Sketch No: SKA- 005  
Plot scale : PLSCALE

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Project no.: R.073578.001  
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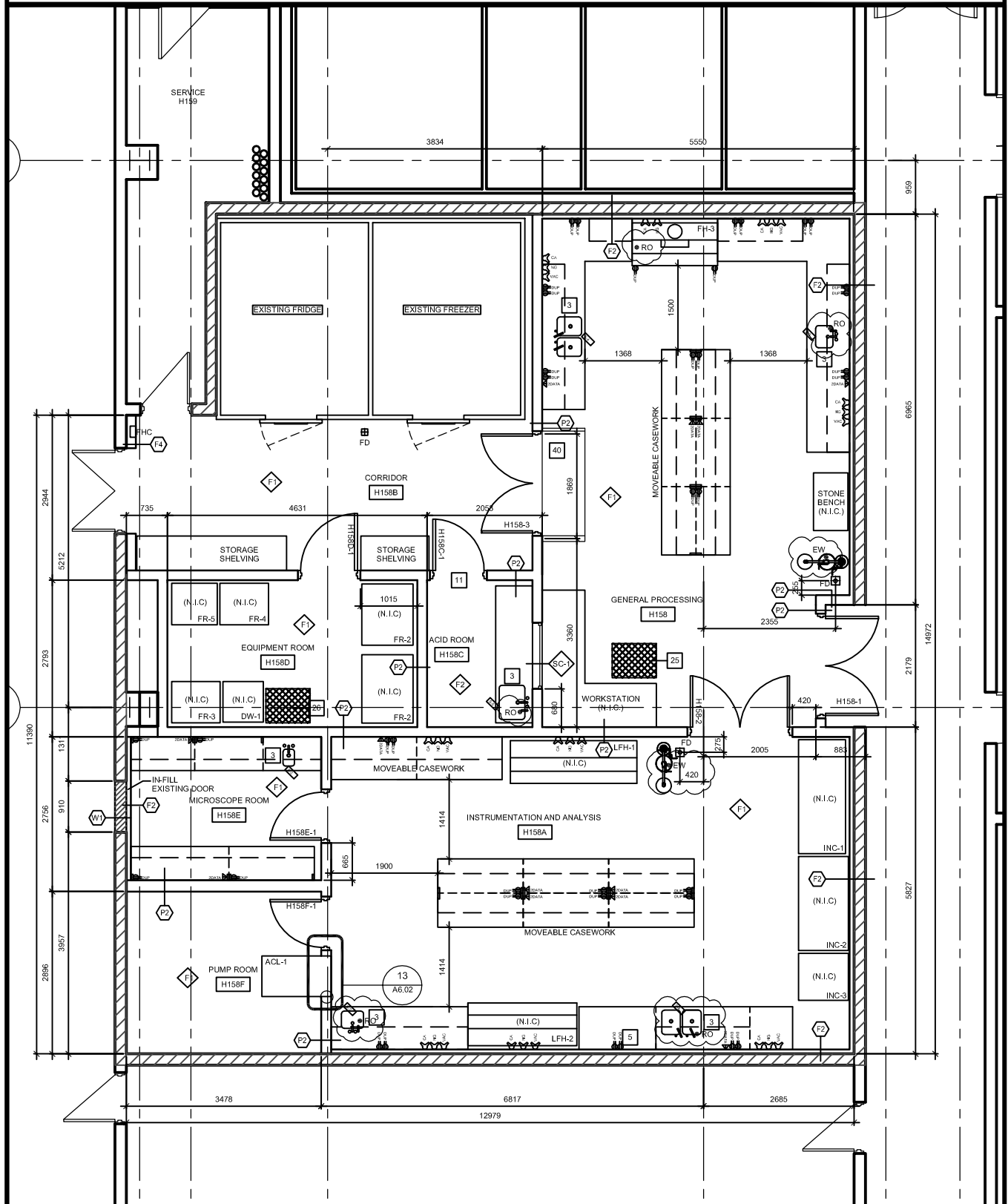


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Drawing title:  
L527/L530 - DESIGN PLAN

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Drawn by : GG	Sketch No: SKA-006
Approved by : GG	Plot scale : 1:100

Drawing no.: A2.10
Project no.: R.073578.001
Project date : 2015-09-04
Date plotted : PLOT
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Drawing title:  
H158 - DESIGN PLAN

Designed by : GG  
Drawn by : GG  
Approved by : GG

Tender:  
Sketch No: SKA-007  
Plot scale : 1:100

Drawing no.: A2.20  
Project no.: R.073578.001  
Project date : 2015-09-04  
Date plotted : PLOT  
Cadd file : DWG

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 22 05 00: Common Work Results for Plumbing.
- .2 Section 22 11 16: Domestic Water Piping
- .3 Section 22 13 17: Drainage Waste and Vent Piping – Cast Iron and Copper
- .4 Section 22 13 18: Drainage Waste and Vent Piping – Plastic

**1.2 REFERENCES**

- .1 ASTM International
  - .1 ASTM A126-04(2014), Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
  - .2 ASTM B62-09, Standard Specification for Composition Bronze or Ounce Metal Castings.
- .2 American Water Works Association (AWWA)
  - .1 ANSI/AWWA C700-09, Standard for Cold Water Meters-Displacement Type, Bronze Main Case.
  - .2 ANSI/AWWA C701-12, Standard for Cold Water Meters-Turbine Type for Customer Service.
  - .3 ANSI/AWWA C702-10, Standard for Cold Water Meters-Compound Type.
- .3 CSA International
  - .1 CSA-B64 Series-11, Backflow Preventers and Vacuum Breakers.
  - .2 CSA B79-08, Commercial and Residential Drains and Cleanouts.
  - .3 CAN/CSA-B356-10, Water Pressure Reducing Valves for Domestic Water Supply Systems.
- .4 Plumbing and Drainage Institute (PDI)
  - .1 PDI-G101-R2010, Testing and Rating Procedure for Grease Interceptors with Appendix of Installation and Maintenance.
  - .2 PDI-WH201-R2010, Water Hammer Arresters Standard.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
  - .2 Product Data:
    - .1 Submit manufacturer's instructions, printed product literature and data sheets for plumbing products and include product characteristics, performance criteria, physical size, finish and limitations.
    - .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29. Indicate VOC's.
-

- .3 Shop Drawings:
  - .1 Indicate on drawings to indicate materials, finishes, method of anchorage, number of anchors, dimensions construction and assembly details and accessories.
- .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Instructions: submit manufacturer's installation instructions.
- .6 Manufacturers' Field Reports: manufacturers' field reports specified.

#### **1.4 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00.
- .2 Operation and Maintenance Data: submit operation and maintenance data for plumbing specialties and accessories for incorporation into manual.
  - .1 Description of plumbing specialties and accessories, giving manufacturers name, type, model, year and capacity.
  - .2 Details of operation, servicing and maintenance.
  - .3 Recommended spare parts list.

#### **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect plumbing materials from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return in accordance with Section 01 74 20.

### **Part 2 PRODUCTS**

#### **2.1 FLOOR DRAINS**

- .1 Floor Drains and Trench Drains: to CSA B79.
- .2 Refer to plumbing schedules.

#### **2.2 ROOF DRAINS**

- .1 Type 1: standard roof drain with cast iron body with aluminum dome, under-deck clamp to suit roof construction, flashing clamp ring with integral gravel stop.

