NOTIFICATION OF REVISION

Public Works and Government
Services Canada **Addendum No. 2**

Solicitation Name: CFIA GTA Laboratory Expansion and Fit-up
Solicitation Number: R.061999.001

Date: Friday, January 30, 2015

1. MECHANICAL

1.1 SPECIFICATIONS

.1 Section 210501 Common Work Results

.1 Replace spec section entirely with the attached revised Section 210501 dated January 13, 2015. Changes are noted in italics.
.2 Section has been updated to include a detailed phasing information for the work.

.2 Section 230593 Testing, Adjusting and Balancing for HVAC

.1 Replace spec section entirely with the attached revised Section 230593 dated January 13, 2015.

.3 Section 230594 Pressure Testing of Ducted Air Systems

.1 Item 1.9.2 Add:
".4 All air supply and exhaust ductwork in labs. tested to meet SMACNA class "C": not >0.2% vol./min. at 2" (500 Pa)."

.4 Section 233113 Metal Ducts – Low Pressure to 500 Pa

.1 Modify Item 2.1.1 to read:
"…250 B – All *supply and* exhaust ductwork in *labs*."

.2 Modify Item 2.1.1.2 to read:
"…or combination thereof. *Ductwork to be sealed airtight constructed of 304 stainless steel and accessible from outside containment areas*."

.5 Section 235000 Heating and Cooling, 2.28 HVAC Split Systems

.1 Modify item 2.28.1.1.1 to read:
"Factory assembled, single piece with all required wiring, piping, controls, R-410A refrigerant charge."
.2 Modify item 2.28.1.1.7 to read:
"Refrigeration components: Refrigerant type is to be R-410a…"

.6 Section 250501 EMCS General Requirements

.1 Replace spec section entirely with the attached revised Section 250501 dated January 13, 2015.

.2 Note that Controls Schematics are now included at the end of Section 250501.

.7 Section 224203 Commercial Washroom Fixtures

.1 Remove item 2.3.4.1, “SS-1 Countertop Mount Sink – Double Bowl” from specification section.

.2 Remove item 2.3.4.11.2, “EW-2 Emergency Eyewash and Drench Shower combination Thermostatic Mixing Valve” from specification section.

.3 Revise item 2.3.4.12.1 to read as follows, “DF-1 Drinking Fountain - Wall mounted, barrier-free drinking fountain with 14 gauge type 304 stainless steel with satin finish, push-button operated stainless steel valve with front accessible cartridge and flow adjustment, 100% lead-free waterways, polish chrome-plated brass bubbler head and waste strainer, integral 6mm stainless steel mounting plate, vandal resistant bottom plate and 32mm NPT trap. Acceptable manufacturers AMERICAN STANDARD, ZURN & HAWS.”

.4 Add item 2.3.4.13 to read as follows, “.13 Relocated Dump Sink Faucet & Pre-Rinse Unit

1. Faucet – Mixing faucet, deck mounted, swing spout, 200mm centres for hot and cold water, brass bar with polished chrome plated finish, self-contained compression valve with replaceable stainless steel seats, 100mm forged brass wrist blade handles, 225mm swing spout, (2) 32mm male shanks with 8mm OD flexible copper tube inlets, centre fitting with 8mm NPT male inlet, furnished complete with flexible PVC hoses, centre tee fitting, locknuts and washers. 8mm NPS female outlet with removable aerator. Faucet factory assembled and tested prior to shipment.
2. Pre-Rinse Unit – Deck mounted, self-closing valve with replaceable stainless steel seat, rubber bound spray head, nylon handle, stainless steel squeeze handle with plastic cover, 35mm hole in deck, 25mm IPS mounting shank with locknut, 2438mm high pressure reinforced PVC hose 10mm NPT male swivel inlet.”

1.2 DRAWINGS

.1 Drawing M-1.01, Mechanical Symbol Legend and drawing list.

.1 Under General notes, revise first paragraph to read “ All equipment and materials…….shall conform to the requirements of the National Building Code and the requirements of Ontario Building Code Section 3.6.4.3.”

.2 Clarification: ‘R’ = Relocate/Reuse on demolition plans. Any equipment, ductwork, or mechanical services hatched out are to be removed. Only equipment, ductwork, or mechanical services not hatched out with the ‘R’ are to be relocated/reused.

.2 Drawing M-2.01, Level 3 HVAC plan, demolition and new work, phase 1.

.1 Under Construction notes, revise to add note 4 to read “AC-1 to arrive on site nitrogen charged, once leak testing has been witnessed by Cx manager contractor, may charge the units with refrigerant.”

.2 Under Contruction notes, revise to add note 5 to read “All HWS/HWR branch lines to new reheat coils to be 25Ø (Typ.) unless indicated otherwise.”

.3 Under Construction notes, revise to add note 6 to read “Provide temporary supply air connection to Lab 317A supply air diffuser to allow space to remain operational during Phase 1 construction.”

.4 Under Construction notes, revise to add note 7 to read “CMMS is required for all installed or removed equipment on site.”

.5 Revise demolition scope of work for Phase 1 as shown on the attached drawing.

.6 Sample Reception and Extraneous Lab general exhaust ducts to be routed to service core as shown on the attached drawing.

.7 Under Construction notes, revise to add note 8 to read “Existing snorkel to be relocated to new extraneous lab. Snorkel exhaust ductwork to be extended to relocated location as shown on this drawing.”

.3 Drawing M-2.02, Level 3 HVAC plan, demolition and new work, phase 2.

.1 Under Construction notes, revise to add note 3 to read “Dedicated space pressure control system, with pressure readout to be provided for space. Refer to controls drawings for further information.”

.2 Provide space pressure control systems for the spaces shown on the attached drawings.

.3 Under Demolition notes, revise to add note 4 to read “Remove all existing services feeding existing fume hood and cup sink along west wall of existing Extraneous Lab ‘325’. Existing services to be cut back to inside service core and capped.”

.4 Remove and cap existing snorkel exhaust ductwork as shown on the attached drawing. Existing snorkel to be relocated to new Extraneous Lab.

.4 Drawing M-2.03, Level 3 HVAC plan, demolition and new work, phase 3.

.1 Under Construction notes, revise to add note 3 to read “Connect new sheet metal exhaust ducts to lab general exhaust service in service core.”

.2 Under Construction notes, revise to add note 4 to read “AC-2 to arrive on site nitrogen charged, once leak testing has been witnessed by Cx manager contractor, may charge the units with refrigerant

.3 Under Contruction notes, revise to add note 5 to read “All HWS/HWR branch lines to new reheat coils to be 25Ø (Typ.) unless indicated otherwise.”

.4 Under Construction notes, revise to add note 6 to read “CMMS is required for all installed or removed equipment on site.”

.5 Under Construction notes, revise to add note 7 to read “Dedicated space pressure control system, with pressure readout to be provided for space. Refer to controls drawings for further information.”

.6 Provide space pressure control systems for the spaces shown on the attached drawings.

.5 Drawing M-3.01, 2, & 3 Level 3 Plumbing plan phase 1, phase 2 & phase 3

.1 Plumbing fixture tags added to attached drawings. Cross-reference tags with spec section 224203 for fixture types.

.6 Drawing M-4.01, 2 & 3 Level 3 Fire protection plan, phase 1, phase 2 & phase 3

.1 Under General notes, revise to add note 3 to read “ Fire protection Hydraulic calculation to be submitted by fire protection contractor. SNC Cx manager to witness the stand pipe flow test.

.2 Under General notes, revise to add note 4 to read “CFIA Laboratories classified as Ordinary Hazard, Group 1 occupancy.”

.7 Drawing M-5.01 Schematics & Details

.1 CFIA Lab Air Systems Schematic revised as shown in the attached drawings.

.2 Canopy Connection / Installation Detail revised as shown in the attached drawings.

.8 Drawing M-6.01, ME schedules.

.1 Split AC unit schedule:
-under manufacturer & unit model number column delete manufacturer's name and unit model number.
-under starter & controls column revise "supplied and installed by div. 15 to be div. 23 & change div 16 to be div. 26."

End of Addendum No. 2

GENERAL NOTES

ALL EQUIPMENT AND MATERIALS LOCATED IN ANY CONCEALED SPACE USED AS A RETURN AIR PLENUM SHALL CONFORM TO THE REQUIREMENTS OF THE NATIONAL BUILDING CODE AND THE REQUIREMENTS OF ONTARIO BUILDING CODE SECTION 3.6.4.3

~~THE POTABLE WATER SYSTEM SHALL BE PROTECTED AGAINST~~ BACK SIPHONAGE FROM ANY MACHINERY OR EQUIPMENT BY A CERTIFIED CAN/CSA B64.10-94 BACKFLOW PREVENTER AS PER THE ONTARIO BUILDING CODE SUBSECTION 7.6.2.

ALL FIRE EXTINGUISHER TO BE TYPE 3A-10BC

HAZARD/GROUP DESIGNATION

ASTERISK ADJACENT TO ROOM NUMBER INDICATES COVERAGE, ALL OTHER AREAS TO BE LIGHT HAZARD COVERAGE WITH A MAXIMUM SQUARE FOOT COVERAGE PER HEAD OF 225 (20.9 SQ. M.)

* ORDINARY HAZARD GROUP 1
** ORDINARY HAZARD GROUP 2

NOT ALL SYMBOLS SHOWN ON THIS LEGEND ARE NECESSARILY USED ON THIS PROJECT.

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PROJECT:
CFIA GTA LABORATORY EXPANSION AND FIT-UP

ARCHITECT: RPL ARCHITECTS INC.

DATE: JAN 30, 2015

DRAWN BY: D.R.

REF. DWG. NO. M-1.01

DWG. NO. SKM-1

ISSUED WITH ADD #002

CONSTRUCTION NOTES:

1. CONNECT NEW SHEET METAL EXHAUST DUCTS TO LAB GENERAL EXHAUST SERVICE IN SERVICE CORE.

2. ALL NEW SUPPLY DUCTWORK TO BE EXTERNALLY INSULATED.

3. ROUTE NEW 250ø STAINLESS STEEL FUMEHOOD EXHAUST DUCTS TO WALL AT GRIDLINE 8 FOR FUTURE CONNECTION TO EXISTING IN PHASE #2.

4. AC-1 TO ARRIVE ON SITE NITROGEN CHARGED, ONCE LEAK TESTING HAS BEEN WITNESSED BY CX MANAGER CONTRACTOR MAY CHARGE THE UNITS WITH REFRIGERANT.

5. ALL HWS/HWR BRANCH LINES TO NEW REHEAT COILS TO BE 25ø (TYP.) UNLESS INDICATED OTHERWISE.

6. PROVIDE TEMPORARY SUPPLY AIR CONNECTION TO LAB 317A SUPPLY AIR DIFFUSER TO ALLOW SPACE TO REMAIN OPERATIONAL DURING PHASE 1 CONSTRUCTION.

7. CMMS IS REQUIRED FOR ALL INSTALLED OR REMOVED EQUIPMENT ON SITE.

8. EXISTING SNORKEL TO BE RELOCATED TO NEW EXTRANEOUS LAB. SNORKEL EXHAUST DUCTWORK TO BE EXTENDED TO RELOCATED LOCATION AS SHOWN ON THIS DRAWING.

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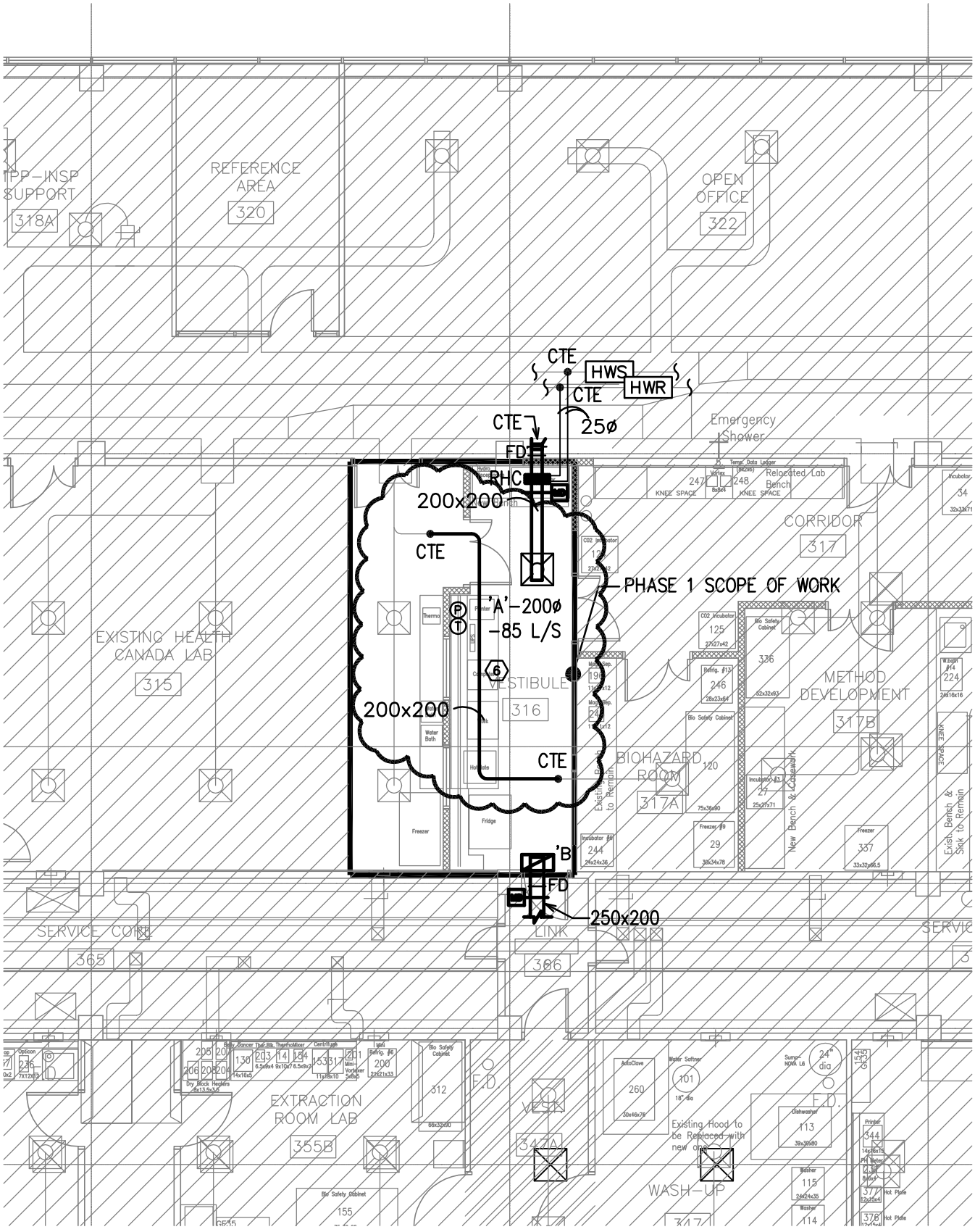
REF. DWG. NO.	M-2.01
DWG. NO.	SKM-2
ISSUED WITH	ADD #002



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M-2.01

DWG. NO.
SKM-3

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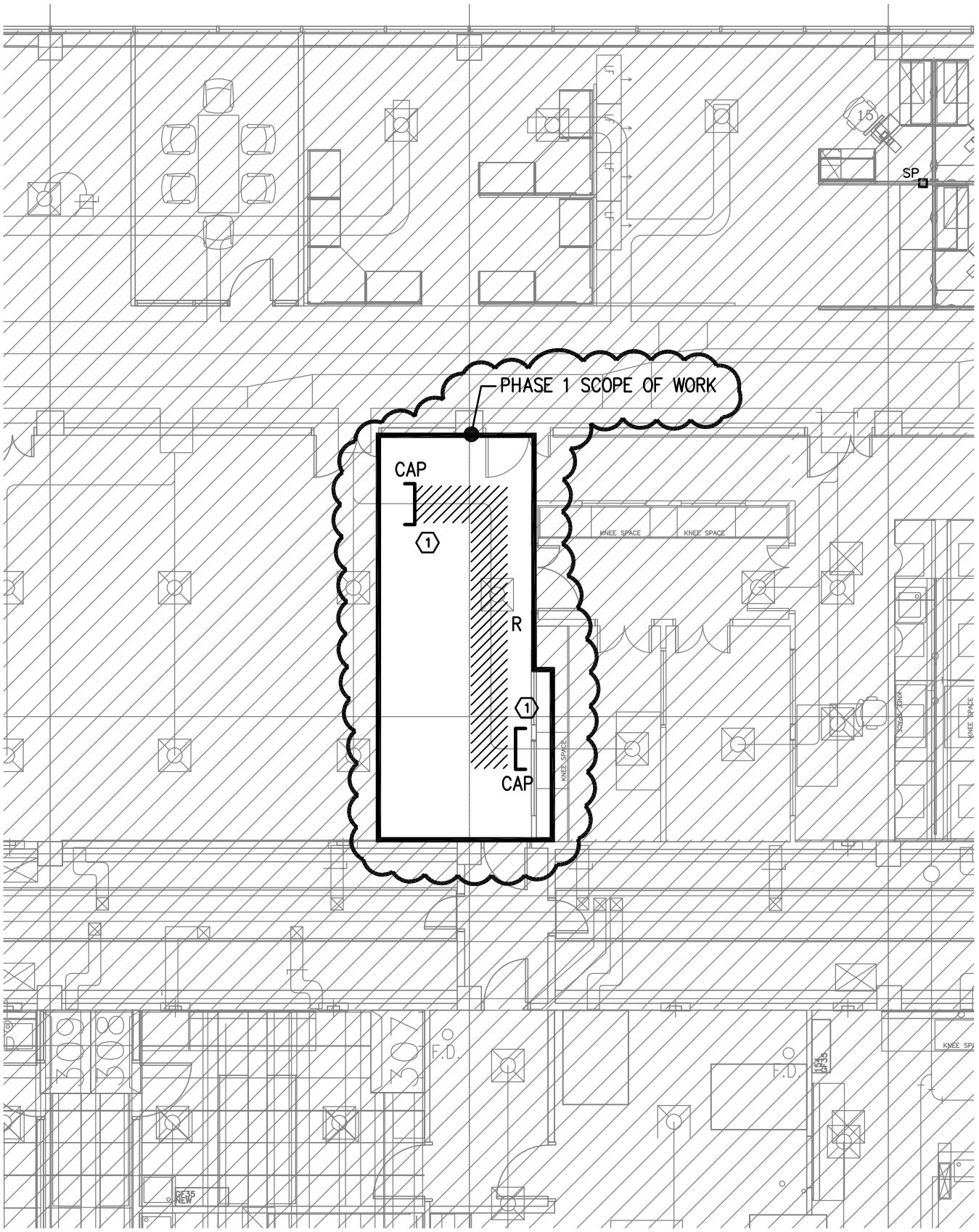

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M-2.01

DWG. NO.
SKM-4

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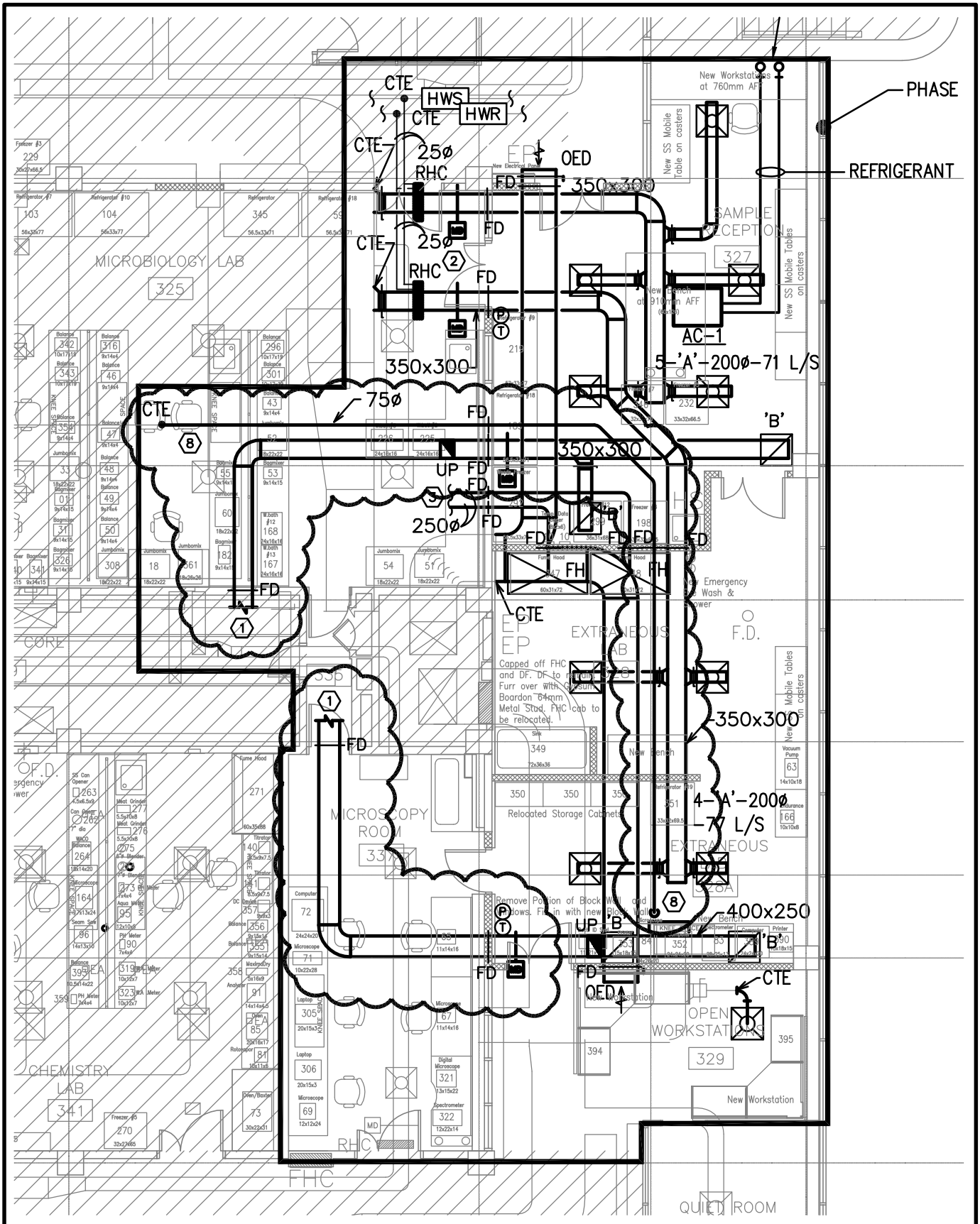

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M-2.01

DWG. NO.
SKM-5

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CONSTRUCTION NOTES:

1. NEW EXHAUST CANOPY HOODS. REFER TO CANOPY ELEVATION/CONNECTION DETAIL FOR FURTHER INFORMATION.

2. ALL SUPPLY DUCTWORK TO BE EXTERNALLY INSULATED.

3. CONNECT NEW SHEET METAL EXHAUST DUCTS TO LAB GENERAL EXHAUST SERVICE IN SERVICE CORE.

4. AC-2 TO ARRIVE ON SITE NITROGEN CHARGED, ONCE LEAK TESTING HAS BEEN WITNESSED BY CX MANAGER CONTRACTOR MAY CHARGE THE UNITS WITH REFRIGERANT.

5. ALL HWS/HWR BRANCH LINES TO NEW REHEAT COILS TO BE 25ø (TYP.) UNLESS INDICATED OTHERWISE.

6. CMMS IS REQUIRED FOR ALL INSTALLED OR REMOVED EQUIPMENT ON SITE.

7. DEDICATED SPACE PRESSURE CONTROL SYSTEM, WITH LOCAL PRESSURE READOUT TO BE PROVIDED FOR SPACE. REFER TO CONTROLS DRAWINGS FOR FURTHER INFORMATION.

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DWG. NO.	SKM-6
ISSUED WITH	ADD #002

GENERAL NOTES:

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ARCHITECTURAL DRAWINGS.
2. CONTRACTOR AND ALL SUB-TRADES ARE RESPONSIBLE TO BE FAMILIAR WITH AND COMPLY WITH ALL ITEMS NOTED IN SEPARATE SPECIFICATION. FAILURE TO DO SO WILL RESULT IN CONTRACTOR CORRECTING ANY DEFICIENCY AT OWN EXPENSE.
3. FIRE PROTECTION HYDRAULIC CALCULATIONS TO BE SUBMITTED BY FIRE PROTECTION CONTRACTOR. SNC CX MANAGER TO WITNESS THE STAND PIPE FLOW TEST.
4. CFIA LABORATORIES ARE CLASSIFIED AS ORDINARY HAZARD, GROUP 1 OCCUPANCY.

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DRAWN BY: D.R.

REF. DWG. NO. M-4.01, 2 & 3

DWG. NO. SKM-7

ISSUED WITH ADD #002

DEMOLITION NOTES:

1. REMOVE EXISTING DUCTWORK AND CAP.
2. EXISTING ABANDONED EXHAUST CANOPY TO BE REMOVED
3. REMOVE EXISTING FUMEHOODS AND CAP SERVICES.
4. REMOVE ALL EXISTING SERVICES FEEDING EXISTING FUME HOOD AND CUP SINK ALONG WEST WALL OF EXISTING EXTRANEOUS LAB '325'. eXISTING SERVICES TO BE CUT BACK TO INSIDE THE SERVICE CORE AND CAPPED.

CONSTRUCTION NOTES:

1. CONNECT TO EXISTING 250ø CAPPED STAINLESS STEEL DUCTS.
2. ALL SUPPLY DUCTWORK TO BE EXTERNALLY INSULATED.
3. DEDICATED SPACE PRESSURE CONTROL SYSTEM, WITH LOCAL PRESSURE READOUT TO BE PROVIDED FOR SPACE. REFER TO CONTROLS DRAWINGS FOR FURTHER INFORMATION.

