



TERRY FOX PUBLIC SCHOOL COBOURG - HRV-HWT-BAS INSTRUMENTATION

1065 RIDDELL AVENUE, COBOURG, ONTARIO K9A 5N4
DRAWINGS - ISSUED FOR PERMIT AND TENDER
PROJECT NUMBER: 1021225
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LIST OF DRAWINGS

ME	C	AAH	IICAL	
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M700 STANDARDS DETAILS

M100 MECHANICAL SPECIFICATION-1 M101 MECHANICAL SPECIFICATION-2 M102 MECHANICAL SPECIFICATION-3 M103 MECHANICAL SPECIFICATION & LEGEND M300 DEMOLITION WORK - HEAT RECOVERY UNIT M301 NEW WORK - HEAT RECOVERY UNIT M302 DEMOLITION WORK - DOMESTIC HOT WATER TANK M303 NEW WORK - DOMESTIC HOT WATER TANK M500 CONTROL SCHEMATIC AND EQUIPMENT SCHEDULES M600 EQUIPMENT SCHEDULE

ELECTRICAL

E-001 LEGEND & SPECIFICATIONS
 E-002 SINGLE LINE DIAGRAM
 E-100 POWER LAYOUT DEMOLITION WORKS - FIRST & SECOND FLOOR
 E-200 POWER LAYOUT NEW WORKS - FIRST & SECOND FLOOR

STRUCUTRAL

S-01 GENERAL NOTES AND SPECIFICATIONS

S-02 KEY PLAN AND DETAILS

TEMPERATURE UPSTREAM OF MOTORIZED DAMPER.

9.TESTING, BALANCING, ADJUSTING AND COMMISSIONING

TEST, BALANCE AND ADJUST THE AIR AND WATER SYSTEMS.

BALANCE REPORT TO THE CONSULTANT FOR REVIEW.

DUCTED CONNECTIONS AND EXCEEDING 1000 CFM)

PRODUCT SHALL BE EQUAL TO SIEMENS.

SYSTEMS, BOTH NEW AND EXISTING.

DIRECTED BY THE CONSULTANT.

HEAT RECOVERY UNIT ROOFTOP UNIT

DESCRIPTION OF THE AIR HANDLING UNIT SCHEDULE.

"EQUAL" OR "ALTERNATE" MUST ADDRESS THESE FACTORS.

AGENCY SUCH AS CETL, ETLUS, UL, CSA PRIOR TO SHIPMENT.

FACTORY TESTED AND CHECKED AS TO PROPER FUNCTION.

CONTINUOUS YEARS OF PROVEN PRODUCTION EXPERIENCE.

UNPROTECTED METAL AND WELDS SHALL BE FACTORY COATED.

IDENTIFICATION MARKS, ELECTRICAL DATA.

NOT MEET SPECIFIED PRODUCT.

KG./CU.M.) DENSITY INSULATION.

TYPE PILLOW BLOCK BEARINGS.

AGENCY SUCH AS UL.

DECELERATION TIMING.

REMOVAL.

2 UNIT CONSTRUCTION

AIR SYSTEMS:

BOXES.

1. GENERAL

PROVIDE OPPOSED BLADE DAMPERS FOR MODULATING OPERATION CONDITION.

PROVIDE PARALLEL BLADE DAMPERS FOR OPEN AND CLOSED TYPE OPERATION.

DAMPERS SHALL BE COMPLETE WITH [120][24]V ELECTRONIC ACTUATOR [C/W 120V/24V

SWITCH. NUMBER OF SETS REQUIRED AS PER CONTROL SEQUENCE OF OPERATION.

CHANGEOVER WITH DUCT MOUNTED TEMPERATURE SENSOR INSTALLED TO SENSE

TRANSFORMER]. ELECTRONIC ACTUATOR SHALL BE FACTORY INSTALLED BY DAMPER

MANUFACTURER. ACTUATORS TO COME WITH SINGLE POLE DOUBLE THROW (SPDT) END

FOR COOLING ONLY APPLICATIONS PROVIDE THERMOSTAT. WHERE APPLICATION IS FOR

COOLING AND HEATING PROVIDE A THERMOSTAT CAPABLE OF COOLING/HEATING/AUTO

PROVIDE TESTING, BALANCING AND COMMISSIONING OF ALL SYSTEMS. COMMISSIONING

PROVIDE AN INDEPENDENT BALANCING COMPANY ACCEPTABLE TO THE CONSULTANT TO

-- PROVIDE AIR BALANCE IN ACCORDANCE WITH THE REQUIREMENTS OF THE DRAWINGS

AND EXISTING) PRIOR TO AIR BALANCING. SUBMIT THREE (3) COPIES OF THE AIR

- PROVIDE BALANCING AND ADJUSTING OF ALL AIR SYSTEMS TO ACHIEVE SPECIFIED

OUTLET, STATIC PRESSURES, FAN DATA, MOTOR DATA AND COIL DATA.

- IDENTIFY PRESSURE DROP ACROSS FILTERS FOR ALL AIR HANDLING UNITS.

- PROVIDE DATA IN THE BALANCING REPORT WHICH INDICATES AIR VOLUMES AT EACH

- PROVIDE DUCT TRAVERSE READINGS FOR EACH AIR HANDLING UNIT AND FAN (WITH

-- VERIFY THE OPERATION OF ALL CONTROL DEVICES, INCLUDING VARIABLE VOLUME

.1 AIR HANDLING UNITS SHALL BE BUILT TO THE LEVEL OF QUALITY AS HEREIN SPECIFIED AND TO THE

BELOW THE STATED CAPACITIES, AIR FLOW RATE, HEAT TRANSFER RATE, FILTRATION EFFICIENCY

SPECIFICALLY DEFINED, SOUND POWER LEVELS MUST NOT BE EXCEEDED. APPLICATIONS FOR

.3 UNLESS STATED OTHERWISE, AIR-HANDLING UNITS ARE TO BE SHIPPED TO THE JOB IN ONE PIECE.

FACTORY ASSEMBLED. MODULAR UNITS ASSEMBLED TO ACHIEVE A CLOSE PROXIMATION TO THE

INTENT OF THIS SPECIFICATION WILL NOT BE CONSIDERED EQUAL, ALL EQUIPMENT SHALL WHERE

SPECIFIED AND APPLICABLE, BE PRE-WIRED, AND FACTORY CERTIFIED BY AN APPROVED TESTING

.4 PRE-WIRED AIR HANDLING UNITS SHALL BEAR AN APPROVED LABEL WITH ALL THE NECESSARY

.6 ALL ELECTRICAL CIRCUITS SHALL UNDERGO A DIELECTRIC STRENGTH TEST, AND SHALL BE

.8 AIR HANDLING UNITS SHALL BE AS MANUFACTURED BY ENGINEERED AIR AND BE BASE BID.

7 THE AIR HANDLING UNITS AND MAJOR COMPONENTS SHALL BE PRODUCTS OF MANUFACTURERS

REGULARLY ENGAGED IN THE PRODUCTION OF SUCH EQUIPMENT AND WITH A MINIMUM OF FIFTEEN

ALTERNATE PRODUCTS MUST SHOW SAVINGS AND CLEARLY INDICATE ALL AREAS WHERE THEY DO

.1 UNIT CASING SHALL BE OF MINIMUM 18 GAUGE (1.3MM) SATIN COAT GALVANIZED SHEET

METAL. SURFACES SHALL BE CLEANED WITH A DEGREASING SOLVENT TO REMOVE OIL AND

METAL OXIDES AND PRIMED WITH A TWO-PART ACID BASED ETCHING PRIMER. FINISH COAT

SHALL BE AN ELECTROSTATICALLY APPLIED ENAMEL, TO ALL EXPOSED SURFACES. ALL

2 ALL WALLS, ROOFS AND FLOORS SHALL BE OF FORMED CONSTRUCTION, WITH AT LEAST TWO

WALL AND FLOOR JOINTS SHALL BE BROKEN IN AND ON ALL OUTDOOR UNITS ROOF JOINTS

BROKEN OUT (EXPOSED) FOR RIGIDITY. ALL JOINTS SHALL BE CAULKED WITH A WATER

.3 THE UNIT SHALL BE PROVIDED SHALL BE PROVIDED WITH A 18 GAUGE ALUMINUM LINER.

.4 UNITS SHALL BE PROVIDED WITH ACCESS DOORS TO THE FOLLOWING COMPONENTS: FANS AND

MOTORS, FILTERS, DAMPERS AND OPERATORS, ACCESS PLENUMS AND HUMIDIFIERS/WET CELI

ELECTRICAL CONTROL PANELS, BURNER COMPRESSOR COMPARTMENTS. ACCESS DOORS SHAL

LINED, AND A MINIMUM OF TWO LEVER HANDLES, OPERABLE FROM BOTH SIDES FOR ALL UNITS

BE LARGE ENOUGH FOR EASY ACCESS. REMOVAL OF SCREWED WALL PANELS WILL NOT BE

.5 UNITS SHALL BE PROVIDED WITH HINGED ACCESS DOORS, WITH E-PROFILE GASKET, FULLY

.7 COOLING COIL DRAIN PANS SHALL BE FABRICATED OF STAINLESS STEEL AND ARE AN INTEGRAL

PANS SHALL EXTEND A MINIMUM OF 6" (152MM) DOWNSTREAM OF COIL FACE AND BE PROVIDED.

SLOPED AND PITCHED SUCH THAT THERE IS NO STANDING WATER. INTERMEDIATE FAST PANS

SHALL BE PROVIDED BETWEEN COOLING COILS WHERE REQUIRED FOR EFFECTIVE MOISTURE

1 CENTRIFUGAL FANS SHALL BE RATED IN ACCORDANCE WITH AMCA STANDARD TEST CODE,

ASSEMBLIES SHALL BE DYNAMICALLY BALANCED DURING FACTORY TEST RUN. FAN SHAFTS SHALL

.2 AIRFOIL AND/OR BI FANS SHALL BE EQUIPPED WITH GREASEABLE, SELF-ALIGNING BALL OR ROLLER

.3 DRIVES SHALL BE ADJUSTABLE ON FANS WITH MOTORS 7 1/2 HP (5.6 KW) OR SMALLER. ON FANS

A RUST INHIBITING COATING. THE AIR BALANCER SHALL PROVIDE FOR DRIVE CHANGES (IF

.4 PROVIDE VARIABLE AIR VOLUME FAN CONTROL FOR UNITS VIA ADJUSTABLE FREQUENCY DRIVE

SHALL BE MOUNTED IN A NEMA 1 ENCLOSURE AND SHALL BE LABELED BY AN APPROVED TESTING

.5 SINE WAVE CARRIER INPUT, PWM OUTPUT. IGBT TRANSISTORS. ADJUSTABLE ACCELERATION AND

WITH LARGER MOTORS, FIXED DRIVES SHALL BE PROVIDED. ALL DRIVES SHALL BE PROVIDED WITH

BE SELECTED FOR STABLE OPERATION AT LEAST 20% BELOW THE FIRST CRITICAL RPM. FAN

BULLETIN 210. FAN MANUFACTURER SHALL BE A MEMBER OF AMCA. ALL FANS AND FAN

PART OF THE FLOOR PANELING, A MINIMUM OF 2" (51MM) DEEP, WITH WELDED CORNERS. DRAIN

WITH A 1 1/2" (38MM) S.S. M.P.T. DRAIN CONNECTION. DRAIN PANS MUST HAVE A FAST PAN AND BE

.6 ALL UNITS SHALL BE INTERNALLY INSULATED WITH 2"(51MM) THICK 1 1/2 LB./CU.FT. (24

BREAKS AT EACH JOINT. JOINTS SHALL BE SECURED BY SHEET METAL SCREWS OR POP RIVETS.

.2 SUBSTITUTION OF ANY PRODUCT OTHER THAN THAT SPECIFIED, MUST ENSURE NO DEVIATION

AND AIR MIXING QUALITY. POWER REQUIREMENTS MUST NOT BE EXCEEDED, AND WHERE

- ADJUST THE AIR PATTERN FOR ALL DIFFUSERS AS INDICATED ON THE DRAWINGS OR AS

AND AABC STANDARDS. AIR BALANCING SHALL BE PERFORMED WITH CLEAN FILTERS

INSTALLED. MECHANICAL CONTRACTOR SHALL CLEAN ALL AIR SYSTEM FILTERS (NEW

SHALL INCLUDE PUTTING INTO SERVICE, ADJUSTING, CALIBRATING AND VERIFYING ALL

21.PRESSURF TESTING ALL PIPING SYSTEMS SHALL BE PRESSURE TESTED TO 860KPA OR 1.5 TIMES SYSTEM

POWER WIRING FOR MECHANICAL EQUIPMENT SHALL BE INSTALLED BY THE ELECTRICAL DIVISION. ALL STARTERS, CONTROL TRANSFORMERS FOR THEM, SAFETY DISCONNECT FOR FAN COIL, ETC. WHERE REQUIRED, SHALL BE PROVIDED BY THE MECHANICAL DIVISION. ALL LOW VOLTAGE CONTROL WIRING SHALL ALSO BE PROVIDED AND INSTALLED BY THE

MECHANICAL DIVISION PROVIDE AND INSTALL NEW SYSTEM COMPONENTS C/W REQUIRED POWER, CONTROLS AND

INTERLOCKING, ALL ELECTRICAL SHOWN TO BE COMPLETED BY ELECTRICAL CONTRACTOR DISCONNECT ELECTRICAL POWER TO EQUIPMENT AND RECONNECT AS REQUIRED.

REQUEST IN WRITING FOR A FINAL INSPECTION OF THE MECHANICAL SYSTEMS. WHEN THE REQUEST IS MADE, ALL DEFICIENCIES MUST BE COMPLETE, BALANCING REPORT SUBMITTED, SYSTEMS READY FOR OPERATION, DATA BOOK SUBMITTED, ALL TAGS, CHARTS AND NAMEPLATES COMPLETED, ALL FIXTURES AND EQUIPMENT CLEANED, SPARE PARTS PROVIDED, RECORD DRAWINGS COMPLETED, CONTROL SYSTEMS OPERATIONAL AND THE OWNER'S STAFF INSTRUCTED IN ALL PHASES OF THE SYSTEM.

24.TESTING AND BALANCING TEST, BALANCE AND ADJUST ALL AIR SYSTEM TO OBTAIN THE DESIGN QUANTITIES. SUBMIT AIR SYSTEMS TEST AND AIR BALANCE REPORT TO THE LANDLORD, CONSULTANT, AND

OWNER'S COORDINATOR.INDICATE ALL TEST RESULTS INCLUDING ENTERING AND LEAVING AIR TEMPERATURES. THIS WORK SHALL BE PERFORMED BY A QUALIFIED TESTING AND BALANCING CONTRACTOR.

MAINTENANCE STAFF ON NON-CONSECUTIVE DAYS, ALLOWING THE OPERATIONS STAFF AN OPPORTUNITY TO FAMILIARIZE THEMSELVES AFTER THE FIRST TRAINING SESSION. TRAINING FOR THE BAS SHALL BE A MINIMUM OF 1 HOUR.

BE LIMITED TO THE FOLLOWING: MAJOR FQUIPMENT SUPPLIERS.

PROVIDE A ROUTINE MAINTENANCE SCHEDULE COORDINATED WITH EQUIPMENT MANUFACTURER, AND GOOD MAINTENANCE PROCEDURES. THIS WILL INCLUDE FILTER CHANGES, LUBRICATION, HUMIDIFIER MAINTENANCE, CLEANING OF BLOWER COMPARTMENTS, AND GENERAL OBSERVANCE TO THE OPERATION OF ALL EQUIPMENT AND

 WARRANTY CERTIFICATES FOR ALL EQUIPMENT. 2. WARRANTY LETTER FROM THE TRADES.

3. CONTROL DIAGRAMS AND HARDWARE LISTS, ENTIRE CONTROL SYSTEM. 5. AS-BUILT DRAWINGS

 SUMMARY OF THE SCOPE OF WORK YEAR FROM DATE OF FINAL ACCEPTANCE. ASSUME FULL RESPONSIBILITY FOR LAYOUT OF ALL WORK AND FOR ANY DAMAGE CAUSED TO OWNER OR OTHERS BY IMPROPER CARRYIN AS SPECIFIED ON DRAWINGS.

> DUCTWORK SHALL BE CONSTRUCTED TO ASHRAE/SMACNA STANDARDS DUCT SIZES ARE LISTED ON DRAWINGS. ALL DUCT SIZES SHOWN ARE CLEAR INSIDE

.5 UNIT MUST CONFORM TO REGULATIONS SET OUT IN THE CANADIAN ENERGY EFFICIENCY ACT FOR LARGE AIR CONDITIONERS (CONDENSING UNITS). PACKAGED UNITS SHALL BE TESTED TO CSA STANDARD C746-98 AND MUST BEAR AN EEV (ENERGY EFFICIENCY VERIFICATION) LABEL PROVIDED BY CSA. "WHERE SPECIFIED AS FACTORY PACKAGED AIR CONDITIONING UNIT, FACTORY ASSEMBLED SPLIT SYSTEMS DO NOT CONFORM TO THE CANADIAN ENERGY EFFICIENCY ACT AND WILL NOT BE CONSIDERED."

AND BLISTERS, WHICH MAY ALLOW THE GLUE TO DRY UP AND CAUSE AN AIR LEAK. ALL ROUND DUCTWORK TO BE SECURED WITH A MINIMUM OF THREE (3) SHEET METAL SCREWS AT ALL DUCT JOINTS. PRIOR TO SEALING THE DUCT JOINT WITH METAL DUCT TAPE TAPE IS TO BE PRESSED TIGHT AGAINST A CLEAN DUCT SURFACE, TO ENSURE NO AIR GAPS AND BLISTERS, WHICH MAY ALLOW THE GLUE TO DRY UP AND CAUSE AN AIR LEAK.

• DUCT REDUCER FITTINGS SHALL HAVE TAPER ANGLES OF 45 DEG. OR LESS. SUPPLY AND RETURN PLENUM COLLAR AREA SHALL BE A MIN. OF 1.5 TIMES THE DUCT AREA ALL BRANCH DUCTS SHALL BE CONNECTED TO THE MAIN WITH A TAPERED BOOT AND

COMMERCIAL / RESIDENTIAL SHEET METAL INSTALLATION PRACTICE AND AS FOLLOWS:

 PROVIDE RETURN AIR CONNECTION TO THE AIR HANDLING EQUIPMENT WITH A ROUNDED HEEL, AND A MINIMUM 150MM (6") RADIUS WITH TURNING VANES. • ALL ELBOWS ARE TO HAVE INSIDE RADIUS AT LEAST 1/3 THE DUCT WIDTH. IF THIS IS NOT

• ALL DUCT TRANSITIONS ARE TO BE AT AN ANGLE OF 15 DEG. PROVIDE FLEXIBLE CONNECTIONS AT ALL FAN AND AIR HANDLING EQUIPMENT CONNECTIONS

• WHERE DUCTS ARE WIDER THAN 24", USE STANDING SEAM DUCT JOINTS/CONNECTIONS.

ELBOWS SHALL HAVE RADIUS OF NOT LESS THAN DUCT WIDTH. BARBER-COLEMAN "AIRTURNS" OR HART & COOLEY "DUCTURNS" TURNING VANES SHALL BE PROVIDED IN ELBOWS OF LESSER RADIUS IN ALL DUCTWORK.

PROVIDE FLEXIBLE CONNECTION AT ALL DUCTED HVAC UNITS AND FANS AND/OR AS INDICATED ON DRAWINGS

INSULATE SUPPLY DUCTWORK AS SHOWN ON DRAWINGS. BLANKET OR RIGID THERMAL INSULATION ON INDOOR DUCTS SHALL BE PROVIDED WHERE INDICATED ON DRAWINGS. THERMAL INSULATION SHALL BE 38MM THICK BLANKET MINERAL FIBER OR 25MM THICK RIGID

AIR DUCTWORK. INSULATION SHALL BE FOIL FACED HAVING FLAME SPREAD RATING OF 25 OR LESS AND A SMOKE DEVELOPMENT CLASSIFICATION OF 50 OR LESS. ACCEPTABLE BLANKET MINERAL FIBER SHALL BE JOHNS MANVILLE MICROLITE DUCT WRAP TYPE OR EQUIVALENT.

SPIN-GLASS TYPE OR EQUIVALENT. SEAL ALL JOINTS WITH ULC LISTED SELF-ADHESIVE INSULATION TAPE FOR INDOOR DUCTS

PROVIDE SHEET METAL JACKET ON INSULATION & DUCTWORK ABOVE THE ROOF.

DUCTWORK FOR FIRST 5M OF DUCTWORK OR AS INDICATED ON DRAWINGS. ACOUSTIC INSULATION SHALL BE 25MM THICK INTERNAL LINING, C/W FACTORY APPLIED BLACK ACRYLIC POLYMER COATING, HAVING FLAME SPREAD RATING OF 25 OR LESS AND SMOKE DEVELOPMENT CLASSIFICATION OF 50 OR LESS. DUCT SIZES SHOWN ON DRAWING

STANDARDS. ACCEPTABLE COATING SHALL BE JOHNS MANVILLE SUPERSEAL OR

ADHESIVE CONFORMING TO ASTM C916. PINS ARE TO BE CUT BACKTIGHT TO WASHER. ALL RAW EDGES TO BE SEALED WITH THE SAME ADHESIVE. ALL LEADING EDGES TO BE PROVIDED WITH A SHEET METAL STRIP ALONG THE EDGE TO SECURE THE LINING TO THE DUCT AND AVOID EROSION OF THE FIBREGLASS.

INSULATION EROSION.

ACCEPTABLE ACOUSTIC DUCT LINER SHALL BE JOHNS MANVILLE PERMACOTE LINACOUSTIC STANDARD/HP OR EQUIVALENT.

BALANCING DAMPERS SHALL BE MANUALLY OPERATED OPPOSED BLADE FOR DUCTS LARGER THAN 20" (508MM) AND SPLITTER TYPE FOR SMALLER DUCTS. SPLITTER DAMPERS SHALL BE COMPLETE WITH CONTROL ROD, PIVOT BRACKET AND BALL JOINT FITTING WITH LOCKING SET SCREW. PROVIDE BALANCING DAMPERS IN THE TRUNK DUCTS AND ALL SUPPLY AND RETURN BRANCH DUCTS AS SHOWN, REQUIRED AND AS REQUESTED BY THE AIR BALANCE TECHNICIAN. DAMPERS ARE TO BE EQUIVALENT TO "DURO-DYNE".

DAMPERS ON THE ROUND BRANCH DUCTS SHALL BE DURO-DYNE MODEL #KS-7 WITH TWO

.6 KEYPAD TO BE REMOVABLE. WITH ALPHANUMERIC DISPLAY ABLE TO PROVIDE OUTPUT STATUS MONITORING, OUTPUT FREQUENCY, OUTPUT VOLTAGE, OUTPUT RPM, AND OUTPUT CURRENT.

HVAC (CONT'D) INCLUDE FAULT LOG DISPLAY WITH CAPACITY FOR THE RECENT 30 FAULTS WITH A TIME STAMP. DIAGNOSTIC DISPLAY MENUS TO INCLUDE REFERENCE SPEED COMMAND. HEAT SINK TEMP. BUS

.7 UNIT MOUNTED MANUAL VFD BYPASS SWITCH LOCKS OUT VFD, FAN RUNS ON MAXIMUM SET VOLUME. BYPASS SWITCH AND ALL INTERLOCK CONTACTS ARE FACTORY MOUNTED AND

VOLTAGE, ACTIVE I/O COMMAND STATUS, TIME FROM POWER UP, AND CURRENT SETTING.

.8 DRIVE SHALL BE FACTORY SUPPLIED AND INSTALLED

.9 MINIMUM CFM OF 50% ON DX, GAS FIRED HEAT EXCHANGERS, AND ELECTRIC HEAT SYSTEMS.

.10 FAN MOTORS SHALL BE TEFC (TOTALLY ENCLOSED FAN COOLED) SUPER E HIGH EFFICIENCY

.1 COILS SHALL BE 5/8" O.D. AND/OR 1/2" O.D. AS MANUFACTURED BY ENGINEERED AIR, CONSTRUCTED OF COPPER TUBE, ALUMINUM FIN, AND COPPER HEADERS WITH SCHEDULE 40 STEEL PIPE CONNECTORS.

.2 FINS CONSTRUCTED OF ALUMINUM OR COPPER SHALL BE RIPPLED FOR MAXIMUM HEAT TRANSFER AND SHALL BE MECHANICALLY BONDED TO THE TUBES BY MECHANICAL EXPANSION OF THE TUBES. THE COILS SHALL HAVE A GALVANIZED STEEL CASING. ALL COILS SHALL BE FACTORY TESTED WITH AIR AT 300 PSIG (2070 KPA) WHILE IMMERSED IN AN ILLUMINATED WATER TANK.

.3 COILS SHALL BE REMOVABLE FROM THE UNIT AT THE HEADER END, UNLESS SHOWN OTHERWISE ON THE DRAWINGS. ALL WATER COILS SHALL BE EQUIPPED WITH A CAPPED VENT TAPPING AT THE TOP OF THE RETURN HEADER OR CONNECTION, AND A CAPPED DRAIN TAPPING AT THE BOTTOM OF THE SUPPLY HEADER OR CONNECTION.

.4 WATER AND GLYCOL COILS SHALL BE CIRCUITED TO PROVIDE ADEQUATE TUBE VELOCITIES TO MEET DESIGN REQUIREMENTS. INTERNAL TURBULATORS ARE NOT ACCEPTABLE.

.5 5/8" O.D. TUBE DIAMETER WATER COILS SHALL BE ARI CERTIFIED.

1 FILTER SECTIONS SHALL BE PROVIDED WITH ADEQUATELY SIZED ACCESS DOORS TO ALLOW EASY REMOVAL OF FILTERS. FILTER REMOVAL SHALL BE FROM ONE SIDE AS NOTED ON THE DRAWINGS.

.2 2"(50MM) PLEATED PANEL DISPOSABLE FILTERS: AN OPTIMUM BLEND OF NATURAL AND SYNTHETIC FIBER MEDIA WITH A RUST RESISTANT SUPPORT GRID AND HIGH-WET STRENGTH BEVERAGE BOARD ENCLOSING FRAME WITH DIAGONAL SUPPORT MEMBERS BONDED TO THE AIR ENTERING AND AIR EXITING SIDE OF EACH PLEAT. PERMANENT RE-USABLE METAL ENCLOSING FRAME. THE FILTER MEDIA SHALL HAVE A MINIMUM EFFICIENCY OF OF MERV 13 PER ASHRAE 52.2. RATED U.L

6. DAMPERS

.1 DAMPERS SHALL BE EXTRUDED ALUMINUM, LOW LEAK, THERMALLY BROKEN, INSULATED BLADE TAMCO SERIES 9000.