## 2.3 CLEANOUTS

- .1 Cleanout Plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing-caulked lead seat or neoprene gasket.
- .2 Access Covers:
  - .1 Wall Access: face or wall type, polished nickel bronze round cover with flush head securing screws, bevelled edge frame complete with anchoring lugs.
  - .2 Floor Access: round cast iron body and frame with adjustable secured nickel bronze top and:
    - .1 Plugs: bolted bronze with neoprene gasket.
    - .2 Cover for Unfinished Concrete Floors: nickel bronze round gasket, vandal-proof screws.
    - .3 Cover for Terrazzo Finish: polished nickel bronze with recessed cover for filling with terrazzo, vandal-proof locking screws.
    - .4 Cover for Tile and Linoleum Floors: polished nickel bronze with recessed cover for linoleum or tile infill, complete with vandal-proof locking screws.
    - .5 Cover for Carpeted Floors: polished nickel bronze with deep flange cover for carpet infill, complete with carpet retainer vandal-proof locking screws.

## 2.4 WATER HAMMER ARRESTORS

- .1 Copper construction, piston type.

## 2.5 BACK FLOW PREVENTERS

- .1 Preventers: to CSA-B64 Series, application as indicated, reduced pressure principle type.

## 2.6 VACUUM BREAKERS

- .1 Breakers: to CSA-B64 Series, vacuum breaker atmospheric.

## 2.7 PRESSURE REGULATORS

- .1 Capacity:
  - .1 Inlet pressure: 1034 kPa.
  - .2 Outlet pressure: 413 kPa.
- .2 Up to NPS 1-1/2 bronze bodies, screwed: to ASTM B62.
- .3 NPS 2 and over, semi-steel bodies, Class 125, flanged: to ASTM A126, Class B.
- .4 Semi-steel spring chambers with bronze trim.

## 2.8 HOSE BIBBS AND SEDIMENT FAUCETS

- .1 Bronze construction complete with integral back flow preventer, hose thread spout, replaceable composition disc, and chrome plated in finished areas.
-



**2.9 WATER MAKE-UP ASSEMBLY**

- .1 Complete with backflow preventer, pressure gauge on inlet and outlet, pressure reducing valve to CAN/CSA-B356, pressure relief valve on low pressure side and gate valves on inlet and outlet.

**2.10 TRAP SEAL PRIMERS**

- .1 Brass, with integral vacuum breaker, NPS 1/2 solder ends, NPS 1/2 drip line connection.

**2.11 STRAINERS**

- .1 860 kPa, Y type with 20 mesh, monel, bronze or stainless steel removable screen.
- .2 NPS 2 and under, bronze body, screwed ends, with brass cap.
- .3 NPS 2 1/2 and over, cast iron body, flanged ends, with bolted cap.

**2.12 IN-LINE CIRCULATORS**

- .1 Volute: cast iron radially split, with screwed or flanged design suction and discharge connections.
  - .2 Impeller: cast bronze lead free.
  - .3 Shaft: stainless steel with bronze sleeve bearing, integral thrust collar.
  - .4 Seal assembly: mechanical for service to 135 degrees C.
  - .5 Coupling: flexible self-aligning.
  - .6 Motor: to NEMA MG 1 TEFC, sleeve bearing.
  - .7 Capacity: as indicated.
  - .8 Design pressure: as indicated.
-

**2.13 ACID NEUTRALIZER**

- .1 Buried acid neutralization tank complete with sediment interceptor and PH monitoring system.
- .2 Neutralization tank

- .1 Sump: Rotationally molded form extra high stress, crack resistant virgin linear, low density polyethylene
- .2 Tops and Inspection Ports: minimum 13mm thick extruded high density, stress relieved, fabrication grade polyethylene sheet stock.
  - .1 Fittings: minimum, series 60 high density polyethylene pipe.
  - .2 Fastening Hardware: Stainless steel.
  - .3 Gaskets: Neoprene.
  - .4 Provide a full charge of limestone at time of building hand over.
  - .5 Provide cover and access hatch flushed with finish floor. Cover to be steel primed coated. Provide inspection port.
  - .6 Unit to be sized for a capacity of 100L empty, and 46L charged, 75mm inlet and 75mm outlet.
- .3 Sediment Interceptor
  - .1 Unit construction to match neutralization tank.
  - .2 Outlet of interceptor to mate and match with inlet of neutralizing tank.
  - .3 Provide cover and access hatch flushed with finish floor. Cover to be steel primed coated.
- .4 PH monitoring System
  - .1 Digital pH monitoring and alarm panel.
  - .2 Microprocessor based meter, fully programmable complete with LCD display and 4-20mA output to BAS, complete with general alarm.

## **2.14 SOLIDS INTERCEPTOR**

- .1 Floor mounted epoxy coated steel solids interceptor, complete with gasketed epoxy steel skid-proof cover secured with hex head centre bolts, removable sediment basket, and no hub connections
- .2 Interceptor body to be steel
- .3 Size for flow rate of 1.58 L/s (25 GPM)

## **2.15 PRE-PACKAGED DUPLEX PUMP STATION**

- .1 Provide duplex pump set, complete with high density polyethylene structural foam basin.
- .2 Basin size to be 610 mm diameter and 915 mm in height. Basin to be one seamless piece.
- .3 Basin to be complete with necessary sealing hardware and flanges
- .4 Duplex cover to be provide with two access plates
- .5 Cover to be water and gas tight.
- .6 Pump station to be complete with floats for on/off control.
- .7 Duplex pump station to be supplied with control panel.

## **Part 3 EXECUTION**

### **3.1 EXAMINATION**

---

- .1 Verification of Conditions: verify that site conditions are acceptable for plumbing specialties and accessories installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect site conditions in area where equipment is to be installed.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied.

### **3.2 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.

### **3.3 INSTALLATION**

- .1 Install in accordance with National Plumbing Code of Canada and local authority having jurisdiction.
- .2 Install in accordance with manufacturer's instructions and as specified.

### **3.4 CLEANOUTS**

- .1 Install cleanouts at base of soil and waste stacks, and rainwater leaders, at locations required code, and as indicated.
- .2 Bring cleanouts to wall or finished floor unless serviceable from below floor.
- .3 Building drain cleanout and stack base cleanouts: line size to maximum NPS 4.

### **3.5 WATER HAMMER ARRESTORS**

- .1 Install on branch supplies to fixtures or group of fixtures and where indicated.

### **3.6 BACK FLOW PREVENTERS**

- .1 Install in accordance with CSA-B64 Series, where indicated and elsewhere as required by code.
  - .1 Drains.
  - .2 Backwater Valves.
  - .3 Water Make-up Assembly.
- .2 Pipe discharge to terminate over nearest drain or service sink.

### **3.7 HOSE BIBBS AND SEDIMENT FAUCETS**

- .1 Install at bottom of risers, at low points to drain systems, and as indicated.

### **3.8 TRAP SEAL PRIMERS**

- .1 Install for floor drains and elsewhere, as indicated.
  - .2 Install on cold water supply to nearest frequently used plumbing fixture, in concealed space, to approval of Departmental Representative.
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- .3 Install soft copper tubing to floor drain.

### 3.9 STRAINERS

- .1 Install with sufficient room to remove basket for maintenance.

### 3.10 WATER MAKE-UP ASSEMBLY

- .1 Install on valved bypass.
- .2 Pipe discharge from relief valve to nearest floor drain.

### 3.11 ACID NEUTRALIZER

### 3.12 BURIED ACID NEUTRALIZATION

- .1 Install in accordance with NBC and National Plumbing Code.
- .2 Provide acid resistant vent directly through roof.

### 3.13 START-UP

- .1 General:
  - .1 In accordance with Section 01 91 13: General Requirements, supplemented as specified herein.
- .2 Timing: start-up only after:
  - .1 Pressure tests have been completed.
  - .2 Disinfection procedures have been completed.
  - .3 Certificate of static completion has been issued.
  - .4 Water treatment systems operational.
- .3 Provide continuous supervision during start-up.

