

# WINDOW AND DOOR REPLACEMENT AND LEARNING COMMONS RENOVATIONS

CLIENT:  
**Hamilton Wentworth District School Board**

20 Education Court | Hamilton, ON | L9A 0B9

Cecil B. Stirling  
Elementary School

340 Queen Victoria Drive  
Hamilton, ON

## DRAWING LIST:

### Architectural

- A1 Floor Plans, Window Types, Door and Frame Types
- A2 Elevations, Door Schedule
- A3 Kindergarten Floor and RCP and Details

### Mechanical

- M0 Mechanical Legend & Drawing List
- M1 Mechanical Specifications
- M2 Mechanical Specifications
- M3 Partial Mechanical Floor Plans
- M4 Mechanical Details
- M5 Mechanical Schedules
- ME1 Mechanical and Electrical Schedules

### Electrical

- E0 Electrical Legend & Drawing List
- E1 Overall Plan
- E2 Partial Electrical Floor Demolition Plan
- E3 Partial Electrical Floor Proposed Plan
- E4 Lighting Schedule and Details
- E5 Electrical Specifications

PROJECT # 2335

ISSUED FOR TENDER - FEBRUARY 2024

**WHITELINE**  
Architects Inc.

83 ONTARIO STREETS  
ST. CATHARINES  
ONTARIO | L2R 5J5

905-688-6087

admin@whitelinearchitects.com

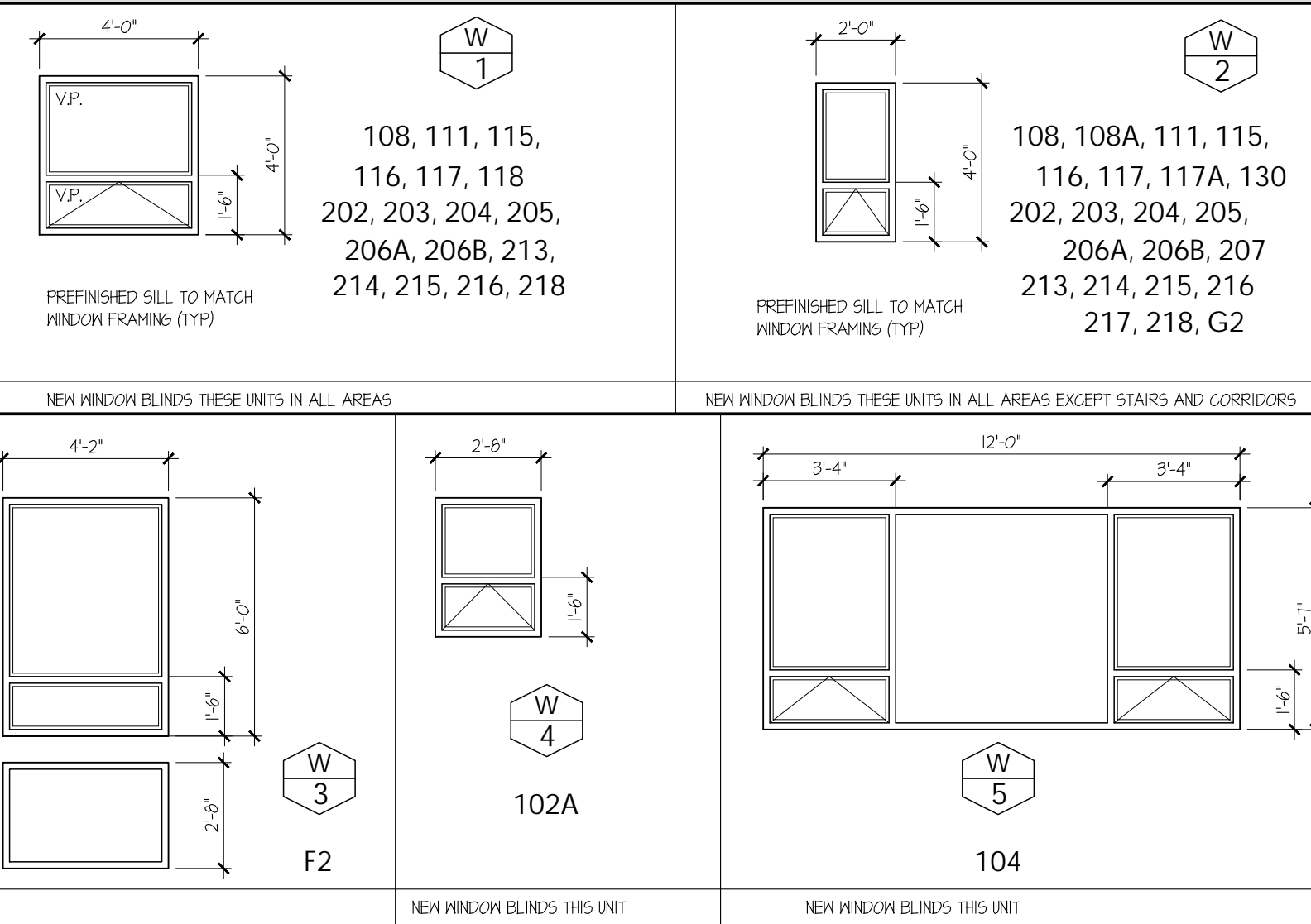
www.whitelinearchitects.com

**WINDOW NOTES:**

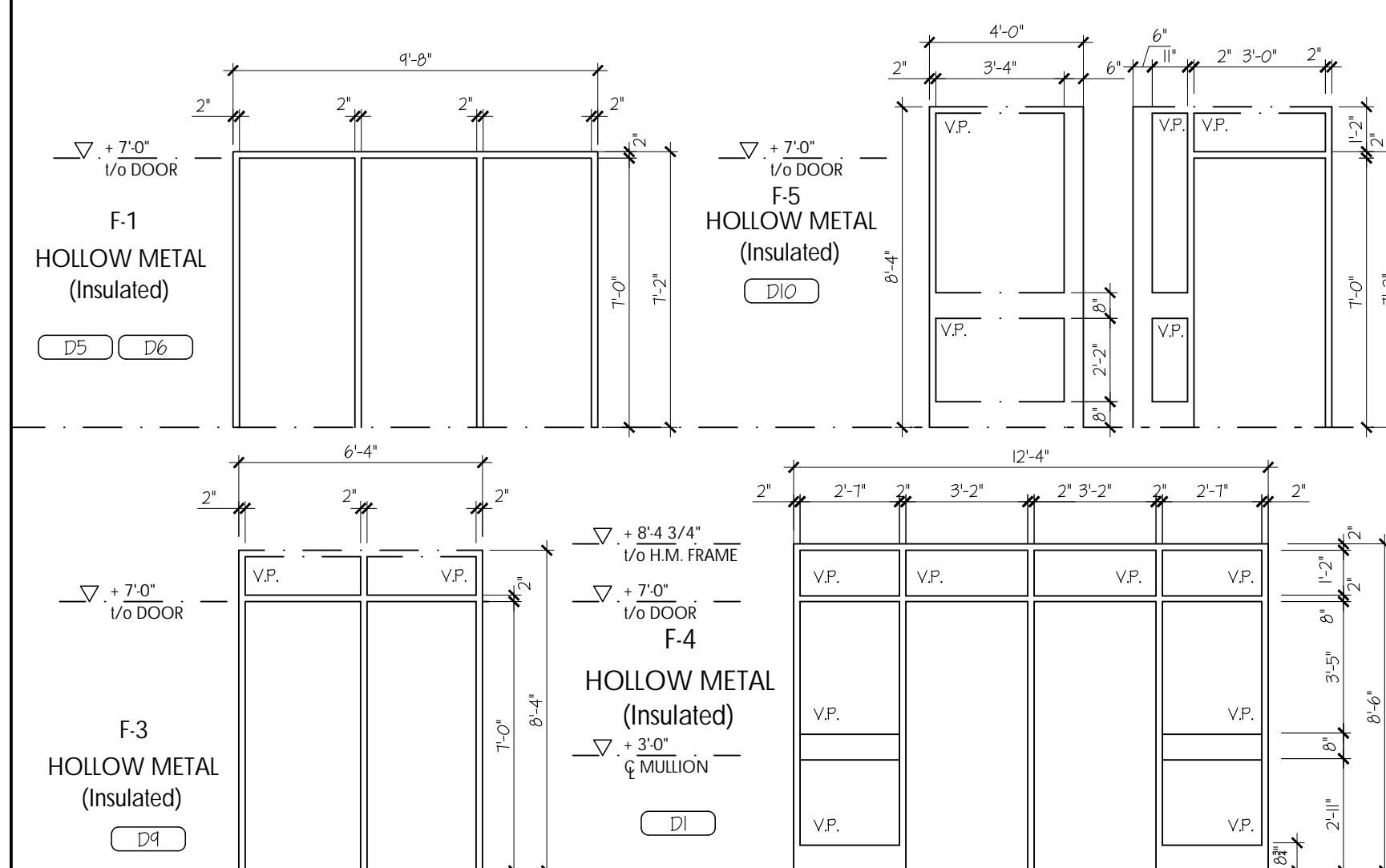
CONTRACTOR TO ALLOW FOR ALL NEW WOOD BLOCKING AND TRIMS AROUND ALL NEW INSTALLATIONS. NO EXTRAS WILL BE ALLOWED.

ALLOW IN BASE BID FOR PAINT TOUCH-UP REPAIRS AT ALL BLOCK INTERIORS AT ALL WINDOW LOCATIONS. NO EXTRAS WILL BE ALLOWED.

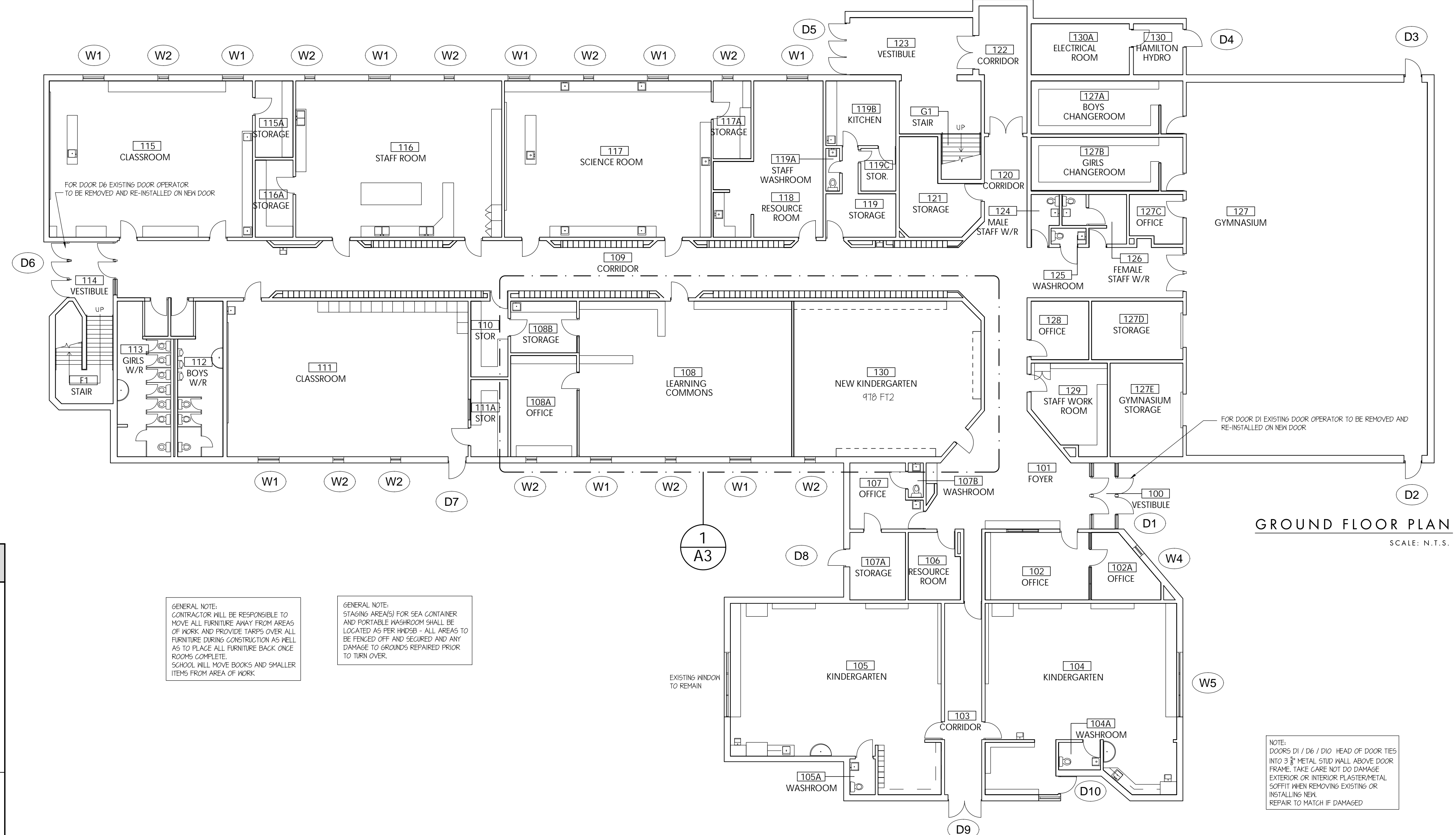
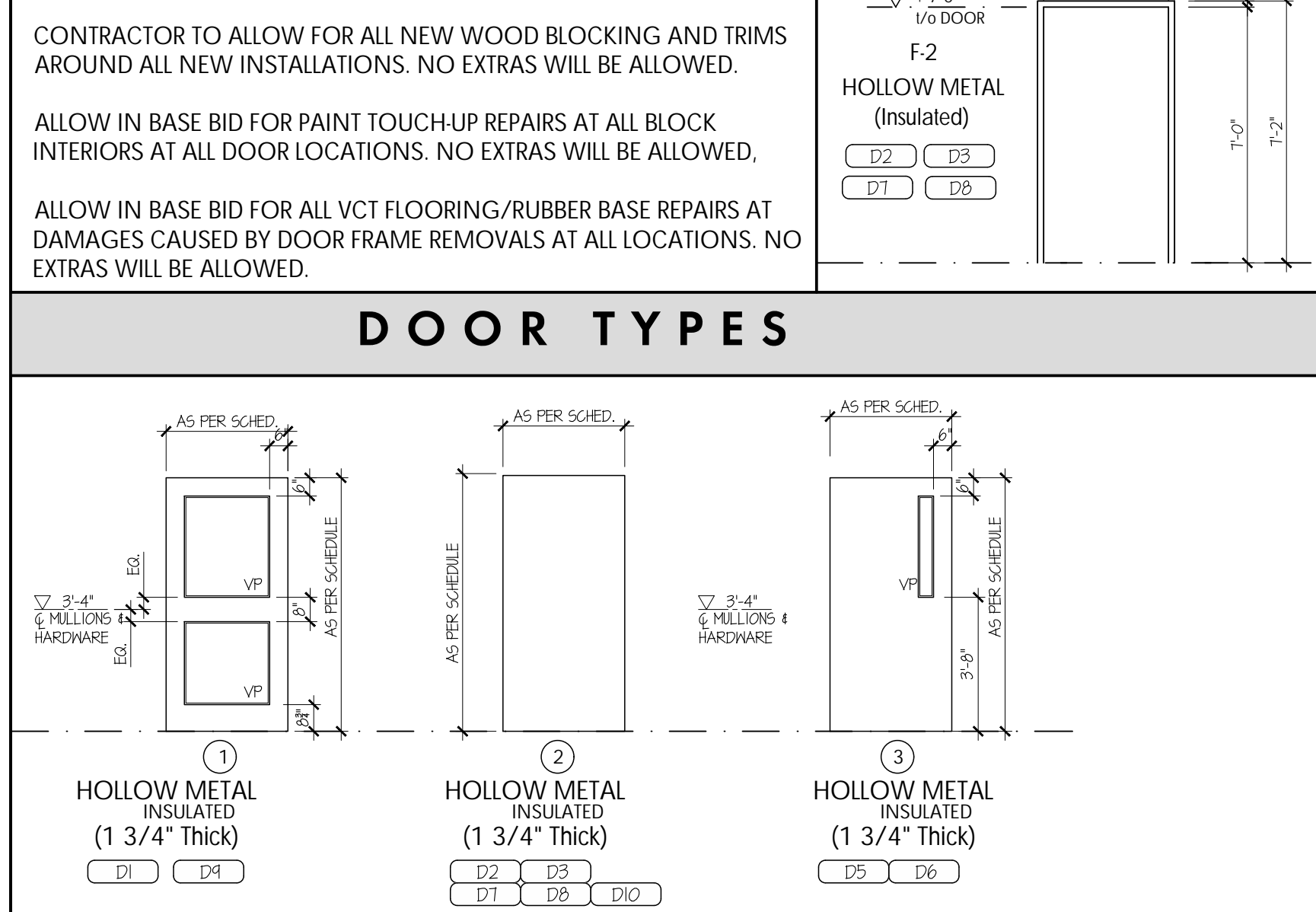
**EXTERIOR WINDOW TYPES**



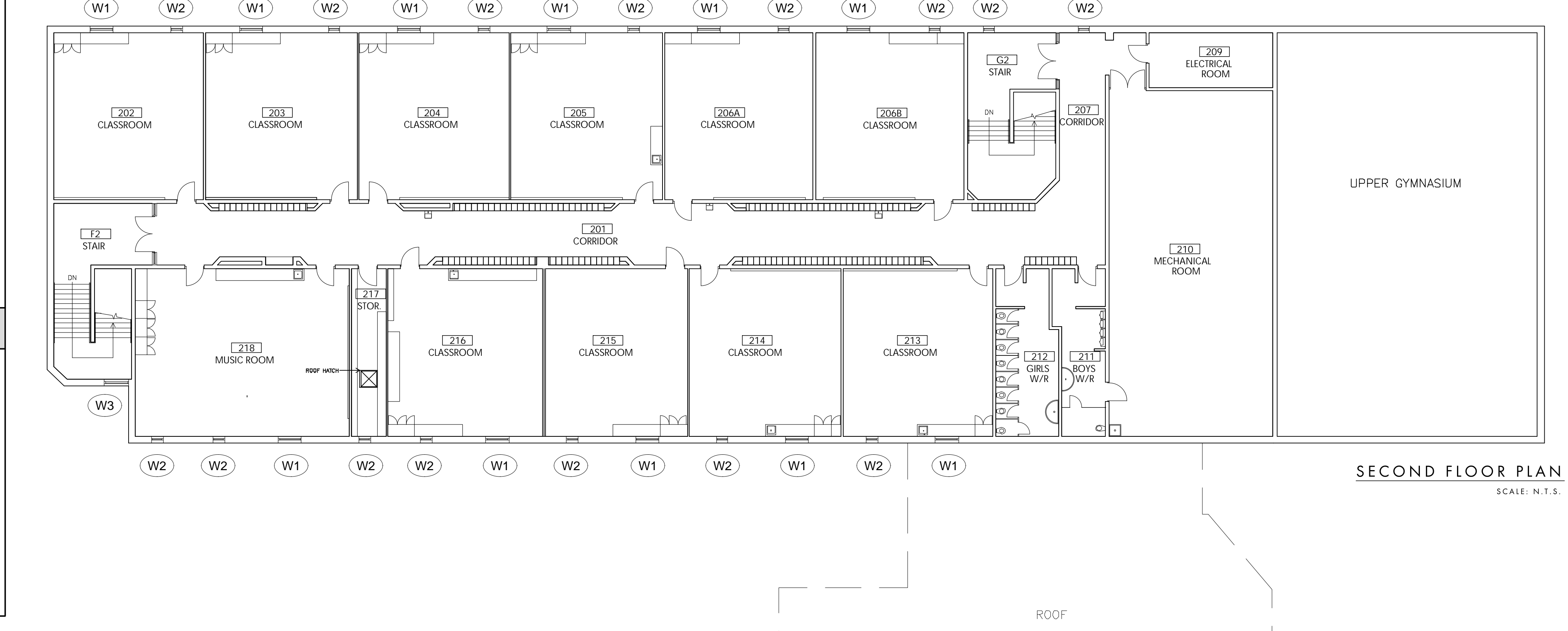
**EXTERIOR FRAMES**



**DOOR TYPES**



**GROUND FLOOR PLAN**  
SCALE: N.T.S.



**SECOND FLOOR PLAN**  
SCALE: N.T.S.

THESE DRAWINGS ARE NOT TO BE SCALED.  
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THE CONTRACTOR MUST FIELD VERIFY ALL DIMENSIONS AND MUST CONFIRM & CORRELATE ALL DETAILS WITHIN THE FULL DRAWING PACKAGE, BEING RESPONSIBLE FOR SAME THROUGHOUT CONSTRUCTION, REPORTING ANY DISCREPANCIES TO THE ARCHITECT PRIOR TO COMMENCING THE RELEVANT WORK.  
ALL DRAWINGS, DETAILS & SPECIFICATIONS REPRESENTED IN THE DRAWINGS ARE TO BE USED FOR CONSTRUCTION ONLY WHEN ISSUED BY THE ARCHITECT AND NOTED ACCORDINGLY IN THE 'ISSUE/REVISIONS' BOX HEREON.

- 1. ISSUED FOR REVIEW DEC 20/23
- 2. ISSUED FOR TENDER FEB 21/24
- 3. ISSUED FOR CONST.

PROJECT:  
Windows & Doors and Library Renovations  
**Cecil B. Stirling Elementary**  
340 Queen Victoria Drive  
Hamilton, ON  
For the HWDSB

SEAL:

NOTE:  
DOORS D1 / D6 / D10 HEAD OF DOOR TIES INTO 3" METAL STUD WALL ABOVE DOOR FRAME. TAKE CARE NOT TO DAMAGE EXTERIOR OR INTERIOR PLASTER/METAL SOFFIT WHEN REMOVING EXISTING OR INSTALLING NEW REPAIR TO MATCH IF DAMAGED

**WHITELINE**  
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DRAWING TITLE:  
**Floor Plan Window Types Door and Frame Types**

SCALE:  
AS NOTED  
DRAWN:  
D. GORDON S.B.  
DATE:  
February 2024

PROJECT #:  
2235  
DRAWING #:

**A1**

PLOTTED 3/5/2024 3:19 P.M.

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- ISSUED FOR REVIEW DEC 20/23
- ISSUED FOR TENDER FEB 21/24
- ISSUED FOR CONST.

PROJECT:  
 Windows & Doors and Library Renovations  
**Cecil B. Stirling Elementary**  
 340 Queen Victoria Drive  
 Hamilton, ON  
 For the HWDSB

SCALE:



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DRAWING TITLE:  
**ELEVATIONS  
 DOOR SCHEDULE**

SCALE:  
 AS NOTED

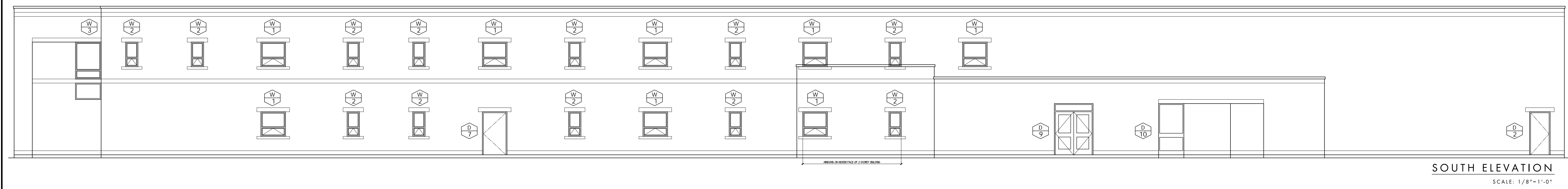
DRAWN:  
 D.GORDON S.B.

DATE:  
 December 2023

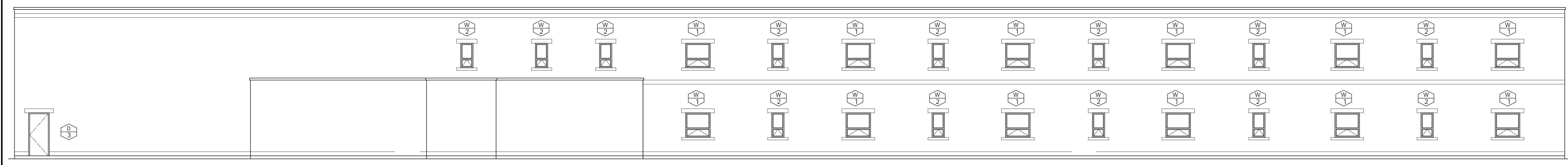
PROJECT #:  
 2235

DRAWING #:  
**A2**

PLOTTED 3/5/2024 3:19 P.M.

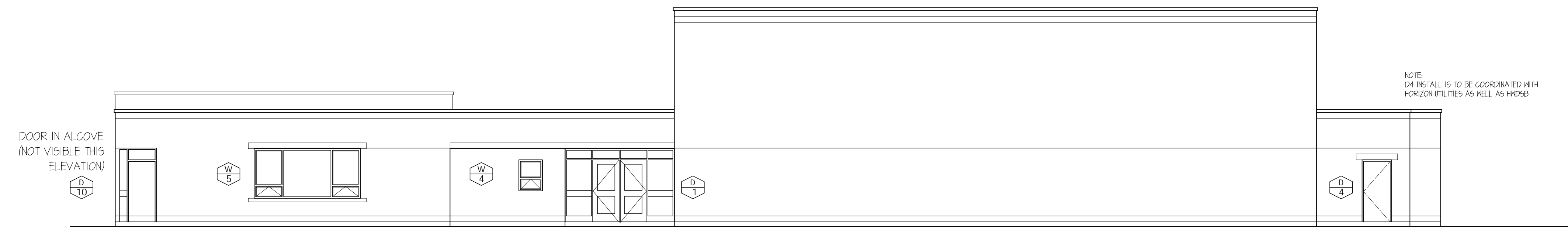


**SOUTH ELEVATION**  
 SCALE: 1/8"=1'-0"

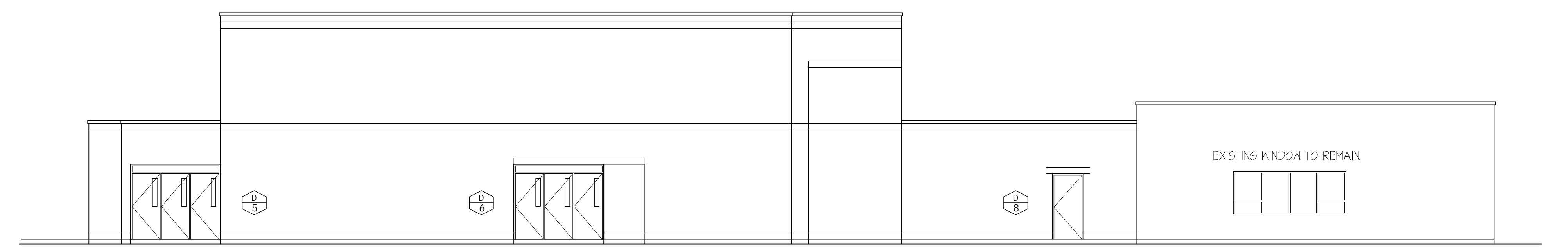


**NORTH ELEVATION**  
 SCALE: 1/8"=1'-0"

- GENERAL NOTES:**
- THE INTENT OF THESE DRAWINGS IS TO SHOW APPROXIMATE EXTENT AND NATURE OF REQUIREMENTS ONLY. THE GENERAL CONTRACTOR IS RESPONSIBLE TO VERIFY ACTUAL SITE CONDITIONS AS THEY ARE RELATED TO NEW CONSTRUCTION ITEMS, REPORTING DISCREPANCIES TO THE ARCHITECT AS REQUIRED.
  - AT ALL WINDOW AND DOOR LOCATIONS NOTED TO BE REPLACED, CONTRACTOR IS RESPONSIBLE TO REMOVE ALL EXISTING MATERIALS, INCLUDING SECURITY SCREENS AND INTERIOR WINDOW BLINDS TO ALLOW FOR EXECUTION OF THE WORK. ALL AREAS TO BE MADE SAFE AND SECURE AT THE END OF WORKING DAY BY PROVIDING SECURED PLYWOOD OVER OPENINGS. CONTRACTOR TO ONLY REMOVE ENOUGH WINDOWS SO THAT THEY CAN REASONABLY CLOSE IN WINDOWS WITHIN A DAY. REMOVAL OF ALL WINDOWS AT ONCE IS NOT ALLOWED.
  - IT IS THE GENERAL CONTRACTOR'S RESPONSIBILITY TO REMOVE & RELOCATE ALL EXISTING F.F.E. (FURNITURE, FIXTURES & EQUIPMENT) ITEMS FROM THE SUBJECT SPACE TO OWNER- DESIGNATED STORAGE LOCATIONS (ON-SITE). ITEMS DESIGNATED FOR RE-USE ARE TO BE RELOCATED INTO SUBJECT SPACES FOLLOWING CONSTRUCTION.
  - ITEMS TO BE DEMOLISHED SHALL BE DISPOSED OF LEGALLY OFF THE SITE AND COMPLY WITH ALL LOCAL HAULING & DISPOSAL REQUIREMENTS AT THE CONTRACTOR'S EXPENSE.
  - THE GENERAL CONTRACTOR SHALL MAINTAIN A SEPARATION BETWEEN AREAS WITHIN THE SCOPE OF WORK AND AREAS OUTSIDE OF THE SCOPE OF WORK BY PROVIDING PLASTIC SHEATHING BETWEEN CONTIGUOUS SPACES AND/OR TEMPORARILY TAPING OF JOINTS AND GAPS TO PREVENT DUST MIGRATION. ALL FURNITURE AND SHELVING TO BE COVERED.
  - THE GENERAL CONTRACTOR SHALL CAUSE NO DAMAGE TO EXISTING CONSTRUCTION TO REMAIN WHEREVER POSSIBLE, AND SHALL TAKE SPECIAL CARE NOT TO ENCROUGH ON ADJACENT OCCUPIED AREAS OR AREAS NOT WITHIN THE SCOPE OF WORK. PROTECT ALL EXISTING FINISHES, DOORS, FRAMES, ETC. WHICH ARE TO REMAIN.
  - THE GENERAL CONTRACTOR SHALL USE ALL MEANS NECESSARY TO ENSURE THE SAFETY OF ADJACENT OCCUPIED AREAS THROUGH THE ERECTION OF CONSTRUCTION HOARDING.
  - THE ARCHITECT SHALL NOT BE HELD LIABLE FOR ANY ASBESTOS OR OTHER HAZARDOUS MATERIALS ON JOBSITE. REFER TO THE HAZARDOUS MATERIALS REPORT IN THE SPECIFICATIONS AND INCLUDE FOR REMOVAL OF ALL ITEMS DENOTED IN REPORT IN ACCORDANCE WITH THE SPECIFIED PROCEDURES.
  - CONTRACTOR TO ALLOW FOR REMOVAL AND RE-INSTATEMENT OF ALL DOOR ALARM CONTACTS ON ALL EXTERIOR DOORS AS WELL AS ANY SWIPE CARD ACCESS DEVICES. REFER TO SPECIFICATIONS FOR LIST OF 52 CERTIFIED INTEGRATORS WHICH CAN BE CONTACTED TO QUOTE ON THIS PROJECT.
  - UPON COMPLETION, CLEAN THE ENTIRE AREA OF WORK TO A TIDY, UNIFORM CONDITION, REMOVING ALL DEBRIS, DUST PARTITIONS AND ASSOCIATED MATERIALS USED DURING THE WORK. CLEAN ALL AREAS IMPACTED BY THE WORK, INCLUDING BUT NOT LIMITED TO, ADJACENT OCCUPIED AREAS AND AREAS NOT WITHIN THE SCOPE OF WORK.
  - ABANDONING ITEMS OR UNUSED UTILITIES IN PLACE IS STRICTLY PROHIBITED, UNLESS SPECIFICALLY PERMITTED BY THE OWNER; ENSURE THAT OBSOLETE MECHANICAL & ELECTRICAL ITEMS ARE REMOVED, CAPPED AND OR HANDLED IN FULL ACCORDANCE WITH AUTHORITIES.
  - COMPLY WITH ALL STANDARD LOCAL, REGIONAL, PROVINCIAL, AND NATIONAL SAFETY REQUIREMENTS FOR DEMOLITION.
  - AT ALL POINTS OF REMOVAL AND/OR REPAIR, MAKE GOOD & PREPARE ALL DISTURBED FINISHES, MATERIALS & SUBSTRATES AS REQUIRED TO ENSURE CLEAN TIE-IN TO NEWLY SPECIFIED MATERIALS THROUGHOUT. PATCH & REPAIR ALL EXISTING ASSEMBLIES WITH MATCHING MATERIALS UNLESS NOTED OTHERWISE.
  - ALLOW FOR SECURE AREA ON SITE FOR PORTABLE TOILET AS WELL AS SEA-CAN FOR STORAGE IF REQUIRED. COORDINATE LOCATION WITH HWDSB PROJECT MANAGER AND SCHOOL.
  - CONTRACTOR SHALL REPAIR ANY 50D OR ASPHALT DAMAGED DUE TO SCAFFOLDING OR OTHER ASSOCIATED WORKS.



**EAST ELEVATION**  
 SCALE: 1/8"=1'-0"



**WEST ELEVATION**  
 SCALE: 1/8"=1'-0"

ALLOW FOR ALL ELECTRICAL ITEMS TO BE REMOVED / REINSTATED AT ALL DOORS AND FRAMES UNDER CONTRACT ALL EXTERIOR DOORS HAVE SECURITY CONTACTS ALL EXTERIOR DOORS HAVE SECURITY CONTACTS WHICH ARE TO BE REMOVED AND REINSTATED UNDER BASE BID- REFER TO SPECIFICATIONS FOR HWDSB APPROVED VENDORS FOR THIS WORK

DOOR SCHEDULE														
ID #	LOCATION	DOOR	FRAME	RATING			LEGEND:		REMARKS					
NO.	FROM	TO	SIZE	MATERIAL	ELEV.	FINISH	MATERIAL	JAMB	ELEV.	FINISH	DEPTH	FIRE RATING	INSERTS	NOTE
D1	EXT	100	2 @ 3'-2" x 7'-0"	INSULATED H.M.	1	PAINT	HOLLOW METAL	A	F-4	PAINT	5 3/4"	--	V.P.	AUTO OPERATOR, ACC. CARD REM. MULL. SERV. KEY
D2	EXT	127	3'-0" X 7'-0"	INSULATED H.M.	2	PAINT	HOLLOW METAL	A	F-2	PAINT	5 3/4"	--	--	--
D3	EXT	127	3'-0" x 7'-0"	INSULATED H.M.	2	PAINT	HOLLOW METAL	A	F-2	PAINT	5 3/4"	--	--	--
D4	EXT	130	EXIST	-	-	PAINT	-	-	-	PAINT	-	--	-	PAINT DOOR AND FRAME ONLY
D5	EXT	123	3 @ 3'-0" x 7'-0"	INSULATED H.M.	3	PAINT	HOLLOW METAL	A	F-1	PAINT	5 3/4"	--	V.P.	CARD ACCESS
D6	EXT	114	3 @ 3'-0" x 7'-0"	INSULATED H.M.	3	PAINT	HOLLOW METAL	A	F-1	PAINT	5 3/4"	--	V.P.	AUTO OPERATOR CARD ACCESS
D7	EXT	111	3'-0" x 7'-0"	INSULATED H.M.	2	PAINT	HOLLOW METAL	A	F-2	PAINT	5 3/4"	--	--	--
D8	EXT	101A	3'-0" x 7'-0"	INSULATED H.M.	2	PAINT	HOLLOW METAL	A	F-2	PAINT	5 3/4"	--	--	SURVEILLANCE KEY
D9	EXT	103	2 @ 3'-0" x 7'-0"	INSULATED H.M.	1	PAINT	HOLLOW METAL	A	F-3	PAINT	5 3/4"	--	V.P.	REM. MULLION CARD ACCESS
D10	EXT	104	3'-0" x 7'-0"	INSULATED H.M.	2	PAINT	HOLLOW METAL	A	F-5	PAINT	5 3/4"	--	--	2 PIECE FRAME

- DOOR AND FRAME NOTES:**
- CONTRACTOR TO VERIFY ALL FRAME SIZES (INCLUDING DEPTHS) AND REPORT ANY DISCREPANCIES TO THE ARCHITECT FOR FURTHER CLARIFICATION PRIOR TO SHOP DRAWING SUBMISSION.
  - INSTALLATION ORIENTATIONS OF ALL DOOR AND DOOR FRAMES TO BE AS PER FLOOR PLANS.
  - ENSURE CLEAR, UNOBSTRUCTED PATH ABOVE FULL WIDTH OF DOOR HEADERS ALLOWING FOR LOW-VOLTAGE WIRING TO RUN AFTER FRAME INSTALLATION. CONTRACTOR TO COORDINATE WITH ELECTRICAL AND OWNER FOR PREP. LOCATIONS.
  - VERTICAL FRAME DIMENSIONS SHOWN INCLUDE DIMENSIONAL ALLOWANCE FOR FRAME WRAP OVER BLOCK COURSING (B.C.) OR 6X6B. AS NOTED.