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REF. DWG. NO.	M-2.02
DWG. NO.	SKM-8
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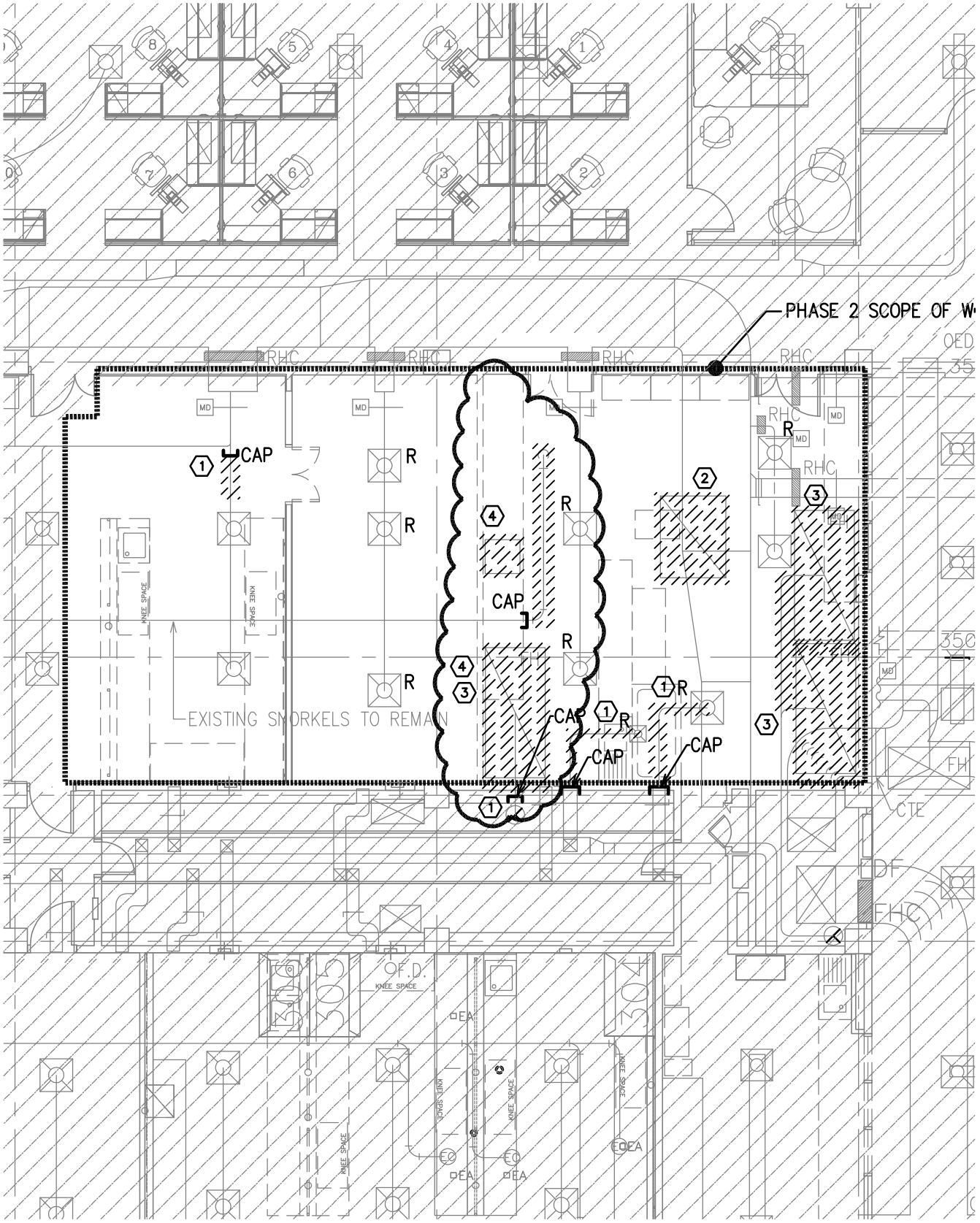

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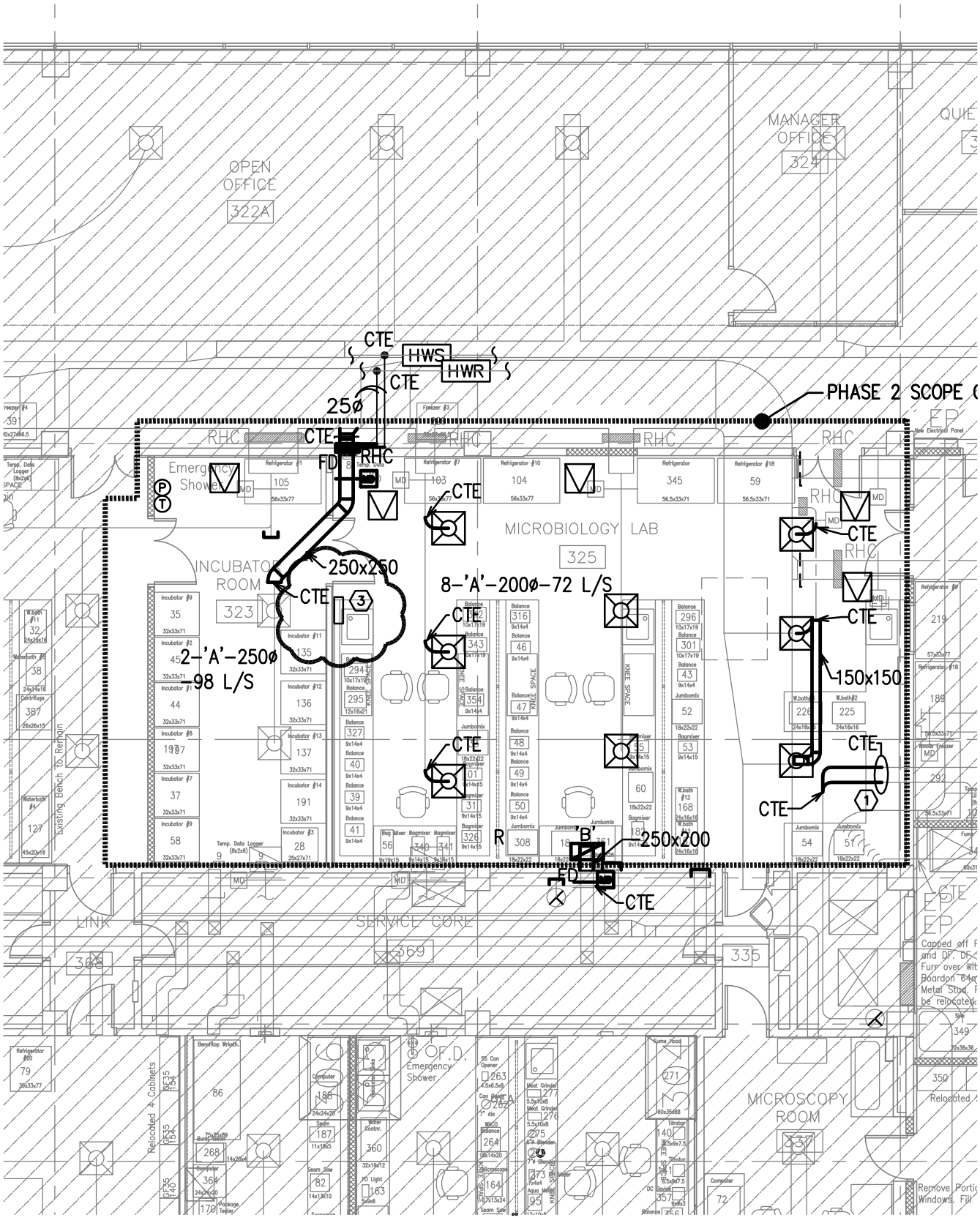

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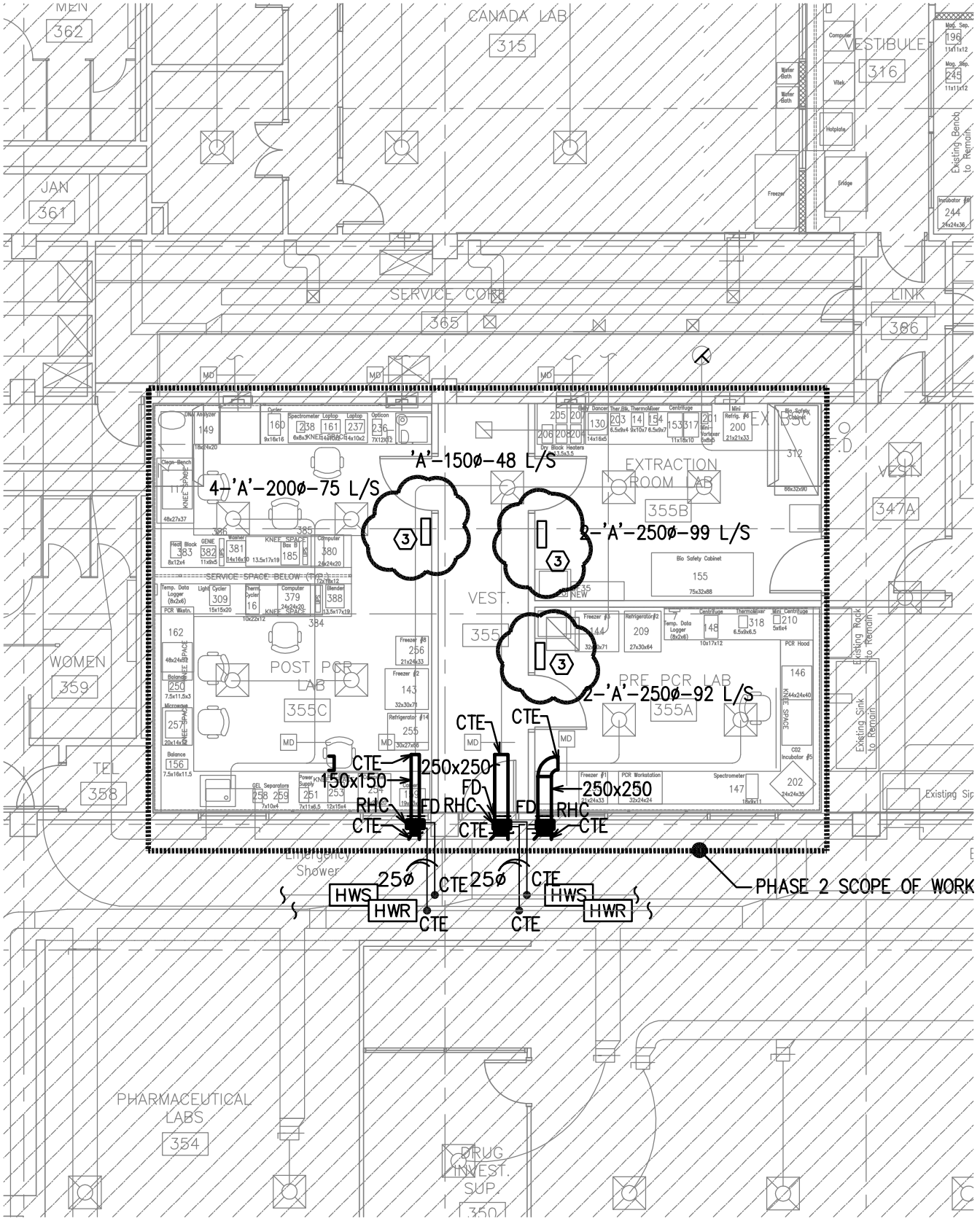

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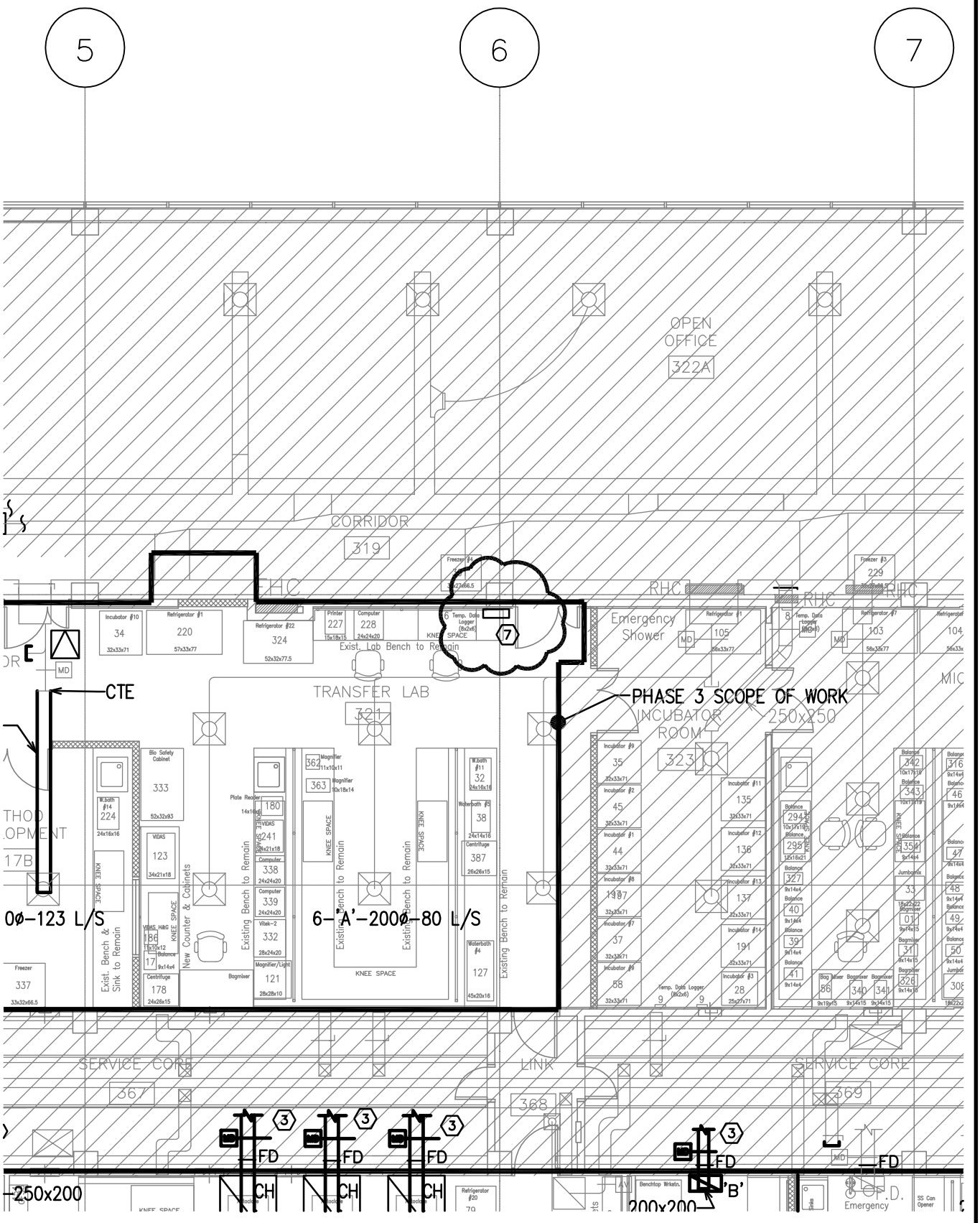

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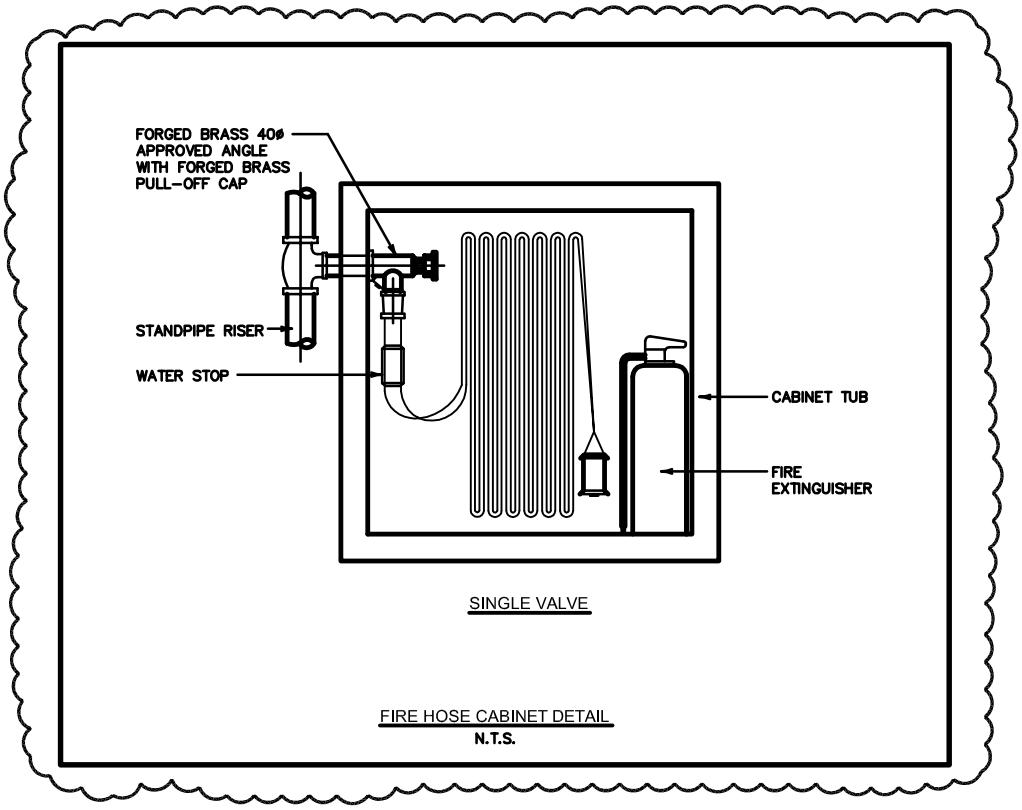

SINGLE VALVE

FIRE HOSE CABINET DETAIL
N.T.S.

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DWG. NO.	SKM-13
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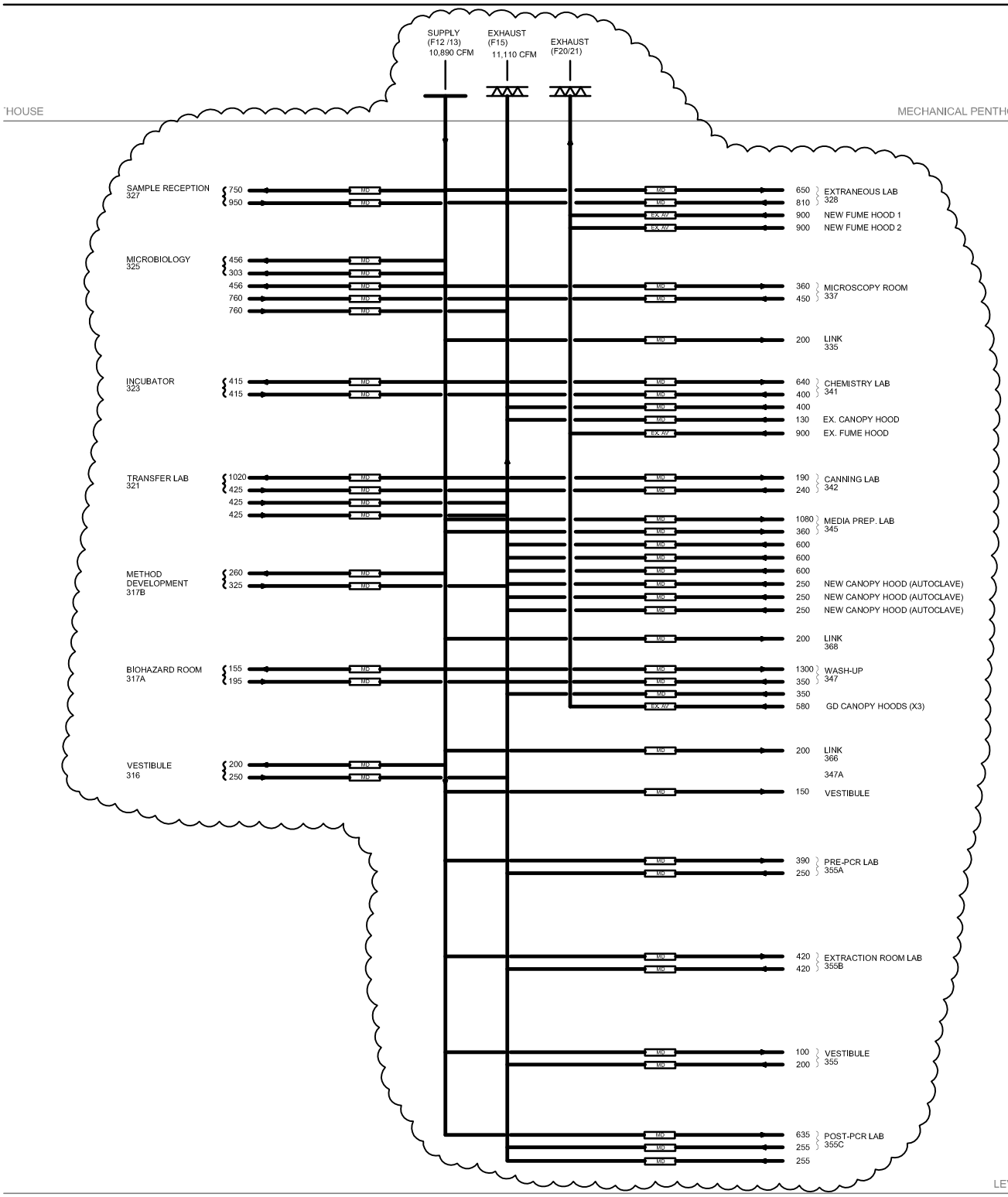

CFIA LAB AIR SYSTEM SCHEMATIC

NTS

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REF. DWG. NO.	M-5.01
DWG. NO.	SKM-14
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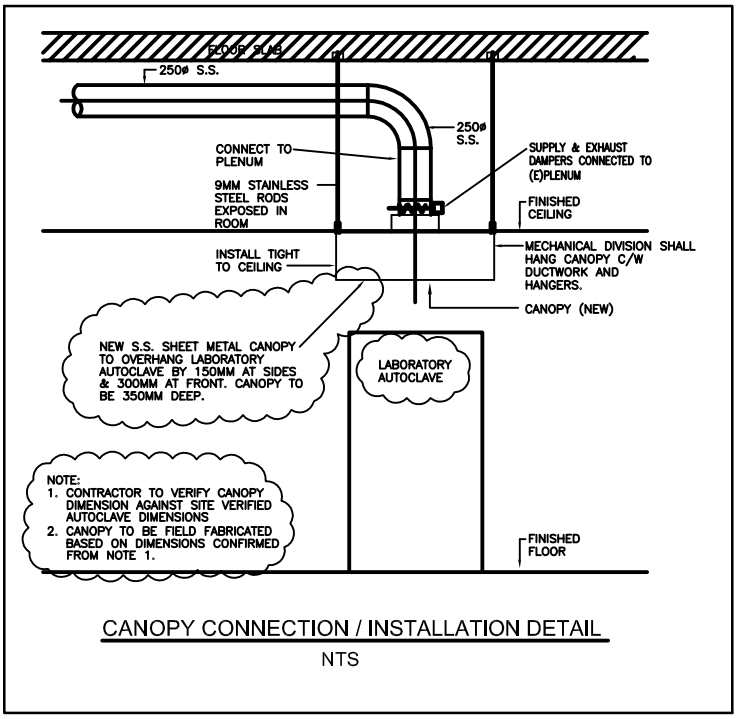

CANOPY CONNECTION / INSTALLATION DETAIL

NTS

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ARCHITECT:	RPL ARCHITECTS INC.
DATE:	JAN 30, 2015
DRAWN BY:	D.R.
REF. DWG. NO.	M-5.01
DWG. NO.	SKM-15
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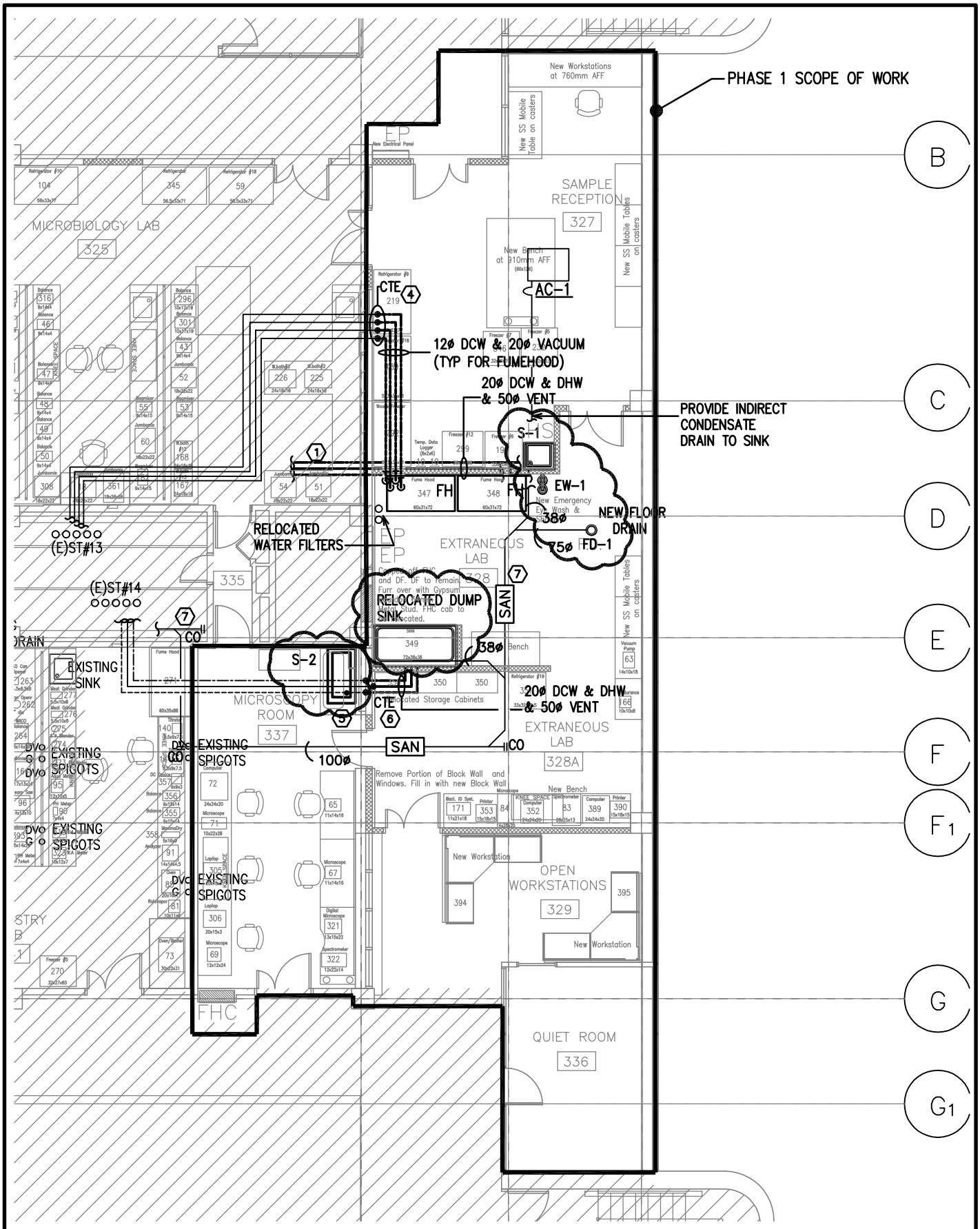