### 3.14 TESTING AND ADJUSTING

- .1 General:
  - .1 Test and adjust plumbing specialties and accessories in accordance with Section 01 91 13: General Requirements, supplemented as specified.
- .2 Timing:
  - .1 After start-up deficiencies rectified.
  - .2 After certificate of completion has been issued by authority having jurisdiction.
- .3 Application tolerances:
  - .1 Pressure at fixtures: +/- 70 kPa.
  - .2 Flow rate at fixtures: +/- 20%.
- .4 Adjustments:
  - .1 Verify that flow rate and pressure meet design criteria.
  - .2 Make adjustments while flow rate or withdrawal is (1) maximum and (2) 25% of maximum and while pressure is (1) maximum and (2) minimum.

- .5 Floor drains:
    - .1 Verify operation of trap seal primer.
    - .2 Prime, using trap primer. Adjust flow rate to suit site conditions.
    - .3 Check operations of flushing features.
    - .4 Check security, accessibility, removability of strainer.
    - .5 Clean out baskets.
  - .6 Vacuum breakers, backflow preventers, backwater valves:
    - .1 Test tightness, accessibility for O&M of cover and of valve.
    - .2 Simulate reverse flow and back-pressure conditions to test operation of vacuum breakers, backflow preventers.
    - .3 Verify visibility of discharge from open ports.
  - .7 Roof drains:
    - .1 Check location at low points in roof.
    - .2 Check security, removability of dome.
    - .3 Adjust weirs to suit actual roof slopes, meet requirements of design.
    - .4 Clean out sumps.
    - .5 Verify provisions for movement of roof systems.
  - .8 Access doors:
    - .1 Verify size and location relative to items to be accessed.
  - .9 Cleanouts:
    - .1 Verify covers are gas-tight, secure, yet readily removable.
  - .10 Water hammer arrestors:
    - .1 Verify proper installation of correct type of water hammer arrester.
  - .11 Pressure regulators, PRV assemblies:
    - .1 Adjust settings to suit locations, flow rates, pressure conditions.
  - .12 Strainers:
    - .1 Clean out repeatedly until clear.
    - .2 Verify accessibility of cleanout plug and basket.
    - .3 Verify that cleanout plug does not leak.
  - .13 Acid neutralizer:
    - .1 Activate, using manufacturer's recommended procedures and materials.
  - .14 Hose bibbs, sediment faucets:
    - .1 Verify that flow and pressure meet design criteria.
    - .2 Check for leaks, replace compression washer if required.
  - .15 Hydronic system water Make-up Assembly:
    - .1 Verify flow, pressure, and connection.
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- .16 Pre-packaged Pump Station
  - .1 Verify flow, pressure, and connection

**3.15 CLOSEOUT ACTIVITIES**

- .1 Commissioning Reports: in accordance with Section 01 91 13: reports, supplemented as specified.
- .2 Training: provide training in accordance with Section 01 91 13: Training of O&M Personnel, supplemented as specified.

**3.16 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**3.17 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by plumbing specialties and accessories installation.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 American National Standards Institute (ANSI) / American Society of Mechanical Engineers (ASME)
  - .1 ASME B16.1-05, Cast Iron Pipe Flanges and Flanged Fittings: Class 25, 125, 250 and 800.
  - .2 ASME B16.25-07, Buttwelding Ends.
  - .3 ASME B16.3-11, Malleable Iron Threaded Fittings: Classes 150 and 300.
  - .4 ANSI/ASME B16.5-09, Pipe Flanges and Flanged Fittings: NPS ½ through 24.
  - .5 ANSI/ASME B16.9-07, Factory-Made Wrought Steel Buttwelding Fittings.
  - .6 ASME B18.2.1-2010, Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series).
  - .7 ASME B18.2.2-2010, Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series).
- .2 American National Standards Institute (ANSI) / American Water Works Association (AWWA)
  - .1 ANSI/AWWA C111/A21.11-12, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- .3 ASTM International Inc.
  - .1 ASTM A47/A47M-99(2014), Standard Specification for Ferritic Malleable Iron Castings.
  - .2 ASTM A53/A53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.
  - .3 ASTM A126-04(2014), Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
- .4 Canadian Standards Association (CSA International)
  - .1 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding.
- .5 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.
  - .1 MSS-SP-70-2006, Cast Iron Gate Valves, Flanged and Threaded Ends.
  - .2 MSS-SP-71-2005, Gray Iron Swing Check Valves, Flanged and Threaded Ends.
  - .3 MSS-SP-80-2008, Bronze Gate, Globe, Angle and Check Valves.
  - .4 MSS-SP-85-2002, Cast Iron Globe and Angle Valves, Flanged and Threaded Ends.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00.



- .2 Product Data:
  - .1 Provide manufacturer's printed product literature and datasheets for valves and pipes and include product characteristics, performance criteria, physical size, finish and limitations.

### **1.3 CLOSEOUT SUBMITTALS**

- .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00.

### **1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle in accordance with Section 01 61 00.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse in accordance with Section 01 74 20.

### **1.5 MAINTENANCE MATERIALS SUBMITTALS**

- .1 Extra Stock Materials:
  - .1 Provide spare parts as follows:
    - .1 Valve seats: one for every ten valves, each size. Minimum one.
    - .2 Discs: one for every ten valves, each size. Minimum one.
    - .3 Stem packing: one for every ten valves, each size. Minimum one.
    - .4 Valve handles: 2 of each size.
    - .5 Gaskets for flanges: one for every ten flanges.

## **Part 2 PRODUCTS**

### **2.1 PIPE**

- .1 Steel pipe: to ASTM A53/A53M, Grade B, as follows:
  - .1 Steam;
    - .1 To NPS 6: Steel Schedule 80, Seamless or ERW
  - .2 Condensate;
    - .1 Steel, Schedule 80, Seamless or ERW

### **2.2 PIPE JOINTS**

- .1 NPS 2 and under: screwed fittings with PTFE tape.
  - .2 NPS 2-1/2 and over: welding fittings and flanges to CSA W48.
  - .3 Flanges: plain or raised face. Flange gaskets to ANSI/AWWA C111/A21.11.
  - .4 Pipe thread: taper.
  - .5 Bolts and nuts: carbon steel, to [NSI/ASME B18.2.1 and ANSI/ASME B18.2.2.
  - .6 Buttwelding ends: to ANSI/ASME B16.25.
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## 2.3 FITTINGS

- .1 Pipe flanges: cast-iron to ASME B16.1, Class 125.
- .2 Screwed fittings: malleable iron to ASME B16.3, Class 150.
- .3 Steel pipe gaskets, flanges and flanged fittings: to ANSI/ASME B16.5.
- .4 Buttwelding fittings: steel to ANSI/ASME B16.9.
- .5 Unions: malleable iron, to ASTM A47/A47M and ASME B16.3.