MECHANICAL COOLING

.1 COMPRESSORS SHALL BE HERMETIC TYPE, 3600 RPM, SET ON RESILIENT NEOPRENE MOUNTS AND COMPLETE WITH LIVE VOLTAGE BREAK INTERNAL OVERLOAD PROTECTION AND INTERNAL PRESSURE RELIEF VALVE. EXTERNAL CRANKCASE HEATERS LOCKED OUT DURING COMPRESSOR OPERATION.

.2 WATER COOLED CONDENSERS SHALL BE COAXIAL. TUBE-IN-TUBE DESIGN, HELICALLY WOUND WITH CONVOLUTED COPPER INNER TUBE FOR WATER, WITH A STEEL OUTER TUBE TO CARRY REFRIGERANT IN THE ANNULAR SPACE. WORKING PRESSURES: 300 PSIG, WATER-SIDE AND 450 PSIG, REFRIGERANT SIDE. CONDENSERS SHALL BE APPROVED AND LABELED. PROVIDE ONE OR MORE CONDENSERS FOR EACH COMPRESSOR.

.3 PACKAGED UNITS SHALL BE CETL, ETLUS APPROVED AND OPERATE DOWN TO 50°F(10°C) AS STANDARD, WHERE APPLICABLE, MULTIPLE REFRIGERATION CIRCUITS SHALL BE SEPARATE FROM EACH OTHER. REFRIGERATION CIRCUITS SHALL BE COMPLETE WITH LIQUID LINE FILTER-DRIERS, COMPRESSORS AND ALL UNITS WITH SEMI-HERMETIC COMPRESSORS SHALL ALSO INCORPORATE LOAD COMPENSATED THERMAL EXPANSION VALVES WITH EXTERNAL EQUALIZERS AND COMBINATION SIGHT GLASS MOISTURE INDICATORS. SEMI-HERMETIC COMPRESSOR UNITS SHALL HAVE CONDENSERS DESIGNED FOR 15°F (8°C) LIQUID SUBCOOLING AND BE EQUIPPED WITH SUCTION LINE FILTERS AND LIQUID LINE MANUAL SHUTOFF VALVES. THE COMPLETE PIPING SYSTEM SHALL BE PURGED AND PRESSURE TESTED WITH DRY NITROGEN, THEN TESTED AGAIN UNDER VACUUM. EACH SYSTEM SHALL BE FACTORY RUN AND ADJUSTED PRIOR TO SHIPMENT.

.4 PACKAGED UNITS SHALL BE SUPPLIED WITH R-410 REFRIGERANT.

.5 CONTROLS FOR HERMETIC COMPRESSOR UNITS SHALL INCLUDE COMPRESSOR AND CONDENSER

.6 CONTROLS FOR SEMI-HERMETIC COMPRESSOR UNITS SHALL INCLUDE COMPRESSOR AND CONDENSER FAN MOTOR CONTACTORS, SUPPLY FAN CONTACTORS AND OVERLOAD PROTECTION. CONTROL CIRCUIT TRANSFORMER, COOLING RELAYS, AMBIENT COMPRESSOR LOCKOUT, MANUAL RESET HIGH PRESSURE CONTROLS, AUTOMATIC RESET LOW PRESSURE CONTROLS, HEAD PRESSURE ACTUATED FAN CYCLING SWITCHES. TEMPERATURE AND PRESSURE ACTUATED CYLINDER UNLOADING, SOLID STATE COMPRESSOR OVERLOAD PROTECTION MODULE WITH INTEGRAL TWO MINUTE ANTI-CYCLE TIMER, OIL PRESSURE FAILURE SWITCH WITH BUILT IN TIME DELAY AND COMPRESSOR SERVICE VALVES

PRESSURE IN THE EVENT OF LOW LOADS. THIS FEATURE SHALL BE PROVIDED ON ALL VAV AND MAKE-UP AIR APPLICATIONS WITH LESS THAN FOUR STAGES OF COOLING CONTROL.

.9 MAKE-UP AIR AND VAV UNITS TO HAVE A MINIMUM OF 3 COMPRESSORS.

.11THE CONTROLLER SHALL INCLUDE AN ADJUSTABLE LOW LIMIT SET POINT FOR FREEZE PROTECTION TO CEASE EQUIPMENT OPERATION IN THE EVENT OF LOW DISCHARGE TEMPERATURE. IF THE DISCHARGE AIR TEMPERATURE FALLS BELOW THE ADJUSTED SET POINT THE BLOWERS WILL SHUT DOWN AND THE OUTSIDE AIR DAMPERS SHALL CLOSE. THE LOW LIMIT BYPASS TIMER SHALL VARY AUTOMATICALLY DEPENDING ON THE THERMAL COEFFICIENT OF THE STYLE OF HEAT EXCHANGER.

.12 IF THE DISCHARGE AIR TEMPERATURE APPROACHES THE LOW LIMIT SET POINT, THE CONTROLLER SHALL AUTOMATICALLY REDUCE THE ECONOMIZER MINIMUM FRESH AIR DOWN TO HALF OF ITS ORIGINAL SETTING TO COMPENSATE.

MECHANICAL COOLING CONTROL TO MAINTAIN DISCHARGE (ROOM) TEMPERATURE. THE MINIMUM RUN AND OFF TIME FOR THE COMPRESSORS SHALL BE VARIABLE BASED ON LOAD REQUIREMENTS.

.14 WHEN IN HEATING MODE, THE C-TRAC3 SHALL PROVIDE A MODULATING CONTROL SIGNAL TO THE HOT WATER COIL ACTUATOR AND VALVE.

15 MECHANICAL COOLING SHALL BE DISABLED BELOW AN ADJUSTABLE LOW AMBIENT TEMPERATURE

.1 THE HEAT PIPE SHALL BE THE SOLE RESPONSIBILITY OF THE UNIT MANUFACTURER. THE MANUFACTURER SHALL GUARANTEE THE PERFORMANCE OF THE PIPE AS TO ITS TOTAL HEAT THE PERFORMANCE NOTED IN THE SCHEDULES, WITHOUT EXCEEDING THE FAN POWER

HVAC (CONT'D)

THE HEAT RECOVERY DEVICE SHALL BE AN AIR-TO-AIR HEAT PIPE HEAT EXCHANGER. THE BASIS OF DESIGN SHALL BE THE ENGINEERED AIR HRP (QDT) HEAT PIPE.

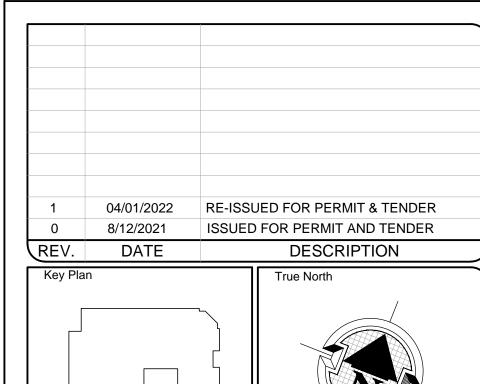
.3 THE HEAT EXCHANGER CORE SHALL BE OF 5/8" OR 1" SEAMLESS ALUMINUM TUBING PERMANENTLY EXPANDED INTO ALUMINUM FINS. EACH TUBE SHALL BE AN INDIVIDUALLY SEALED HEAT PIPE FILLED WITH A WORKING FLUID CONFORMING TO GROUP 1 IN THE AMERICAN NATIONAL STANDARD SAFETY CODE FOR MECHANICAL REFRIGERATION. SERPENTINE COILS OR HEADERED TUBES WILL NOT BE CONSIDERED EQUAL AND SHALL BE BID AS AN ALTERNATE.

.4 THE SECONDARY SURFACE SHALL BE CONTINUOUS PLATE ALUMINUM FINS OF CORRUGATED DESIGN TO PRODUCE MAXIMUM HEAT TRANSFER EFFICIENCY, AND REDUCE THE FROST THRESHOLD OF THE UNIT.

.5 HEAT PIPE TUBES MUST BE WICKED. THE CAPILLARY WICK OF EACH HEAT PIPE SHALL BE AN INTEGRAL PART OF THE INNER WALL OF THE TUBE TO PROVIDE A COMPLETELY WETTED SURFACE FOR MAXIMUM HEAT PIPE CAPACITY WITH MINIMUM HEAT TRANSFER RESISTANCE. NON WICKED HEAT PIPES WILL NOT BE CONSIDERED AS AN EQUAL, UNLESS THEY HAVE A MINIMUM OF 20% ADDITIONAL ROWS, AND ARE INCREASED IN FACE AREA TO PROVIDE A PRESSURE DROP EQUAL TO OR LESS THAN THAT SPECIFIED FOR THE QDT HEAT PIPES.

.6 A PARTITION SHALL BE PROVIDED TO ISOLATE THE EXHAUST AND SUPPLY AIR STREAMS FROM EACH OTHER TO PREVENT CROSS-CONTAMINATION.

.7 THE SUPPLY AIR SIDE OF THE HRP (QDT) HEAT PIPE SHALL BE EQUIPPED WITH OPPOSED BLADE FACE AND BYPASS DAMPERS WITH ACCOMPANYING LINKAGE AND OPERATING CONTROLS. WHICH WILL ACT TO BYPASS COLD AIR AROUND THE SUPPLY SIDE OF THE COIL IN ORDER TO PROVIDE TEMPERATURE AND FROST CONTROL FOR SINGLE SEASON RECOVERY





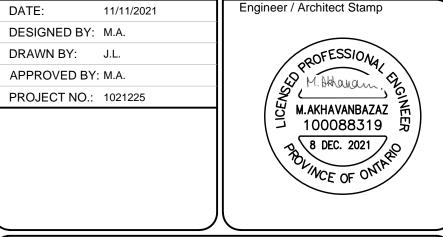


AS SHOWN

Drawing Overall Scale

TERRY FOX PUBLIC SCHOOL COBOURG HRV-HWT-BAS INSTRUMENTATION 1065 RIDDELL AVE, COBOURG, ON K9A 5N4

MECHANICAL SERVICES MECHANICAL SPECIFICATIONS I



M-100

17.PENETRATIONS THROUGH FLOORS AND WALLS UNLESS OTHERWISE SPECIFIED ON ARCHITECTURAL DRAWINGS, GLASS FIBER FIRE

FIRESTOP CAULKING SHALL BE JOHNS MANVILLE FIRETEMP CAULK OR EQUIVALENT PRIOR TO WORK COMMENCING ON SITE COORDINATE OPENINGS WITH SERVICES BELOW

PROVIDE STEEL PIPE SLEEVES, AND SHEET METAL DUCT SLEEVES WHERE PENETRATING CONCRETE OR CONCRETE BLOCK WALLS AND FLOOR SLABS. SLEEVES SHALL EXTEND ABOVE THE FLOOR SLAB 1", TO PROVIDE WATER PROOFING PROTECTION TO THE FLOOR

PROVIDE CONTINUOUS INSULATION AROUND PIPING PENETRATING THE SLEEVES. SEAL THE ANNULAR SPACE BETWEEN THE SLEEVE AND THE SERVICE WITH FIRE RATED INSULATION AND SEALANT EQUAL TO "DOW CORNING" #3-6548 SILICON RTV FOAM PENETRATION SEALANT.

NAME PLATES TO BE ENGRAVED WHITE LETTERS ON BLACK, AND SCREWED TO THE TO PROVIDE THE UNIT NUMBER DESIGNATION AND SERVICE. NEW EQUIPMENT IDENTIFICATION NUMBER SHALL BE CONSECUTIVE WITH THE EXISTING

REPLACE/ADD/ RELOCATE, MODIFICATION TO EQUIPMENT/SERVICES BUT NOT LIMITED TO: . AIR BALANCING

FURNISH ALL LABOR, MATERIALS, EQUIPMENT, TOOLS AND SUPPORTS AS WELL AS SUPERVISION TO PROVIDE A COMPLETE INSTALLATION, TESTED AND IN WORKING ORDER, AS SHOWN ON THE DRAWINGS.

REMOVAL AND DISPOSAL OF THE EQUIPMENT MAKE GOOD ALL DAMAGES TO CEILINGS, WALLS, EXISTING EQUIPMENT AND/OR SYSTEM. COORDINATE WORK AND WORKING HOURS WITH THE OWNER AND OTHER TRADES TO MINIMIZE DISRUPTION. WHERE WORK DISRUPTS OR INTERFERES WITH BUILDING OCCUPANTS, MAKE ALL NECESSARY ARRANGEMENTS WITH THE LANDLORD OR FACILITY MANAGER FOR A SUITABLE TIME PERIOD FOR THE WORK OR SYSTEM SHUT-DOWN TO OCCUR. LIFE SAFETY SYSTEMS ARE NOT TO BE LEFT INOPERABLE DURING UNSUPERVISED TIMES OF THE DAY, AND SHALL BE FULLY OPERATIONAL AT THE END OF EACH WORKING DA

CODES AND STANDARDS

A. HVAC

B. INSULATION

D. CONTROLS

ALL WORK SHALL CONFORM TO THE CURRENT ISSUES OF:

THE ONTARIO BUILDING CODE. ONTARIO ELECTRICAL SAFETY CODE. BYLAWS AND REGULATIONS ISSUED BY THE BUILDING AUTHORITY HAVING JURISDICTION.

SMACNA GUIDE TSSA REQUIREMENTS NFPA STANDARDS

. SPECIFICATIONS COMPLY WITH THE GENERAL SECTIONS AND APPLICABLE SECTIONS OF THE GENERAL CONTRACT SPECIFICATIONS.

4. PERMITS, FEES & INSPECTIONS

OBTAIN AND PAY FOR ALL REQUIRED PERMITS, INSPECTIONS, ETC. AS REQUIRED BY THE AUTHORITIES HAVING JURISDICTION. OBTAIN ALL PERMITS BEFORE PROCEEDING WITH WORK.

CONTRACTOR SHALL BE RESPONSIBLE SHOULD FAILURE OCCUR. THE CONTRACTOR SHALL CONTACT THE BUILDING DEPARTMENT AND THE MECHANICAL CONSULTANT FOR A REVIEW OF THE MECHANICAL SYSTEMS COMPLETED FOR ROUGH IN PRIOR TO CLOSING UP CEILINGS AND WALLS. PROVIDE A MINIMUM ONE (1) WEEK NOTICE. ALL ROUGH-IN DEFICIENCIES ARE TO BE RECTIFIED WITH A CALL FOR A RE-INSPECTION. PRIOR TO CLOSING UP THE CEILINGS AND WALLS. FAILURE TO HAVE THE INSPECTIONS

REVIEWS, WITH ALL REMEDIAL WORK AND MAKING GOOD OF ALL CONSTRUCTION / REMEDIA WORK AT THE CONTRACTOR'S EXPENSE. CONTRACTOR SHALL COORDINATE WITH TSSA REGARDING REFRIGERANT PIPING FOR INSPECTION AND APPROVAL.

PROVIDED WILL RESULT IN OPENING THE WALLS AND CEILINGS FOR THE REQUIRED

EXAMINE SITE CONDITIONS TO ENSURE THAT WORK CAN BE SATISFACTORILY CARRIED OU AS SHOWN. IF SITE EXAMINATION REVEALS ANY HIDDEN DIFFICULTIES, THESE MUST BE INDICATED IN THE TENDER PRICE, AND BROUGHT TO THE ATTENTION OF THE ENGINEER.

. DRAWINGS

DRAWINGS SHOW GENERAL INTENT OF THE WORK AND PROPOSED ROUTING ONLY. FIELD MEASURE TO CONFIRM ALL EXISTING DIMENSIONS, DUCT AND PIPING SIZES BEFORE PROCEEDING WITH FABRICATION. DO NOT SCALE DRAWINGS. CONTRACTOR SHALL BE RESPONSIBLE FOR IDENTIFYING POSSIBLE INTERFERENCES..

WARRANT ALL LABOR AND MATERIALS INCLUDED IN THIS CONTRACT FOR A PERIOD OF ONE

OUT OF THE WORK. LEAVE PREMISES IN CLEAN AND NEAT CONDITION AT TERMINATION OF WORK EACH DAY.

DO NOT ACCUMULATE DEBRIS AND WASTE MATERIALS ON SITE. REMOVE FROM SITE DAILY.

USE ONLY NEW AND CSA CERTIFIED EQUIPMENT AND MATERIALS UNLESS OTHERWISE INDICATED. ONLY FIRST CLASS WORKMANSHIP WILL BE ACCEPTED WITH RESPECT TO

INSTALLATION WORK. ONLY FIRST CLASS WORKMANSHIP WILL BE ACCEPTED, NOT ONLY IN REGARDS TO SAFETY EFFICIENCY, DURABILITY, ETC., BUT ALSO IN REGARDS TO THE NEATNESS OF DETAIL. UNLESS SHOWN OTHERWISE. ALL PIPE WORK MUST BE LINED UP PARALLEL TO, OR AT RIGH ANGLES TO THE BUILDING WALLS. EQUIPMENT MUST BE ACCURATELY SET, PLUMBED, AND

LEVELED, AND HANGER RODS MUST BE SIMILARLY IN TRUE VERTICAL ALIGNMENT. IN

STANDARD PRACTICES, SAFETY, ACCESSIBILITY, DURABILITY AND NEATNESS OF

GENERAL, THE ENTIRE WORK THROUGHOUT SHALL FIRST CLASS AND WORKMANLIKE AND PRESENT A NEAT AND CLEAN APPEARANCE ON COMPLETION.

11.SHOP DRAWINGS SUBMIT 3 COPIES OF SHOP DRAWINGS AND PRODUCT DATA FOR ENGINEER'S REVIEW

COVERING ALL RELEVANT DETAILS AND DIMENSIONS. KEEP ACCURATE RECORD OF "AS-BUILT" DRAWINGS AND SUBMIT THESE BEFORE FINAL CERTIFICATE OF COMPLETION. BURIED SERVICES MUST BE DIMENSIONED. AFTER COMPLETION OF THE WORK PROVIDE THE OWNER AND ENGINEER WITH AS-BUILT

- RECORD DRAWINGS IN AUTOCAD 2007 FORMAT 13.OPERATION & MAINTENANCE (O&M) MANUAL SUBMIT 4 COPIES OF O&M MANUALS TO CONSULTANT FOR REVIEW. MANUALS SHALL INCLUDE SHOP DRAWINGS OF ALL NEW EQUIPMENT, TEST AND BALANCE REPORTS, COMMISSIONING REPORTS, WARRANTIES, AND OPERATION AND MAINTENANCE
- PROCEDURES.
- 14.EXISTING EQUIPMENT AND SYSTEMS DISCONNECT, RECONNECT OR RELOCATE EXISTING EQUIPMENT OR SERVICES WHERE SHOWN OR REQUIRED TO PERMIT NEW WORK TO BE INSTALLED WITHOUT INTERFERENCES ENSURE THAT REQUIRED SERVICES ARE MAINTAINED. COORDINATE WITH THE OWNER AND OWNERS REPRESENTATIVE BEFORE ANY SERVICES ARE INTERRUPTED. COORDINATE ALL ROUTING OF NEW SERVICES AS THEY MAY BE ADJUSTED TO ACCOMMODATE EXISTING SERVICES PROVIDING THAT THE INTENT OF THE DRAWINGS IS MET AND THE SAME STANDARDS ARE MAINTAINED. PROVIDE DRAWINGS OF PROPOSED REVISIONS FOR APPROVAL BEFORE BEGINNING ANY WORK AND INCORPORATE IN AS BUILT DRAWINGS.
- COORDINATE ALL ROUTING CHANGES WITH OTHER TRADES WHO MAY BE AFFECTED. CONSULTANT TO BE ADVISED PRIOR TO CHANGES WHERE CHANGES COULD BE THE CONTRACTOR IS TO TAKE EXTRA CARE DURING THIS INSTALLATION NOT TO DISTURB ANY OPERATIONS. IT IS CRITICAL THAT THERE WILL BE NO UNSCHEDULED SHUTDOWNS OR INTERRUPTIONS OF ANY OPERATIONS. ALL ASSOCIATED COSTS OF SUCH WILL BE PASSED
- ON TO THE CONTRACTOR. 5.OPEN FLAMES AND WELDING NO OPEN FLAMES OR WELDING IS PERMITTED WITHIN THE BUILDING WITHOUT WRITTEN
- PERMISSION BY THE OWNER AND THE CONSULTANT.
- 16.CUTTING, PATCHING AND PAINTING REQUIREMENTS PROVIDE CUTTING PATCHING AND PAINTING FOR ALL OPENINGS. USE QUALIFIED TRADES FOR THIS WORK. RESTORE FINISHES TO MATCH EXISTING. SUPPLY AND INSTALL APPROVED FIRE STOP AS REQUIRED TO MAINTAIN FIRE RATING. PIPING AND VENTS THROUGH WALLS AND ROOF SHALL BE BY MECHANICAL CONTRACTOR, INCLUDING ALL PATCHING. ALL RATED WALL OPENINGS SHALL BE PACKED WITH AN
- APPROVED FIRE RESISTANT INSULATION AND SHALL BE SEALED WITH AN APPROVED FIRE STOP EQUAL TO 'DOW CORNING' SILICONE SEALANT.
- RETARDANT INSULATION OR FIRESTOP CAULKING SHALL BE PACKED AROUND DUCT AND PIPE OPENINGS IN FLOORS AND WALLS AT TIME OF DUCT AND PIPE INSTALLATION.
- OPENINGS IN SLABS AND CONCRETE WALLS ARE TO BE X-RAYED WITH X-RAYS SUBMITTED TO THE BASE BUILDING STRUCTURAL ENGINEER FOR APPROVAL

- PROVIDE LAMACOID NAMEPLATE FOR ALL PIECES OF EQUIPMENT BOTH NEW AND EXISTING EQUIPMENT. IF SCREW FASTENING IS NOT POSSIBLE, PROVIDE BRASS CHAINS. PLATES ARI EQUIPMENT ON THE FLOOR. NUMBERING SYSTEM TO BE VERIFIED ON SITE.

- 20 DIFLECTRIC ISOLATION
- PROVIDE ISOLATION WHEN USING DISSIMILAR MATERIALS TO PREVENT GALVANIC ACTION.
- OPERATING PRESSURE FOR A DURATION OF 4 HRS UNLESS OTHERWISE INDICATED.

- 25.CLOSE OUT DOCUMENTATION AND TRAINING CONTRACTOR TO PROVIDE A THREE-DAY TRAINING SESSION FOR THE OWNER'S
- PROVIDE CLOSE-OUT DOCUMENTATION ON USB. THE CONTENTS SHALL INCLUDE BUT NOT NAMES, ADDRESSES, PHONE NUMBERS, AND CONTACTS OF ALL SUB-CONTRACTORS AND
- EQUIPMENT MANUFACTURER'S INFORMATION INCLUDING PERFORMANCE CAPACITIES, INSTALLATION, AND MAINTENANCE DATA.
- ATTENDING TO ANY DETAILS ARISING.
 - 4. CONTROL TRADE LETTER VERIFYING VISUAL CONFIRMATION AND COMMISSIONING OF THE
- 6. AIR BALANCING REPORT 7. TSSA APPROVAL CERTIFICATE TO BE INCLUDED IN CLOSE OUT DOCUMENTATION.

HVAC

PROVIDE AND INSTALL NEW HRV C/W ASSOCIATED DUCTWORK, SENSORS, CONTROL, ETC CONNECT THE NEW HRV TO THE EXISTING BAS AND UPDATE THE SEQUENCE OF OPERATION GRAPHICS AND CONTROL AS-BUILT DRAWINGS.

DIMENSIONS DUCTWORK HANGERS AND SUPPORTS SHALL BE ALL DUCTWORK TO BE SUPPORTED WITH DUCT STRAPS AT 5'-0" OC. AND AS REQUIRED TO SUPPORT THE DUCT JOINTS ALL ROUND DUCTWORK TO BE SECURED WITH A MINIMUM OF THREE (3) SHEET METAL SCREWS AT ALL DUCT JOINTS. PRIOR TO SEALING THE DUCT JOINT WITH METAL DUCT TAPE TAPE IS TO BE PRESSED TIGHT AGAINST A CLEAN DUCT SURFACE. TO ENSURE NO AIR GAPS

BALANCING DAMPER.

POSSIBLE, PROVIDE A MINIMUM 6" RADIUS WITH TURNING VANES.

INDICATE CLEAR INSIDE DIMENSIONS.

DAMPER BLADE TO THE SHAFT.

FIRE RESISTANT NEOPRENE COATED GLASS FABRIC.

5. DUCTWORK THERMAL INSULATION MINERAL FIBERBOARD FOR CONDITIONED AIR DUCTWORK AND 50MM RIGID FOR OUTDOOR

ACCEPTABLE RIGID MINERAL FIBERBOARD SHALL BE JOHNS MANVILLE 800 SERIES

AND INSULATION. UNLESS OTHERWISE SPECIFIED PROVIDE ALUMINUM JACKET ON ALL EXPOSED DUCTWORK.

ACOUSTIC INSULATION SHALL BE PROVIDED AND INSTALLED ON SUPPLY AIR CONDITIONING

APPLY BLACK ACRYLIC POLYMER COATING TO ALL FIELD CUT EDGES AS PER SMACNA WHERE HUMIDIFICATION (DUCT TYPE) IS REQUIRED, INSULATION MATERIAL TO BE MICROBIA GROWTH RESISTANT. LINING SHALL BE PINNED AT 12" O.C., AND ADHERED WITH FULL AREA COVERAGE WITH AN

ALL EXPOSED PORTIONS OF THE FIBREGLASS LINING, NOT COVERED WITH THE THERMOSETTING RESIN JACKET SHALL BE BUTTERED DOWN TO AVOID ANY POSSIBILITY OF

POINT DAMPER SUPPORTS. RECTANGULAR DUCT BRANCHES SHALL HAVE HEAVY DUTY DURO-DYNE MODEL #KS-385 QUADRANT DAMPER AND END BEARINGS WITH SPOT WELDED PROVIDE SPLITTER DAMPERS AT ALL MAIN BRANCHES WHERE THE BRANCH CONNECTS TO

REQUIRED) DURING THE AIR BALANCE PROCEDURE.