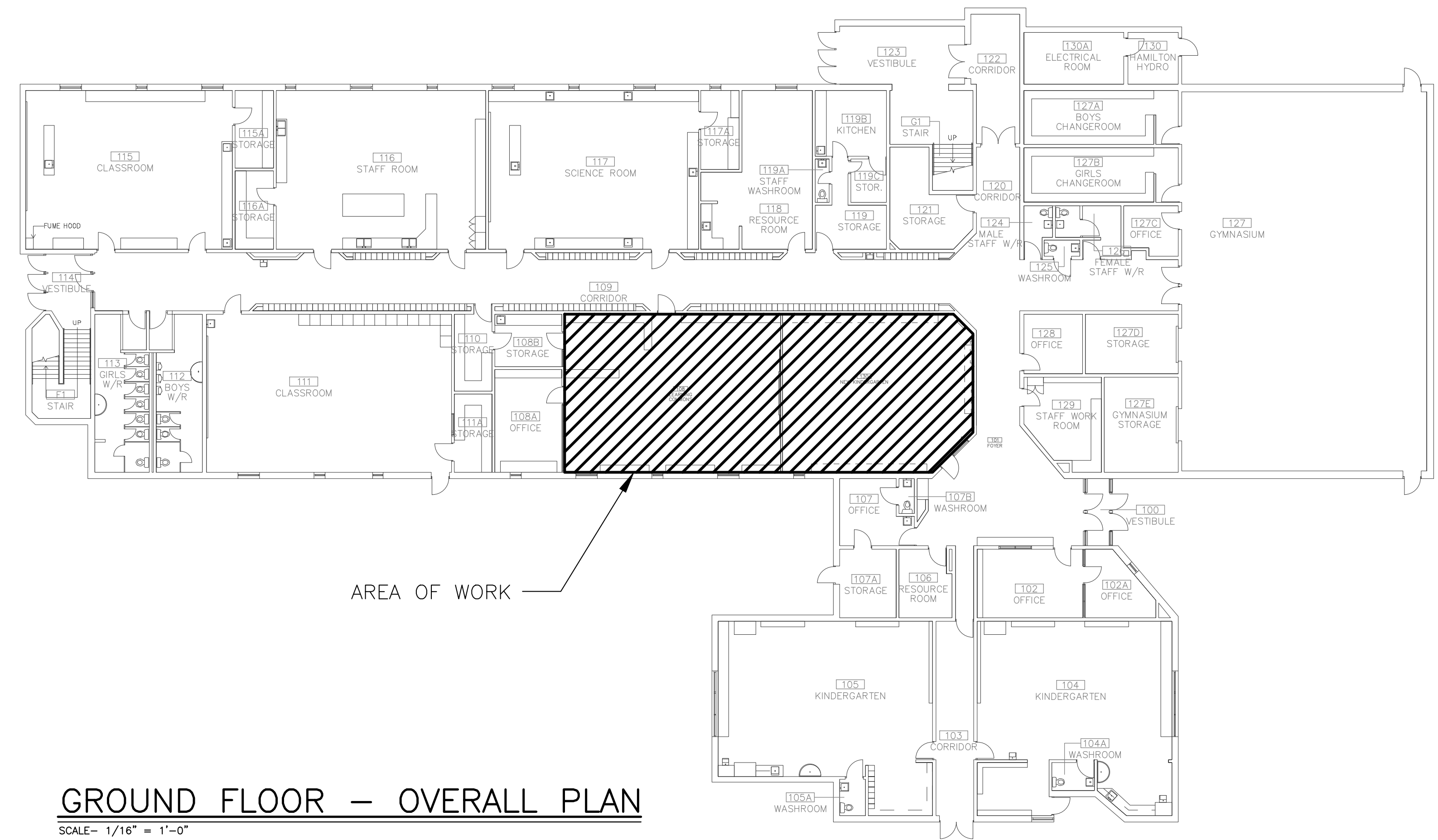


VENTILATION LEGEND	
	SOUND INSULATION
	FLEXIBLE CONNECTION
	DUCT OFFSET
	DUCT OFFSET (SINGLE LINE)
	TURNING VANES
	BALANCING DAMPER
	FIRE DAMPER
	SPLITTER DAMPER
	BACKDRAFT DAMPER
	OPPOSED BLADE DAMPER
	SUPPLY DUCT SECTION
	RETURN DUCT SECTION
	SUPPLY DIFFUSER
	EXHAUST GRILLE
	DIFFUSER DESIGNATION AND CFM
	GRILLE DESIGNATION AND CFM
	FLEXIBLE ROUND DUCT
	CAPPED END DUCT
	DUCT REDUCER/ENLARGER
	TRANSITION  TO  ROUND
	THERMOSTAT
	ACCESS DOOR
	ABOVE FINISHED FLOOR
	CUBIC FEET PER MINUTE

VALVE LEGEND	
	VALVE - SEE SPEC
	CHECK VALVE
	STRAINER
	PRESSURE REDUCING VALVE
	2-WAY CONTROL VALVE
	RELIEF VALVE
	SOLENOID VALVE
	HOSE BIBB
	CIRCUIT BALANCE VALVE

PIPING LEGEND	
	HOT WATER SUPPLY (HWS)
	HOT WATER RETURN (HWR)
	EQUIPMENT DRAIN LINE
	PIPE ANCHOR
	BOTTOM TAKE-OFF
	TOP TAKE-OFF
	ELBOW UP
	ELBOW DOWN
	VALVE - SEE SPECIFICATIONS
	UNION CONNECTION
	FLANGED CONNECTION
	PLUG CAP
	AIR VENT
	AUTOMATIC AIR VENT
	THERMOSTAT w/GUARD
	FLOW METERING DEVICE (FMD)
	CONTINUOUS CONVECTORS
	RADIANT PANELS
	ABOVE FINISHED FLOOR
	CIRCUIT BALANCING VALVE
	GALLONS PER MINUTE
	REQUIRED
	THERMOSTATIC CONTROL VALVE
	TYPICAL
	HEAT EXCHANGER
	HEATING COIL

DRAWING LIST	
DWG No.	DRAWING TITLE
M0	MECHANICAL LEGEND AND DRAWING LIST
M1	MECHANICAL SPECIFICATIONS
M2	MECHANICAL SPECIFICATIONS
M3	PARTIAL MECHANICAL FLOOR PLANS
M4	MECHANICAL DETAILS
M5	MECHANICAL SCHEMATICS & SCHEDULES
ME1	MECHANICAL & ELECTRICAL SCHEDULES



**GROUND FLOOR - OVERALL PLAN**

SCALE- 1/16" = 1'-0"

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1. ISSUED FOR PERMIT 23/11/10
2. ISSUED FOR TENDER 24/02/29

PROJECT:  
Window and Door  
Upgrades at:

Cecil B.  
Stirling  
Elementary  
340 Queen Victoria  
Drive  
Hamilton, ON  
For the HWDSB

SCALE:

EXP Services Inc.

t: 905.525.6069 | f: 905.528.7310  
1266 South Service Road,  
Suite C-11, Stony Creek,  
ON, L5E 5R9  
Canada

www.exp.com



• BUILDINGS • EARTH & ENVIRONMENT • ENERGY  
• INDUSTRIAL • INFRASTRUCTURE • SUSTAINABILITY

DRAWING TITLE:  
Mechanical  
Legend, Key  
Plan &  
Drawing List

SCALE:  
AS NOTED

DRAWN:  
J.LL

DATE:  
OCTOBER 2023

PROJECT #:  
ALL-23012666-A0

DRAWING #:  
MO

**MECHANICAL SPECIFICATIONS – GENERAL**

ABBREVIATED SPECIFICATION DESCRIBES SOME EQUIPMENT AND MATERIALS TO BE INCLUDED IN THE WORK. ONLY FIRST CLASS WORKMANSHIP, MATERIALS AND PRACTICES WILL BE ACCEPTED.

**GENERAL****1. GENERAL REQUIREMENTS**

- A. READ AND CONFORM TO:  
 1 DIVISION 1 REQUIREMENTS AND DOCUMENTS REFERRED TO THEREIN.  
 B. THE SPECIFICATIONS ARE INTEGRAL WITH THE DRAWINGS WHICH ACCOMPANY THEM. NEITHER IS TO BE USED ALONE, ANY ITEM OR SUBJECT OMITTED FROM ONE BUT IMPLIED IN THE OTHER IS FULLY AND PROPERLY REQUIRED.  
 C. WHEREVER DIFFERENCES OCCUR IN THE TENDER DOCUMENTS, THE MOST ONEROUS CONDITION GOVERNS. BASE THE BID ON THE COSTLIEST ARRANGEMENT.  
 D. CONFORM TO THE LATEST EDITION OF ONTARIO BUILDING CODE (CSA STANDARDS), ONTARIO FIRE CODE, LOCAL & DISTRICT BYLAWS, REGULATIONS, & PUBLISHED ENGINEERING STANDARDS.  
 E. NOTIFY CONSULTANT UPON DISCOVERY OF CONDITIONS WHICH ADVERSELY AFFECT WORK OF THIS DIVISION. NO ALLOWANCE WILL BE MADE AFTER LETTING OF CONTRACT FOR ANY EXPENSES INCURRED THROUGH FAILURE TO DO SO.  
 F. ARRANGE AND PAY FOR PERMITS AND INSPECTIONS BY AUTHORITIES HAVING JURISDICTION, UNDER TAKING OF THIS DIVISION. MAKE MODIFICATIONS REQUIRED BY AUTHORITIES.  
 G. ALL TRADESMEN EMPLOYED ON THE PROJECT SHALL HOLD VALID TRADE CERTIFICATES/LICENSES AND SHALL MAKE A COPY AVAILABLE FOR REVIEW BY THE CONSULTANT AND/OR OWNER WHEN REQUESTED.

**1.2 SCOPE OF WORK**

- A. PRODUCTS AND METHODS MENTIONED OR SHOWN IN THE CONTRACT DOCUMENTS COMPLETE WITH INCIDENTALS NECESSARY FOR A COMPLETE OPERATING INSTALLATION. PROVIDE ALL TOOLS, EQUIPMENT AND SERVICES REQUIRED TO DO THE WORK.  
 B. SITE EXAMINE EXISTING CONDITIONS WHICH MAY AFFECT WORK OF THIS DIVISION. EXAMINE ALL CONTRACT DOCUMENTS IN CONJUNCTION WITH SITE EXAMINATION TO ENSURE THAT WORK OF THIS DIVISION MAY BE SATISFACTORILY COMPLETED.  
 C. DISCONNECTION AND REMOVAL OF VARIOUS MECHANICAL EQUIPMENT IN AREAS TO BE TURNED OVER TO THE OWNER.  
 D. DISCONNECTION AND MAKING SAFE OF VARIOUS MECHANICAL SYSTEMS AND EQUIPMENT IN AREAS TO BE DEMOLISHED AND/OR RENOVATED.  
 E. ON COMPLETION OF RENOVATIONS, MODIFICATIONS AND/OR REPAIRS, TEST ENTIRE SYSTEM AS IF NEW. REPORT REPAIRS OR REPLACEMENTS REQUIRED OF EXISTING EQUIPMENT, PIPING, FITTINGS OR DEVICES THAT ARE NOT INCLUDED IN CONTRACT TO CONSULTANT AND OWNER FOR INSTRUCTION.  
 F. CUTTING AND PATCHING OF NEW OR EXISTING WORK.  
 G. IDENTIFICATION OF EQUIPMENT, PIPING, VALVES AND CONTROLLERS.  
 H. PERFORM START-UP AND COMPLETELY COMMISSION ALL EQUIPMENT AND SYSTEMS INSTALLED AND/OR MODIFIED UNDER THIS CONTRACT. COMMISSIONING WORK SHALL BE COMPLETED TO THE SATISFACTION OF THE CONSULTANT PRIOR TO ACCEPTANCE OF THE WORK.  
 I. APPLY FOR & OBTAIN ALL PERMITS INCLUDING BUILDING PERMITS, & TSSA APPLICATIONS, LICENSES, OR CERTIFICATES NECESSARY FOR THE PERFORMANCE OF THE WORK. COORDINATE ALL WORK WITH BUILDING OFFICIALS & AUTHORITIES HAVING JURISDICTION.  
 J. TAKE SUCH MEASURES AND INCLUDE IN BID PRICE FOR THE PROPER PROTECTION OF THE EXISTING BUILDING AND ITS FINISHES AT ALL TIMES DURING ALTERATIONS AND CONSTRUCTION OF THE NEW ADDITION. COORDINATE THIS PROTECTIVE WORK WITH THE OWNER.  
 K. VERIFY THE CORRECT OPERATION OF EACH EQUIPMENT ITEM PROVIDED AND/OR ALTERED AND EACH SYSTEM IN TOTAL AND OBTAIN THE OWNER'S APPROVAL PRIOR TO STARTING AND/OR RETURNING TO OPERATION.  
 L. REVIEW HYDRONIC HEATING SYSTEM WATER TREATMENT AND PREPARE FOR NEW EQUIPMENT INSTALLATION. COORDINATE WITH OWNER'S WATER CHEMICAL TREATMENT VENDOR FOR ALL NEW WORK AND MODIFICATION:  
 1 AQUARIAN CHEMICALS INC. – MAURO CESA, 416-540-1883, mces@aquarianchemicals.com

**1.3 SUBMITTALS**

- A. SHOP DRAWINGS: PREPARE AND SUBMIT TWO (2) COPIES OF SHOP DRAWINGS OF ALL EQUIPMENT ITEMS TO THE CONSULTANT FOR REVIEW. THE CONSULTANT WILL RETURN ONE COPY, MARKED WITH COMMENTS AND THEIR REVIEW STAMP AS THEY BECOME APPROPRIATE.  
 1 CLEARLY INDICATE MANUFACTURER'S AND SUPPLIER'S NAMES, MODEL NUMBERS, DETAILS OF CONSTRUCTION, ACCURATE DIMENSIONS, CAPACITIES AND PERFORMANCE. PRIOR TO SUBMISSION CHECK AND CERTIFY AS CORRECT, SHOP DRAWINGS AND DATA SHEETS. DO NOT ORDER EQUIPMENT UNTIL A COPY OF THE SHOP DRAWINGS, REVIEWED BY CONSULTANT, HAS BEEN RETURNED TO CONTRACTOR.  
 2 THE CONSULTANT WILL NOT REVIEW SHOP DRAWINGS THAT FAIL TO BEAR THE CONTRACTOR'S STAMP OF APPROVAL OR CERTIFICATION.  
 B. AS-BUILT RECORDS: BEFORE FINAL PAYMENT, SUBMIT TWO SETS OF AS-BUILTS DRAWINGS IN AUTOCAD FORMAT SHOWING ALL CHANGES & CONCEALED SECTIONS DIMENSIONED.  
 C. REQUESTS FOR SHUT-DOWN: OBTAIN PERMISSION FOR SYSTEMS SHUT-DOWN AND/OR SERVICE INTERRUPTION FROM THE OWNER PRIOR TO DISRUPTION OF ANY SYSTEM OR SERVICE IN USE BY THE OWNER. EMPLOY THE OWNER'S STANDARD FORM OF REQUEST WHERE AVAILABLE.  
 D. REQUESTS FOR START-UP: OBTAIN PERMISSION FROM THE OWNER TO START-UP OR TO RETURN TO SERVICE ANY ITEM OF EQUIPMENT, SYSTEM OR SERVICE INSTALLED OR PREVIOUSLY SHUT-DOWN BY THE OWNER.  
 E. WARRANTY: PROVIDE WRITTEN GUARANTEE FOR ALL NEW EQUIPMENT & WORKMANSHIP FOR ONE (1) YEAR FROM DATE OF SUBSTANTIAL COMPLETION. FIVE (5) YEARS FOR COMPRESSOR & HEAT EXCHANGER. DEFECTIVE PARTS REPAIRED OR REPLACED WITHOUT CHARGE.

**1.4 TRAINING**

- A. PROVIDE MINIMUM OF (2) TRAINING SESSIONS, AND (4) HOURS FOR EACH SESSION, THROUGHOUT THE CONTRACT PERIOD. THE TRAINING WILL BE PROVIDED FOR PERSONNEL DESIGNATED BY THE OWNER.  
 B. THESE OBJECTIVES WILL BE DIVIDED INTO LOGICAL GROUPINGS; PARTICIPANTS MAY ATTEND ONE OR MORE OF THESE, DEPENDING ON LEVEL OF KNOWLEDGE.  
 C. THE INSTRUCTOR(S) SHALL BE FACTORY-TRAINED AND EXPERIENCED IN TEACHING THIS TECHNICAL MATERIAL.  
 D. TRAINING WILL BEGIN WHEN THE OPERATING AND MAINTENANCE MANUALS HAVE BEEN DELIVERED TO THE OWNER OR REVIEWED BY THE ENGINEER'S REPRESENTATIVE.  
 E. BUILDING WALK THROUGH AND LOCATION OF EQUIPMENT  
 F. OPERATING PROCEDURES  
 G. MAINTENANCE PROCEDURES  
 H. TROUBLE-SHOOTING PROCEDURES  
 I. SPARE PARTS REQUIRED  
 J. PROJECT RECORD DOCUMENTS: UPON COMPLETION OF INSTALLATION, SUBMIT AN ELECTRONIC COPY. THE DOCUMENTS SHALL BE SUBMITTED FOR APPROVAL PRIOR TO FINAL COMPLETION AND INCLUDE:  
 1 PROJECT RECORD DRAWINGS – THESE SHALL BE AS-BUILT VERSIONS OF THE SUBMITTAL SHOP DRAWINGS. ONE SET OF ELECTRONIC MEDIA .PDF DRAWING FILES SHALL BE PROVIDED.  
 2 TESTING AND COMMISSIONING REPORTS AND CHECKLISTS SIGNED OFF BY TRAINED FACTORY (EQUIPMENT MANUFACTURERS) AND FIELD COMMISSIONING PERSONNEL.

**2 COMMON WORK RESULTS****2.1 PIPING SPECIALTIES**

- A. DART TYPE, 125 LB. (860 KPA) BLACK MALLEABLE IRON UNIONS SHALL BE USED WITH ALL STEEL PIPE FOR PIPING 2-1/2" (65 MM) AND SMALLER.  
 B. SLIP-ON, 150 LB. (1000 KPA) CARBON STEEL FLANGES WITH 1/16" (4 MM) RAISED FACE SHALL BE USED WITH ALL STEEL PIPE FOR PIPING LARGER THAN 2-1/2" (65 MM).  
 C. GASKETS FOR JOINING FLANGED STEEL PIPE SHALL BE 1/16" (4 MM) CRANITE RING TYPE GASKETS.  
 D. PIPING SPECIALTIES INCLUDING BACKFLOW PREVENTERS, STRAINERS, VALVES ETC. SHALL BE LINE SIZE UNLESS INDICATED OTHERWISE ON DRAWINGS.  
 E. STRAINERS  
 1 APPROVED MANUFACTURERS: SARCO SB, S.A. ARMSTRONG, CRANE, CONBRACO, COLTON  
 2 IN COPPER TUBING: CLASS 250, WYE TYPE, BRONZE, SCREWED CONNECTION, WITH BLIND CAPS, AND 1/32" (0.8 MM) PERFORATED STAINLESS STEEL SCREEN  
 3 IN STEEL PIPING: 2" (50MM) AND SMALLER  
 1 BODY AND COVER: SCREWED, LINE SIZE Y TYPE STRAINER,

**MECHANICAL SPECIFICATIONS – GENERAL**

SEMI-STEEL CONFORMING TO ASTM A278-85, CLASS 30, COMPLETE WITH SCORED BLIND CAP. PRIMARY SERVICE RATING OF 125 PSI @ 350 F (860 KPA @ 178 C). BODY SHALL HAVE SIDE DRAIN CONNECTION.

**GENERAL****1. GENERAL REQUIREMENTS**

- A. READ AND CONFORM TO:  
 1 DIVISION 1 REQUIREMENTS AND DOCUMENTS REFERRED TO THEREIN.  
 B. THE SPECIFICATIONS ARE INTEGRAL WITH THE DRAWINGS WHICH ACCOMPANY THEM. NEITHER IS TO BE USED ALONE, ANY ITEM OR SUBJECT OMITTED FROM ONE BUT IMPLIED IN THE OTHER IS FULLY AND PROPERLY REQUIRED.  
 C. WHEREVER DIFFERENCES OCCUR IN THE TENDER DOCUMENTS, THE MOST ONEROUS CONDITION GOVERNS. BASE THE BID ON THE COSTLIEST ARRANGEMENT.  
 D. CONFORM TO THE LATEST EDITION OF ONTARIO BUILDING CODE (CSA STANDARDS), ONTARIO FIRE CODE, LOCAL & DISTRICT BYLAWS, REGULATIONS, & PUBLISHED ENGINEERING STANDARDS.  
 E. NOTIFY CONSULTANT UPON DISCOVERY OF CONDITIONS WHICH ADVERSELY AFFECT WORK OF THIS DIVISION. NO ALLOWANCE WILL BE MADE AFTER LETTING OF CONTRACT FOR ANY EXPENSES INCURRED THROUGH FAILURE TO DO SO.  
 F. ARRANGE AND PAY FOR PERMITS AND INSPECTIONS BY AUTHORITIES HAVING JURISDICTION, UNDER TAKING OF THIS DIVISION. MAKE MODIFICATIONS REQUIRED BY AUTHORITIES.  
 G. ALL TRADESMEN EMPLOYED ON THE PROJECT SHALL HOLD VALID TRADE CERTIFICATES/LICENSES AND SHALL MAKE A COPY AVAILABLE FOR REVIEW BY THE CONSULTANT AND/OR OWNER WHEN REQUESTED.

**1.2 SCOPE OF WORK**

- A. PRODUCTS AND METHODS MENTIONED OR SHOWN IN THE CONTRACT DOCUMENTS COMPLETE WITH INCIDENTALS NECESSARY FOR A COMPLETE OPERATING INSTALLATION. PROVIDE ALL TOOLS, EQUIPMENT AND SERVICES REQUIRED TO DO THE WORK.  
 B. SITE EXAMINE EXISTING CONDITIONS WHICH MAY AFFECT WORK OF THIS DIVISION. EXAMINE ALL CONTRACT DOCUMENTS IN CONJUNCTION WITH SITE EXAMINATION TO ENSURE THAT WORK OF THIS DIVISION MAY BE SATISFACTORILY COMPLETED.  
 C. DISCONNECTION AND REMOVAL OF VARIOUS MECHANICAL EQUIPMENT IN AREAS TO BE TURNED OVER TO THE OWNER.  
 D. DISCONNECTION AND MAKING SAFE OF VARIOUS MECHANICAL SYSTEMS AND EQUIPMENT IN AREAS TO BE DEMOLISHED AND/OR RENOVATED.  
 E. ON COMPLETION OF RENOVATIONS, MODIFICATIONS AND/OR REPAIRS, TEST ENTIRE SYSTEM AS IF NEW. REPORT REPAIRS OR REPLACEMENTS REQUIRED OF EXISTING EQUIPMENT, PIPING, FITTINGS OR DEVICES THAT ARE NOT INCLUDED IN CONTRACT TO CONSULTANT AND OWNER FOR INSTRUCTION.  
 F. CUTTING AND PATCHING OF NEW OR EXISTING WORK.  
 G. IDENTIFICATION OF EQUIPMENT, PIPING, VALVES AND CONTROLLERS.  
 H. PERFORM START-UP AND COMPLETELY COMMISSION ALL EQUIPMENT AND SYSTEMS INSTALLED AND/OR MODIFIED UNDER THIS CONTRACT. COMMISSIONING WORK SHALL BE COMPLETED TO THE SATISFACTION OF THE CONSULTANT PRIOR TO ACCEPTANCE OF THE WORK.  
 I. APPLY FOR & OBTAIN ALL PERMITS INCLUDING BUILDING PERMITS, & TSSA APPLICATIONS, LICENSES, OR CERTIFICATES NECESSARY FOR THE PERFORMANCE OF THE WORK. COORDINATE ALL WORK WITH BUILDING OFFICIALS & AUTHORITIES HAVING JURISDICTION.  
 J. TAKE SUCH MEASURES AND INCLUDE IN BID PRICE FOR THE PROPER PROTECTION OF THE EXISTING BUILDING AND ITS FINISHES AT ALL TIMES DURING ALTERATIONS AND CONSTRUCTION OF THE NEW ADDITION. COORDINATE THIS PROTECTIVE WORK WITH THE OWNER.  
 K. VERIFY THE CORRECT OPERATION OF EACH EQUIPMENT ITEM PROVIDED AND/OR ALTERED AND EACH SYSTEM IN TOTAL AND OBTAIN THE OWNER'S APPROVAL PRIOR TO STARTING AND/OR RETURNING TO OPERATION.  
 L. REVIEW HYDRONIC HEATING SYSTEM WATER TREATMENT AND PREPARE FOR NEW EQUIPMENT INSTALLATION. COORDINATE WITH OWNER'S WATER CHEMICAL TREATMENT VENDOR FOR ALL NEW WORK AND MODIFICATION:  
 1 AQUARIAN CHEMICALS INC. – MAURO CESA, 416-540-1883, mces@aquarianchemicals.com

**1.3 SUBMITTALS**

- A. SHOP DRAWINGS: PREPARE AND SUBMIT TWO (2) COPIES OF SHOP DRAWINGS OF ALL EQUIPMENT ITEMS TO THE CONSULTANT FOR REVIEW. THE CONSULTANT WILL RETURN ONE COPY, MARKED WITH COMMENTS AND THEIR REVIEW STAMP AS THEY BECOME APPROPRIATE.  
 1 CLEARLY INDICATE MANUFACTURER'S AND SUPPLIER'S NAMES, MODEL NUMBERS, DETAILS OF CONSTRUCTION, ACCURATE DIMENSIONS, CAPACITIES AND PERFORMANCE. PRIOR TO SUBMISSION CHECK AND CERTIFY AS CORRECT, SHOP DRAWINGS AND DATA SHEETS. DO NOT ORDER EQUIPMENT UNTIL A COPY OF THE SHOP DRAWINGS, REVIEWED BY CONSULTANT, HAS BEEN RETURNED TO CONTRACTOR.  
 2 THE CONSULTANT WILL NOT REVIEW SHOP DRAWINGS THAT FAIL TO BEAR THE CONTRACTOR'S STAMP OF APPROVAL OR CERTIFICATION.  
 B. AS-BUILT RECORDS: BEFORE FINAL PAYMENT, SUBMIT TWO SETS OF AS-BUILTS DRAWINGS IN AUTOCAD FORMAT SHOWING ALL CHANGES & CONCEALED SECTIONS DIMENSIONED.  
 C. REQUESTS FOR SHUT-DOWN: OBTAIN PERMISSION FOR SYSTEMS SHUT-DOWN AND/OR SERVICE INTERRUPTION FROM THE OWNER PRIOR TO DISRUPTION OF ANY SYSTEM OR SERVICE IN USE BY THE OWNER. EMPLOY THE OWNER'S STANDARD FORM OF REQUEST WHERE AVAILABLE.  
 D. REQUESTS FOR START-UP: OBTAIN PERMISSION FROM THE OWNER TO START-UP OR TO RETURN TO SERVICE ANY ITEM OF EQUIPMENT, SYSTEM OR SERVICE INSTALLED OR PREVIOUSLY SHUT-DOWN BY THE OWNER.  
 E. WARRANTY: PROVIDE WRITTEN GUARANTEE FOR ALL NEW EQUIPMENT & WORKMANSHIP FOR ONE (1) YEAR FROM DATE OF SUBSTANTIAL COMPLETION. FIVE (5) YEARS FOR COMPRESSOR & HEAT EXCHANGER. DEFECTIVE PARTS REPAIRED OR REPLACED WITHOUT CHARGE.

**1.4 TRAINING**

- A. PROVIDE MINIMUM OF (2) TRAINING SESSIONS, AND (4) HOURS FOR EACH SESSION, THROUGHOUT THE CONTRACT PERIOD. THE TRAINING WILL BE PROVIDED FOR PERSONNEL DESIGNATED BY THE OWNER.  
 B. THESE OBJECTIVES WILL BE DIVIDED INTO LOGICAL GROUPINGS; PARTICIPANTS MAY ATTEND ONE OR MORE OF THESE, DEPENDING ON LEVEL OF KNOWLEDGE.  
 C. THE INSTRUCTOR(S) SHALL BE FACTORY-TRAINED AND EXPERIENCED IN TEACHING THIS TECHNICAL MATERIAL.  
 D. TRAINING WILL BEGIN WHEN THE OPERATING AND MAINTENANCE MANUALS HAVE BEEN DELIVERED TO THE OWNER OR REVIEWED BY THE ENGINEER'S REPRESENTATIVE.  
 E. BUILDING WALK THROUGH AND LOCATION OF EQUIPMENT  
 F. OPERATING PROCEDURES  
 G. MAINTENANCE PROCEDURES  
 H. TROUBLE-SHOOTING PROCEDURES  
 I. SPARE PARTS REQUIRED  
 J. PROJECT RECORD DOCUMENTS: UPON COMPLETION OF INSTALLATION, SUBMIT AN ELECTRONIC COPY. THE DOCUMENTS SHALL BE SUBMITTED FOR APPROVAL PRIOR TO FINAL COMPLETION AND INCLUDE:  
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- A. DART TYPE, 125 LB. (860 KPA) BLACK MALLEABLE IRON UNIONS SHALL BE USED WITH ALL STEEL PIPE FOR PIPING 2-1/2" (65 MM) AND SMALLER.  
 B. SLIP-ON, 150 LB. (1000 KPA) CARBON STEEL FLANGES WITH 1/16" (4 MM) RAISED FACE SHALL BE USED WITH ALL STEEL PIPE FOR PIPING LARGER THAN 2-1/2" (65 MM).  
 C. GASKETS FOR JOINING FLANGED STEEL PIPE SHALL BE 1/16" (4 MM) CRANITE RING TYPE GASKETS.  
 D. PIPING SPECIALTIES INCLUDING BACKFLOW PREVENTERS, STRAINERS, VALVES ETC. SHALL BE LINE SIZE UNLESS INDICATED OTHERWISE ON DRAWINGS.  
 E. STRAINERS  
 1 APPROVED MANUFACTURERS: SARCO SB, S.A. ARMSTRONG, CRANE, CONBRACO, COLTON  
 2 IN COPPER TUBING: CLASS 250, WYE TYPE, BRONZE, SCREWED CONNECTION, WITH BLIND CAPS, AND 1/32" (0.8 MM) PERFORATED STAINLESS STEEL SCREEN  
 3 IN STEEL PIPING: 2" (50MM) AND SMALLER  
 1 BODY AND COVER: SCREWED, LINE SIZE Y TYPE STRAINER,

**HVAC SPECIFICATIONS****1 HVAC HYDRONIC PIPING****1.1 HYDRONIC PIPING – GENERAL:**

- A. KEEP OPEN ENDS OF PIPE FREE FROM SCALE AND DIRT. PROTECT OPEN ENDS WITH TEMPORARY PLUGS OR CAPS. AFTER COMPLETION, FILLS, CLEAN, AND TREAT SYSTEMS.  
 B. PROVIDE NON-CONDUCTING DIELECTRIC CONNECTIONS WHENEVER JOINING DISSIMILAR METALS IN OPEN SYSTEMS.  
 C. PRIME COAT EXPOSED STEEL HANGERS AND SUPPORTS, HANGERS AND SUPPORTS LOCATED IN CRAWL SPACES, PIPE SHAFTS, AND SUSPENDED CEILING SPACES ARE NOT CONSIDERED EXPOSED.  
 D. AIR VENTS SHALL BE SELECTED TO SUIT THE SYSTEM OPERATING PRESSURES AND SHALL BE AUTOMATIC AND COMPLETE WITH ISOLATING VALVES.  
 E. PIPE ALL DISCHARGE FROM TEMPERATURE & PRESSURE SAFETY RELIEF VALVES TO A POINT OF SAFE DISCHARGE DIRECTLY INTO A FLOOR DRAIN, HUB DRAIN OR SAFE OUTDOOR LOCATION.  
 F. AUTOMATIC FEED VALVES: PROVIDE AUTOMATIC FEED VALVE ON THE COLD WATER MAKE-UP LINE TO EACH NEW HOT WATER HEATING SYSTEM.  
 G. TEST LIQUID HEAT TRANSFER PIPING HYDROSTATICALLY AT NOT LESS THAN 150% OF OPERATING PRESSURE OR NOT LESS THAN 125 PSI (860 KPA) WHICHEVER IS THE GREATER. TEST PERIOD SHALL BE NOT LESS THAN SIX (6) HOURS DURATION DURING WHICH TIME EACH JOINT SHALL BE INSPECTED, GIVEN A SHARP TAP WITH A HAMMER AND CHECKED FOR LEAKS.

**1.2 VALVES – GENERAL**

- A. CONFORM TO REQUIREMENTS OF ANSI, ASTM, ASME, AND APPLICABLE MSS STANDARDS.  
 B. MANUFACTURER'S NAME AND PRESSURE RATING CLEARLY MARKED ON BODY TO MSS-SP-25.  
 C. VALID CRN (CANADIAN REGISTRATION NUMBER) REQUIRED FOR EACH VALVE.  
 D. MATERIALS:  
 1 BRONZE: ASTM B62 OR B61 AS APPLICABLE  
 2 BRASS: ASTM B283 C3770  
 3 CAST IRON: ASTM A126 CLASS B  
 E. END CONNECTIONS:  
 1 THREADED ENDS: ANSI B1.20.1  
 2 FLANGED ENDS: ANSI B16.1 (CLASS 125), ANSI B16.5  
 3 FACE-TO-FACE DIMENSIONS: ANSI B16.10  
 F. DESIGN AND TESTING:  
 1 BRONZE GATE & CHECK VALVES: MSS-SP-80  
 2 BALL VALVES: MSS-SP-110  
 3 CAST IRON GATE VALVES: MSS-SP-70  
 4 CAST IRON GLOBE VALVES: MSS-SP-85  
 5 CAST IRON CHECK: MSS-SP-71  
 6 BUTTERFLY VALVES: MSS-SP-67  
 G. ACCEPTABLE MANUFACTURERS: KITZ, CRANE, JENKINS, CONBRACO, NIBCO

**1.3 HYDRONIC SYSTEMS TO 150 PSIG, ABOVE GROUND**

- A. NOMINAL OPERATING PRESSURE 125 PSIG  
 B. DESIGN PRESSURE 150 PSIG  
 C. TEST PRESSURE 225 PSIG  
 D. DESIGN TEMPERATURE 350°F  
 E. CORROSION ALLOWANCE 0.0625 IN.  
 F. STEEL PIPE  
 ASTM A53 GR.B ERW OR ASTM A106 GR.B SMLS, SCH 40  
 G. JOINTS, 2" AND SMALLER  
 150 LB. MALLEABLE IRON  
 H. SCREWED FITTINGS  
 CL 150, ASTM A-47 MALLEABLE IRON, ASTM A-153 GALVANIZED, ANSI B2.1 THREADS.  
 2-1/2" AND LARGER WELDED  
 WITH FLANGES AT CONNECTIONS TO EQUIPMENT  
 J. BONTS  
 ASTM A234 GR. WFB  
 K. BUTT WELD FITTINGS  
 ASTM A105, CLASS 150, RAISED FACE, WELD NECK OR SLIP ON  
 L. FLANGES  
 ASTM A307 C.S. BOLTS, SO. HEAD; ASTM A563 NUTS, HEX HEAD  
 N. GASKETS  
 1/16" (1.6 MM) THICK PREFORMED STEEL BRACKET AND WROUGHT STEEL CLAMP WITH ADJUSTABLE STEEL YOKE AND CAST IRON ROLL.  
 O. COPPER TUBING  
 2" AND SMALLER ASTM B88, TYPE L, HARD DRAWN.  
 P. JOINTS:  
 SOLDER, LEAD FREE, ASTM B32, 95-5 TIN-ANTIMONY, OR TIN AND SILVER, WITH MELTING RANGE 220°C TO 280°C.  
 Q. FITTINGS:  
 ASME B16.18, CAST BRASS, OR ASME B16.22, SOLDER WROUGHT COPPER UNION WITH GALVANIZED OR PLATED STEEL THREADED END, COPPER SOLDER END, WATER IMPERVIOUS ISOLATION BARRIER.  
 R. DIELECTRIC UNIONS:  
 S. VALVES, 2" AND SMALLER: ASTM A105  
 1 GATE VALVES (ISOLATING) 300 PSIG NON-SHOCK WOG, ASTM B62 BRONZE BODY, SOLID WEDGE DISC, RISING STEM, BRONZE TRIM, THREADED ENDS, KITZ #25  
 2 GLOBE VALVES (THROTTLING) 300 PSIG NON-SHOCK WOG, ASTM B62 BRONZE BODY, COMPOSITION (TEFLON) DISC, RISING STEM, BRONZE TRIM, THREADED ENDS, KITZ #29  
 3 CHECK VALVES (BACKFLOW) 300 PSIG NON-SHOCK WOG, ASTM B62 BRONZE BODY, Y-PATTERN HORIZONTAL, SWING TYPE DISC, THREADED ENDS, KITZ #29  
 4 BALL VALVES (DRAIN) 600 PSIG NON-SHOCK WOG, FORGED BRASS, 2-PIECE, CHROME BALL AND STEM, FULL PORT, BLOW-OUT PROOF PIPE SEATS & STEM, LEVER HANDLE, THREADED ENDS, KITZ #68AC.  
 T. PROVIDE STEM EXTENSIONS FOR INSULATED PIPING.  
 U. PROVIDE GEAR OPERATOR AND CHAIN ON VALVES INSTALLED ABOVE 10FT AFF.  
 V. STRAINERS, 2" AND SMALLER CLASS 250, 400 PSIG WOG, CAST IRON BODY, Y-PATTERN, SCREWED CAP AND ENDS, A167 304 STAINLESS STEEL SCREEN WITH 1/32" PERFORATIONS. MUELLER STEAM 11M.