## 2.4 VALVES

- .1 Connections:
  - .1 NPS 2 and smaller: screwed ends.
  - .2 NPS 2 1/2 and larger:
    - .1 Equipment: Flanged ends.
    - .2 Elsewhere: Flanged ends.
- .2 Gate valves: Application: Steam service, for isolating equipment, control valves, gravity condensate return service, steam drip point assemblies.
  - .1 Gate Valves up to 40 mm: Bronze body, inside screw, traveling stem, solid wedge, screw-in bonnet, threaded ends rating 860 kPa steam.
  - .2 Gate Valves 50 mm and Over: Cast iron body, flanged ends, O.S. and Y, rising stem, bronze trim, solid wedge, rating 860 kPa steam
- .3 Globe valves: Application: Steam service, throttling, flow control, emergency bypass.
  - .1 Globe Valves up to 40 mm: Bronze body, screw over bonnet, threaded ends, rating 1035 kPa steam.
  - .2 Globe Valves 50 mm and Over: Cast iron body, flanged ends, O.S. and Y, renewable bronze seat ring, renewable composition disc. Rating 860 kPa steam.
- .4 Drain valves: Gate, Class 125, non-rising stem, solid wedge disc, as specified Section 23 05 23.01.
- .5 Lift check valves:
  - .1 NPS 2 and under: Class 125, lift, with composition disc, as specified Section 23 05 23.01.
  - .2 NPS 2 1/2 and over: as specified Section 23 05 23.01.

**2.5 VALVE OPERATORS**

- .1 Provide suitable handwheel operators for valves.
- .2 Provide gear operators for valves 250 mm and over.
- .3 Provide valves larger than 100 mm located more than 2.1 m from floor, in equipment rooms, with chain operated sheaves. Extend chains to 1.5 m above floor, and hook to clips to clear walking aisles.

**Part 3 EXECUTION**

**3.1 APPLICATION**

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

**3.2 PIPING**

- .1 Install pipework in accordance with Section 23 05 01, and supplemented as specified below.
- .2 Connect branch lines into top of mains.
- .3 Install piping in direction of flow with slopes as follows, unless indicated:
  - .1 Steam: 1:240.
  - .2 Condensate return: 1:70.
- .4 Make provision for thermal expansion as indicated.
- .5 Drip pocket: line size.

**3.3 VALVES**

- .1 Install valves at an accessible height (maximum 1200 mm above finished floor) wherever possible.

**3.4 TESTING**

- .1 Test system in accordance with Section 21 05 01.
- .2 Test pressure: 1-1/2 times maximum system operating pressure or 860 kPa whichever is greater.

**3.5 SYSTEM START-UP**

- .1 In accordance with Section 23 08 02.

**3.6 PERFORMANCE VERIFICATION (PV)**

- .1 General:
  - .1 Verify performance in accordance with Section 23 08 01 and supplemented as specified herein.

- .2 Timing, only after:
  - .1 Pressure tests successfully completed.
  - .2 Flushing as specified has been completed.
  - .3 Water treatment system has been commissioned.
- .3 PV Procedures:
  - .1 Verify complete drainage of condensate from steam coils.
  - .2 Verify proper operation of system components, including, but not limited to:
    - .1 Steam traps - verify no blow-by.
    - .2 Flash tanks.
    - .3 Thermostatic vents.
- .4 Humidifiers: for commissioning procedures, refer to Section 23 84 13.

### **3.7 CLEANING**

- .1 Clean in accordance with Section 01 74 11.
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 American Society for Mechanical Engineers (ASME International)
- .2 ASTM International Inc.
  - .1 ASTM A126-04(2009), Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
  - .2 ASTM A167-99(2009), Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
  - .3 ASTM A216/A216M-08, Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding for High-Temperature Service.
  - .4 ASTM A240/A240M-10a, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
  - .5 ASTM A276-10, Standard Specification for Stainless Steel Bars and Shapes.
  - .6 ASTM A278/A278M-01(2006), Standard Specification for Gray Iron Castings for Pressure - Containing Parts for Temperatures up to 650 Degrees F (350 degrees C).
  - .7 ASTM A351/A351M-10, Standard Specification for Castings, Austenitic, for Pressure- Containing Parts.
  - .8 ASTM A564/A564M-10, Standard Specification for Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes.
  - .9 ASTM B62-09, Standard Specification for Composition Bronze or Ounce Metal Castings.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature Canadian Registration Number (CRN), and datasheets for steam traps, vacuum breakers, pressure reducing valves, air vents, safety relief valves, and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Provide two copies WHMIS MSDS - Material Safety Data Sheets.
- .3 Closeout Submittals:
  - .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 and include following:

**1.3 DELIVERY, STORAGE AND HANDLING**

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- .1 Deliver, store and handle in accordance with Section 01 61 00.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, paddling, and packaging materials in accordance with Section 01 74 20.

## **Part 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Cast steel: to ASTM A216/A216M.
- .2 Cast iron: to ASTM A278, Class 300.
- .3 Bronze: to ASTM B62.
- .4 Stainless steel: to ASTM A351/A351M.

### **2.2 INVERTED BUCKET STEAM TRAP 0-1000 KPA**

- .1 Application: for non-modulating steam services on humidifiers.
- .2 Cast iron body and cap. Stainless steel bucket, seat, head, operating mechanism and strainer. Integral vacuum breaker. Service pressure rating: 1035 kPa steam, temperature rating 230°C

### **2.3 VACUUM BREAKERS 2.10-68 KPA**

- .1 Application: on inlets to steam coils, heat exchangers and as indicated.
- .2 Materials: body and cap - lead-free brass; spring - stainless steel; stem and seat - lead-free brass.
- .3 Capacity: as indicated.

### **2.4 PRESSURE REDUCING VALVE**

- .1 Location: as indicated.
- .2 Type: as indicated
- .3 Internally piloted pressure reducing valves: Internally piloted, piston operated pressure reducing valve, incorporating two valves. A pilot and a main valve to be contained within one unit. Valve to be cast iron, with field adjustable screw to achieve desired set pressure, operating with a flat diaphragm and stainless steel valves and seats. Piston and cylinder shall be made of bronze. Valve to be self-contained and does not require an external sensing line.
- .4 Direct-acting pressure reducing valves: Valve to be cast iron, with field adjustable screw to achieve desired set pressure, operating with a flat diaphragm and stainless steel valve and set. Valve to be self-contained and does not require an external sensing line.
- .5 Connections:
  - .1 Under NPS 2: screwed ends.

- .6 Capacity:
  - .1 As indicated.

## **2.5 SAFETY AND RELIEF VALVES**

- .1 Spring loaded type of bronze with high capacity and full nozzle and to ASME code.
- .2 Material: body forged copper alloy; valve - housing cast bronze; spring – stainless steel; lead-free bronze/brass trim.
- .3 Capacity: as indicated

## **2.6 DRIP PAN ELBOWS**

- .1 Application: on discharge of steam safety relief valves as indicated.
- .2 Cast iron or steel with screwed or flanged inlet and threaded drain connections.

## **2.7 PIPE LINE STRAINERS**

- .1 Application: ahead of condensate pumps, steam traps, control valves and elsewhere as indicated.
- .2 Working pressure: 860 kPa.
- .3 Size to 40 mm: 1720 kPa rating, screwed, cast iron casting, Y-pattern sediment separator with 0.8 mm 304 stainless steel screen. Connections: screwed.
- .4 Size 50 mm and Over: 1720 kPa flanges, cast iron, Y-pattern, sediment separator with 1.6 mm 304 stainless steel screen

## **2.8 DRAIN COOLER**

- .1 Locations: at condensate discharge points of humidifiers and steam traps.
- .2 Tanks: vertical type with threaded drop tube connections.
- .3 Sizes: 330 mm height x 279 mm diameter, 6.8 kg weight.
- .4 Body constructed of ASTM A48 cast iron, fittings constructed of malleable iron, body constructed of brass, sensing bulb constructed of bronze.
- .5 Flow rate of total condensate and cooling water combined: 19 lpm
- .6 Construction: to ASME code.
- .7 Maximum working pressure: 860 kPa.
- .8 Connections: NPS 2 and under, screwed.
- .9 Finish: prime coated.
- .10 Supports: vertical legs for vertical tank; saddles for horizontal tank.