SHAFTS SHALL BE PROVIDED WITH A RUST INHIBITING COATING.

.7 PROVIDE HOT GAS BYPASS ON THE LEAD COMPRESSOR TO MAINTAIN ADEQUATE SUCTION

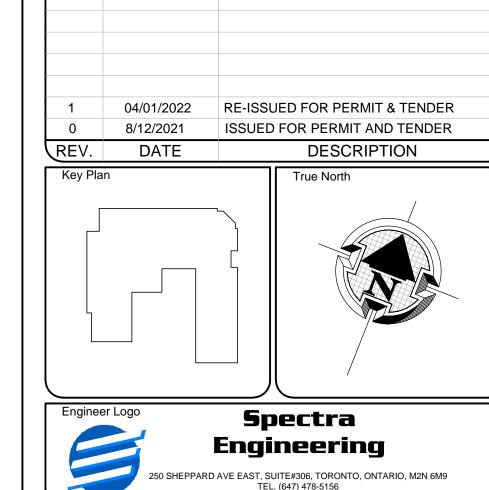
.8 COMPRESSORS SHALL BE LOCATED ON THE SIDE OF THE UNIT IN A SERVICE ENCLOSURE COMPLETE WITH HINGED ACCESS DOORS C/W CAMLOCK FASTENERS HANDLES FOR EASE OF

.10 THE CONTROLLER SHALL AUTOMATICALLY START IN HEATING, ECONOMIZER, OR COOLING MODE BASED ON CONTINUOUSLY MONITORED AMBIENT TEMPERATURE AND LOAD REQUIREMENTS.

.13 THE C-TRAC3 ELECTRONIC TEMPERATURE CONTROL SYSTEM SHALL PROVIDE 3 STAGES OF

8. HRP (QDT) HEAT PIPES

TRANSFER CAPACITY, AND ITS OPERATION, ALTERNATE RECLAIM DEVICES SHALL MEET OR EXCEED REQUIREMENTS SPECIFIED.



1.1 GENERAL REQUIREMENTS

- 1.1.A PROVIDE THE NECESSARY DESIGN, INSTALLATION, PROGRAMMING, SUPERVISION, COMMISSIONING AND OPERATOR TRAINING TO ENSURE FOR A COMPLETE AND FULLY OPERATIONAL SYSTEM.
- 1.1.B PERFORM AN IN-DEPTH REVIEW OF ALL EXISTING CONTROL COMPONENTS (E.G. CONTROL VALVES, CONTROL DAMPERS, LINKAGES, ACTUATORS, ETC.) TO BE RE-USED BY THE NEWLY INSTALLED BAS. IMMEDIATELY REPORT ANY DEFECTIVE OR INOPERATIVE COMPONENTS TO THE
- 1.1.C CO-ORDINATE THE WORK OF THE MECHANICAL CONTRACTOR (SEE SECTION 3.1) AND ALL SUB-CONTRACTORS REQUIRED TO COMPLETE THE SCOPE OF WORK AS SPECIFIED IN THE CONTRACT DOCUMENTS
- 1.1.D THE CONTROLS CONTRACTOR AND ALL SUB-CONTRACTORS SHALL EMPLOY ONLY CERTIFIED TRADESPERSONS TO CARRY OUT ALL APPLICABLE WORK.
- 1.1.E PROVIDE HAND-OFF-AUTO (H-O-A) SWITCHES FOR EXISTING EQUIPMENT STARTERS WHERE SPECIFIED.
- 1.1.F PROVIDE ALL NECESSARY POWER WIRING AND HARDWARE TO COMPLETE THE ENTIRE PROJECT INCLUDING BUT NOT LIMITED TO, WIRING, FITTINGS, CONNECTORS, CONDUITS. HANGERS/SUPPORTS, BOX COVERS AND ALL OTHER ACCESSORIES REQUIRED TO ENSURE COMPLETE, SAFE AND FULLY OPERATIONAL SYSTEMS. THIS SHALL INCLUDE THE POWER WIRING FOR ALL THE EQUIPMENT INSTALLED BY THE MECHANICAL CONTRACTOR.
- 1.1.G ARRANGE FOR ELECTRICAL AUTHORITY INSPECTION OF ALL ELECTRICAL WORK. ARRANGE FOR A SEPARATE INSPECTION OF ANY FIELD ASSEMBLED ELECTRICAL PANELS OR SYSTEMS THAT HAVE NOT BEEN PRE-APPROVED BY CSA/ULC. SUBMIT THE CERTIFICATE OF INSPECTION AND PRODUCT APPROVAL CERTIFICATE WITH THE AS-BUILT DOCUMENTATION.
- 1.1.H IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO PROVIDE WRITTEN NOTIFICATION TO THE KPRDSB. PRIOR TO TENDER CLOSING, OF ANY ERRORS, OMISSIONS, DISCREPANCIES OF AMBIGUITIES CONTAINED IN THESE DOCUMENTS. FOLLOWING THE AWARD OF THE CONTRACT KPRDSB RESERVES THE RIGHT TO ACT AS THE SOLE ARBITER OF ANY DISPUTES ARISING FROM THE INTERPRETATION OF THESE CONTRACT DOCUMENTS.

1.2 APPROVED CONTROL SYSTEM MANUFACTURERS

- 1.2.A ONLY APPROVED BUILDING AUTOMATION SYSTEMS WILL BE ACCEPTED. NO SUBSTITUTES OR ALTERNATES ARE ALLOWED. THE ACCEPTED SYSTEM MANUFACTURES AND VENDORS ARE:
 - 1. SETPOINT BUILDING AUTOMATION INC. 400 SPINNAKER WAY, UNIT#1 CONCORD, ONTARIO, L4K 5Y9 905-669-8012

1.3 SHOP DRAWING SUBMITTALS

- 1.3.A PREPARE AND SUBMIT SIX (6) COPIES OF SHOP DRAWING MANUALS FOR THE REVIEW AND APPROVAL OF THE ENGINEER. UNDER NO CIRCUMSTANCES SHALL THE CONTROLS CONTRACTOR COMMENCE SITE WORK PRIOR TO THE ACCEPTANCE OF SHOP DRAWINGS BY THE
- 1.3.B $\,\,$ THE CONTRACTOR SHALL INCLUDE WITH THE SHOP DRAWING SUBMITTAL. A LISTING OF ALL BAS PROGRAMMING CODE OR LOGIC DIAGRAMS FOR REVIEW BY THE ENGINEER. THIS REVIEW SHALL BE FOR GENERAL CONFORMANCE WITH THE DRAWINGS AND SPECIFICATIONS. ACCEPTANCE OF THE INITIAL PROGRAMMING SUBMISSION BY THE ENGINEER DOES NOT RELIEVE THE CONTRACTOR OF THE RESPONSIBILITIES UNDER 1.3.C BELOW.
- 1.3.C THE ENGINEER AND/OR DESIGNATE SHALL CONDUCT A SUBSEQUENT DETAILED REVIEW OF PROGRAMMING CODE AND WORKSTATION GRAPHICS DURING THE SUBSTANTIAL COMPLETION INSPECTION OF THE WORK WHEN ALL SPECIFIED SYSTEMS AND EQUIPMENT ARE OPERATING UNDER BAS CONTROL. THE INTENT OF THIS REVIEW SHALL BE TO OPTIMIZE AND FINE-TUNE THIS PROGRAMMED STRATEGIES, SETTINGS, PARAMETERS AND WORKSTATION GRAPHICS. THE CONTRACTOR SHALL MAKE ADDITIONAL MODIFICATIONS AND/OR CHANGES TO THE PROGRAMMING CODE AND/OR WORKSTATION GRAPHICS AS DIRECTED BY THE ENGINEER.
- 1.3.D THE SHOP DRAWING SUBMITTAL SHALL INCLUDE THE FOLLOWING:

1. CONTROL SCHEMATICS FOR EACH SYSTEM 2. DETAILED SEQUENCE OF OPERATION FOR EACH CONTROLLED SYSTEM.

- 3. SYSTEM ARCHITECTURE INDICATING THE TYPE AND MODEL NUMBER FOR ALL BAS COMPONENTS, THE PROPOSED INTERCONNECTION AND LOCATION OF ALL PANELS, NETWORK CONNECTION AND KEY PERIPHERAL DEVICES (WORKSTATIONS, MODEMS, PRINTERS REPEATERS, ETC)
- 4. BAS POINTS LIST INDICATING THE PANEL ID, PANEL LOCATION, HARDWARE ADDRESS, POINT ACRONYM, POINT DESCRIPTION, FIELD DEVICE TYPE, POINT TYPE (I.E. AO/DO/AI/DI), END DEVICE FAIL POSITION, END DEVICE MANUFACTURE AND MODEL NUMBER AND WIRE TAG ID. 5. PROVIDE A LIST OF FIELD LABELS (I.E. LAMICOIDS) WITH PROPOSED SOFTWARE NAMES AND POINT DESCRIPTIONS.
- 6. WIRING DIAGRAMS INCLUDING COMPLETE POWER SYSTEM, INTERLOCKS, CONTROL AND DATA COMMUNICATIONS.
- 8. MANUFACTURERS' DATA/SPECIFICATION SHEETS AND CATALOGUE CUTS FOR ALL MATERIAL AND EQUIPMENT SUPPLIED, INCLUDING THE CARETAKERS' PCS. 9. AUTOMATIC CONTROL VALVE AND DAMPER, VAV BOX AND TERMINAL UNIT SCHEDULES WHERE

1.4 AS-BUILT DOCUMENTATION

- 1.4.A PREPARE ONE (1) PRELIMINARY COPY OF BAS AS BUILT AND OPERATING/MAINTENANCE MANUALS AND SUBMIT DIRECTLY TO THE ENGINEER FOR REVIEW AND ACCEPTANCE. UPON REVIEW AND ACCEPTANCE BY ENGINEER, PROCEED WITH THE PREPARATION OF MULTIPLE COPIES OF THE AS BUILT DOCUMENTATION FOR DISTRIBUTION AT THE PROJECT TURNOVER
- 1.4 B. FOR PROJECTS INVOLVING A SEPARATE MECHANICAL SUB-CONTRACTOR, OBTAIN ONE (1) HARD COPY AND ONE (1) CD OF THE FINAL MECHANICAL DOCUMENTATION FROM THE MECHANICAL CONSULTANT FOR INSERTION INTO A COMBINED BAS-MECHANICAL AS-BUILT MANUAL. SUBMIT THIS MANUAL TO THE ENGINEER FOR REVIEW AND ACCEPTANCE.
- 1.4.C ONCE THE BAS AS-BUILT DOCUMENTATION HAS BEEN ACCEPTED BY THE ENGINEER, COMBINE THE MECHANICAL FINAL DOCUMENTATION WITH THE BAS DOCUMENTATION. PREPARE AND MAKE UP SIX (6) COPIES OF THE COMBINED BAS-MECHANICAL DOCUMENTATION MANUALS AND SUBMIT THEM AT THE PROJECT TURN-OVER MEETING.
- 1.4.D $\,$ THE BAS CONTRACTOR SHALL PROVIDE A USB WITH EACH MANUAL TO INCLUDE ALL OF THE AS BUILT DOCUMENTATION CONTAINED WITHIN THE MANUAL (MECHANICAL DOCUMENTATION, FIXTURE CUTS, OPERATING/MAINTENANCE PROCEDURES, COMMISSIONING AND START-UF CERTIFICATES, WARRANTIES, LETTERS, GRAPHICS, POINTS LISTS, PROGRAMMING, SEQUENCES ETC.) AND SHALL ALSO INCLUDE AS BUILT DRAWINGS IN AUTOCAD FORMAT. KPRDSB WILL SUPPLY ELECTRONIC COPIES OF THE ORIGINAL TENDER BAS DRAWINGS TO THE BAS CONTRACTOR.
- 1.4.E THE AS-BUILT DOCUMENTATION SHALL INCLUDE THE FOLLOWING:
- 1. AN INFORMATION SHEET THAT CONTAINS: SCHOOL NAME AND ADDRESS
- A BRIEF DESCRIPTION OF THE CONTROL DETAILS. I.E. TOTAL # OF POINTS, LIST OF EQUIPMENT CONTROLS AND THE PANELS TO WHICH THEY A CONNECTED.
- PANEL'S INFORMATION I.E. PART NUMBERS FOR PANELS USED AND THERE SERIAL NUMBERS AND REVISION # (IF APPLICABLE).
- SOFTWARE VERSION
- BAS/KPRDSB WAN IP ADDRESS.
- WARRANTY START DATE AND DURATION.
- BAS CONTRACTOR NAME, ADDRESS, AND PHONE NUMBER.
- 2. DETAILED SEQUENCE OF OPERATION FOR EACH CONTROLLED SYSTEM. 3. CONTROL SCHEMATICS FOR EACH SYSTEM. INCLUDING A SYSTEM ARCHITECTURE INDICATING THE TYPE AND MODEL NUMBER FOR ALL BAS COMPONENTS, THE PROPOSED INTERCONNECTION AND LOCATION OF ALL PANELS, NETWORK CONNECTION AND KEY
- 4. BAS POINTS LIST INDICATING THE PANEL ID, PANEL LOCATION, HARDWARE ADDRESS, POINT ACRONYM, POINT DESCRIPTION, FIELD DEVICE TYPE, POINT TYPE (I.E. AO/DO/AI/DI), END DEVICE FAIL POSITION, END DEVICE MANUFACTURE AND MODEL NUMBER AND WIRE TAG ID. 5. FLOOR PLAN WITH THE LOCATION OF ALL FIELD MOUNTED CONTROL DEVICES.
- 6. PROGRAMMING CODE FOR ALL DDC CONTROLLERS. 7. WIRING DIAGRAMS INCLUDING POWER SUPPLY SYSTEM, INTERLOCKS, CONTROL AND DATA
- 8. MANUFACTURERS' DATA/SPECIFICATION SHEETS AND CATALOGUE CUTS FOR ALL MATERIAL AND EQUIPMENT SUPPLIED (E.G. VALVES, STARTERS, VFDS, ETC.), INCLUDING MATERIAL SUPPLIED UNDER A SEPARATE MECHANICAL SCOPE OF WORK. THIS SECTION SHALL INCLUDE A SUMMARY SHEET THAT INDICATES ALL BAS DEVICE, MANUFACTURERS', MODEL NUMBER,
- AND QUANTITY OF EACH USED ON THIS JOB. 9. AUTOMATIC CONTROL VALVE AND DAMPER, VAV BOX AND TERMINAL UNIT SCHEDULES WHERE
- 10. ELECTRICAL AUTHORITY INSPECTION CERTIFICATES GENERAL INSPECTION AND PRODUCT APPROVAL INSPECTION. 11. COMMISSIONING LIST INCLUDING THE NAME OF THE COMMISSIONING AGENT OF THE BAS CONTRACTOR, HIS SIGNATURE AND THE DATE OF COMMISSIONING.
- 1.4.F FOR PROJECTS THAT INCLUDE MECHANICAL PIPING RETROFITS, PROVIDE A FRAMED AND LAMINATED COLOUR SCHEMATIC OF THE AS-BUILT PIPING LAYOUT. NOMINAL DRAWING SIZE SHALL BE 24" X 18". SECURELY AFFIX THE DRAWING WITH SCREWS TO WALL OF BOILER ROOM OR OTHER SUITABLE LOCATION SUBJECT TO THE APPROVAL OF THE ENGINEER. SUBMIT A COPY
- 1.4.G PROVIDE COMPLETED KPRDSB EQUIPMENT UPDATE FORM FOR EACH PIECE OF EQUIPMENT THAT

OF THE DRAWING TO THE ENGINEER FOR APPROVAL PRIOR TO INSTALLATION.

12. BAS PROGRAMMING DATABASE AND SITE GRAPHICS STORED ON A DVD.

- HAS BEEN REMOVED AND FOR EACH NEW PIECE OF EQUIPMENT THAT HAS BEEN INSTALLED. SAMPLE FORMS SHALL BE PROVIDED BY KPRDSB.
- 1.4.H CONSULT WITH THE HEAD MAINTENANCE AT THE CONCLUSION OF THE PROJECT TO DETERMINE THE SPECIFIC EQUIPMENT OPERATING SCHEDULES REQUIRED FOR THE FACILITY. ENSURE THAT BAS WEEKLY AND HOLIDAY SCHEDULES FOR ALL CONTROLLED EQUIPMENT ARE CUSTOMIZED TO MATCH THE ACTUAL OCCUPANCY REQUIREMENTS OF THE FACILITY. INCLUDE WITH THE AS-BUILT DOCUMENTATION, A LISTING OF ALL PROGRAMMED EQUIPMENT WEEKLY SCHEDULES INSTALLED
- I.4.I PROVIDE A LISTING OF ALL NETWORK ADDRESSES AND CONFIGURATION SETTINGS FOR EACH DDC PANEL (NEW OR EXISTING) WITHIN THE FACILITY. THE INFORMATION PROVIDED SHOULD BE SUFFICIENT TO ALLOW FOR THE FUTURE REPLACEMENT AND ACTIVATION OF THE PANEL BY KPRDSB STAFF

1.5 WARRANTY

- I.5.A ALL LABOUR AND MATERIAL (HARDWARE AND SOFTWARE) SUPPLIED UNDER THIS CONTRACT SHALL BE WARRANTED FREE FROM DEFECTS FOR A PERIOD OF TWO (2) YEARS AFTER FINAL COMPLETION AND ACCEPTANCE. FINAL COMPLETION AND ACCEPTANCE IS DEFINED AS THE DATE OF THE PROJECT TURNOVER MEETING OR THE DATE OF THE FINAL COMPLETION CERTIFICATE ISSUED BY THE KPRDSB BAS COORDINATOR, WHICHEVER OCCURS FIRST CONTROL SYSTEM FAILURES DURING THE WARRANTY PERIOD SHALL BE ADJUSTED. REPAIRED OR REPLACED AT NO ADDITIONAL COST TO KPRDSB. THE CONTRACTOR SHALL RESPOND TO KPRDSB'S REQUEST FOR WARRANTY SERVICE WITHIN ONE (1) BUSINESS DAY.
- 1.5.B THE FINAL COMPLETION AND ACCEPTANCE DATE SHALL BE THE DATE OF THE PROJECT
- I.5.C ALL WORK SHALL HAVE A SINGLE WARRANTY DATE, EVEN WHEN THE OWNER HAS RECEIVED BENEFICIAL USE OF PART OF THE SYSTEM IN ADVANCE OF THE FINAL COMPLETION DATE.
- 5.D THE CONTRACTOR SHALL BE RESPONSIBLE FOR CORRECTING ANY DEFICIENCIES, ERRORS OR OMISSIONS IN OPERATING STRATEGIES, PROGRAMMING CODE, SYSTEM FUNCTIONALITY OR PARAMETERS AND OPERATOR WORKSTATION GRAPHICS DURING THE WARRANTY PERIOD.

1.6 OWNERSHIP OF PROPRIETARY MATERIAL

BAS & CONTROLS (CONT'D)

AT THE TIME OF THE PROJECT TURNOVER MEETING.

- 1.6.A ALL PROJECT-DEVELOPED SOFTWARE AND DOCUMENTATION SHALL BECOME THE PROPERTY OF KPRDSB. THESE INCLUDE, BUT ARE NOT LIMITED TO:
- 1. PROJECT GRAPHIC IMAGES 2. RECORD DRAWINGS 3. PROJECT DATABASE
- 4. PROJECT APPLICATION PROGRAMMING CODE 5. ALL DOCUMENTATION
- 1.7 FACILITIES WITH EXISTING BAS
- 1.7.A WHERE A FACILITY HAS AN EXISTING BAS THAT IS TO BE REPLACED, MODIFIED OR UPGRADED, THE CONTROLS CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THAT THE ENTIRE SYSTEM (HARDWARE, PROGRAMMING AND SYSTEM GRAPHICS) AND ALL INTEGRAL PARTS (NEW AND RE-USED) FUNCTION AS AN INTEGRATED AND SEAMLESS SYSTEM. SPECIFICALLY. THE INTERACTIVE WORKSTATION GRAPHICS SHALL BE CREATED FOR BOTH THE NEW AND RE-USED PARTS OF THE BAS USING THE LATEST AND MOST UP-TO-DATE VERSION OF THE

MANUFACTURER'S GRAPHICS SOFTWARE (SEE ALSO 1.7.D, 1.7.E, 1.7J).

- 1.7.B PROVIDE CURRENT GENERATION PRODUCTS ONLY. THE SUPPLY OF OUT-OF-DATE OR OBSOLETE PRODUCTS SHALL NOT BE ACCEPTED. THE SUPPLY OF DISCONTINUED PRODUCTS OR PRODUCTS NO LONGER SUPPORTED BY THE MANUFACTURER SHALL NOT BE ACCEPTED.
- 7.C ENSURE COMPLETE INTEROPERABILITY AND COMPATIBILITY BETWEEN NEW AND EXISTING DDC SYSTEMS AND COMPONENTS. PROVIDE SYSTEM FIRMWARE AND/OR HARDWARE UPGRADES TO EXISTING DDC PANELS/MODULES WHERE REQUIRED TO ENSURE A COMPLETE WORKING SYSTEM TO THE SATISFACTION OF THE ENGINEER. ENSURE THAT FIRMWARE REVISION LEVEL OF ALL CONTROLLERS IS THE MOST UP TO DATE AS RECOMMENDED BY THE MANUFACTURER AND IS CONSISTENT THROUGHOUT THE FACILITY.
- 1.7.D FOR EXISTING AUTOMATED LOGIC INSTALLATIONS, PROVIDE ONLY NATIVE ALC WEBCTRL CONTROLLERS AND DEVICES COMPATIBLE WITH EXEC 6 OR EXEC B FIRMWARE OR LATER. FOR ALL CONTROLLERS, PROVIDE NEW PROGRAMMING AND GRAPHICS FOR SPECIFIC USE WITH THE ALC WEBCTRL SYSTEM
- 7.E FOR EXISTING DELTA CONTROLS INSTALLATIONS, PROVIDE ONLY DELTA VERSION 3 SERIES CONTROLLERS AND DEVICES. FOR ALL CONTROLLERS, PROVIDE NEW PROGRAMMING AND GRAPHICS FOR SPECIFIC USE WITH THE DELTA VERSION 3 SERIES SYSTEM.
- .7.F WHERE AN EXISTING DDC PANEL IS RE-USED. ENSURE THAT SUFFICIENT CONTROLLER MEMORY IS PRESENT TO PROVIDE FOR ALL SPECIFIED CONTROL FUNCTIONS. PROVIDE MEMORY AND/OR PANEL UPGRADES WHERE REQUIRED TO MEET SYSTEM MEMORY REQUIREMENTS.
- .7.G ENSURE THAT ALL RE-USED DDC PANELS/MODULES ARE UPGRADED TO BE COMPATIBLE WITH THE LATEST VERSION OF SYSTEM FIRMWARE AND SYSTEM OPERATING SOFTWARE.
- 1.7.H THE CONTROLS CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THE SCOPE OF BAS RETRO-COMMISSIONING WORK (IF ANY) THAT IS INCLUDED IN THIS PROJECT. RETRO-COMMISSIONING OF THE EXISTING BAS IS NOT REQUIRED FOR MOST PROJECTS AND WILL GENERALLY BE LIMITED TO ENERGY RETROFIT AND/OR SPECIFIC BUILDING CONTROLS UPGRADE PROJECTS. PROVIDE A SEPARATE PRICE FOR THIS WORK WHERE INDICATED IN THE CONTRACT DOCUMENTS OR REQUESTED BY THE ENGINEER OR KPRDSB.
- 7.I PROVIDE NEW LABELING FOR WIRING, DEVICES AND EQUIPMENT WHERE EXISTING LABELING DOES NOT MEET THE REQUIREMENTS OF THESE SPECIFICATIONS OR WHERE PANEL HARDWARE ADDRESSING IS MODIFIED AS A RESULT OF THE NEW PROJECT WORK.
- 7.J PROVIDE ONLY NEW, CUSTOMIZED WEBCTRL OR DELTA V3 GRAPHICS FOR ANY EXISTING AUTOMATION PANELS THAT ARE RE-USED AND REMAIN PART OF THE BAS NETWORK WITHIN THE FACILITY. PROGRAMMING AND GRAPHICS MUST BE FULLY COMPATIBLE WITH THE BAS MANUFACTURER'S LATEST SOFTWARE AND FIRMWARE REVISION LEVEL.

1.8 AS FOUND CONDITIONS REPORT FOR EXISTING BAS

- I.8.A WHERE MODIFICATIONS, UPGRADES OR ADDITIONS ARE MADE TO AN EXISTING BAS, FACILITY, THE BAS CONTRACTOR SHALL CARRY OUT AN OPERATIONAL REVIEW OF ALL EXISTING BAS DEVICES PRIOR TO THE START OF ANY PROJECT WORK RELATED TO THIS CONTRACT. THE PURPOSE OF THE REVIEW IS TO PROVIDE A "SNAP SHOT" OF FOUND CONDITIONS PRIOR TO THE START OF WORK AND TO IDENTIFY ANY OPERATIONAL DEFICIENCIES OR ABNORMALITIES RELATED TO THE EXISTING BAS EQUIPMENT.
- 1.8.B THE REPORT SHALL INCLUDE THE FOLLOWING: A REPORT OR SCREEN SHOT OF ALL INPUTS TO THE SYSTEM TO VERIFY CORRECT READINGS (I.E. NO OPEN CIRCUITS OR FAILED DEVICES) A REPORT TO INDICATE WHETHER ANY HARDWARE I/O'S OR SOFTWARE OBJECTS ARE FOUND IN
- MANUAL MODE A SCREEN SHOT SHOWING WHETHER ALL DDC PANELS ARE ON-LINE AND COMMUNICATING NORMALLY COPIES OF EXISTING PANEL DATABASES AND GRAPHICS FILES
- I.8.C $\,\,$ THE REPORT SHALL BE SUBMITTED TO THE KPRDSB BAS COORDINATOR **PRIOR TO THE START OF** ANY SITE WORK. IF THIS REPORT IS NOT PROVIDED, OR IS PROVIDED AFTER SITE WORK HAS COMMENCED, THEN IT WILL BE ASSUMED THAT THE EXISTING BAS AT THE FACILITY IS OPERATING WITHOUT PROBLEMS OR DEFECTS.