**1.6 EQUIPMENT DRAINS AND OVERFLOWS**

- A. COPPER TUBING: ASTM B88, TYPE M AND DW, HARD DRAWN.  
 1 FITTINGS: ASME B16.18, CAST BRASS, OR ASME B16.22 SOLDER WROUGHT COPPER.  
 2 JOINTS: SOLDER, LEAD FREE, ASTM B32, 95-5 TIN-ANTIMONY, OR TIN AND SILVER, WITH MELTING RANGE 4428°F TO 536°F (220°C TO 280°C).

**1.7 CIRCUIT BALANCING VALVES**

- A. CIRCUIT BALANCING VALVES; 2" (50 MM) AND SMALLER  
 1 SCREWED CONNECTION, GLOBE STYLE DESIGN, NONFERROUS, PRESSURE DIE-CAST, NONPOROUS METAL COPPER ALLOY. EACH VALVE SHALL BE IDENTIFIED BY THE MANUFACTURER AND INSTALLED IN ANY DIRECTION. IT WILL NOT AFFECT FLOW MEASUREMENT.  
 2 VALVES SHALL PROVIDE THE FOLLOWING FUNCTIONS:  
 1 PRECISE FLOW MEASUREMENT.  
 2 PRECISION FLOW BALANCING.  
 3 POSITIVE SHUT OFF WITH NO DRIP SEAT AND TEFLON DISC.  
 4 DRAIN CONNECTION WITH PROTECTIVE CAP.  
 3 VALVES SHALL HAVE FOUR 360° ADJUSTMENT TURNS OF HANDWHEEL FOR MAXIMUM VERNIER-TYPE SETTING WITH "HIDDEN MEMORY" FEATURE TO PROGRAM THE VALVE WITH PRECISION TAMP-PROOF BALANCING SETTING.  
 4 VALVES SHALL BE SHIPPED IN A 4.5 R FACTOR POLYURETHANE CONTAINER THAT SHALL BE USED AS INSULATION AFTER VALVE IS INSTALLED.  
 5 PROVIDE VALVES SUITABLE FOR MAXIMUM WORKING PRESSURE OF 250 PSI (1720 KPA) AND MAXIMUM OPERATING TEMPERATURE OF 250°F (121°C).  
 6 ACCEPTABLE PRODUCTS: S.A. ARMSTRONG CRV I INDICATED OR TOUR & ADERSON STA-D OR NEWMAN HATTERSLEY.

**2 HVAC DUCT INSULATION****2.1 GLASS FIBRE, FLEXIBLE**

- A. MANUFACTURER: CERTAINTED SOFT TOUCH AND WIDE WRAP  
 B. OTHER ACCEPTABLE MANUFACTURERS: JOHNS MANVILLE MICROLITE.  
 C. INSULATION: ASTM C553; ASTM C1290, CAN 51.11-92, ASTM C1136, NFPA 90A; ASTM E84, ASTM E84, ASTM E136.  
 1 'KSI' VALUE : ASTM C518, 0.039 AT 24 °C ( 0.27 @ 75.2 °F )  
 2 MAXIMUM SERVICE TEMPERATURE: 121 °C (250 °F )  
 3 MAXIMUM MOISTURE ABSORPTION: ASTM C1104; <5% BY WEIGHT.

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 B. PROVIDE NON-CONDUCTING DIELECTRIC CONNECTIONS WHENEVER JOINING DISSIMILAR METALS IN OPEN SYSTEMS.  
 C. PRIME COAT EXPOSED STEEL HANGERS AND SUPPORTS, HANGERS AND SUPPORTS LOCATED IN CRAWL SPACES, PIPE SHAFTS, AND SUSPENDED CEILING SPACES ARE NOT CONSIDERED EXPOSED.  
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 F. AUTOMATIC FEED VALVES: PROVIDE AUTOMATIC FEED VALVE ON THE COLD WATER MAKE-UP LINE TO EACH NEW HOT WATER HEATING SYSTEM.  
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**1.2 VALVES – GENERAL**

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 D. MATERIALS:  
 1 BRONZE: ASTM B62 OR B61 AS APPLICABLE  
 2 BRASS: ASTM B283 C3770  
 3 CAST IRON: ASTM A126 CLASS B  
 E. END CONNECTIONS:  
 1 THREADED ENDS: ANSI B1.20.1  
 2 FLANGED ENDS: ANSI B16.1 (CLASS 125), ANSI B16.5  
 3 FACE-TO-FACE DIMENSIONS: ANSI B16.10  
 F. DESIGN AND TESTING:  
 1 BRONZE GATE & CHECK VALVES: MSS-SP-80  
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 G. ACCEPTABLE MANUFACTURERS: KITZ, CRANE, JENKINS, CONBRACO, NIBCO

**1.3 HYDRONIC SYSTEMS TO 150 PSIG, ABOVE GROUND**

- A. NOMINAL OPERATING PRESSURE 125 PSIG  
 B. DESIGN PRESSURE 150 PSIG  
 C. TEST PRESSURE 225 PSIG  
 D. DESIGN TEMPERATURE 350°F  
 E. CORROSION ALLOWANCE 0.0625 IN.  
 F. STEEL PIPE  
 ASTM A53 GR.B ERW OR ASTM A106 GR.B SMLS, SCH 40  
 G. JOINTS, 2" AND SMALLER  
 150 LB. MALLEABLE IRON  
 H. SCREWED FITTINGS  
 CL 150, ASTM A-47 MALLEABLE IRON, ASTM A-153 GALVANIZED, ANSI B2.1 THREADS.  
 2-1/2" AND LARGER WELDED  
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 1/16" (1.6 MM) THICK PREFORMED STEEL BRACKET AND WROUGHT STEEL CLAMP WITH ADJUSTABLE STEEL YOKE AND CAST IRON ROLL.  
 O. COPPER TUBING  
 2" AND SMALLER ASTM B88, TYPE L, HARD DRAWN.  
 P. JOINTS:  
 SOLDER, LEAD FREE, ASTM B32, 95-5 TIN-ANTIMONY, OR TIN AND SILVER, WITH MELTING RANGE 220°C TO 280°C.  
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 ASME B16.18, CAST BRASS, OR ASME B16.22, SOLDER WROUGHT COPPER UNION WITH GALVANIZED OR PLATED STEEL THREADED END, COPPER SOLDER END, WATER IMPERVIOUS ISOLATION BARRIER.  
 R. DIELECTRIC UNIONS:  
 S. VALVES, 2" AND SMALLER: ASTM A105  
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 2 GLOBE VALVES (THROTTLING) 300 PSIG NON-SHOCK WOG, ASTM B62 BRONZE BODY, COMPOSITION (TEFLON) DISC, RISING STEM, BRONZE TRIM, THREADED ENDS, KITZ #29  
 3 CHECK VALVES (BACKFLOW) 300 PSIG NON-SHOCK WOG, ASTM B62 BRONZE BODY, Y-PATTERN HORIZONTAL, SWING TYPE DISC, THREADED ENDS, KITZ #29  
 4 BALL VALVES (DRAIN) 600 PSIG NON-SHOCK WOG, FORGED BRASS, 2-PIECE, CHROME BALL AND STEM, FULL PORT, BLOW-OUT PROOF PIPE SEATS & STEM, LEVER HANDLE, THREADED ENDS, KITZ #68AC.  
 T. PROVIDE STEM EXTENSIONS FOR INSULATED PIPING.  
 U. PROVIDE GEAR OPERATOR AND CHAIN ON VALVES INSTALLED ABOVE 10FT AFF.  
 V. STRAINERS, 2" AND SMALLER CLASS 250, 400 PSIG WOG, CAST IRON BODY, Y-PATTERN, SCREWED CAP AND ENDS, A167 304 STAINLESS STEEL SCREEN WITH 1/32" PERFORATIONS. MUELLER STEAM 11M.

**1.6 EQUIPMENT DRAINS AND OVERFLOWS**

- A. COPPER TUBING: ASTM B88, TYPE M AND DW, HARD DRAWN.  
 1 FITTINGS: ASME B16.18, CAST BRASS, OR ASME B16.22 SOLDER WROUGHT COPPER.  
 2 JOINTS: SOLDER, LEAD FREE, ASTM B32, 95-5 TIN-ANTIMONY, OR TIN AND SILVER, WITH MELTING RANGE 4428°F TO 536°F (220°C TO 280°C).

**1.7 CIRCUIT BALANCING VALVES**

- A. CIRCUIT BALANCING VALVES; 2" (50 MM) AND SMALLER  
 1 SCREWED CONNECTION, GLOBE STYLE DESIGN, NONFERROUS, PRESSURE DIE-CAST, NONPOROUS METAL COPPER ALLOY. EACH VALVE SHALL BE IDENTIFIED BY THE MANUFACTURER AND INSTALLED IN ANY DIRECTION. IT WILL NOT AFFECT FLOW MEASUREMENT.  
 2 VALVES SHALL PROVIDE THE FOLLOWING FUNCTIONS:  
 1 PRECISE FLOW MEASUREMENT.  
 2 PRECISION FLOW BALANCING.  
 3 POSITIVE SHUT OFF WITH NO DRIP SEAT AND TEFLON DISC.  
 4 DRAIN CONNECTION WITH PROTECTIVE CAP.  
 3 VALVES SHALL HAVE FOUR 360° ADJUSTMENT TURNS OF HANDWHEEL FOR MAXIMUM VERNIER-TYPE SETTING WITH "HIDDEN MEMORY" FEATURE TO PROGRAM THE VALVE WITH PRECISION TAMP-PROOF BALANCING SETTING.  
 4 VALVES SHALL BE SHIPPED IN A 4.5 R FACTOR POLYURETHANE CONTAINER THAT SHALL BE USED AS INSULATION AFTER VALVE IS INSTALLED.  
 5 PROVIDE VALVES SUITABLE FOR MAXIMUM WORKING PRESSURE OF 250 PSI (1720 KPA) AND MAXIMUM OPERATING TEMPERATURE OF 250°F (121°C).  
 6 ACCEPTABLE PRODUCTS: S.A. ARMSTRONG CRV I INDICATED OR TOUR & ADERSON STA-D OR NEWMAN HATTERSLEY.

**2 HVAC DUCT INSULATION****2.1 GLASS FIBRE, FLEXIBLE**

- A. MANUFACTURER: CERTAINTED SOFT TOUCH AND WIDE WRAP  
 B. OTHER ACCEPTABLE MANUFACTURERS: JOHNS MANVILLE MICROLITE.  
 C. INSULATION: ASTM C553; ASTM C1290, CAN 51.11-92, ASTM C1136, NFPA 90A; ASTM E84, ASTM E84, ASTM E136.  
 1 'KSI' VALUE : ASTM C518, 0.039 AT 24 °C ( 0.27 @ 75.2 °F )  
 2 MAXIMUM SERVICE TEMPERATURE: 121 °C (250 °F )  
 3 MAXIMUM MOISTURE ABSORPTION: ASTM C1104; <5% BY WEIGHT.

**2 HVAC DUCT INSULATION****2.1 GLASS FIBRE, FLEXIBLE**

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## HVAC SPECIFICATIONS

- .3 10/120 ASTM E84 FLAME/SMOKE RATING.
  - .4 -40F TO 250F CONTINUOUS TEMPERATURE RANGE.
  - .5 WHITE WOVEN FIBERGLASS COLOUR.
  - .6 GALVANIZED STEEL CONFORMING TO ASTM-A-525 G 60 OR BETTER
  - B. ACCEPTABLE MANUFACTURERS' DURO-DYNE, DDFDC.
- 9.10 **HANGERS AND SUPPORTS**
- A. FABRICATE STRAP HANGERS TO SAME MATERIAL AS DUCT, HANGER CONFIGURATION TO SMCNA DETAILS. 20" (500 MM) IS MAXIMUM DUCT SIZE TO BE SUPPORTED BY STRAP HANGER.
  - B. ROD AND ANGLE HANGERS; GALVANIZED STEEL TO SMCNA DETAILS.
  - C. HANGER ATTACHMENTS: MANUFACTURED CONCRETE INSERTS, EXPANSION SHIELDS AND BOLTED STEEL CLAMPS. DO NOT WELD RODS TO STEEL DECKS OR USE POWER ACTUATED FASTENERS.

- 9.12 **DUCT SEALANT**
- A. GENERAL: LOW VOC, WATER BASED SEALANT, NON-TOXIC, NON-COMBUSTIBLE, NON-FLAMMABLE, AND TESTED IN ACCORDANCE WITH CAN4/ULC-1102. FLAME SPREAD SHALL NOT EXCEED 25 AND SMOKE DEVELOPED SHALL NOT EXCEED 50.
  - B. ACCEPTABLE PRODUCTS: MULTI-PURPOSE DUCT SEALANT AS MANUFACTURED BY TRANS CONTINENTAL EQUIPMENT, DURO DYNE SWB DUCT SEALER, IRON GRIP 601 AS SUPPLIED BY ALPHA SHEET METAL CO., OR UNI-GRIP DUCT SEALER FROM UNITED MCGILL CORPORATION.

10. **TESTING, ADJUSTING, BALANCING**
- 10.1 **PREPARATION**
- A. PROVIDE INSTRUMENTS REQUIRED FOR TESTING, ADJUSTING, AND BALANCING OPERATIONS. MAKE INSTRUMENTS AVAILABLE TO CONSULTANT TO FACILITATE SPOT CHECKS DURING TESTING.
  - B. PROVIDE ADDITIONAL BALANCING DEVICES AS REQUIRED.
- 10.2 **INSTALLATION TOLERANCES**
- A. AIR HANDLING SYSTEMS: ADJUST TO WITHIN PLUS OR MINUS 5 PERCENT OF DESIGN FOR RETURN AND EXHAUST SYSTEMS.
  - B. AIR OUTLETS AND INLETS: ADJUST TOTAL TO WITHIN PLUS 5 PERCENT AND MINUS 5 PERCENT OF DESIGN TO SPACE. ADJUST OUTLETS AND INLETS IN SPACE TO WITHIN PLUS OR MINUS 5 PERCENT OF DESIGN.
  - C. HYDRONIC SYSTEMS: ADJUST TO WITHIN PLUS OR MINUS 10 PERCENT OF DESIGN.

- 10.3 **ADJUSTING**
- A. ENSURE RECORDED DATA REPRESENTS ACTUAL MEASURED OR OBSERVED CONDITIONS.
  - B. PERMANENTLY MARK SETTINGS OF VALVES, DAMPERS, AND OTHER ADJUSTMENT DEVICES ALLOWING SETTINGS TO BE RESTORED. SET AND LOCK MEMORY STORES.
  - C. AFTER ADJUSTMENT, TAKE MEASUREMENTS TO VERIFY BALANCE HAS NOT BEEN DISRUPTED OR THAT SUCH DISRUPTION HAS BEEN RECTIFIED.
  - D. LEAVE SYSTEMS IN PROPER WORKING ORDER, REPLACING BELT GUARDS, CLOSING ACCESS DOORS, CLOSING DOORS TO ELECTRICAL SWITCH BOXES, AND RESTORING THERMOSTATS TO SPECIFIED SETTINGS.
  - E. AT FINAL INSPECTION, RECHECK RANDOM SELECTIONS OF DATA RECORDED IN REPORT. RECHECK POINTS OR AREAS AS SELECTED AND WITNESSED BY THE OWNER.
  - F. CHECK AND ADJUST SYSTEMS APPROXIMATELY SIX MONTHS AFTER FINAL ACCEPTANCE AND SUBMIT REPORT.

- 10.4 **AIR SYSTEM PROCEDURE**
- A. ADJUST AIR HANDLING AND DISTRIBUTION SYSTEMS TO PROVIDE REQUIRED OR DESIGN SUPPLY, RETURN, AND EXHAUST AIR QUANTITIES AT SITE ALTITUDE.
  - B. MAKE AIR QUANTITY MEASUREMENTS IN DUCTS BY PITOT TUBE TRAVERSE OF ENTIRE CROSS-SECTIONAL AREA OF DUCT.
  - C. MEASURE AIR QUANTITIES AT AIR INLETS AND OUTLETS.
  - D. ADJUST DISTRIBUTION SYSTEM TO OBTAIN UNIFORM SPACE TEMPERATURES FREE FROM OBJECTIONABLE DRAFTS AND NOISE.
  - E. USE BRANCH VOLUME CONTROL DAMPERS AND SPLITTERS TO REGULATE AIR QUANTITIES. DEVICES AT AIR OUTLETS MAY BE USED ONLY TO THE EXTENT THAT ADJUSTMENTS DO NOT CREATE OBJECTIONABLE AIR MOTION OR SOUND LEVELS.
  - F. VARY TOTAL SYSTEM AIR QUANTITIES BY ADJUSTMENT OF FAN SPEEDS. ADJUST AIRFLOW TO DESIGN QUANTITY. PROVIDE DRYE CHANGES AS REQUIRED. MAKE ALLOWANCES FOR LOADING OF FILTERS TO 50% OF MANUFACTURERS' RECOMMENDATIONS FOR FAN PRESSURE AT FANS WITH FIXED SPEED DRIVES AND TO 100% OF MANUFACTURERS' RECOMMENDATIONS FOR FINAL PRESSURE AT FANS WITH VARIABLE SPEED DRIVES.
  - G. PROVIDE SYSTEM SCHEMATIC WITH REQUIRED AND ACTUAL AIR QUANTITIES RECORDED AT EACH OUTLET OR INLET.
  - H. MEASURE STATIC AIR PRESSURE CONDITIONS ON AIR SUPPLY UNITS, INCLUDING FILTER AND COIL PRESSURE DROPS, AND TOTAL PRESSURE ACROSS THE FAN.
  - I. ADJUST OUTSIDE AIR AUTOMATIC DAMPERS, OUTSIDE AIR, AND RETURN AIR, AND EXHAUST DAMPERS FOR DESIGN CONDITIONS.

- 10.5 **WATER SYSTEM PROCEDURE**
- A. ADJUST WATER SYSTEMS TO PROVIDE REQUIRED OR DESIGN QUANTITIES.
  - B. USE CALIBRATED VENTURI TUBES, ORIFICES, OR OTHER METERED FITTINGS AND PRESSURE GAUGES TO DETERMINE FLOW RATES FOR SYSTEM BALANCE. WHERE FLOW METERING DEVICES ARE NOT INSTALLED, BASE FLOW BALANCE ON TEMPERATURE DIFFERENCE ACROSS VARIOUS HEAT TRANSFER ELEMENTS IN THE SYSTEM.
  - C. ADJUST SYSTEMS TO PROVIDE SPECIFIED PRESSURE DROPS AND FLOWS THROUGH HEAT TRANSFER ELEMENTS PRIOR TO THERMAL TESTING. PERFORM BALANCING BY MEASUREMENT OF TEMPERATURE DIFFERENTIAL IN CONJUNCTION WITH AIR BALANCING.
  - D. EFFECT SYSTEM BALANCE WITH AUTOMATIC CONTROL VALVES FULLY OPEN TO HEAT TRANSFER ELEMENTS.
  - E. EFFECT ADJUSTMENT OF WATER DISTRIBUTION SYSTEMS BY MEANS OF BALANCING COCKS, VALVES, AND FITTINGS. DO NOT USE SERVICE OR SHUT-OFF VALVES FOR BALANCING UNLESS INDEXED FOR BALANCE POINT.

5. **EQUIPMENT SPECIFICATIONS**
- 5.1 **UNIT VENTILATORS (UV-1)**
- A. DESCRIPTION & CERTIFICATION
- .1 THE SUPPLIER SHALL PROVIDE A VERTICAL CLASSROOM UNIT VENTILATOR WITH AN UP-FLOW DESIGN. AN EXTERIOR WALL-MOUNTED UNIT WILL NOT BE ACCEPTABLE. A CHANGEAIR UNIT VENTILATOR MANUFACTURED BY SYSTEMAIR COMMERCIAL AHU LTD. SHALL BE COMPLETE AND FACTORY FINISHED.
  - .2 INTERNAL DESIGN INCLUDING FRESH AIR INTAKE AND CONDENSING FAN RELIEF SHALL BE SUCH THAT ALL EXTERIOR WALL PENETRATIONS WILL BE ABOVE 35" FROM THE FINISHED FLOOR LEVEL.
  - .3 UNIT SHALL BE ETL (OR EQUIVALENT) CERTIFIED AND LABELED INDICATING THAT THE EQUIPMENT HAS BEEN INDEPENDENTLY TESTED AND MEETS THE REQUIRED CURRENT APPLICABLE SAFETY STANDARDS, UL 1995 AND CAN/CSA 22.2 NO.236, FOR BOTH IN THE UNITED STATES AND CANADA. UNITS SHALL BE MANUFACTURED IN AN ISO 9001 REGISTERED FACILITY OR BY A COMPANY MANUFACTURING VENTILATION EQUIPMENT FOR AT LEAST 25 YEARS.
  - .4 THE MANUFACTURER SHALL PROVIDE SOUND DATA IN ACCORDANCE TO AHRI STANDARD 260 "SOUND-RATING OF DUCTED AIR MOVING AND CONDITIONING EQUIPMENT". SOUND DATA MUST BE COLLECTED IN AN ARA ACCREDITED REVERBERANT LABORATORY.
  - .5 SOUND RATINGS ARE TO BE IN THE FORM OF OCTAVE BAND SOUND POWER LEVELS (DB) FROM 63 TO 8000 HZ DERIVED FROM ONE-THIRD OCTAVE BAND MEASUREMENTS. SOUND DATA PROVIDED MUST MEET OR EXCEED MINIMUM REQUIREMENTS FOR USE WITHIN ANSI S12.60 CALCULATIONS.
- B. CABINET CONSTRUCTION
- .1 CABINET CONSTRUCTION SHOULD BE SUCH THAT THE INTERNAL 16-GAUGE FRAME SUPPORTS ALL INTERNAL METAL PANS AND COMPONENTS. EXTERIOR PANELS SHOULD NOT SUPPORT ANY INTERNAL COMPONENTS.
  - .2 THE OUTER CABINET DOORS AND SIDES WILL BE MADE OF 18-GAUGE STEEL AND CABINET PANELS SHALL ATTACH TO THE FRAME WITHOUT VISIBLE SCREWS, RIVETS OR FASTENERS.
  - .3 THE CABINET FRONT SHALL INCORPORATE TWO FULLY INSULATED FULL-SIZED HINGED PANELS HELD CLOSED BY NO LESS THAN TWO TAMPER-RESISTANT CAM LOCKS IN EACH PANEL. FRONT DOORS SHALL ALLOW ACCESS TO ALL THE INTERNAL COMPONENTS.

## HVAC SPECIFICATIONS

4. THE CABINET SHALL BE PAINTED WITH A POWDER COAT BAKED ENAMEL-TEXTURED FINISH TO AN APPLIANCE STANDARD. THE COLOR SHALL BE THE MANUFACTURER'S STANDARD SAND.
- A. INSULATION:
- .1 NON-FIBROUS INSULATION: CABINET PANELS SHALL BE THERMALLY/ACOUSTICALLY INSULATED WITH A MINIMUM 1" (2.54CM) THICK, FIBER-FREE, LOW DENSITY, FOAM INSULATION. IT SHALL OFFER HIGH SOUND ABSORPTION, LOW THERMAL CONDUCTIVITY, EXCELLENT EMISSION PROPERTIES, MICROBIOLOGICAL RESISTANCE, AND HIGH FIRE RESISTANCE. IT SHALL HAVE LOW VOC EMISSION PROPERTIES AND MUST MEET OR EXCEED ISO 16000 CLASS A REQUIREMENTS OF INDOOR AIR QUALITY ACCEPTABILITY. IT SHALL BE TESTED TO ISO 846:2019 (A/B/C) TO DETERMINE BACTERIAL AND FUNGAL GROWTH RESISTANCES. MICROBIOLOGICAL RESISTANCE TESTING TO ASTM G21 WILL NOT BE SUFFICIENT. THE INSULATION SHALL MEET MINIMUM FIRE HAZARD CLASSIFICATION RATINGS OF 25 FLAME SPREAD INDEX AND 50 SMOKE DEVELOPED INDEX WHEN TESTED TO ASTM E84, BEING A UL94 V0/HF-1 FLAME RATING AND CAN/ULC S102, INCLUDING AGENTS USED IN THE MANUFACTURE OF THE FOAM SHALL HAVE A LOW GLOBAL WARMING POTENTIAL (GWP) AND BE ACCEPTED WITHIN THE REGULATIONS OUTLINED IN THE EPA SNAP RULE 21 AND 22 PROGRAMS.
- B. AIR DISTRIBUTION
- .1 A DUCT COLLAR 24" X 12" IS SUPPLIED WITH THE UNIT VENTILATOR FOR CONNECTION OF DUCTWORK AT STATO OF EXTERNAL DUCTING AND CEILING DIFFUSERS SHOULD BE WITHIN THE 0.1"-0.5" ESP RANGE. ALL EXTERNAL DUCTWORK AND DIFFUSERS MUST BE CORRECTLY SIZED, FABRICATED, AND SUPPLIED BY OTHERS.
- C. RETURN GRILLES
- .1 THE UNIT SHALL BE SUPPLIED WITH MATCHING COLOR STANDARD PUNCHED RETURN GRILLES. THE RETURN PUNCHED GRILLES SHALL BE DESIGNED TO REDUCE THE GENERATED SOUND.

- D. FILTERS
- .1 EACH UNIT SHALL BE EQUIPPED WITH TWO 2" PLEATED DISPOSABLE FILTERS (MERV 13). THE LOCATION OF THE FILTER SHALL BE IN SUCH A WAY THAT IT PROVIDES 100% FILTRATION OF BOTH RE-CIRCULATED AND OUTSIDE FRESH AIR.
  - .2 HEATING - HOT WATER COIL.
  - .3 THE UNIT SHALL BE SUPPLIED WITH A HOT WATER COIL CONSTRUCTED OF SEAMLESS DRAWN COPPER TUBES MECHANICALLY EXPANDED INTO DIE-FORMED FIN COLLARS OF TEMPERED, CORRUGATED ALUMINUM FIN STOCK, ASSURING A POSITIVE BOND FOR OPTIMAL HEAT TRANSFER AND THE PREVENTION OF ELECTROLYTIC ACTION. THE COIL SHALL BE CONSTRUCTED WITH A MANUAL AIR VENT AND DRAIN PLUG. THE COIL SHALL BE SIZED TO PROVIDE THE REQUIRED HEATING CAPACITY AS SHOWN IN THE SCHEDULE. SUPPLY AND RETURN CONNECTIONS (½ OR 1" NOMINAL TUBING) STUBBED OUT THE TOP LEFT OF THE UNIT.

- E. WATER CONTROL VALVES AND PIPING COMPONENTS: A MODULATING SIEMENS POWERITE 599 GLOBE VALVE SHALL BE SUPPLIED LOOSE WITH EACH UNIT BY THE MANUFACTURER AND IS TO BE INSTALLED BY THE INSTALLING CONTRACTOR. ISOLATION VALVES, SHUTTING BALANCING VALVE AND STRAINER SHALL BE SUPPLIED AND INSTALLED BY THE MANUFACTURER.
- F. SINGLE PACKAGED AIR CONDITIONING
- .1 ALL REFRIGERANT COMPONENTS SHALL BE FACTORY INSTALLED AND CONNECTED, REQUIRING NO FIELD FABRICATION OR INSTALLATION OF COILS, LINES-SETS OR CONDENSING CAPACITY.
  - .2 THE PACKAGED AIR CONDITIONING SYSTEM SHALL BE DESIGNED AND CHARGED WITH R410A. THE SYSTEM SHALL BE EQUIPPED WITH ONE DIRECT EXPANSION VALVE AND MATCHED WITH THE COMPRESSOR, DESIGNED TO PROVIDE THE REQUIRED COOLING CAPACITY.
  - .3 A DIRECT EXPANSION (DX) COIL SHALL BE MOUNTED IN THE EVAPORATOR COIL SECTION, AND CONNECTED TO THE CORRECTLY SIZED CONDENSING COIL IN THE CONDENSER COIL SECTION. COILS ARE ORIENTED IN A WAY TO PROVIDE OPTIMAL HEAT TRANSFER. THE COIL SHALL BE CONSTRUCTED OF SEAMLESS DRAWN COPPER TUBES MECHANICALLY EXPANDED INTO DIE-FORMED FIN COLLARS OF TEMPERED, CORRUGATED ALUMINUM FIN STOCK, ASSURING A POSITIVE BOND FOR OPTIMAL HEAT TRANSFER AND THE PREVENTION OF ELECTROLYTIC ACTION. COILS SHALL BE INTERNALLY COMMERCIAL CLEAN, AND DEHYDRATED. THE ENDPATES SHALL BE OF GALVANIZED STEEL CONSTRUCTION.

- G. COMPRESSOR
- .1 UNITS SHALL BE EQUIPPED WITH A FACTORY-INSTALLED, HERMETICALLY SEALED, TWO-STAGE, SCROLL TYPE COMPRESSOR SIZED CORRECTLY TO MATCH THE COILS AND PROVIDE THE SPECIFIED CAPACITY. THE COMPRESSOR SHOULD BE MOUNTED ON RUBBER ISOLATORS TO REDUCE VIBRATION TRANSMISSION TO THE BUILDING. THE COMPRESSOR SHALL HAVE EXCESSIVE MOTOR TEMPERATURE AND CURRENT BY MEANS OF AN INTERNAL OVERLOAD PROTECTOR.
  - .2 A LOW-PRESSURE SWITCH WILL DISABLE THE COMPRESSOR IF EXCESSIVE SYSTEM PRESSURE IS ACHIEVED. A LOW PRESSURE CUT OUT IS ALSO PROVIDED TO DISABLE THE COMPRESSOR IF REFRIGERANT PRESSURE IS BELOW AN ACCEPTABLE THRESHOLD. EACH UNIT SHALL BE EQUIPPED WITH A "COMPRESSOR CRANKCASE HEATER" TO PREVENT MIGRATION AND MIXING OF REFRIGERATION WITH THE OIL IN THE CRANKCASE.
  - .3 THE COMPRESSOR SHALL OPERATE IN A TWO-STAGE COOLING SEQUENCE. THE FIRST STAGE WILL BE MECHANICAL COOLING - 2/3 OF COMPRESSOR CAPACITY (67%) AND THE SECOND STAGE WILL BE MECHANICAL COOLING - FULL COMPRESSOR CAPACITY (100%).
- H. DRAIN PAN
- .1 INSULATED DRAIN PAN: THE STAINLESS-STEEL METAL INSULATED DRAIN PAN SHALL BE DESIGNED WITH BOTH FRONT TO BACK AND SIDE TO SIDE SLOPE TO THE PRIMARY DRAIN OUTLET ELIMINATING ANY STANDING WATER IN THE PAN. THE DRAIN PAN SHALL BE COATED WITH CLOSED-CELL INSULATION.

- I. DAMPERS - STANDARD VENTILATION:
- .1 THE VENTILATION DAMPER SHALL BE AN INSULATED GALVANIZED DAMPER OPERATED BY ZERO MAINTENANCE AND CONCEALED LINKAGE. THE OUTSIDE BLADE EDGE AND JAMB SEALS SHALL BE OF THE PRESSURE-SENSITIVE TYPE FOR LOW LEAKAGE.
  - .2 THE DAMPER SHALL BE EQUIPPED WITH A BELIMO SPRING RETURN DAMPER ACTUATOR WITH A MINIMUM TORQUE OF 18 IN./LB. THE ACTUATOR MUST PROVIDE PROPORTIONAL DAMPER CONTROL IN RESPONSE TO INPUT OF 2 TO 10 VDC. ACTUATORS SHALL BE PROTECTED FROM OVERLOAD AT ALL ANGLES OF ROTATION.
  - .3 THE DAMPER ACTUATOR SHALL MODULATE DAMPERS TO ALLOW OUTSIDE AIR TO MIX WITH RETURN AIR. THE DISCHARGE AIR FLOW THROUGH THE DAMPER OCCUPIED PERIOD TO BE FIXED TO A MINIMUM OUTSIDE AIR OF 450 CFM. IT SHALL HAVE THE CAPABILITY OF OPENING DURING AN ECONOMIZER CYCLE TO ALLOW UP TO 100% OF THE TOTAL SUPPLY AIR THROUGH THE OUTSIDE AIR DAMPER

- J. SUPPLY FAN
- .1 SUPPLY MOTOR AND FAN ASSEMBLY SHALL CONSIST OF TWO FAN BODIES TO SUPPLY THE SPECIFIED AIRFLOW. EACH FAN BODY SHALL BE A DOUBLE INLET CENTRIFUGAL TYPE BLOWER WITH BOTH FANS DRIVEN BY ONE ELECTRONICALLY COMMUTATED MOTOR (ECM) CAPABLE OF VARIABLE SPEED OPERATION. THE EC MOTOR SHALL BE PROGRAMMABLE TO DELIVER THE SPECIFIED AIRFLOW AT THE RATED EXTERNAL STATIC PRESSURE. THIS PROVIDES EFFICIENT FAN OPERATION. PERMANENT SPLIT CAPACITOR (PSC) MOTORS WILL NOT BE ACCEPTABLE.
  - .2 THE SUPPLY FAN SHALL BE ORIENTATED IN A WAY SUCH THAT THE MIXED AIR WILL BE DRAWN THROUGH BOTH THE HEATING AND COOLING COILS.
  - .3 THE SUPPLY FAN MOTOR SHALL BE ISOLATED FROM THE SUPPLY FANS BY USING ZINC-PLATED DOUBLE WIRE MOUNTING BRACKETS AND RUBBER ANTI-VIBRATION MOUNTS TO REDUCE THE SOUND-INDUCED VIBRATIONS. FAN ASSEMBLY SLIDER SHALL SIT ON FELT INSULATION.