## **Part 3 EXECUTION**

### **3.1 APPLICATION**

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- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.
- .2 Maintain proper clearance around equipment to permit maintenance.

### **3.2 STRAINERS**

- .1 Install as indicated.
- .2 Ensure clearance for removal of basket.
- .3 Install valved blow-down as indicated.

### **3.3 SAFETY RELIEF VALVE**

- .1 Pipe to atmosphere independent of other vents and in accordance with applicable code.
- .2 Support discharge pipe against reaction forces and to take up thermal movement.
- .3 Drain pipe from drip pan elbow to terminate over floor drain.

### **3.4 STEAM TRAPS**

- .1 Install unions on inlet and outlet.

### **3.5 PRESSURE REDUCING VALVES**

- .1 Install on 3-valve bypass with strainer on inlet.
- .2 Pipe as indicated. Follow manufacturer's installation instructions.

### **3.6 FLASH TANKS**

- .1 Pipe arrangement as indicated.

### **3.7 PERFORMANCE VERIFICATION**

- .1 In accordance with Section 23 08 01.

### **3.8 CLEANING**

- .1 Clean in accordance with Section 01 74 11.
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 American National Standards Institute/Air Movement and Control Association (ANSI/AMCA)
  - .1 ANSI/AMCA Standard 210-2007/( ANSI/ASHRAE 51-07), Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
- .2 International Organization of Standardization (ISO)
  - .1 ISO 3741-2010, Acoustics-Determination of Sound Power Levels of Noise Sources Using Sound Pressure - Precision Methods for Reverberation Rooms.
- .3 National Fire Protection Association (NFPA)
  - .1 NFPA 90A-12, Standard for the Installation of Air Conditioning and Ventilating Systems.
- .4 Underwriter's Laboratories (UL)
  - .1 UL 181-2005(R2008), Factory-Made Air Ducts and Air Connectors.
- .5 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
  - .1 ASHRAE 130-2008, Methods of Testing Air Terminal Units

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for air terminal units and include product characteristics, performance criteria, physical size, electrical connection information, finish and limitations.
- .3 Shop Drawings:
  - .1 Indicate the following:
    - .1 Capacity.
    - .2 Pressure drop.
    - .3 Noise rating.
    - .4 Leakage.
    - .5 Electrical connection requirements.

- .4 Test and Evaluation Reports:
  - .1 Test data: to procedures documented by ASHRAE 130

### **1.3 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00.
- .2 Operation and Maintenance Data: submit operation and maintenance data for air terminal units] for incorporation into manual.

### **1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground, indoors, and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect air terminal units from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 74 20.

## **Part 2 PRODUCTS**

### **2.1 SYSTEM DESCRIPTION**

- .1 Performance Requirements:
  - .1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from certified ADC (Air Diffusion Council) testing agency signifying adherence to codes and standards.

### **2.2 MANUFACTURED UNITS**

- .1 Terminal units of the same type to be product of one manufacturer.
- .2 Supplier of venturi valve to provide all associated controls and sensors for the system to function as described within the scope of work.

### **2.3 VARIABLE VOLUME TERMINAL BOXES – LABORATORY SYSTEMS**

- .1 Pressure independent reset to air flow between minimum and maximum air volume.
  - .2 Sizes, capacities, differential pressures and sound ratings: as indicated on drawings.
  - .3 The airflow control device shall be a venturi valve.
  - .4 The valve assembly manufacturer's Quality Management System shall be registered to ISO 9001:2008
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- .5 Airflow control device shall be tested in accordance with ASHRAE 130.
  - .6 The airflow control device shall be pressure independent over its specified differential static pressure operating range. An integral pressure independent assembly shall respond and maintain specific airflow within one second of a change in duct static pressure irrespective of the magnitude of pressure and/or flow change or quantity of airflow controllers on a manifolded system.
  - .7 The airflow control device shall maintain accuracy within  $\pm 5\%$  of signal over an airflow turndown range of no less than:
    - .1 12.5 to 1 (medium pressure all valve sizes)
    - .2 16 to 1 (medium pressure w/o 350mm valve)
    - .3 7 to 1 (low pressure all valve sizes)
    - .4 11 to 1 (low pressure w/o 350mm valve)
    - .5 8 to 1 (medium pressure shut-off all valve sizes)
    - .6 14 to 1 (medium pressure shut-off w/o 350mm valve)
    - .7 5 to 1 (low pressure shut-off all valve sizes)
    - .8 9 to 1 (low pressure shut-off w/o 350mm valve)
  - .8 No minimum entrance or exit duct diameters shall be required to ensure accuracy and/or pressure independence.
  - .9 No rotational/axial orientation requirements shall be required to ensure accuracy and/or pressure independence.
  - .10 The airflow control device shall maintain pressure independence regardless of loss of power.
  - .11 The airflow control device shall be constructed of one of the following types
    - .1 Class A: The airflow control device for non-corrosive airstreams, such as supply, shall be constructed of 16-gauge aluminum. The device's shaft and internal "S" link shall be made of 316 stainless steel. The shaft support brackets shall be made 316 stainless steel (shutoff valves). The pivot arm shall be 303/304 stainless (for shut off valves). The pressure independent springs shall be a spring-grade stainless steel. All shaft bearing surfaces shall be made of a PP (polypropylene) or PPS (polyphenylene sulfide) composite. Sound attenuating devices used in conjunction with general exhaust or supply airflow control devices shall be constructed using 24 gauge galvanized steel or other suitable material used in standard duct construction. No sound absorptive materials of any kind shall be used.
    - .2 Class B: The airflow control device for corrosive, or potentially corrosive, airstreams, such as fume hoods, general exhaust, and biosafety cabinets, shall have a baked-on, corrosion-resistant phenolic coating. The device's shaft shall be made of 316 stainless steel with a Teflon coating. The shaft support brackets shall be made of 316 stainless steel. The pivot arm and internal "S" link shall be made of 316 or 303 stainless steel. The pressure independent springs shall be a spring-grade stainless steel. The internal nuts, bolts and rivets shall be stainless steel. All shaft bearing surfaces shall be made of PP (polypropylene) or PPS (polyphenylene sulfide) composite.
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- .12 Actuation
  - .1 For electrically actuated VAV operation, a CE certified electronic actuator shall be factory mounted to the valve. Loss of main power shall cause the valve to position itself in an appropriate failsafe state. Options for these failsafe states include: normally open-maximum position, normally closed-minimum position and last position. This position shall be maintained constantly without external influence, regardless of external conditions on the valve (within product specifications).
  - .2 Actuation to be high speed, and response time from 0-90% flow shall be no greater than 1 second.
- .13 The controller for the airflow control devices shall be microprocessor based and operate using peer-to-peer control architecture. The room-level airflow control devices shall function as a standalone network, providing feedback to the existing Building Management System
- .14 The room-level control network shall utilize a BACnet communications protocol.
- .15 There shall be no reliance on external or building-level control devices to perform room-level control functions. Each laboratory control system shall have the capability of performing fume hood control, pressurization control, temperature control, humidity control, and implement occupancy and emergency mode control schemes.
- .16 Terminal devices serving the supply air into L527, L530, L530A and L530B shall be programmed and installed for pressure and temperature control via connection to the dual duct air distribution system.