1.9 INTEROPERABILITY WITH THIRD PARTY DEVICES

- I.9.A WHERE THE BAS IS INTERFACED TO THIRD PARTY DEVICES (I.E. VFDS, CHILLER PANELS, EQUIPMENT CONTROLLERS, ETC.), USE ONLY HARD-WIRED, PHYSICAL I/O'S TO ACHIEVE DESIRED
- .9.B TO FACILITATE AND SIMPLIFY POST-CONSTRUCTION SERVICING OF EQUIPMENT AND SYSTEMS BY KPRDSB STAFF, THE USE OF INDUSTRY STANDARD COMMUNICATION PROTOCOLS (I.E. BACNET, LONWORKS MODBUS) SHALL NOT BE USED TO INTERFACE THE BAS TO THIRD PARTY DEVICES, UNLESS SPECIFICALLY APPROVED BY THE KPRDSB.

1.10 TESTING, ADJUSTING AND BALANCING (TAB)

- I.10.A $\,$ WHERE SPECIFIED, PROVIDE THE SERVICES OF AN APPROVED TAB COMPANY. ENSURE THAT ALL APPLICABLE SITE PERSONNEL EMPLOYED BY THE TAB COMPANY MEET KPRDSB TRADES CERTIFICATION AND REGISTRATION REQUIREMENTS.
- I.10.B THE CONTROLS CONTRACTOR SHALL WALK THROUGH THE PROJECT WITH THE TAB ENGINEER AND DESCRIBE THE TRADE WORK ON IT.
- .10.C THE CONTROLS CONTRACTOR SHALL PROVIDE TEST HOLES AND COVERS, DRIVE CHANGES, ADDITIONAL DAMPERS, PIPE CORRECTIONS, ACCESS THROUGH CEILING, ETC AS REQUIRED BY THE TAB ENGINEER. PROVIDE STEPLADDERS, LIFTERS, SCAFFOLDS WHERE REQUIRED TO ACCESS FOR TESTING OF EQUIPMENT. REPLACE ALL TEMPORARILY REMOVED PARTS TO THEIR ORIGINAL POSITION.
- I.10.D TAB WORK SHALL BE PERFORMED TO ANSI/ASHRAE-III-1988 AND 62-1989. OTHER STANDARDS ARE AS LISTED IN THE NBCTA 1995 DIRECTORY, AABC AND NEBB PUBLICATIONS.
- 10.E THE TAB REPORT SHALL BE BASED ON TRUE TESTS WHICH ARE PROPERLY DOCUMENTED. THE REPORT SHALL HAVE ALL ELEMENTS OF DESCRIPTION, DESIGN, EQUIPMENT SUPPLIER AND TESTING DATA. THE TESTING METHOD (SET UP), APPLIED TESTING INSTRUMENTS, ACHIEVED ACCURACY AND COMFORT LEVEL NEED TO BE DESCRIBED AND COMMENTED.

BAS & CONTROLS (CONT'D) 1.10.F WHERE APPLICABLE, THE TAB REPORT SHALL HAVE THE FOLLOWING STRUCTURE:

- FRONT TITLE SHEET
- TABLE OF CONTENT SYSTEMS DESCRIPTION, TESTING METHOD AND COMMENTS
- PERFORMANCE TABLE, WHICH INCLUDES ALL SYSTEMS
- EQUIPMENT TEST SHEET C/W S.P. PROFILE AUTOCAD SCHEMATICS
- REPORT CERTIFICATION
- PERFORMANCE CURVES BUILDING PRESSURIZATION DIAGNOSIS

PART 2 PRODUCTS

DEFICIENCIES

2.0 SYSTEM HARDWARE

- 2.1.A THE SYSTEM ARCHITECTURE WILL BE COMPRISED OF PCUS (PRIMARY CONTROL UNITS), PACS (PROGRAMMABLE APPLICATION CONTROLLERS), ASCS (APPLICATION SPECIFIC CONTROLLERS) AND ANY REQUIRED COMMUNICATIONS OR INTERFACE COMPONENTS NETWORKED TOGETHER TO PROVIDE A SYSTEM OF CONNECTED CONTROLLERS THAT OPERATE AS A SINGLE BAS FOR THE ENTIRE PROJECT
- 2.1.B THE BUILDING OPERATOR SHALL BE ABLE TO ACCESS THE LOCAL BAS BY LOGGING ONTO AN EXISTING KPRDSB NETWORK PC. ALL REQUIRED SITE DATABASE AND GRAPHICS FILES SHALL RESIDE ON THE KPRDSB CENTRAL BAS SERVER.
- 2.1.C SUPPLY PCU'S, PAC'S AND ASC'S AS REQUIRED TO INTERFACE TO ALL SPECIFIED EQUIPMENT
- 2.1.D ALLOW FOR A MINIMUM OF 25% SPARE PROGRAM AND TREND MEMORY CAPACITY IN EACH PCU
- 2.1.E FOR EACH SPECIFIED BAS CONTROL POINT, THE CONTRACTOR SHALL SUPPLY THE HARDWARE POINT TYPE (E.G. AL AO, DI, DO) AS INDICATED ON THE CONTROLS POINTS LIST. THE LISE OF ALTERNATE HARDWARE POINT TYPES OR THE USE OF EXTERNAL INTERFACE CARDS OR DEVICES. TO SIMULATE THE FUNCTION OF A SPECIFIED HARDWARE POINT TYPE IS NOT ACCEPTABLE. FOR EXAMPLE. THE USE OF A DO POINT AND AN EXTERNAL PWM CARD TO SIMULATE THE FUNCTION OF A PHYSICAL AO POINT SHALL NOT BE ACCEPTED.

2.1.1 PRIMARY CONTROL UNITS (PCU)

- 2.1.1.A USE ONLY PRIMARY CONTROL UNITS TO DIRECTLY CONTROL ANY MAJOR MECHANICAL EQUIPMENT. MAJOR MECHANICAL EQUIPMENT INCLUDES AIR HANDLING UNITS, BOILER PLANTS, CHILLER PLANTS, COOLING TOWERS, ROOF-TOP UNITS AND OTHER CRITICAL EQUIPMENT.
- 2.1.1.B FOR DELTA CONTROLS, EXAMPLES OF CONTROLLERS THAT SHALL BE ACCEPTED AS A PCU:
 - DSC 1616 DSC 1212 DSC 1280
- 2.1.1.C FOR AUTOMATED LOGIC, EXAMPLES OF CONTROLLERS THAT SHALL BE ACCEPTED AS A PCU: ME-LINE MODULES SE-LINE MODULES
- 1.1.1.D EACH PCU SHALL CONTAIN A REAL TIME CLOCK AND SUFFICIENT MEMORY TO STORE THE ITS OWN APPLICATION DATABASE, OPERATING PARAMETERS, USER PROGRAMS AND TREND DATA
- 1.1.1.E BATTERY BACKUP SHALL BE PROVIDED TO SUPPORT THE REAL-TIME CLOCK AND ALL VOLATILE MEMORY FOR A MINIMUM OF 72 HOURS TO ELIMINATE OPERATING DATA RELOAD IN CASE OF
- 2.1.1.F EACH PCU OUTPUT SHALL INCLUDE A HAND/OFF/AUTO (HOA) SELECTOR SWITCH FOR EACH
- ANALOG AND DIGITAL OUTPUT 2.1.1.G EACH PCU SHALL HAVE A MINIMUM OF 10% SPARE CAPACITY FOR EACH TYPE OF INPUT AND
- 2.1.2 PROGRAMMABLE APPLICATION CONTROLLERS (PAC)

OUTPUT CHANNELS AND 10%.

- 2.1.2.A PROGRAMMABLE APPLICATION CONTROLLERS (PAC) ARE FULLY PROGRAMMABLE CONTROLLERS USED FOR CONTROLLING DISTRIBUTED EQUIPMENT INCLUDING BUT NOT LIMITED TO VAV BOXES HEAT PUMPS FORCE FLOW UNITS AND UNIT VENTUATORS. THE KPRDSB CONSIDERS EXAMPLES OF PAC'S TO INCLUDE THE ALC ZN SERIES CONTROLLERS AND THE DELTA DVC, DFC AND DAC SERIES CONTROLLERS.
- 2.1.2.B PACS SHALL <u>NOT</u> BE USED FOR CONTROLLING MAJOR MECHANICAL EQUIPMENT AS DESCRIBED
- 2.1.2.C EACH PAC SHALL CONTAIN A REAL TIME CLOCK AND SUFFICIENT RAM TO STORE ITS OWN APPLICATION DATABASE, OPERATING PARAMETERS, USER PROGRAMS AND TREND DATA
- 2.1.2.D BATTERY BACKUP SHALL BE PROVIDED TO SUPPORT THE REAL-TIME CLOCK AND ALL VOLATILE MEMORY FOR A MINIMUM OF 72 HOURS TO ELIMINATE OPERATING DATA RELOAD IN CASE OF
- 2.1.2.E THE USE OF PACS SHALL $\underline{\mathsf{NOT}}$ BE PERMITTED UNLESS WRITTEN APPROVAL IS OBTAINED FROM

2.1.3 APPLICATION SPECIFIC CONTROLLERS (ASC)

- 2.1.3.A APPLICATION SPECIFIC CONTROLLERS (ASC) ARE PRE-PROGRAMMED CONTROLLERS USED TO CONTROL LARGE QUANTITIES OF DISTRIBUTED EQUIPMENT SUCH AS HEAT PUMPS OR VAV
- 2.1.3.B ASCS SHALL NOT BE USED TO CONTROL MAJOR MECHANICAL EQUIPMENT OR COMMON EQUIPMENT SUCH AS EXHAUST FANS, FORCE FLOW UNITS, UNIT VENTILATORS OR URINAL TANK
- 2.1.3.C THE USE OF ASCS SHALL $\underline{\mathsf{NOT}}$ BE PERMITTED UNLESS WRITTEN APPROVAL IS OBTAINED FROM THE ENGINEER.

2.1.4 FAIL STATE POSITION OF OUTPUTS

- 2.1.4.A UNLESS SPECIFIED OTHERWISE, CONFIGURE BAS OUTPUT POINTS FOR THE FOLLOWING FAIL
- STATE (E.G. DEVICE POSITION UPON PANEL FAILURE): HEATING VALVES FULL HEAT TO TERMINAL DEVICE MIXING DAMPERS FULL RE-CIRCULATION AIR
- FACE/BYPASS DAMPERS FULL HEAT ZONE DAMPERS **FULL HEAT** HEATING PUMPS ON (EXCEPT BOILER BELLY PUMPS)
- BOILER BELLY PUMPS VARIABLE FREQUENCY DRIVES ON, MINIMUM PROGRAMMED SPEED LIGHTING RELAYS LAST STATE BOILERS (1 STAGE) LOW ON, HIGH OFF
- BOILERS (MULTI-STAGE) COOLING EQUIPMENT ELECTRIC HEATING DOMESTIC HOT WATER PUMPS ROOF-TOP GAS BURNERS
- 2.2 SYSTEM SOFTWARE

2.2.1 BAS ALARM OUTPUT / SURVEILLANCE SYSTEM ARMED STATUS

- 2.2.1.A PROVIDE A BINARY OUTPUT POINT AND NORMALLY-CLOSED RELAY FOR THE BAS ALARM. THE BAS ALARM OUTPUT SHALL BE ACTIVATED WHEN ANY MONITORED SPACE TEMPERATURE IS LESS THAN 10C AND THE OUTDOOR AIR TEMPERATURE IS LESS THAN 5C. ON BAS PANEL FAILURE, THE BAS ALARM OUTPUT SHALL FAIL TO THE NON-ALARM (CONTACTS CLOSED) STATE.
- 2.2.1.B PROVIDE A BINARY INPUT AND 10VDC RELAY TO MONITOR THE BUILDING SURVEILLANCE PANEL ARMED STATUS. THE RELAY SHALL BE ENERGIZED WHEN THE BUILDING SURVEILLANCE SYSTEM
- 2.2.1.C PROVIDE WIRING FROM THE BAS PANEL TO THE DESIGNATED BUILDING SURVEILLANCE PANEL. TERMINATION TO THE SURVEILLANCE PANEL SHALL BE PERFORMED BY KPRDSB. ENSURE SUFFICIENT SPARE CABLING IS PROVIDED TO ALLOW FOR TERMINATION BY OTHERS.

2.3 BAS DYNAMIC GRAPHICS

- 2.3.A PROVIDE CUSTOMIZED, SITE SPECIFIC DYNAMIC GRAPHICS TO MEET THE REQUIREMENTS OF THE CONSULTANT AND/OR THE KPRDSB ENGINEER.
- 2.3.B CONTACT THE KPRDSB ENGINEER FOR SPECIFIC REQUIREMENTS REGARDING BAS GRAPHICS CONTENT, LAYOUT AND FUNCTIONALITY.

2.4 FIELD DEVICES

BAS & CONTROLS (CONT'D) **BAS & CONTROLS (CONT'D)**

2.4.1 AUTOMATIC CONTROL VALVES

- 2.4.1.A AUTOMATIC CONTROL VALVES SHALL BE SUPPLIED BY THE CONTROLS CONTRACTOR AND
- INSTALLED BY THE MECHANICAL CONTRACTOR. 2.4.1.B AUTOMATIC CONTROL VALVES, UNLESS OTHERWISE SPECIFIED, SHALL BE GLOBE TYPE VALVES. THE USE OF BALL VALVES IN SIZES 1-1/2" (40MM) AND SMALLER SHALL ALSO BE ACCEPTABLE.
- VALVES AND ACTUATORS SHALL BE ORDERED AS ONE FACTORY-ASSEMBLED AND TESTED UNIT. 2.4.1.C SUBMIT TO THE ENGINEER FOR REVIEW, A VALVE SCHEDULE CONTAINING THE FOLLOWING INFORMATION FOR EACH VALVE:
- a. VALVE TYPE AND SIZE
- b. CONNECTION TYPE
- c. LINE SIZE d. VALVE MANUFACTURER AND MODEL NUMBER
- e. VALVE FLOW COEFFICIENT DESIGN FLOW
- PRESSURE DROP ACROSS VALVE MAXIMUM CLOSE-OFF PRESSURE
- ACTUATOR MANUFACTURER AND MODEL NUMBER ACTUATOR MAXIMUM TORQUE
- 2.4.1.D VALVES 2" (50MM) AND SMALLER SHALL BE CONSTRUCTED OF BRONZE. VALVES 2 1/2" (65MM) AND LARGER SHALL HAVE IRON BODIES AND BRONZE MOUNTINGS.
- 2.4.1.E ALL CONTROL VALVES SHALL HAVE STAINLESS STEEL STEMS. BALL VALVES SHALL BE EQUIPPED WITH STAINLESS STEEL BALLS AND STEMS.
- 2.4.1.F THE BRONZE IN BODIES AND BONNETS OF ALL BRONZE VALVES SHALL CONFORM TO ASTM B62 FOR VALVES RATED UP TO 150PSIG (1035 KPA) WORKING PRESSURE AND TO ASTM B61 FOR VALVES RATED AT 200 PSIG (1380 KPA) WORKING PRESSURE.
- 2.4.1.G THE BODIES AND BONNETS OF IRON BODY VALVES SHALL CONFORM TO ASTM A126, CLASS B. 2.4.1.H CONTROL VALVE DISCS AND SEATS SHALL BE OF BRONZE FOR 100 °C OR LESS FLUID

TEMPERATURE AND OF STAINLESS STEEL FOR FILLID TEMPERATURES ABOVE 100 °C.

- 2.4.1.I THE CONTROL VALVES SHALL HAVE TIGHT SHUT-OFF. FLAT DISK VALVES ARE NOT ACCEPTABLE. 2.4.1.J CONTROL VALVES 2" (50MM) AND SMALLER SHALL BE COMPLETE WITH SCREWED ENDS TYPE EXCEPT FOR BRONZE VALVES INSTALLED IN SOLDERED COPPER PIPING WHICH SHALL BE COMPLETE WITH SOLDERING ENDS. CONTROL VALVES LARGER THAN 2" (50MM) SHALL BE
- COMPLETE WITH FLANGED END TYPE AND PROPER FLANGED ADAPTERS TO COPPER SHALL BE PROVIDED WHERE FLANGED VALVES ARE INSTALLED IN COPPER PIPING

2.4.1.K THE WATER CONTROL VALVES SHALL BE SIZED FOR A PRESSURE DROP OF 6 FT. WATER COLUMN

- OR AS INDICATED ON MECHANICAL DRAWINGS. 2.4.1.L THE ZONE STEAM CONTROL VALVES SHALL BE SIZED FOR THE RESPECTIVE STEAM FLOWS AND PRESSURE DROP OF 25% OF THE INLET ABSOLUTE MAXIMUM OPERATING PRESSURE.
- 2.4.1.MEACH AUTOMATIC CONTROL VALVE MUST PROVIDE THE DESIGN OUTPUT AND FLOW RATES AT PRESSURE DROPS COMPATIBLE WITH EQUIPMENT SELECTED.

2.4.1.N EACH AUTOMATIC CONTROL VALVE MUST BE SUITABLE FOR THE PARTICULAR SYSTEM WORKING

- 2.4.1.0 EACH AUTOMATIC CONTROL VALVE SHALL BE FITTED WITH A POSITION INDICATOR.
- .4.1.P ALL THE SAME TYPE CONTROL VALVES SHALL BE THE PRODUCTS OF A SINGLE MANUFACTURER AND HAVE THE MANUFACTURER'S NAME, PRESSURE RATING AND SIZE CLEARLY MARKED ON THE OUTSIDE OF THE BODY.
- .4.1.QUNLESS OTHERWISE INDICATED AND EXCEPT THE STEAM ZONE CONTROL VALVES, CONTROL VALVES FOR PROPORTIONAL OPERATION SHALL HAVE EQUAL PERCENTAGE CHARACTERISTICS, WHILE THE CONTROL VALVES FOR OPEN/SHUT TWO-POSITION OPERATION SHALL HAVE STRAIGHT LINE FLOW CHARACTERISTICS.
- 2.4.1.R THE ZONE STEAM CONTROL VALVES SHALL HAVE LINEAR CHARACTERISTICS.

2.4.1.S HEATING VALVES SHALL BE NORMALLY OPEN AND COOLING VALVES ARE TO BE NORMALLY CLOSED, UNLESS OTHERWISE SPECIFIED.

- a. SIEMENS FLOWRITE GLOBE VALVE WITH SKC/SKD ACTUATORS
- b. BELIMO B2/B3 SERIES CCV BALL VALVE, STAINLESS STEEL, (SIZES 1" AND SMALLER) BELIMO B2-HT (HIGH TEMPERATURE) BALL VALVE, STAINLESS STEEL, FOR LOW PRESSURE

STEAM APPLICATIONS (SIZES 1" AND SMALLER) 2.4.2 AUTOMATIC CONTROL VALVE ACTUATORS

2.4.1.T STANDARD OF ACCEPTANCE

- 2.4.2.A EACH AUTOMATIC CONTROL VALVE SHALL BE FITTED WITH A "FAIL-SAFE" OPERATOR CAPABLE OF
- TIGHT SHUT-OFF AGAINST THE DIFFERENTIAL IMPOSED BY THE SYSTEM. 2.4.2.B FOR INTERIOR ZONE APPLICATIONS SUCH AS PERIMETER RADIATION, VAV BOX COILS AND FORCE FLOW UNITS WHERE THERE IS MINIMAL RISK OF EQUIPMENT FREEZING DUE TO ACTUATOR
- FAILURE, THE USE OF NON-SPRING RETURN ACTUATORS SHALL BE ALLOWED. 2.4.2.C OPERATORS FOR VALVES IN ELECTRIC-ELECTRONIC CONTROL SYSTEMS SHALL BE SINGLE
- PHASE AC, 24V ELECTRIC MOTOR OPERATORS. 2.4.2.D VALVE ACTUATORS ON VALVES 2 IN. DIA. AND LARGER SHALL BE PROVIDED WITH A MANUAL
- 2.4.2.E VALVE ACTUATORS SHALL ACCEPT A 0-10VDC OR 4-20MA CONTROL SIGNAL FOR ALL PROPORTIONAL APPLICATIONS

2.4.2.F FLOATING POINT CONTROL OF VALVES IS NOT ACCEPTABLE UNDER ANY CIRCUMSTANCES.

POSITION OVERRIDE

- 2.4.3 AUTOMATIC CONTROL DAMPERS 2.4.3.A THE AUTOMATIC CONTROL DAMPERS NOT PROVIDED AS PART OF THE PACKAGED EQUIPMENT SHALL BE SUPPLIED BY THE CONTROL SUBCONTRACTOR AND INSTALL BY THE MECHANICAL

2.4.3.B THE AUTOMATIC CONTROL DAMPERS SHALL BE OPPOSED BLADE TYPE FOR MIXING AND

- PARALLEL BLADE TYPE FOR "ON-OFF" SERVICE. 2.4.3.C MAXIMUM DAMPER BLADE LENGTH SHALL BE 4'-0"(1.2M). MAXIMUM PERMISSIBLE LEAKAGE SHALL NOT EXCEED 1% OF THE TOTAL FLOW BASED ON AN APPROACH VELOCITY OF 1,500FPM(7.5M/S) OVER A TEMPERATURE RANGE OF -30 °F (-34.4 °C) TO 100 °F (37.7 °C) AND A PRESSURE OF 3 IN H20 (0.75 KPA). UNLESS OTHERWISE NOTED, BLADES ARE TO BE CONSTRUCTED OF FORMED GALVANIZED STEEL WITH NEOPRENE SEAL EDGES, CONTINUOUS STOPS AND SEALS ON ALL
- SIDES, OIL IMPREGNATED BRONZE BEARINGS AND GALVANIZED STEEL CHANNEL FRAMES. 2.4.3.D CENTRE BAR LINKAGE CONNECTORS SHALL BE USED WHEREVER POSSIBLE BUT WHERE CENTRE BAR LINKAGE CANNOT BE USED DUE TO SPACE LIMITATIONS, EXTERNAL LINKAGE CONNECTORS

OR TWO POSITION CONTROL DAMPERS.

2.4.4 AUTOMATIC CONTROL DAMPER ACTUATORS 2.4.4.A ALL NEW ACTUATORS FOR CONTROL DAMPERS SHALL BE ELECTRIC TYPE AND BE POWERED BY A SINGLE PHASE AC 24V OVERLOAD-PROOF SYNCHRONOUS MOTOR.

2.4.4.B ALL NEWLY PROVIDED ACTUATORS SHALL BE DIRECT-COUPLED TYPE FOR BOTH MODULATING

- 2.4.4.C DAMPER ACTUATORS SHALL ACCEPT A 0-10VDC CONTROL VOLTAGE SIGNAL FOR ALL PROPORTIONAL APPLICATIONS
- 2.4.4.D ALL DAMPER ACTUATORS SHALL BE SELECTED TO OPERATE MAXIMUM DAMPER LOADS OF 28 2.4.4.E EACH ACTUATOR SHALL BE "FAIL SAFE", COMPLETE WITH EXTERNAL ADJUSTABLE STOPS TO LIMIT THE LENGTH OF STROKE IN EITHER DIRECTION AND MOUNTED ON AN ADJUSTABLE

BRACKET. OPERATING ARMS SHALL HAVE DOUBLE YOKE LINKAGES AND DOUBLE SET OF

2.4.4.F THE STANDARD OF ACCEPTANCE SHALL BE BELIMO.

2.4.5 SPACE TEMPERATURE SENSORS

SCREWS FOR FASTENING TO THE DAMPER SHAFT.

- 2.4.5.A SENSORS SHALL UTILIZE A 10KOHM THERMISTOR TO SENSE TEMPERATURE.
- 2.4.5.B STANDARD TEMPERATURE SENSORS SHALL USE A VENTILATED DESIGN INCORPORATING A TWO-PIECE ABS CASE.

2.4.5.C PROVIDE STAINLESS STEEL, VENTILATED PLATE-TYPE TEMPERATURE SENSORS FOR INSTALLATION IN PUBLIC AREAS SUCH AS STAIRWAYS, VESTIBULES, LOBBIES, GYMNASIUMS AND

- .4.5.D MOUNT SENSORS AT A HEIGHT OF 60" ABOVE THE FINISHED FLOOR. UNLESS INDICATED OTHERWISE, MOUNT NEW SENSORS ADJACENT TO THE EXISTING THERMOSTAT IN THE SPACE.
- .4.5.E END-TO-END ACCURACY +/- 0.3 °C OVER THE ENTIRE OPERATING RANGE.
- .4.5.G DO NOT MOUNT SENSORS ON OUTSIDE WALLS OR OTHER LOCATIONS INFLUENCED BY EXTERNAL

- ANTICIPATOR AND FIXED COOLING ANTICIPATOR, SYSTEM AND FAN SWITCHING SUBBASE

- .4.6.D THE STANDARD OF ACCEPTANCE SHALL BE HONEYWELL T874 WITH Q674E SUBBASE AND
- EQUIPPED WITH A STYLIZED HOUSING SUITABLE FOR WALL MOUNTING IN FINISHED AREAS, AN

- .4.7.A CURRENT SENSORS (CT) SHALL BE USED FOR STATUS MONITORING OF ALL MOTOR-DRIVEN
- .4.7.C THE CURRENT SENSORS SHALL BE MOUNTED INSIDE THE STARTER CABINETS WHENEVER

.4.7.D STANDARD OF ACCEPTANCE

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- 2.4.8.A THE STATUS RELAYS SHALL BE MOUNTED INSIDE NEWLY PROVIDED ENCLOSURES MOUNTED
- 4.9.A PROVIDE AIR PRESSURE TRANSMITTERS WITH THE FOLLOWING MINIMUM CHARACTERISTICS:
- a. SOLID STATE DESIGN.
- TEMPERATURE COMPENSATION. e. 4-20MA OUTPUT ONLY. VOLTAGE OUTPUT IS NOT ACCEPTABLE.

INSTALLATION METHOD.

SETRA MODEL 264

- .4.10 DUCT TEMPERATURE SENSORS

d. ASSEMBLY COMPLETE WITH WIRING HOUSING AND MOUNTING FLANGE.

- 2.4.11 DUCT AVERAGING TEMPERATURE SENSORS
- 2.4.11.A PROVIDE PLENUM MOUNTED MIXED AIR TEMPERATURE AVERAGING TYPE SENSORS WITH THE FOLLOWING MINIMUM CHARACTERISTICS:
- TEMPERATURE SENSORS ENCAPSULATED AT EQUAL DISTANCES ALONG THE 24 FOOT LENGTH OF THE ELEMENT. THE ASSEMBLY ACTS AS A SINGLE SENSOR REPORTING THE
- c. MOUNT IN A ZIGZAG MANNER TO PROVIDE CONTINUOUS COVERAGE OF THE ENTIRE DUCT CROSS-SECTIONAL AREA.