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ARCHITECT:	RPL ARCHITECTS INC.
DATE:	JAN 30, 2015
DRAWN BY:	D.R.
REF. DWG. NO.	M-3.01
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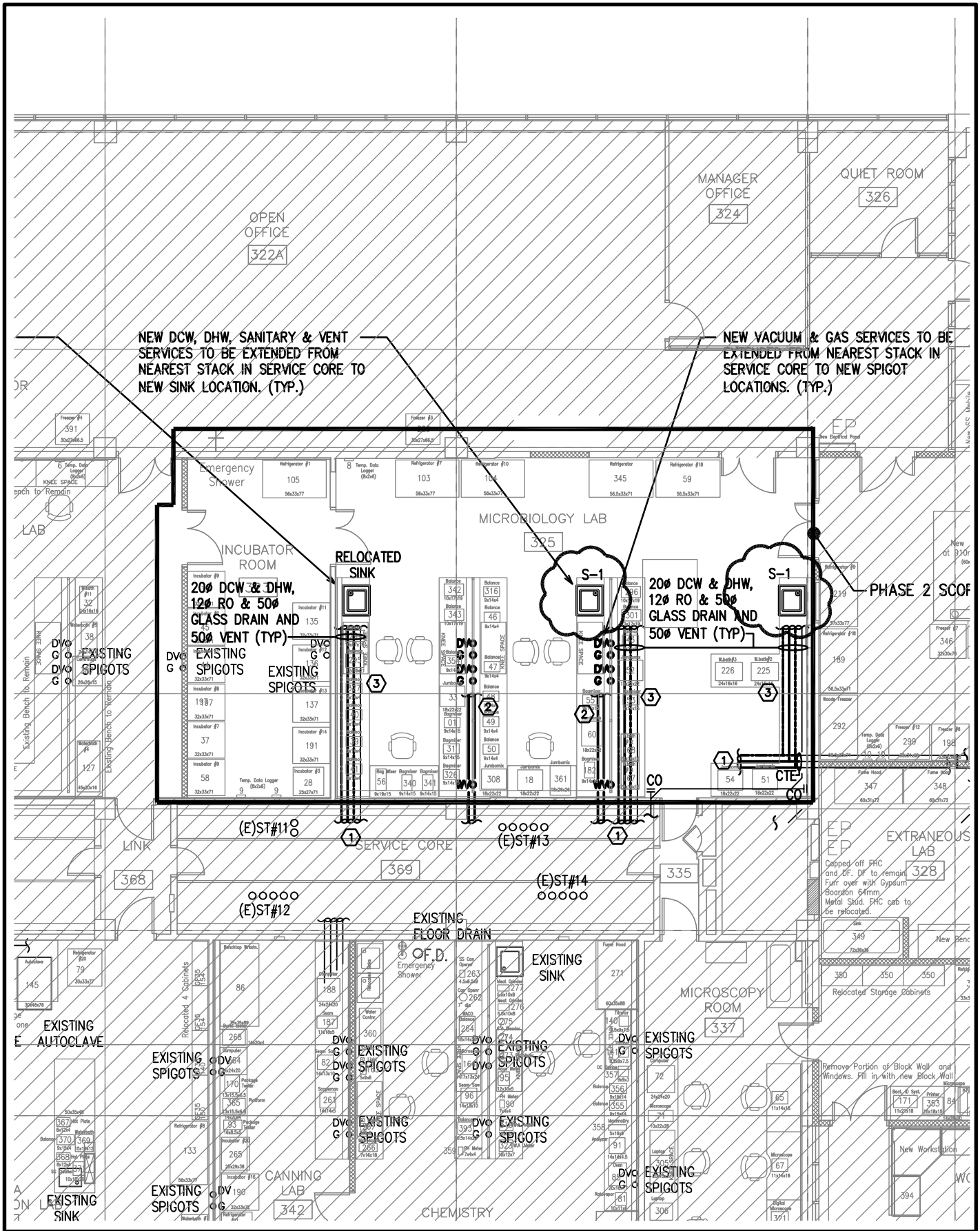

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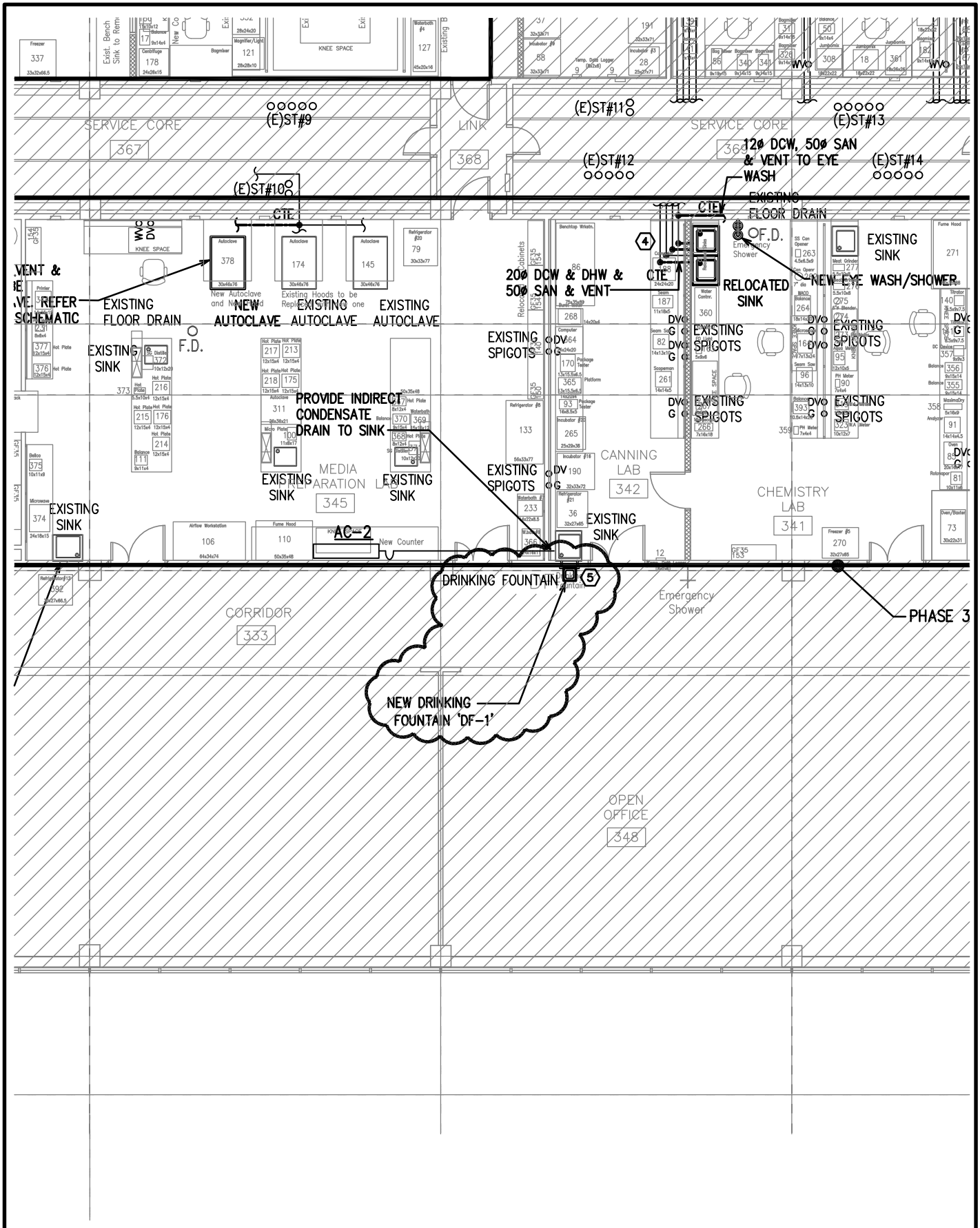
PROJECT: CFIA GTA LABORATORY EXPANSION AND FIT-UP	REF. DWG. NO. M-3.02
ARCHITECT: RPL ARCHITECTS INC.	DWG. NO. SKM-17
DATE: JAN 30, 2015 / DRAWN BY: D.R.	ISSUED WITH ADD #002



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PROJECT: CFIA GTA LABORATORY EXPANSION AND FIT-UP		REF. DWG. NO. M-3.03
ARCHITECT: RPL ARCHITECTS INC.		DWG. NO. SKM-18
DATE: JAN 30, 2015	DRAWN BY: D.R.	ISSUED WITH ADD #002

PART 1 GENERAL

1.1 GENERAL

.1 This section covers items common to all sections of Division 21, 22, 23 & 25.

1.2 SCOPE OF WORK

.1 The work of this section includes all labour, materials, and equipment necessary for the complete installation of the mechanical systems shown on the drawings and described in these specifications.

.2 It is the requirement of this work to provide all systems complete, functioning in intended system operation, notwithstanding that every item necessarily required may not be specifically mentioned.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for mechanical equipment and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Ontario, Canada.

.2 Drawings to show:

.1 Mounting arrangements.

.2 Operating and maintenance clearances.

.3 Drawings and product data accompanied by:

.1 Detailed drawings of bases, supports, and anchor bolts.

.2 Acoustical sound power data, where applicable.

.3 Points of operation on performance curves.

.4 Manufacturer to certify current model production.

.5 Certification of compliance to applicable codes.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for mechanical equipment for incorporation into manual.

.1 Operation and maintenance manual approved by Owner, and final copies deposited with Owner before final inspection.

.2 Operation data to include:

.1 Control schematics for systems including environmental controls.

.2 Description of systems and their controls.

.3 Description of operation of systems at various loads together with reset schedules and seasonal variances.

.4 Operation instruction for systems and component.

.5 Description of actions to be taken in event of equipment failure.

.6 Valves schedule and flow diagram.

.7 Colour coding chart.

.3 Maintenance data to include:

.1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.

.2 Data to include schedules of tasks, frequency, tools required and task time.

.4 Performance data to include:

.1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.

.2 Equipment performance verification test results.

.3 Special performance data as specified.

.4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

.5 Approvals:

.1 Submit 2 copies of draft Operation and Maintenance Manual to Owner for approval. Submission of individual data will not be accepted unless directed by Owner.

.2 Make changes as required and re-submit as directed by Owner.

.6 Additional data:

.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.7 Site records:

.1 Owner will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur.

.2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection.

.8 As-Built drawings:

.1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.

.2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).

.3 Submit Owner for approval and make corrections as directed.

.4 Perform testing, adjusting and balancing for HVAC using as-built drawings.

.5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

.9 Submit copies of as-built drawings for inclusion in final TAB report.

1.5 MAINTENANCE MATERIAL SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Furnish spare parts as follows:

.1 One set of packing for each pump.

.2 One casing joint gasket for each size pump.

.3 One head gasket set for each heat exchanger.

.4 One glass for each gauge glass.

.5 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.

.3 Provide one set of special tools required to service equipment as recommended by manufacturers.

.4 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

.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 in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect equipment/materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

1.7 PHASING OF WORK

.1 *Work is to proceed in Phases in order to minimize disruption to client activities. Phases are described as follows:*

.1 *Phase 1a – New Labs 327, 328, 328A, 329, 337*

.1 *Remove existing ductwork and diffusers located in space dedicated to new labs 327, 328, 328A, 329. Cap ductwork.*

.2 *Perform air balancing on affected office supply fan F-110.*

.3 *Sample Preparation 327 – new casework with raceway, new island casework with vertical service column (power).*

.4 *Sample Preparation 327 – new hand sink and taps.*

.5 *Sample Preparation 327 – new electrical panel on Corridor 319*

.6 *Sample Preparation 327 – new door 327 with card reader, strike, closer and auto door bottom.*

.7 *Sample Preparation 327 – new door 325A with closer and auto door bottom.*

.8 *Existing Extraneous Lab 325A – disconnect and cap off pipes, electrical receptacles and remove ss bench on east wall to make way for new door opening. Remaining area in lab to be kept operational until Phase 1d.*

.9 *Extraneous Lab 328 – coring of slab for new drain. Existing Lab Level 2 (below) access required to ceiling for installation of new drain pipe.*

.10 *Extraneous Lab 328 – new eyewash shower*

.11 *Extraneous Lab 328 – 2 new fume hoods.*

.12 *Provide new laboratory services connected from existing stack to bench spigots.*

.13 *Provide two (2) new supply air ducts c/w new motorized dampers and hydronic reheat coils, and*

diffusers as indicated on drawings, connected to existing lab supply air system. Connect reheat coils to existing hot water supply and return piping located in service core. Duct branch and hydronic piping to remain isolated until beginning of Phase 2 work.

.14 Connect new sheet metal exhaust ducts to existing lab general exhaust service in service core. Duct branch to remain isolated until beginning of Phase 2 work.

.15 Route new stainless steel fume hood exhaust ducts to wall at gridline 8 for future connect to existing in Phase 2.

.16 Extraneous Lab 328– new door 328 with closer and auto door bottom.

.17 Extraneous Lab 328A – new casework with spigot (CA) and raceway on south wall.

.18 Extraneous Lab 328A – existing snorkel from Existing Extraneous Lab 325A installed over new casework on south wall.

.19 Extraneous Lab 328A – new door 327 with card reader, strike, closer and auto door bottom.

.20 Extraneous Lab 328A – new door 337A with closer and auto door bottom.

.2 Phase 1b

.1 Remove existing ductwork and diffusers located in room 316 and adjacent areas as shown on drawings. Cap ductwork.

.2 Existing Health Canada Lab 317 – disconnect existing casework, spigots and electrical receptacles. Build wall. Reconnect existing casework and , spigots and install new raceway.

.3 Vestibule 316 – new casework with raceway.

.4 Provide new supply air duct c/w new motorized dampers and hydronic reheat coils, and diffusers as

indicated on drawings, connected to existing lab supply air system. Connect reheat coils to existing hot water supply and return piping located in service core. Duct branch and hydronic piping to remain isolated until beginning of Phase 2 work.

.5 Connect new sheet metal exhaust ducts to existing lab general exhaust service in service core. Duct branch to remain isolated until beginning of Phase 2 work.

.6 Vestibule 316 - relocation of existing Auto Door Opener for door 366A.

.7 Vestibule 316 - new doors 316 and 317C each with closer and auto door bottom.

.3 Phase 1c

.1 Owner needs to keep Microscopy 337 operational until near the end of Phase 1a.

.2 Microscopy 337 – new dump sink, drain and fixtures.

.3 Microscopy 337 – new raceways and spigots (CA).

.4 Microscopy 337 – new door 335 with closer and auto door bottom.

.5 Microscopy 337 – existing door 337 with new auto door bottom, strike and card reader.

.6 Microscopy 337 – new FHC on Corridor 333.

.4 Phase 1d

.1 Owner needs to keep Extraneous 325A operational until Phase 1d.

.2 Existing Extraneous Lab 325A – disconnect existing fume hoods/associated ducts and dump sink and reverse osmosis filters (2).

.3 Extraneous Lab 328 – extend and reconnect ducts to new fume hoods.

.4 Extraneous Lab 328 – install existing dump sink and reconnect

to extended plumbing.

.5 Extraneous Lab 328 – install existing reverse osmosis water filters (2)

.6 Canning 341 – installation of new drinking fountain at Corridor 333.

.5 Phase 2a

.1 Remove existing ductwork in rooms 355, 323, 325, and cap as indicated on drawing M-2.02 detail 1.

.2 Enable new ductwork, motorized dampers and reheat coils added or modified in Phase 1.

.3 Perform TAB on lab supply air handling systems, lab exhaust fans and fume hood exhaust fans.

.4 Microbiology 325 - new and relocated casework: sinks and spigots.

.5 Microbiology 325 - new and relocated casework: new raceways.

.6 Provide new laboratory services connected from existing stack to bench spigots.

.7 Microbiology 325 – new door 335A with closer and auto door bottom.

.8 Microbiology 325 – existing door 325 with existing closer and new auto door bottom.

.9 Microbiology 325 – new door 325B with closer and auto door bottom.

.10 Incubator 323 – new door 323 with closer and auto door bottom.

.11 Provide new supply air duct c/w new motorized dampers and hydronic reheat coils, and new or relocated diffusers as indicated on drawings, connected to existing lab supply air system. Connect reheat coils to existing hot water supply and return piping located in service core. Duct branch and hydronic piping to remain isolated until beginning of Phase 3 work.

.12 Connect new sheet metal exhaust duct to existing lab general

exhaust service in service core. Duct branch to remain isolated until beginning of Phase 3 work.

.13 Connect fume hood exhaust duct provided in Phase 1a to existing fume hood exhaust duct.

.6 Phase 2b

.1 PCR Suite 355 – new and existing electrical receptacles.

.2 PCR Suite 355 – existing doors with existing closers and existing auto door bottoms

.3 Provide new supply air duct c/w new motorized dampers and hydronic reheat coils, and new or relocated diffusers as indicated on drawings, connected to existing lab supply air system. Connect reheat coils to existing hot water supply and return piping located in service core. Duct branch and hydronic piping to remain isolated until beginning of Phase 3 work.

.4 Connect new sheet metal exhaust duct to existing lab general exhaust service in service core. Duct branch to remain isolated until beginning of Phase 3 work.

.7 Phase 3a1

.1 Owner needs to keep existing Microbiology 321 operational during this phase.

.2 Corridor 317 – (part of Phase 3a2 commissioning for Transfer Lab 321).

.3 Corridor 317 – existing casework: spigots (part of Phase 3a2 Commissioning for Transfer Lab 321).

.4 Corridor 317 – existing door with new auto door bottom, strike and card reader.

.5 Bio Hazard 317A – new door 317a with closer and auto door bottom.

.6 Method Development 317B – new door 317b with closer and auto door bottom.

.7 Method Development 317B – new and

existing casework: spigots.

.8 Method Development 317B – new casework: raceways.

.8 Phase 3a2

.1 Install new condensing units for AC-1 and AC-2 on roof.

.2 Remove existing ductwork and cap as indicated on drawing M-2.03 detail 1.

.3 Enable new ductwork, motorized dampers and reheat coils added or modified in Phase 2.

.4 Perform TAB on lab supply air handling systems, lab exhaust fans and fume hood exhaust fans.

.5 Provide new supply air ducts c/w new motorized dampers and hydronic reheat coils, and new or relocated diffusers as indicated on drawings, connected to existing lab supply air system. Connect reheat coils to existing hot water supply and return piping located in service core. Duct branch and hydronic piping to remain isolated until beginning of Phase 3 work.

.6 Connect new sheet metal exhaust duct to existing lab general exhaust service in service core. Duct branch to remain isolated until beginning of Phase 3 work.

.7 Transfer Lab 321 – existing casework: spigots.

.8 Transfer Lab 321 – existing door 321 with new auto door bottom.

.9 Transfer Lab 368a – existing door 366a with new auto door bottom.

.9 Phase 3b

.1 Media Preparation 345 – Autoclaves (2 existing in lab and 1 existing to be installed).

.2 Media Preparation 345 – Autoclave canopies (3 new to be installed).

.3 Provide new plumbing services for relocated Autoclave as shown in detail on drawing M-5.01. Installation of Autoclave by CFIA.

.4 Wash-Up 347 – Autoclave canopy to be replaced with new

.5 Wash-Up 347 – Dishwasher canopy to be replaced with new

.6 Provide new supply air ducts c/w new motorized dampers and hydronic reheat coils, and new or relocated diffusers as indicated on drawings, connected to existing lab supply air system. Connect reheat coils to existing hot water supply and return piping located in service core. Duct branch and hydronic piping to remain isolated until beginning of Phase 3 work.

.7 Connect new sheet metal exhaust duct to existing lab general exhaust service in service core. Duct branch to remain isolated until beginning of Phase 3 work.

.8 Connect canopy exhaust hoods to lab exhaust duct c/w motorized damper and controls.

.10 Phase 3c

.1 Canning 342 – existing garburators (2)

.2 Canning 342 – spigots

.3 Canning 342 - raceways

.4 Chemistry 341 – existing sinks, taps, drains and eyewash

.5 Chemistry 341 – spigots

.6 Chemistry 342 - raceways

.7 Chemistry 341 – emergency shower

.8 Provide new supply air ducts c/w new motorized dampers and hydronic reheat coils, and new or relocated diffusers as indicated on drawings, connected to existing lab supply air system. Connect reheat coils to existing hot water supply and return piping located in service core. Duct branch and hydronic piping to remain isolated until beginning of Phase 3 work.

.9 Connect new sheet metal exhaust duct to existing lab general exhaust service in service core.

Duct branch to remain isolated until beginning of Phase 3 work.

.10 Connect canopy exhaust hoods to lab exhaust duct c/w motorized damper and controls.

.11 Perform Final TAB on systems, equipment, components, controls for the following:

.1 F12/13

.2 F15

.3 F9

.4 F20/21

.5 F110

.6 All motorized dampers, fume hoods, canopy hoods, and hydronic reheat coils serving the areas of work.

.7 Confirm calibration of all airflow stations and pressure monitoring devices.

PART 2 PRODUCTS

2.1 MATERIALS

.1 HVAC R Equipment:

.1 Refrigerant:

.1 Non CFC based refrigerant.

.2 EXAMINATION

.2 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for equipment installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Owner.

.2 Inform Owner of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied.

2.2 PAINTING REPAIRS AND RESTORATION

.1 Do painting in accordance with Section 09 91 23 - Interior Painting.

.2 Prime and touch up marred finished paintwork to match original.

.3 Restore to new condition, finishes which have been damaged.

2.3 FIELD QUALITY CONTROL

.1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.2 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

2.4 DEMONSTRATION

.1 Owner will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

.2 Trial usage to apply to following equipment and systems:

.1 HVAC

.2 Domestic Water

.3 Fire Suppression

.3 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.4 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

.5 Instruction duration time requirements as specified in appropriate sections.

.6 Contractor will record these demonstrations on video tape for future reference.

2.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.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 - Cleaning.

2.6 PROTECTION

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system,

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 TAB is used throughout this Section to describe the process, methods and requirements of testing, adjusting and balancing for HVAC.

.2 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do other work as specified in this section.

1.2 QUALIFICATIONS OF TAB PERSONNEL

.1 Submit names of personnel to perform TAB to Owner within 90 days of award of contract.

.2 Provide documentation confirming qualifications, successful experience.

.3 TAB: performed in accordance with the requirements of standard under which TAB Firm's qualifications are approved:

.1 Associated Air Balance Council, (AABC) National Standards for Total System Balance, MN-1-2002.

.2 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing - 2002.

.4 Recommendations and suggested practices contained in the TAB Standard: mandatory.

.5 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.

.6 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.

.7 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.

.8 TAB Standard quality assurance provisions such as performance guarantees form part of this contract.

.1 For systems or system components not covered in TAB Standard, use TAB

procedures developed by TAB Specialist.

.2 Where new procedures, and requirements, are applicable to Contract requirements have been published or adopted by body responsible for TAB Standard used (AABC, NEBB, or TABB), requirements and recommendations contained in these procedures and requirements are mandatory.

1.3 PURPOSE OF TAB

.1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads.

.2 Adjust and regulate equipment and systems to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.

.3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

.4 Advise OWNER and Mechanical Contractor if additional sheaves required to meet balance point, Contractor shall pay for sheaves.

1.4 EXCEPTIONS

.1 TAB of systems and equipment regulated by codes, standards to satisfaction of authority having jurisdiction.

1.5 CO-ORDINATION

.1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule to ensure completion before acceptance of project.

.2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

.3 TAB work will occur in Phases as per the phased construction schedule. Refer to Section 210501 and drawings. TAB contractor to allow for return visits to perform TAB at

the end of each Phase as well as at the final stage, which will include verification of pressure differential at each lab entrance.

.4 *TAB contractor to allow for demonstration of TAB work as required by Commissioning agent.*

1.6 PRE-TAB REVIEW

.1 Review contract documents before project construction is started and confirm in writing to OWNER adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.

.2 Review specified standards and report to OWNER in writing proposed procedures which vary from standard.

.3 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

1.7 START-UP

.1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.

.2 Follow special start-up procedures specified elsewhere in Division 23.

1.8 OPERATION OF SYSTEMS DURING TAB

.1 Operate systems for length of time required for TAB and as required by Owner for verification of TAB reports.

1.9 START OF TAB

.1 Notify Owner 14 days prior to start of TAB.

.2 Start TAB when building is essentially completed, including:

.3 Installation of ceilings, doors, windows, other construction affecting TAB.