## **2.4 EXHAUST AND SUPPLY AIRFLOW DEVICE CONTROLLER**

- .1 The airflow control device shall be a microprocessor-based design and shall use closed loop control to linearly regulate airflow based on a digital control signal. The device shall generate a digital feedback signal that represents its airflow.
- .2 The airflow control device shall store its control algorithms in non-volatile, re-writeable memory. The device shall be able to stand-alone or to be networked with other room-level digital airflow control devices using an industry standard protocol
- .3 Room-level control functions shall be embedded in and carried out by the airflow device controller using distributed control architecture. Critical control functions shall be implemented locally; no room-level controller shall be required.
- .4 The airflow control device shall use industry standard 24 VAC power.
- .5 The airflow control device shall have provisions to connect a notebook PC commissioning tool and every node on the network shall be accessible from any point in the system
- .6 The airflow control device shall have built-in integral input/output connections that address fume hood control, temperature control, humidity control occupancy control, emergency control, and non-network sensors switches and control devices. At a minimum, the airflow controller shall have:

- .1 Three universal inputs capable of accepting 0 to 10 VAC, 4 to 20 mA, 0 to 65 K ohms, or Type 2 or Type 3 10 K ohm @ 25 degree C thermistor temperature sensors.
- .2 One digital input capable of accepting a dry contact or logic level signal input.
- .3 Two analog outputs capable of developing either a 0 to 10 VAC or 4 to 20 mA linear control signal.
- .4 One Form C (SPDT) relay output capable of driving up to 1 A @ 24 VAC/VAC.
- .7 The airflow control device shall maintain a temperature set point by controlling the airflow from the hot and cold deck supply air or the reheat valve (as applicable) in response to a room temperature sensor.
- .8 Provide dual duct temperature control sequence for for all units serving the supply air into L527, L530, L530A and L530B. Two valves shall modulate the hot deck and cold deck to maintain supply air temperature.

## 2.5

### LOCAL TEMPERATURE CONTROL AND DISPLAY UNIT

- .1 The control system shall be complete with a view touch screen monitor with 175mm capacitive touch screen and local display that allows control and system variables to be displayed on a user interface terminal device. The Local Display Unit shall connect to the room-level network and provide access to all room-level control data.
- .2 The display unit shall be powered by 24 VAC or 24 VAC.
- .3 The Local Display Unit shall be flush mounted directly to a standard electrical enclosure or DIN rail. Electrical conductors shall terminate inside the display module housing to a pluggable terminal block
- .4 The display unit shall utilize an LCD display with variable contrast adjustment and backlighting to adapt the display to various lighting conditions.
- .5 The display unit shall provide a means of entering and displaying a unique location descriptor that may be used to identify the location and/or function of the display unit. The descriptor shall allow up to two lines of at least 13 alphanumeric characters to be entered in the description field
- .6 The display unit shall allow access to pertinent flow, temperature, humidity, pressure data, as well as occupancy and emergency mode control status, and current device or system alarm status. Data shall be viewable in units of measure appropriate for users of the system.
- .7 The display unit shall have the ability to display up to 250 parameters, organized into display screens of up to five parameters per screen. Each screen shall have the ability to have a descriptive name of up to 16 alphanumeric characters for ease of navigation. Each parameter being displayed shall have the ability to include such information as:
  - .1 Descriptive tag (up to 13 alphanumeric characters)
  - .2 Present value, which may be read directly off the network, or conditioned with a fixed multiplier and/or offset to scale the value for the desired units of measure
  - .3 Units of measure, which are configurable based on local user conventions

- .8 Set points and editable control parameters shall be viewable on the Local Display Unit. The user shall have the ability to enable a pass code to prevent unauthorized changes to set points and editable control parameters.

## 2.6 FUME HOOD AND SASH POSITION MONITOR

- .1 A fume hood monitor shall be provided along with a sash position monitor to be installed inside the fume hood by fume hood manufacture at the factory. This same monitor shall generate an exhaust airflow control signal for the appropriate airflow control device in order to provide a constant average face velocity. Audible and separate visual alarms shall be provided for flow alarm and emergency exhaust conditions. The fume hood monitor shall incorporate the following capabilities:
  - .1 LED display with the ability to display one of the following measurements:
    - .1 Cubic feet per minute (CFM)
    - .2 Metres cubed per hour (m3/h)
    - .3 Feet per minute (fpm)
    - .4 Metres per second (m/s)
  - .2 Alarm muting option, which silences the audible alarm for an adjustable time period when the mute button is pushed. If another alarm is generated during the mute period, the new alarm will override the mute delay and the alarm will sound again
  - .3 Auto alarm muting option, which sets the alarm to mute automatically after 20 seconds.
  - .4 Emergency Exhaust button with LED, which activates an emergency exhaust mode. In this mode, the exhaust air is at its maximum flow. When activated, the alarm will sound and the LED will flash. To activate emergency exhaust mode, push the button. Push the button again to cancel emergency exhaust mode.
  - .5 Flow Alarm LED, which illuminates to indicate an unsafe airflow condition. The audible alarm will also activate and may be muted.
  - .6 Broken retracting cable alarm, an audible alarm with a flashing LED that indicates whether a vertical sash sensor cable is detached, thereby ensuring the fume hood users' safety.
  - .7 Diversity Alarm LED that can be activated locally or from the BAS system. No audible alarm will be generated at the fume hood monitor.
  - .8 Energy waste alarm option, which generates a local visual and audible alarm to notify when the fume hood sash is open beyond its minimum flow position and the lights in the room are off. When activated, the LED display will show "ENRG" and the audible alarm will sound until the sash is closed. The light levels at which the alarm is both initiated and cancelled shall be configurable. Alternatively, the sash position will be provided to the BAS and set as an alarm.

- .9 Fume hood decommissioning option, which commands the exhaust flow through the fume hood to the minimum allowed by the exhaust valve when the sash is fully closed and no chemicals are present in the hood. The mode shall be initiated by either a pushbutton sequence on the fume hood monitor, external momentary switch input to the fume hood monitor, or a network command. When activated, the LED display will show "OFF," and the exhaust valve will move to its minimum position or shutoff position. Safety shall be built into the decommission option, whereby opening the fume hood sash will automatically return the fume hood exhaust to an in-use operating volume as determined by the sash sensor. Fume hood decommissioning shall be a point that can be integrated to the BAS system.

## 2.7

### ROOM SENSORS

- .1 For variable air volume (VAV) systems in laboratories with new fume hoods, a sash sensor shall be provided to measure the height of each vertically moving fume hood sash. Control systems employing sidewall-mounted velocity sensors shall be unacceptable.
- .2 A presence and motion sensor shall be provided to determine an operator's presence in front of a hood by detecting the presence and/or motion of an operator, and to command the LACS from an in-use operating face velocity (e.g., 0.41 m/s) to a standby face velocity (e.g., 0.3 m/s) and vice versa
  - .1 The sensor shall define an adjustable detection zone that extends approximately 50 cm (20 inches) from the front of the fume hood. If the sensor does not detect presence and/or motion in its detection zone within 30 to 3,000 seconds, it shall command the system to the user-adjustable standby face velocity. When the sensor detects the presence and/or motion of an operator within the detection zone, it shall command the system to the in use face velocity within 1.0 second
  - .2 The sensor shall sense an inanimate object when placed in the detection zone and remain in the standard mode of operation for 30 to 3,000 seconds, after which it will return to a standby mode. Operators shall enter and leave the zone with the unit adjusting automatically between in-use and standby modes. If the inanimate object is moved or taken out of the zone, the unit shall adapt to the change automatically.
  - .3 The sensor shall have an adjustable detection zone capable of covering a fume hood up to 2400mm wide and be mounted from 1800mm to 2400mm feet above the floor surface.
  - .4 The sensor shall be configurable for varying levels of lighting intensity and motion sensitivity.
  - .5 The sensor shall have the ability to operate on either AC or DC power sources.
  - .6 Wide area motion detectors (on the hood or at the room level) shall be unacceptable.
- .3 The airflow at the fume hood shall vary in a linear manner between two adjustable minimum and maximum flow set points to maintain a constant face velocity throughout this range. A minimum volume flow shall be set to assure flow through the fume hood even with the sash fully closed.