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- .4.12.A PROVIDE OUTDOOR AIR TEMPERATURE SENSORS WITH THE FOLLOWING MINIMUM CHARACTERISTICS:
- c. BOTH SENSORS SHALL BE MOUNTED INSIDE A HEAVY-DUTY (BLOW-PROOF) SOLAR SHIELD. d. PROVIDE A HEAVY-DUTY, METAL, WIRE GUARD.

.4.12.B STANDARD OF ACCEPTANCE:

- a. THE PUSH BUTTON SHALL BE SURFACE MOUNTED.
- KLOCKNER MOELLER RD-111/KC/

2.4.5.F PROVIDE A HEAVY-DUTY METAL GUARD FOR EXISTING ZONE THERMOSTATS THAT REMAIN IN SERVICE. IN A TYPICALLY CLASSROOM. THIS WOULD BE A PNEUMATIC THERMOSTAT CONTROLLING A PERIMETER HEATING VALVE. IN THIS SITUATION, THE SPACE SENSOR IS MONITORING TEMPERATURE ONLY AND NOT DIRECTLY CONTROLLING AN END DEVICE.

2.4.5.H STANDARD OF ACCEPTANCE:

- 2.4.6.A PROVIDE NEW THERMOSTATS TO REPLACE EXISTING WHERE SPECIFIED.
- ACCEPTED AS AN ALTERNATE TO THE THERMOSTAT IN 2.4.6.D. THE CONTROLLER SHALL BE

- NOT BE ACCEPTED. END-TO-END ACCURACY +/- 1% OF FULL SCALE AT EACH RANGE.

2.4.8 STATUS RELAYS (SOLID STATE)

- 2.4.8.B STANDARD OF ACCEPTANCE:
- 2.4.9 AIR DIFFERENTIAL PRESSURE TRANSMITTER
- b. OPERATING ON CAPACITANCE PRINCIPLE. WITH NON-INTERACTIVE FINE RESOLUTION ZERO AND SPAN ADJUSTMENTS. d. END-TO-END ACCURACY +/- 1% OF FULL SCALE PRESSURE RANGE, INCLUDING
- 2.4.9.B PROVIDE A PITOT-TUBE STYLE STATIC OR VELOCITY PRESSURE PROBE (8" NOMINAL) AND FITTING
- .4.10.A PROVIDE DUCT MOUNTED TEMPERATURE SENSORS (DTS) WITH THE FOLLOWING MINIMUM

a. SENSOR ENCAPSULATED IN A 200MM LONG, 6MM OD COPPER OR STAINLESS STEEL PROBE. b. OPERATING RANGE 0-60 DEGREES C.

- a. CONSTRUCTED OF FT6 PLENUM RATED CABLE INCORPORATING A MINIMUM OF 9
- b. END-TO-END ACCURACY +/- 0.3 °C.

AVERAGE TEMPERATURE FROM ALL INDIVIDUAL SENSORS.

d. THE USE OF THERMISTOR TYPE SENSORS IS ACCEPTABLE.

- .4.12 OUTDOOR AIR TEMPERATURE SENSORS
- a. EACH SENSOR SHALL BE 10KOHM THERMISTOR PROBE b. PROVIDE TWO SENSORS FOR EACH SITE.

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CHARACTERISTICS:

b. THE CASING SHALL BE HEAVY-DUTY AND ABRASION-PROOF.

a. THE UNIT SHALL HAVE A BUTTON THAT IS FLUSH WITH CASING.

2.4.13.B STANDARD OF ACCEPTANCE:

THERMAL SOURCES (E.G. COMPUTERS, BOILER ROOMS).

ENERCORP, GREYSTONE

- 2.4.6 HEATING/COOLING THERMOSTATS (LOW VOLTAGE)
- 2.4.6.B UNLESS INDICATED OTHERWISE, THERMOSTATS SHALL BE EQUIPPED WITH COILED BIMETAL SENSING ELEMENTS AND MERCURY SWITCHES. INDIVIDUAL HEATING AND COOLING SETPOINT LEVERS, MULTIPLE STAGES OF HEATING AND COOLING AS REQUIRED, ADJUSTABLE HEATING

(OFF-HEAT-COOL-AUTO) AND KEY LOCK COVER WITH INTERNAL THERMOMETER.

- .4.6.C MOUNT NEW THERMOSTATS IN THE SAME LOCATION AS EXISTING.
- TG504A1025 KEY LOCK COVER WITH INTERNAL THERMOMETER .4.6.E THE USE OF A FULLY PROGRAMMABLE, NATIVE BACNET, DIGITAL ROOM CONTROLLER SHALL BE

LCD DISPLAY AND KEYPAD. THE STANDARD OF ACCEPTANCE SHALL BE DELTA DNT-T305.

.4.6.F RETURN EXISTING THERMOSTATS, WHERE REPLACED, TO THE ENGINEER.

- .4.7 CURRENT SENSORS (ANALOG)
- EQUIPMENT, WHERE SPECIFIED. .4.7.B TECHNICAL PERFORMANCE - OUTPUT SHOULD BE ONLY 4-20MA ONLY. VOLTAGE OUTPUT WILL
- POSSIBLE. IF THIS IS NOT POSSIBLE DUE TO SPACE LIMITATION, PROVIDE AN ENCLOSURE TO HOUSE THE SENSOR.
- NEAR THE RESPECTIVE EQUIPMENT STARTER CABINETS
- a. OMRON G7L-1A

- .4.9.C STANDARD OF ACCEPTANCE:

c. END-TO-END ACCURACY +/- 0.3 °C

- .4.10.B STANDARD OF ACCEPTANCE: ENERCORP, GREYSTONE

- .4.11.B STANDARD OF ACCEPTANCE:

- 4.13.A WHERE SPECIFIED, PROVIDE A PUSH BUTTON WITH THE FOLLOWING MINIMUM

Spectra

Drawing Overall Scale

DESIGNED BY: M.A.

DRAWN BY: J.L.

APPROVED BY: M.A.

PROJECT NO.: 1021225

8/12/2021

DATE

REV.

Kawartha Pine Ridge

AS SHOWN

TERRY FOX PUBLIC SCHOOL COBOURG

HRV-HWT-BAS INSTRUMENTATION

1065 RIDDELL AVE, COBOURG, ON K9A 5N4

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DESCRIPTION

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Engineering

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District School Board

MECHANICAL SERVICES MECHANICAL SPECIFICATIONS II

> QOFESSION, > M. Akhanan M.AKHAVANBAZAZ 100088319

Engineer / Architect Stamp

Drawing No. Phase Revisi M-101

FROM 0.15 TO 60A (MINIMUM).

2.4.14 CURRENT SWITCHES

- 2.4.14.B THE CURRENT SENSOR SHALL PROVIDE ON/OFF STATUS INDICATION OF ELECTRICAL
- 2.4.14.C THE CURRENT SENSORS SHALL BE MOUNTED INSIDE THE STARTER CABINETS WHENEVER POSSIBLE. IF THIS IS NOT POSSIBLE DUE TO SPACE LIMITATION, PROVIDE AN ENCLOSURE TO HOUSE THE SENSOR
- 2.4.14.D THE CURRENT SENSOR SHALL BE ISOLATED TO 600VAC RMS (UL RATINGS), 300VAC RMS (CE RATINGS)
- 2.4.14.E THE CURRENT SENSOR OUTPUT SHALL BE N.O., SOLID STATE, 1A @30VAC/DC

2.4.14.F STANDARD OF ACCEPTANCE:

a. VERIS INDUSTRIES - HAWKEYE H300/H600

2.4.15 FIRESTOPPING AND SMOKE SEAL MATERIALS

- 2.4.15.A ASBESTOS-FREE ELASTOMERIC MATERIALS TESTED. LISTED AND LABELLED BY ULC IN ACCORDANCE WITH CAN4-S115-M85, FOR INSTALLATION IN U.L.C. DESIGNATED FIRESTOPPING AND SMOKE SEAL SYSTEMS. THESE SYSTEMS SHALL PROVIDE A POSITIVE FIRE, WATER AND SMOKE SEAL AND A FIRE- RESISTANCE RATING (FLAME, SMOKE HOSE STREAM AND TEMPERATURE) NOT LESS THAN THE FIRE RESISTANCE RATING OF SURROUNDING
- 2.4.15.B MATERIALS SHALL FORM ULC LISTED OR UL CLASSIFIED ASSEMBLIES AND BE COMPATIBLE WITH ABUTTING DISSIMILAR MATERIALS AND FINISHES.
- 2.4.15.C STANDARD OF ACCEPTANCE:
- a. 3M CANADA LIMITED
- b. A/D FIRE PROTECTION SYSTEM LTD. c. FIRE STOP SYSTEM
- 2.4.16 MOTOR STARTERS AND ACCESSORIES
- 2.4.16.A STARTERS SHALL BE CSA AND ULC APPROVED
- 2.4.16.B STARTERS SHALL BE FULL VOLTAGE, NON-REVERSING MAGNETIC STARTERS. FULI PROTECTION IS TO BE PROVIDED IN THE STARTERS BY MEANS OF ONE THERMAL OVERLOAD RELAY PER PHASE PER STARTER WITH MANUAL RESET BUTTON TO SUIT THE SERVICE FACTOR AND ACCELERATION TIME OF THE MOTOR SERVED.
- 2.4.16.C STARTERS SHALL BE EQUIPPED WITH AUXILIARY CONTACTS TO SATISFY INTERLOCKING AND AUTOMATIC CONTROL REQUIREMENTS, "HAND-OFF-AUTOMATIC" SWITCHES, PILOT LIGHTS (GREEN-ON: RED-OFF), THERMAL OVERLOADS, NECESSARY FUSES AND CONTROL TRANSFORMER (IF REQUIRED) FOR OPERATION OF ALL CONTROLS ON 120V SINGLE PHASE.
- 2.4.16.D WHERE REQUIRED BY APPLICABLE CODES, STARTERS SHALL BE EQUIPPED WITH "QUICK-MAKE" AND "QUICK-BREAK" FUSED DISCONNECTS.
- 2.4.16.E STANDARD OF ACCEPTANCE:
- SQUARE D CO. LTD. b. ALLEN-BRADLEY CANADA LTD
- c. SIEMENS
- d. EATON/CUTLER-HAMMER e. MOELLER
- 2.4.16.F FUSES IN STARTERS TO BE CSA CERTIFIED FORM 1, CURRENT AND ENERGY LIMITING TYPE 200,000 AMPERE INTERRUPTING CAPACITY WITH NEMA CLASS "J" REJECTION TYPE MOUNTINGS.
- 2.4.16.G SIZE FUSES INSTALLED IN STARTERS OR IN DISCONNECT SWITCHES USED IN CONJUNCTION WITH MAGNETIC STARTERS, FOR MOTOR AND BRANCH CIRCUIT PROTECTION IN ACCORDANCE WITH FUSE MANUFACTURER'S RECOMMENDATIONS. PROVIDE ONE SPARE SET OF THREE FUSES FOR EACH RATING AND TYPE OF FUSE USED.
- 2.4.16.H STANDARD OF ACCEPTANCE:
- a. APPLETON ELECTRIC COMPANY b. CHASE SHAWMUTT-AMP, TRAP
- c. ENGLISH ELECTRIC COMPANY OF CANADA
- 2.4.16.I ENCLOSURES FOR LOOSE STARTERS ARE TO BE EEMAC 1A, UNLESS OTHERWISE SPECIFIED

2.4.17 VARIABLE FREQUENCY MOTOR DRIVES

2.4.17.1 PRODUCTS

- 1. ENVIRONMENTAL OPERATING CONDITIONS: 0 TO 40C CONTINUOUS. VFD'S THAT CAN OPERATE AT 40 C INTERMITTENTLY (DURING A 24 HOUR PERIOD) ARE NOT ACCEPTABLE AND MUST BE OVERSIZED. ALTITUDE 0 TO 3300 FEET ABOVE SEA LEVEL, LESS THAN 95% HUMIDITY NON-CONDENSING
- 2. ENCLOSURE SHALL BE RATED UL TYPE 1 AND SHALL BE UL LISTED AS A PLENUM RATED VFD. VFD'S WITHOUT THESE RATINGS ARE NOT ACCEPTABLE.
- 3. FOR 600V NETWORKS, THE INPUT VOLTAGE OF THE VFD SHALL BE RATED 500V -10% TO 600V + 10% MINIMUM. VFD RATED FOR 575V +/- 10% OR LESS ARE NOT ACCEPTABLE.
- 4. ALL VFDS SHALL HAVE THE FOLLOWING STANDARD FEATURES: a. ALL VFDS SHALL HAVE THE SAME CUSTOMER INTERFACE, INCLUDING DIGITAL DISPLAY, AND KEYPAD, REGARDLESS OF HORSEPOWER RATING. THE KEYPAD SHALL BE REMOVABLE, CAPABLE OF REMOTE MOUNTING AND ALLOW FOR UPLOADING AND DOWNLOADING OF
- PARAMETER SETTINGS AS AN AID FOR START-UP OF MULTIPLE VFDS. b. THE KEYPAD SHALL INCLUDE HAND-OFF-AUTO SELECTIONS AND MANUAL SPEED CONTROL. THE DRIVE SHALL INCORPORATE "BUMPLESS TRANSFER" OF SPEED REFERENCE WHEN SWITCHING BETWEEN "HAND" AND "AUTO" MODES. THERE SHALL BE FAULT RESET AND "HELP" BUTTONS ON THE KEYPAD. THE HELP BUTTON SHALL INCLUDE "ON-LINE"
- ASSISTANCE FOR PROGRAMMING AND TROUBLESHOOTING. c. THERE SHALL BE A BUILT-IN TIME CLOCK IN THE VFD KEYPAD. THE CLOCK SHALL HAVE A BATTERY BACKUP WITH 10 YEARS MINIMUM LIFE SPAN. THE CLOCK SHALL BE USED TO DATE AND TIME STAMP FAULTS AND RECORD OPERATING PARAMETERS AT THE TIME OF FAULT. IF THE BATTERY FAILS, THE VFD SHALL AUTOMATICALLY REVERT TO HOURS OF OPERATION SINCE INITIAL POWER UP. THE CLOCK SHALL ALSO BE PROGRAMMABLE TO CONTROL START/STOP FUNCTIONS, CONSTANT SPEEDS, PID PARAMETER SETS AND OUTPUT RELAYS. THE VFD SHALL HAVE A DIGITAL INPUT THAT ALLOWS AN OVERRIDE TO THE TIME CLOCK (WHEN IN THE OFF MODE) FOR A PROGRAMMABLE TIME FRAME. THERE SHALL BE FOUR (4) SEPARATE, INDEPENDENT TIMER FUNCTIONS THAT HAVE BOTH WEEKDAY AND WEEKEND
- d. THE VFD'S SHALL UTILIZE PRE-PROGRAMMED APPLICATION MACRO'S SPECIFICALLY DESIGNED TO FACILITATE START-UP. THE APPLICATION MACROS SHALL PROVIDE ONE COMMAND TO REPROGRAM ALL PARAMETERS AND CUSTOMER INTERFACES FOR A PARTICULAR APPLICATION TO REDUCE PROGRAMMING TIME. THE VFD SHALL HAVE TWO USER MACROS TO ALLOW THE END-USER TO CREATE AND SAVE CUSTOM SETTINGS.
- e. THE VFD SHALL HAVE COOLING FANS THAT ARE DESIGNED FOR EASY REPLACEMENT. THE FANS SHALL BE DESIGNED FOR REPLACEMENT WITHOUT REQUIRING REMOVING THE VFD FROM THE WALL OR REMOVAL OF CIRCUIT BOARDS. THE VFD COOLING FANS SHALL OPERATE ONLY WHEN REQUIRED. TO EXTEND THE FAN AND BEARING OPERATING LIFE, OPERATING TEMPERATURE WILL BE MONITORED AND USED TO CYCLE THE FANS ON AND
- f. THE VFD SHALL BE CAPABLE OF STARTING INTO A COASTING LOAD (FORWARD OR REVERSE) UP TO FULL SPEED AND ACCELERATE OR DECELERATE TO SETPOINT WITHOUT SAFETY TRIPPING OR COMPONENT DAMAGE (FLYING START).
- THE VFD SHALL HAVE THE ABILITY TO AUTOMATICALLY RESTART AFTER AN OVER-CURRENT OVER-VOLTAGE, UNDER-VOLTAGE, OR LOSS OF INPUT SIGNAL PROTECTIVE TRIP. THE NUMBER OF RESTART ATTEMPTS, TRIAL TIME, AND TIME BETWEEN ATTEMPTS SHALL BE
- h. THE OVERLOAD RATING OF THE DRIVE SHALL BE 110% OF ITS NORMAL DUTY CURRENT RATING FOR 1 MINUTE EVERY 10 MINUTES, 130% OVERLOAD FOR 2 SECONDS. THE MINIMUM FLA RATING SHALL MEET OR EXCEED THE VALUES IN THE NEC/UL TABLE 430-150 FOR 4-POLE
- i. THE VFD SHALL HAVE AN INTEGRAL 5% IMPEDANCE LINE REACTORS TO REDUCE THE HARMONICS TO THE POWER LINE AND TO ADD PROTECTION FROM AC LINE TRANSIENTS THE 5% IMPEDANCE MAY BE FROM DUAL (POSITIVE AND NEGATIVE DC BUS) REACTORS, OR 5% AC LINE REACTORS. VFD'S WITH ONLY ONE DC REACTOR SHALL ADD AC LINE REACTORS. THE INPUT CURRENT RATING OF THE VFD SHALL BE NO MORE THAN 3% GREATER THAN THE OUTPUT CURRENT RATING.
- k. THE VFD SHALL INCLUDE A COORDINATED AC TRANSIENT PROTECTION SYSTEM CONSISTING OF 4-120 JOULE RATED MOV'S (PHASE TO PHASE AND PHASE TO GROUND), A CAPACITOR CLAMP, AND 5% IMPEDANCE REACTORS.
- I. THE VFD SHALL BE CAPABLE OF SENSING A LOSS OF LOAD (BROKEN BELT / BROKEN COUPLING) AND SIGNAL THE LOSS OF LOAD CONDITION. THE DRIVE SHALL BE PROGRAMMABLE TO SIGNAL THIS CONDITION VIA A KEYPAD WARNING, RELAY OUTPUT AND/OR OVER THE SERIAL COMMUNICATIONS BUS. RELAY OUTPUTS SHALL INCLUDE PROGRAMMABLE TIME DELAYS THAT WILL ALLOW FOR DRIVE ACCELERATION FROM ZERO SPEED WITHOUT SIGNALLING A FALSE UNDER-LOAD CONDITION.
- m. IF THE INPUT REFERENCE (4-20MA OR 2-10V) IS LOST, THE VFD SHALL GIVE THE USER THE OPTION OF EITHER (1) STOPPING AND DISPLAYING A FAULT, (2) RUNNING AT A PROGRAMMABLE PRESET SPEED, (3) HOLD THE VFD SPEED BASED ON THE LAST GOOD REFERENCE RECEIVED, OR (4) CAUSE A WARNING TO BE ISSUED, AS SELECTED BY THE USER. THE DRIVE SHALL BE PROGRAMMABLE TO SIGNAL THIS CONDITION VIA A KEYPAD WARNING, RELAY OUTPUT AND/OR OVER THE SERIAL COMMUNICATION BUS.

n. THE VFD SHALL HAVE PROGRAMMABLE "SLEEP" AND "WAKE UP" FUNCTIONS TO ALLOW THE

DRIVE TO BE STARTED AND STOPPED FROM THE LEVEL OF A PROCESS FEEDBACK SIGNAL.

- 5. ALL VFDS TO HAVE THE FOLLOWING ADJUSTMENTS: a. THREE (3) PROGRAMMABLE CRITICAL FREQUENCY LOCKOUT RANGES TO PREVENT THE VFD
- FROM OPERATING THE LOAD CONTINUOUSLY AT AN UNSTABLE SPEED. b. TWO (2) PID SETPOINT CONTROLLERS SHALL BE STANDARD IN THE DRIVE, ALLOWING PRESSURE OR FLOW SIGNALS TO BE CONNECTED TO THE VFD, USING THE MICROPROCESSOR IN THE VFD FOR THE CLOSED LOOP CONTROL. THE VFD SHALL HAVE 250 MA OF 24 VDC AUXILIARY POWER AND BE CAPABLE OF LOOP POWERING A TRANSMITTER SUPPLIED BY OTHERS. THE PID SETPOINT SHALL BE ADJUSTABLE FROM THE VED KEYPAD ANALOG INPUTS, OR OVER THE COMMUNICATIONS BUS, THERE SHALL BE TWO PARAMETER SETS FOR THE FIRST PID THAT ALLOW THE SETS TO BE SWITCHED VIA A DIGITAL INPUT SERIAL COMMUNICATIONS OR FROM THE KEYPAD FOR NIGHT SETBACK, SUMMER/WINTER SETPOINTS, ETC. THERE SHALL BE AN INDEPENDENT, SECOND PID LOOP THAT CAN UTILIZE THE SECOND ANALOG INPUT AND MODULATE ONE OF THE ANALOG OUTPUTS TO MAINTAIN SETPOINT OF AN INDEPENDENT PROCESS (IE. VALVES, DAMPERS, ETC.). ALL SETPOINTS. PROCESS VARIABLES. ETC. TO BE ACCESSIBLE FROM THE SERIAL COMMUNICATION NETWORK. THE SETPOINTS SHALL BE SET IN ENGINEERING UNITS AND NOT REQUIRE A PERCENTAGE OF THE TRANSDUCER INPUT.
- c. TWO (2) PROGRAMMABLE ANALOG INPUTS SHALL ACCEPT CURRENT OR VOLTAGE SIGNALS. TWO (2) PROGRAMMABLE ANALOG OUTPUTS (0-20MA OR 4-20 MA). THE OUTPUTS MAY BE PROGRAMMED TO OUTPUT PROPORTIONAL TO FREQUENCY, MOTOR SPEED, OUTPUT VOLTAGE, OUTPUT CURRENT, MOTOR TORQUE, MOTOR POWER (KW), DC BUS VOLTAGE,
- ACTIVE REFERENCE, AND OTHER DATA. e. SIX (6) PROGRAMMABLE DIGITAL INPUTS FOR MAXIMUM FLEXIBILITY IN INTERFACING WITH
- EXTERNAL DEVICES. TYPICALLY PROGRAMMED AS FOLLOWS f. THERE SHALL BE A RUN PERMISSIVE CIRCUIT FOR DAMPER OR VALVE CONTROL. REGARDLESS OF THE SOURCE OF A RUN COMMAND (KEYPAD, INPUT CONTACT CLOSURE, TIME-CLOCK CONTROL, OR SERIAL COMMUNICATIONS) THE VFD SHALL PROVIDE A DRY CONTACT CLOSURE THAT WILL SIGNAL THE DAMPER TO OPEN (VFD MOTOR DOES NOT
- OPERATE). g. WHEN THE DAMPER IS FULLY OPEN, A NORMALLY OPEN DRY CONTACT (END-SWITCH) SHALL
- CLOSE. THE CLOSED END-SWITCH IS WIRED TO AN VFD DIGITAL INPUT AND ALLOWS VFD MOTOR OPERATION. TWO SEPARATE SAFETY INTERLOCK INPUTS SHALL BE PROVIDED. h. WHEN EITHER SAFETY IS OPENED, THE MOTOR SHALL BE COMMANDED TO COAST TO STOP, AND THE DAMPER SHALL BE COMMANDED TO CLOSE. THE KEYPAD SHALL DISPLAY "START ENABLE 1 (OR 2) MISSING". THE SAFETY STATUS SHALL ALSO BE TRANSMITTED OVER THE

SERIAL COMMUNICATIONS BUS. ALL DIGITAL INPUTS SHALL BE PROGRAMMABLE TO INITIATE

- THREE (3) PROGRAMMABLE DIGITAL FORM-C RELAY OUTPUTS. THE RELAYS SHALL INCLUDE PROGRAMMABLE ON AND OFF DELAY TIMES AND ADJUSTABLE HYSTERESIS. DEFAULT SETTINGS SHALL BE FOR RUN. NOT FAULTED (FAIL SAFE). AND RUN PERMISSIVE. THE RELAYS SHALL BE RATED FOR MAXIMUM SWITCHING CURRENT 8 AMPS AT 24 VDC AND 0.4 A AT 250 VAC; MAXIMUM VOLTAGE 300 VDC AND 250 VAC; CONTINUOUS CURRENT RATING 2 AMPS RMS. OUTPUTS SHALL BE TRUE FORM C TYPE CONTACTS; OPEN COLLECTOR OUTPUTS ARE NOT ACCEPTABLE.
- SEVEN (7) PROGRAMMABLE PRESET SPEEDS. k. TWO INDEPENDENTLY ADJUSTABLE ACCELERATION AND DECELERATION RAMPS WITH 1 1800 SECONDS ADJUSTABLE TIME RAMPS
- THE VFD SHALL INCLUDE A MOTOR FLUX OPTIMIZATION CIRCUIT THAT WILL AUTOMATICALLY REDUCE APPLIED MOTOR VOLTAGE TO THE MOTOR TO OPTIMIZE ENERGY CONSUMPTION AND AUDIBLE MOTOR NOISE. m. THE VFD SHALL INCLUDE A CARRIER FREQUENCY CONTROL CIRCUIT THAT REDUCES THE
- CARRIER FREQUENCY BASED ON ACTUAL VFD TEMPERATURE THAT ALLOWS THE HIGHEST CARRIER FREQUENCY WITHOUT DE-RATING THE VFD OR OPERATING AT HIGH CARRIER FREQUENCY ONLY AT LOW SPEEDS.
- n. THE VFD SHALL INCLUDE PASSWORD PROTECTION AGAINST PARAMETER CHANGES.
- 6. THE KEYPAD SHALL INCLUDE A BACKLIT LCD DISPLAY THE DISPLAY SHALL BE IN COMPLETE ENGLISH WORDS FOR PROGRAMMING AND FAULT DIAGNOSTICS (ALPHA-NUMERIC CODES ARE NOT ACCEPTABLE). THE KEYPAD SHALL UTILIZE THE FOLLOWING ASSISTANTS:
- a. START-UP ASSISTANTS b. PARAMETER ASSISTANTS
- c. MAINTENANCE ASSISTANT
- d. TROUBLESHOOTING ASSISTANT
- 7. ALL APPLICABLE OPERATING VALUES SHALL BE CAPABLE OF BEING DISPLAYED IN ENGINEERING (USER) UNITS. A MINIMUM OF THREE OPERATING VALUES FROM THE LIST BELOW SHALL BE CAPABLE OF BEING DISPLAYED AT ALL TIMES. THE DISPLAY SHALL BE IN COMPLETE ENGLISH WORDS (ALPHA-NUMERIC CODES ARE NOT ACCEPTABLE):
- a. OUTPUT FREQUENCY b. MOTOR SPEED (RPM, %, OR ENGINEERING UNITS)