.4 Application of weather stripping, sealing, and caulking.

.5 Pressure, leakage, other tests specified elsewhere Division 23.

.6 Provisions for TAB installed and operational.

.7 Start-up, verification for proper, normal and safe operation of mechanical and associated

electrical and control systems affecting TAB including but not limited to:

.1 Proper thermal overload protection in place for electrical equipment.

.2 Air systems:

.1 Filters in place, clean.

.2 Duct systems clean.

.3 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.

.4 Correct fan rotation.

.5 Fire, smoke, volume control dampers installed and open.

.6 Coil fins combed, clean.

.7 Access doors, installed, closed.

.8 Outlets installed, volume control dampers open.

.3 Water systems:

.1 Flushed, filled, vented.

.2 Correct pump rotation.

.3 Strainers in place, baskets clean.

.4 Isolating and balancing valves installed, open.

.5 Calibrated balancing valves installed, at factory settings.

.6 Chemical treatment systems complete, operational.

1.10 APPLICATION TOLERANCES

.1 Do TAB to following tolerances of design values:

.1 HVAC systems: plus 5%, minus 5%.

.2 Hydronic systems: plus or minus 10%.

1.11 ACCURACY TOLERANCES

.1 Measured values accurate to within plus or minus 2% of actual values.

1.12 INSTRUMENTS

.1 Prior to TAB, submit to Owner list of instruments used together with serial numbers.

.2 Calibrate in accordance with requirements of most stringent of referenced standard for

either applicable system or HVAC system.

.3 Calibrate within 28 days of TAB. Provide certificate of calibration to OWNERRepresentative.

1.13 SUBMITTALS

.1 Submit, prior to commencement of TAB:

.2 Proposed methodology and procedures for performing TAB if different from referenced standard.

1.14 PRELIMINARY TAB REPORT

.1 Submit for checking and approval of Owner, prior to submission of formal TAB report, sample of rough TAB sheets. Include:

.1 Details of instruments used.

.2 Details of TAB procedures employed.

.3 Calculations procedures.

.4 Summaries.

1.15 TAB REPORT

.1 Submit format for approval with referenced standard.

.2 TAB report to show results in English units and to include:

.1 Project record drawings.

.2 System schematics.

.3 Submit 4 bound copies of TAB Report to Owner for verification and approval, in bilingual.

1.16 VERIFICATION

.1 Reported results subject to verification by Owner.

.2 Provide personnel and instrumentation to verify up to 30% of reported results.

.3 Number and location of verified results as directed by Owner.

.4 Pay costs to repeat TAB as required to satisfaction of Owner.

1.17 SETTINGS

.1 After TAB is completed to satisfaction of Owner, replace drive guards, close access doors, lock devices in set positions, ensure

sensors are at required settings.

.2 Permanently mark settings to allow restoration at any time during life of facility. Do not eradicate or cover markings.

1.18 COMPLETION OF TAB

.1 TAB considered complete when final TAB Report received and approved by DCC.

.2 Interim reports are to be provided at the completion of each Phase of construction.

1.19 AIR SYSTEMS

.1 Standard: TAB to AABC, SMACNA and ASHRAE.

.2 Do TAB of systems, equipment, components, controls specified Division 23 *including the following:*

.1 F12/13

.2 F15

.3 F9

.4 F20/21

.5 F110

.6 All motorized dampers, fume hoods, canopy hoods, and hydronic reheat coils serving the areas of work.

.7 Confirm calibration of all airflow stations and pressure monitoring devices.

.3 Qualifications: personnel performing TAB/current member in good standing of AABC qualified to standards of AABC.

.4 Quality assurance: perform TAB under direction of supervisor qualified to standards of AABC.

.5 Measurements: to include as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dewpoint), duct cross-sectional area, RPM, electrical power, voltage, noise, vibration.

.6 Locations of equipment measurements: to include as appropriate:

.1 Inlet and outlet of dampers, filter, coil, humidifier, fan, other equipment

causing changes in conditions.

.2 At controllers, controlled device.

.7 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

1.20 OTHER TAB REQUIREMENTS

.1 General requirements applicable to work specified this paragraph:

.1 Qualifications of TAB personnel: as for air systems specified this section.

.2 Quality assurance: as for air systems specified this section.

.2 Building pressure conditions:

.1 Adjust HVAC systems, equipment, controls to ensure specified pressure condition indicated below at all times.

.2 TAB procedures:

.1 Directional airflow to be achieved as shown in schematic on mechanical drawing M-5.01.

.2 Verification of directional airflow to be performed in both occupied and unoccupied modes of operation.

PART 2 PRODUCTS

1.21 NOT USED

.1 Not used.

PART 3 EXECUTION

1.22 NOT USED

.1 Not used.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

.1 Division 1, General Requirements, is part of this Section and shall apply as if repeated here.

.2 Comply with requirements of Section 23.

.3 A Commissioning Manager has been appointed by PWGSC to oversee the complete commissioning of the mechanical, electrical and controls systems for this project. The Commissioning Manager will be involved in construction stage, performance testing stage, including seasonal performance testing, training stage and operations and maintenance documentation stage. The following Specifications outline important requirements that will affect Division 1, 21, 22, 23 & 25 associated with the commissioning process.

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 91 31 – Commissioning (Cx) Plan.
- .3 Section 01 91 33 - Commissioning Forms.
- .4 Section 01 91 41 - Commissioning Training.
- .5 Section 23 05 03 – Mechanical Systems Commissioning.
- .6 Division 21 / 22 / 23 / 25 / 26 Specification Sections.

.4 Division 21, 22, 23 & 25 Contractor must carefully review these Section in preparing their Bid for this Project and the successful Division 21, 22, 23 & 25 Contractor must follow the requirements of this Section and bear all costs associated with services required to assist Commissioning Manager.

1.2 DESCRIPTION

.1 The third floor laboratory area is being renovated. Existing air handling units and exhaust systems will remain. New ventilation system components (supply dampers, exhaust dampers, air flow stations and exhaust air venturi valves) will be connected into the existing air systems.

.2 The facility currently operates on an existing Delta control system. All new work is to be tied into the existing system for monitoring and control as described below. Include in the cost of this project any costs associated with upgrading existing Delta Control system to support new controls and devices, including new field controllers as required. Provide new graphics and update the existing database to include the new controls.

.3 Existing dampers and actuators to be re-used. New dampers and actuators are to be provided for new duct take-offs as shown on drawings. Provide new air flow monitoring devices to measure airflow at each damper.

.4 All fume hood exhaust control will be performed through a Venturi valve. As part of this project, two new fume hoods are being provided by others to replace two existing fume hoods; Venturi valves from decommissioned fume hoods are to be re-used and integrated into new fume hoods controls, and into lab controls under this contract.

.5 This contractor is responsible to provide new fume hood controllers for new fume hoods. Controllers to be provided to fume hood manufacturer for factory installation. Control contractor responsible for field connection, configuration and commissioning of controller.

.6 The control system for the laboratories will maintain airflows, pressure and temperature in the space. Provide new laboratory controllers and airflow stations as required to achieve the updated controls strategies. Fume hood controllers to control the face velocity across the opened fume hood sash at 100 fpm.

.7 All laboratory controllers to come complete with a BACnet communication card for connection to the existing BAS.

.8 Existing electronic control valves for heating coils to remain.

.9 The following labs will be supplied with new Lab Controllers, which will measure (and display) room pressure, and control supply air dampers, exhaust air dampers and reheat coils. The Lab Controller will control to maintain constant room

pressure.

.1 Transfer Lab (321)

.2 Microbiology (325)

.3 Pre PCR Lab (355A)

.4 Extraction Room Lab (355B)

.5 Post PCR Lab (355C)

.10 The remaining labs will be balanced in all modes of operation using supply and exhaust air dampers to maintain constant static pressure. Where there are no existing static pressure sensors, new static pressure sensors will be provided for monitoring at the building automation system.

.11 This contractor will provide network wiring between all control devices which will be connected into the existing BAS. Provide new devices as required to incorporate all new/revised controls to sit on the existing BAS.

.12 Refer Controls Drawings following this section for a schematic summary of all BAS points to be incorporated, including an indication of new and existing points.

.13 This contractor will provide emergency power to all controllers and control devices. Emergency power circuits will be provided by Division 26.

1.3 WORK PERFORMED BY THIS SECTION

.1 Furnish all labour, material, tools and equipment required to deliver a complete and functional Laboratory Control System as shown on the drawings and described in the specification.

.2 Provide an intuitive, reliable, easy to use graphical user interface that allows the operators to easily monitor and control all systems.

.3 Provide all controllers, air dampers, control devices, actuators, air flow stations, sensors, wiring, programming and commissioning for a fully operational system as described herein.

.4 Installation Management

.1 All aspects of the project to be performed under the direct supervision of the controls contractor. This includes design, wiring, programming and verification.

.2 Provide coordination with other trades as required.

.5 Controllers and Software

.1 Provide a BACnet based DDC control system that utilizes distributed control for the system as shown on the drawings and described herein.

.2 System to be built around the ANSI/ASHRAE Standard 135-2012 (BACnet).

.3 Provide all programming to deliver the system and sequences as described.

.4 Provide an intuitive graphical user interface that allows the operators to easily monitor and control the systems.

.6 Control Devices

.1 Provide all new air dampers and actuators as shown on the drawings (bolded) and/or as described in the sequence of operation. Refer also to equipment schedules on drawing M-6.01.

.2 Provide all new control valves (e.g. for new reheat coils) as shown on the drawings (bolded) and/or as described in the sequence of operation. Refer also to equipment schedules on drawing M-6.01.

.3 Provide all control devices and sensors as shown on the drawings, control schematics at the end of this section, and/or described in the sequence of operation.

.7 Wiring

.1 Supply and install all electrical wiring for components furnished under this section. All wiring shall be in accordance with the governing electrical authority.

.2 Electrical interlock wiring of field devices (i.e., flow switches, thermostats) associated with equipment specified under

other sections of this Division is the responsibility of the contractor installing that equipment, unless indicated otherwise.

.3 Power at 120V/60Hz/1Ph is provided under Division 26 in each area as required by the control systems. This includes wiring and conduit up to control panels and electrical power from power panels to BAS panels. Coordinate exact requirements with Division 26.

.8 Hardware and Software Verification

.1 Provide all work and documentation to confirm that all devices are installed, wired, programmed and operating as intended.

.2 Provide all work and documentation to confirm that all systems are operating as described in the sequence of operation and the project documents.

.3 Provide all work and documentation to confirm that requirements of the Commissioning Manager are satisfied.

.4 Location to be coordinated with owner.

.9 Documentation

.1 Provide shop drawings and all documents necessary to supply and install the BAS.

.2 Provide all verification reports as necessary to confirm the installed BAS is fully functional and meets the project requirements.

.3 Provide all as built record drawings, training manuals and operating manuals as required for the operator to manage and operate the facility.

.4 Record documents to capture any

and all changes, including but not limited to:

.1 Contract documents
.2 Interface wiring
.3 Device locations
.4 Alarm messages
.5 Sequences of operation
.6 Operating parameters
.7 Performance trends

.10 Operator Training

.1 Provide a minimum of two (2) days of on-site training for owner/ facility maintenance personnel.

.2 Training to include: Day to day operation, Setpoint adjustments, Understanding DDC components, Review of as-built documents, Understanding system operation, Standard troubleshooting procedures etc.

.11 Arrange for all the necessary inspections and approvals of built-up and modified control systems and relay panels by governing authorities. All electrical equipment, material and its installation shall conform to the current requirements of the following authorities:

.1 CSA
.2 Ontario Hydro Safety Authority
.3 OBC
.4 Ontario Electrical Code

.12 Provide assistance to the balancer for balancing all hydronic and air systems.

1.4 QUALITY ASSURANCE

.1 Qualifications: All work performed by this Section shall be by contractors qualified to work on the existing BAS system (Delta Controls).

.2 All materials and devices used on this project to be new, regularly manufactured and be of the latest design standard.

.3 The installer shall have an established working relationship with the controls vendor.

.4 The controls contractor will provide an experienced project manager to oversee all aspects of the project including preparation of

shop drawings, installation and start-up.

1.5 SUBMITTALS

.1 Submit control shop drawings and wiring diagrams with I/O points, written sequences of operation and components description.

.2 Submit catalogue cuts and specifications on all controls and equipment.

1.6 GUARANTEE

.1 Warranty shall cover all costs for parts, labour, associated travel and expenses for a period of one (1) year following substantial completion of the project.

.2 Control system failures during the warranty period shall be adjusted, replaced or repaired at no additional cost to the owner.

.3 Controls contractor will respond to failures within 24 hours of a call for service.

1.7 ACCEPTANCE

.1 Acceptance by the Consultant will be granted when:

.1 All components installed, operating, calibrated and verified.

.2 System programming is complete and has been accepted, and operating personnel training is complete.

.3 As-built drawings, operating instructions and all other close-out documentation has been submitted.

.4 Refer to additional acceptance requirements in Commissioning Specifications:

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 91 31 – Commissioning (Cx) Plan.

.3 Section 01 91 33 - Commissioning Forms.

.4 Section 01 91 41 - Commissioning Training.

.5 Section 23 05 03 – Mechanical Systems Commissioning.

1.8 ADJUSTMENT AND TRAINING

.1 On completion of the Work, calibrate and adjust all components to operate as required.

.2 Allow for sufficient verification time for HVAC controls verification and commissioning with commissioning manager.

.3 As this work is being carried out in an occupied environment, verification of controls will be an on-going process. Rooms controls are to be verified and tested as each room is completed. The work of the controls contractor is to follow the phasing schedule and will be tied closely to the progress of work by other trades. Notify Consultant and Owner one (1) week in advance of system verification. Refer to project Phasing as described in Section 21 05 01 Common Work Results.

.4 Provide two (2) days training to the owner’s representative on the operation of the systems installed. Training to include: Day to day operation, Setpoint adjustments, Understanding DDC components, Review of as-built documents, Understanding system operation, Standard troubleshooting procedures etc.

.5 Allow for two (2) days of additional programming as requested by Owner’s Representative.

1.9 SHOP DRAWINGS

.1 Submit eight (8) copies of shop drawings for review by Consultant. Shop drawings pertain to each particular item as specified; show project and component name, item reference number, certified physical and performance data; and clearly indicate all applicable parts and accessories. Affix Contractor's "Approved" stamp on all copies of all shop drawings prior to their submittal to the Engineer for review. Electronic shop drawing submissions are acceptable, so long as stamps are affixed. Approval stamp shows name of firm, date the approval was made and the

checker's signature or initials. Should the above requirements not be adhered to, shop drawings submitted will be returned for proper re-submittal.

.2 Shop drawing review by the Consultant is for the sole purpose of ascertaining conformance with general design concept. This review does not mean that the Consultant approves the detail design inherent in the shop drawings, responsibility for which remains with the Contractor submitting same, and such review shall not relieve the Contractor of his responsibility for errors or omission in the shop drawings or of his responsibility for meeting all requirements of the Contract Documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of the work of all subtrades.

.3 Shop drawings (Adobe “PDF” format) shall show the following:

1. Communication link diagram showing location of each controller and network connection to operator workstation.

2. List of connected data points (input/output summaries) including controllers to which they are connected and input/output devices (sensors, transducers, etc.).

3 Drawings of each HVAC system showing all connected devices, all wiring connections between all components with terminal numbers, all data point addresses (connected and calculated) and operator notations. Wiring diagrams shall clearly designate between Division 21, 22, 23 & 25 and Division 26.

4. Documentation of all maintenance

procedures for each system components including inspection, periodic preventive maintenance, fault diagnosis and repair or replacement of defective module. This shall include calibration, maintenance and repair of sensors, transmitters, transducers and panels plus diagnostics and repair or replacement of all system hardware.

.5 Damper schedules with construction details and dimensions. Identify air valves in accordance with specification and drawings.

.6 Specifications and data sheets for all control system components including relays, switches, thermostats, controllers, dampers, indicators, flow switches, sensors and similar components.

.7 Valve schedules with construction details, pressure drops and flows.

.8 Complete sequences of operation for each zone.

.9 Technical specification data sheets of each system component and software module.

.4 Provide a copy of all “as-built” shop drawings in each of the Manuals specified. Provide an Operator’s manual consisting of instructions, program listings and control sequences. As-built drawings to capture changes in contract documents, interference wiring, routing, device locations, and controls scope. They will also include device part numbers, panel locations and wire routing.

.5 Shop Drawing must be reviewed by the Consultant before any materials are delivered or installed at

site.

1.10 SYSTEM PERFORMANCE

.1 Performance Standards. System shall conform to the following minimum standards over network connections. Systems shall be tested using manufacturer's recommended hardware and software for operator workstation.

.1 Graphic Display. A graphic with 20 dynamic points shall display with current data within 1 sec.

.2 Graphic Refresh. A graphic with 20 dynamic points shall update with current data within 8 sec. and shall automatically refresh every 15 sec.

.3 Configuration and Tuning Screens. Screens used for configuring, calibrating, or tuning points, PID loops, and similar control logic shall automatically refresh within 6 sec.

.4 Object Command. Devices shall react to command of a binary object within 2 sec. Devices shall begin reacting to command of an analog object within 2 sec.

.5 Alarm Response Time. An object that goes into alarm shall be annunciated at the workstation within 5 sec.

.6 Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 1 sec. Select execution times consistent with the mechanical process under control.

.7 Performance. Programmable controllers shall be able to completely execute DDC PID control loops at a frequency adjustable down to once per sec. Select execution times consistent with the mechanical process under control.

.8 Multiple Alarm Annunciations. Each workstation on the network (one only required initially) shall receive alarms within 5 sec of other workstations.

.9 Reporting Accuracy. System shall report values with minimum end-to-end accuracy listed in Table 1.

.10 Control Stability and Accuracy. Control loops shall maintain measured variable at setpoint within tolerances listed in Table 2.

Table 1 - Reporting Accuracy

Measured Variable	Reported Accuracy
Space Temperature	±0.5°C (±1°F)
Ducted Air	±0.5°C (±1°F)
Outside Air	±1.0°C (±2°F)
Dew Point	±1.5°C (±3°F)
Water Temperature	±0.5°C (±1°F)
Delta-T	±0.15°C (±0.25°F)
Relative Humidity	±5% RH
Water Flow	±2% of full scale
Airflow (terminal)	±10% of full scale (see Note 1)
Airflow (measuring stations)	±5% of full scale
Airflow (measuring stations - pressurized spaces)	±3% of full scale/range of device)
Air Pressure (ducts)	±25 Pa (±0.1 in. w.g.)
Air Pressure (space)	±3 Pa (±0.01 in. w.g.)
Water Pressure	±2% of full scale (see Note 2)
Electrical (A, V, W, Power Factor)	±1% of reading (see Note 3)
Carbon Monoxide (CO)	±5% of reading
Carbon Dioxide (CO_2)	±50 ppm

Note 1: 10% - 100% of scale
Note 2: For both absolute and differential pressure
Note 3: Not including utility-supplied meters

Table 2 - Control Stability and Accuracy

Controlled Variable	Control Accuracy	Range of Medium
Air Pressure	±3 Pa (±0.01 in. w.g.)	
Airflow	±10% of full scale	
Space Temperature	±1.0°C (±2.0°F)	
Duct Temperature	±1.5°C (±3°F)	
Humidity	±5% RH	
Fluid Pressure	±10 kPa (±1.5 psi)	

1.11 RELATED WORK

.1 Products Furnished but Not Installed by This Section:

.1 None

.2 Products Installed but Not Furnished by This Section:

.1 None

.3 Products or Services Not Furnished or Installed by This Section:

.1 Fume Hoods
.2 Access Doors
.3 Power Wiring for Control Panels

.4 Circuit Breakers or Power Sources for Controls
.5 Internet Connection
.6 Power wiring for all electric motors will be by Division 26 unless indicated otherwise
.6 Electromagnetic starters with required number of ancillary contactors will be supplied and installed by Division 26 unless supplied as an integral part of equipment.

.4 Supply and installation of control valves will be by this Section.

.4 Fume hood controls will be provided and commissioned by others, however the work to migrate the existing Venturi valve control points over to the new fume hood controller is included in this contract. This contractor is responsible to ensure that the Lab Controllers operate properly with and interface as necessary with fume hood controls.

PART 2 PRODUCTS

2.1 ACTUATORS

.1 Electric/Electronic Sized to provide adequate power for opening, closing and modulating dampers or valves in specified time.

.2 Provide each actuator with a bracket for attaching to ductwork, building structure, or equipment. Do not install actuators in ducts or fresh air intakes.

.3 Provide actuators to equipment manufacturer's specifications.

.4 All damper and valve actuators to be provided with spring return to normal position

.5 Unless shown otherwise on drawings, actuators to be provided and set up such that all heating valves and return air dampers are normally open and cooling valves, exhaust and outdoor air

dampers are normally closed.

.6 Actuators for Valves:

.1 Each automatic control valve shall be fitted with a "fail-safe" operator capable of tight shut-off against the differential imposed by the system.

.2 Valve actuators on valves 3 in. dia. and larger shall be provided with a manual position override.

.3 Floating point control of valves is not acceptable under any circumstances.

.7 Actuators for Dampers:

.1 All actuators for control dampers shall be electric type and be powered by a single phase AC 24V overload-proof synchronous motor.

.2 All actuators shall be direct-coupled type for both modulating or two position control dampers.

.3 All damper actuators shall be selected to operate maximum damper loads of 28 sq.ft. (2.6 sq.m.).

.4 Each actuator shall be "fail safe", complete with external adjustable stops to limit the length of stroke in either direction and mounted on an adjustable bracket. Operating arms shall have double yoke linkages and double set of screws for fastening to the damper shaft.

2.2 AUTOMATIC CONTROL VALVES

.1 Properly sized and selected by the manufacturer in accordance with load requirements and characteristics of the systems to which they are applied. Do not provide, under any conditions, valves smaller than 20mm (3/4").

.2 Water pressure drop through all two-way modulating control valves: 18 kPa (2.5 PSI) Water pressure drop through all three-way modulating major system valves; 35 kPa (5 PSI). Pressure drop through all three-way valves for radiant in-slab heating/

cooling system to be modulating system valves; 10 kPa (1.5 PSI).

.3 The valves 50mm (2”) and smaller shall be constructed of bronze. The valves 65mm (2 1/2”) and larger shall have iron bodies and bronze mountings.

.4 All control valves shall have stainless steel stems. Ball valves shall be equipped with stainless steel balls and stems.

.5 The bronze in bodies and bonnets of all bronze valves shall conform to ASTM B62 for valves rated up to 1035 Kpa (150psig) working pressure and to ASTM B61 for valves rated at 1380 Kpa (200 psig) working pressure.

.6 The bodies and bonnets of iron body valves shall conform to ASTM A126, Class B.

.7 Control valve discs and seats shall be of bronze for 100 °C or less fluid temperature and of stainless steel for fluid temperatures above 100 °C.

.8 The control valves shall have tight shut-off. Flat disk valves are not acceptable.

.9 Control valves 50mm (2”) and smaller shall be complete with screwed ends type, except for bronze valves installed in soldered copper piping which shall be complete with soldering ends. Control valves larger than 50mm (2”)shall be complete with flanged end type and proper flanged adapters to copper shall be provided where flanged valves are installed in copper piping.

.10 Each automatic control valve must provide the design output and flow rates at pressure drops compatible with equipment selected.

.11 Each automatic control valve must be suitable for the particular system working pressure.

.12 Each automatic control valve shall be fitted with a position indicator.

.13 All the same type control valves shall be the products of a single manufacturer and have the manufacturer’s name, pressure rating and size clearly marked on the outside of the body.

.14 Unless otherwise indicated and except the steam zone control valves, control valves for proportional operation shall have equal percentage characteristics, while the control valves for open/shut two-position operation shall have straight line flow characteristics.

.15 Heating valves shall be normally open and cooling valves are to be normally closed, unless otherwise

specified.

2.3 SPACE TEMPERATURE CONTROLLERS

.1 Mount sensors at a height of 1675mm (5'-6") above the finished floor. Unless indicated otherwise.

.2 End-to-end accuracy +/- 0.3 °C over the entire operating range. Humidity to be accurate to +/- 3 % (10 – 90% RH).

.3 Sensors to be microprocessor based with touch screen LCD for visual display and operator interface. Sensors to monitor both temperature and humidity.

.4 Do not mount sensors on outside walls or other locations influenced by external thermal sources (e.g. computers, boiler rooms, lab equipment).

2.4 AIR VOLUME MONITORING

.1 Provide multipoint air flow velocity measuring probes to monitor air flow rate.

.2 Air velocity probe to be accurate to within suitable range for the application (i.e. velocity measurement of probe must match velocity requirements of the system).

.3 Provide pressure sensor suitable for specific velocity pressure measuring application and compatible with laboratory control system.

2.5 ROOM PRESSURE SENSORS

.1 Provide room pressure sensors with no display to monitor room pressure relative to a common reference pressure.

.2 Provide pressure sensor suitable for specific application and compatible with laboratory control system. Sensors to be accurate to 0.5% FS.

2.6 WIRING

.1 Provide all electrical wiring and components required (of any voltage) within the temperature control system such as low limit protection, thermostats, alarms, relays and interlocks as required to achieve the control function specified in the schematic drawings and sequences of operation. This work to include wiring into prefabricated control circuits (as co-ordinated with the appropriate sub trade or supplier) of the various systems. Also provide suitably rated relays for single phase motors wired in series with manual starters where EMCS start/stop operation is required. Provide "Hand-Off-Auto" switch on relays.

.2 Provide all power and interconnecting wiring

to EMCS field panels and terminal actuators and fan powered terminal fans Co-ordinate with Division 26 Subtrade for appropriate locations of all power outlets for head-end equipment (monitor/keyboard, printers, clock).

.3 24 Volt, EMCS wiring may be run in ceiling spaces utilizing approved plenum cable.