- K. CONDENSING FAN
- .1 THE CONDENSING MOTOR AND FAN ASSEMBLY SHALL COOL THE CONDENSING COIL AND ALSO BE DESIGNED IN SUCH A WAY AS TO RELIEVE STALE ROOM AIR AT THE SAME RATE AT WHICH OUTSIDE AIR IS ENTERING THE ROOM. THE ASSEMBLY SHALL HAVE TWO BACKWARD CURVED CENTRIFUGAL FANS DRIVEN BY INTEGRAL ELECTRONICALLY COMMUTATED MOTORS (ECM) CAPABLE OF VARIABLE SPEED OPERATION. PERMANENT SPLIT CAPACITOR (PSC) MOTORS WILL NOT BE ACCEPTABLE. THE FAN ASSEMBLY SHALL BE CAPABLE OF EXHAUSTING UP TO 100% AIRFLOW EQUAL TO INCOMING OUTDOOR AIR.
- L. ELECTRICAL - GENERAL ELECTRICAL
- .1 THE MAIN POWER SUPPLY SHALL CONNECT TO THE UNIT THROUGH A WIRE RACEWAY DIRECTLY TO EITHER A TERMINAL BLOCK OR TO THE UNFUSED DISCONNECT PROVIDED BY THE UNIT MANUFACTURER. STANDARD ELECTRICAL SUPPLY VOLTAGE SHALL BE 208 VAC 3 PHASE 60 HZ FOR UV-1 & UV-2. STANDARD ELECTRICAL SUPPLY VOLTAGE SHALL BE 208 VAC 1 PHASE 60 HZ FOR UV-A.
  - .2 SERVICE DISCONNECT
  - .3 THE CABINET FRONT SHALL BE SUPPLIED WITH A LINE VOLTAGE SERVICE DISCONNECT (MAXIMUM 80 AMPS) AND A DOOR SWITCH FOR CONTROL VOLTAGE. INTERRUPT TO DISABLE THE MECHANICAL COMPONENTS WHEN THE SERVICE PANEL IS REMOVED. THE DISCONNECT SWITCH IS LOCKABLE IN THE OFF

## HVAC SPECIFICATIONS

- POSITION.
- .2 ALL INTERNAL FUNCTIONS MUST BE FUSE PROTECTED BY A TIME DELAY FUSE PROPERLY RATED FOR THE AMPERAGE LOAD.
- N. COMMISSIONING, ON-SITE START-UP, INSTALLATION MANUALS AND WARRANTY
- O. START-UP AND IOM
- .1 INSTALLATION SHALL BE IN FULL ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS MANUAL, GENERALLY ACCEPTED PRACTICE AND ALL APPLICABLE CODES. IMPROPER INSTALLATION OF THE UNITS MAY VOID THE WARRANTY. FIELD ASSEMBLED ACCESSORIES SHALL BE FABRICATED AS MENTIONED IN THE INSTRUCTION MANUALS AND DRAWINGS. STORAGE AND HANDLING OF THE EQUIPMENT SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS. THE FILTERS SHALL BE CLEAN OR REPLACED PRIOR TO TURNING THE BUILDING OVER TO THE OWNER.
  - .2 ON-SITE STARTUP: THE MANUFACTURER'S AGENT THAT SUPPLIES THE EQUIPMENT SHALL BE RESPONSIBLE FOR OVERSEEING OR REVIEWING THE INSTALLATION AT THE INITIAL START-UP OR SOON THEREAFTER. THE AGENT WILL ALSO DEMONSTRATE TO THE BUILDING MAINTENANCE PERSONNEL THE OPERATION OF THE UNIT(S) AND EXPLAIN WARRANTY PROCEDURES.
  - .3 AT THE COMPLETION OF THE INSTALLATION, THE MANUFACTURER WILL PROVIDE THE OWNER WITH 2 SETS OF INSTALLATION, OPERATION AND SERVICE MANUALS WITH SHOP DRAWINGS AND ELECTRICAL DIAGRAMS.

- P. WARRANTY
- .1 THE MANUFACTURER SHALL SUPPLY A LIMITED 14-MONTH WARRANTY ON ALL PARTS AND A THREE-YEAR WARRANTY ON THE DAMPER ACTUATOR FROM THE DATE OF SHIPPING.
  - .2 PARTS AND LABOR WARRANTY:
  - .1 TOGETHER WITH PARTS ONLY WARRANTY THE MANUFACTURER SHALL COVER LABOR FOR REPLACEMENT OF APPROVED PARTS AT THE STANDARD LABOR RATE AND TIME AS PER THE FLAT RATE TIME CHART SUPPLIED BY THE MANUFACTURER. THIS PARTS AND LABOR WARRANTY SHALL BE FOR A PERIOD OF ONE YEAR.
- R. CONTROLS
- .1 UNIT VENTILATOR SHALL HAVE
    - .1 DDC MREADY TERMINAL STRIP CONTROL.
    - .2 UNIT CONTROLLER
      - .1 THE CONTROLLER MUST ALSO BE ABLE TO RUN STANDALONE AND OCCUPANCY DETERMINED BY AN INTERNAL WEEKLY AND ANNUAL SCHEDULE.
      - .2 THE ROOM INTERFACE SHALL BE SUPPLIED WITH THE CONTROLLER, WHICH WILL BE WALL MOUNTED. THIS SENSOR WILL SENSE THE TEMPERATURE IN THE ROOM AND PROVIDE AN OPERATOR INTERFACE WITH LIMITED PROGRAMMING ADJUSTMENTS AND OVERRIDES. THE ROOM INTERFACE WILL ALSO HAVE A BUILT-IN OCCUPANCY SENSOR TO DETECT MOTION.

- S. ACCESSORIES
- .1 EXTERIOR LOUVERS AND WALL SLEEVE
    - .1 AN EXTERIOR, WEATHER-RESISTANT VENTEX 2435 LOUVER SHALL BE (4" DEEP) ALUMINUM WITH A STANDARD POWDER COAT PAINT FINISH FROM THE MANUFACTURER'S STANDARD COLOR LIST (BRONZE OR GRAY). LOUVER SHALL BE LINED WITH ½ GALVANIZED BIRD SCREEN MESH. LOUVER SIZE AND DESIGN SHALL BE MATCHED TO THE MODEL TO PROVIDE PROPER VENTILATION AIR INTAKE ENSURING NO WATER INGRESS AND ROOM AIR EXHAUST.
    - .2 A 22-GAUGE METAL WALL SLEEVE SUITED TO MATCH THE 12" DEEP WALL SHALL BE INCLUDED WITH THE STANDARD LOUVER WITH APPROPRIATE METAL DIVIDERS TO SEPARATE INTAKE AND EXHAUST AIR AT STANDARD SILL HEIGHT.
  - .2 SHROUD, PLENUMS AND PIPE CHASE
    - .1 TOP DUCT COVER: A 3-SIDED, NON-INSULATED COSMETIC TOP DUCT COVER SHALL BE INCLUDED WITH EACH UNIT VENTILATOR AS REQUIRED. THE COVER SHALL BE CONSTRUCTED OF HEAVY 18-GAUGE STEEL WITH TEXTURED POWDER COAT FINISH TO MATCH THE UNIT VENTILATOR. THE TOP DUCT COVER HEIGHT SHALL BE STANDARD 30" THAT CAN BE CUT DOWN TO BE 2" TO 3" ABOVE THE SUSPENDED CEILING HEIGHT.
    - .2 REAR PLENUM: REAR PLENUM SHALL BE INCLUDED WITH EACH UNIT VENTILATOR AS REQUIRED. THE PLENUM SHALL BE CONSTRUCTED OF HEAVY 18-GAUGE STEEL WITH 1" (2.54 CM) FLANGE FOR UNIT MOUNT AND PAINTED IN TEXTURED POWDER COAT FINISH TO MATCH CABINET COLOR. THE PLENUM IS FACTORY INSULATED WITH 1" (2.54 CM) ACOUSTIC MATERIAL AND INCLUDES A FULL UNINSULATED BACK. THE REAR PLENUM IS SUPPLIED ASSEMBLED WITH FIELD MOUNTING TO THE UNIT REQUIRED. THE REAR PLENUM DEPTH SHALL BE STANDARD 10" AND HEIGHT TO MATCH THE UNIT HEIGHT.

- 5.2 **SINGLE DUCT BYPASS AIR TERMINAL UNITS (TB-1, TB-2)**
- A. BASIS OF DESIGN: PRICE INDUSTRIES, INC.
- B. BYPASS UNITS: LGB
- B. PERFORMANCE REQUIREMENTS:
- .1 THE ASSEMBLIES SHALL BE PRESSURE DEPENDENT AND SHALL RESET TO ANY AIRFLOW BETWEEN ZERO AND THE MAXIMUM CATALOGED AIR VOLUME.
  - .2 USE ATTENUATION VALUES FOUND IN AHRI 885.
- C. GENERAL:
- .1 FURNISH AND INSTALL PRICE MODEL LGB LOW PRESSURE GATE BYPASS TERMINAL UNITS. THE TERMINAL UNITS SHALL BE FACTORY-ASSEMBLED, VARIABLE AIR VOLUME CONTROL BYPASS UNITS, RATED IN ACCORDANCE WITH AHRI 880.
- D. CONSTRUCTION:
- .1 THE UNIT CASING SHALL BE CONSTRUCTED OF A MINIMUM 22 GAUGE, 0.032 INCH GALVANIZED STEEL.
  - .2 THE CASING SHALL BE ACOUSTICALLY AND THERMALLY LINED WITH MINIMUM 0.50 INCH DUAL-DENSITY INSULATION, MEETING THE REQUIREMENTS OF NFPA 90A, UL 181, ASTM C1338, AND ASTM C1071.
  - .3 UNITS SHALL INCORPORATE A GATE VALVE WITH POLYETHYLENE BEARINGS WHICH SLIDE IN A METAL TRACK. SINGLE BLADE PIVOTING DAMPERS WILL NOT BE ACCEPTED.
  - .4 UNITS SHALL INCLUDE INTEGRAL INLET AND BYPASS BALANCING DAMPERS FOR FIELD ADJUSTMENT.
  - .5 STATIC PRESSURE TAPS SHALL BE PROVIDED TO FACILITATE BALANCING.
  - .6 A MINIMUM AIR VOLUME STOP SHALL BE PROVIDED FOR FIELD ADJUSTMENT.

- E. OPTIONS:
- .1 DISCHARGE ATTENUATOR:
    - .1 THE TERMINAL UNIT SHALL BE SUPPLIED WITH A SEPARATE THREE FOOT DISCHARGE ATTENUATOR TO DECREASE DISCHARGE SOUND POWER LEVELS.
- F. ELECTRICAL REQUIREMENTS:
- .1 THE BYPASS UNITS SHALL BE SUPPLIED WITH A SINGLE-POINT POWER CONNECTION.
  - .2 THE BYPASS UNIT EQUIPMENT WIRING SHALL COMPLY WITH THE REQUIREMENTS OF NFPA 70.

- G. EXAMINATION
- .1 VERIFY THAT CONDITIONS ARE SUITABLE FOR INSTALLATION.
  - .2 INSTALL THE TERMINAL UNITS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
  - .3 INSTALL THE INLETS OF AIR TERMINAL UNITS AND AIRFLOW SENSORS A MINIMUM OF THREE DUCT DIAMETERS FROM ELBOWS, TRANSITIONS, AND DUCT TAKEOFFS.
  - .4 SEE DRAWINGS FOR THE SIZE(S) AND DUCT LOCATION(S) OF THE AIR TERMINAL UNITS.
  - .5 PROVIDE CEILING ACCESS DOORS OR LOCATE UNITS ABOVE EARLY REMOVABLE CEILING COMPONENTS.
  - .6 SUPPORT UNITS INDIVIDUALLY FROM THE STRUCTURE.
  - .7 EMBED ANCHORS IN CONCRETE IN ACCORDANCE WITH ASTM E488/E488M.
  - .8 DO NOT SUPPORT FROM DUCTWORK.
  - .9 CONNECT THE TERMINALS TO THE DUCTWORK.
  - .10 VERIFY THAT ELECTRIC POWER IS AVAILABLE AND OF THE CORRECT CHARACTERISTICS.

- H. ADJUSTING
- .1 ENSURE DAMPER OPERATOR ATTACHED TO ASSEMBLY ALLOWS FULL MODULATION OF FLOW RANGE FROM 100 PERCENT OF DESIGN FLOW TO ZERO.
- I. ELECTRICAL - GENERAL ELECTRICAL
- .1 THE MAIN POWER SUPPLY SHALL CONNECT TO THE UNIT THROUGH A WIRE RACEWAY DIRECTLY TO EITHER A TERMINAL BLOCK OR TO THE UNFUSED DISCONNECT PROVIDED BY THE UNIT MANUFACTURER. STANDARD ELECTRICAL SUPPLY VOLTAGE SHALL BE 208 VAC 3 PHASE 60 HZ FOR UV-1 & UV-2. STANDARD ELECTRICAL SUPPLY VOLTAGE SHALL BE 208 VAC 1 PHASE 60 HZ FOR UV-A.
  - .2 SERVICE DISCONNECT
  - .3 THE CABINET FRONT SHALL BE SUPPLIED WITH A LINE VOLTAGE SERVICE DISCONNECT (MAXIMUM 80 AMPS) AND A DOOR SWITCH FOR CONTROL VOLTAGE. INTERRUPT TO DISABLE THE MECHANICAL COMPONENTS WHEN THE SERVICE PANEL IS REMOVED. THE DISCONNECT SWITCH IS LOCKABLE IN THE OFF

## CONTROL SPECIFICATIONS

1. GENERAL
- A. THE WORK SHALL INCLUDE DESIGN, SUPPLY, INSTALLATION, AND COMMISSIONING. A COMPLETE MICROPROCESSOR BASED AUTOMATIC CONTROL SYSTEM TO ACHIEVE THE PERFORMANCE SPECIFIED IN THE FOLLOWING CLAUSES.
  - B. FOR EXISTING SITES VISIT THE PREMISES PRIOR TO TENDER TO BECOME FAMILIAR WITH FIELD CONDITIONS AND EXISTING EQUIPMENT.
  - C. THE CONTROL SYSTEM SHALL BE INSTALLED BY THE CONTROL SUBCONTRACTOR AS AN INTEGRAL PART OF THE MECHANICAL SUB-CONTRACT. THE SYSTEM SHALL BE INSTALLED BY TRADE CERTIFIED ELECTRICIANS REGULARLY EMPLOYED BY THE CONTROL SUB-CONTRACTOR.
  - D. THE CONTROLS CONTRACTOR WILL SPECIFICALLY READ ALL MECHANICAL AND ELECTRICAL DRAWINGS, SPECIFICATIONS, AND ADDENDA AND DETERMINE THE CONTROLS WORK PROVIDED BY THE MECHANICAL CONTRACTOR, HIS SUBCONTRACTORS, AND THE ELECTRICAL CONTRACTOR. THE CONTROLS CONTRACTOR IS EXPECTED TO HAVE THE EXPERTISE TO COORDINATE THE WORK OF OTHER CONTRACTORS AND TO MAKE A COMPLETELY COORDINATED BUILDING AUTOMATION CONTROL SYSTEM (BACS) FOR THE MECHANICAL SYSTEMS. THE CONTROLS SPECIFICATIONS ARE SPECIFICALLY WRITTEN TO COORDINATE THE MECHANICAL AND ELECTRICAL SYSTEMS. WHERE OTHERS ARE SPECIFICALLY SPECIFIED TO ALLOW FOR CONTROLS WORK, THEN THE BACS CONTRACTOR WILL NOT ALLOW FOR THAT WORK. THIS CLAUSE IS NOT INTENDED TO MAKE THE CONTROLS CONTRACTOR RESPONSIBLE FOR WORK NOT SPECIFIED, BUT TO MAKE THE CONTRACTOR RESPONSIBLE FOR EXAMINING THE SPECIFICATIONS FOR CONTRADICTIONS AND OVERLAP.
  - E. THE BACS CONTRACTOR SHALL PROVIDE THE NECESSARY ENGINEERING, INSTALLATION, SUPERVISION, COMMISSIONING AND PROGRAMMING FOR A COMPLETE AND FULLY OPERATIONAL SYSTEM. THE CONTRACTOR WILL PROVIDE AS MANY TRIPS TO THE JOB SITE FOR INSTALLATION, SUPERVISION, AND COMMISSIONING AS ARE NECESSARY TO COMPLETE THE PROJECT TO THE SATISFACTION OF THE CONSULTANT AND/OR BUILDING PROJECT SUPERVISOR.
  - F. THE SYSTEM SHALL CONSIST OF ALL OPERATOR INTERFACES, MICROPROCESSOR-BASED CONTROLLERS, SENSORS, WELLS, AUTOMATIC CONTROL VALVES, CONTROL DAMPERS, TRANSDUCERS, AND RELAYS, AUTOMATIC CONTROL VALVES, AND DAMPER ACTUATORS.

2. SCOPE OF WORK
- A. THIS PROJECT SCOPE SHALL INCLUDE, BUT NOT BE LIMITED TO, THE FOLLOWING WORK:
- B. PREPARATION OF CONTROL SHOP DRAWINGS FOR REVIEW AND APPROVAL. SEE SUBMITTALS. SUPPLY AND INSTALL A NETWORK OF DIRECT DIGITAL CONTROL (DDC) PANELS AND FIELD DEVICES. SEE HARDWARE, SOFTWARE AND FIELD DEVICES
    - .1 SUPPLY AND INSTALL CUSTOMIZED GRAPHICS SOFTWARE TO BUILDING STANDARDS, SYSTEM SOFTWARE, AND THIRD PARTY SOFTWARE AS SPECIFIED.
    - .2 INSTALL, WIRE AND LABEL ALL DDC CONTROL SYSTEM COMPONENTS.
    - .3 CALIBRATE AND COMMISSION THE INSTALLED CONTROL SYSTEM. 4 PROVIDE MAINTENANCE MANUALS AND AS-BUILT DRAWINGS. SEE AS-BUILT DOCUMENTATION.
    - .5 PROVIDE CUSTOMIZED TRAINING FOR BUILDING OPERATIONS, MAINTENANCE AND TECHNICAL STAFF. SEE TRAINING.
    - .6 PROVIDE A ONE-YEAR ON SITE PARTS AND LABOUR WARRANTY ON ALL COMPONENTS.

3. **BASE BUILDING BAS VENDOR**
- A. BIDS FOR THE BACS CONTROL WILL ONLY BE ACCEPTED FROM AUTHORIZED VENDORS/INSTALLERS OF THE FOLLOWING MANUFACTURERS:
- CHAMBERLAIN BUILDING SERVICES INC. - ALEX SKALJAC, 905-664-1914, a.skalj@cbbs.ca

4. **TRAINING**
- A. PROVIDE MINIMUM OF (4) TRAINING SESSIONS, AND (4) HOURS FOR EACH SESSION, THROUGHOUT THE CONSTRUCTION PERIOD. THE TRAINING WILL BE PROVIDED FOR PERSONNEL DESIGNATED BY THE OWNER.
  - B. THESE OBJECTIVES WILL BE DIVIDED INTO LOGICAL GROUPINGS; PARTICIPANTS MAY ATTEND ONE OR MORE OF THESE, DEPENDING ON LEVEL OF KNOWLEDGE REQUIRED.
  - C. THE INSTRUCTOR SHALL BE PROVIDED WITH THE FOLLOWING:
    - .1 DAY-TO-DAY BAS OPERATORS
    - .2 BAS TROUBLESHOOTING & MAINTENANCE
  - D. THE INSTRUCTOR(S) SHALL BE FACTORY-TRAINED AND EXPERIENCED IN TEACHING THIS TECHNICAL MATERIAL.
  - E. TRAINING WILL BEGIN WHEN THE OPERATING AND MAINTENANCE MANUALS HAVE BEEN DELIVERED TO THE OWNER OR REVIEWED BY THE ENGINEER'S REPRESENTATIVE.
  - F. THE ECONOMIZER SHALL CLOSE WHENEVER THE FREEZESTAT IS ON.

- G. OPERATING PROCEDURES
- H. MAINTENANCE PROCEDURES
- H.1 TROUBLE-SHOOTING PROCEDURES
  - I. SPARE PARTS REQUIRED
  - J. PROJECT RECORD DOCUMENTS: UPON COMPLETION OF INSTALLATION, SUBMIT AN ELECTRONIC COPY. THE DOCUMENTS SHALL BE SUBMITTED FOR APPROVAL PRIOR TO FINAL COMPLETION AND INCLUDE:
    - .1 PROJECT RECORD DRAWINGS - THESE SHALL BE AS-BUILT VERSIONS OF THE SUBMITTAL SHOP DRAWINGS; ONE SET OF ELECTRONIC MEDIA .PDF DRAWING FILES SHALL BE PROVIDED.
    - .2 TESTING AND COMMISSIONING REPORTS AND CHECKLISTS SIGNED OFF BY TRAINED FACTORY (EQUIPMENT MANUFACTURERS) AND FIELD (BAS) COMMISSIONING PERSONNEL.

5. **SEQUENCE OF OPERATIONS**
- 4.1 **BY-PASS TERMINAL BOX (TB-1, TB-2)**
- A. RUN CONDITIONS - SCHEDULED:
- .1 OCCUPIED MODE: THE UNIT SHALL MAINTAIN
    - . A 75°F (ADJ.) COOLING SETPOINT
    - . A 70°F (ADJ.) HEATING SETPOINT.
    - . UNOCCUPIED MODE (NIGHT SETBACK): THE UNIT SHALL MAINTAIN
      - . A 85°F (ADJ.) COOLING SETPOINT.
      - . A 65°F (ADJ.) HEATING SETPOINT.

- ALARMS SHALL BE PROVIDED AS FOLLOWS:
- . HIGH ZONE TEMP: IF THE ZONE TEMPERATURE IS GREATER THAN THE COOLING SETPOINT BY A USER DEFINABLE AMOUNT (ADJ.).
  - . LOW ZONE TEMP: IF THE ZONE TEMPERATURE IS LESS THAN THE HEATING SETPOINT BY A USER DEFINABLE AMOUNT (ADJ.).
  - . MINIMUM VENTILATION ON CARBON DIOXIDE (CO2) CONCENTRATION:
  - . WHEN IN THE OCCUPIED MODE, THE CONTROLLER SHALL MEASURE THE ZONE CO2 CONCENTRATION AND MODULATE THE ZONE DAMPER OPEN ON RISING CO2 CONCENTRATIONS, OVERRIDING NORMAL DAMPER OPERATION TO MAINTAIN A CO2 SETPOINT OF NOT MORE THAN 750 PPM (ADJ.).
- ALARMS SHALL BE PROVIDED AS FOLLOWS:
- . HIGH ZONE CARBON DIOXIDE CONCENTRATION: IF THE ZONE CO2 CONCENTRATION IS GREATER THAN 1000PPM (ADJ.) WHEN IN THE OCCUPIED MODE.

- F. ZONE SETPOINT ADJUST:
- . THE OCCUPANT SHALL BE ABLE TO ADJUST THE ZONE TEMPERATURE HEATING AND COOLING SETPOINTS AT THE ZONE SENSOR.
- G. ZONE UNOCCUPIED OVERRIDE:
- . A TIMED LOCAL OVERRIDE CONTROL SHALL ALLOW AN OCCUPANT TO OVERRIDE THE SCHEDULE AND PLACE THE UNIT INTO AN OCCUPIED MODE FOR AN ADJUSTABLE PERIOD OF TIME. AT THE EXPIRATION OF THIS TIME, CONTROL OF THE UNIT SHALL AUTOMATICALLY RETURN TO THE SCHEDULE.
- H. CONSTANT VOLUME TERMINAL UNIT - FLOW CONTROL:
- . THE UNIT SHALL MAINTAIN CONSTANT AIRFLOW THROUGH ONE OF THE FOLLOWING:
    - . OCCUPIED:
      - . THE ZONE DAMPER SHALL MODULATE TO MAINTAIN A CONSTANT OCCUPIED AIRFLOW (ADJ.) DISTRIBUTED INTO THE ZONE.
      - . WHEN ZONE TEMPERATURE IS LESS THAN ITS HEATING SETPOINT, THE CONTROLLER SHALL ENABLE HEATING TO MAINTAIN THE ZONE TEMPERATURE AT ITS HEATING SETPOINT.
    - . UNOCCUPIED:

## CONTROLS SPECIFICATIONS

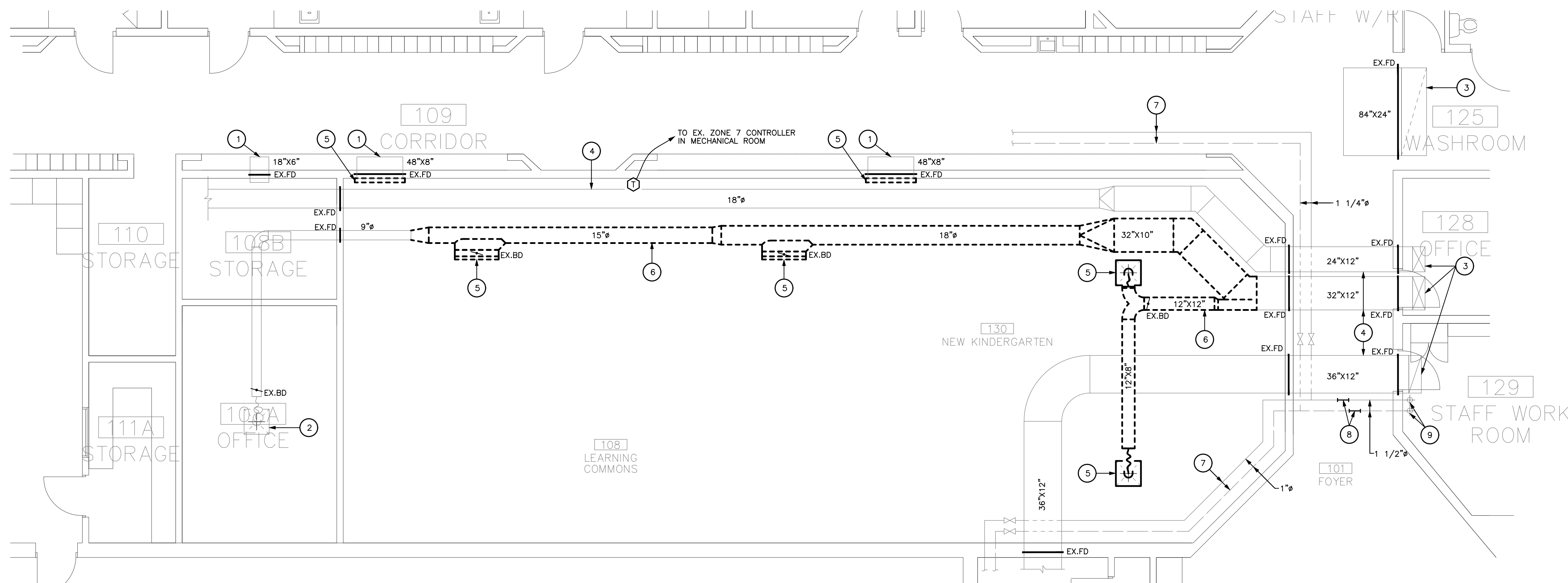
- . THE ZONE DAMPER SHALL MODULATE TO A CONSTANT UNOCCUPIED AIRFLOW (ADJ.) DISTRIBUTED INTO THE ZONE.
  - . WHEN ZONE TEMPERATURE IS LESS THAN ITS HEATING SETPOINT, THE CONTROLLER SHALL ENABLE HEATING TO MAINTAIN THE ZONE TEMPERATURE AT ITS UNOCCUPIED HEATING SETPOINT.
- 4.2 **UNIT VENTILATOR (UV-1, UV-2)**
- A. RUN CONDITIONS:
- . THE UNIT SHALL RUN ACCORDING TO A USER DEFINABLE TIME SCHEDULE.
  - . THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING A FREEZESTAT STATUS.
  - . THE FAN SHALL RUN ANYTIME THE UNIT IS COMMANDED TO RUN UNLESS SHUTDOWN ON SAFETIES.
- B. ZONE SETPOINT ADJUST:
- . THE ZONE TEMPERATURE HEATING AND COOLING SETPOINTS SHALL BE ADJUSTED AT THE BAS GRAPHIC INTERFACE. SETPOINTS SHALL BE AS FOLLOWS:
    - . COOLING UNOCCUPIED: 85°F (ADJ.)
    - . COOLING OCCUPIED: 75°F (ADJ.)
    - . HEATING UNOCCUPIED: 65°F (ADJ.)
    - . HEATING OCCUPIED: 70°F (ADJ.)

- C. ZONE OPTIMAL START:
- . THE UNIT SHALL USE AN OPTIMAL START ALGORITHM FOR MORNING START-UP. THIS ALGORITHM SHALL MINIMIZE THE UNOCCUPIED WARM-UP OR COOL-DOWN PERIOD WHILE STILL ACHIEVING COMFORT CONDITIONS BY THE START OF SCHEDULED OCCUPIED PERIOD.
- D. ZONE UNOCCUPIED OVERRIDE:
- . A TIMED LOCAL OVERRIDE CONTROL SHALL BE ALLOWED AT THE BAS GRAPHIC INTERFACE TO OVERRIDE THE SCHEDULE AND PLACE THE UNIT INTO AN OCCUPIED MODE FOR AN ADJUSTABLE PERIOD OF TIME. AT THE EXPIRATION OF THIS TIME, CONTROL OF THE UNIT SHALL AUTOMATICALLY RETURN TO THE SCHEDULE.

- E. COOLING:
- . THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND STAGE THE COOLING TO MAINTAIN ITS COOLING SETPOINT. TO PREVENT SHORT CYCLING, THERE SHALL BE A USER DEFINABLE (ADJ.) DELAY BETWEEN STAGES, AND EACH STAGE SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME.
  - . THE COOLING SHALL BE ENABLED WHENEVER:
    - . OUTSIDE AIR TEMPERATURE IS GREATER THAN 60°F (ADJ.).
    - . AND THE ZONE TEMPERATURE IS ABOVE COOLING SETPOINT.
    - . AND THE FAN IS ON.
- F. HEATING COIL VALVE:
- . THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND ENABLE HEATING TO MAINTAIN HEATING SETPOINT.
    - . WHEN HEATING IS ENABLED THE CONTROLLER SHALL MEASURE THE LEAVING AIR TEMPERATURE AND MODULATE THE HEATING COIL VALVE TO MAINTAIN THE ZONE TEMPERATURE SET POINT.

- H. THE HEATING SHALL BE ENABLED WHENEVER:
- . OUTSIDE AIR TEMPERATURE IS LESS THAN 65°F (ADJ.).
  - . AND THE ZONE TEMPERATURE IS BELOW HEATING SETPOINT.
  - . AND THE FAN IS ON.
- G. ECONOMIZER:
- . THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND MODULATE THE MIXED AIR DAMPERS IN SEQUENCE TO MAINTAIN THE ZONE COOLING SETPOINT. THE OUTSIDE AIR DAMPERS SHALL MAINTAIN A MINIMUM ADJUSTABLE POSITION AS VERIFIED BY THE AIR BALANCER OPEN DURING HEATING AND VENTILATION WHENEVER OCCUPIED. THE ECONOMIZER SHALL BE ENABLED WHENEVER:
    - . OUTSIDE AIR TEMPERATURE IS AT LEAST 3°F (ADJ.) LESS THAN THE ZONE TEMPERATURE.
    - . AND THE OUT





**DMOLITION HVAC PARTIAL GROUND FLOOR PLAN**

SCALE- 3/16" = 1'-0"

**DRAWING NOTES**

- 1 EXISTING RETURN TRANSFER BOOT TO REMAIN.
- 2 EXISTING SUPPLY REGISTER TO REMAIN.
- 3 DUCT CONTINUES UP TO MECHANICAL ROOM ABOVE.
- 4 EXISTING DUCT WORK TO REMAIN.
- 5 DEMOLISH AND DISPOSE OF EXISTING AIR REGISTER.
- 6 DEMOLISH AND DISPOSE OF EXISTING DUCTWORK TO EXTENT SHOWN.
- 7 EXISTING HEATING WATER SUPPLY AND RETURN TO REMAIN.
- 8 INDICATED SECTION OF PIPE TO BE CUT AND REMOVED FROM SITE.
- 9 PIPE CONTINUES UP TO MECHANICAL ROOM ABOVE.

THESE DRAWINGS ARE NOT TO BE SCALED  
 ALL DRAWINGS, THE DESIGN, AND THE DETAILS THEREON REMAIN THE PROPERTY OF THE ARCHITECT AND ARE NOT TO BE ALTERED, RE-USED OR REPRODUCED WITHOUT THE ARCHITECT'S EXPRESS WRITTEN CONSENT.  
 THE CONTRACTOR MUST FIELD VERIFY ALL DIMENSIONS AND MUST CONFIRM & CORRELATE ALL DETAILS WITHIN THE FULL DRAWING PACKAGE BEING RESPONSIBLE FOR SAME THROUGHOUT CONSTRUCTION, REPORTING ANY DISCREPANCIES TO THE ARCHITECT PRIOR TO COMMENCING THE RELEVANT WORK.  
 ALL DRAWINGS, DETAILS & SPECIFICATIONS REPRESENTED IN THE DRAWINGS ARE TO BE USED FOR CONSTRUCTION ONLY WHEN ISSUED BY THE ARCHITECT AND NOTED ACCORDINGLY IN THE "ISSUE/REVISIONS" BOX HEREON.

1. ISSUED FOR PERMIT 23/11/10
2. ISSUED FOR TENDER 24/02/29

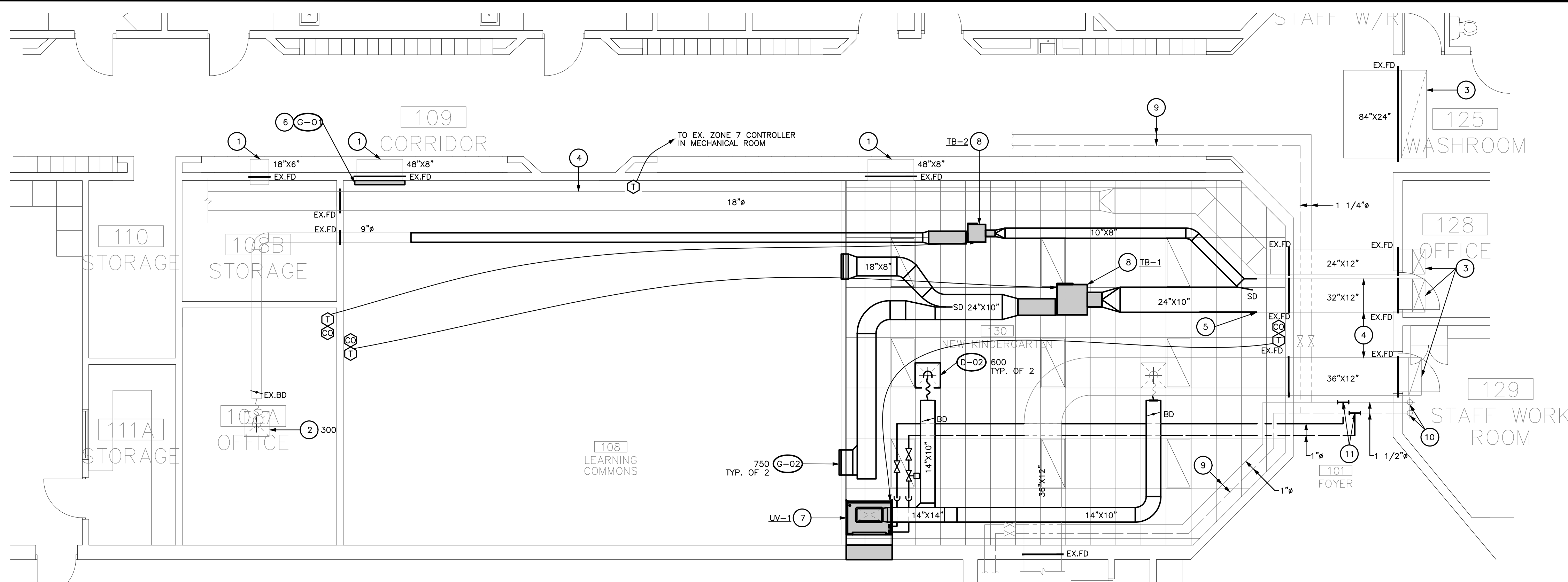
**GENERAL NOTES**

- A) THE EXISTING SERVICES SHOWN ON THIS DRAWING HAVE BEEN TAKEN FROM THE ORIGINAL AS-BUILT DRAWINGS. THIS INFORMATION MUST NOT BE ASSUMED TO BE COMPLETE OR UP-TO-DATE. THE MECHANICAL CONTRACTOR SHALL CARRY OUT A FULL SURVEY OF ALL EXISTING SERVICES AND STRUCTURE TO CONFIRM THE SIZE AND LOCATION OF THESE SERVICES, BEFORE THE COMMENCEMENT OF ANY WORK.
- B) ALL DISCONNECTED DUCTWORK AND PIPING TO BE CAPPED OFF UNLESS OTHERWISE NOTED
- C) ALL CUTTING AND PATCHING OF EXISTING ROOF, FLOORS AND WALLS TO BE BY MECHANICAL CONTRACTOR
- D) FOR DRAWING LEGENDS SEE DRAWING M0.0

PROJECT:  
 Window and Door Upgrades at:

Cecil B. Stirling Elementary  
 340 Queen Victoria Drive  
 Hamilton, ON  
 For the HWDSB

SEAL:



**PROPOSED HVAC PARTIAL GROUND FLOOR PLAN**

SCALE- 3/16" = 1'-0"

**DRAWING NOTES**

- 1 EXISTING RETURN TRANSFER BOOT TO REMAIN.
- 2 EXISTING SUPPLY REGISTER TO REMAIN. REBALANCE TO AIRFLOW INDICATED.
- 3 EXISTING DUCT CONTINUES UP TO MECHANICAL ROOM ABOVE.
- 4 EXISTING DUCT WORK TO REMAIN.
- 5 PROVIDE NEW SPLITTER DAMPER AND CONNECT TO EXISTING DUCTWORK. BALANCE EXTRACTOR TO SUIT NEW AIRFLOW DISTRIBUTIONS INDICATED ON PLAN DISTRIBUTION. SEAL CONNECTION TO MAKE AIR TIGHT
- 6 CONNECT NEW GRILLE TO EXISTING DUCTWORK. SEAL CONNECTION TO MAKE AIR TIGHT.
- 7 INSTALL NEW UNIT VENTILATOR AS PER MANUFACTURERS INSTRUCTIONS. REFER TO SHEET M3 FOR DETAILS. WALL LOUVRE AND WALL SLEEVE TO BE SUPPLIED BY THE MANUFACTURER.
- 8 INSTALL NEW BYPASS TERMINAL BOX AS PER MANUFACTURERS INSTRUCTIONS. BY PASS BOX TO COME COMPLETE WITH 3FT SOUND ATTENUATOR.
- 9 EXISTING HEATING WATER SUPPLY AND RETURN TO REMAIN.
- 10 PIPE CONTINUES UP TO MECHANICAL ROOM ABOVE.
- 11 CONNECT TO EXISTING HEATING WATER SUPPLY AND RETURN PIPING.