UPON AN APPLICATION OR REMOVAL OF 24VDC

- c. MOTOR CURRENT
- d. CALCULATED MOTOR TORQUE e. CALCULATED MOTOR POWER (KW)
- f. DC BUS VOLTAGE g. OUTPUT VOLTAGE
- 8. THE VFD SHALL INCLUDE A FIREMAN'S OVERRIDE INPUT. UPON RECEIPT OF A CONTACT CLOSURE FROM THE FIREMAN'S CONTROL STATION, THE VFD SHALL OPERATE AT AN ADJUSTABLE PRESET SPEED. THE MODE SHALL OVERRIDE ALL OTHER INPUTS (ANALOG/DIGITAL, SERIAL COMMUNICATION, AND ALL KEYPAD COMMANDS) AND FORCE THE MOTOR TO RUN AT THE ADJUSTABLE, PRESET SPEED. "OVERRIDE MODE" SHALL BE DISPLAYED ON THE KEYPAD. UPON REMOVAL OF THE OVERRIDE SIGNAL, THE VFD SHALL RESUME

9. SERIAL COMMUNICATIONS

- a. THE VFD SHALL HAVE AN RS-485 PORT AS STANDARD. THE PROTOCOLS SHALL BE BACNET EACH INDIVIDUAL DRIVE SHALL HAVE THE PROTOCOL IN THE BASE VED. THE USE OF THIRD PARTY GATEWAYS AND MULTIPLEXERS IS NOT ACCEPTABLE. ALL PROTOCOLS SHALL BE "CERTIFIED" BY THE GOVERNING AUTHORITY. USE OF NON-CERTIFIED PROTOCOLS IS NOT
- b. THE BACNET CONNECTION SHALL BE AN RS485, MS/TP INTERFACE OPERATING AT 9.6, 19.2, 38.4, OR 76.8 KBPS. THE CONNECTION SHALL BE TESTED BY THE BACNET TESTING LABS (BTL) AND BE BTL LISTED. THE BACNET INTERFACE SHALL CONFORM TO THE BACNET STANDARD DEVICE TYPE OF AN APPLICATIONS SPECIFIC CONTROLLER (B-ASC). THE INTERFACE SHALL SUPPORT ALL BIBBS DEFINED BY THE BACNET STANDARD PROFILE FOR A B-ASC INCLUDING, BUT NOT LIMITED TO:
- a. DATA SHARING READ PROPERTY B. b. DATA SHARING - WRITE PROPERTY - B.
- c. DEVICE MANAGEMENT DYNAMIC DEVICE BINDING (WHO-IS; I-AM). d. DEVICE MANAGEMENT - DYNAMIC OBJECT BINDING (WHO-HAS; I-HAVE).
- e. DEVICE MANAGEMENT COMMUNICATION CONTROL B.
- IF ADDITIONAL HARDWARE IS REQUIRED TO OBTAIN THE BACNET INTERFACE, THE VFD MANUFACTURER SHALL SUPPLY ONE BACNET GATEWAY PER DRIVE. MULTIPLE VFDS SHARING ONE GATEWAY SHALL NOT BE ACCEPTABLE
- :. SERIAL COMMUNICATION CAPABILITIES SHALL INCLUDE, BUT NOT BE LIMITED TO; RUN-STOP CONTROL, SPEED SET ADJUSTMENT, PROPORTIONAL/INTEGRAL/DERIVATIVE PID CONTROL ADJUSTMENTS, CURRENT LIMIT, ACCELERATION/DECELERATION TIME ADJUSTMENTS, AND LOCK AND UNLOCK THE KEYPAD. THE DRIVE SHALL HAVE THE CAPABILITY OF ALLOWING THE DDC TO MONITOR FEEDBACK SUCH AS PROCESS VARIABLE FEEDBACK, OUTPUT SPEED / FREQUENCY, CURRENT (IN AMPS), % TORQUE, POWER (KW), KILOWATT HOURS (RE-SETTABLE), OPERATING HOURS (RE-SETTABLE), AND DRIVE TEMPERATURE.
- d. THE DDC SHALL ALSO BE CAPABLE OF MONITORING THE VFD RELAY OUTPUT STATUS, DIGITAL INPUT STATUS, AND ALL ANALOG INPUT AND ANALOG OUTPUT VALUES. ALL DIAGNOSTIC WARNING AND FAULT INFORMATION SHALL BE TRANSMITTED OVER THE SERIAL COMMUNICATIONS BUS. REMOTE VFD FAULT RESET SHALL BE POSSIBLE. THE FOLLOWING ADDITIONAL STATUS INDICATIONS AND SETTINGS SHALL BE TRANSMITTED OVER THE SERIAL COMMUNICATIONS BUS - KEYPAD "HAND" OR "AUTO" SELECTED, BYPASS SELECTED, THI ABILITY TO CHANGE THE PID SETPOINT. AND THE ABILITY TO FORCE THE UNIT TO BYPASS (IF BYPASS IS SPECIFIED). THE DDC SYSTEM SHALL ALSO BE ABLE TO MONITOR IF THE MOTOR IS RUNNING IN THE VFD MODE OR BYPASS MODE (IF BYPASS IS SPECIFIED) OVER SERIAL COMMUNICATIONS. A MINIMUM OF 15 FIELD PARAMETERS SHALL BE CAPABLE OF BEING
- THE VFD SHALL ALLOW THE DDC TO CONTROL THE DRIVE'S DIGITAL AND ANALOG OUTPUTS VIA THE SERIAL INTERFACE. THIS CONTROL SHALL BE INDEPENDENT OF ANY VFD FUNCTION. FOR EXAMPLE, THE ANALOG OUTPUTS MAY BE USED FOR MODULATING CHILLED WATER VALVES OR COOLING TOWER BYPASS VALVES. THE DRIVE'S DIGITAL (RELAY) OUTPUTS MAY BE USED TO ACTUATE A DAMPER, OPEN A VALVE OR CONTROL ANY OTHER DEVICE THAT REQUIRES A MAINTAINED CONTACT FOR OPERATION. IN ADDITION, ALL OF THE DRIVE'S DIGITAL AND ANALOG INPUTS SHALL BE CAPABLE OF BEING MONITORED BY THE DDC SYSTEM.
- THE VFD SHALL INCLUDE AN INDEPENDENT PID LOOP FOR CUSTOMER USE. THE INDEPENDENT PID LOOP MAY BE USED FOR COOLING TOWER BYPASS VALUE CONTROL, CHILLED WATER VALUE CONTROL, ETC. BOTH THE VFD CONTROL PID LOOP AND THE INDEPENDENT PID LOOP SHALL CONTINUE FUNCTIONING EVEN IF THE SERIAL COMMUNICATIONS CONNECTION IS LOST. THE VFD SHALL KEEP THE LAST GOOD SET-POINT COMMAND AND LAST GOOD DO & AO COMMANDS IN MEMORY IN THE EVENT THE SERIAL COMMUNICATIONS CONNECTION IS LOST.
- 10. ALL VFD'S THROUGH 60HP SHALL BE PROTECTED FROM INPUT AND OUTPUT POWER MIS-WIRING. THE VFD SHALL SENSE THIS CONDITION AND DISPLAY AN ALARM ON THE KEYPAD.
- 11. OPTIONAL FEATURES TO BE PROVIDED ARE:
- 1. OPTIONAL FEATURES TO BE FURNISHED AND MOUNTED BY THE DRIVE MANUFACTURER. ALL OPTIONAL FEATURES SHALL BE UL LISTED AND CSA APPROVED BY THE DRIVE MANUFACTURER

BAS & CONTROLS (CONT'D)

- AS A COMPLETE ASSEMBLY AND CARRY A UL508 AND CSA LABEL 2. A COMPLETE FACTORY WIRED AND TESTED BYPASS SYSTEM CONSISTING OF AN OUTPUT
- CONTACTOR AND BYPASS CONTACTOR. OVERLOAD PROTECTION AND SHALL BE PROVIDED IN 3.1 COORDINATION WITH NEW MECHANICAL WORK BOTH DRIVE AND BYPASS MODES.
- 3. DOOR INTERLOCKED, PADLOCKABLE CIRCUIT BREAKER THAT WILL DISCONNECT ALL INPUT POWER FROM THE DRIVE AND ALL INTERNALLY MOUNTED OPTIONS. 4. FUSED VFD ONLY DISCONNECT (SERVICE SWITCH). FAST ACTING FUSES EXCLUSIVE TO THE VFD - FAST ACTING FUSES ALLOW THE VFD TO DISCONNECT FROM THE LINE PRIOR TO CLEARING UPSTREAM BRANCH CIRCUIT PROTECTION, MAINTAINING BYPASS CAPABILITY
- BYPASS DESIGNS, WHICH HAVE NO SUCH FUSES, OR THAT INCORPORATE FUSES COMMON TO BOTH THE VFD AND THE BYPASS WILL NOT BE ACCEPTED. THREE CONTACTOR BYPASS SCHEMES ARE NOT ACCEPTABLE.
- 5. THE DRIVE / BYPASS SHALL PROVIDE SINGLE-PHASE MOTOR PROTECTION IN BOTH THE VFD AND BYPASS MODES. THE FOLLOWING OPERATORS SHALL BE PROVIDED:
- a. BYPASS HAND-OFF-AUTO b. DRIVE MODE SELECTOR
- c. BYPASS MODE SELECTOR
- d BYPASS FAULT RESET
- 6. THE FOLLOWING INDICATING LIGHTS (LED TYPE) SHALL BE PROVIDED. A TEST MODE OR PUSH TO TEST FEATURE SHALL BE PROVIDED
- a. POWER-ON (READY)
- b. RUN ENABLE (SAFETIES) OPEN
- c. DRIVE MODE SELECT DAMPER OPENING d. BYPASS MODE SELECTED
- e. DRIVE RUNNING
- f. BYPASS RUNNING g. DRIVE FAULT
- h. BYPASS FAULT BYPASS H-O-A MODE AUTOMATIC TRANSFER TO BYPASS SELECTED
- k. SAFETY OPEN DAMPER OPENING
- m. DAMPER END-SWITCH MADE
- 7. THE FOLLOWING RELAY (FORM C) OUTPUTS FROM THE BYPASS SHALL BE PROVIDED:
- a. SYSTEM STARTED
- b. SYSTEM RUNNING c. BYPASS OVERRIDE ENABLED
- d. DRIVE FAULT e. BYPASS FAULT (MOTOR OVERLOAD OR UNDER-LOAD (BROKEN BELT)) f. BYPASS H-O-A POSITION
- 8. THE DIGITAL INPUTS FOR THE SYSTEM SHALL ACCEPT 24V OR 115VAC (SELECTABLE). THE BYPASS SHALL INCORPORATE INTERNALLY SOURCED POWER SUPPLY AND NOT REQUIRE AN EXTERNAL CONTROL POWER SOURCE. 9. CUSTOMER INTERLOCK TERMINAL STRIP - PROVIDE A SEPARATE TERMINAL STRIP FOR CONNECTION OF FREEZE FIRE SMOKE CONTACTS AND EXTERNAL START COMMAND. ALL

EXTERNAL SAFETY INTERLOCKS SHALL REMAIN FULLY FUNCTIONAL WHETHER THE SYSTEM IS

- IN HAND, AUTO, OR BYPASS MODES (NOT FUNCTIONAL IN FIREMAN'S OVERRIDE 2). THE REMOTE START/STOP CONTACT SHALL OPERATE IN VFD AND BYPASS MODES. 10. DEDICATED DIGITAL INPUT THAT WILL TRANSFER MOTOR FROM VFD MODE TO BYPASS MODE UPON DRY CONTACT CLOSURE FOR FIREMAN'S OVERRIDE. TWO MODES OF OPERATION ARE REQUIRED.
- a. ONE MODE FORCES THE MOTOR TO BYPASS OPERATION AND OVERRIDES BOTH THE VFD AND BYPASS H-O-A SWITCHES AND FORCES THE MOTOR TO OPERATE ACROSS THE LINE (TEST MODE). THE SYSTEM WILL ONLY RESPOND TO THE DIGITAL INPUTS AND MOTOR PROTECTIONS. b. THE SECOND FIREMAN'S OVERRIDE MODE REMAINS AS ABOVE, BUT WILL ALSO DEFEAT THE
- OVERLOAD AND SINGLE-PHASE PROTECTION FOR BYPASS AND IGNORE ALL KEYPAD AND DIGITAL INPUTS TO THE SYSTEM (RUN UNTIL DESTRUCTION). 11. THE VFD SHALL INCLUDE A "RUN PERMISSIVE CIRCUIT" THAT WILL PROVIDE A NORMALLY OPEN CONTACT WHENEVER A RUN COMMAND IS PROVIDED (LOCAL OR REMOTE START
- COMMAND IN VFD OR BYPASS MODE). THE VFD SYSTEM (VFD OR BYPASS) SHALL NOT OPERATE THE MOTOR UNTIL IT RECEIVES A DRY CONTACT CLOSURE FROM A DAMPER OR VALVE END-SWITCH. WHEN THE VFD SYSTEM SAFETY INTERLOCK (FIRE DETECTOR, FREEZESTAT HIGH STATIC PRESSURE SWITCH, ETC) OPENS, THE MOTOR SHALL COAST TO A STOP AND THE RUN PERMISSIVE CONTACT SHALL OPEN, CLOSING THE DAMPER OR VALVE. 12. CLASS 20 OR 30 (SELECTABLE) ELECTRONIC MOTOR OVERLOAD PROTECTION SHALL BE
- 13. THERE SHALL BE AN INTERNAL SWITCH TO SELECT MANUAL OR AUTOMATIC BYPASS. 14. THERE SHALL BE AN ADJUSTABLE CURRENT SENSING CIRCUIT FOR THE BYPASS TO

PROVIDE LOSS OF LOAD INDICATION (BROKEN BELT) WHEN IN THE BYPASS MODE.

- 2.4.17.2 PRODUCTS
 - CERTIFIED FACTORY START-UP SHALL BE PROVIDED FOR EACH DRIVE BY A FACTORY AUTHORIZED SERVICE CENTER. A CERTIFIED START-UP FORM SHALL BE FILLED OUT FOR EACH DRIVE WITH A COPY PROVIDED TO THE OWNER.
 - PROVIDE AN ALLOWANCE FOR THE FACTORY-AUTHORIZED TECHNICIAN OF ONE SITE VISIT OF ONE DAY TO TRAIN OPERATING STAFF IN THE OPERATING AND MAINTENANCE OF THE DRIVE. FOR THE DURATION OF THE WARRANTY PERIOD, PROVIDE A CALL BACK WITHIN 30 MINUTES OF
 - RECEIVING AN EMERGENCY CALL FOR SERVICE AND PROVIDE ON-SITE SERVICE WITHIN TWO (2) HOURS.
- 2.4.17.3 STANDARD OF ACCEPTANCE:
- b. DANFOSS
- 2.4.18 LIGHTING RELAYS
- 2.4.18.A ALL RELAYS USED FOR SWITCHING LIGHTING LOADS SHALL BE THE LATCHING TYPE. MAINTAINED RELAYS OR CONTACTORS SHALL NOT BE ACCEPTED.
- 2.4.18.B PROVIDE CUSTOM LIGHTING ENCLOSURES TO HOUSE ALL LIGHTING RELAYS. THE ENCLOSURES SHALL BE EQUIPPED WITH BARRIERS TO SEPARATE THE CONTROL AND LOAD
- 2.4.18.C PROVIDE LOCAL ON PUSHBUTTONS AT EACH LIGHTING RELAY ENCLOSURE TO ALLOW FOR MANUAL OPERATION OF ALL LIGHTING RELAYS IN THE CASE OF BAS PANEL FAILURE. PRESSING THE PUSHBUTTON SHALL TURN ON ALL LIGHTING RELAYS BY APPLYING VOLTAGE DIRECTLY TO THE RELAY (I.E. BYPASS THE BAS). IF A LIGHTING PANEL IS LOCATED IN AN AREA ACCESSIBLE BY STUDENTS OR TEACHING STAFF, PROVIDE MOMENTARY KEY SWITCHES IN LIEU OF PUSHBUTTONS. THE KEY TYPE SHALL BE DESIGNATED BY THE ENGINEER. DELIVER ALL KEYS TO THE ENGINEER AT THE COMPLETION OF THE PROJECT.
- 2.4.18.D THE STANDARD OF ACCEPTANCE SHALL BE G.E. RR-7 AND RR-8 RELAYS.

2.4.19 CO2 SENSORS

- 2.4.19.A PROVIDE CO2 SENSORS FOR EITHER WALL OR DUCT MOUNTING APPLICATIONS AS SPECIFIED. PROVIDE A HEAVY DUTY METAL GUARD TO PROTECT THE SENSOR WHEN MOUNTED ON WALLS. PROVIDE THE FACTORY-SUPPLIED DUCT MOUNTING KIT FOR ALL DUCT MOUNT
- 2.4.19.B THE SENSOR SHALL BE MICROPROCESSOR CONTROLLED, FULLY DIGITAL, NON-DISPERSIVE DUAL WAVELENGTH INFRARED TECHNOLOGY WITH TEMPERATURE COMPENSATION. THE DEVICE OUTPUT SHALL BE 4 TO 20MA.
- 2.4.19.C THE SENSOR SHALL HAVE A MEASUREMENT RANGE OF 0 TO 2000PPM WITH AN ACCURACY
- 2.4.19.D INSTALL THE SENSOR IN ACCORDANCE WITH ALL MANUFACTURER'S INSTRUCTIONS. WALL MOUNTED SENSORS SHALL BE INSTALLED AT A MINIMUM HEIGHT OF 60" ABOVE THE FINISHED FLOOR. SENSORS SHALL NOT BE MOUNTED ON AN OUTSIDE WALL, CLOSE TO A WINDOW, DOOR OR IN DRAFT AREAS WITH DIRECT AIRFLOW.
- 2.4.19.D THE SENSOR SHALL BE AUTO CALIBRATING FOR A GUARANTEED INTERVAL OF 5 YEARS.
- 2.4.19.F THE STANDARD OF ACCEPTANCE SHALL BE GREYSTONE CCD4A.
- 2.4.20.A PROVIDE A HEAVY DUTY, METAL THERMOSTAT GUARD FOR SPECIFIED EXISTING, STAND-ALONE THERMOSTATS.
- 2.4.20.B THE GUARD SHALL BE HAVE A MINIMUM 18 GUAGE METAL COVER AND 22 GUAGE RING BASE. THE UNIT SHALL BE TAMPER-RESISTANT AND EQUIPPED WITH A LOCK AND KEY. THE COLOUR OF THE UNIT SHALL BE BEIGE.
- 3.5.F WHERE NEWLY INSTALLED DAMPER SIZES EXCEED 28 SQ. FT. (2.6 SQ. M) MULTIPLE OPERATORS 2.4.20.C THE STANDARD OF ACCEPTANCE SHALL BE WHITE RODGERS MODEL #F29-0222.

BAS & CONTROLS (CONT'D)

PART 3 EXECUTION

SITE WORK WITH THE MECHANICAL CONTRACTOR.

- 3.1.A IN A FACILITY WHERE MECHANICAL RETROFITS ARE PLANNED, OBTAIN AND REVIEW THE MECHANICAL DRAWINGS AND MECHANICAL SPECIFICATIONS FOR EACH SITE. COORDINATE ALL
- PROVIDE ALL SPECIFIED LABOUR AND MATERIAL AS INDICATED IN THE MECHANICAL DRAWINGS AND/OR SPECIFICATIONS. PROVIDE WRITTEN INSTALLATION INSTRUCTIONS FOR ALL SUPPLIED EQUIPMENT AND DEVICES TO BE INSTALLED BY THE MECHANICAL CONTRACTOR.
- THERMOWELLS TO THE MECHANICAL CONTRACTOR FOR INSTALLATION, WHERE SPECIFIED. IF A SEPARATE MECHANICAL CONTRACTOR HAS NOT BEEN HIRED BY KPRDSB TO WORK ON THE PROJECT, THE CONTROLS CONTRACTOR SHALL BE RESPONSIBLE FOR THE INSTALLATION OF
- 3.1.D THE CONTROLS CONTRACTOR SHALL BE RESPONSIBLE FOR IDENTIFYING AND MARKING THE LOCATION OF NEW THERMOWELLS TO BE INSTALLED IN PIPING. MAKE ARRANGEMENTS TO HAVE THE MECHANICAL CONSULTANT OR KPRDSB ENGINEER (WHERE APPLICABLE) REVIEW AND APPROVE ALL THERMOWELL LOCATIONS PRIOR TO INSTALLATION.
- 3.1.E INSTALL AND COMMISSION ANY BAS POINTS ASSOCIATED WITH THE NEW MECHANICAL WORK DURING THE SAME TIME FRAME AS THIS WORK.
- 3.1.F THE CONTROLS CONTRACTOR SHALL PROVIDE ALL MATERIAL AND LABOUR TO CARRY OUT ALL THE ELECTRICAL WORK (POWER AND CONTROLS) ASSOCIATED WITH THE NEW MECHANICAL
- 3.2 GENERAL INSTALLATION OF CONTROLS
- 3.2.A REMOVE ALL EXISTING FIELD AND PANEL MOUNTED CONTROL DEVICES (E.G. TRANSDUCERS, CONTROLLERS, THERMOSTATS, ETC.) THAT HAVE BEEN MADE REDUNDANT OR INOPERATIVE BY THE NEW BAS CONTROL STRATEGIES. REMOVE ANY OTHER CONTROLS AS SPECIFIED OR DIRECTED BY THE ENGINEER.
- 3.2.B ENSURE THAT ALL SYSTEMS REMAIN OPERATIVE AT ALL TIMES, WHETHER UNDER THE EXISTING CONTROLS OR UNDER THE NEW CONTROLS. DO NOT LEAVE ANY SYSTEM WITHOUT SOME FORM OF AUTOMATIC CONTROL. DO NOT DISCONNECT OR MODIFY EXISTING EQUIPMENT UNTIL READY TO ENERGISE SAME UNDER THE NEW WORK.
- 3.2.C PROPERLY CUT AND CAP ALL REMAINING ACTIVE CONTROL AIR LINES.
- 3.2.D PROVIDE PROPERLY SIZED COVER PLATES FOR ALL OPENINGS RESULTING FROM THE REMOVAL OF REDUNDANT CONTROL DEVICES. THIS SHALL BE APPLICABLE TO WALLS, DUCTWORK AND

CONTROL PANELS. IN OCCUPIED AREAS, COVER PLATES SHALL BE STAINLESS STEEL.

- 3.2.E THE CONTROL SEQUENCES INDICATE ONLY THE PRINCIPAL ITEMS OF EQUIPMENT CONTROLLING THE SYSTEMS. SUPPLEMENT EACH CONTROL SYSTEM WITH RELAYS AND AUXILIARIES TO ENABLE EACH SYSTEM TO PERFORM AS SPECIFIED AND TO PERMIT PROPER OPERATION AND SUPERVISION OF IT.
- PROVIDE COMPLETE IDENTIFICATION AND LABELLING FOR NEW AND EXISTING DEVICES AND
- 3.2.G PROVIDE NEW CABLING, CONDUITS, CONTROL CABINETS, POWER SUPPLIES AND OTHER AUXILIARY EQUIPMENT, AS REQUIRED FOR A COMPLETE OPERATIONAL SYSTEM

POWER SOURCES AND WIRING METHODS

- 3.3.A ALL WIRING SHALL BE INSTALLED IN EMT CONDUIT UNLESS SPECIFIED OTHERWISE. EXPOSED WIRING IN FINISHED AREAS (E.G. CORRIDORS, CLASSROOMS, GYMNASIUMS, ETC.) SHALL BE INSTALLED IN WIREMOLD (COLOUR TO MATCH SURROUNDING AREA).
- WIRING FROM DDC CONTROLLERS TO SENSORS AND ACTUATORS AND CONTROL SYSTEM NETWORK AND LOW VOLTAGE WIRING RUNNING IN ACCESSIBLE CELLINGS MAY BE INSTALLED. USING LVT CABLE. WHERE THE CEILING IS USED AS A RETURN AIR PLENUM, PLENUM RATED CABLE SHALL BE USED IN LIEU OF LVT CABLE.
- 3.3.C INSTALL EMT AND CABLE AT RIGHT ANGLES TO BUILDING LINES, SECURELY FASTENED, AND IN ACCORDANCE WITH CURRENT ELECTRICAL CODES AND STANDARDS.
- 3.3.D POWER AND CONTROL WIRING SHALL BE COPPER CONDUCTOR (RW90). FOR POWER WIRING. PROVIDE #12 AWG (MINIMUM) WITH A 3% MAXIMUM VOLTAGE DROP IN ACCORDANCE WITH CEC REQUIREMENTS. CONTROL WIRING SHALL BE A MINIMUM OF #14 AWG, UNLESS OTHERWISE
- 3.3.E WIRING SMALLER THAN 18 GAUGE SHALL NOT BE ACCEPTED ON THE PROJECT. EXCEPTIONS ARE MADE FOR WIRING BETWEEN TERMINAL COMPUTER DEVICES, WIRE IN STANDARD COMMUNICATION CABLES, SUCH AS PRINTERS AND SHORT HAUL MODEMS, WIRE USED IN COMMUNICATION NETWORKS, I.E. ANY CABLE TRANSFERRING DIGITAL DATA, USING TWISTED
- CRIMP CONNECTORS IS NOT ALLOWED WHEN CONNECTING FIELD WIRING TO SENSOR OR DEVICE LEADS. THE USE OF WIRE NUTS IS ACCEPTABLE IN THIS APPLICATION. 3.3.G POWER FOR CONTROL SYSTEM SHALL $\underline{\mathsf{NOT}}$ BE OBTAINED BY TAPPING INTO MISCELLANEOUS CIRCUITS THAT COULD BE INADVERTENTLY SWITCHED OFF. ONLY DEDICATED CIRCUIT(S) SHALL

3.3.F THE WIRING FROM PANELS TO DEVICES SHALL BE INSTALLED WITHOUT SPLICES. THE USE OF

POWER THE CONTROL SYSTEM. PROVIDE ADDITIONAL BREAKERS OR ELECTRICAL PANELS AS 3.3.H MOUNT TRANSFORMERS AND OTHER PERIPHERAL EQUIPMENT IN PANELS LOCATED IN

SERVICEABLE AREAS. PROVIDE LINE-SIDE BREAKERS/FUSES FOR EACH TRANSFORMER.