.4 All wiring within mechanical or electrical spaces, where subject to damage or where penetrating through floors or building shall be in EMT conduit.

2.7 FUME HOOD CONTROLLERS

.1 Description

.1 Fume Hood Controllers shall be furnished and installed to monitor and control the measured face velocity of new fume hoods independent of sash position and duct static pressure. The system shall continuously monitor sash position and face velocity to comply with the recommendation set forth in Appendix A of OSHA regulation 29 CFR 1910.1450. The system shall also indicate the presence of airflow to comply with the NFPA 45 Standard.

.2 Fume Hood Controllers are to be compatible with new fume hoods.

.3 Division 25 contractor is to supply the fume hood sensor to the fume hood manufacturer for factory installation. Division 25 contractor will wire, configure and commission Fume Hood Controller in the field.

.4 Fume Hood Controller is to be tied into BAS by Division 25 contractor.

.2 System Performance Requirements

.1 The Fume Hood Controller shall use a sidewall sensor to measure the average fume hood face velocity. The sidewall sensor shall have the sensitivity to measure the effects of obstructions and duct static pressure fluctuations on the average fume hood face velocity. The fume hood sensor shall have a resolution of 1 foot per minute velocity and shall detect any change in the face velocity within 0.05

second. Volumetric airflow measurements used to imply fume hood face velocity shall not be acceptable.

.2 The Fume Hood Controller shall be completely independent for each individual fume hood. The fume hood control system shall control the face velocity independent of other fume hood and laboratory control systems. The Fume Hood Controller shall be able to respond to face velocity disturbances caused by events including but not limited to sash movement.

.3 Room air shall be drawn across the sensing element. If hood design or installation prohibits room air from being drawn across the sensor, a fume hood sensor venting kit shall vent room air through an orifice in the front of the hood to the sensing element. Fume hoods needing vent kits include but are not limited to those hoods where the chase is connected to the plenum or extends up to the ceiling.

.4 To ensure fast, accurate control, the Fume Hood Controller shall have a PID control algorithm with two sets of tuning constants. The two sets of tuning constants enable fast response to large disturbances while maintaining stability at setpoint. The control sensitivity defining the breakpoint between input and steady state response shall be adjustable. The fume hood face velocity control system shall update the control output 20 times per second.

.5 Local audible and visual alarms and relay contacts shall be enabled whenever the measured face velocity falls below a user configurable low alarm set point or rises above a user configurable high alarm set point. A mute key shall silence the audible alarm.

.6 Calibration shall be done electronically through the use of the

integral keypad. Calibration shall consist of adjusting the sensor zero point and sensor span to match a reference measurement. Password protection of the calibration items shall limit unauthorized access. Neither remote calibration nor calibrating through the use of potentiometers is acceptable. Factory calibration alone is not permitted.

.7 The Fume Hood Controller shall have an emergency key and an emergency input contact, either of which shall completely open that fume hood's damper (or variable speed drive) for maximum exhaust in the event of a spill.

.8 For energy-efficiency, the Fume Hood Controller shall have a setback input contact and a setback key, either of which shall initiate control for that fume hood at a reduced face velocity setpoint. The Fume Hood Controller shall automatically adjust high and low alarm set points to avoid nuisance alarms when setback mode is enabled.

.3 Products

.1 The Fume Hood Controller shall use a sidewall sensor to measure the average fume hood face velocity. The sidewall sensor shall use a precision platinum RTD, ceramic coated for corrosion resistance and ease of maintenance. The sidewall sensor shall be temperature compensated over a range of 55°F to 95°F. Systems employing a thermistor-based face velocity sensor or measuring the exhaust flow volume and open sash area to calculate face velocity are not allowed.

.2 The Fume Hood Controller shall have a graphic display of the measured average face velocity and all configuration parameters. Configuration shall be done through a keypad integral to the controller. Password protection shall limit unauthorized access to configuration parameters. The controller shall have

indicator lights for alarm, mute, or normal operating conditions. High, low or no flow alarm contacts shall close in the appropriate alarm condition. An analog output of face velocity shall be user-configurable to either 0 to 10V or 4 to 20 mA. The Fume Hood Monitor (Model FHC50-01-BAC) shall have an RS-485 communications port, supporting BACnet® MS/TP protocol for seamless integration to building automation system.

2.8 LAB (PRESSURE/ VOLUME) CONTROLLER

.1 Description

.1 A room controller system shall be furnished and installed to maintain the measured laboratory pressurization independent of supply and exhaust flow volumes. The system shall ensure that the air flows into the laboratory space from areas of low hazard to comply with the requirement for air flow monitors in ANSI Z9.5.

.2 Product Requirements

.1 Systems and equipment by manufacturers shall be part of a completely designed, tested, cataloged, and factory coordinated package from a single manufacturer. Manufacturer shall have successful customer installations of room control systems in operation for a period of over five years.

.2 Room control systems designed to solely maintain either a pressure differential or volume offset are unacceptable.

.3 Warranty

.1 The room control system shall have a limited two-year warranty for all parts. The warranty shall commence on the date of shipment from the manufacturer.

.4 System Performance

.1 The room control system shall be completely independent for each individual laboratory. The room control system shall not depend on measurements from other laboratory

control systems.

.2 The room control system shall independently control the supply and the general exhaust to maintain a difference between the supply and exhaust flow volumes (offset). If the offset is greater than setpoint, then the room controller shall decrease the general exhaust flow rate and then increase the supply flow rate to its maximum set point until the desired offset is achieved. If the offset is less than setpoint, the room controller shall decrease the supply flow rate to its ventilation minimum setpoint and then increase the general exhaust flow rate until the desired offset is achieved. The room controller shall receive signals related to the supply, general exhaust, and fume hood or total exhaust air flow volumes. All signals shall be hardwired to the Lab Controller; networked values from other devices (except in the case of a dedicated network built for a particular zone) not specific to that particular zone is not acceptable.

.3 The room control system shall measure the pressure differential between the laboratory and reference space. The room control system shall reset the offset within user-configured limits to maintain room pressure set point. The room pressure sensor shall have a resolution of 5% of the measured value and shall detect any change in the room pressure within 0.1 second, with a minimum reading of 0.001 inches H_2O.

.4 The room controller shall control the space temperature by modulating the reheat valve. When the space is too warm, the room controller shall close the reheat valve. When the space is too cool, the room controller shall open the reheat valve.

.5 To ensure fast, accurate control, the room control system shall have a PID control algorithm with two sets of

tuning constants. The two sets of tuning constants enable fast response to large disturbances while maintaining stability at setpoint. The control sensitivity defining the breakpoint between input and steady state response shall be adjustable. The room control system shall update the control output 10 times per second.

.6 Local audible and visual alarms and relay contacts shall be enabled whenever the measured room pressure differential falls below a user configurable low alarm set point or rises above a user configurable high alarm set point, after a configurable delay. A mute key shall temporarily silence the audible alarm. Manual or automatic reset of the alarms shall be configurable.

.7 Local audible and visual alarms shall be enabled whenever the supply or exhaust air volume falls below the configurable low alarm set point, after a configurable delay. A mute key shall temporarily silence the audible alarm. Manual or automatic reset of the alarms shall be configurable.

.8 The room controller shall have an unoccupied mode, enabled through BACnet MS/TP communications. In unoccupied conditions, the room controller shall utilize a second minimum supply flow set point.

.9 Calibration of room pressure differential and air flows shall be done electronically through the use of the integral keypad. Calibration shall consist of adjusting the sensor zero point and sensor span to match a reference measurement. Password protection of the calibration items shall limit unauthorized access. Neither remote calibration nor calibrating through the use of potentiometers is acceptable.

.10 The Lab Control system shall measure the supply flow volume, exhaust flow

volume, and room pressure differential. Systems that exclusively measure the room pressure or supply and exhaust flow volumes are not allowed.

.11 The room control system shall accept at least 3 supply, 3 general exhaust measurements.

.12 The room controller shall have a digital display of all configuration parameters. Configuration shall be done through a keypad integral to the controller. Password protection shall limit unauthorized access to configuration parameters. The controller shall also have indicator lights for low and high alarm and normal operating conditions. The room controller shall have an shall have an RS-485 communications port, supporting BACnet MS/TP protocol for integration to building automation system.

.13 The room pressure sensor shall be bi-directional. The sensor shall be capable of being mounted in the corridor (reference space) or the laboratory (controlled space). The room pressure sensor shall use two in-line ceramic coated RTDs to measure the pressure differential. The room pressure sensor shall be temperature compensated over a range of 55°F to 95°F. Sensors employing a thermistor-based sensor or that cannot differentiate between positive and negative pressures are not allowed. Field-calibration of the sensor shall be performed through the keypad on the room controller.

2.9 FIELD CONTROLLER

.1 Description

.1 Provide one or more native BACnet application controllers for each system as required to adequately cover all objects listed in the object list and/or as shown on the controls schematics. All controllers shall interface to building controller through either MS/TP LAN using BACnet

protocol, or Ethernet LAN using BACnet over Ethernet or BACnet TCP/IP. No gateways shall be used. Controllers shall include input, output and self-contained logic program as needed for complete control of units. Controllers shall be fully programmable using graphical programming blocks. Programming tool shall be resident on operator workstation and be the same tool as used for the building controller. No auxiliary or non-BACnet controllers shall be used.

.2 Standard BACnet object types supported shall include, as a minimum, Analog Input, Analog Output, Analog Value, Binary Input, Binary Output, Binary Value, Multi-state Values, Device, File, and Program object types. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

.3 Application controllers shall include universal inputs with 12-bit resolution that accept 3K and 10K thermistors, 0-10VDC, Platinum 1000 ohm RTD, 0-5VDC, 4-20mA and dry contact signals. Any input on a controller may be either analog or digital with a minimum of three inputs that accept pulses. Controller shall also include support and modifiable programming for interface to intelligent room sensor with digital display. Controller shall include binary and analog outputs on board. Analog outputs with 12-bit resolution shall support either 0-10VDC or 0-20mA. Binary outputs shall have LED indication of status. Software shall include scaling features for analog outputs. Application controller shall include 20VDC voltage supply for use as power supply to external sensors.

.4 All program sequences shall be stored on board application controller in

EEPROM. No batteries shall be needed to retain logic program. All program sequences shall be executed by controller up to 20 times per second (minimum of 10 times per second) and capable of multiple PID loops for control of multiple devices. All calculations shall be completed using floating-point math and system shall support display of all information in floating-point nomenclature at operator's terminal.

.5 Programming of application controller shall be completely modifiable in the field over installed BACnet LANs. Application controller shall be programmed using manufacturer programming tools.

PART 3 EXECUTION

3.1 COMPONENTS

.1 Mount all controllers and relays within control panel cubicles. Mount exposed components for easy access and protect from damage.

.2 Venturi Valves

.1 The Div 25 contractor shall connect all wiring between existing venturi valves and new Lab Controller as required.

.3 Fume Hood Controls

.1 The fume hood manufacturer shall install the velocity sensor and velocity controller on each fume hood, as recommended by the manufacturer's installation instructions.

.2 The Div 25 contractor shall connect all control wiring as required.

.4 Lab (Pressure/Volume) Controllers

.1 Installation

.1 The BAS contractor shall install the room controller system where indicated, as recommended by the manufacturer's installation instructions.

.2 The BAS contractor shall connect all control wiring as required.

.2 Equipment Start-Up, Calibration & Training

.1 Lab controls are to be started up and tested based on the sequence

.2 The manufacturer or a factory-authorized representative shall perform system start up. Start-up shall include calibration of controls. Calibration shall be performed only after substantial completion of the building. Ceilings and doors shall be installed and the HVAC systems (exhaust and supply fans) shall be properly air-balanced. The balancing contractor shall be responsible for final verification and reporting of all air flows.

.3 The manufacturer or a factory-authorized representative shall provide 8 hours of training for building personnel.

3.2 COORDINATION .1 Attend and assist in commissioning, start up and testing of smoke/fire dampers.

3.3 WIRING .1 All new and existing control devices are to be powered from emergency power circuits. Circuits will be provided by Division 26, all downstream connections including 120-24V transformers and all low voltage wiring are by Div. 25 contractor.

.2 Install all wiring in conduit and conform to CSA, ULC and local Code requirements as well as requirements as specified in Division 26 except as stipulated in following paragraph .2.

.3 EMCS 24 Volt Wiring:

.1 In ceiling spaces, approved plenum cable to be installed neatly clipped to structure in 4 foot intervals and run parallel and at right angles to building structural members. Plenum cable to be installed a minimum of 5cm clear of any electrical or mechanical components requiring access or servicing.

.2 All EMCS wiring installed within walls and where exposed to be installed in conduit conforming to requirements of Division 26.

3.4 LABELLING

.1 All control equipment is to be labelled with lamacoid plates with a designation corresponding to the specific system point description/label. All lamacoids shall be mechanically fastened to surfaces. Submit samples to the Owner for approval.

.2 Labelling applies to all control components including panels, sensors, dampers, etc. Labelling to conform to CFIA requirements and must include at minimum device descriptions and control system address.

3.5 COMMISSIONING – LAB SYSTEMS

.1 Check the installation of each sensor, actuator and controlled device.

.2 Verify and record in as built OEM drawings the wiring of each I/O sensor and device as installed.

.3 Calibrate each sensor as required.

.4 Manually operate each output for every system with a portable Display Terminal supplied by the contractor for commissioning.

.5 Tune each control loop and print the response of trends for hard copy record. Identify correct PID parameters on all print outs.

.6 Verify all start/stop operations, e.g. “schedule control”, “Optimized control”, “unoccupied mode” setback.

.7 Verify all custom control programs and alarm functions.

.8 Perform end-to-end checks from an operator terminal to all sensors and actuators to verify system communications and control.

.9 Provide all testing documentation in order to meet CL2 lab certification standards.

3.6 SEQUENCES OF OPERATION

.1 Refer to schematics on the drawings and the EMCS Operation Summary at the end of this section.

.2 All labs are to be programmed with a minimum of two modes of operation; “occupied” and “unoccupied”. A time of day schedule will dictate

the whether the labs are in “occupied’ or “unoccupied” mode. Time schedules shall be able to be configured on a zone-by-zone basis as well as linked to a single adjustable schedule.

.3 Lab Control - Dynamic Volume Matching With Space Pressure Offset Influence:

.1 General

.1 The rooms are to be maintained at a relative positive/negative pressure relative to their surroundings as shown on the mechanical plans. The reference pressure shall be the common office corridor.

.2 The system consists of a supply air damper with heating coil, one or more general exhaust air damper(s), a fume hood (or other dedicated lab equipment exhaust, if present) with venturi valve and fume hood controller and a remote temperature sensor.

.3 The system maintains constant supply and exhaust air volumes to/from the space. Air volume setpoints will vary between the occupied and unoccupied modes.

.4 The Lab Controller will incorporate both flow tracking and space pressure control. The Lab Controller will also modulate the supply air heating coil.

.5 The Lab Controller operates independently of any network. It is however provided with a BACnet MS/TP terminal for connection to a BAS.

.6 The Lab Controller is equipped with an LED display, interface buttons, and audible and visual alarms.

.7 The fume hood controller operates independently of any network. It is however provided with a connection to the Lab Controller, which is in turn networked into the BAS. The fume hood controller will control the exhaust air venturi valve to maintain the fume hoods face velocity at 100 fpm. The controller is provided with a LED display, interface buttons, and audible and visual alarms.

.2 Modes of Operation

.1 The occupied and unoccupied modes are determined by the time of day schedule set through the BAS.

.3 Occupied Mode

.1 The Lab Controller will modulate the supply air damper to maintain the supply air volume at setpoint (occupied). Supply air is maintained at a constant volume.

.2 The Lab Controller will modulate the exhaust air damper to maintain the exhaust air volume at setpoint (occupied). The exhaust air setpoint is continuously calculated to ensure that the room pressure setpoint is maintained. Volume offset is maintained between minimum and maximum levels that are set in the controller. Note the calculated volume setpoint for the general exhaust valve takes into consideration the measured volume being exhausted by the fume hood. That is as the fume hood exhaust increases the general exhaust setpoint should decrease.

.3 The fume hood controller will modulate the exhaust air venturi valve to maintain the face velocity on the fume hood at 100 fpm.

.4 The airside heating coil is controlled to maintain the space temperature at setpoint (occupied).

.4 Unoccupied Mode

.1 The system controls as per the occupied mode with the following exceptions:

.2 The air volume setpoints are set to the unoccupied values (reduced setpoints).

.4 Fixed Volume Matched Pressure Controlled Rooms

.1 General

.1 The system consists of a supply air damper with heating coil, an exhaust air damper, air monitoring probes, system controllers, a space pressure

sensor and a space temperature sensor.

.2 The system maintains constant supply and exhaust air volumes to/from the space. Air volume setpoints will vary between the occupied and unoccupied modes.

.3 The room controller will incorporate flow tracking. Space pressure will be monitored. The room controller will also modulate the supply air heating coil.

.2 Modes of Operation

.1 The occupied and unoccupied modes are determined by the time of day schedule set through the BAS.

.3 Occupied Mode

.1 The room controller will modulate the supply air damper to maintain the supply air volume at setpoint (occupied). Supply air is maintained at a constant volume. Final air volumes are to be confirmed by the air balancer, based on the actual space pressures achieved.

.2 The controller will modulate the exhaust air damper to maintain the exhaust air volume at setpoint (occupied). Final air volumes are to be confirmed by the air balancer, based on the actual space pressures achieved.

.3 The airside heating coil is controlled to maintain the space temperature at setpoint (occupied).

.4 Unoccupied Mode

.1 The system controls as per the occupied mode with the following exceptions:

.2 The air volume setpoints are set to the unoccupied values (reduced setpoints). Final air volumes are to be confirmed by the air balancer, based on the actual space pressures achieved.

.5 Integration with Other Systems

.1 The occupied/unoccupied modes are

shared over the network.

.5 Typical Split AC Unit

.1 General

.1 The unit is provided with a stand-alone temperature controller (by unit manufacturer). The stand-alone temperature controller will control the AC unit to maintain the space temperature at setpoint. Space temperature setpoint to be set 2 Deg C higher than the BAS temperature setpoint so that the split AC unit operates as 2nd stage or backup in the event the air side cooling can not maintain space temperature.

.2 A/C Unit status and alarms (fault) to be monitored at BAS. Integration may require a dedicated control card, provided by Div 25.

.6 Alarms

.1 Provide the following BAS alarms:

.1 Room Static Pressure Alarm: Alarm enabled when room static pressure value deviates from setpoint by more than 12.5 Pa for 15 consecutive minutes.

.2 Air Flow Alarm: Alarm when air flow rate at any air flow station deviates from setpoint by more than 25 litres per second for 15 consecutive minutes.

.3 Loss of containment: Alarm when any negatively pressurized space records positive room static pressure (relative to reference pressure) for 15 consecutive minutes.

.4 Equipment failure: Alarm when any equipment goes into alarm status.

.5 High/low space temperature alarm. Alarm when space temperature deviates from setpoint by more than 5 deg. C for 15 consecutive minutes.

.6 Any other BAS alarms that apply to existing control devices within the scope of this project are to be extended to new control equipment. If

a conflict occurs between existing alarms and those identified above, the consultant will

.7 All alarm limits will are to be demonstrated to owner and/or commissioning manager to confirm operation.

.7 Trending

.1 BAS to record trend data and save data for a minimum of 30 days at 15 minute intervals.

.2 Trending to include the following points:

.1 Room temperature

.2 Room static pressure

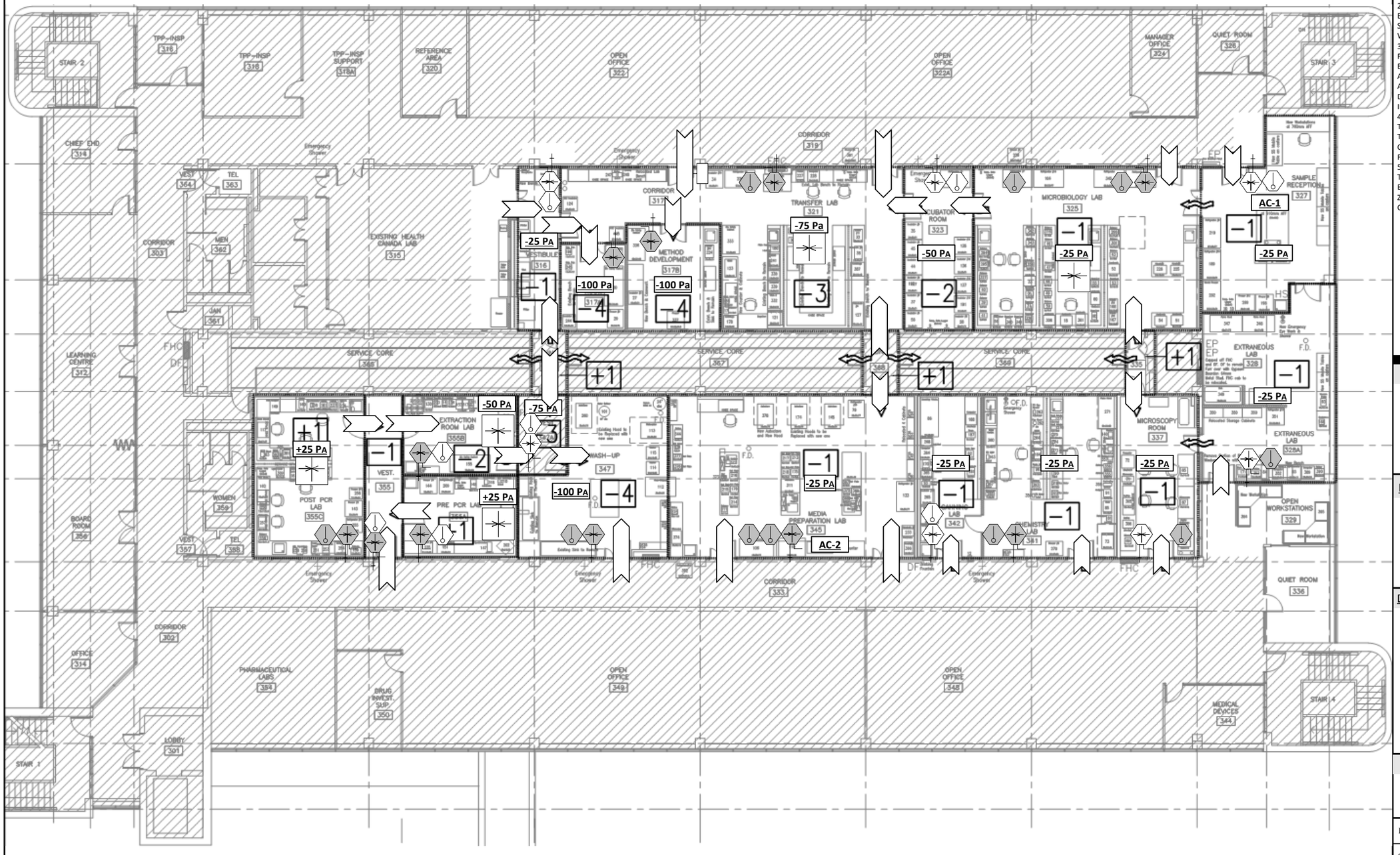
.3 Supply air flow

.4 General exhaust air flow

.5 Fume Hood air flow.

END OF SECTION 25 05 01

FLOOR PLAN INDICATING AIR FLOW REQUIREMENTS



AREAS SHOWN ARE TO BE PROVIDED WITH A BLANK (NO-DISPLAY) SPACE PRESSURE SENSOR, WITH PRESSURE READOUT TO THE DELTA OPERATOR WORKSTATION. ALL SPACE PRESSURE SENSORS SHALL BE RELATIVE TO THE OFFICE CORRIDOR SPACE PRESSURE.
PRESSURE IN THESE ZONES IS TO BE CONTROLLED BY "FIXED VOLUME MATCHED PRESSURE CONTROL" .

AREAS SHOWN ARE TO BE PROVIDED WITH DEDICATED SPACE PRESSURE CONTROL SYSTEM, WITH LOCAL PRESSURE READOUT AND ALARMING. THE DEDICATED SPACE PRESSURE CONTROL SYSTEM IS TO BE INTEGRATED INTO THE DELTA CONTROLS SYSTEM. LOCATIONS OF LOCAL ALARMING PANELS TO BE DETERMINED ON SITE, BASED ON FINAL LAYOUT OF LAB EQUIPMENT.
PRESSURE IN THESE ZONES IS TO BE CONTROLLED BY "DYNAMIC VOLUME MATCHING WITH SPACE PRESSURE OFFSET INFLUENCE"

AIR FLOW DIRECTIONAL ARROWS PROVIDED TO CLARIFY THE RELATIVE AIRFLOW BETWEEN SPACES. THIS RELATIVE AIRFLOW IS NECESSARY FOR PROPER OPERATION OF THE LAB SPACES. THIS RELATIVE AIRFLOW SHOULD NOT BE COMPROMISED DURING INSTALL.

SENSORS PROVIDE PICTOGRAPHIC REPRESENTATION OF WHERE THERE ARE EXISTING POINTS IN ZONES, OR WHERE NEW POINTS ARE REQUIRED IN ZONES. LOCATIONS ARE TO BE CONFIRMED ON SITE, INCLUDING RELOCATION REQUIREMENTS, BASED ON FINAL LAYOUT OF LAB EQUIPMENT.