EXP Services Inc.  
 t: 905.525.6069 | f: 905.528.7310  
 1266 South Service Road,  
 Suite C-11, Stoney Creek,  
 ON, L8E 5R9  
 Canada  
 www.exp.com



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**GENERAL NOTES**

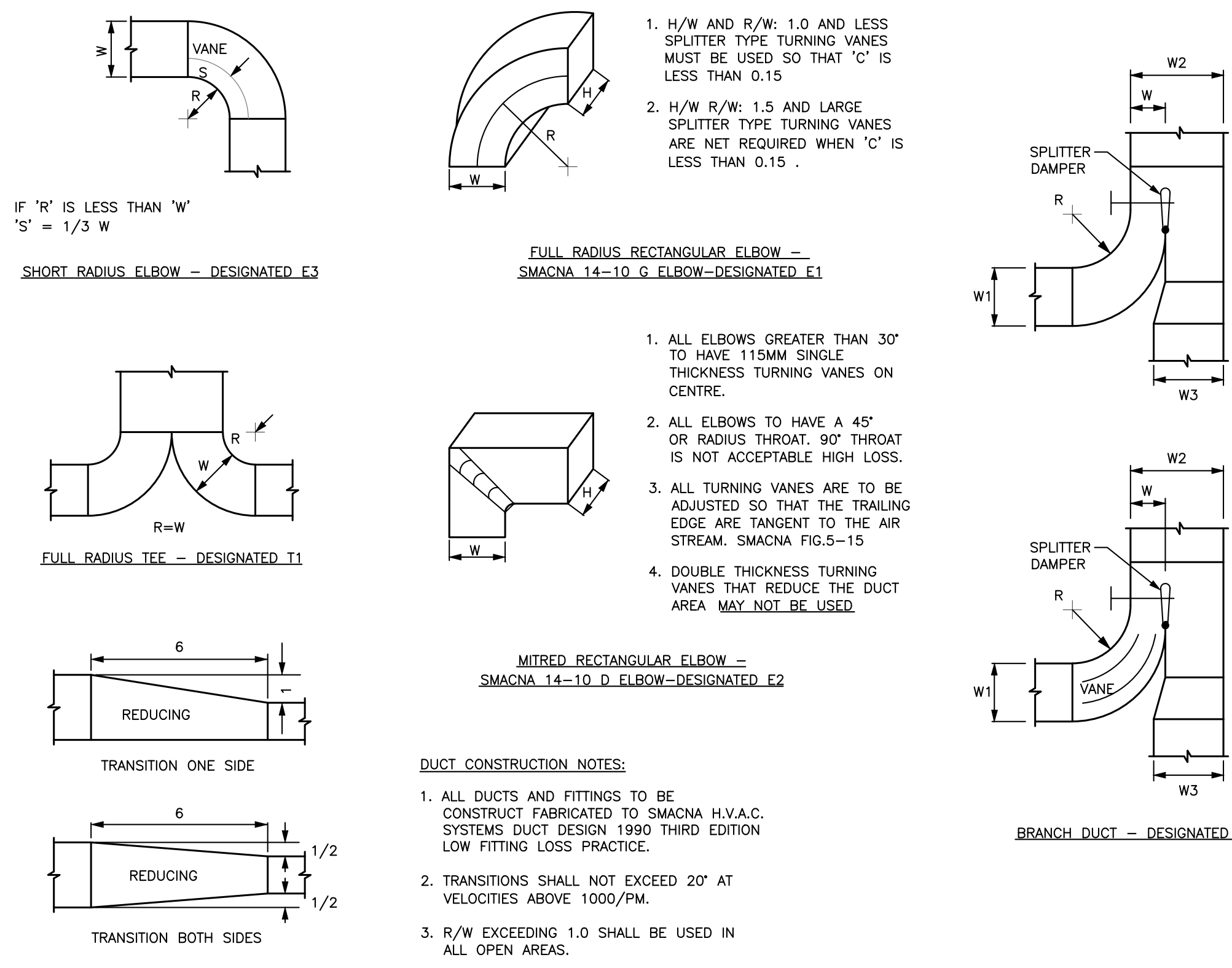
- A) FOR EXACT LOCATION OF GRILLES AND DIFFUSERS REFER TO ARCHITECTURAL REFLECTED CEILING PLAN.
- B) ALL DUCTWORK AND EQUIPMENT TO BE CONCEALED IN CEILING SPACE UNLESS NOTED OTHERWISE.
- C) DUCT RUNOUTS TO MATCH GRILLE/DIFFUSER SIZE UNLESS OTHERWISE NOTED.
- D) DUCTWORK LOCATIONS TO BE FULLY CO-ORDINATED WITH GENERAL PLUMBING, SPRINKLER AND ELECTRICAL CONTRACTORS PRIOR TO FABRICATION OR INSTALLATION.
- E) FOR DRAWING LEGENDS SEE DRAWING M0.0.
- F) READ IN CONJUNCTION WITH SCHEMATICS AND DETAILS.

DRAWING TITLE:  
 PARTIAL MECHANICAL FLOOR PLAN

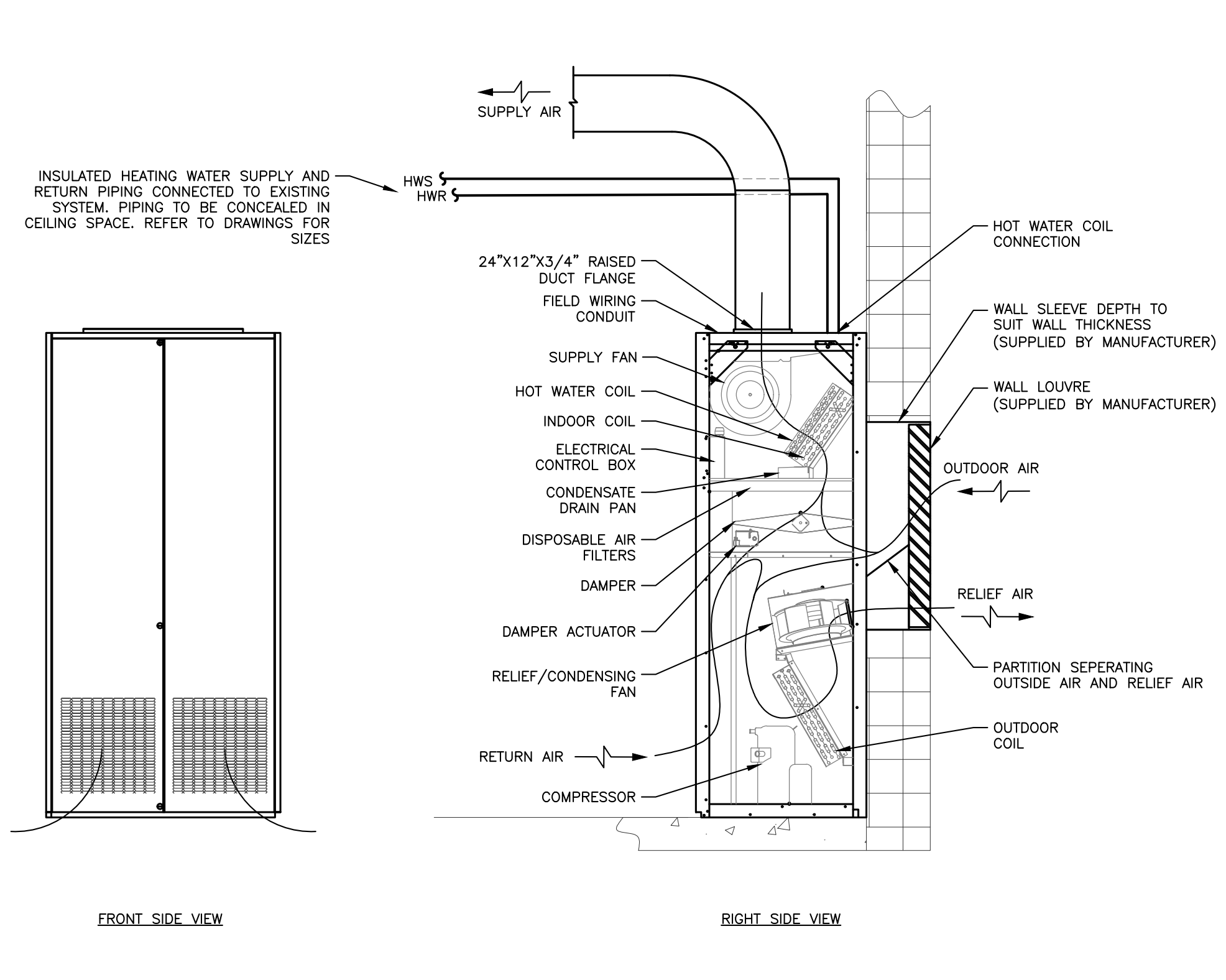
SCALE:  
 AS NOTED  
 DRAWN:  
 J.L.  
 DATE:  
 OCTOBER 2023  
 PROJECT #:  
 ALL-23012666-A0  
 DRAWING #:

M3

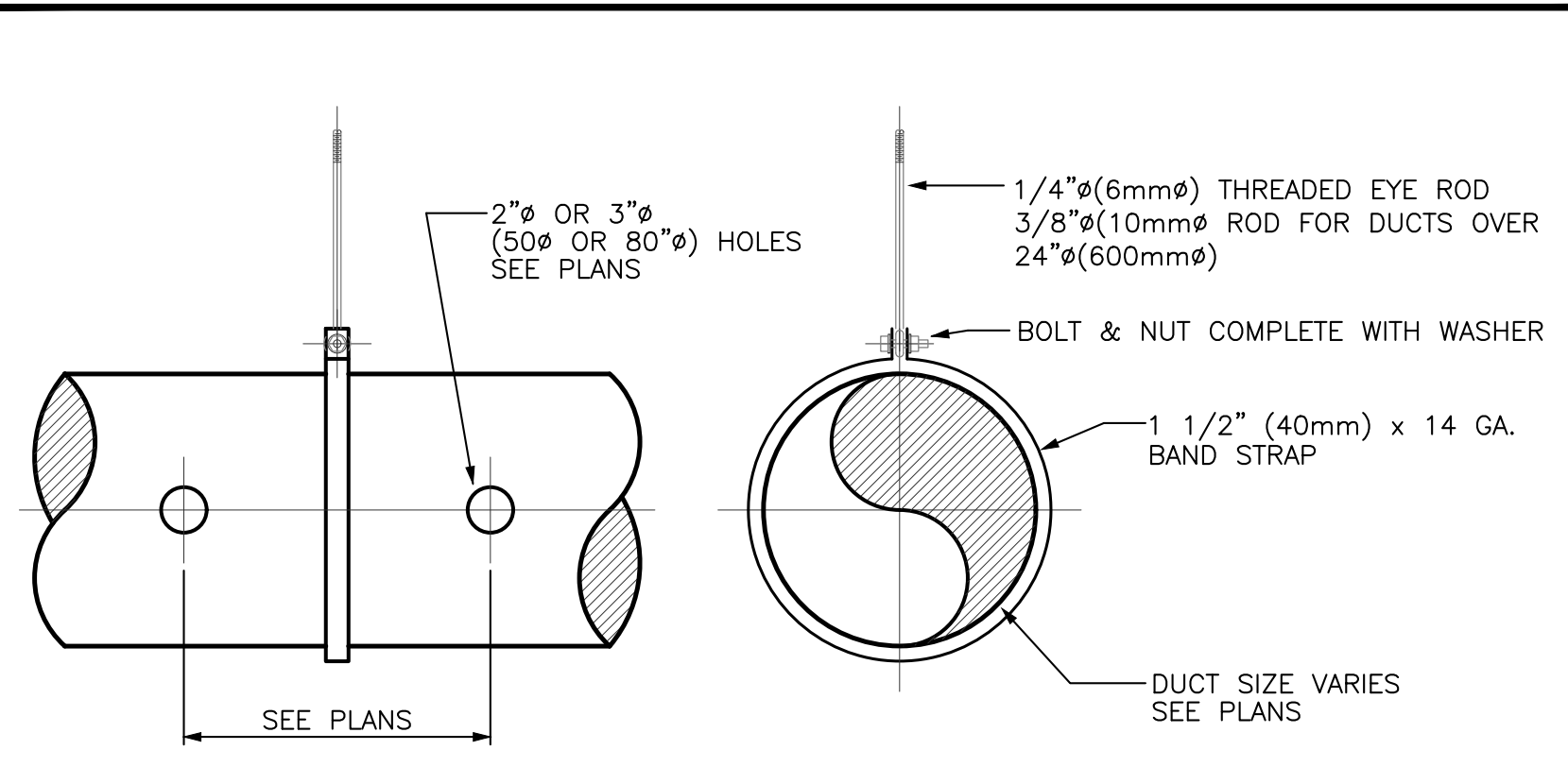
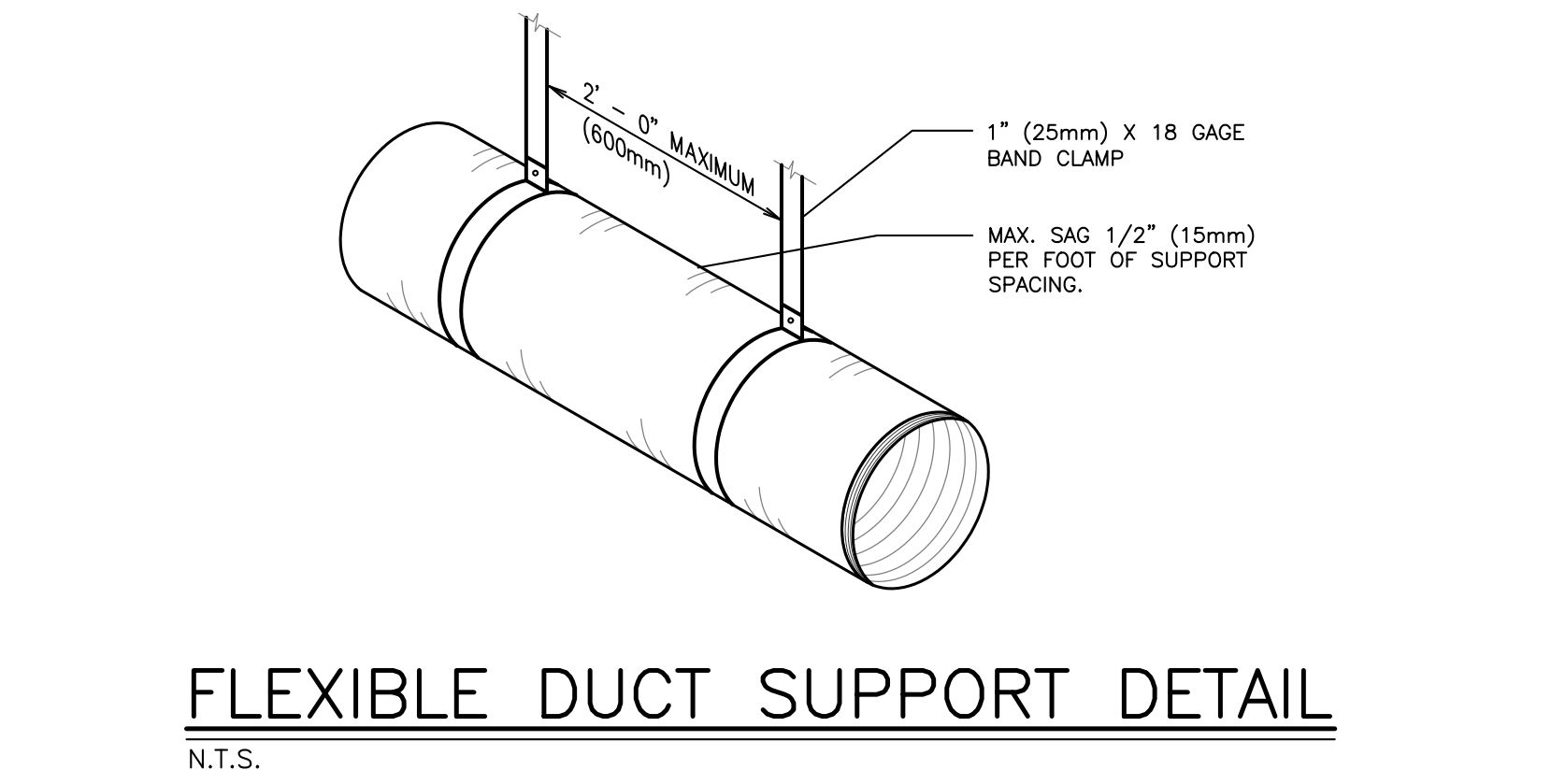




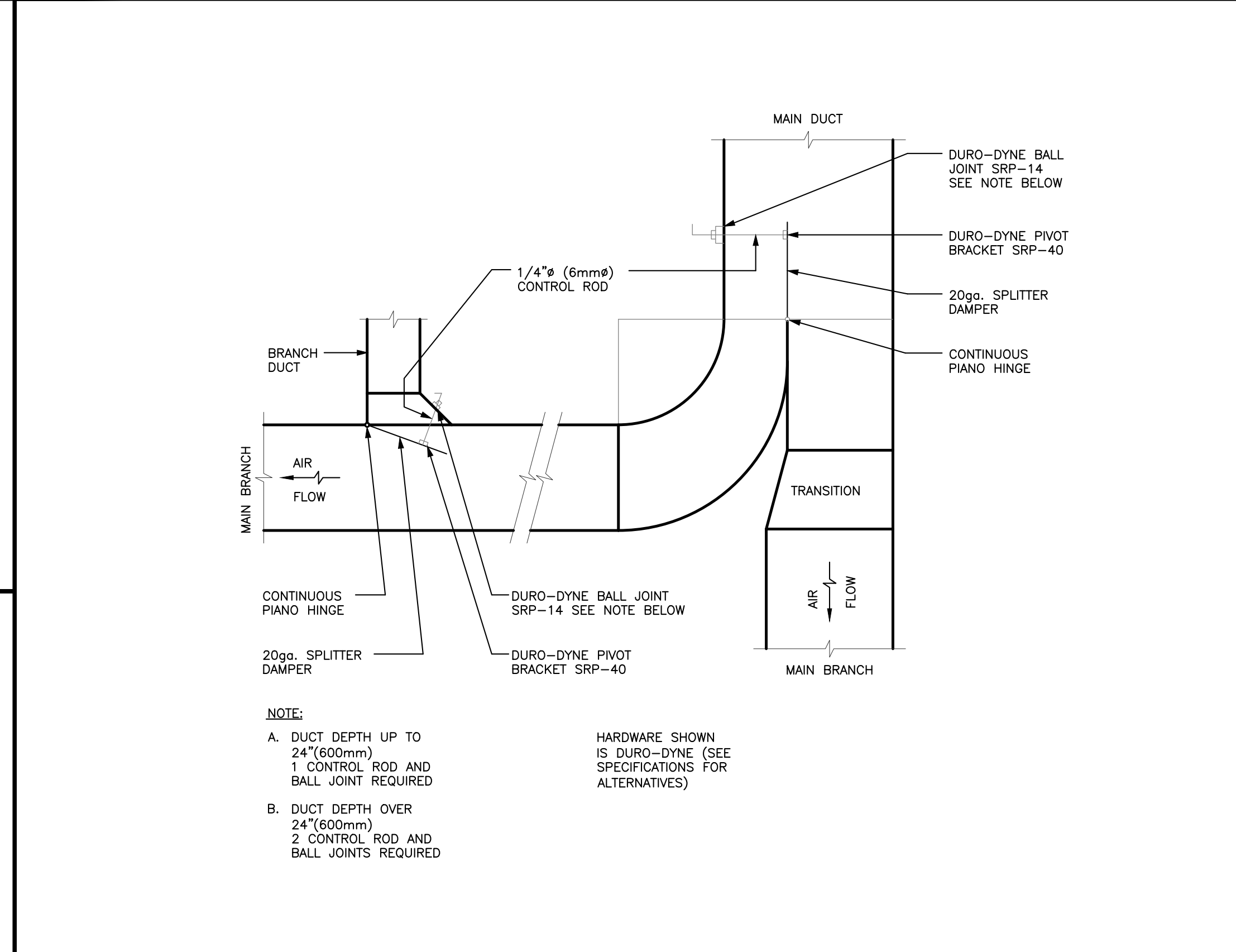
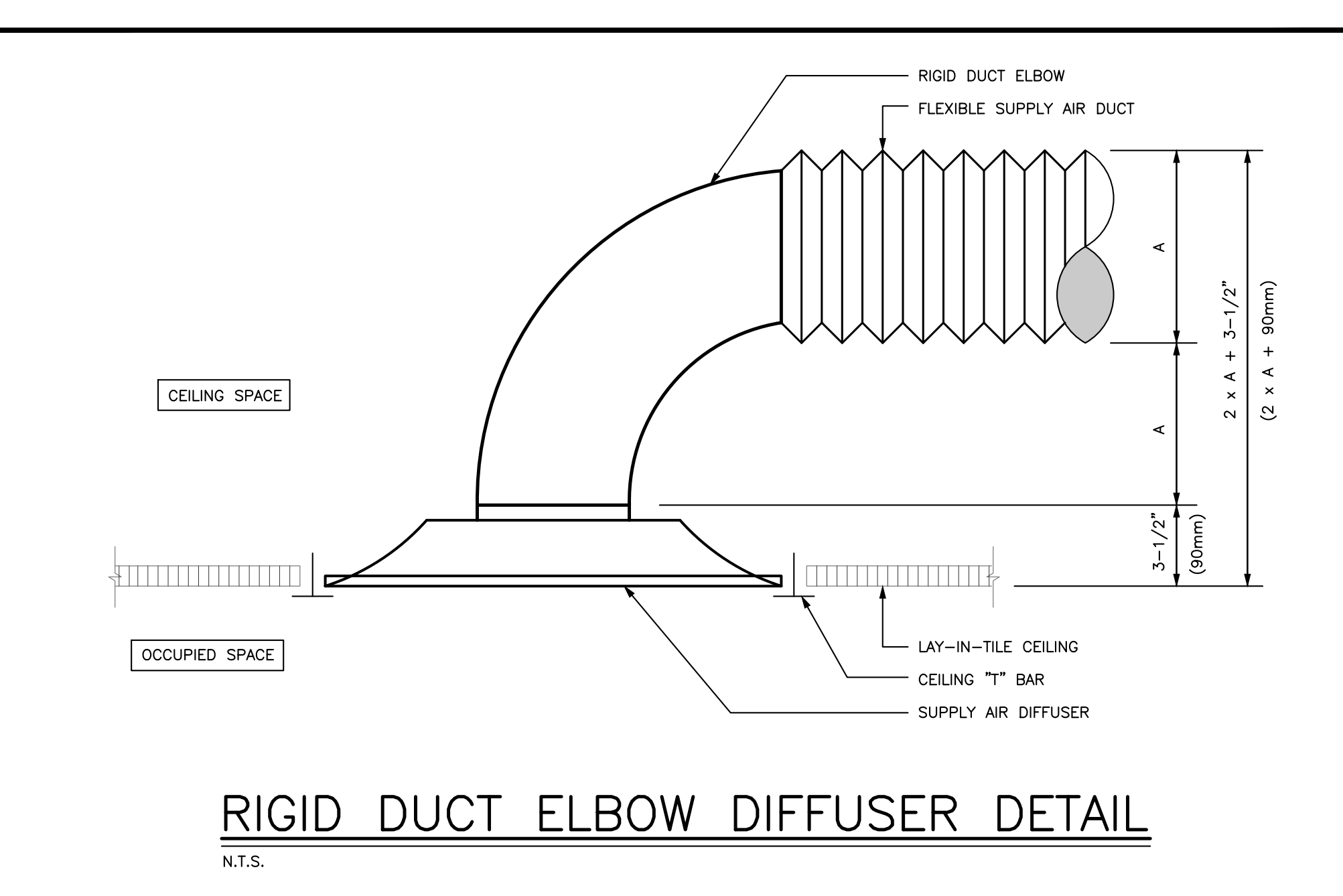
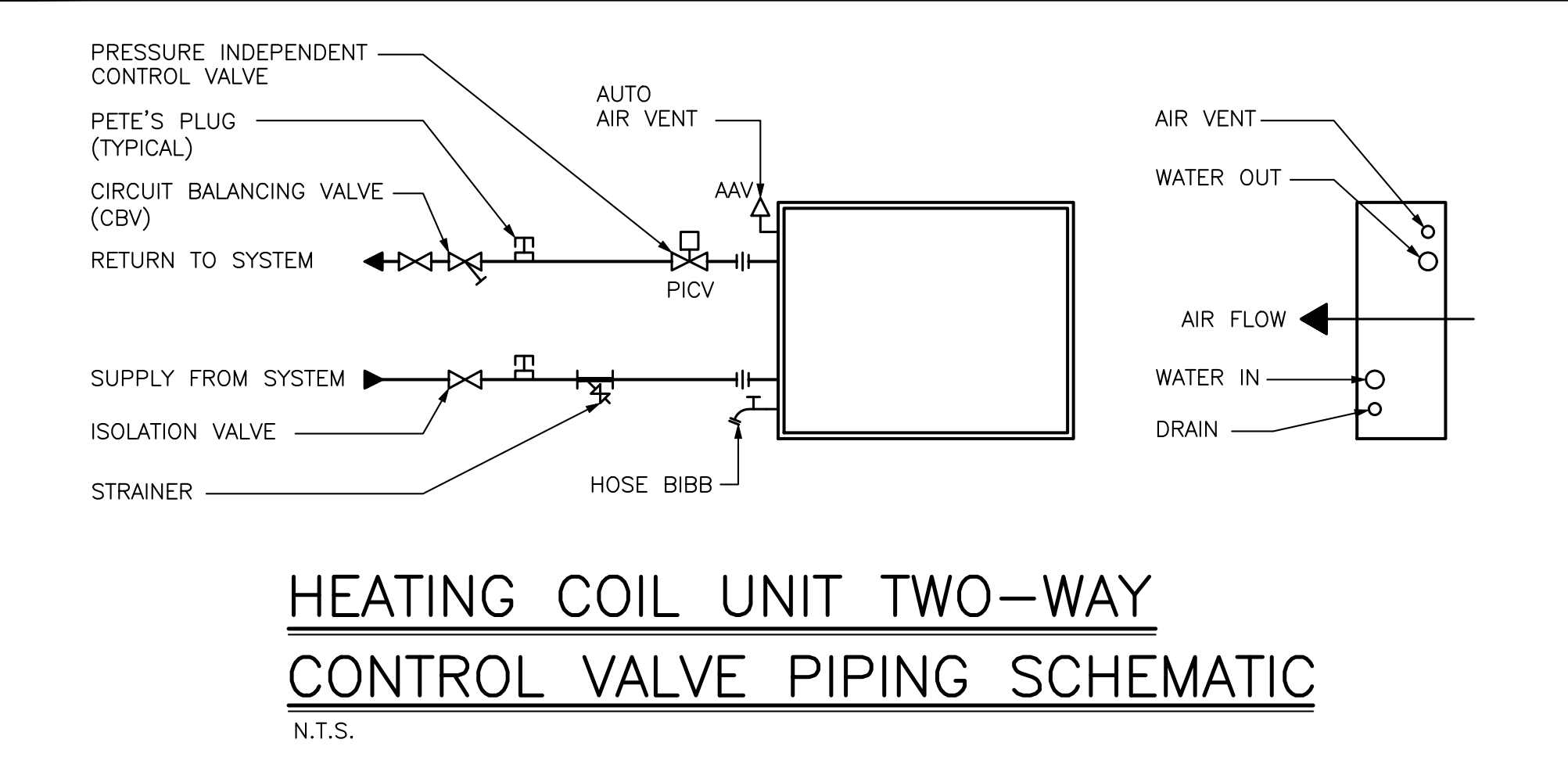
**SQUARE, RADIUS ELBOW AND TRANSITION FITTINGS**  
N.T.S.



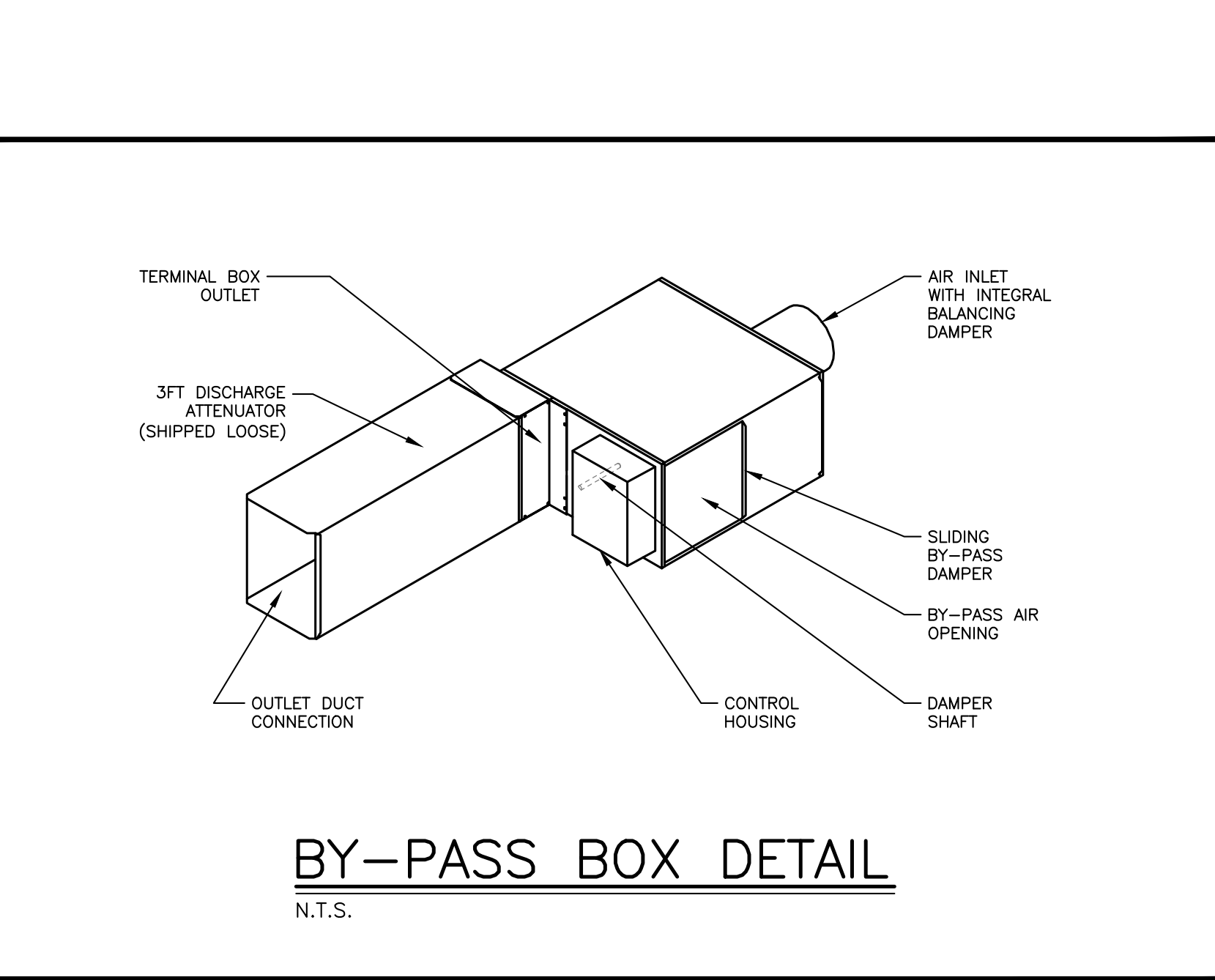
**UNIT VENTILATOR EXTERIOR WALL INSTALLATION DETAIL**  
N.T.S.