- 3.3.I ALL 120 VAC POWER FOR ANY CONTROLS EQUIPMENT SHALL BE FROM DEDICATED CIRCUITS. PROVIDE A BREAKER LOCK FOR EACH BREAKER USED TO SUPPLY THE CONTROL SYSTEM. UPDATE THE PANEL CIRCUIT DIRECTORY.
- 3.3.J A DEDICATED POWER CIRCUIT MAY BE USED TO POWER DDC PANELS AND EQUIPMENT WITHIN THE SAME OR ADJOINING MECHANICAL ROOMS. THE USE OF ONE POWER CIRCUIT TO POWER DDC PANELS DISTRIBUTED THROUGHOUT THE BUILDING IS NOT ACCEPTABLE. 3.3.K THE CONTROLLER MAY BE POWERED FROM THE EQUIPMENT THAT IT IS DIRECTLY CONTROLLING

(I.E. HEAT PUMP, ROOFTOP UNIT) ONLY IF THE CONTROLLER CONTROLS NO OTHER EQUIPMENT

- AND THE POWER SUPPLY TO THE CONTROLLER REMAINS ENERGIZED INDEPENDENTLY OF UNIT OPERATION OR STATUS.
- PROVIDE ALL REQUIRED CODE GAUGE BOXES, CONNECTORS AND OTHER WIRING ACCESSORIES. 3.3M FOR ALL DC WIRING, POSITIVE CONDUCTORS SHALL BE WHITE OR RED IN COLOUR WHILE
- 3.3N ON EXTERIOR BUILDING SURFACES, WIRING SHALL BE RATED FOR 90C AND WET ENVIRONMENTS. CONDUIT SHALL BE RIGID METAL OR RIGID PVC WITH WATERPROOF JOINTS AND CONNECTORS
- USED THROUGHOUT.

NEGATIVE CONDUCTORS SHALL BE BLACK IN COLOUR.

3.4 INSTALLATION OF TEMPERATURE SENSORS IN PIPING 3.4.A THE CONTROLS CONTRACTOR SHALL SUPERVISE AND DIRECT THE MECHANICAL CONTRACTOR

TO ENSURE THAT THERMOWELLS ARE INSTALLED AS DESCRIBED HEREIN.

- 3.4.B FOR EACH IMMERSION SENSOR, PROVIDE A COMPATIBLE THERMOWELL TO THE MECHANICAL CONTRACTOR FOR INSTALLATION. PROVIDE STAINLESS STEEL THERMOWELLS WHERE INSTALLED IN PIPING CARRYING CORROSIVE OR CHEMICALLY REACTIVE FLUIDS.
- C INSTALL THERMOWELLS IN PIPING SUCH THAT THE BOTTOM OF THE WELL DOES NOT MAKE CONTACT WITH THE PIPE. INSTALL THE WELL AT A 90 DEGREE ELBOW OR TEE WHERE THE PIPE DIAMETER IS LESS THAN THE WELL LENGTH. 3.4.D IF THE USE OF STRAP-ON SENSORS HAS BEEN APPROVED BY THE ENGINEER, USE METAL

CLAMPS TO SECURELY FASTEN THE SENSOR TO THE PIPING. APPLY HEAT TRANSFER

COMPOUND TO THE CONTACT AREA BETWEEN THE SENSOR AND PIPING. RE-INSULATE ALL

INSTALLATION OF STANDARD CONTROL DAMPERS AND ACTUATORS.

3.5.D ENSURE THAT EACH DAMPER ASSEMBLY IS PROPERLY MOUNTED.

3.5.A SUPPLY NEW AUTOMATIC CONTROL DAMPERS WHERE SPECIFIED. 3.5.B THE NEW DUCTS AND/OR PLENUMS-MOUNTED DAMPERS SHALL BE INSTALLED AS PART OF THE

AIR DISTRIBUTION WORK SPECIFIED IN A DIFFERENT SECTION OF THE SPECIFICATION.

- 3.5.C THE DAMPERS SHALL BE MADE AVAILABLE AT THE SITE AT THE LOCATION WHERE THEY ARE
- 3.5.E THE LINKAGE AND MOTORS SHALL BE PROVIDED AND COMPLETELY CONNECTED FOR ALL CONTROL DAMPERS, INCLUDING FOR DAMPERS FACTORY SUPPLIED WITH EQUIPMENT.
- 3.5.G WHEREVER POSSIBLE, THE NEW DAMPER ACTUATORS SHALL BE INSTALLED SO THEY ARE

BAS & CONTROLS (CONT'D)

- 3.6.A ALL CONTROL VALVES SHALL BE SUPPLIED BY THE CONTROLS CONTRACTOR AND INSTALLED BY
- 3.6.C THE CONTROLS CONTRACTOR SHALL ENSURE THAT EACH CONTROL VALVE ASSEMBLY IS
- 3.1.C THE CONTROLS CONTRACTOR SHALL SUPPLY ALL REQUIRED VALVES, DAMPERS AND .6.D THE CONTROLS CONTRACTOR SHALL TEST, ADJUST AND VERIFY THE OPERATION OF EACH
 - 6 F MOTORIZED BUTTERFLY VALVES (USUALLY INSTALLED FOR BOILER ISOLATION) SHALL BE SUPPLIED AND INSTALLED BY THE MECHANICAL CONTRACTOR BUT SHALL BE WIRED UP BY THE
 - INSTALLATION OF OUTDOOR AIR TEMPERATURE SENSORS
 - .7.A THE OUTDOOR AIR SENSORS SHALL BE MOUNTED SO THAT THE VENTILATION SLOTS ON THE SOLAR SHIELDS ARE FACING DOWNWARD (WHEN MOUNTED HORIZONTALLY) OR TOWARDS THE WALL (WHEN MOUNTED VERTICALLY).
 - .7.B MOUNT THE SENSORS ON THE NORTH-FACING SIDE OF THE BUILDING AWAY FROM DIRECT

 - .7.D ENSURE THAT THE SENSORS ARE LOCATED AWAY FROM BUILDING EXHAUST AIR OR EQUIPMENT

COLD ALARM AQUASTATS IN EXISTING BUILDINGS

- 3.8.A IDENTIFY THE LOCATION OF ALL EXISTING COLD ALARM AQUASTATS INSTALLED ON THE HEATING WATER PIPING. THESE AQUASTATS (USUALLY STRAP-ON TYPE) ARE NORMALLY LOCATED IN THE
- BE INDICATED IN THE SITE SPECIFIC INFORMATION FOR EACH SITE (SEE APPENDIX A). REGARDLESS OF THE INFORMATION PROVIDED. IF ANY, THE CONTROLS CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR LOCATING ALL EXISTING COLD ALARM AQUASTATS IN EACH FACILITY AND CARRYING OUT THE WORK DESCRIBED HEREIN.
- THE RELOCATED BOILER ROOM AQUASTAT SHALL BE THE ONLY DEVICE IN THE ALARM CIRCUIT.

.8.E TEST TRIP THE RELOCATED OR NEW BOILER ROOM AQUASTAT AND VERIFY THAT A CORRECT

ALARM SIGNAL HAS BEEN RECEIVED BY THE BUILDING SURVEILLANCE SYSTEM.

- 3.9.A EXISTING PNEUMATIC DAMPER ACTUATORS UNDER BAS CONTROL SHALL BE PHYSICALLY INTERLOCKED (E.G. SOLENOID AIR VALVE EXHAUSTS CONTROL AIR WHEN FAN IS OFF) TO RETURN TO THEIR FAIL SAFE POSITIONS WHEN THEIR RESPECTIVE FAN IS OFF. REGARDLESS OF
- .9.B THE CONTROLS CONTRACTOR SHALL IMMEDIATELY REPORT TO THE ENGINEER ANY SITUATION IN WHICH AN EXISTING PNEUMATIC DAMPER ACTUATOR TO BE PLACED UNDER BAS CONTROL IS NOT PNEUMATICALLY INTERLOCKED TO THE FAN STARTER OR WHERE AN EXISTING PNEUMATIC INTERLOCK IS INOPERATIVE OR DEFECTIVE.
- DESCRIBED IN 3.9.B, IT SHALL BE ASSUMED THAT ALL PNEUMATIC INTERLOCKS WERE PRESENT AND FUNCTIONING AT THE TIME OF THE CONTROLS INSTALLATION. ANY SUBSEQUENT DEFICIENCIES RELATED TO MISSING OR DEFECTIVE PNEUMATIC INTERLOCKS SHALL BE CORRECTED BY THE CONTROLS CONTRACTOR AT NO ADDITIONAL COST TO KPRDSB. D.D. UNLESS SPECIFIED OTHERWISE, PNEUMATIC HEATING VALVES UNDER BAS CONTROL IN AIR
- ELECTRIC-TO-PRESSURE TRANSDUCERS (EPT) CONTROLLING HEATING VALVES ARE SUPPLIED WITH NON-SWITCHED MAIN CONTROL AIR.

CONTROL AIR WHEN FAN IS OFF) TO THE RESPECTIVE FAN STARTER.

- 10.A WHERE CONDUITS PENETRATE THE FIRE RATED CONSTRUCTION. ULC LISTED AND LABELLED
- WALLS OR SLABS AND AS FOLLOWS:

1. CONDUIT THROUGH A FLOOR WITH A SLEEVED OR CORE DRILLED CIRCULAR OPENING - ULC

- SYSTEM SP115 2. CONDUIT THROUGH A FLOOR WITH A CAST OR CUT RECTANGULAR OPENING - ULC SYSTEM
- 10.B SELECT THICKNESS AND ARRANGEMENT OF BACK-UP MATERIALS TO SUIT SIZE OF SERVICE, LENGTH OF SLEEVE AND ANTICIPATED MOVEMENT.
- INSTALLATION OF WALL OPENING COVER PLATES
- I1.A $\,$ ALL EXISTING WALL OPENINGS OF THE REMOVED ELECTRICAL AND CONTROL DEVICES SHALL BE COVERED WITH PROPERLY SIZED PLATES IN AN APPROVED MANNER SO THAT THE FINISHED WORK PRESENTS A NEAT AND CLEAN APPEARANCE.
- WORK SHALL BE DONE BY THE BAS CONTRACTOR. ALL CUTTING SHALL BE PERFORMED IN A NEAT AND TRUE FASHION, WITH PROPER TOOLS AND EQUIPMENT TO THE ENGINEER AND/OR KPRDSB PROJECT REPRESENTATIVE APPROVAL. THE SURFACES SHALL BE MADE GOOD TO REASONABLY MATCH EXISTING FINISHES TO THE ENGINEER AND/OR KPRDSB PROJECT
- TO X-RAY THE WALLS OR SLABS AND IN ANY CASE HE SHALL NOT DRILL OR CUT ANY SURFACE WITHOUT THE KPRDSB PROJECT REPRESENTATIVES APPROVAL.
- 2.C THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REPAIR OF ANY DAMAGE TO EXISTING SERVICES, EXPOSED OR CONCEALED, CAUSED AS A RESULT OF THIS WORK.

FOR THE LENGTH OF THE OPENING AS FOLLOWS:

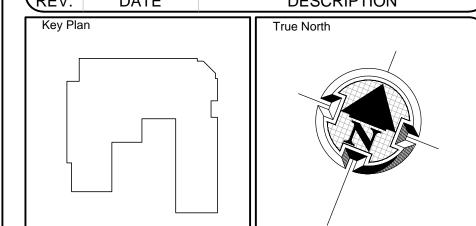
- .13.A THE VOID BETWEEN THE CONDUIT OPENING AND THE CONDUIT SHALL BE PACKED AND SEALED
- SEAL BOTH ENDS OF THE OPENING WITH NON-HARDENING SILICONE BASE CAULKING COMPOUND TO PRODUCE A WATERTIGHT SEAL.

1. PACK OPENINGS IN NON-FIRE RATED INTERIOR CONSTRUCTION WITH MINERAL WOOL AND

3.14 ACCESS DOORS INSTALLATION

- .14.B ACCESS DOORS SHALL BE INSTALLED SUCH AS TO GIVE PROPER ACCESS TO ALL NEWLY INSTALLED ELECTRICAL AND CONTROL EQUIPMENT AND OTHER SIMILAR ELECTRICAL WORK WHICH MAY NEED MAINTENANCE OR REPAIR BUT WHICH ARE CONCEALED IN INACCESSIBLE
- WORKING ON THE PARTICULAR TYPE OF CONSTRUCTION IN WHICH THE DOORS ARE REQUIRED.

.9.C IF THE CONTROLS CONTRACTOR FAILS TO REPORT TO THE ENGINEER ANY ABNORMALITIES AS RE-ISSUED FOR PERMIT & TENDER ISSUED FOR PERMIT AND TENDER 8/12/2021 HANDLERS SHALL NOT BE PHYSICALLY INTERLOCKED (E.G. SOLENOID AIR VALVE EXHAUSTS REV. DATE DESCRIPTION 9.F. PROVIDE LABOUR AND MATERIAL AS REQUIRED TO ENSURE THAT ALL NEW AND EXISTING





Drawing Overall Scale

DATE:

TERRY FOX PUBLIC SCHOOL COBOURG

HRV-HWT-BAS INSTRUMENTATION

1065 RIDDELL AVE, COBOURG, ON K9A 5N4

SPECIFICATIONS III

AS SHOWN

Kawartha Pine Ridge

District School Board

MECHANICAL SERVICES MECHANICAL

Engineer / Architect Stamp DESIGNED BY: M.A. QOFESSION, DRAWN BY: J.L. APPROVED BY: M.A. > M. Akhanan PROJECT NO.: 1021225 M.AKHAVANBAZAZ 100088319

Drawing No. Phase Revisi

M-102

3.6 INSTALLATION OF AUTOMATIC CONTROL VALVES AND ACTUATORS

THE MECHANICAL CONTRACTOR, UNLESS SPECIFIED OTHERWISE.

ACCESSIBLE FROM OUTSIDE DUCTS, PLENUMS AND EQUIPMENT CASINGS.

- 3.6.B EACH CONTROL VALVE SHALL BE EQUIPPED WITH ITS OWN ACTUATOR.
- PROPERLY CONNECTED AND INSTALLED.
- CONTROL VALVE TO ENSURE THAT IT IS PROPERLY FUNCTIONING, AS REQUIRED AND LEFT IN SAFE WORKING ORDER.
- CONTROLS CONTRACTOR. THE VALVE DETAILS ARE IN THE MECHANICAL SPECIFICATIONS.

- 3.7.C MOUNT THE SENSORS IN AN EASILY SERVICEABLE LOCATION.
- AIR FLOWS.
- BOILER ROOM BUT MAY ALSO BE FOUND IN OTHER FAN ROOMS THROUGHOUT THE BUILDING. .8.B FOR INFORMATION PURPOSES ONLY. THE LOCATION OF KNOWN COLD ALARM AQUASTATS MAY
- 8.C ONCE ALL EXISTING COLD ALARM AQUASTATS IN THE FACILITY HAVE BEEN LOCATED, RELOCATE ONE FUNCTIONAL AQUASTAT (OR PROVIDE ONE NEW AQUASTAT) TO THE BOILER PRIMARY SUPPLY WATER HEADER. PROVIDE NEW WIRING TO CONNECT TO THE EXISTING ALARM CIRCUIT.
- .8.D REMOVE ALL ADDITIONAL COLD ALARM AQUASTATS AND WIRING IN THE FACILITY.
- PNEUMATIC FAIL SAFE INTERLOCKS
- .10 INSTALLATION OF FIRESTOPPING AND SMOKE SEAL MATERIALS
- FIRESTOPPING AND SMOKE SEAL MATERIALS SHALL BE SUPPLIED AND INSTALLED IN ACCORDANCE WITH ULC FIRESTOP SYSTEM REQUIREMENTS TO SEAL HOLES AND VOIDS IN THE
- 3. CONDUIT THROUGH A WALL WITH A SLEEVED OR CORE DRILLED CIRCULAR OPENING ULC 4. CONDUIT THROUGH A WALL WITH A RECTANGULAR CAST OR CUT OPENING - ULC SYSTEM
- 10.C AT TIME OF APPLICATION ALL SURFACES SHALL BE PROPERLY CLEANED, DRIED AND FREE FROM DUST, OIL, GREASE, LOOSE OR FLAKING PAINT AND FOREIGN MATERIALS.
- .12 CUTTING AND PATCHING .12.A ALL CUTTING, PATCHING, PAINTING AND MAKING GOOD FOR THE INSTALLATION OF THE BAS
- 12.B LOCATION OF THE EXISTING SERVICES CONCEALED IN THE CONSTRUCTION. IF ANY. SHALL BE DETERMINED PRIOR TO DRILLING OR CUTTING AN OPENING. IF REQUIRED. THE CONTRACTOR IS
- .13 PACKING AND SEALING CORE DRILLED CONDUIT OPENINGS
- 2. PACK AND SEAL OPENINGS IN FIRE RATED WALLS AND SLABS AS SPECIFIED IN THIS SECTION

AND AS PER ARTICLE ENTITLED "INSTALLATION OF FIRESTOPPING AND SMOKE SEAL

- .14.A ALL ACCESS DOORS SHALL BE FLUSH MOUNTED.
- 14.C ALL ACCESS DOORS SHALL BE INSTALLED BY THE PROFESSIONAL TRADES SPECIALIZED IN

BAS & CONTROLS (CONT'D)

3.15 ELECTRICAL WIRING AND ACCESSORIES

BAS & CONTROLS (CONT'D) **GENERAL NOTES** SECURELY ATTACH TO THE INSIDE OF THE RESPECTIVE CONTROL CABINET. **GENERAL NOTES:**

> ALL SHUTDOWNS OF ANY PORTION OF EXISTING BASE BUILDING SYSTEMS SHALL BE PERFORMED BY GENERAL CONTRACTOR /OR COORDINATED WITH THE LANDLORD FOR TIME AND DURATION OF INTERRUPTIONS AND ADHERENCE TO THE LANDLORD'S

INSTRUCTIONS IN THIS REGARD. B. ALL THE WORK MUST COMPLY WITH KPRDSB'S GUIDELINES WHERE APPLICABLE. COMPLY

C. BE SURE TO READ THE SPECIFICATIONS AND ALL DRAWINGS BEFORE ORDERING MATERIALS OR COMMENCING CONSTRUCTION WORK. IF ANY OF THE ABOVE INSTRUCTIONS ARE NOT CARRIED OUT AND IT RESULTS IN ADDITIONAL COSTS DURING OR AFTER CONSTRUCTION, NO ADDITIONAL CHARGES WILL BE PAID BY THE KPRDSB OR ITS

D. WORK SHALL INCLUDE TESTING AND BALANCING OF ALL AIR AND HYDRONIC SYSTEMS AS APPLICABLE. MAKE ALL ADJUSTMENTS TO PROVIDE DESIGN REQUIREMENTS.

ALL ROOFING AND PENETRATIONS SHALL BE DONE IN STRICT ACCORDANCE WITH KPRDSB STANDARD DETAILS AND ONLY BY KPRDSB APPROVED ROOFING TRADES, IF THE ROOF IS UNDER WARRANTY, ONLY THE WARRANTY HOLDER SHALL BE RETAINED TO PERFORM THE

F. SECURE AND PAY FOR ALL REQUIRED PERMITS.

WITH ALL APPLICABLE CODES.

G. INCLUDE COST OF PREMIUM TIME IN TENDER PRICE FOR WORK DURING NIGHTS, WEEKENDS, OR OTHER TIMES OUTSIDE NORMAL WORKING HOURS NECESSARY TO MAINTAIN ALL MECHANICAL SERVICES IN OPERATION.

H. WORK IN OCCUPIED AREAS, DRILLING OF FLOORS AND WALLS, AND OTHER WORK OPERATIONS THAT MAY CREATE NOISE SHALL BE PERFORMED IN COORDINATION WITH BUILDING MANAGEMENT

TIE-INS TO EXISTING SERVICES MUST BE ARRANGED AS ITEM ABOVE. ALLOW FOR REVISIONS / CHANGES TO EXISTING INSTALLATIONS IN ORDER TO INSTALL

NEW SERVICES AND AT NO EXTRA COST TO THE OWNER.

K. ALL EXISTING STRUCTURES AND SERVICES DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED TO ORIGINAL STANDARD AND AT NO ADDITIONAL COST TO OWNER.

CO-OPERATE WITH ALL TRADES INSTALLING EQUIPMENT WHICH MAY AFFECT THE MECHANICAL WORK AND ARRANGE THE WORK IN PROPER RELATION WITH FOUIPMENT INSTALLED UNDER ALL DIVISIONS OF THE CONTRACT FOR THE SATISFACTORY

PROVIDE WHERE SHOWN AND/OR REQUIRED BY SITE CONDITIONS, ALL ACCESS DOORS COMPATIBLE WITH CEILING/WALL TYPES AND FINISHES. MARK IN AN APPROVED MANNER, T-BAR CEILING TILES WHICH ARE USED FOR ACCESS. PROVIDE MILCORE OR APPROVED EQUAL ACCESS DOORS. IN ADDITION, PROVIDE ACCESS DOORS TO ALL EXISTING BUILDING SYSTEMS CLEANOUTS ON VERTICAL STACKS, BACKWATER VALVES AND CEILING SUSPENDED EQUIPMENT. PROVIDE MINIMUM SIZE OF CEILING ACCESS OF 4 SQUARE FEET.

N. THE CONTRACTOR SHALL ARRANGE THE SCHEDULE AND PROCEED WITH THE WORK DESCRIBED WITH THE MINIMUM DISTURBANCE AND INTERRUPTION OF EXISTING FACILITIES AND SERVICES.

ASSUME FULL RESPONSIBILITY FOR LAYOUT OF THE WORK AND FOR ANY DAMAGE CAUSED TO THE OWNER OR OTHERS BY IMPROPER LOCATION OR CARRYING OUT OF THIS

P. X-RAY FLOOR/WALL OR ANY CONCRETE SURFACES PRIOR TO CUTTING OR CORING OPENINGS FOR MECHANICAL PROVISIONING.

CONTRACTOR SHALL VISIT THE SITE DURING THE TENDER AND REVIEW DRAWINGS WITH THE EXISTING CONDITION AND IDENTIFY ANY DISCREPANCIES OR INTERFERENCES BETWEEN DRAWINGS AND SITE CONDITIONS AND ALLOW IN THEIR PRICING TO MODIFY/ RELOCATE EXISTING SERVICES (CONDUITS, PIPING, DUCTWORK, ETC) FOR INSTALLATION OF NEW SERVICES. ADDITIONAL FEES FOR THE ABOVE WILL NOT BE APPROVED AFTER CLOSING THE TENDER.

R. CONTRACTOR SHALL REMOVE CEILING FOR ACCESS TO PIPING ABOVE CEILING WHEN EXISTING PIPING TO BE REMOVED/ NEW PIPING TO BE INSTALLED ABOVE CEILING AND RE-INSTALL CEILING FOLLOWING COMPLETION OF WORK AND PAINT WHOLE CEILING TO

S. CONTRACTOR TO PRE-AUDIT FOR ALL AIR SYSTEMS IN THIS CONTRACT. T. CONTRACTOR SHALL PERFORM A COMPLETE TEST AND BALANCING AFTER COMPLETION OF THE WORK AND SUBMIT REPORT TO CONSULTANT AND KPRDSB

U. THE MECHANICAL CONTRACTOR IS RESPONSIBLE FOR COMMISSIONING OF REPLACED AND NEW HEATING/COOLING EQUIPMENT AND C/W ALL ASSOCIATED DAMPERS, VALVES,

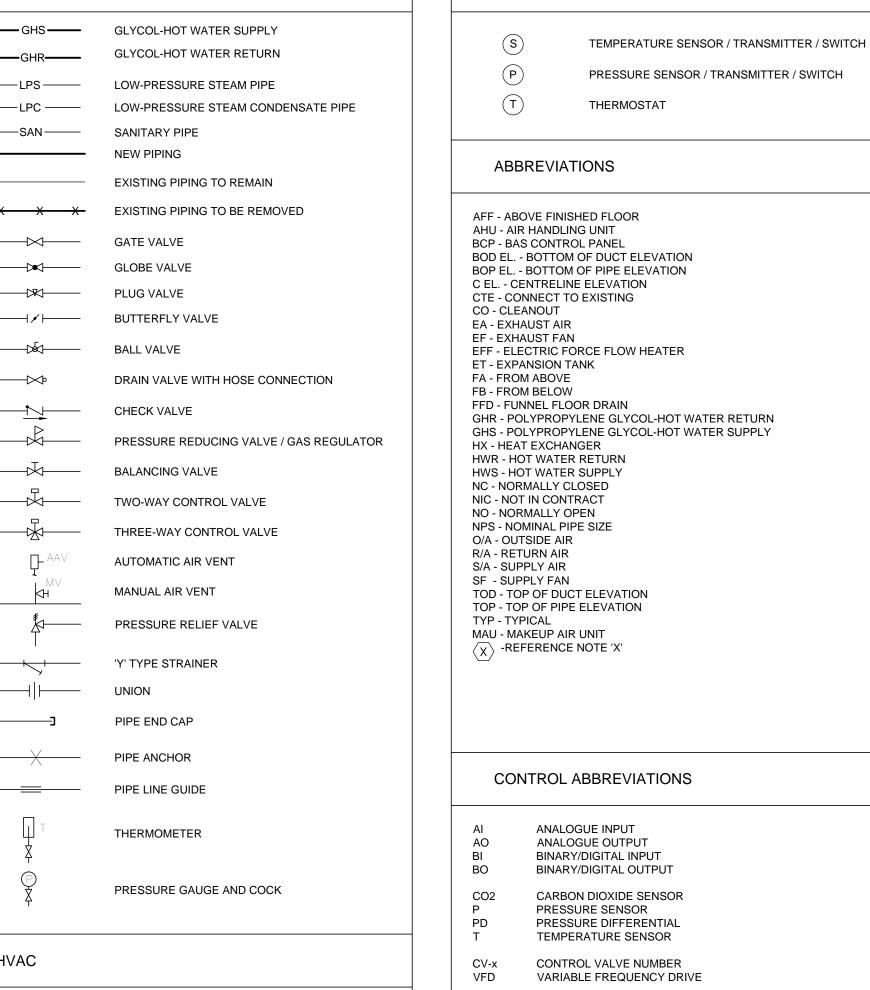
V. CONTRACTOR SHALL PROVIDE ANY EQUIPMENT NECESSARY FOR PERFORMING AIR BALANCING.