## 2.8 INDUCTION UNITS

- .1 Induction units shall be as indicated on the Mechanical and Architectural Drawings and shall meet the capacity and acoustical performance requirements specified and indicated on the mechanical equipment schedules. Performance data shall be based on the installation above a one or two way discharge diffuser with a maximum airflow resistance of 7.5 Pa (0.03 in H<sub>2</sub>O).
- .2 Induction units shall be designed to fit in the enclosure. All units shall consist of a casing, primary air plenum, water coil frame and mixing chamber manufactured from 20 GA G-60 galvanized sheet steel conforming to ASTM-653 standards. The primary air plenum shall deliver air through a series of induction nozzles and into a mixing chamber. Secondary air shall be drawn into the side of the unit through the vertically mounted water coil and combined with the primary air in the mixing chamber. A single oval air connection spigot shall be mounted on the side or at the end of the unit as indicated on the Drawings. All sheet metal joints in the primary air plenum and air connection spigot shall be sealed airtight. The overall height of the unit shall not exceed 290mm (11½").
- .3 Primary air shall be discharged into the mixing chamber through multi-lobed induction nozzles. The size and quantity of nozzles shall be selected to provide the primary and secondary airflows at the inlet static pressure and noise levels specified. Nozzles shall be manufactured from UL 94 V-0 flame retardant thermoplastic.
- .4 Induction units shall be fitted with a commissioning tube for measuring the static pressure differential between the primary air plenum and the room. Each unit shall be provided with an airflow calibration chart showing primary airflow rate for given nozzle configuration at different static pressures.
- .5 Secondary water coils shall be two pipe configuration as indicated on the schedules. The single vertically mounted coil shall be manufactured with 12mm (½") seamless copper tubing with a minimum 0.016" wall thickness mechanically expanded into corrugated aluminum fins spaced at 12 fins per inch. Coils shall be fitted with a condensate pan manufactured from welded G-60 galvanized steel and powder coated black. The condensate pan shall be sloped at least 1% in accordance with ASHRAE standard 62 and fitted with a plastic capped 12mm (½") O.D copper drain connection. Water velocity in the tubes shall be at least 0.254 m/s (50 FPM) and not exceed 1.219 m/s (240 FPM). The coils shall have a maximum working pressure of no less than 2068 kPa (300 PSI) and be factory tested for leakage at 3447 kPa (500 PSI). Coils shall be rated in accordance with AHRI standard 410. Coil connections shall be 12mm (½" O.D.) bare copper for field sweating to the water circuit. Water coils connection handing shall be as shown on the Drawings.
- .6 Induction unit shall be delivered to site clean and flushed. Each unit shall be labeled with identification tagging and commissioning requirements for primary air and chilled water flow. Units shall be individually packaged in cardboard cartons and palletized on wooden skids.
- .7 The manufacturer shall provide the following options where marked on the Schedules and Drawings



- .1 ½" thick thermal insulation applied to the interior of the primary air plenum to prevent condensation forming on the outside of the unit casing and the interior surfaces of the primary air chamber. Thermal insulation shall be manufactured in accordance with ASTM C1071-05, UL-181 (Air Erosion) and ASTM E84 25/50 (flame spread and smoke density) standards.
- .2 Removable lint screen shall be installed on the face of the coil.
- .3 ½" NPT female threaded connections fitted to the water coil, suitable for field connection to a ½" NPT male flexible hose.

### **Part 3 EXECUTION**

#### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that site conditions are acceptable for air terminal units installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect area where air terminal units are to be installed.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied.

#### **3.2 INSTALLATION**

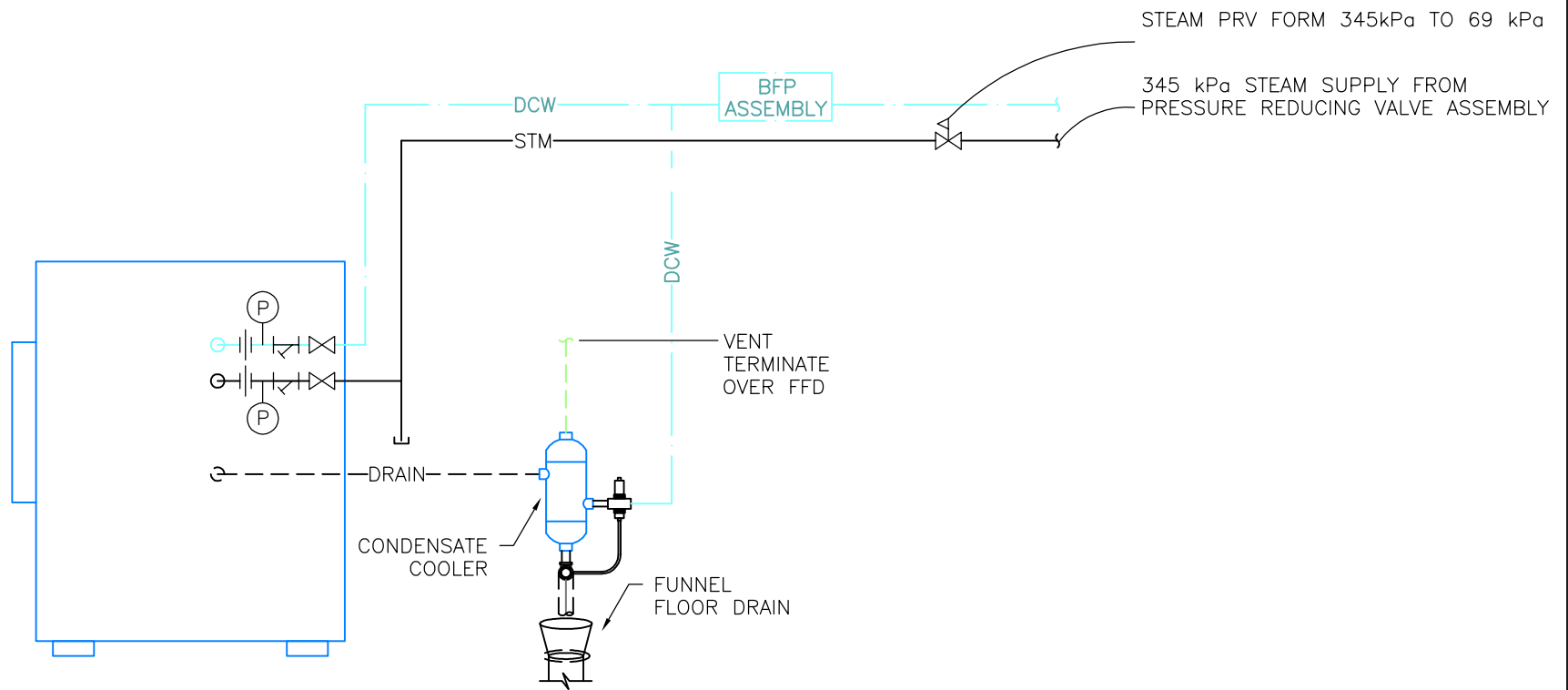
- .1 Install in accordance with manufacturers recommendations.
- .2 Support equipment independently of ductwork.
- .3 Install with at least 1000 mm of flexible inlet ducting and minimum of four duct diameters of straight inlet duct, same size as inlet.
- .4 Locate controls, dampers and access panels for easy access.
- .5 Induction Units
  - .1 Induction unit shall be independently suspended from the wall structure at four points.
  - .2 Air connections to the main primary air duct shall be made with flexible duct with all joints sealed and made airtight.
  - .3 Flexible hoses shall comprise a PTFE lined hose with stainless steel wire braided jacket rated for a maximum operating pressure of not less than 500 PSI at 200°F.