NOTES

1. CONTROL POINTS INDICATED IN GREY ARE EXISTING. CONTROL POINTS INDICATED IN WHITE ARE PROPOSED.
2. A COMPLETE LAB VENTILATION CONTROL SYSTEM IS TO BE INSTALLED IN EACH ZONE. LAB VENTILATION CONTROL SYSTEMS SHALL BE INSTALLED IN SEQUENCE AS PER THE PHASING DIAGRAM SO AS TO PROVIDE A COMPLETE WORKING SYSTEM AT ALL STAGES DURING CONSTRUCTION.
3. THE EXISTING CONTROL SYSTEM (DELTA CONTROLS) IS TO REMAIN FUNCTIONAL THROUGHOUT THE CONSTRUCTION OF THE PROJECT. THE EXISTING CONTROL SYSTEM CONTROLS SPACE PRESSURIZATION OF ZONES, AND IS CRITICAL TO THE FUNCTION OF THE LABS. AT NO TIME SHALL THE ABILITY TO OPERATE THE EXISTING BUILDING AUTOMATION SYSTEM DURING NORMAL WORKING HOURS BE COMPROMISED AS A RESULT OF THE INSTALLATION OF THE NEW SYSTEM.
4. THE NEW LAB VENTILATION CONTROL SYSTEM IS TO BE INTEGRATED INTO THE EXISTING DELTA CONTROL SYSTEM, COMPLETE WITH NEW GRAPHICS, TRENDING, ALARMING, AS REQUIRED. CONTROLS REQUIREMENTS AS LAID OUT BY THE SPECIFICATIONS AND THE COMMISSIONING AGENT SHALL BE FOLLOWED BY THE DIV 25 CONTRACTOR.
5. LAB VENTILATION CONTROLS PER ZONE ARE TO BE NETWORKED INTO THE DELTA CONTROLS VIA BACnet MS/TP THROUGH A BACnet MS/TP TO BACnet/IP ROUTER. ROUTER TO BE PROVIDED BY DELTA CONTROLS. LAB ZONES TO BE INTEGRATED TO ALLOW VISIBILITY TO OPERATIONS STAFF AND COMMISSIONING AGENT DURING CONSTRUCTION.

MCW Consultants Ltd.

PROJECT

CFIA·ACIA

DRAWING

CANADIAN FOOD INSPECTION AGENCY

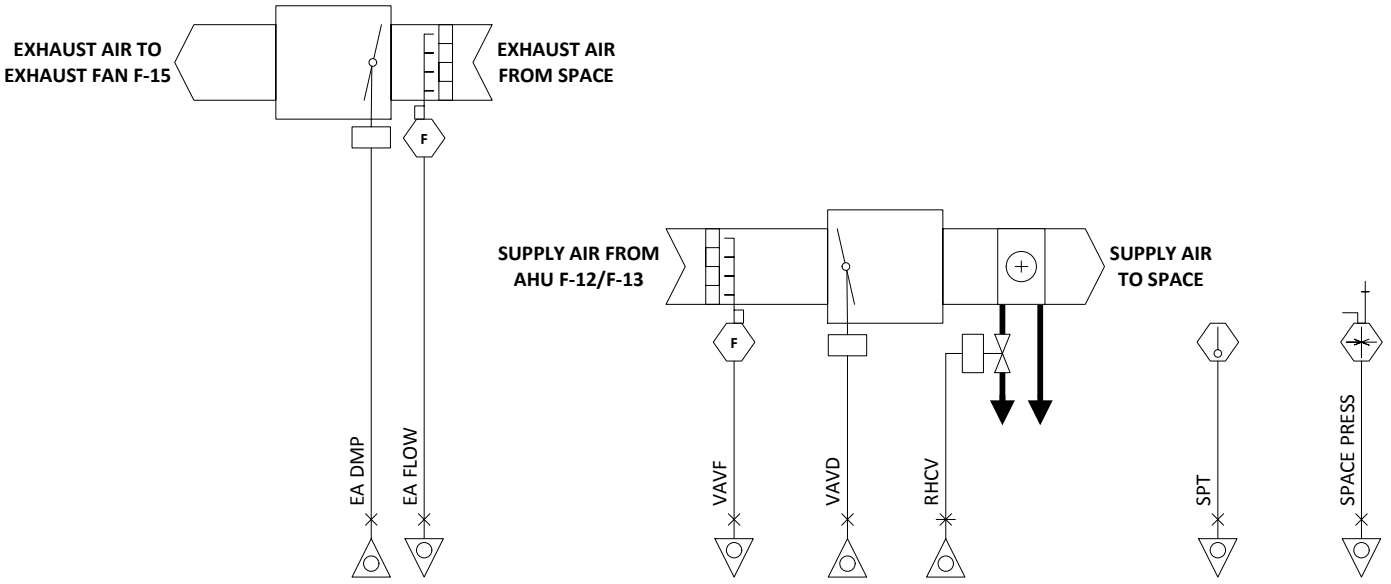
CANADIAN FOOD INSPECTION AGENCY LAB CONTROL OVERVIEW

PROJECT NO.

R. 061999.001

DRAWN BY :	M.Greey	DATE:	19/01/2015
CHECKED BY:	J.Gray	DATE:	21/01/2015
SCALE: NTS			
FILE: 9552 CFIA Controls Drawings.vsd			
Sheet	BAS-1	1 of 20	

ROOM	MODE	SUPPLY (CFM)	EXHAUST (CFM)
316	OCCUPIED	200	250
	UNOCCUPIED	100	125



AIR FLOW CONTROL
VESTIBULE – 316

NOTES

1. CONTROL POINTS INDICATED IN GREY ARE EXISTING. CONTROL POINTS INDICATED IN WHITE ARE PROPOSED.
2. A COMPLETE LAB VENTILATION CONTROL SYSTEM IS TO BE INSTALLED IN EACH ZONE. LAB VENTILATION CONTROL SYSTEMS SHALL BE INSTALLED IN SEQUENCE AS PER THE PHASING DIAGRAM SO AS TO PROVIDE A COMPLETE WORKING SYSTEM AT ALL STAGES DURING CONSTRUCTION.
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PROJECT

CFIA·ACIA

DRAWING

CANADIAN FOOD INSPECTION AGENCY

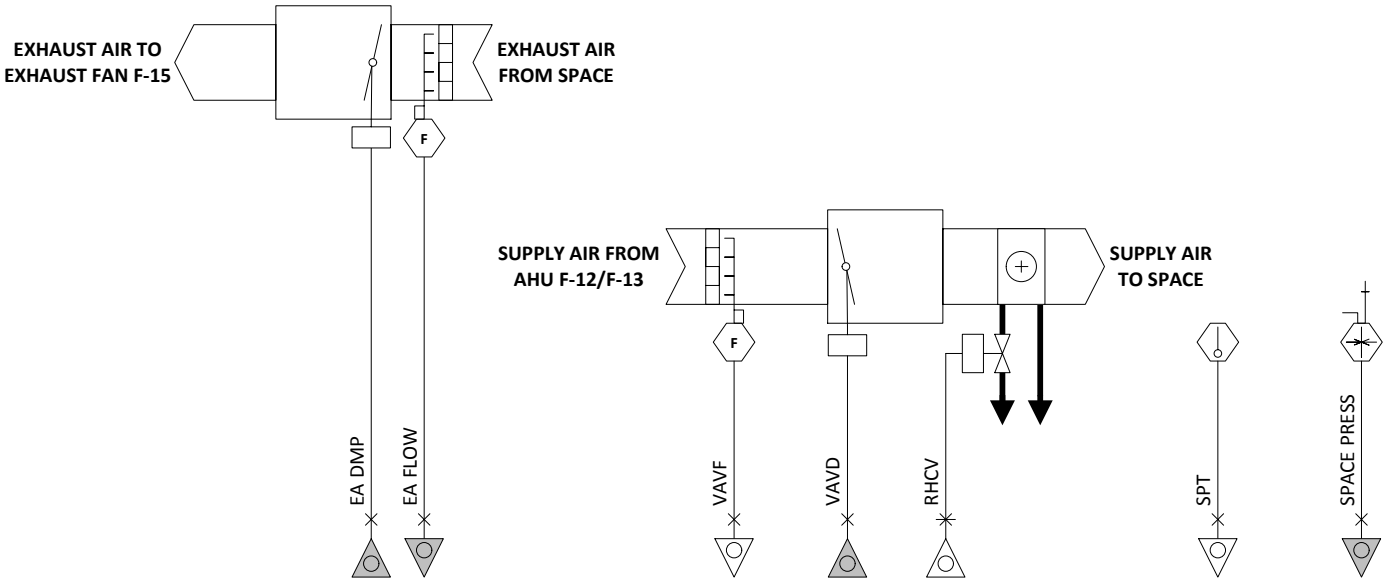
VESTIBULE – 316

PROJECT NO.

R. 061999.001

DRAWN BY :	M.Greey	**DATE:**	19/01/2015
CHECKED BY:	J.Gray	**DATE:**	21/01/2015
SCALE:	NTS		
FILE:	9552 CFIA Controls Drawings.vsd		

ROOM	MODE	SUPPLY (CFM)	EXHAUST (CFM)
317A	OCCUPIED	155	195
	UNOCCUPIED	0	0



AIR FLOW CONTROL
BIOHAZARD – 317A

NOTES

1. CONTROL POINTS INDICATED IN GREY ARE EXISTING. CONTROL POINTS INDICATED IN WHITE ARE PROPOSED.
2. A COMPLETE LAB VENTILATION CONTROL SYSTEM IS TO BE INSTALLED IN EACH ZONE. LAB VENTILATION CONTROL SYSTEMS SHALL BE INSTALLED IN SEQUENCE AS PER THE PHASING DIAGRAM SO AS TO PROVIDE A COMPLETE WORKING SYSTEM AT ALL STAGES DURING CONSTRUCTION.
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MCW Consultants Ltd.

PROJECT

CFIA·ACIA

DRAWING

CANADIAN FOOD INSPECTION AGENCY

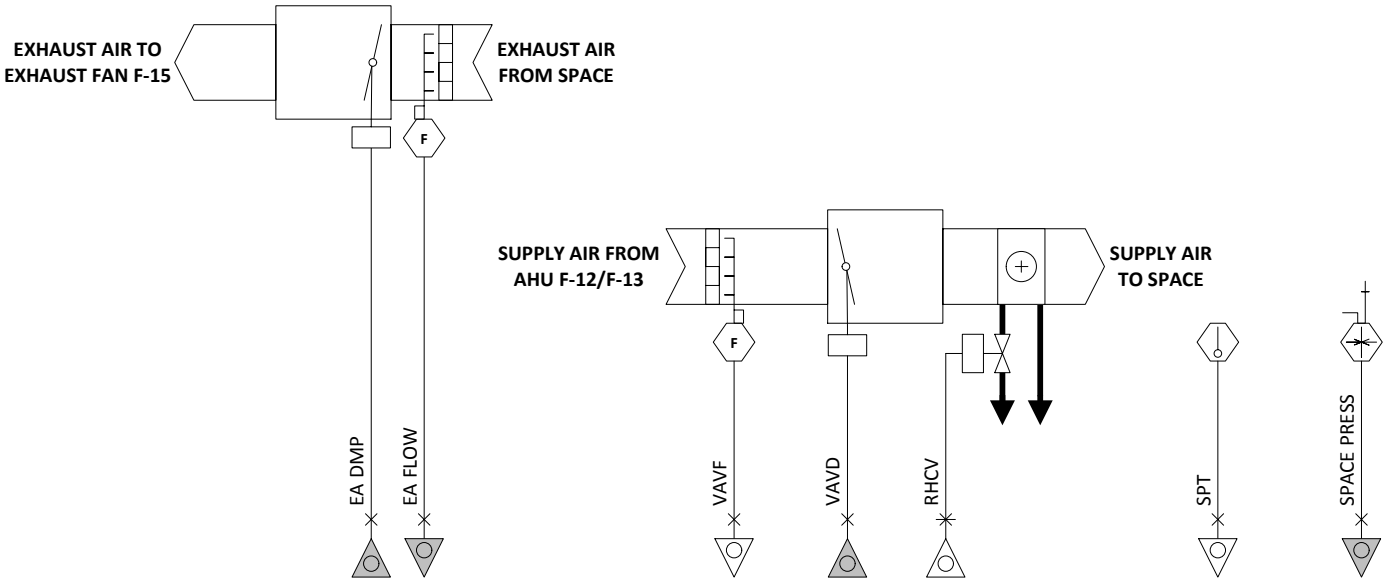
BIOHAZARD – 317A

PROJECT NO.

R. 061999.001

DRAWN BY :	M.Greey	**DATE:**	19/01/2015
CHECKED BY:	J.Gray	**DATE:**	21/01/2015
SCALE:	NTS		
FILE:	9552 CFIA Controls Drawings.vsd		
SHEET:	BAS-3		3 of 20

ROOM	MODE	SUPPLY (CFM)	EXHAUST (CFM)
317B	OCCUPIED	260	325
	UNOCCUPIED	130	163



AIR FLOW CONTROL

METHOD DEVELOPMENT – 317B

NOTES

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PROJECT

CFIA·ACIA

DRAWING

CANADIAN FOOD INSPECTION AGENCY

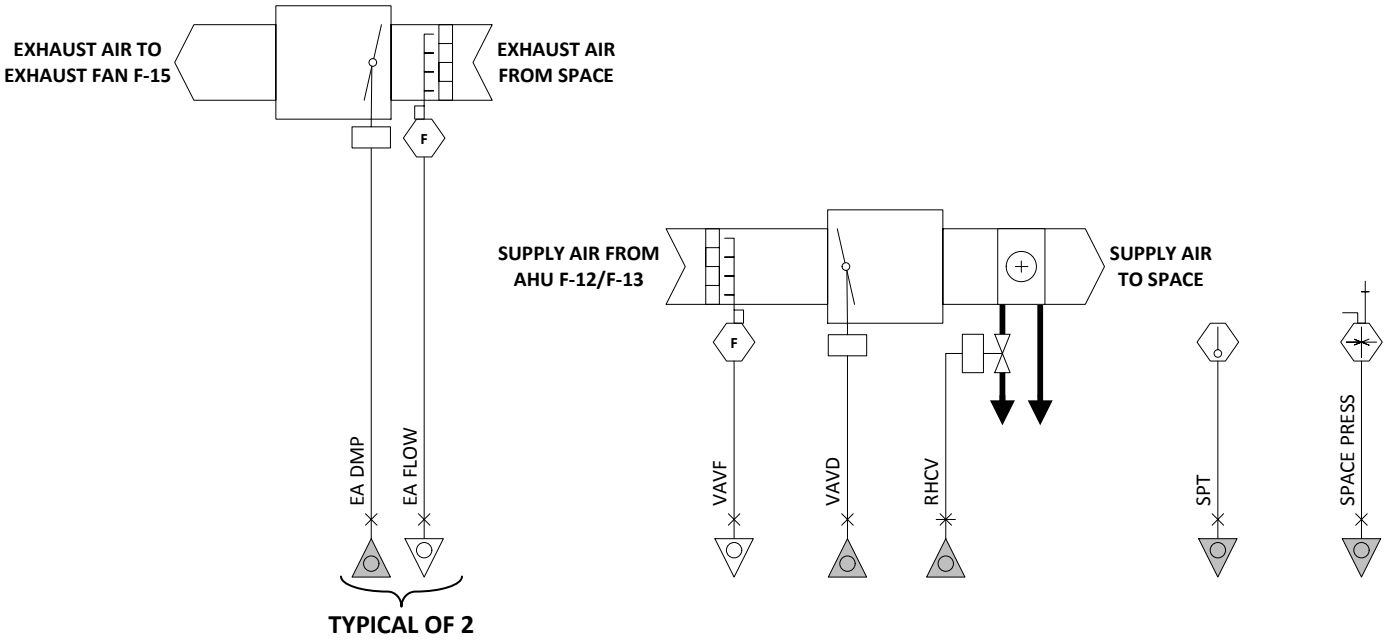
METHOD DEVELOPMENT – 317B

PROJECT NO.

R. 061999.001

DRAWN BY :	M.Greey	**DATE:**	19/01/2015
CHECKED BY:	J.Gray	**DATE:**	21/01/2015
SCALE:	NTS		
FILE:	9552 CFIA Controls Drawings.vsd		
SHEET:	BAS-4		4 of 20

ROOM	MODE	SUPPLY (CFM)	EXHAUST (CFM)
321	OCCUPIED	1020	1275
	UNOCCUPIED	510	636



AIR FLOW CONTROL
TRANSFER LAB – 321

NOTES

1. CONTROL POINTS INDICATED IN GREY ARE EXISTING. CONTROL POINTS INDICATED IN WHITE ARE PROPOSED.
2. A COMPLETE LAB VENTILATION CONTROL SYSTEM IS TO BE INSTALLED IN EACH ZONE. LAB VENTILATION CONTROL SYSTEMS SHALL BE INSTALLED IN SEQUENCE AS PER THE PHASING DIAGRAM SO AS TO PROVIDE A COMPLETE WORKING SYSTEM AT ALL STAGES DURING CONSTRUCTION.
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PROJECT

CFIA·ACIA

DRAWING

CANADIAN FOOD INSPECTION AGENCY

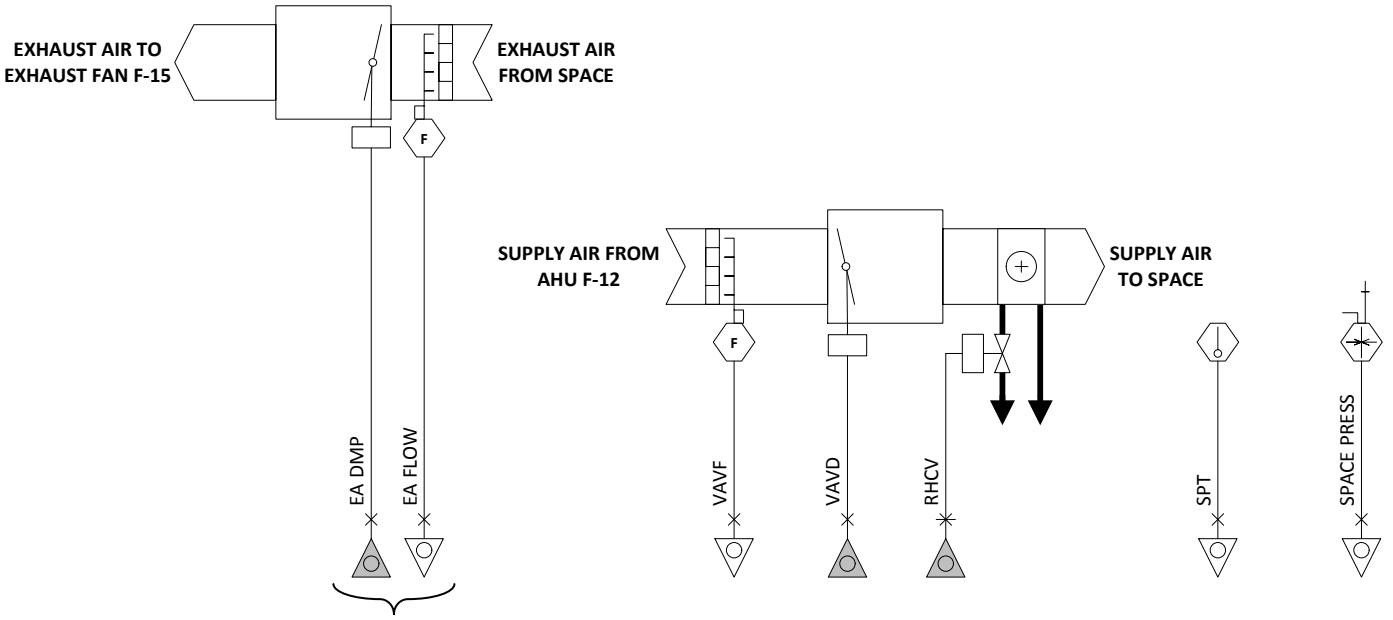
TRANSFER LAB – 321

PROJECT NO.

R. 061999.001

DRAWN BY :	M.Greey	**DATE:**	19/01/2015
CHECKED BY:	J.Gray	**DATE:**	21/01/2015
SCALE:	NTS		
FILE:	9552 CFIA Controls Drawings.vsd		

ROOM	MODE	SUPPLY (CFM)	EXHAUST (CFM)
323	OCCUPIED	415	415
	UNOCCUPIED	207	207



TYPICAL OF 2
(1 TO F15 & 1 TO F20)

AIR FLOW CONTROL
INCUBATOR ROOM – 323

NOTES

1. CONTROL POINTS INDICATED IN GREY ARE EXISTING. CONTROL POINTS INDICATED IN WHITE ARE PROPOSED.
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PROJECT

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DRAWING

CANADIAN FOOD INSPECTION AGENCY

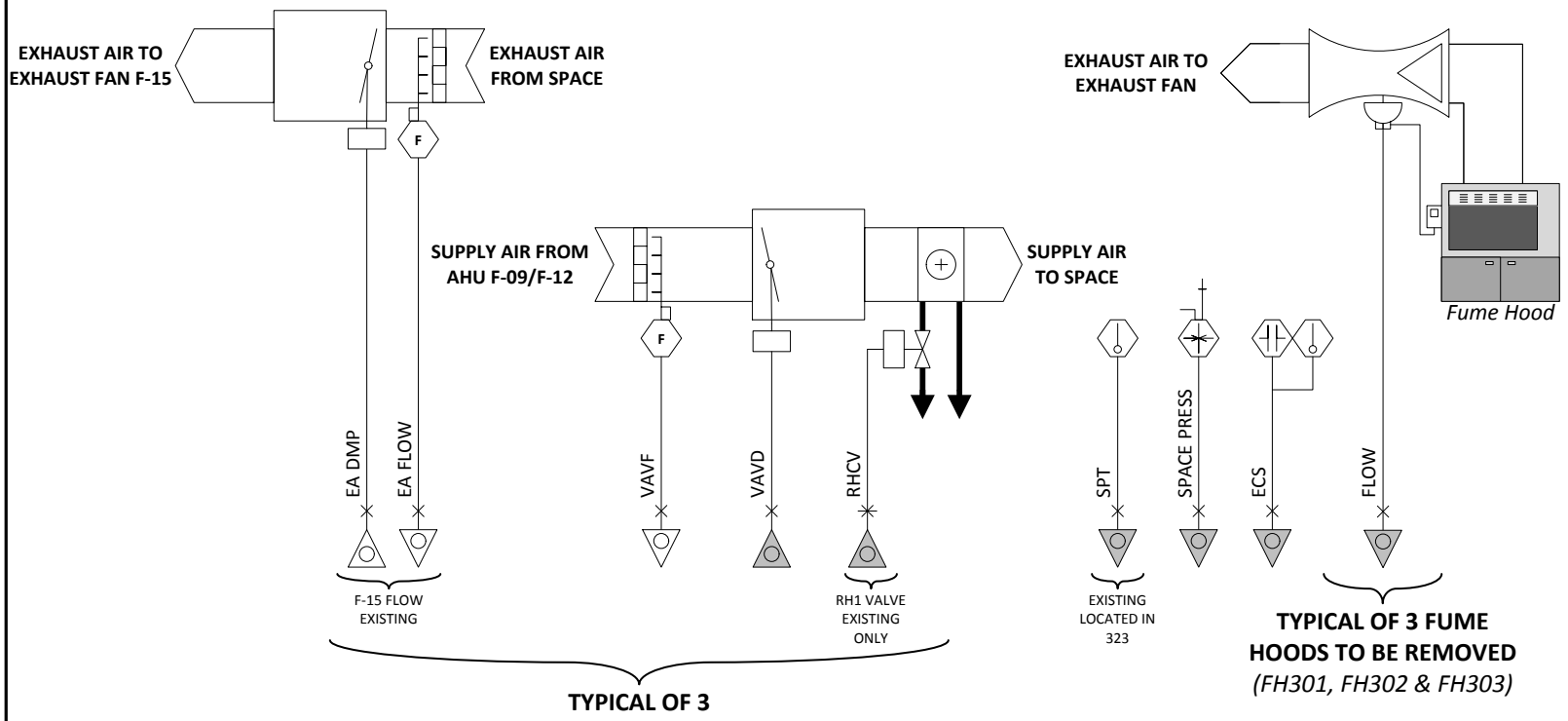
INCUBATOR ROOM – 323

PROJECT NO.

R. 061999.001

DRAWN BY :	M.Greey	**DATE:**	19/01/2015
CHECKED BY:	J.Gray	**DATE:**	21/01/2015
SCALE:	NTS		
FILE:	9552 CFIA Controls Drawings.vsd		

ROOM	MODE	SUPPLY (CFM)	EXHAUST (CFM)
325	OCCUPIED	1215	1520
	UNOCCUPIED	608	760



AIR FLOW CONTROL
MICROBIOLOGY – 325

NOTES

1. CONTROL POINTS INDICATED IN GREY ARE EXISTING. CONTROL POINTS INDICATED IN WHITE ARE PROPOSED.
2. A COMPLETE LAB VENTILATION CONTROL SYSTEM IS TO BE INSTALLED IN EACH ZONE. LAB VENTILATION CONTROL SYSTEMS SHALL BE INSTALLED IN SEQUENCE AS PER THE PHASING DIAGRAM SO AS TO PROVIDE A COMPLETE WORKING SYSTEM AT ALL STAGES DURING CONSTRUCTION.
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MCW Consultants Ltd.