**DETAIL - SPIRAL DUCT SUPPORT**  
N.T.S.



**TYPICAL DUCT CONNECTION**  
N.T.S.



**BY-PASS BOX DETAIL**  
N.T.S.

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PROJECT:  
Window and Door Upgrades at:  
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SCALE:

EXP Services Inc.  
t: 905.525.6069 | f: 905.528.7310  
1266 South Service Road,  
Suite C-11, Stoney Creek,  
ON, L3E 5R9  
Canada  
www.exp.com

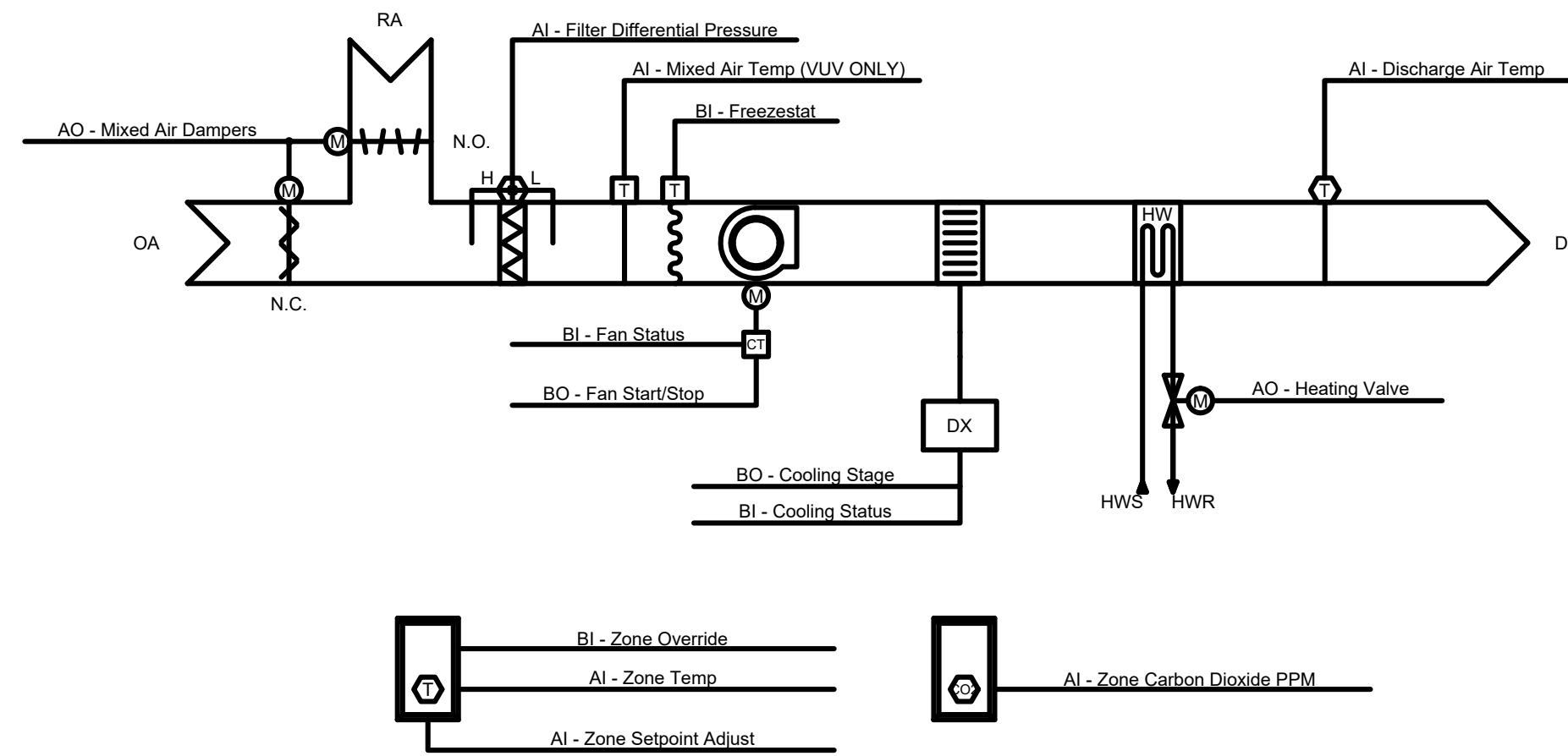


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DRAWING TITLE:  
**MECHANICAL DETAILS**

SCALE:  
AS NOTED  
DRAWN:  
J.L.  
DATE:  
OCTOBER 2023  
PROJECT #:  
ALL-23012666-A0  
DRAWING #:

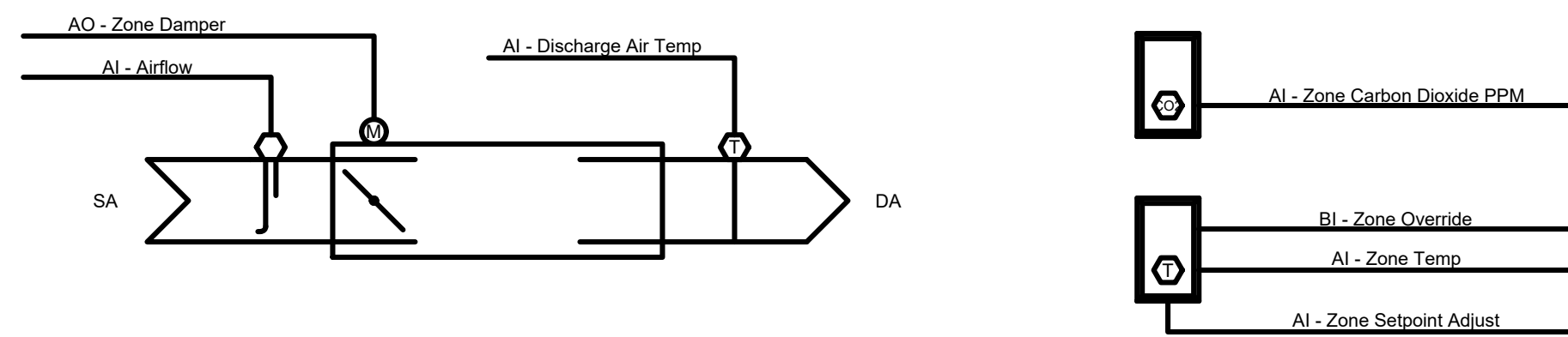
M4



POINT NAME	HARDWARE POINTS	SOFTWARE POINTS	TREND	ALARM	SHOW ON GRAPHIC
DISCHARGE AIR TEMP	AI	-	Y	N	Y
MIXED AIR TEMP	AI	-	Y	N	Y
FILTER DIFFERENTIAL PRESSURE	AI	-	Y	N	Y
ZONE CARBON DIOXIDE PPM	AI	-	Y	N	Y
ZONE SETPOINT ADJUST	AI	-	N	N	Y
ZONE TEMP	AI	-	Y	N	Y
HEATING VALVE	AO	-	Y	N	Y
MIXED AIR DAMPERS	AO	-	Y	N	Y
FAN STATUS	BI	-	Y	N	Y
FREEZESTAT	BI	-	Y	Y	Y
ZONE OVERRIDE	BI	-	Y	N	Y
COOLING STATUS	BI	-	Y	N	Y
COOLING STAGE (REFER TO SHOP DRAWINGS FOR QTY OF STAGES)	BO	-	Y	N	Y
FAN START/STOP	BO	-	Y	N	Y
COOLING SETPOINT	-	AV	Y	N	Y
HEATING SETPOINT	-	AV	Y	N	Y
ZONE CARBON DIOXIDE PPM SETPOINT	-	AV	Y	N	Y
FAN FAILURE	-	-	N	Y	N
FAN IN HAND	-	-	N	Y	N
FAN RUNTIME EXCEEDED	-	-	N	Y	N
CONDENSER FAN FAILURE	-	-	N	Y	N
CONDENSER FAN IN HAND	-	-	N	Y	N
CONDENSER FAN RUNTIME EXCEEDED	-	-	N	Y	N
FILTER CHANGE REQUIRED	-	-	N	Y	N
HIGH DISCHARGE AIR TEMP	-	-	N	Y	N
HIGH ZONE CARBON DIOXIDE CONCENTRATION	-	-	N	Y	N
HIGH ZONE TEMP	-	-	N	Y	N
LOW DISCHARGE AIR TEMP	-	-	N	Y	N
LOW ZONE TEMP	-	-	N	Y	N

### UNIT VENTILATOR CONTROL SCHMETIC

N.T.S.



POINT NAME	HARDWARE POINTS	SOFTWARE POINTS	TREND	ALARM	SHOW ON GRAPHIC
AIRFLOW	AI	-	Y	N	Y
ZONE CARBON DIOXIDE PPM	AI	-	Y	N	Y
ZONE SETPOINT ADJUST	AI	-	N	N	Y
ZONE TEMP	AI	-	Y	N	Y
DISCHARGE AIR TEMPERATURE	AI	-	Y	N	Y
ZONE DAMPER	AO	-	Y	N	Y
ZONE OVERRIDE	BI	-	Y	N	Y
AIRFLOW SETPOINT	-	AV	Y	N	Y
COOLING SETPOINT	-	AV	Y	N	Y
HEATING SETPOINT	-	AV	Y	N	Y
ZONE CARBON DIOXIDE PPM SETPOINT	-	AV	Y	N	Y
HIGH ZONE CARBON DIOXIDE CONCENTRATION	-	-	N	Y	N
HIGH ZONE TEMP	-	-	N	Y	N
LOW ZONE TEMP	-	-	N	Y	N

NOTE: BY-PASS TERMINAL BOX TO BE SHOWN AS DOWNSTREAM OF MIXING BOX ON EXISTING CONTROL GRAPHICS. TB-01 & TB-02 TO BE SHOWN CONTINUING DOWNSTREAM ON GRAPHIC FOR MIXING BOX SERVING ZONE NO. 07 OF EXISTING MULTI-ZONE AH1

### BY-PASS TERMINAL BOX CONTROL SCHMETIC

N.T.S.

CB STERLING ES ADDITIONAL SCOPE										JOB No.		ALL-23012666-A0		
MECHANICAL SCHEDULE - GRILLES AND REGISTERS														
DWG. DESIGNATION	MODEL			SIZE		CFM		SP (IN W.G.)		MECHANICAL REMARKS				
	BORDER	FRAME	CORE	Length	Width	MIN	MAX	MIN	MAX					
G-01	N	N	N	630L	48	12	1100	2200	0.006	0.022	EH PRICE, LOUVERED RETURN GRILLE, ALUMINUM CONSTRUCTION			
G-02	N	N	N	620L	24	8	600	900	0.016	0.04	EH PRICE, LOUVERED SUPPLY GRILLE, ALUMINUM CONSTRUCTION, DOUBLE DEFLECTION, CWV OBD			

OBD = OPPOSED BLADE DAMPER  
 ALL GRILLES AND DIFFUSERS TO BE COLOUR B12 (WHITE)  
 ALL GRILLES TO HAVE 'A' FASTENING

CB STERLING ES ADDITIONAL SCOPE										JOB No.		ALL-23012666-A0	
MECHANICAL SCHEDULE - AIR DIFFUSERS													
DWG. DESIGNATION	MODEL		FACE PLATE SIZE	NECK SIZE (Dia. IN)	CFM		SP (IN W.G.)		MECHANICAL REMARKS				
	SERIES	FRAME			MIN	MAX	MIN	MAX					
D-01	SCD	31	24"x24"	14"	450	850	0.01	0.04	EH PRICE SQUARE CONE DIFFUSER, ALUMINUM CONSTRUCTION				

FRAME 31 IS FOR T'BAR CEILING  
 FRAME 31/SPF IS FOR PLASTER CEILING  
 FOR EXPOSED DUCT MULTIPLY THROWBY 0.7  
 ALL DIFFUSERS TO BE COLOUR B12 (WHITE)

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1. ISSUED FOR PERMIT 23/11/10
2. ISSUED FOR TENDER 24/02/29

PROJECT:  
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 340 Queen Victoria Drive  
 Hamilton, ON  
 For the HWDSB

SEAL:

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DRAWING TITLE:  
 MECHANICAL SCHEMATIC & SCHEDULES

SCALE:

AS NOTED

DRAWN:

J.LL

DATE:

OCTOBER 2023

PROJECT #:

ALL-23012666-A0

DRAWING #:

M5

JOB NAME		CB STERLING ES ADDITIONAL SCOPE										JOB No.		ALL-23012666-A0				
MECHANICAL SCHEDULE - AIR TERMINAL BOXES																		
DWG. DESIGNATION	SYSTEM and ROOM	MODEL	SPEC TYPE	INLET SIZE (IN)		OUTLET SIZE (IN)		CFM		MECHANICAL REMARKS	WIRING FOR MECHANICAL EQUIPMENT SCHEDULE						ELECTRICAL WIRING INSTRUCTIONS	
				Ø	SIZE (L x W) (IN)	MAX	OPERATING	MOTOR W or HP	MCA FLA		MCOP	VAC/Ø	ROOM STARTER TYPE	REMOTE CONTROL DEVICE	DISC. TYPE			
TB-1	LEARNING COMMONS	BH PRICE LGB 6	BB	6	9 x 10	400	300	SLIDING GATE VALVE BYPASS TERMINAL UNIT, C/W 3FT SOUND ATTENUATOR, PROVIDE 120/24VAC STEP DOWN TRANSFORMER						24VAC				SINGLE POINT CONNECTION, WIRE COMPLETELY
TB-2	OFFICE	BH PRICE LGB 14	BB	14	15 x 16	2100	1500	SLIDING GATE VALVE BYPASS TERMINAL UNIT, C/W 3FT SOUND ATTENUATOR, PROVIDE 120/24VAC STEP DOWN TRANSFORMER						24VAC				SINGLE POINT CONNECTION, WIRE COMPLETELY

JOB NAME		CB STERLING ES ADDITIONAL SCOPE										JOB No.		ALL-23012666-A0				
MECHANICAL SCHEDULE - UNIT VENTILATORS																		
DWG. DESIGNATION	SYSTEM and ROOM	MODEL	CFM		COOLING		HEATING		GPM	PD (IN. W.G.)	MECHANICAL REMARKS	WIRING FOR MECHANICAL EQUIPMENT SCHEDULE						ELECTRICAL WIRING INSTRUCTIONS
			TOTAL	OUTDOOR	CAPACITY (BTU/H)	EER	CAPACITY (BTU/H)	MOTOR W or HP				MCA FLA	MCOP	VAC/Ø	ROOM STARTER TYPE	REMOTE CONTROL DEVICE	DISC. TYPE	
UV-1	KINDERGARTEN	SYSTEMAIR SCHMIDT HPA IQ - O CABINET 3T	1200	450	36.3	11.3	82.3	8	1.16	PACKAGED COOLING, 1 STAGE DX COOLING, HYDRONIC HOT WATER COOL, MERV 13 FILTERS C/W WALL SLEEVE, LOUVRE, ROOM SENSOR, DISCONNECT SWITCH		22.9	30	208/3		BAS	TYPE 2	DIV. 26 TO WIRE UNIT THROUGH DISCONNECT SUPPLIED BY MECHANICAL DIVISION. ALL CONTROL WIRING BY MECHANICAL DIVISION

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DRAWING TITLE:  
 MECHANICAL & ELECTRICAL SCHEDULES

SCALE:  
 AS NOTED

DRAWN:  
 J.L.

DATE:  
 OCTOBER 2023

PROJECT #:  
 ALL-23012666-A0

DRAWING #:

ME1



POWER DISTRIBUTION AND SMALL POWER			
	DUPLEX RECEPTACLE, WALL MOUNTED		DOUBLE DUPLEX RECEPTACLE, WALL MOUNTED
	DUPLEX RECEPTACLE, ABOVE BACKSPASH OF CABINET, COUNTERTOP OR SINK		DOUBLE DUPLEX RECEPTACLE, ABOVE BACKSPASH OF CABINET, COUNTERTOP OR SINK
	DUPLEX RECEPTACLE, FLUSH MTD IN CEILING		DOUBLE DUPLEX RECEPTACLE, FLUSH MOUNTED IN CEILING
	HALF SWITCHED DUPLEX RECEPTACLE, WALL MOUNTED		SIMPLEX RECEPTACLE, WALL MOUNTED
	SPECIAL PURPOSE RECEPTACLE, WALL MOUNTED. NEMA CONFIGURATION AS NOTED ON PLANS		SPECIAL PURPOSE RECEPTACLE, CEILING MOUNTED. NEMA CONFIGURATION AS NOTED ON PLANS
	SHADING REPRESENTS RECEPTACLE ON LIFE SAFETY BRANCH		SHADING REPRESENTS RECEPTACLE ON UPS BRANCH
	SHADING REPRESENTS RECEPTACLE ON NON-LIFE SAFETY BRANCH		SHADING REPRESENTS RECEPTACLE WITH ISOLATED GROUND
	DISCONNECT SWITCH, REFER TO EQUIPMENT CONNECTION SCHEDULE FOR DISCONNECT TYPE, UON		
	COMBINATION MOTOR STARTER DISCONNECT		
	MOTOR STARTER		
	VARIABLE FREQUENCY DRIVE		
	DIRECT CONNECTION, WALL MOUNTED. SUBSCRIPT 'X' INDICATES UNIQUE IDENTIFIER, REFER TO EQUIPMENT CONNECTION SCHEDULE.		
	DIRECT CONNECTION, CEILING MOUNTED. SUBSCRIPT 'X' INDICATES UNIQUE IDENTIFIER, REFER TO EQUIPMENT CONNECTION SCHEDULE.		
	MOTOR, SUBSCRIPT 'X' DENOTES MOTOR DESIGNATION, REFER TO EQUIPMENT CONNECTION SCHEDULE		
	GROUND BUS BAR		
	FURNITURE OUTLET, WALL MOUNTED		
	PANELBOARD		
	TRANSFORMER		
	FLOOR BOX, DUPLEX RECEPTACLE		SPECIAL FLOORBOX, "F" INDICATES UNIQUE FLOOR BOX TYPE
	FLOOR BOX, DOUBLE DUPLEX RECEPT		
 RECEPTACLE TYPE NUMBER INDICATES BRANCH CIRCUIT NUMBER			

CIRCUITING	
	BLDG-E1MDPH.10 CIRCUIT NUMBER PANEL DESIGNATION
	3#12#12G.21mmC CONDUIT SIZE GROUND CONDUCTOR QUANTITY AND SIZE CIRCUIT CONDUCTOR QUANTITY AND SIZE

FIRE ALARM SYSTEM			
	FIRE ALARM STROBE, WALL MOUNTED		FIRE ALARM STROBE, CEILING MOUNTED.
	FIRE ALARM HORN, WALL MOUNTED		FIRE ALARM HORN, CEILING MOUNTED
	FIRE ALARM HORN/STROBE, WALL MOUNTED		FIRE ALARM HORN/STROBE, CEILING MOUNTED
	FIRE ALARM SPEAKER, WALL MOUNTED		FIRE ALARM SPEAKER, CEILING MOUNTED
	FIRE ALARM SPEAKER/STROBE, WALL MOUNTED		FIRE ALARM SPEAKER/STROBE, CEILING MOUNTED
	FIRE ALARM BELL, WALL MOUNTED		FIRE ALARM PULL STATION
	HEAT DETECTOR, WALL MOUNTED		HEAT DETECTOR, CEILING MOUNTED
	SMOKE DETECTOR, WALL MOUNTED		SMOKE DETECTOR, CEILING MOUNTED
	SMOKE DETECTOR, DUCT MOUNTED		FIRE/SMOKE DAMPER
	CARBON MONOXIDE DETECTOR		SMOKE DAMPER
	FIREFIGHTERS TELEPHONE OUTLET		SMOKE ALARM
	REMOTE INDICATOR LIGHT		COMBINATION SMOKE ALARM AND CARBON MONOXIDE DETECTOR
	FIRE ALARM CONTROL PANEL		TAMPER SWITCH
	FIRE ALARM REMOTE ANNUCIATOR PANEL		REMOTE TEST STATION
	DATA GATHERING PANEL		FLOW SWITCH
	FIRE ALARM TERMINAL CABINET		SUPERVISORY VALVE
	FIRE ALARM TRANSPONDER PANEL		ELECTRO-MAGNETIC DOOR HOLDER

MASTER CLOCK SYSTEM	
	ANALOG MASTER CLOCK
	DIGITAL MASTER CLOCK
	ELAPSED DIGITAL TIMER CLOCK

TELECOMMUNICATIONS SYSTEM			
	WALL MOUNT VOICE OUTLET		FLOOR MOUNT VOICE OUTLET
	WALL MOUNT DATA OUTLET		FLOOR MOUNT DATA OUTLET
	WALL MOUNT DATA/VOICE OUTLET		FLOOR MOUNT DATA/VOICE OUTLET
	CEILING MOUNT VOICE OUTLET		CEILING MOUNT DATA FOR WIRELESS ACCESS POINT
	CEILING MOUNT DATA OUTLET		
	CEILING MOUNT DATA/VOICE OUTLET		
<b>DEVICE LEGEND</b>  NUMBER OF DATA JACKS      NUMBER OF DATA/VOICE JACKS NUMBER OF VOICE JACKS NO SUBSCRIPT = (1) DATA/VOICE <b>MOUNTING:</b> OUTLET MOUNTING HEIGHTS TO BE COORDINATED WITH INTERIOR DESIGNER DURING DD PHASE			

PUBLIC ADDRESS SYSTEM			
<b>DEVICE LEGEND</b> DEVICE TAG → AAA M ← MOUNTING TAG ALL PUBLIC ADDRESS SYSTEM DEVICES ARE WALL MOUNTED UNLESS OTHERWISE INDICATED BY MOUNTING TAG			
	PAGING SPEAKERS OR HORN		PAGING STATION

AUDIOVISUAL SYSTEM DEVICES			
<b>DEVICE LEGEND</b> DEVICE TAG → AAA M ← MOUNTING TAG SECONDARY ATTRIBUTE			
	AV CONNECTIVITY PLATE	*X DENOTES AV OUTLET TYPE. REFER TO AV SYSTEMS DETAILS	
	DISPLAY		
	TELEVISION OUTLET		
	PROJECTOR SCREEN		
	PROJECTOR		
	AV SYSTEM CAMERA		
	INFRARED RADIATOR		
	ANTENNA		
	AV SYSTEM ROOM OCCUPANCY SENSOR		
	AV SYSTEM PARTITION SENSOR		
	PHOTOMETRIC SENSOR		
	BACnet INTERFACE TO AV SYSTEM		
	LIGHTING INTERFACE TO AV SYSTEM		
	SHADE/DRAPE INTERFACE TO AV SYSTEM		
	MICROPHONE		
	TOUCH SCREEN		
	ROOM SCHEDULING PANEL		
	ROOM SCHEDULING SIGN		
	BUTTON PANEL		
	AV SYSTEM SPEAKER		
	SUBWOOFER SPEAKER		
	LOCAL CREDENZA RACK		
	AV RACK		
	FLOOR BOX	*X DENOTES TYPE. REFER TO AV SYSTEMS DETAILS	
	POKE THROUGH	*X DENOTES TYPE. REFER TO AV SYSTEMS DETAILS	
	TABLE BOX	*X DENOTES TYPE. REFER TO AV SYSTEMS DETAILS	

MISCELLANEOUS DEVICES	
	JUNCTION BOX, WALL MOUNTED
	JUNCTION BOX, CEILING MOUNTED
	CONTACTOR, SUBSCRIPT 'X' INDICATES UNIQUE IDENTIFIER
	CONTROL RELAY & REQUIRED INPUT/OUTPUT MODULE

DEMOLITION	
< R >	EXISTING TO BE REMOVED
< RL >	EXISTING TO BE RELOCATED
< EX >	EXISTING TO REMAIN
< NL >	EXISTING - NEW LOCATION
	DEMOLITION CONDUIT
	DEMOLITION EQUIPMENT
	EXISTING TO REMAIN CONDUIT
	EXISTING TO REMAIN EQUIPMENT
	RELOCATED / NEW CONDUIT
	RELOCATED / NEW EQUIPMENT

TAGS AND CALL OUT SYMBOLS	
	SECTION CALLOUT SECTION DESIGNATION SHEET NUMBER
	DETAIL CALLOUT DETAIL DESIGNATION SHEET NUMBER
	REVISION CALLOUT
	KEYNOTE CALLOUT

ABBREVIATIONS			
A	ANALOG	MCB	MAIN CIRCUIT BREAKER
AFCI	ARC FAULT CIRCUIT INTERRUPTOR	MCC	MOTOR CONTROL CENTER
AFF	ABOVE FINISHED FLOOR	MD	MOTORIZED DAMPER
ATS	AUTOMATIC TRANSFER SWITCH	MH	MOUNTING HEIGHT
BM	BEAM MOUNTED	NC	NORMALLY CLOSED
CK	CLOCK HANGER	NO	NORMALLY OPEN
CL	CEILING MOUNTED	OC	OVER THE COUNTER
EMT	ELECTRICAL METALLIC TUBING	PL	POLE MOUNTED
EP	EXPLOSION PROOF	PTZ	PAN, TILT, ZOOM
F	FURNITURE OR MILLWORK MOUNTED	ST	SHUNT TRIP
FL	FLOOR MOUNTED	TP	TAMPER PROOF
GFCI	GROUND FAULT CIRCUIT INTERRUPTER	WP	WEATHER PROOF
GFI	GROUND FAULT INTERRUPTER		

GENERAL NOTES	
1.	ELECTRICAL DOCUMENTS ARE BASED ON AVAILABLE INFORMATION AND, SHALL BE READ IN CONJUNCTION WITH ARCHITECTURAL, INTERIOR DESIGN, STRUCTURAL, KITCHEN / FOOD SERVICE, MECHANICAL, ELEVATORS, FF&E, CIVIL, AND LANDSCAPE CONSULTANT DOCUMENTS.
2.	THE ELECTRICAL DRAWINGS ARE DIAGRAMMATIC AND SHOW GENERAL ARRANGEMENTS OF ELECTRICAL AND SYSTEMS DEVICES. THE FINAL LOCATION AND ELEVATION OF ALL ELECTRICAL AND SYSTEMS DEVICES SHALL BE COORDINATED WITH ARCHITECTURAL/INTERIOR DESIGNER'S PACKAGES. REPORT ANY DISCREPANCIES TO CONSULTANT.
3.	PROVIDE COMPLETE FIRE ALARM SYSTEM AS REQUIRED BY APPLICABLE CODES AND AUTHORITY HAVING JURISDICTION.
4.	PROVIDE ELECTRICAL COORDINATION WITH MECHANICAL EQUIPMENT SELECTION AND LOCATION. REFER TO MECHANICAL EQUIPMENT SCHEDULES FOR DETAILS. VERIFY THE FINAL LOCATION OF MECHANICAL EQUIPMENT PRIOR TO INSTALLATION. REFER TO MECHANICAL EQUIPMENT / MOTOR CONTROL DETAIL FOR FURTHER DETAILS.
5.	ENSURE LIGHTING CONTROL WILL TURN-ON LIGHT FIXTURES ON EMERGENCY POWER TO FULL BRIGHTNESS IN FIRE ALARM EVENT OR LOSS OF NORMAL POWER.
6.	DOOR HARDWARE SCHEDULE BY DOOR HARDWARE CONSULTANT. REFER TO ARCHITECTURAL FLOOR PLANS FOR DOOR HOLD OPEN DEVICE LOCATIONS AND OTHER DOOR HARDWARE INFORMATION.
7.	CONTRACTOR TO INCLUDE FOR PAYMENT OF REQUIREMENT PERMITS, FEES, LICENCES, CERTIFICATES OF INSPECTION, ETC. IF REQUIRED.
8.	CABLE AND CONDUIT SIZES INDICATED ON DRAWINGS ARE MINIMUM SIZES AND SHALL BE INCREASED BASED ON ACTUAL ROUTING AND VOLTAGE DROP.

LIGHTING, LIGHTING SWITCHING & CONTROLS			
AF10 7ab UPPER CASE LETTERS INDICATE LIGHTING FIXTURE TYPE NUMBER INDICATES CIRCUIT NUMBER, LOWER CASE LETTER INDICATES SWITCH/LEG			
	LIGHTING FIXTURE ON NORMAL BRANCH POWER - CEILING MOUNTED		LIGHTING FIXTURE ON EMERGENCY BRANCH POWER OR NIGHT LIGHT - CEILING MOUNTED
	LIGHTING FIXTURE ON NORMAL BRANCH POWER - WALL MOUNTED		LIGHTING FIXTURE ON EMERGENCY BRANCH POWER OR NIGHT LIGHT - WALL MOUNTED
	STRIP LIGHTING FIXTURE ON NORMAL BRANCH POWER		STRIP LIGHTING FIXTURE ON EMERGENCY BRANCH POWER OR NIGHT LIGHT
	PENDANT LINEAR FIXTURE ON NORMAL BRANCH POWER		PENDANT LINEAR FIXTURE ON EMERGENCY BRANCH POWER OR NIGHT LIGHT
	DOWNLIGHT LIGHTING FIXTURE ON NORMAL BRANCH POWER - RECESSED MOUNTED		DOWNLIGHT LIGHTING FIXTURE ON EMERGENCY BRANCH POWER OR NIGHT LIGHT - RECESSED MOUNTED
	PENDANT LIGHTING FIXTURE ON NORMAL BRANCH POWER		PENDANT LIGHTING FIXTURE ON EMERGENCY BRANCH POWER OR NIGHT LIGHT
	WALL WASH LIGHTING FIXTURE ON NORMAL BRANCH POWER - ARROW INDICATES DIRECTION OF BEAM		WALL WASH LIGHTING FIXTURE ON EMERGENCY BRANCH POWER OR NIGHT LIGHT - ARROW INDICATES DIRECTION OF BEAM
	WALL SCONCE LIGHTING FIXTURE ON NORMAL BRANCH POWER - WALL MOUNTED		WALL SCONCE LIGHTING FIXTURE ON EMERGENCY BRANCH POWER OR NIGHT LIGHT - WALL MOUNTED
	TRACK LIGHT HEAD ON NORMAL BRANCH POWER		TRACK LIGHT HEAD ON EMERGENCY BRANCH POWER OR NIGHT LIGHT
	BOLLARD LIGHT FIXTURE ON NORMAL BRANCH POWER		BOLLARD ON EMERGENCY BRANCH POWER OR NIGHT LIGHT
	SITE LIGHTING SINGLE HEAD ON NORMAL BRANCH POWER - POLE MOUNTED		SITE LIGHTING SINGLE HEAD ON EMERGENCY BRANCH POWER OR NIGHT LIGHT - POLE MOUNTED
	SITE LIGHTING DUAL HEAD ON NORMAL BRANCH POWER - POLE MOUNTED		SITE LIGHTING DUAL HEAD ON EMERGENCY BRANCH POWER OR NIGHT LIGHT - POLE MOUNTED
	EXIT SIGN - SINGLE FACE - CEILING MOUNTED		EXIT SIGN - DUAL FACE - CEILING MOUNTED
	EXIT SIGN - SINGLE FACE - WALL MOUNTED		EXIT SIGN - DUAL FACE - WALL MOUNTED
	LOW LEVEL EXIT SIGN - SINGLE FACE - WALL OR DOOR MOUNTED		SINGLE REMOTE EMERGENCY LIGHT - WALL MOUNTED
	DUAL HEAD EMERGENCY LIGHT WITH INTEGRAL BATTERY PACK - WALL MOUNTED		DUAL REMOTE EMERGENCY LIGHT - WALL MOUNTED
	SPST SWITCH, WALL MOUNTED. 'ab' INDICATES INDIVIDUAL GANGED SWITCHES AND ASSOCIATED SWITCH LEGS CONTROLLED, SUBSCRIPT 'X' INDICATES:		K - KEY OPERATED LV - LOW VOLTAGE P - PILOT LIGHT T - WALL BOX TIMER WP - WEATHER PROOF
	OCCUPANCY SENSOR, CEILING MOUNTED		OCCUPANCY SENSOR, WALL MOUNTED
	VACANCY SENSOR, CEILING MOUNTED		VACANCY SENSOR, WALL MOUNTED

DRAWING LIST	
DWG No.	DRAWING TITLE
E0	ELECTRICAL LEGEND AND DRAWING LIST
E1	OVERALL PLAN
E2	PARTIAL ELECTRICAL FLOOR DEMOLITION PLAN
E3	PARTIAL ELECTRICAL FLOOR PROPOSED PLAN
E4	LIGHTING SCHEDULE AND DETAILS
E5	ELECTRICAL SPECIFICATIONS
ME1	MECHANICAL & ELECTRICAL SCHEDULES

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- INDUSTRIAL • INFRASTRUCTURE • SUSTAINABILITY

DRAWING TITLE:  
**ELECTRICAL LEGEND AND DRAWING LIST**

SCALE:

N.T.S.

DRAWN:

ABS

DATE:

OCTOBER 2023

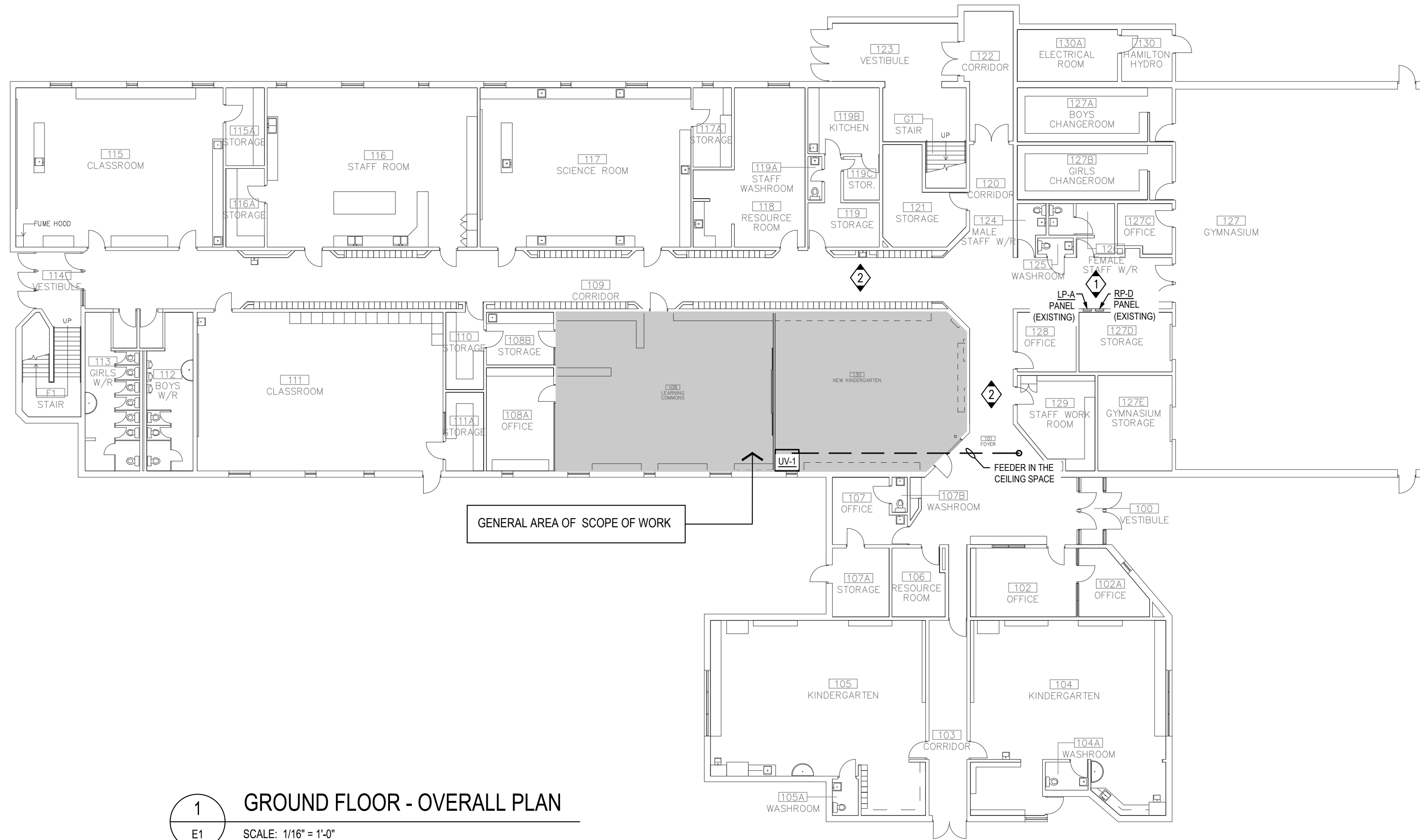
PROJECT #:

ALL-23012666-A0

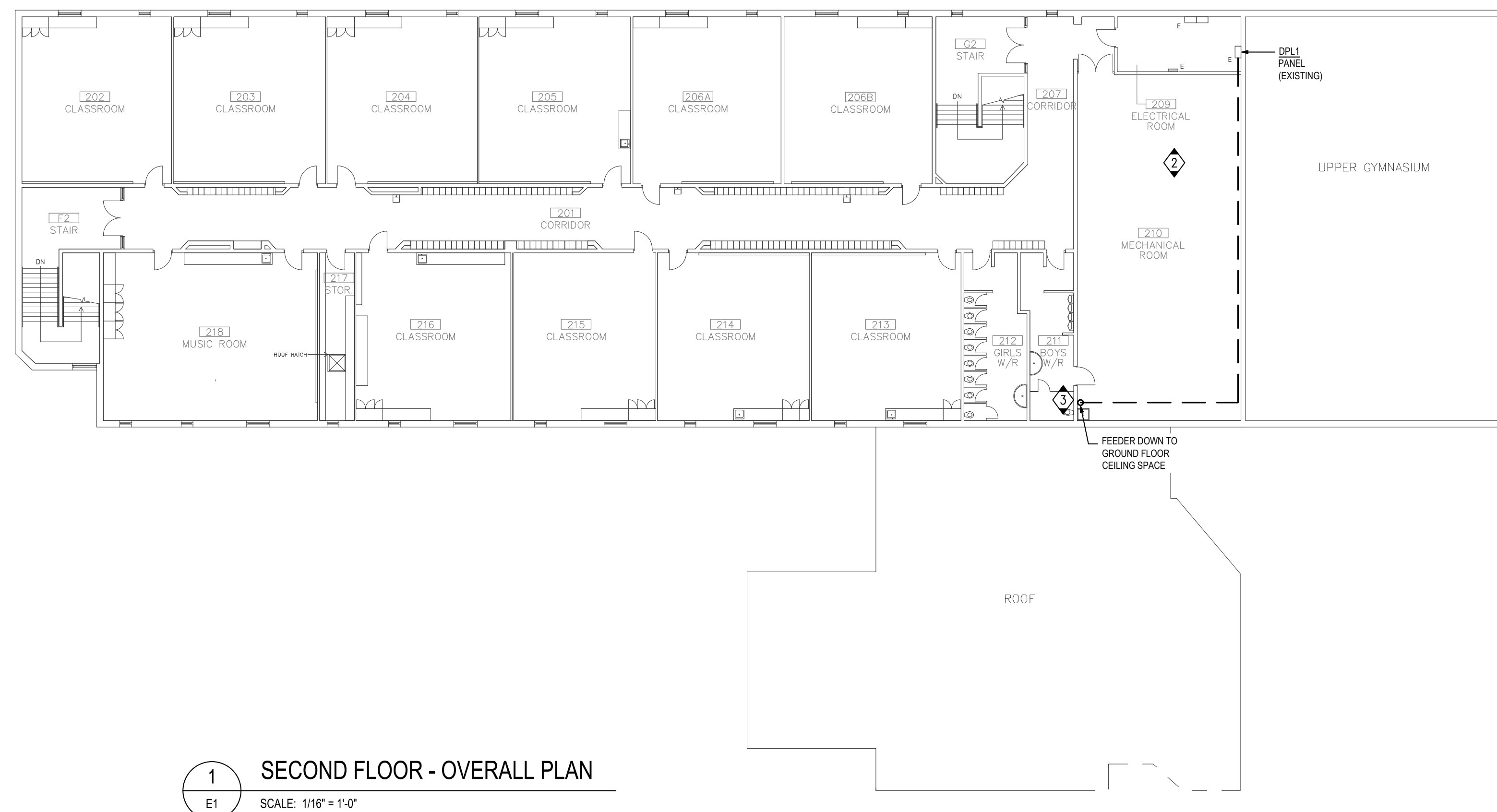
DRAWING #:

E0





1 GROUND FLOOR - OVERALL PLAN  
E1 SCALE: 1/16" = 1'-0"



1 SECOND FLOOR - OVERALL PLAN  
E1 SCALE: 1/16" = 1'-0"

**DRAWING NOTES**

- 1 EXISTING PANELBOARD TO REMAIN.
- 2 ALLOW IN PRICE FOR TEMPORARILY REMOVING CEILING TILES, LIGHT FIXTURES OR ANY OTHER IMPEDIMENTS TO INSTALL THE FEEDER CONDUIT IN CEILING SPACE. AFTER INSTALLATION, RE-INSTATE ALL LIGHT FIXTURES AND CEILING MOUNTED DEVICES.
- 3 CONTRACTOR TO CORE CUT SUITABLE OPENINGS TO ACCOMMODATE FEEDER INSTALLATION. COORDINATE WORK WITH TRADE CUTTING FLOOR SLAB. SITE CONFIRM EXACT LOCATION. AVOID CUTTING BARS. CONTACT CONSULTANT IF THERE IS AN EXISTING INTERFERING WITH THE CORING LOCATION. PROVIDE SUITABLE FIRE STOPPING AND SMOKE SEAL MATERIALS AROUND FEEDER, TO MAINTAIN FIRE RATING OF SURFACE BEING PENETRATED.