#### **3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
    - .1 Leave Work area clean at end of each day.
  - .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
  - .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
-

- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

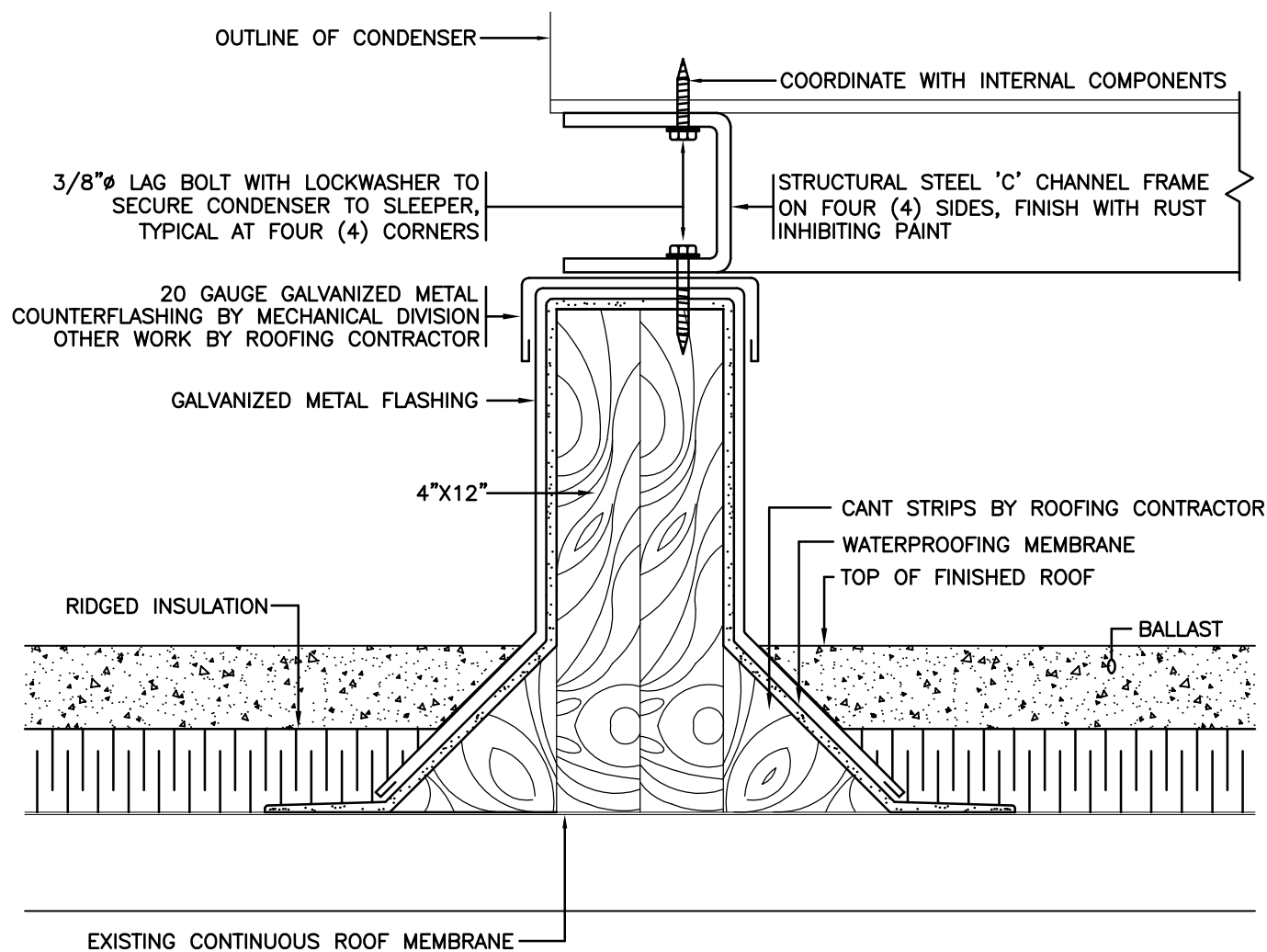


20

M5.01

## TYPICAL STEAM HUMIDIFIER CONNECTION DETAIL

SCALE: N.T.S.



22

M5.01

## DETAIL OF WOODEN SLEEPER

SCALE: N.T.S.

TO BE READ IN CONJUNCTION WITH DRAWING: M5.01

PROJECT TITLE: CANADA CENTRE FOR INLAND WATERS  
PROJECT #: R.073578.001  
DRAWING TITLE: MECHANICAL DETAILS

DRAWING #: SKM- 001  
DRAWN BY: MH  
CHECKED BY: DM  
DATE: 2015- 09- 04

**DIALOG**

PRESSURE REDUCING VALVE SCHEDULE

TAG	SERVICE	TYPE	E.P. (KPA)	L.P. (KPA)	DESIGN FLOW (KG/HR)	SIZE (mm)	REMARKS
PRV-1	CLEAN STEAM	DIRECT ACTING PRESSURE REGULATOR	344	69	11.97	9	PRV-1 TO BE SERVED BY PSV-1. PRV-1 AND PSV-1 TO SERVE HUMIDIFIER ON AHU-3.
PRV-2	CLEAN STEAM	DIRECT ACTING OPERATED PRESSURE REGULATOR	344	69	24.17	12	PRV-3 TO BE SERVED BY PSV-2. PRV-3 AND PSV-2 TO SERVE HUMIDIFIER ON AHU-5.
PRV-3	CLEAN STEAM	INTERNAL PILOT OPERATED PRESSURE REGULATOR	344	69	11.97	25	PRV-3 TO BE SERVED BY PSV-3. PRV-3 AND PSV-3 TO SERVE HUMIDIFIER ON AHU-1.

PRESSURE SAFETY VALVE SCHEDULE

TAG	SERVICE	SIZE (mm x mm)	PRESSURE SET POINT (KPA)	ORFICE	MAX DESIGN FLOW (KG/HR)	REMARKS
PSV-1	PRV-1	12 x 19	103	D	79	MAX DESIGN FLOW TO BE COORDINATED WITH MAX. FLOW THROUGH FROM CORRESPONDING PRESSURE REDUCING VALVE.
PSV-2	PRV-2	12 x 19	103	D	79	MAX DESIGN FLOW TO BE COORDINATED WITH MAX. FLOW THROUGH FROM CORRESPONDING PRESSURE REDUCING VALVE.
PSV-3	PRV-3	25 x 32	103	F	220	MAX DESIGN FLOW TO BE COORDINATED WITH MAX. FLOW THROUGH FROM CORRESPONDING PRESSURE REDUCING VALVE.

INDUCTION UNIT SCHEDULE

TAG	PRIMARY AIR (L/S)	NOZZLE PRESSURE (Pa)	COIL POWER (kW)	WATER FLOW RATE RATE (L/S)	WATER PRESSURE DROP (kPa)	NOTES
IND-A	17	300	0.67	0.09	30	1, 2
IND-B	26	275	0.93	0.09	30	1, 2
IND-C	24	225	0.88	0.09	30	1, 2

- 1 COIL CAPACITIES BASED ON 12°C ENTERING WATER TEMPERATURE AND 24°C ENTERING AIR TEMPERATURE.
- 2 PROVIDE NEW INDUCTION UNITS COMPLETE WITH WALL-TO-WALL ENCLOSURES