PROJECT

CFIA·ACIA

DRAWING

CANADIAN FOOD INSPECTION AGENCY

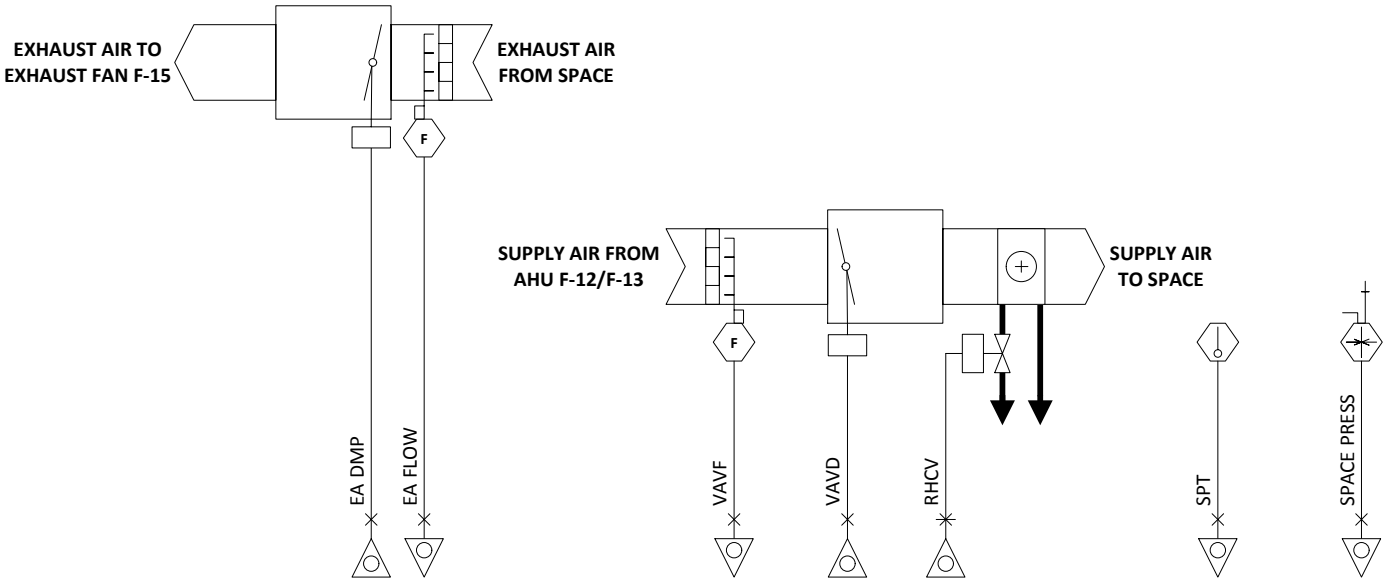
MICROBIOLOGY – 325

PROJECT NO.

R. 061999.001

DRAWN BY :	M.Greey	**DATE:**	19/01/2015
CHECKED BY:	J.Gray	**DATE:**	21/01/2015
SCALE:	NTS		
FILE:	9552 CFIA Controls Drawings.vsd		

ROOM	MODE	SUPPLY (CFM)	EXHAUST (CFM)
327	OCCUPIED	750	950
	UNOCCUPIED	375	475



AIR FLOW CONTROL

SAMPLE RECEPTION – 327

NOTES

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MCW Consultants Ltd.

PROJECT

CFIA·ACIA

DRAWING

CANADIAN FOOD INSPECTION AGENCY

SAMPLE RECEPTION – 327

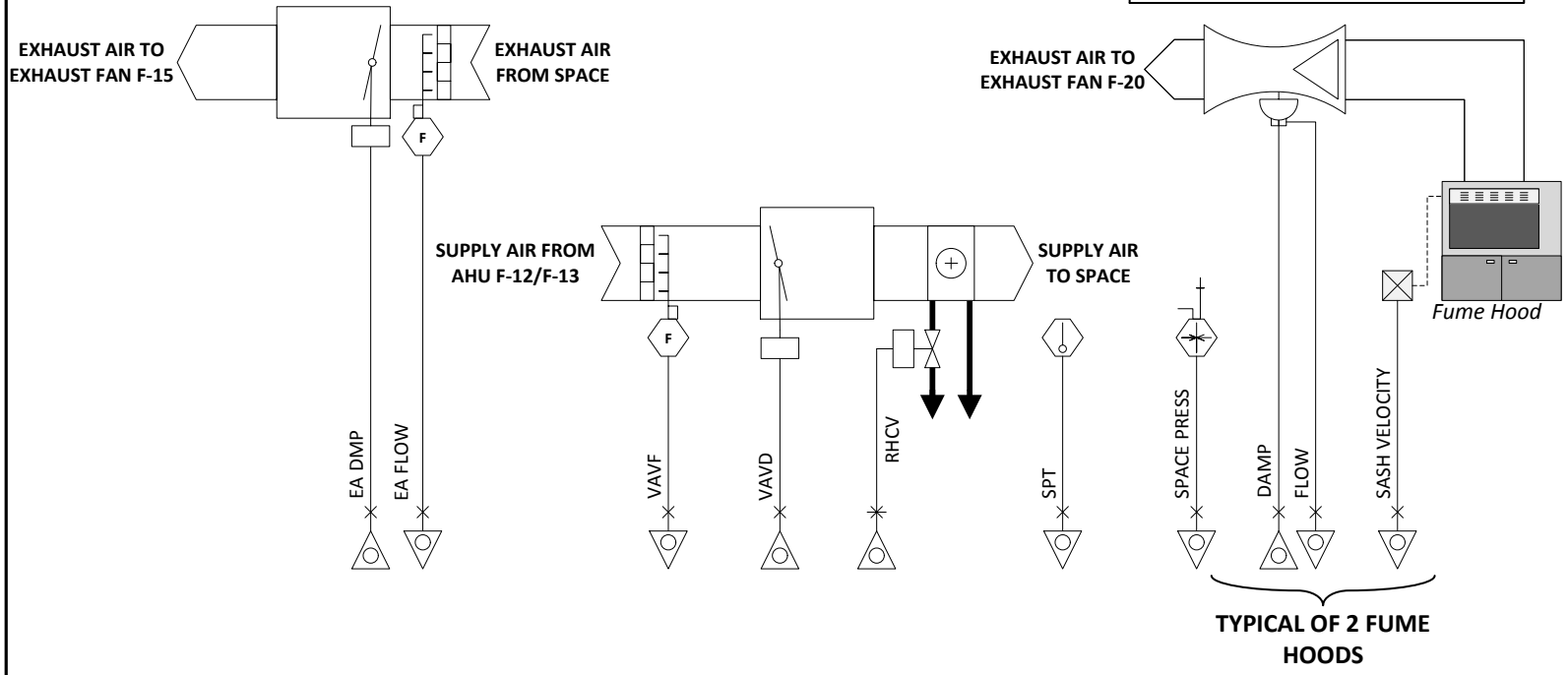
PROJECT NO.

R. 061999.001

DRAWN BY :	M.Greey	**DATE:**	19/01/2015
CHECKED BY:	J.Gray	**DATE:**	21/01/2015
SCALE:	NTS		
FILE:	9552 CFIA Controls Drawings.vsd		

ROOM	MODE	SUPPLY (CFM)	EXHAUST (CFM)
328	OCCUPIED	650	810
	UNOCCUPIED	325	405

SASH VELOCITY TO DIRECTLY INFLUENCE VENTURI VALVE POSITION, WITH ALL CONTROL VARIABLES BEING PASSED ON TO LOCAL LAB CONTROLLER, AND VISIBLE TO DELTA CONTROL OPERATOR WORKSTATION.



AIR FLOW CONTROL

EXTRANEOUS LAB – 328

NOTES

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4. THE NEW LAB VENTILATION CONTROL SYSTEM IS TO BE INTEGRATED INTO THE EXISTING DELTA CONTROL SYSTEM, COMPLETE WITH NEW GRAPHICS, TRENDING, ALARMING, AS REQUIRED. CONTROLS REQUIREMENTS AS LAID OUT BY THE SPECIFICATIONS AND THE COMMISSIONING AGENT SHALL BE FOLLOWED BY THE DIV 25 CONTRACTOR.
5. LAB VENTILATION CONTROLS PER ZONE ARE TO BE NETWORKED INTO THE DELTA CONTROLS VIA BACnet MS/TP THROUGH A BACnet MS/TP TO BACnet/IP ROUTER. ROUTER TO BE PROVIDED BY DELTA CONTROLS. LAB ZONES TO BE INTEGRATED TO ALLOW VISIBILITY TO OPERATIONS STAFF AND COMMISSIONING AGENT DURING CONSTRUCTION.

MCW Consultants Ltd.

PROJECT

CFIA·ACIA

DRAWING

CANADIAN FOOD INSPECTION AGENCY

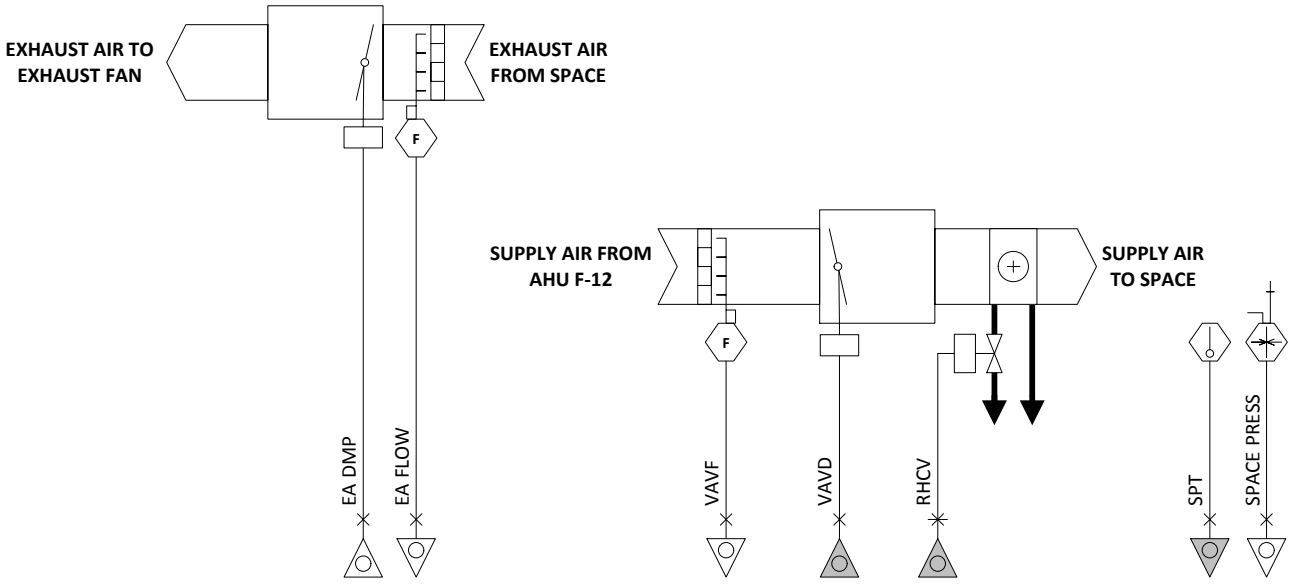
EXTRANEOUS LAB – 328

PROJECT NO.

R. 061999.001

DRAWN BY :	M.Greey	**DATE:**	19/01/2015
CHECKED BY:	J.Gray	**DATE:**	21/01/2015
SCALE:	NTS		
FILE:	9552 CFIA Controls Drawings.vsd		
SHEET:	BAS-9		9 of 20

ROOM	MODE	SUPPLY (CFM)	EXHAUST (CFM)
337	OCCUPIED	360	450
	UNOCCUPIED	180	225



AIR FLOW CONTROL
MICROSCOPY – 337

NOTES

1. CONTROL POINTS INDICATED IN GREY ARE EXISTING. CONTROL POINTS INDICATED IN WHITE ARE PROPOSED.
2. A COMPLETE LAB VENTILATION CONTROL SYSTEM IS TO BE INSTALLED IN EACH ZONE. LAB VENTILATION CONTROL SYSTEMS SHALL BE INSTALLED IN SEQUENCE AS PER THE PHASING DIAGRAM SO AS TO PROVIDE A COMPLETE WORKING SYSTEM AT ALL STAGES DURING CONSTRUCTION.
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MCW Consultants Ltd.

PROJECT

CFIA·ACIA

DRAWING

CANADIAN FOOD INSPECTION AGENCY

MICROSCOPY – 337

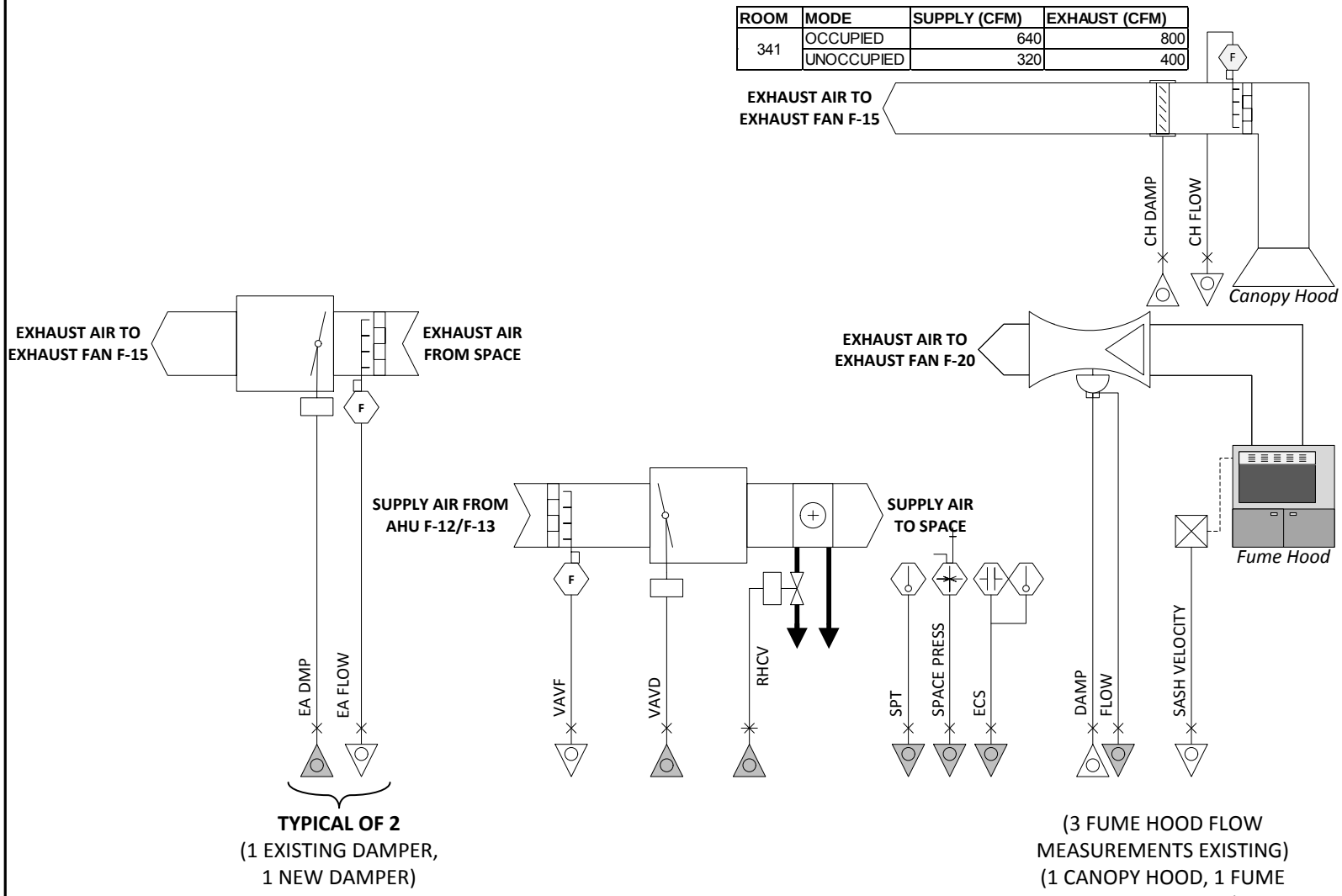
PROJECT NO.

R. 061999.001

DRAWN BY :	M.Greey	**DATE:**	19/01/2015
CHECKED BY:	J.Gray	**DATE:**	21/01/2015
SCALE:	NTS		
FILE:	9552 CFIA Controls Drawings.vsd		

SHEET:	BAS-10	10 of 20

ROOM	MODE	SUPPLY (CFM)	EXHAUST (CFM)
341	OCCUPIED	640	800
	UNOCCUPIED	320	400



AIR FLOW CONTROL
CHEMISTRY LAB – 341

SASH VELOCITY TO DIRECTLY INFLUENCE VENTURI VALVE POSITION, WITH ALL CONTROL VARIABLES VISIBLE TO DELTA CONTROL OPERATOR WORKSTATION.
CONTRACTOR TO RESOLVE DISCREPANCY BETWEEN QUANTITY OF EXISTING FLOW MEASUREMENTS AND FINAL QUANTITIES OF LAB EQUIPMENT (1 FUME HOOD, 1 CANOPY). ANY EXTRANEOUS FLOW MEASUREMENT TO BE REMOVED FROM THE CONTROL SYSTEM DATABASE.

NOTES

1. CONTROL POINTS INDICATED IN GREY ARE EXISTING. CONTROL POINTS INDICATED IN WHITE ARE PROPOSED.
2. A COMPLETE LAB VENTILATION CONTROL SYSTEM IS TO BE INSTALLED IN EACH ZONE. LAB VENTILATION CONTROL SYSTEMS SHALL BE INSTALLED IN SEQUENCE AS PER THE PHASING DIAGRAM SO AS TO PROVIDE A COMPLETE WORKING SYSTEM AT ALL STAGES DURING CONSTRUCTION.
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MCW Consultants Ltd.

PROJECT

CFIA·ACIA

DRAWING

CANADIAN FOOD INSPECTION AGENCY

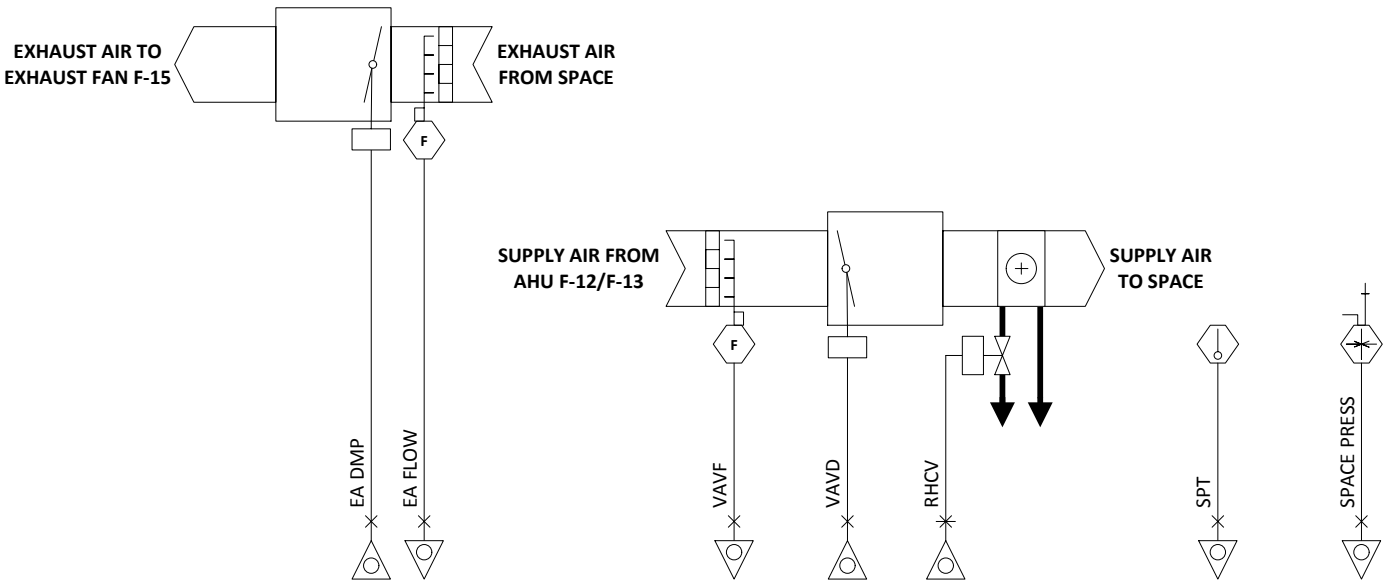
CHEMISTRY LAB – 341

PROJECT NO.

R. 061999.001

DRAWN BY :	M.Greey	**DATE:**	19/01/2015
CHECKED BY:	J.Gray	**DATE:**	21/01/2015
SCALE:	NTS		
FILE:	9552 CFIA Controls Drawings.vsd		
SHEET:	BAS-11		11 of 20

ROOM	MODE	SUPPLY (CFM)	EXHAUST (CFM)
342	OCCUPIED	190	240
	UNOCCUPIED	95	120



AIR FLOW CONTROL
CANNING LAB – 342

(1 LAMINAR FLOW WORKSTATION NOT TO BE CONNECTED TO THE BAS)

NOTES

1. CONTROL POINTS INDICATED IN GREY ARE EXISTING. CONTROL POINTS INDICATED IN WHITE ARE PROPOSED.
2. A COMPLETE LAB VENTILATION CONTROL SYSTEM IS TO BE INSTALLED IN EACH ZONE. LAB VENTILATION CONTROL SYSTEMS SHALL BE INSTALLED IN SEQUENCE AS PER THE PHASING DIAGRAM SO AS TO PROVIDE A COMPLETE WORKING SYSTEM AT ALL STAGES DURING CONSTRUCTION.
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MCW Consultants Ltd.

PROJECT

CFIA·ACIA

DRAWING

CANADIAN FOOD INSPECTION AGENCY

CANNING LAB – 342

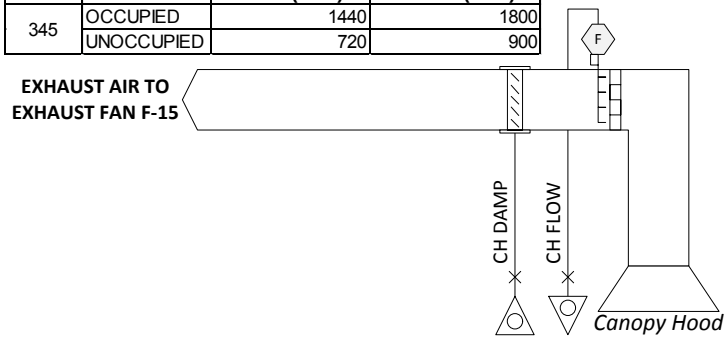
PROJECT NO.

R. 061999.001

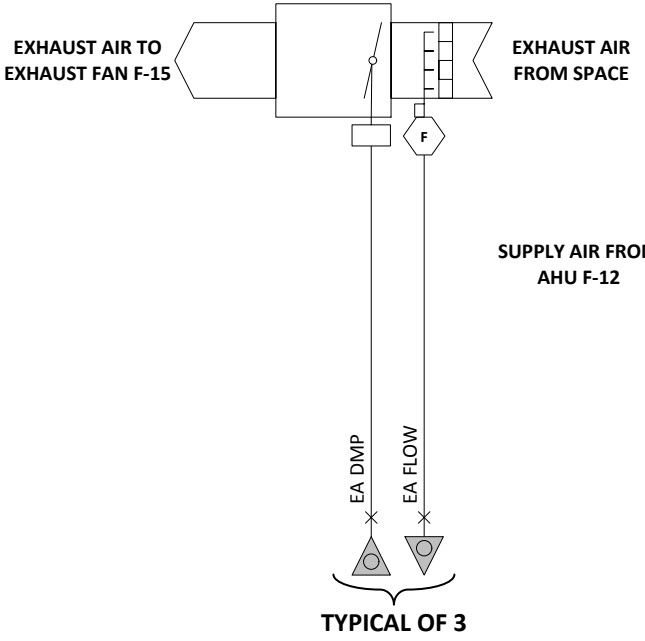
DRAWN BY :	M.Greey	**DATE:**	19/01/2015
CHECKED BY:	J.Gray	**DATE:**	21/01/2015
SCALE:	NTS		
FILE:	9552 CFIA Controls Drawings.vsd		

SHEET:	BAS-12	12 of 20

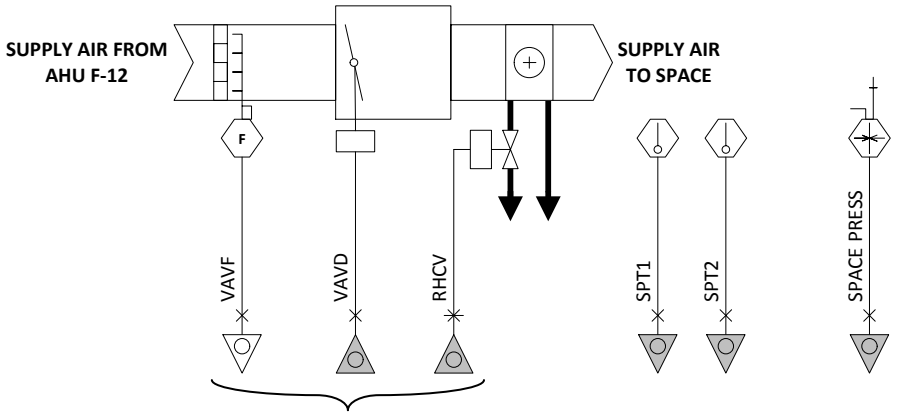
ROOM	MODE	SUPPLY (CFM)	EXHAUST (CFM)
345	OCCUPIED	1440	1800
	UNOCCUPIED	720	900



TYPICAL OF 3



TYPICAL OF 3



TYPICAL OF 2 SUPPLY AIR BOXES

AIR FLOW CONTROL

MEDIA PREPERATION – 345

NOTES

1. CONTROL POINTS INDICATED IN GREY ARE EXISTING. CONTROL POINTS INDICATED IN WHITE ARE PROPOSED.
2. A COMPLETE LAB VENTILATION CONTROL SYSTEM IS TO BE INSTALLED IN EACH ZONE. LAB VENTILATION CONTROL SYSTEMS SHALL BE INSTALLED IN SEQUENCE AS PER THE PHASING DIAGRAM SO AS TO PROVIDE A COMPLETE WORKING SYSTEM AT ALL STAGES DURING CONSTRUCTION.
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MCW Consultants Ltd.