**ELECTRICAL GENERAL DEMOLITION NOTES**

1. THE ELECTRICAL CONTRACTOR SHALL, AS PART OF HIS WORK, PERFORM ALL RELATED DEMOLITION, MODIFICATIONS, RELOCATION OF ELECTRICAL DISTRIBUTION AND OTHER EQUIPMENT AND RELATED WORK, INCLUDING NEW WORK NECESSARY TO COMPLETE THE PROJECT.
2. THE ELECTRICAL CONTRACTOR SHALL VERIFY ALL FIELD CONDITIONS AND DIMENSIONS PRIOR TO SUBMITTING BIDS. REFER TO EXISTING DRAWINGS AND VISIT THE SITE TO DETERMINE THE EXTENT OF THE DEMOLITION AND NEW WORK REQUIRED.
3. THE ELECTRICAL CONTRACTOR SHALL VERIFY ALL TECHNICAL DETAILS OF EQUIPMENT TO BE REMOVED. WHERE THERE IS A DISCREPANCY WITH THE TENDER DOCUMENTS, CONTRACTOR SHALL ENGAGE CONSULTANTS FOR DIRECTIONS. ELECTRICAL CONTRACTOR SHALL MAKE A LIST OF ALL EQUIPMENT TO BE REMOVED. THIS LIST SHALL BE WITH ALL FOLLOWING INFORMATION:  
MAKE MODEL  
\*\* MANUFACTURER  
\*\* TECHNICAL DETAILS  
\*\* LOCATION THIS LIST SHALL BE SUBMITTED TO THE OWNER FOR RECORD PURPOSES.
4. THE ELECTRICAL CONTRACTOR SHALL NOT DISCONNECT EQUIPMENT AND ELECTRICAL CIRCUITS IN THE RENOVATION AREA OR ANY PART OF THE BUILDING WITHOUT PRIOR NOTIFICATION AND PERMISSION FROM THE OWNER. EXTREME CARE SHALL BE TAKEN TO MINIMIZE DISTURBANCE TO THE SURROUNDING AREA.
5. ITEMS REMOVED AND NOT SCHEDULED TO BE RELOCATED SHALL BE OFFERED TO THE OWNER FOR THEIR USE. IF NOT ACCEPTED BY THE OWNER, THE ELECTRICAL CONTRACTOR SHALL DISPOSE OF THE MATERIAL FROM THE SITE IN ACCORDANCE WITH LOCAL REGULATIONS. THE ELECTRICAL CONTRACTOR SHALL DELIVER ITEMS ACCEPTED BY THE OWNER TO THE DESIGNATED LOCATIONS AS DIRECTED BY THE OWNER.
6. IN ALL CASES WHERE WORK IS REMOVED, THE ELECTRICAL CONTRACTOR SHALL PROVIDE ALL NECESSARY MATERIALS AND LABOR TO SUSTAIN OPERATION OF ALL PARTS OF THE SYSTEMS CONNECTING TO OR FROM THE PART REMOVED, COMPLETING ALL WORK IN STRICT ACCORDANCE WITH APPLICABLE CODES.
7. ALL WIRING, CABLES AND FEEDERS INCLUDING BOTH CONNECTED TO DEVICES AND EQUIPMENT TO BE DEMOLISHED AND EXISTING THAT WERE ABANDONED IN PLACE SHALL BE REMOVED BACK TO THEIR SOURCES. UNLESS NOTED OTHERWISE, CONDUITS AND/OR WIRING SHALL, WHERE NECESSARY, BE RE-CIRCUIT AROUND THE REMOVED PART, KEEPING OCCUPIED PARTS OF THE BUILDING SYSTEM IN FULL SERVICE.
8. ALL EXISTING CONDUITS WHICH HAVE BEEN ABANDONED OR ARE UNUSED SHALL BE REMOVED.
9. PROVIDE BLANK METAL COVER PLATES FOR ALL JUNCTION/DEVICE BOXES NO LONGER IN USE THAT ARE EMBEDDED IN FLOOR SLAB OR MASONRY WALLS. PROVIDE PLUGS FOR ALL PANELS WHERE CONDUIT HAS BEEN REMOVED. COVER PLATES SHALL BE PAINTED TO MATCH EXISTING CONDITIONS.
10. WHERE REQUIRED COORDINATE WITH THE CONSULTANTS/OWNER FOR EXISTING PARTITIONS TO BE REMOVED TO FACILITATE WORK. DISCONNECT EXISTING BRANCH CIRCUITS SERVING DEVICES IN PARTITIONS TO BE REMOVED. MAINTAIN CONTINUITY OF CIRCUITS SERVING EXISTING DEVICES IN OTHER AREAS TO REMAIN.
11. LIGHTING FIXTURES: REMOVE LIGHTING FIXTURES AND SWITCH CONTROL WHEN THE FIXTURE TO BE REMOVED IS SERVED BY A CIRCUIT THAT SUPPLIES FIXTURES IN OTHER AREAS THAT ARE TO REMAIN. THE ELECTRICAL CONTRACTOR SHALL MAINTAIN THE CONTINUITY OF THE CIRCUIT TO THE REMAINING FIXTURES.
12. POWER RECEPTACLES: REMOVE RECEPTACLES WHEN THE RECEPTACLE TO BE REMOVED IS SERVED BY A CIRCUIT THAT SUPPLIES RECEPTACLES IN OTHER AREAS THAT ARE TO REMAIN. THE ELECTRICAL CONTRACTOR SHALL MAINTAIN THE CONTINUITY OF THE CIRCUIT TO THE REMAINING RECEPTACLES.
13. FIRE ALARM SYSTEM: COORDINATE AND CONSULT WITH CURRENT FIA SYSTEM SERVICE CONTRACTOR OR THEIR QUALIFIED REPRESENTATIVE FOR ALL FIRE ALARM DEMOLITION AND MODIFICATIONS. OPERATION SHALL BE MAINTAINED OF EXISTING FIRE ALARM SYSTEM SPECIFICALLY AS IT RELATES TO ADJACENT AREAS WHICH ARE NOT INCLUDED IN THE SCOPE OF THIS PROJECT.
14. ELECTRICAL CONTRACTOR SHALL PROVIDE UPDATED TYPE WRITTEN PANEL DIRECTORIES FOR ALL PANELS AFFECTED BY THE DEMOLITION AND/OR NEW WORK. CIRCUIT BREAKERS NOT USED FOR NEW WORK SHALL BE LABELED AS SPARE.
15. FOR EXISTING DEVICES/CIRCUITRY THAT ARE INDICATED TO BE REMOVED BACK TO POINT OF ORIGIN THESE ITEMS ARE TO BE REMOVED BACK TO POINT OF ORIGIN UNLESS THERE WILL BE EXISTING DEVICES ON THE SAME CIRCUIT THAT ARE LOCATED OUTSIDE AREA OF WORK THAT ARE TO REMAIN. IN THAT CASE, REMOVE THE EXISTING DEVICES/CIRCUITRY IN AREA OF WORK BACK TO THESE EXISTING DEVICES TO REMAIN. ALL DEVICES/CIRCUITRY IN SURROUNDING AREAS THAT ARE TO REMAIN ARE TO BE KEPT ENERGIZED. FOR REMOVAL OF CONDUIT AND WIRING OUTSIDE OF AREA OF WORK COORDINATE AND SCHEDULE WITH OWNER PRIOR TO PERFORMING WORK.

**GENERAL NOTES**

- A. PRIOR TO BIDDING, ELECTRICAL CONTRACTOR SHALL VISIT SITE AND BE FAMILIAR WITH ALL EXISTING CONDITIONS INCLUDING BUT NOT LIMITED TO EQUIPMENT LOCATIONS AND OTHER POSSIBLE INSTALLATION DIFFICULTIES. PAY AND OBTAIN ANY PERMITS REQUIRED INCLUDING ESA.
- B. ALL CONDUIT ROUTES SHOWN ON DRAWINGS ARE APPROXIMATE AND NOT FINAL. CONTRACTOR SHALL VERIFY ROUTES AND DO A WALKTHROUGH BEFORE BID. CONTRACTOR SHALL ACCOUNT FOR POSSIBLE DAMAGE AND REPAIR TO EXISTING CEILING AND LIGHT FIXTURES. ALL MAIN CONDUIT RUNS SHALL BE IN CORRIDOR CEILING SPACE.
- C. EXTEND/PROVIDE NEW WIRING/CONDUIT FOR ALL DEVICES THAT ARE RELOCATED.
- D. ALL NEW RECEPTACLES IN THE SCHOOL SHALL BE TAMPER RESISTANT TYPE.
- E. REMOVE AND RE-INSTATE ALL REQUIRED T-BAR OR DRY TYPE CEILING TO FACILITATE ELECTRICAL INSTALLATIONS. ANY DAMAGES TO T-BAR SHALL BE RE-INSTATED.
- F. UNLESS OTHERWISE NOTED WITH A CIRCUIT NUMBER, RE-USE EXISTING CIRCUIT BREAKERS THAT HAD BECOME SPARE FROM THE DEMOLITION TO FEED NEW RECEPTACLES. MAXIMUM 6 DUPLEX RECEPTACLES PER CIRCUIT UNLESS OTHERWISE NOTED.
- G. ALL LT. CABLES SHALL BE PLENUM RATED.
- H. UNLESS NOTED OTHERWISE, EVERY CONDUIT CONTAINING 120V OR GREATER WIRING SHALL CONTAIN A SEPARATE INSULATED GROUND WIRE RATED FOR 600V.  
FOR EACH PANEL BOARD, PROVIDE AN UPDATED, TYPE WRITTEN DIRECTORY INDICATING ROOM AND ROOM NUMBER, EQUIPMENT IDENTIFICATIONS, SPARE OR SPACE AS APPLICABLE. DIRECTORY SHALL BE MOUNTED INSIDE PANEL BOARD.
- J. ALL EMPTY CONDUITS SHALL CONTAIN PULL WIRES.
- K. EQUIPMENT OR DEVICES THAT ARE LOCATED ABOVE OPENINGS SUCH AS DOORS, LOUVERS, ETC., SHALL BE CENTERED ABOVE OPENING. THIS NOTE REFERS TO, BUT IS NOT LIMITED TO EXIT LIGHTS, EXTERIOR LIGHT FIXTURES, ETC.
- L. CONCEAL ALL CONDUIT IN FINISHED SPACES, IN UNFINISHED SPACES, ALL OUTLET BOXES SHALL BE RECESSED, AND ALL CONDUIT SHALL BE CONCEALED TO THE HIGHEST EXTENT POSSIBLE.
- M. PROVIDE CONDUIT BUSHINGS FOR ALL CONDUIT NIPPLES, SLEEVES, AND STUBS FROM WALL BOXES TO ABOVE CEILING.
- N. FLEXIBLE METALLIC CONDUIT SHALL BE USED FOR ALL CONNECTIONS TO MOTORS AND VIBRATING EQUIPMENT, TRANSFORMERS AND LIGHT FIXTURES. THE MAXIMUM ALLOWABLE LENGTH IS 3' FOR MOTORS, TRANSFORMERS AND 4' FOR LIGHT FIXTURES. WHIPS, PVC JACKETED FLEX SHALL BE USED IN OUTDOOR AND POTENTIALLY WET LOCATION AREAS. THE USE OF FLEXIBLE CONDUIT OTHER THAN AS SPECIFIED IS PROHIBITED.
- O. MINIMUM CONDUCTOR SIZE SHALL BE INCREASED AS REQUIRED FOR LONG RUNS, HIGH AMBIENT TEMPERATURES AND MULTIPLE CONDUCTORS IN RACEWAY FOR VOLTAGE DROP. INCREASE THE MINIMUM CONDUCTOR SIZES AS FOLLOWS (FOR ENTIRE CIRCUIT FROM CIRCUIT BREAKER TO LAST DEVICES OR LIGHT FIXTURE IN CIRCUIT):  
  
USE #10 AWG CONDUCTORS FOR 20 AMPERE, 120-VOLT, BRANCH CIRCUITS LONGER THAN 75 FEET.  
  
USE #8 AWG CONDUCTORS FOR 20 AMPERE, 120-VOLT, BRANCH CIRCUITS LONGER THAN 120 FEET.  
  
USE #10 AWG CONDUCTORS FOR 20 AMPERE, 277-VOLT, BRANCH CIRCUITS LONGER THAN 130 FEET.
- P. THE USE OF FLEXIBLE NONMETALLIC CONDUIT IS PROHIBITED UNLESS PRIOR APPROVAL IS OBTAINED.
- Q. CONDUIT INSTALLATION SHALL BE PARALLEL TO BUILDING LINES. NO BRANCH CIRCUIT CONDUIT WILL BE INSTALLED UNDER OR GRAD/FLOOR SLABS. JUNCTION BOXES IN INACCESSIBLE SPACES WILL BE PROHIBITED, UNLESS SPECIFICALLY INDICATED OTHERWISE.

THESE DRAWINGS ARE NOT TO BE SCALED  
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THE CONTRACTOR MUST FIELD VERIFY ALL DIMENSIONS AND MUST CORRELATE ALL DETAILS WITHIN THE FULL DRAWING PACKAGE BEING RESPONSIBLE FOR SAME THROUGHOUT CONSTRUCTION, REPORTING ANY DISCREPANCIES TO THE ARCHITECT PRIOR TO COMMENCING THE RELEVANT WORK.  
ALL DRAWINGS, DETAILS & SPECIFICATIONS REPRESENTED IN THE DRAWINGS ARE TO BE USED FOR CONSTRUCTION ONLY WHEN ISSUED BY THE ARCHITECT AND NOTED ACCORDINGLY IN THE "ISSUE/REVISIONS" BOX HEREON.

1. ISSUED FOR PERMIT 23/11/10
2. ISSUED FOR TENDER 24/02/29

PROJECT:  
Window and Door  
Upgrades at:

Cecil B. Stirling  
Elementary  
340 Queen Victoria  
Drive  
Hamilton, ON  
For the HWDSB

SCALE:

EXP Services Inc.  
t: 905.525.6069 | f: 905.528.7310  
1266 South Service Road,  
Suite C-11, Stony Creek,  
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DRAWING TITLE:  
OVERALL PLAN

SCALE:

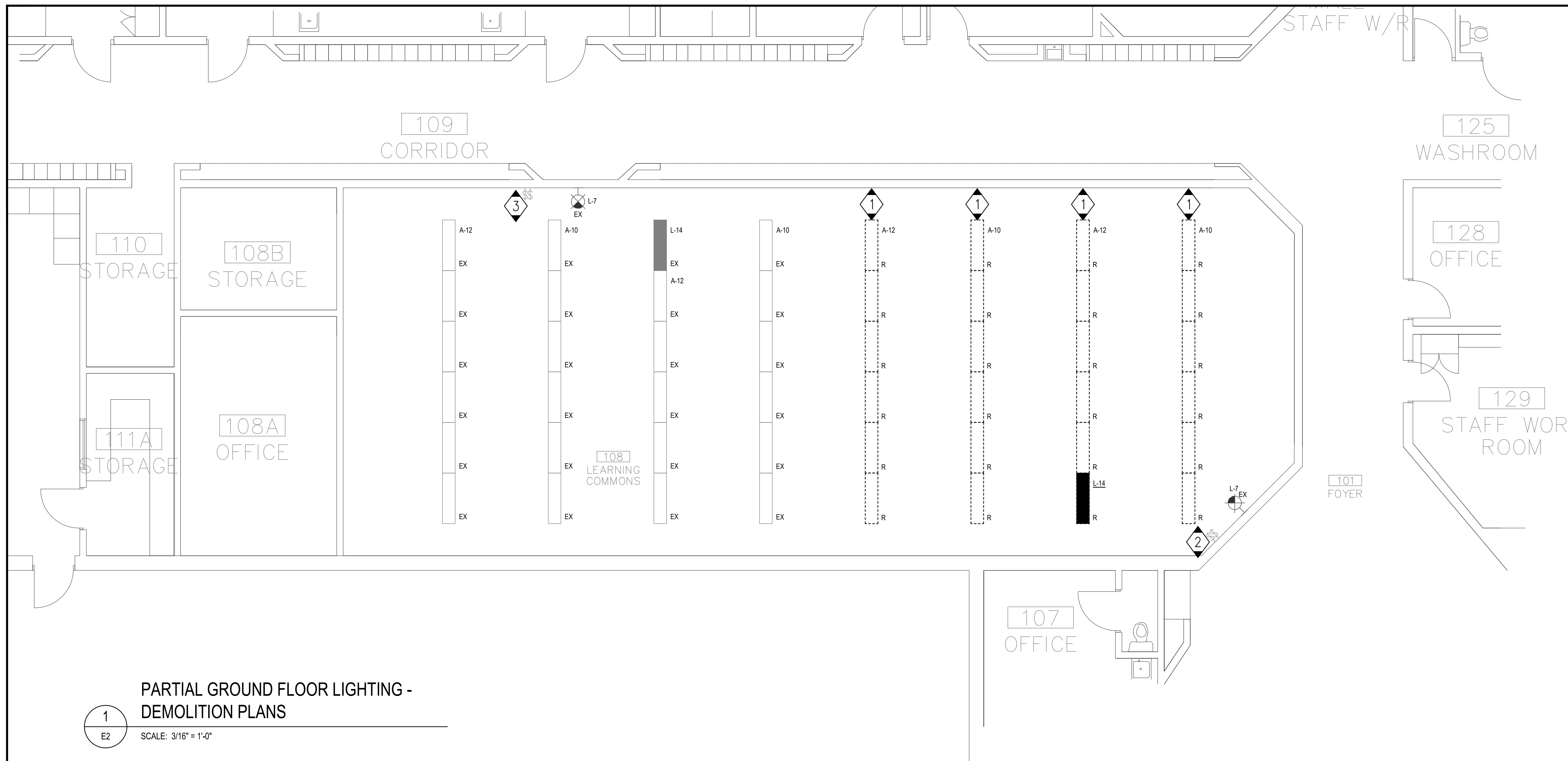
DRAWN:  
ABS

DATE:  
OCTOBER 2023

PROJECT #:  
ALL-23012666-A0

DRAWING #:

E1



**PARTIAL GROUND FLOOR LIGHTING - DEMOLITION PLANS**

1  
E2 SCALE: 3/16" = 1'-0"

**GENERAL NOTES**

- PRIOR TO BIDDING, ELECTRICAL CONTRACTOR SHALL VISIT SITE AND BE FAMILIAR WITH ALL EXISTING CONDITIONS INCLUDING BUT NOT LIMITED TO EQUIPMENT LOCATIONS AND OTHER POSSIBLE INSTALLATION DIFFICULTIES. PAY AND OBTAIN ANY PERMITS REQUIRED INCLUDING ESA.
- CONTRACTOR TO VERIFY SUPPLYING VOLTAGE BEFORE COMMENCING WORK AND INFORM THE CONSULTANT OF ANY DISCREPANCY.

**DRAWING NOTES**

- DISCONNECT AND REMOVE EXISTING ROW OF LIGHT FIXTURES. TEMPORARILY COIL EXISTING BRANCH CIRCUIT WIRING FOR RE-USE TO FEED NEW LIGHT FIXTURES. REFER TO E3 FOR NEW LIGHTING PLAN. MODIFY TO SUIT.
- EXISTING 3WAY LIGHT SWITCHES TO BE REPLACED. REFER TO DRAWING E3 FOR THE NEW LIGHTING CONTROLS. EXISTING LIGHTING SWITCH WIRING TO BE MODIFY TO SUIT.
- EXISTING 3WAY LIGHT SWITCHES TO BE REPLACED FOR STANDARD TOGGLE SWITCHES. MODIFY THE EXISTING CONTROL WIRING SO THE NEW SWITCHES CONTROL THE EXISTING LIGHTS IN THE LEARNING COMMONS ROOM.

**ELECTRICAL GENERAL DEMOLITION NOTES**

- THE ELECTRICAL CONTRACTOR SHALL, AS PART OF HIS WORK, PERFORM ALL RELATED DEMOLITION, MODIFICATIONS, RELOCATION OF ELECTRICAL DISTRIBUTION AND OTHER EQUIPMENT AND RELATED WORK, INCLUDING NEW WORK NECESSARY TO COMPLETE THE PROJECT.
- THE ELECTRICAL CONTRACTOR SHALL VERIFY ALL FIELD CONDITIONS AND DIMENSIONS PRIOR TO SUBMITTING BIDS. REFER TO EXISTING DRAWINGS AND VISIT THE SITE TO DETERMINE THE EXTENT OF THE DEMOLITION AND NEW WORK REQUIRED.
- THE ELECTRICAL CONTRACTOR SHALL VERIFY ALL TECHNICAL DETAILS OF EQUIPMENT TO BE REMOVED. WHERE THERE IS A DISCREPANCY WITH THE TENDER DOCUMENTS, CONTRACTOR SHALL ENGAGE CONSULTANTS FOR DIRECTIONS. ELECTRICAL CONTRACTOR SHALL MAKE A LIST OF ALL EQUIPMENT TO BE REMOVED. THIS LIST SHALL BE WITH ALL FOLLOWING INFORMATION:  
 \*\* MAKE/MODEL  
 \*\* MANUFACTURER  
 \*\* TECHNICAL DETAILS  
 \*\* LOCATION THIS LIST SHALL BE SUBMITTED TO THE OWNER FOR RECORD PURPOSES.
- THE ELECTRICAL CONTRACTOR SHALL NOT DISCONNECT EQUIPMENT AND ELECTRICAL CIRCUITS IN THE RENOVATION AREA OR ANY PART OF THE BUILDING WITHOUT PRIOR NOTIFICATION AND PERMISSION FROM THE OWNER. EXTREME CARE SHALL BE TAKEN TO MINIMIZE DISTURBANCE TO THE SURROUNDING AREA.
- ITEMS REMOVED AND NOT SCHEDULED TO BE RELOCATED SHALL BE OFFERED TO THE OWNER FOR THEIR USE AND IF NOT ACCEPTED BY THE OWNER, THE ELECTRICAL CONTRACTOR SHALL DISPOSE OF THE MATERIAL FROM THE SITE IN ACCORDANCE WITH LOCAL REGULATIONS. THE ELECTRICAL CONTRACTOR SHALL DELIVER ITEMS ACCEPTED BY THE OWNER TO THE DESIGNATED LOCATIONS AS DIRECTED BY THE OWNER.
- ALL WIRING, CABLES AND FEEDERS INCLUDING BOTH CONNECTED TO DEVICES AND EQUIPMENT TO BE DEMOLISHED AND EXISTING THAT WERE ABANDONED IN PLACE SHALL BE REMOVED BACK TO THEIR SOURCES. UNLESS NOTED OTHERWISE, CONDUITS AND/OR WIRING SHALL, WHERE NECESSARY, BE RE-CIRCUIT AROUND THE REMOVED PART, KEEPING OCCUPIED PARTS OF THE BUILDING SYSTEM IN FULL SERVICE.
- ALL EXISTING CONDUITS WHICH HAVE BEEN ABANDONED OR ARE UNUSED SHALL BE REMOVED.
- PROVIDE BLANK METAL COVER PLATES FOR ALL JUNCTION/DEVICE BOXES NO LONGER IN USE THAT ARE EMBEDDED IN FLOOR SLAB OR MASONRY WALLS. PROVIDE PLUGS FOR ALL PANELS WHERE CONDUIT HAS BEEN REMOVED. COVER PLATES SHALL BE PAINTED TO MATCH EXISTING CONDITIONS.
- WHERE REQUIRED COORDINATE WITH THE CONSULTANT/SOWNER FOR EXISTING PARTITIONS TO BE REMOVED TO FACILITATE WORK. DISCONNECT EXISTING BRANCH CIRCUITS SERVICING DEVICES IN PARTITIONS TO BE REMOVED. MAINTAIN CONTINUITY OF CIRCUITS SERVICING EXISTING DEVICES IN OTHER AREAS TO REMAIN.
- LIGHTING FIXTURES: REMOVE LIGHTING FIXTURES AND SWITCH CONTROL WHEN THE FIXTURE TO BE REMOVED IS SERVED BY A CIRCUIT. THAT SUPPLIES FIXTURES IN OTHER AREAS THAT ARE TO REMAIN. THE ELECTRICAL CONTRACTOR SHALL MAINTAIN THE CONTINUITY OF THE CIRCUIT TO THE REMAINING FIXTURES.
- POWER RECEPTACLES: REMOVE RECEPTACLES. WHEN THE RECEPTACLE TO BE REMOVED IS SERVED BY A CIRCUIT THAT SUPPLIES RECEPTACLES IN OTHER AREAS, THAT ARE TO REMAIN, THE ELECTRICAL CONTRACTOR SHALL MAINTAIN THE CONTINUITY OF THE CIRCUIT TO THE REMAINING RECEPTACLES.
- FIRE ALARM SYSTEM: COORDINATE AND CONSULT WITH CURRENT FIA SYSTEM SERVICE CONTRACTOR OR THEIR QUALIFIED REPRESENTATIVE FOR ALL FIRE ALARM DEMOLITION AND MODIFICATIONS. OPERATION SHALL BE MAINTAINED OF EXISTING FIRE ALARM SYSTEM SPECIFICALLY AS IT RELATES TO ADJACENT AREAS WHICH ARE NOT INCLUDED IN THE SCOPE OF THIS PROJECT.
- ELECTRICAL CONTRACTOR SHALL PROVIDE UPDATED TYPE WRITTEN PANEL DIRECTORIES FOR ALL PANELS AFFECTED BY THE DEMOLITION AND/OR NEW WORK. CIRCUIT BREAKERS NOT USED FOR NEW WORK SHALL BE LABELED AS SPARE.
- FOR EXISTING DEVICES/CIRCUITRY THAT ARE INDICATED TO BE REMOVED BACK TO POINT OF ORIGIN- THESE ITEMS ARE TO BE REMOVED BACK TO POINT OF ORIGIN. UNLESS THERE WILL BE EXISTING DEVICES ON THE SAME CIRCUIT THAT ARE LOCATED OUTSIDE AREA OF WORK THAT ARE TO REMAIN. IN THAT CASE, REMOVE THE EXISTING DEVICES/CIRCUITRY IN AREA OF WORK BACK TO THESE EXISTING DEVICES TO REMAIN. ALL DEVICES/CIRCUITRY IN SURROUNDING AREAS THAT ARE TO REMAIN ARE TO BE KEPT ENERGIZED. FOR REMOVAL OF CONDUIT AND WIRING OUTSIDE OF AREA OF WORK COORDINATE AND SCHEDULE WITH OWNER PRIOR TO PERFORMING WORK.

THESE DRAWINGS ARE NOT TO BE SCALED

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THE CONTRACTOR MUST FIELD VERIFY ALL DIMENSIONS AND MUST CONTRIBUTE & CORRELATE ALL DETAILS WITHIN THE FULL DRAWING PACKAGE BEING RESPONSIBLE FOR SAME THROUGHOUT CONSTRUCTION, REPORTING ANY DISCREPANCIES TO THE ARCHITECT PRIOR TO COMMENCING THE RELEVANT WORK

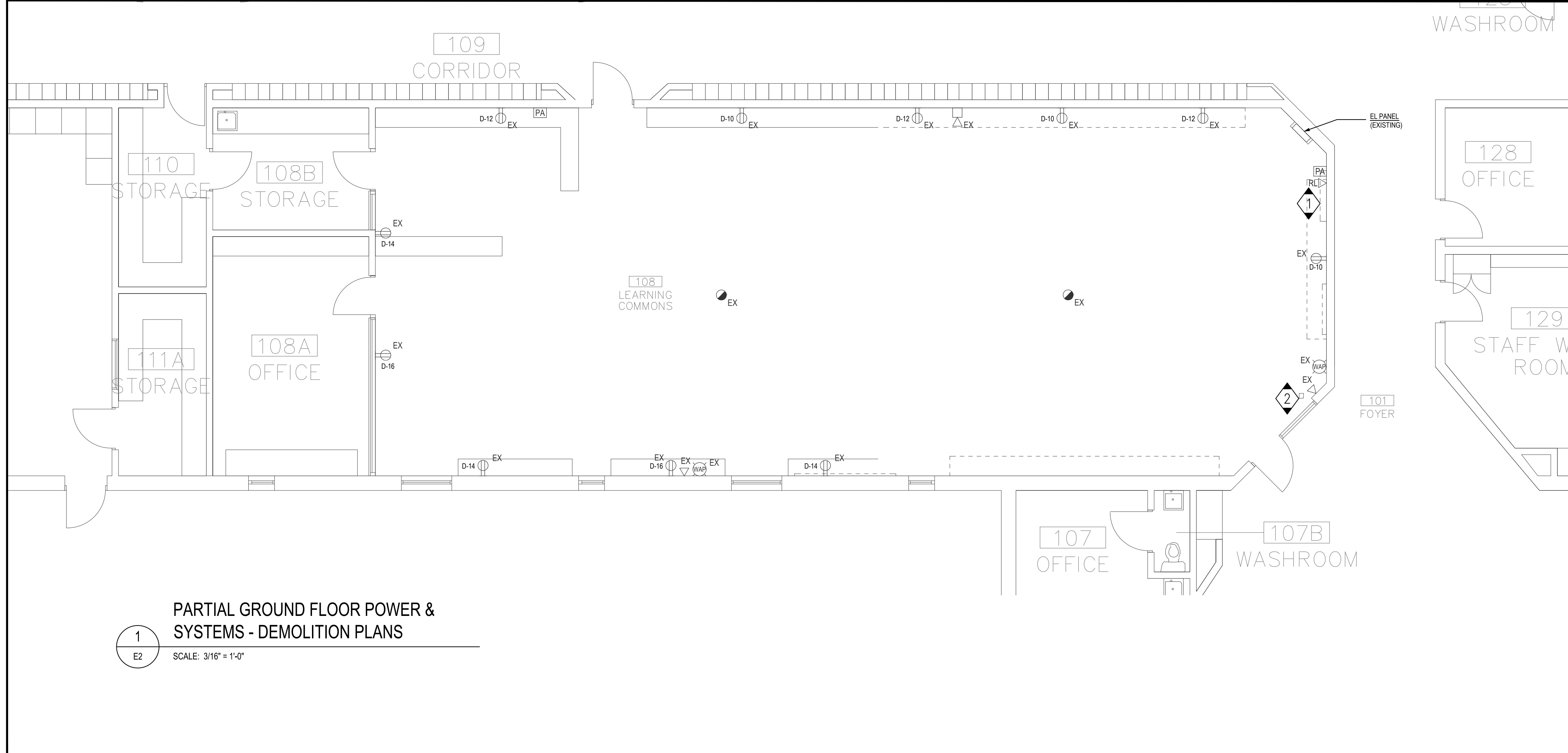
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- ISSUED FOR PERMIT 23/11/10
- ISSUED FOR TENDER 24/02/29

PROJECT:  
Window and Door Upgrades at:

Cecil B. Stirling Elementary  
340 Queen Victoria Drive  
Hamilton, ON  
For the HWDSB

SCALE:



**PARTIAL GROUND FLOOR POWER & SYSTEMS - DEMOLITION PLANS**

1  
E2 SCALE: 3/16" = 1'-0"

**DRAWING NOTES**

- EXISTING DATA AND AV SYSTEMS FOR THE SHORT THROW PROJECTOR TO BE RELOCATED. REFER TO E3 FOR NEW LOCATION. MODIFY CONDUIT ROUGH-IN AND COORDINATE WITH OWNER'S IT DEPARTMENT.
- EXISTING POWER POLE TO BE REMOVED. REMOVE ALL ASSOCIATED WIRING AND CONDUIT BACK TO THE SOURCE. MAKE SAFE.

EXP Services Inc.  
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1286 South Service Road,  
Suite C1-1, Stoney Creek,  
ON, L8E 5R9  
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DRAWING TITLE:  
**PARTIAL ELECTRICAL FLOOR DEMOLITION PLAN**

SCALE:  
AS NOTED

DRAWN:  
ABS

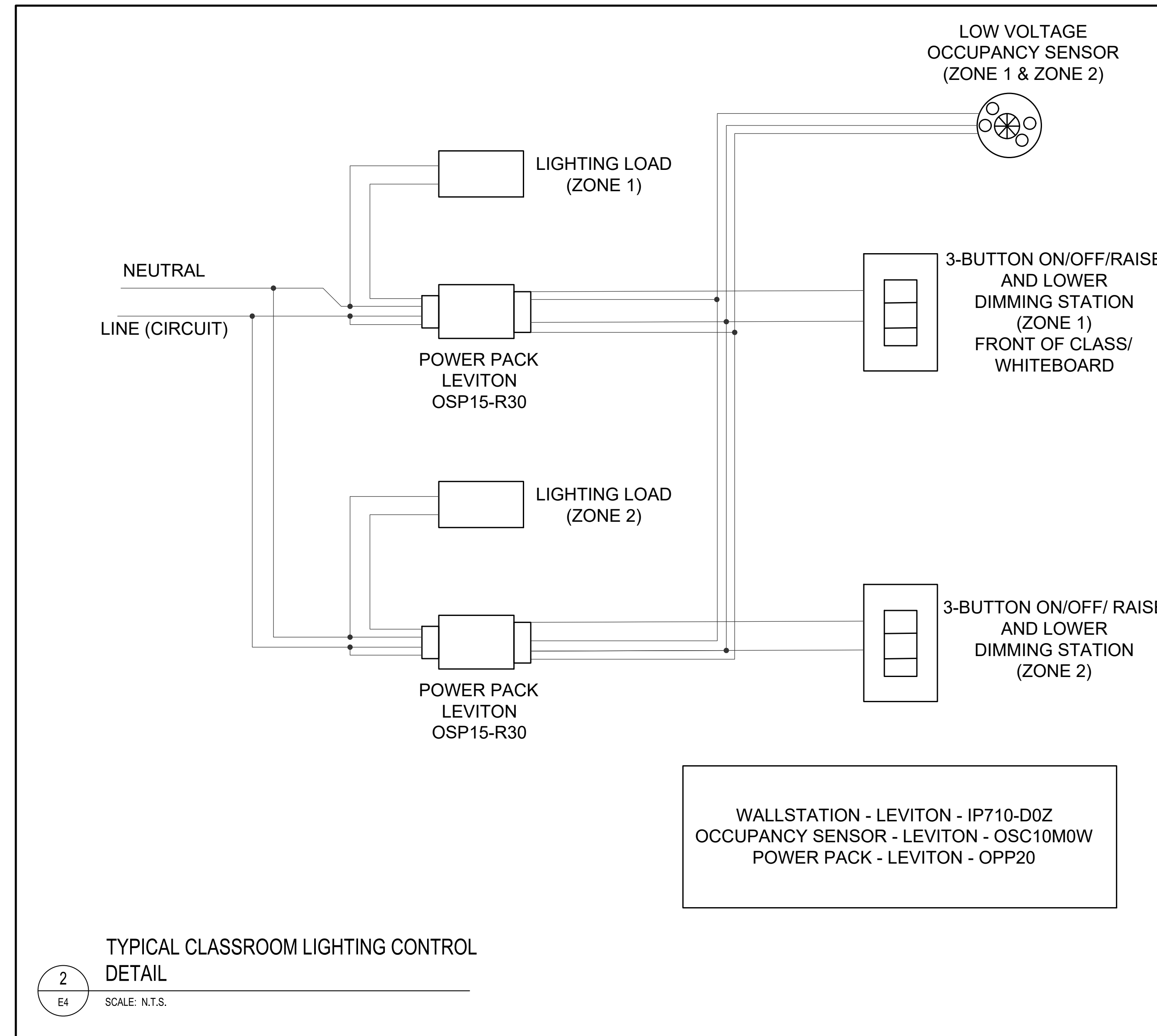
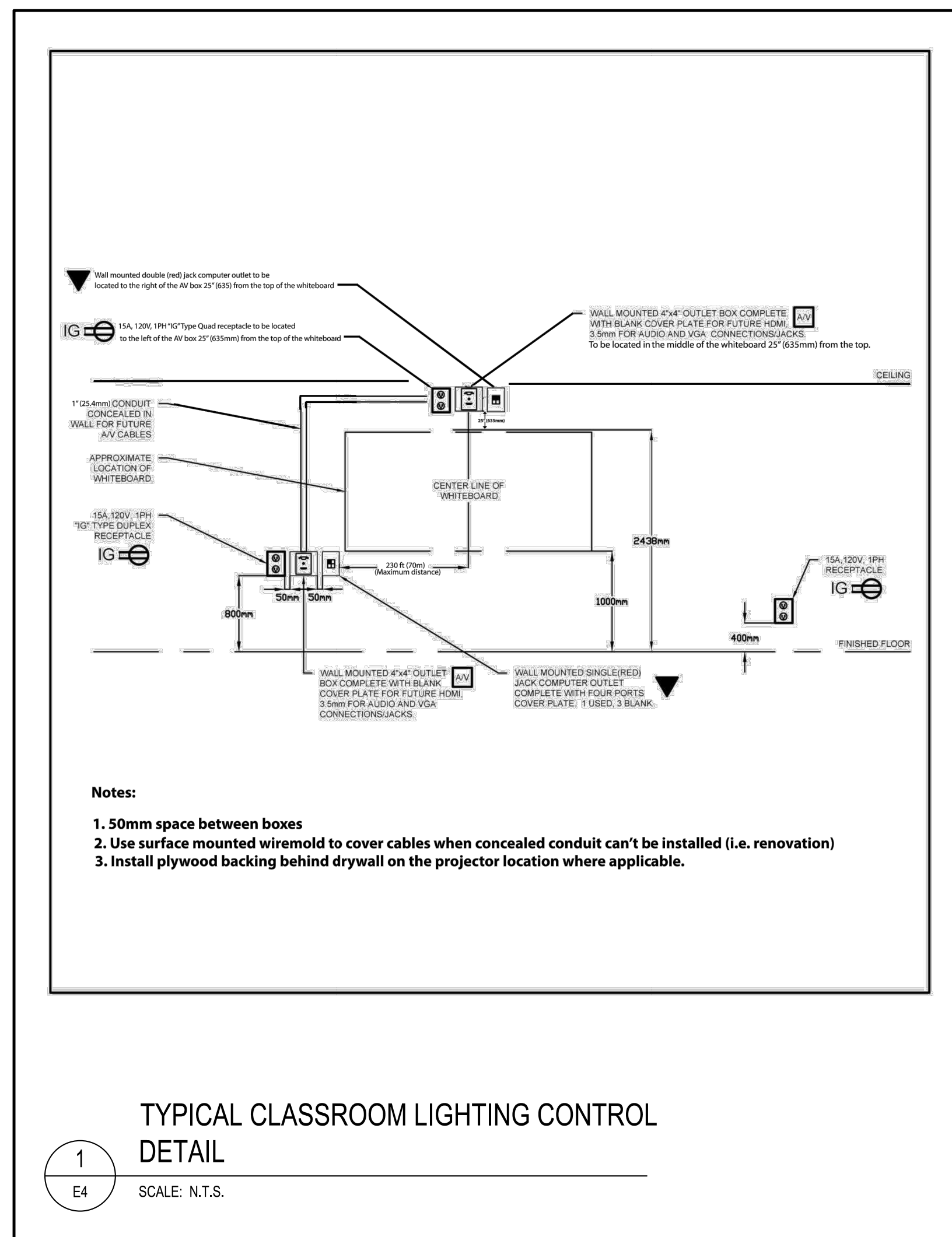
DATE:  
OCTOBER 2023

PROJECT #:  
ALL-23012666-A0

DRAWING #:  
E2



LIGHTING FIXTURE SCHEDULE				
TYPE	DESCRIPTION / REQUIREMENTS	MOUNTING	INPUT WATTS	MANUFACTURER
AA	- 2'-0" x 4'-0" FLAT PANEL LED TROFFER - EXTRUDED ALUMINUM HOUSING - ACRYLIC DIFFUSER, FLAT OPAL LENS - SWITCHABLE PANEL, LOW LUMEN PACKAGE - 4800 LUMEN OUTPUT - 4000K COLOUR TEMPERATURE, 80 CRI - 120-347V DRIVER WITH 0-10V DIMMING	RECESSED ACOUSTICAL TILE CEILING	37.4W	COOPER LIGHTING METALUX CGTS NUV SERIES LITHONIA # CPX 2x4 AL08 SWW7 M2 SERIES CREE LIGHTING #C-TR-C SERIES SIGNIFY 2SBP SERIES OR APPROVED EQUALS
<b>NOTE:</b> 1. FIXTURE DESCRIPTION AND REQUIREMENTS LISTED ARE RECOMMENDATIONS FOR THE FIXTURE TYPE UTILIZED IN THIS PROJECT AND MAY NOT INCLUDE ALL OPTIONS AVAILABLE FOR EVERY MANUFACTURERS FIXTURE SERIES LISTED. CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING A COMPLETE FIXTURE INSTALLED WITH ALL NECESSARY HARDWARE.				



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THE CONTRACTOR MUST FIELD VERIFY ALL DIMENSIONS AND MUST CORRECT & CORRELATE ALL DETAILS WITHIN THE FULL DRAWING PACKAGE BEING RESPONSIBLE FOR SAME THROUGHOUT CONSTRUCTION, REPORTING ANY DISCREPANCIES TO THE ARCHITECT PRIOR TO COMMENCING THE RELEVANT WORK.

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DRAWING TITLE:  
 LIGHTING  
 SCHEDULE  
 AND DETAILS

SCALE:  
 AS NOTED

DRAWN:  
 ABS

DATE:  
 OCTOBER 2023

PROJECT #:  
 ALL-23012666-A0

DRAWING #:

E 4



# ELECTRICAL SPECIFICATIONS

## 1. RELATED INSTRUCTIONS

- 1.1. THIS SPECIFICATION SHALL APPLY TO AND GOVERN ALL WORK BY DIVISION 16.
- 1.2. FURNISH ALL LABOUR, MATERIAL, TOOLS, EQUIPMENT, ETC., REQUIRED TO COMPLETE ALL WORK SHOWN ON THE DRAWINGS AND HEREIN SPECIFIED. THE WORK SHALL BE IN ACCORDANCE WITH RULES AND REGULATIONS OF ALL AUTHORITIES HAVING LEGAL JURISDICTION OVER THE WORK. PROVIDE ANY SMALL ITEMS OF WORK NOT SPECIFICALLY CALLED FOR BUT REQUIRED TO COMPLETE THE INTENDED INSTALLATION.
- 1.3. THE WORK OF THE ELECTRICAL DIVISION SHALL BE COORDINATED WITH THE WORK OF OTHER DIVISIONS TO AVOID INTERFERENCE. COORDINATE THE WORK TO ENSURE THE BEST INSTALLATION.
- 1.4. REMOVE ALL DEBRIS AND WASTE MATERIALS FROM THE SITE CAUSED BY THIS CONTRACTOR IN THE PERFORMANCE OF THE ELECTRICAL WORK.
- 1.5. THIS DIVISION SHALL CARRY OUT ANY CUTTING, DRILLING, CORING, PATCHING NECESSARY FOR THE ELECTRICAL WORK. PROVIDE APPROVED ULC FIRE STOP CONDUITS PENETRATING FIRE-RATED ASSEMBLIES.

## 2. LIABILITY INSURANCE

- 2.1. OBTAIN AND CARRY PROPER INSURANCE TO FULLY PROTECT BOTH THE OWNER AND HIMSELF FROM ANY AND ALL CLAIMS DUE TO ACCIDENTS, MISFORTUNES, ACTS OF GOD, ETC.

## 3. CODES, PERMITS AND INSPECTION

- 3.1. BUILDING PERMIT SHALL BE OBTAINED BY OWNER.
- 3.2. ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR, AND OBTAIN ALL OTHER PERMITS, INSPECTIONS, VERIFICATIONS, ETC., AS REQUIRED BY ALL AUTHORITIES HAVING JURISDICTION OVER THIS WORK AND PAY FOR ALL FEES RELATED TO SAME.
- 3.3. DELIVER ALL PERMITS TO THE OWNER AS SOON AS THEY BECOME AVAILABLE.
- 3.4. AT THE CONCLUSION OF THE PROJECT, SUBMIT TO THE OWNER, THE ELECTRICAL SAFETY AUTHORITY FINAL ACCEPTANCE CERTIFICATE.

## 4. DRAWINGS

- 4.1. DO NOT SCALE THE DRAWINGS ANY INFORMATION INVOLVING ACCURATE MEASUREMENTS SHALL BE OBTAINED FROM THE BUILDING.
- 4.2. THE DRAWINGS INDICATE THE GENERAL LOCATION AND ROUTE OF THE CONDUITS, WIRING DEVICES, EQUIPMENT, ETC., AND ARE SHOWN DIAGRAMMATICALLY ONLY. CHANGE LOCATION OF ANY DEVICE/EQUIPMENT WITHIN 3M OF INDICATED LOCATION AT NO ADDITIONAL COST TO OWNER PROVIDED INSTRUCTIONS ARE RECEIVED PRIOR TO COMMENCING ROUGH-IN WORK. PRIOR TO COMMENCING ANY ROUGH-IN OR INSTALLATION WORK VISIT SITE, MEET WITH THE OWNERS REPRESENTATIVE AND CONFIRM EXACT LOCATION OF ALL DEVICES.
- 4.3. WHERE INCONSISTENCIES OCCUR, NOTIFY THE CONSULTANT/OWNER IMMEDIATELY AND DO NOT PROCEED WITH THE WORK UNTIL WRITTEN INSTRUCTIONS ARE RECEIVED FROM CONSULTANT/OWNER.

## 5. RECORD DRAWINGS AND EQUIPMENT MANUALS

- 5.1. AS THE PROJECT PROGRESSES, RECORD, ON A SET OF WHITE PRINTS, ALL ADDENDA, CHANGES TO AND DEVIATIONS FROM THE PLANS MADE DURING THE CONSTRUCTION PERIOD. ALSO, RECORD THE LOCATION OF ALL LIGHT FIXTURES AND OTHER ELECTRICAL EQUIPMENT AND WIRING FOR SAME.
- 5.2. MAKE THESE PROGRESS RECORD DRAWING WHITE PRINTS AVAILABLE TO THE CONSULTANTS FOR THEIR REVIEW AT ALL TIMES DURING THE CONSTRUCTION PERIOD.
- 5.3. AT THE CONCLUSION OF THE PROJECT, TRANSFER ALL RECORD DRAWING INFORMATION TO A UNIVERSAL SERIAL BUS (USB).
- 5.4. THE CONSULTANT SHALL PROVIDE TO THE CONTRACTOR AN ELECTRONIC REPRESENTATION OF THE DRAWINGS. COMPLETE AND RETURN THE RELEASE FORM "TRANSFER OF FILES ON ELECTRONIC MEDIA" IN ORDER TO RECEIVE AND USE THE ELECTRONIC FILES. (SAMPLE OF THE FORM CAN BE PROVIDED ON REQUEST).
- 5.5. BEFORE SUBSTANTIAL PERFORMANCE OF THE CONTRACT, COMPLY WITH THE FOLLOWING:
  - 4.5.1. PROVIDE A USB CONTAINING ALL UPDATED RECORD DRAWING INFORMATION AS SPECIFIED HEREIN.

- 4.5.2. PROVIDE TWO (2) SETS OF EQUIPMENT DATA SHEETS AND/OR MANUFACTURER'S MAINTENANCE MANUALS COVERING EACH SYSTEM AND ITS COMPONENTS IN ACCORDANCE WITH REQUIREMENTS OF EACH APPROPRIATE SECTION. THESE SETS ARE TO BE IN GOOD QUALITY BINDERS EQUAL TO VYN-L-LINE #VA-3096-B 2", (51mm) RINGS. THE BINDER IS TO BE DIVIDED INTO SECTIONS WITH TABS CLEARLY MARKED INDICATING THE SYSTEMS, ETC.

## 6. EQUIPMENT AND MATERIAL

- 6.1. ALL EQUIPMENT AND MATERIAL, UNLESS SPECIFICALLY NOTED OTHERWISE, SHALL BE NEW AND WITHOUT BLEMISH OR DEFECT. ALL MATERIAL AND EQUIPMENT SHALL BEAR ULC, OR CSA LABELS.

## 7. ACCESSIBILITY

- 7.1. INSTALL ALL WORK SO AS TO BE READILY ACCESSIBLE FOR OPERATION MAINTENANCE AND REPAIRS.

## 8. RESPONSIBILITY

- 8.1. BE RESPONSIBLE FOR WORK UNTIL COMPLETION AND FINAL ACCEPTANCE, FOR REPLACING ANY ITEM THAT MAY BE DEFECTIVE, DAMAGED, LOST OR STOLEN WITHOUT ADDITIONAL COST TO THE OWNER OR DELAY TO THE COMPLETION OF THE PROJECT.

## 9. CONDUIT, AND WIRING

- 9.1. USE EMT CONDUIT FOR ALL WIRING UNLESS NOTED OTHERWISE. ALL CONDUIT SHALL BE INSTALLED PARALLEL TO BUILDING LINES AND SECURELY FASTENED.
- 9.2. UNLESS NOTED OTHERWISE, CONDUITS SHALL BE CONCEALED ABOVE FINISHED CEILING, OR IN WALL PARTITIONS. EMT COMPLETE WITH STEEL SET SCREW TYPE CONNECTORS AND COUPLINGS.
- 9.3. MINIMUM SIZE TRADE CONDUIT IS 16MM. MINIMUM SIZE TRADE CONDUIT FOR COMMUNICATIONS IS 27MM. MINIMUM SIZE TRADE CONDUIT FOR SECURITY AND CCTV IS 21MM.
- 9.4. DO NOT RUN CONDUITS IN FIRE RATED CEILING SPACES.
- 9.5. FLEXIBLE CONDUIT SUITABLE FOR THE SPECIFIC APPLICATION AS PER OESC, AND NOT EXCEEDING 5 FEET IN LENGTH, SHALL BE USED FOR FINAL SHORT CONNECTIONS TO MOTORS, TRANSFORMERS AND SIMILAR EQUIPMENT TO PREVENT TRANSMISSION OF VIBRATION. FIXTURES AND SWITCH LEGS IN WOODEN, BLOCK OR STEEL PARTITIONS, SHALL NOT EXCEED 10 FEET IN LENGTH.
- 9.6. CONDUIT AND CABLES SHALL BE INSTALLED TO AVOID PROXIMITY TO WATER AND HEATING PIPES, EXCEPT WHERE CROSSINGS ARE UNAVOIDABLE.
- 9.7. CONDUIT AND CABLES MUST NOT PASS THROUGH STRUCTURAL STEEL MEMBERS, CONCRETE BEAMS OR COLUMNS, WITHOUT PERMISSION FROM THE ENGINEER.

- 9.8. SURFACE RACEWAY SYSTEM WITH WIRING LAID IN SHALL BE ACCEPTABLE BUT KEPT TO A MINIMUM IN AREAS WHERE EMT CONDUIT CAN NOT BE CONCEALED. TWO PIECE STEEL ASSEMBLY MANUFACTURED AS LAY-IN TYPE RACEWAY C/W TEES, ELBOWS AND HANGER FITTING AND SUPPORTS REQUIRED FOR A COMPLETE SYSTEM - WIREMOLD OR APPROVED EQUAL.
- 9.9. ALL CONDUCTORS, UNLESS NOTED OTHERWISE, SHALL BE INSTALLED IN CONDUIT.

- 9.10. ALL CONDUCTORS SHALL BE COPPER, RW90 XLPE #12 AWG MINIMUM UNLESS NOTED OTHERWISE. WHERE THE DISTANCE FROM THE PANELBOARD TO THE LAST OUTLET EXCEEDS 50', #10 AWG CONDUCTOR MUST BE USED FOR THE FULL LENGTH OF THE CIRCUIT.

- 9.11. THE USE OF FLEXIBLE METALLIC-SHEATHED AC90 (BX) CABLES AS BRANCH WIRING SHALL BE LIMITED TO DRYWALL WALL DROPS TO SWITCHES, RECEPTACLES AND POWER OUTLETS THROUGH WALL CAVITIES, OR TO WIRING FROM JUNCTION BOXES IN DROP CEILING TO LIGHTING FIXTURES AND BETWEEN LIGHTING FIXTURES. SUPPORT BX DROPS INDEPENDENTLY. DO NOT LAY BX CABLES ON SUSPENDED CEILING. MAXIMUM RUN DISTANCE SHALL BE 10 FEET.

## 10. COLOUR CODING

- 10.1. PROVIDE COLOUR CODING MARKINGS USING MATERIALS SUITABLE FOR THE OPERATING ENVIRONMENT OR EQUIPMENT, CONDUIT AND CABLES.

- 10.2. COLOUR CODING, TO CONFORM TO CANADIAN AND ONTARIO ELECTRICAL CODES, SHALL BE:  
PHASE A: RED  
PHASE B: BLACK  
PHASE C: BLUE  
GREEN  
NEUTRAL: WHITE

- 10.1. PROVIDE COLOUR CODED WIRES FOR FIRE ALARM CABLES, MATCH EXISTING.

- 10.2. PROVIDE COLOUR CODED WIRES FOR COMMUNICATION CABLES, MATCH EXISTING.

## 11. GROUNDING AND BONDING

- 11.1. THE GROUNDING AND BONDING OF THE ELECTRICAL SYSTEM IN ALL CASED SHALL CONFORM TO THE INSPECTION AUTHORITY HAVING JURISDICTION.

- 11.2. ALL FLEXIBLE CONDUIT SHALL BE PROPERLY BONDED.

- 11.3. ALL CONDUIT SHALL INCLUDE A BOND WIRE, SIZED TO OESC.

## 12. OUTLET, PULL AND JUNCTION BOXES

- 12.1. ALL LIGHTING FIXTURES, RECEPTACLES AND OTHER WIRING DEVICES FOR ANY CONDUIT SYSTEM SHOWN ON THE DRAWINGS IN WALLS, CEILINGS OR FLOOR, SHALL BE PROVIDED WITH AN OUTLET BOX AS SPECIFIED BELOW.

- 12.2. ALL OUTLET BOXES SHALL BE MANUFACTURED OF GAUGE GALVANIZED STEEL UNLESS SPECIFIED OTHERWISE AND SHALL BE SIZED FOR THE NUMBER OF WIRES ENTERING A BOX AS REQUIRED BY THE LOCAL ELECTRICAL CODE.

- 12.3. CEILING BOXES SHALL BE FOUR INCHES OCTAGON OR SQUARE COMPLETE WITH FITTINGS WHERE REQUIRED TO SUPPORT FIXTURES.

- 12.4. ALL OUTLET BOXES SHALL BE SUPPORTED INDEPENDENTLY OF THE CONDUIT.

- 12.5. PULL BOXES SHALL BE INSTALLED IN CONDUIT RUNS WHERE REQUIRED TO FACILITATE THE PULLING IN OF CABLE.

- 12.6. WHERE EMPTY CONDUIT ONLY IS TO BE INSTALLED FOR COMMUNICATIONS PATHWAYS, PULL BOXES SHALL BE INSTALLED ON STRAIGHT SECTIONS OF CONDUIT RUNS AND AT INTERVALS SUCH THAT NO CABLE WILL HAVE TO BE PULLED THROUGH MORE THAN TWO 90 DEGREE BENDS.

- 12.7. JUNCTION AND PULL BOXES SHALL BE LOCATED SO AS TO BE ACCESSIBLE AT ALL TIMES, WHEN INSTALLED IN CEILING SPACE, LOCKABLE ACCESS HATCHES MUST BE PROVIDED UNLESS CEILING TILE IS TO BE OF THE LAY-IN OR SNAP-IN STYLE.

- 12.8. CEILING BOXES SHALL BE FOUR INCHES OCTAGON OR SQUARE COMPLETE WITH FITTINGS WHERE REQUIRED TO SUPPORT FIXTURES.

- 12.9. ALL OUTLET BOXES SHALL BE SUPPORTED INDEPENDENTLY OF THE CONDUIT.

- 12.10. PULL BOXES SHALL BE INSTALLED IN CONDUIT RUNS WHERE REQUIRED TO FACILITATE THE PULLING IN OF CABLE.

- 12.11. WHERE EMPTY CONDUIT ONLY IS TO BE INSTALLED FOR COMMUNICATIONS PATHWAYS, PULL BOXES SHALL BE INSTALLED ON STRAIGHT SECTIONS OF CONDUIT RUNS AND AT INTERVALS SUCH THAT NO CABLE WILL HAVE TO BE PULLED THROUGH MORE THAN TWO 90 DEGREE BENDS.

- 12.12. JUNCTION AND PULL BOXES SHALL BE LOCATED SO AS TO BE ACCESSIBLE AT ALL TIMES, WHEN INSTALLED IN CEILING SPACE, LOCKABLE ACCESS HATCHES MUST BE PROVIDED UNLESS CEILING TILE IS TO BE OF THE LAY-IN OR SNAP-IN STYLE.

## 13. WIRING DEVICES

- 13.1. SWITCHES: RATED 125VAC, 20 AMPERES AND LOW VOLTAGE IVORY TOGGLE TYPE COMPATIBLE WITH EXISTING.

- 13.2. INSTALL SINGLE THROW SWITCHES WITH HANDLE IN "UP" POSITION WHEN SWITCH CLOSED (ON).

- 13.3. INSTALL SWITCHES IN GANG-TYPE OUTLET BOX AT 1100mm ABOVE FINISHED FLOOR UNLESS INDICATED OTHERWISE.

- 13.4. 125V SWITCHES AS SHOWN SHALL BE LOW VOLTAGE COMPLETE WITH TRANSFORMERS AND CONTROL RELAYS LOCATED CONCEALED IN CEILING SPACES

- 13.5. RECEPTACLES: 3-WIRE, U-GROUND TYPE GENERAL PURPOSE, HEAVY DUTY, NEMA 5-15R.

- 13.6. INSTALL RECEPTACLES IN GANG-TYPE OUTLET BOX AT 450mm ABOVE FINISHED FLOOR UNLESS NOTED OTHERWISE.

- 13.7. ONE PIECE GANG PLATES SHALL BE USED IN LOCATIONS WHERE MORE THAN ON DEVICES IS TO BE MOUNTED.

- 13.8. DO NOT INSTALL OUTLETS BACK-TO-BACK, STAGGER OUTLETS IN THE STUD CAVITIES TO REDUCE POSSIBILITY OF SOUND TRANSMISSION.

- 13.9. NEW RECEPTACLES SHALL MATCH EXISTING IN COLOUR.

- 13.10. COVERPLATES:
  - 13.10.1. PROVIDE No.301 STAINLESS STEEL, BRUSHED COVERPLATES C/W PROTECTIVE PLASTIC FILM UNTIL PAINTING AND OTHER WORK IS FINISHED FOR ALL WIRING DEVICES MOUNTED IN A FLUSH MOUNTED OUTLET BOX. PROVIDE COMMON COVERPLATE WHEN WIRING DEVICES ARE GROUPED TOGETHER.

- 13.10.2. PROVIDE FITTING SHEET METAL (CAST) COVERPLATES FOR WIRING DEVICES MOUNTED IN SURFACE FS OR FD TYPE CONDUIT BOXES.

- 13.10.3. DO NOT USE COVERPLATES MEANT FOR FLUSH OUTLET BOXES ON SURFACE MOUNTED BOXES.

- 13.11. ACCEPTABLE MANUFACTURERS ARE:
  - 13.11.1. HUBBELL
  - 13.11.2. LEVITON
  - 13.11.3. LEGRAND
  - 13.11.4. COOPER
  - 13.11.5. OR OTHER APPROVED EQUALS

- 13.12. ACCEPTABLE MANUFACTURERS ARE:
  - 13.12.1. HUBBELL
  - 13.12.2. LEVITON
  - 13.12.3. LEGRAND
  - 13.12.4. COOPER
  - 13.12.5. OR OTHER APPROVED EQUALS

- 13.13. ACCEPTABLE MANUFACTURERS ARE:
  - 13.13.1. HUBBELL
  - 13.13.2. LEVITON
  - 13.13.3. LEGRAND
  - 13.13.4. COOPER
  - 13.13.5. OR OTHER APPROVED EQUALS

- 13.14. ACCEPTABLE MANUFACTURERS ARE:
  - 13.14.1. HUBBELL
  - 13.14.2. LEVITON
  - 13.14.3. LEGRAND
  - 13.14.4. COOPER
  - 13.14.5. OR OTHER APPROVED EQUALS

- 13.15. ACCEPTABLE MANUFACTURERS ARE:
  - 13.15.1. HUBBELL
  - 13.15.2. LEVITON
  - 13.15.3. LEGRAND
  - 13.15.4. COOPER
  - 13.15.5. OR OTHER APPROVED EQUALS

- 13.16. ACCEPTABLE MANUFACTURERS ARE:
  - 13.16.1. HUBBELL
  - 13.16.2. LEVITON
  - 13.16.3. LEGRAND
  - 13.16.4. COOPER
  - 13.16.5. OR OTHER APPROVED EQUALS

- 13.17. ACCEPTABLE MANUFACTURERS ARE:
  - 13.17.1. HUBBELL
  - 13.17.2. LEVITON
  - 13.17.3. LEGRAND
  - 13.17.4. COOPER
  - 13.17.5. OR OTHER APPROVED EQUALS

- 13.18. ACCEPTABLE MANUFACTURERS ARE:
  - 13.18.1. HUBBELL
  - 13.18.2. LEVITON
  - 13.18.3. LEGRAND
  - 13.18.4. COOPER
  - 13.18.5. OR OTHER APPROVED EQUALS

- 13.19. ACCEPTABLE MANUFACTURERS ARE:
  - 13.19.1. HUBBELL
  - 13.19.2. LEVITON
  - 13.19.3. LEGRAND
  - 13.19.4. COOPER
  - 13.19.5. OR OTHER APPROVED EQUALS

- 13.20. ACCEPTABLE MANUFACTURERS ARE:
  - 13.20.1. HUBBELL
  - 13.20.2. LEVITON
  - 13.20.3. LEGRAND
  - 13.20.4. COOPER
  - 13.20.5. OR OTHER APPROVED EQUALS

- 13.21. ACCEPTABLE MANUFACTURERS ARE:
  - 13.21.1. HUBBELL
  - 13.21.2. LEVITON
  - 13.21.3. LEGRAND
  - 13.21.4. COOPER
  - 13.21.5. OR OTHER APPROVED EQUALS

- 13.22. ACCEPTABLE MANUFACTURERS ARE:
  - 13.22.1. HUBBELL
  - 13.22.2. LEVITON
  - 13.22.3. LEGRAND
  - 13.22.4. COOPER
  - 13.22.5. OR OTHER APPROVED EQUALS

- 14.3. DISCONNECT SWITCH BLADES SHALL BE FULLY VISIBLE WHEN IN THE "OFF" POSITION.

- 14.4. PREVENT DOOR FROM BEING OPENED WHEN SWITCH IS CLOSED. PROVISION SHALL BE MADE TO DEFEAT THIS INTERLOCK WITH A SCREWDRIVER.

- 14.5. DISCONNECT SWITCHES SHALL BE SPRINKLER PROOF IN INDOOR SPRINKLERED AREAS, NEMA 3R IN WET LOCATIONS.

- 14.6. A DISCONNECT SWITCH SHALL BE INSTALLED AHEAD OF ALL MOTORS, STARTERS AND ELECTRICAL DEVICES WHERE REQUIRED TO MEET CODE REGULATIONS, WHERE THE DEVICE IS INSTALLED UNDER THE ELECTRICAL DIVISION OR ANY OTHER DIVISION.

- 14.7. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.7.1. SCHNEIDER
  - 14.7.2. EATON
  - 14.7.3. SIEMENS

- 14.8. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.8.1. SCHNEIDER
  - 14.8.2. EATON
  - 14.8.3. SIEMENS

- 14.9. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.9.1. SCHNEIDER
  - 14.9.2. EATON
  - 14.9.3. SIEMENS

- 14.10. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.10.1. SCHNEIDER
  - 14.10.2. EATON
  - 14.10.3. SIEMENS

- 14.11. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.11.1. SCHNEIDER
  - 14.11.2. EATON
  - 14.11.3. SIEMENS

- 14.12. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.12.1. SCHNEIDER
  - 14.12.2. EATON
  - 14.12.3. SIEMENS

- 14.13. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.13.1. SCHNEIDER
  - 14.13.2. EATON
  - 14.13.3. SIEMENS

- 14.14. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.14.1. SCHNEIDER
  - 14.14.2. EATON
  - 14.14.3. SIEMENS

- 14.15. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.15.1. SCHNEIDER
  - 14.15.2. EATON
  - 14.15.3. SIEMENS

- 14.16. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.16.1. SCHNEIDER
  - 14.16.2. EATON
  - 14.16.3. SIEMENS

- 14.17. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.17.1. SCHNEIDER
  - 14.17.2. EATON
  - 14.17.3. SIEMENS

- 14.18. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.18.1. SCHNEIDER
  - 14.18.2. EATON
  - 14.18.3. SIEMENS

- 14.19. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.19.1. SCHNEIDER
  - 14.19.2. EATON
  - 14.19.3. SIEMENS

- 14.20. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.20.1. SCHNEIDER
  - 14.20.2. EATON
  - 14.20.3. SIEMENS

- 14.21. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.21.1. SCHNEIDER
  - 14.21.2. EATON
  - 14.21.3. SIEMENS

- 14.22. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.22.1. SCHNEIDER
  - 14.22.2. EATON
  - 14.22.3. SIEMENS

- 14.23. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.23.1. SCHNEIDER
  - 14.23.2. EATON
  - 14.23.3. SIEMENS

- 14.24. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.24.1. SCHNEIDER
  - 14.24.2. EATON
  - 14.24.3. SIEMENS

- 14.25. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.25.1. SCHNEIDER
  - 14.25.2. EATON
  - 14.25.3. SIEMENS

- 14.26. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.26.1. SCHNEIDER
  - 14.26.2. EATON
  - 14.26.3. SIEMENS

- 14.27. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.27.1. SCHNEIDER
  - 14.27.2. EATON
  - 14.27.3. SIEMENS

- 14.28. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.28.1. SCHNEIDER
  - 14.28.2. EATON
  - 14.28.3. SIEMENS

- 14.29. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.29.1. SCHNEIDER
  - 14.29.2. EATON
  - 14.29.3. SIEMENS

- 14.30. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.30.1. SCHNEIDER
  - 14.30.2. EATON
  - 14.30.3. SIEMENS

- 14.31. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.31.1. SCHNEIDER
  - 14.31.2. EATON
  - 14.31.3. SIEMENS

- 14.32. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.32.1. SCHNEIDER
  - 14.32.2. EATON
  - 14.32.3. SIEMENS

- 14.33. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.33.1. SCHNEIDER
  - 14.33.2. EATON
  - 14.33.3. SIEMENS

- 14.34. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.34.1. SCHNEIDER
  - 14.34.2. EATON
  - 14.34.3. SIEMENS

- 14.35. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.35.1. SCHNEIDER
  - 14.35.2. EATON
  - 14.35.3. SIEMENS

- 14.36. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.36.1. SCHNEIDER
  - 14.36.2. EATON
  - 14.36.3. SIEMENS

- 14.37. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.37.1. SCHNEIDER
  - 14.37.2. EATON
  - 14.37.3. SIEMENS

- 14.38. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.38.1. SCHNEIDER
  - 14.38.2. EATON
  - 14.38.3. SIEMENS

- 14.39. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.39.1. SCHNEIDER
  - 14.39.2. EATON
  - 14.39.3. SIEMENS

- 14.40. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.40.1. SCHNEIDER
  - 14.40.2. EATON
  - 14.40.3. SIEMENS

- 14.41. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.41.1. SCHNEIDER
  - 14.41.2. EATON
  - 14.41.3. SIEMENS

- 14.42. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.42.1. SCHNEIDER
  - 14.42.2. EATON
  - 14.42.3. SIEMENS

- 14.43. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.43.1. SCHNEIDER
  - 14.43.2. EATON
  - 14.43.3. SIEMENS

- 14.44. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.44.1. SCHNEIDER
  - 14.44.2. EATON
  - 14.44.3. SIEMENS

- 14.45. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.45.1. SCHNEIDER
  - 14.45.2. EATON
  - 14.45.3. SIEMENS

- 14.46. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.46.1. SCHNEIDER
  - 14.46.2. EATON
  - 14.46.3. SIEMENS

- 14.47. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.47.1. SCHNEIDER
  - 14.47.2. EATON
  - 14.47.3. SIEMENS

- 14.48. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.48.1. SCHNEIDER
  - 14.48.2. EATON
  - 14.48.3. SIEMENS

- 14.49. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.49.1. SCHNEIDER
  - 14.49.2. EATON
  - 14.49.3. SIEMENS

- 14.50. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.50.1. SCHNEIDER
  - 14.50.2. EATON
  - 14.50.3. SIEMENS

- 14.51. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.51.1. SCHNEIDER
  - 14.51.2. EATON
  - 14.51.3. SIEMENS

- 14.52. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.52.1. SCHNEIDER
  - 14.52.2. EATON
  - 14.52.3. SIEMENS

- 14.53. DISCONNECT ACCEPTABLE MANUFACTURERS ARE:
  - 14.53.1. SCHNEIDER
  - 14.53.2. EATON
  - 14.53.3. SIEMENS