PROJECT

CFIA·ACIA

DRAWING

CANADIAN FOOD INSPECTION AGENCY

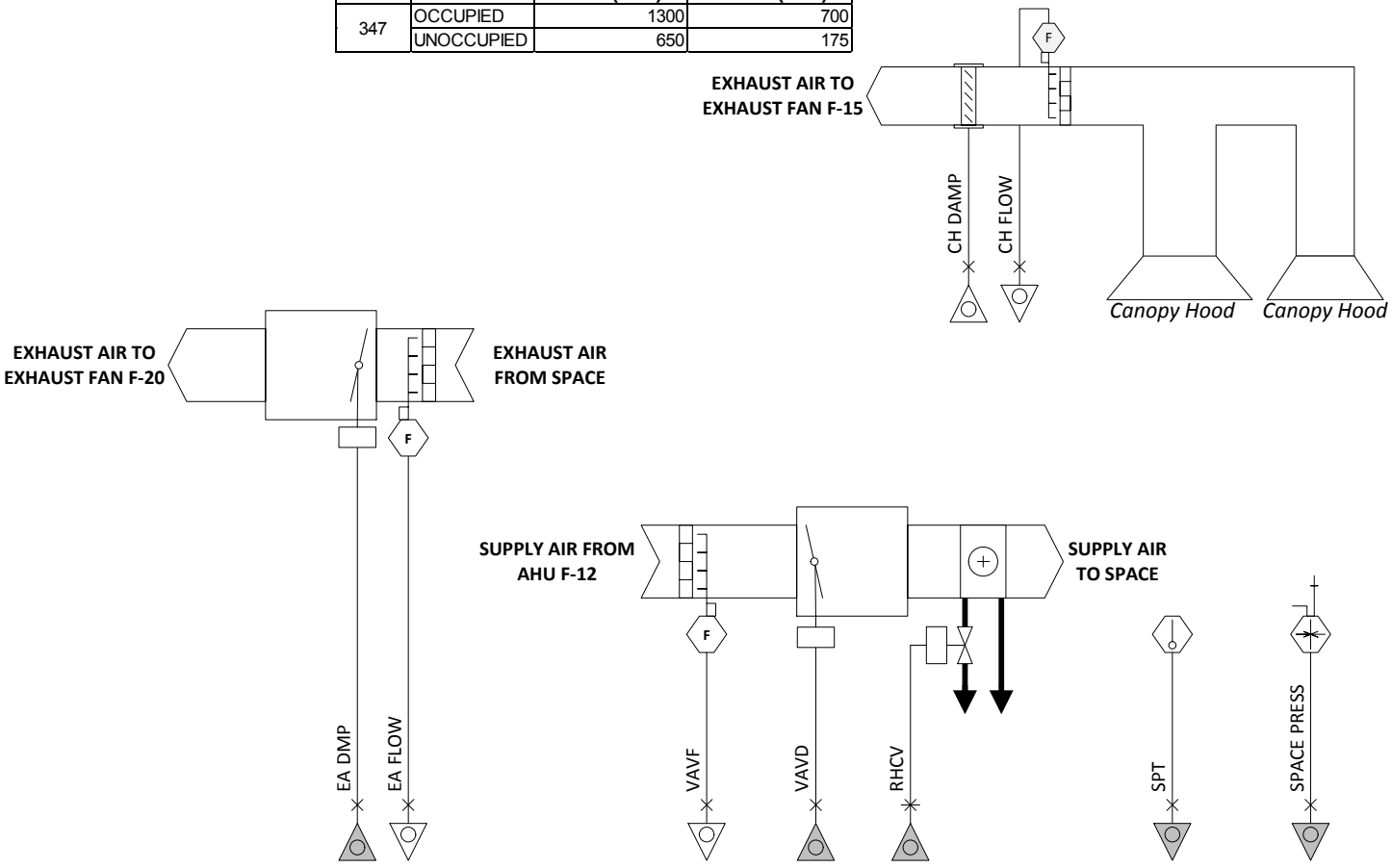
MEDIA PREPERATION – 345

PROJECT NO.

R. 061999.001

DRAWN BY :	M.Greey	**DATE:**	19/01/2015
CHECKED BY:	J.Gray	**DATE:**	21/01/2015
SCALE:	NTS		
FILE:	9552 CFIA Controls Drawings.vsd		

ROOM	MODE	SUPPLY (CFM)	EXHAUST (CFM)
347	OCCUPIED	1300	700
	UNOCCUPIED	650	175



AIR FLOW CONTROL

WASH-UP – 347

NOTES

1. CONTROL POINTS INDICATED IN GREY ARE EXISTING. CONTROL POINTS INDICATED IN WHITE ARE PROPOSED.
2. A COMPLETE LAB VENTILATION CONTROL SYSTEM IS TO BE INSTALLED IN EACH ZONE. LAB VENTILATION CONTROL SYSTEMS SHALL BE INSTALLED IN SEQUENCE AS PER THE PHASING DIAGRAM SO AS TO PROVIDE A COMPLETE WORKING SYSTEM AT ALL STAGES DURING CONSTRUCTION.
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MCW Consultants Ltd.

PROJECT

CFIA·ACIA

DRAWING

CANADIAN FOOD INSPECTION AGENCY

WASH-UP – 347

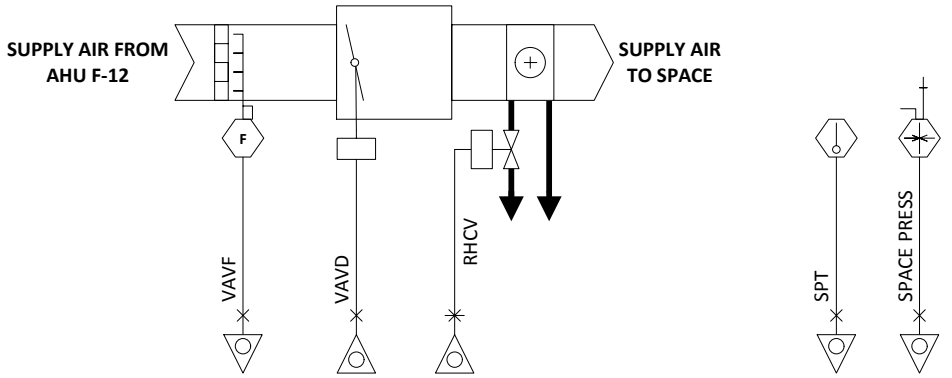
PROJECT NO.

R. 061999.001

DRAWN BY :	M.Greey	**DATE:**	19/01/2015
CHECKED BY:	J.Gray	**DATE:**	21/01/2015
SCALE:	NTS		
FILE:	9552 CFIA Controls Drawings.vsd		

SHEET:	BAS-14	14 of 20

ROOM	MODE	SUPPLY (CFM)	EXHAUST (CFM)
347A	OCCUPIED	150	N/A
	UNOCCUPIED	75	N/A



AIR FLOW CONTROL
VESTIBULE – 347A

NOTES

1. CONTROL POINTS INDICATED IN GREY ARE EXISTING. CONTROL POINTS INDICATED IN WHITE ARE PROPOSED.
2. A COMPLETE LAB VENTILATION CONTROL SYSTEM IS TO BE INSTALLED IN EACH ZONE. LAB VENTILATION CONTROL SYSTEMS SHALL BE INSTALLED IN SEQUENCE AS PER THE PHASING DIAGRAM SO AS TO PROVIDE A COMPLETE WORKING SYSTEM AT ALL STAGES DURING CONSTRUCTION.
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MCW Consultants Ltd.

PROJECT

CFIA·ACIA

DRAWING

CANADIAN FOOD INSPECTION AGENCY

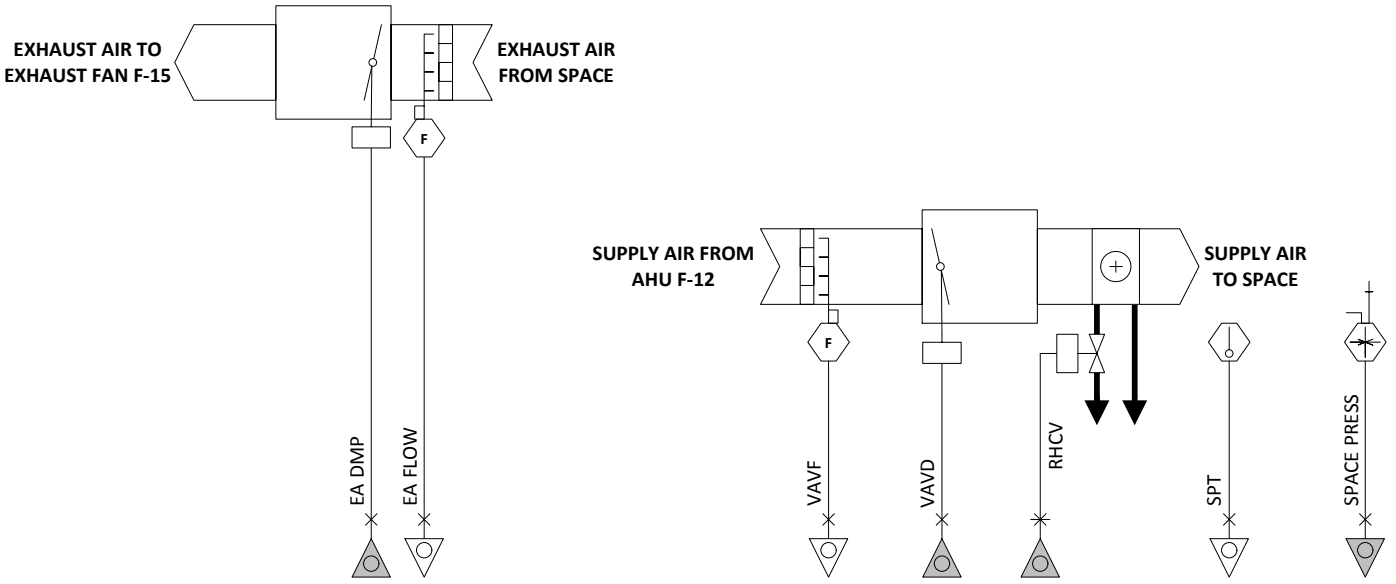
VESTIBULE – 347A

PROJECT NO.

R. 061999.001

DRAWN BY :	M.Greey	**DATE:**	19/01/2015
CHECKED BY:	J.Gray	**DATE:**	21/01/2015
SCALE:	NTS		
FILE:	9552 CFIA Controls Drawings.vsd		

ROOM	MODE	SUPPLY (CFM)	EXHAUST (CFM)
355	OCCUPIED	100	200
	UNOCCUPIED	50	100



AIR FLOW CONTROL
VESTIBULE – 355

NOTES

1. CONTROL POINTS INDICATED IN GREY ARE EXISTING. CONTROL POINTS INDICATED IN WHITE ARE PROPOSED.
2. A COMPLETE LAB VENTILATION CONTROL SYSTEM IS TO BE INSTALLED IN EACH ZONE. LAB VENTILATION CONTROL SYSTEMS SHALL BE INSTALLED IN SEQUENCE AS PER THE PHASING DIAGRAM SO AS TO PROVIDE A COMPLETE WORKING SYSTEM AT ALL STAGES DURING CONSTRUCTION.
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MCW Consultants Ltd.

PROJECT

CFIA·ACIA

DRAWING

CANADIAN FOOD INSPECTION AGENCY

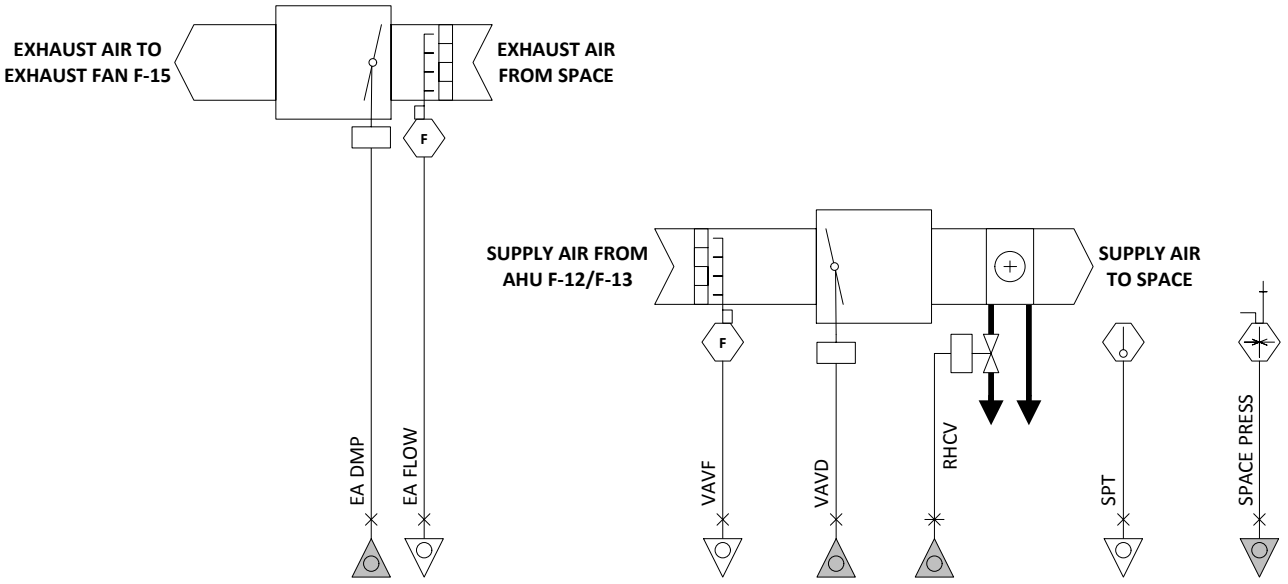
VESTIBULE – 355

PROJECT NO.

R. 061999.001

DRAWN BY :	M.Greey	**DATE:**	19/01/2015
CHECKED BY:	J.Gray	**DATE:**	21/01/2015
SCALE:	NTS		
FILE:	9552 CFIA Controls Drawings.vsd		

ROOM	MODE	SUPPLY (CFM)	EXHAUST (CFM)
355A	OCCUPIED	390	250
	UNOCCUPIED	195	125



AIR FLOW CONTROL

PRE-PCR LAB – 355A

NOTES

1. CONTROL POINTS INDICATED IN GREY ARE EXISTING. CONTROL POINTS INDICATED IN WHITE ARE PROPOSED.
2. A COMPLETE LAB VENTILATION CONTROL SYSTEM IS TO BE INSTALLED IN EACH ZONE. LAB VENTILATION CONTROL SYSTEMS SHALL BE INSTALLED IN SEQUENCE AS PER THE PHASING DIAGRAM SO AS TO PROVIDE A COMPLETE WORKING SYSTEM AT ALL STAGES DURING CONSTRUCTION.
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MCW Consultants Ltd.

PROJECT

CFIA·ACIA

DRAWING

CANADIAN FOOD INSPECTION AGENCY

PRE-PCR LAB – 355A

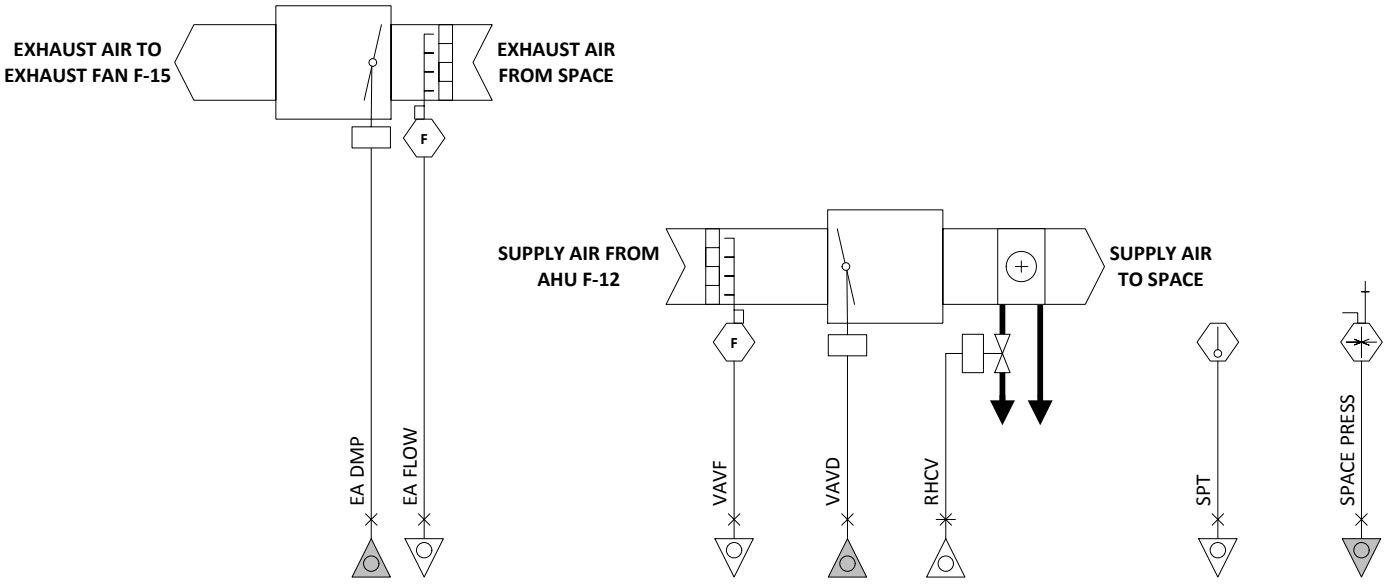
PROJECT NO.

R. 061999.001

DRAWN BY :	M.Greey	**DATE:**	19/01/2015
CHECKED BY:	J.Gray	**DATE:**	21/01/2015
SCALE:	NTS		
FILE:	9552 CFIA Controls Drawings.vsd		

SHEET:	BAS-17	17 of 20

ROOM	MODE	SUPPLY (CFM)	EXHAUST (CFM)
355B	OCCUPIED	420	420
	UNOCCUPIED	210	210



AIR FLOW CONTROL
EXTRACTION LAB – 355B

NOTES

1. CONTROL POINTS INDICATED IN GREY ARE EXISTING. CONTROL POINTS INDICATED IN WHITE ARE PROPOSED.
2. A COMPLETE LAB VENTILATION CONTROL SYSTEM IS TO BE INSTALLED IN EACH ZONE. LAB VENTILATION CONTROL SYSTEMS SHALL BE INSTALLED IN SEQUENCE AS PER THE PHASING DIAGRAM SO AS TO PROVIDE A COMPLETE WORKING SYSTEM AT ALL STAGES DURING CONSTRUCTION.
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MCW Consultants Ltd.

PROJECT

CFIA·ACIA

DRAWING

CANADIAN FOOD INSPECTION AGENCY

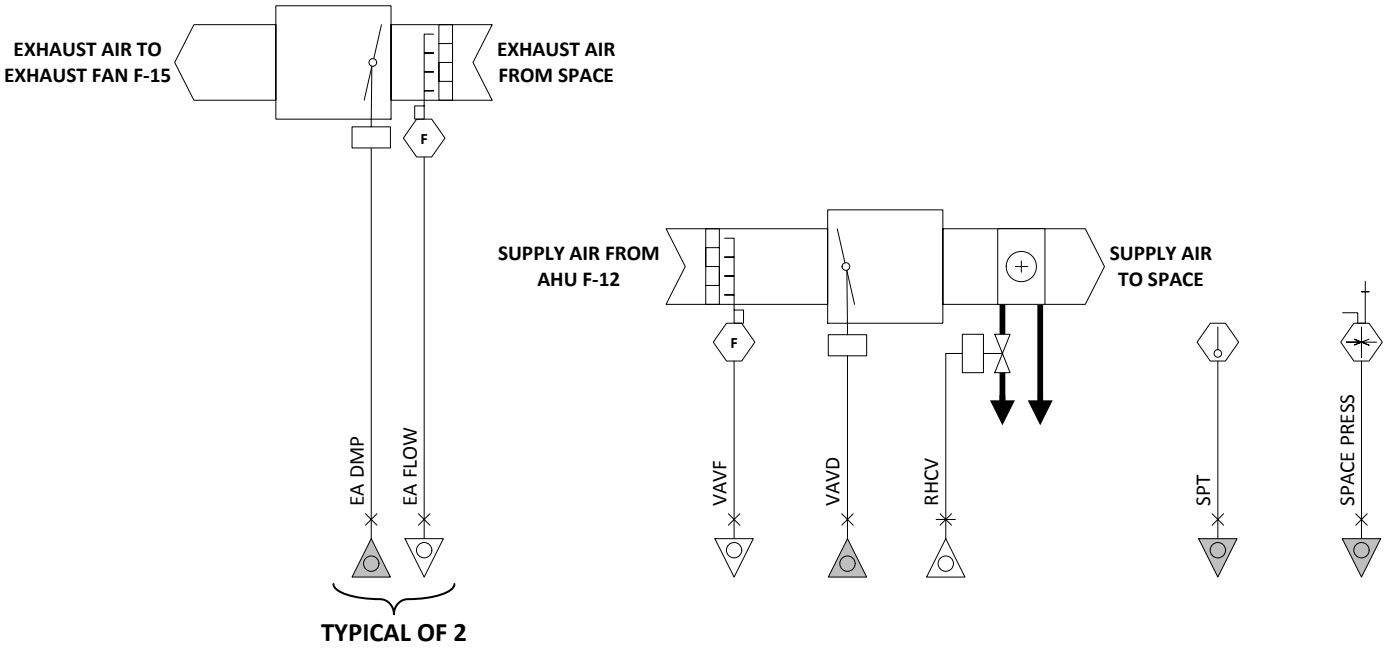
EXTRACTION LAB – 355B

PROJECT NO.

R. 061999.001

DRAWN BY :	M.Greey	**DATE:**	19/01/2015
CHECKED BY:	J.Gray	**DATE:**	21/01/2015
SCALE:	NTS		
FILE:	9552 CFIA Controls Drawings.vsd		

ROOM	MODE	SUPPLY (CFM)	EXHAUST (CFM)
355C	OCCUPIED	635	510
	UNOCCUPIED	317	254



AIR FLOW CONTROL

POST PCR LAB – 355C

NOTES

1. CONTROL POINTS INDICATED IN GREY ARE EXISTING. CONTROL POINTS INDICATED IN WHITE ARE PROPOSED.
2. A COMPLETE LAB VENTILATION CONTROL SYSTEM IS TO BE INSTALLED IN EACH ZONE. LAB VENTILATION CONTROL SYSTEMS SHALL BE INSTALLED IN SEQUENCE AS PER THE PHASING DIAGRAM SO AS TO PROVIDE A COMPLETE WORKING SYSTEM AT ALL STAGES DURING CONSTRUCTION.
3. THE EXISTING CONTROL SYSTEM (DELTA CONTROLS) IS TO REMAIN FUNCTIONAL THROUGHOUT THE CONSTRUCTION OF THE PROJECT. THE EXISTING CONTROL SYSTEM CONTROLS SPACE PRESSURIZATION OF ZONES, AND IS CRITICAL TO THE FUNCTION OF THE LABS. AT NO TIME SHALL THE ABILITY TO OPERATE THE EXISTING BUILDING AUTOMATION SYSTEM DURING NORMAL WORKING HOURS BE COMPROMISED AS A RESULT OF THE INSTALLATION OF THE NEW SYSTEM.
4. THE NEW LAB VENTILATION CONTROL SYSTEM IS TO BE INTEGRATED INTO THE EXISTING DELTA CONTROL SYSTEM, COMPLETE WITH NEW GRAPHICS, TRENDING, ALARMING, AS REQUIRED. CONTROLS REQUIREMENTS AS LAID OUT BY THE SPECIFICATIONS AND THE COMMISSIONING AGENT SHALL BE FOLLOWED BY THE DIV 25 CONTRACTOR.
5. LAB VENTILATION CONTROLS PER ZONE ARE TO BE NETWORKED INTO THE DELTA CONTROLS VIA BACnet MS/TP THROUGH A BACnet MS/TP TO BACnet/IP ROUTER. ROUTER TO BE PROVIDED BY DELTA CONTROLS. LAB ZONES TO BE INTEGRATED TO ALLOW VISIBILITY TO OPERATIONS STAFF AND COMMISSIONING AGENT DURING CONSTRUCTION.

MCW Consultants Ltd.

PROJECT

CFIA·ACIA

DRAWING

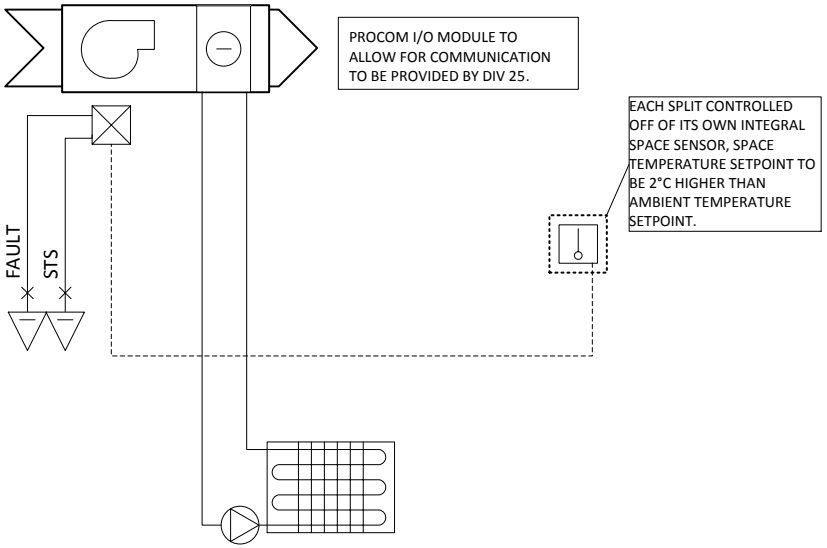
CANADIAN FOOD INSPECTION AGENCY

POST PCR LAB – 355C

PROJECT NO.

R. 061999.001

DRAWN BY :	M.Greey	**DATE:**	19/01/2015
CHECKED BY:	J.Gray	**DATE:**	21/01/2015
SCALE:	NTS		
FILE:	9552 CFIA Controls Drawings.vsd		



SPLIT A/C SYSTEMS

TYPICAL OF 2

NOTES

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SPLIT A/C SYSTEMS

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SHEET:	BAS-20	20 of 20