GLYCOL-HOT WATER SUPPLY GLYCOL-HOT WATER RETURN ——LPS —— LOW-PRESSURE STEAM PIPE ——LPC —— LOW-PRESSURE STEAM CONDENSATE PIPE -----SAN------SANITARY PIPE EXISTING PIPING TO REMAIN X X EXISTING PIPING TO BE REMOVED GATE VALVE GLOBE VALVE PLUG VALVE BUTTERFLY VALVE BALL VALVE DRAIN VALVE WITH HOSE CONNECTION CHECK VALVE BALANCING VALVE TWO-WAY CONTROL VALVE THREE-WAY CONTROL VALVE AUTOMATIC AIR VENT MANUAL AIR VENT PRESSURE RELIEF VALVE 'Y' TYPE STRAINER UNION PIPE END CAP PIPE ANCHOR PIPE LINE GUIDE THERMOMETER PRESSURE GAUGE AND COCK

MECHANICAL LEGEND

PIPING

NPS - NOMINAL PIPE SIZE O/A - OUTSIDE AIR R/A - RETURN AIR S/A - SUPPLY AIR SF - SUPPLY FAN TOD - TOP OF DUCT ELEVATION TOP - TOP OF PIPE ELEVATION TYP - TYPICAL MAU - MAKEUP AIR UNIT $\langle \chi \rangle$ -REFERENCE NOTE 'X' **CONTROL ABBREVIATIONS** ANALOGUE INPUT ANALOGUE OUTPUT BINARY/DIGITAL INPUT BINARY/DIGITAL OUTPUT CARBON DIOXIDE SENSOR CO2 PRESSURE SENSOR PRESSURE DIFFERENTIAL PD TEMPERATURE SENSOR CONTROL VALVE NUMBER CV-x VFD VARIABLE FREQUENCY DRIVE

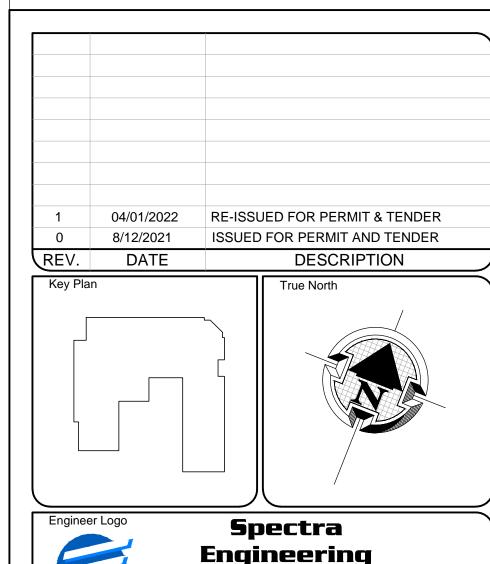


SINGLE LINE

√ X − X − X − √

├

CONTROLS:







Kawartha Pine Ridge District School Board

Drawing Overall Scale

AS SHOWN

Project Name & Address

DATE:

TERRY FOX PUBLIC SCHOOL COBOURG HRV-HWT-BAS INSTRUMENTATION

1065 RIDDELL AVE, COBOURG, ON K9A 5N4

MECHANICAL SERVICES

MECHANICAL SPECIFICATION & LEGEND

Engineer / Architect Stamp 11/11/2021 DESIGNED BY: M.A. DRAWN BY: J.L. OFESSION APPROVED BY: M.A. 1. Akhawan PROJECT NO.: 1021225 M.AKHAVANBAZAZ 100088319

> Drawing No. Phase Revis M-103

DUCT WORK - (RECTANGULAR) DUCT WORK - (ROUND) DUCT WORK - (FLEXIBLE) ACOUSTIC DUCT XX INSULATION (INTERNAL) OPPOSED BLADE DAMPER PARALLEL BLADE DAMPER · 1 FIRE DAMPER FIRE/SMOKE DAMPER М DAMPER ACTUATOR (MOTORIZED) BUTTERFLY DAMPER (BALANCING) BACKDRAFT DAMPER DUCT - SUPPLY AIR

FLEXIBLE CONNECTION

EQUIPMENT MARK NO. 'A' - INDICATES ITEM 'x' - INDICATES UNIT COUNTER FUNNEL FLOOR DRAIN

DUCT - RETURN / EXHAUST / TRANSFER

DUCT TO BE DEMOLISHED

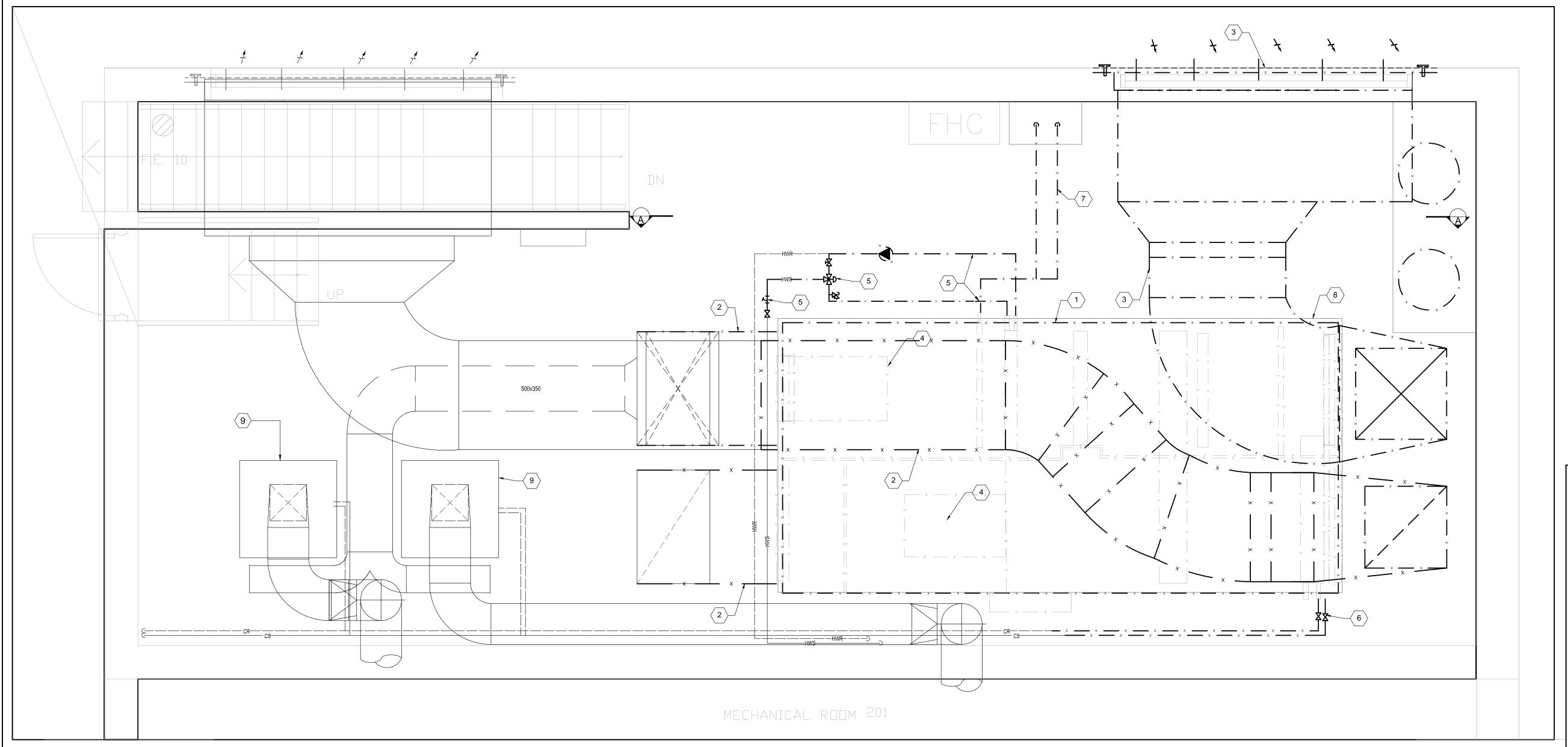
DIFFUSER, GRILLE, OR TERMINAL UNIT 'A' - INDICATES TYPE 'B' - INDICATES SIZE (INCH)

'C' - INDICATES CAPACITY (CFM)

XXX

DOUBLE LINE

В



HEAT RECOVERY UNIT DEMOLITION PLAN

SECTION A-A

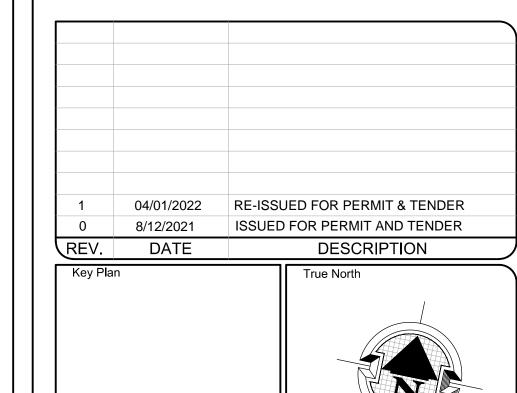
SCALE: 1:25

DEMOLITION NOTES:

- EXISTING HRV C/W SUPPLY/RETURN FAN; HEATING/DX COILS AND COMPRESSOR AND CONDENSER TO BE DEMOLISHED C/W ALL ELECTRICAL AND CONTROL CONNECTION. PREPARE FOR INSTALLATION OF NEW UNIT. REFER TO NEW WORK PLAN FOR MORE DETAIL.
- 2 EXISTING SUPPLY; EXHAUST AND RETURN DUCT TO BE DEMOLISHED PARTIALLY AS SHOWN AND MODIFIED AS REQUIRED FOR THE NEW WORK.
- DEMOLISH AND REMOVE ALL O/A DUCT TO HRV AND 3150mmx1600mm LOUVER IN THIS MECHANICAL ROOM. PREPARE THE OPENING FOR INSTALLING THE NEW HRV THROUGH.
- 4 EXISTING HRV SUPPLY/RETURN FAN AND COMPRESSOR TO BE DEMOLISHED C/W ALL ELECTRICAL AND CONTROL CONNECTION. PREPARE FOR INSTALLATION OF NEW UNIT. REFER TO NEW WORK PLAN
- EXISTING HWS & HWR PIPING TO AHU AND ASSOCIATED VALVES/ 3-WAY VALVE TO BE DEMOLISHED. RELOCATED CIRC PUMP TO NEW HEATING CONNECTION MODIFY THE MAIN BRANCHES AS REQUIRED AND MAKE READY FOR NEW WORK. REFER TO NEW WORK PLAN FOR DETAIL.
- 6 EXISTING CS & CR CONDENSER PIPING TO HRV AND ASSOCIATED SOLENOID VALVE; TEMPERATURE SENSOR; FLOW SWITCHES AND THERMOMETER TO BE DEMOLISHED. MODIFY THE MAIN BRANCHES AS REQUIRED AND MAKE READY FOR NEW WORK. REFER TO NEW WORK PLAN FOR DETAIL.
- 7 EXISTING STEAM HUMIDIFIER PIPING TO AHU AND ASSOCIATED VALVES TO BE DEMOLISHED AND REMOVED.
- UNDERNEATH CONCRETE PAD TO REMAIN. FINISH CONCRETE PAD SURFACE TO MATCH SURROUNDING. PREPARE FOR INSTALLATION OF NEW UNIT.REFER TO NEW WORK PLAN FOR MORE DETAIL.
- GENERAL CONTRACTOR ENSURE THAT THE CONSTRUCTION AREA IS ISOLATED, AND THE HEAT PUMPS REMAIN IN OPERATION DURING CONSTRUCTION PERIOD TIME

GENERAL NOTES:

- 1. ALL EXISTING SERVICES SHOWN HAS BEEN EXTRACTED FROM AVAILABLE BASE BUILDING DRAWINGS AND RANDOM SITE SURVEYS. NOT ALL EXISTING SERVICES/SITE INFORMATION HAS BEEN SHOWN NOR CAN THE INFORMATION SHOWN BE GUARANTEED FOR PRECISE ACCURACY. CONTRACTOR SHALL THEREFORE VISIT THE SITE PRIOR TO SUBMITTING A BID TO SATISFY THEMSELVES THAT ALL WORK SHOWN AND/OR SPECIFIED CAN BE CARRIED OUT IN ACCORDANCE WITH THE CONTRACT DOCUMENT.
- 2. ALL EXISTING EQUIPMENT TAG NOS. USED ON THIS DRAWING ARE BASED ON EXISTING BASE BUILDING STANDARDS.
- 3. ALL CUTTING/PATCHING/CORING OF WALLS AND FLOORS REQUIRED TO ACCOMMODATE NEW MECHANICAL WORK IS TO BE ARRANGED AND PAID FOR BY MECHANICAL CONTRACTOR. X-RAY FLOORS/CONCRETE WALLS PRIOR TO CORING/CUTTING.
- 4. THE MECHANICAL DRAWINGS DO NOT SHOW ALL THE ARCHITECTURAL AND STRUCTURAL DETAILS. ANY SPECIFIC INFORMATION INVOLVING ACCURATE MEASURING OF THE BUILDING SHALL BE TAKEN FROM THE BUILDING DRAWINGS OR AT THE BUILDING. MAKE WITHOUT ADDITIONAL CHARGE, ANY NECESSARY CHANGES OR ADDITIONS TO THE RUNS OF DUCTS AND PIPES TO ACCOMMODATE THE ABOVE CONDITIONS.
- 5. COORDINATE WITH ALL OTHER TRADES AND SITE SUPERINTENDENT ON ALL WORK.
- 6. ALL ABANDONED PIPING WHICH ARE NO LONGER BEING USED SHALL BE REMOVED FROM THE SITE. CONTRACTOR SHALL ENSURE PRIOR TO REMOVAL OF ANY PIPING THAT THE SYSTEM IS COMPLETELY ISOLATED AND IS NOT ALIVE.
- 7. WORK SHALL INCLUDE STARTUP OF ALL SYSTEMS, FURNISHING OF OPERATING AND MAINTENANCE INSTRUCTIONS, AND ONE (1) YEAR GUARANTEE, COMMENCING ON THE DATE OF ACCEPTANCE BY THE TENANT
- 8. CONNECTIONS BETWEEN DUCTS AND FANS/AHUS SHALL BE MADE WITH 6" LONG FLEXIBLE NEOPRENE.
- SUPPORT ALL NEW DUCTS AND PIPES FROM THE CEILING/ROOF STRUCTURE.
- 10. ALL ROOFING AND PENETRATIONS SHALL BE DONE IN STRICT ACCORDANCE WITH KPRDSB STANDARD DETAILS AND ONLY BY KPRDSB APPROVED ROOFING TRADES. IF THE ROOF IS UNDER WARRANTY, ONLY THE WARRANTY HOLDER SHALL BE RETAINED TO PERFORM THE WORK.
- 11. NEW CONTROL SYSTEM TO BE DDC AS PER KPRDSB STANDARD.
- 12. ALL REDUNDANT WALL / ROOF OPENINGS SHALL BE SEALED AND FIRE-STOPPED AS REQUIRED.





Spectra Engineering

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Kawartha Pine Ridge
District School Board

Drawing Overall Scale

AS SHOWN

Project Name & Address

TERRY FOX PUBLIC SCHOOL COBOURG
HRV-HWT-BAS INSTRUMENTATION
1065 RIDDELL AVE, COBOURG, ON K9A5N4

Drawing Title

MECHANICAL SERVICES

DEMOLITION WORK

HEAT RECOVERY UNIT DEMOLITION PLAN

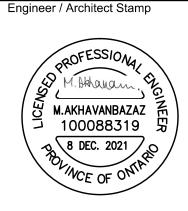
DATE: 11/11/2021

DESIGNED BY: J.L

DRAWN BY: J.L.

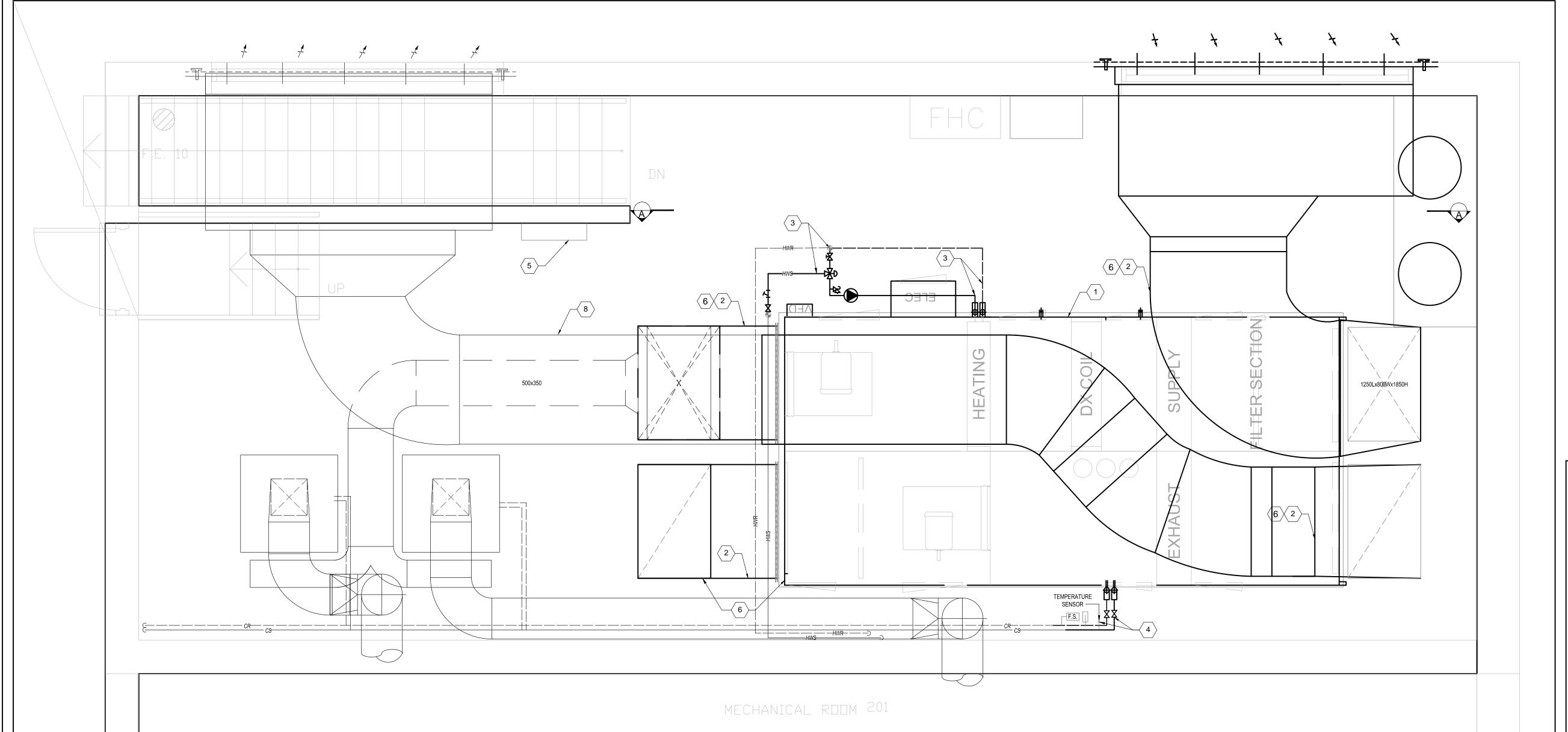
APPROVED BY: M. A

PROJECT NO.: 1021225

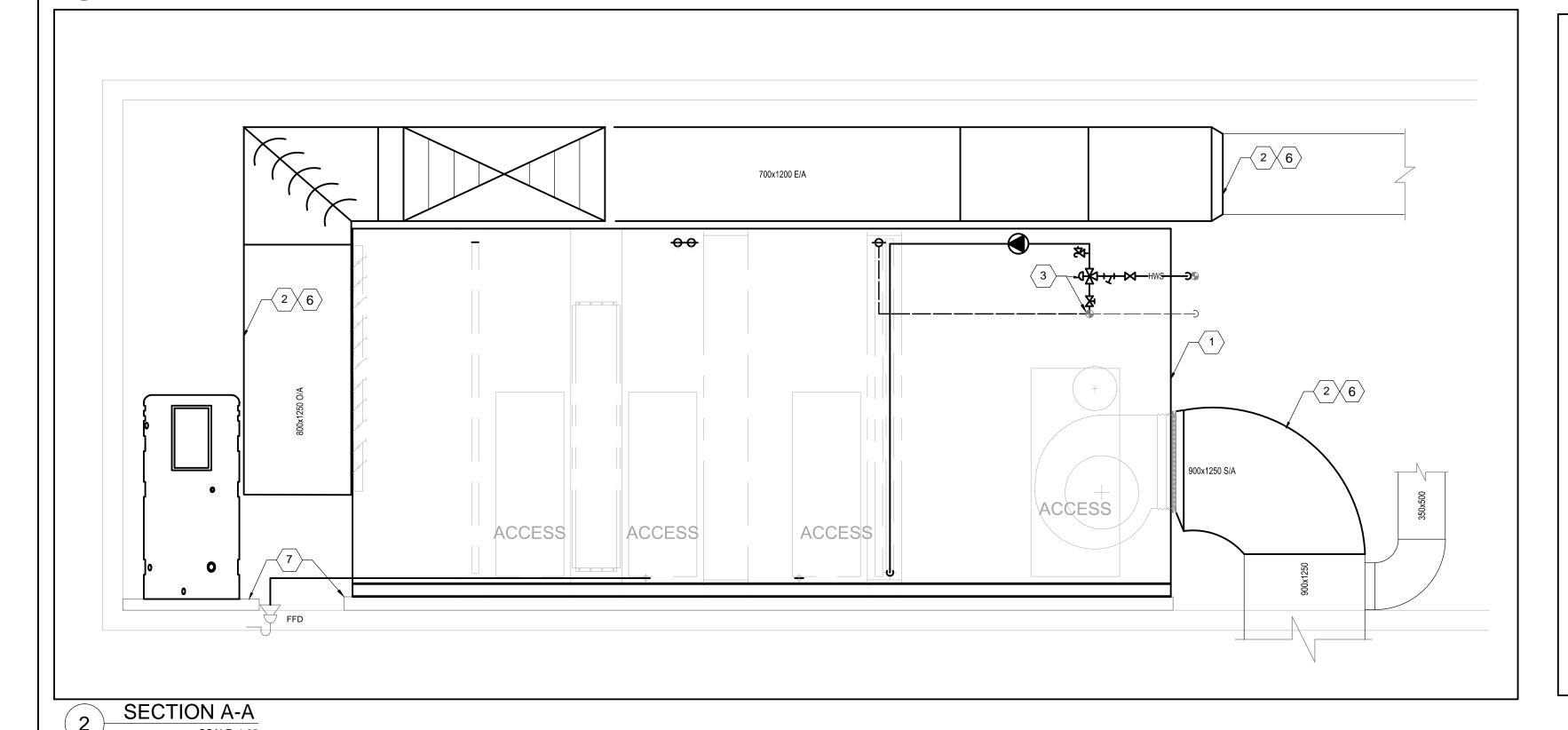


Drawing No. Phase Revision

M-300 T 0



HEAT RECOVERY UNIT NEW PLAN

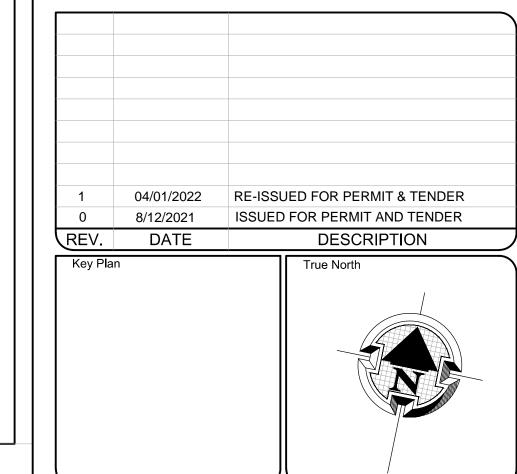


DESIGN NOTES:

- PROVIDE AND INSTALL NEW HRV AS PER EQUIPMENT SCHEDULE AND IN ACCORDANCE WITH MANUFACTURE'S INSTALLATION INSTRUCTION. THE UNIT SHALL BE BROUGHT INTO THE MECHANICAL ROOM IN SECTIONS THROUGH THE OUTSIDE O/A LOUVER OPENING, AND ASSEMBLED BY MECHANICAL CONTRACTOR ON SITE. RE-CONNECT ALL EXITING SERVICES INCLUDING POWER AND CONTROL. COMMISSION THE NEW UNIT AND SUBMIT THE REPORT FOR REVIEW AND APPROVAL. MODIFY THE DUCTWORK AS REQUIRED TO SUIT FOR CONNECTION TO THE NEW UNIT. CONNECT THE UNIT TO THE NEW CONTROLLER.
- PROVIDE AND INSTALL NEW INSULATED S/A, R/A; O/A AND E/A DUCTWORK AND CONNECT TO EXISTING SUPPLY DUCTS AS SHOWN. EXACT DUCT LAYOUT AND TIE-IN POINTS TO EXISTING DUCTWORK SHALL BE VERIFIED ON SITE. PROVIDE ACCESS DOOR ON DUCTS FOR ALL NEW DAMPERS AS REQUIRED.PROVIDE SUPPORT AS REQUIRED PER DETAIL DRAWING AS REQUIRED.
- PROVIDE AND INSTALL NEW INSULATED 75Ø HOT WATER PIPING CONNECTION FOR THE NEW HRV C/W CONTROL VALVES; REUSED PUMP AND ALL ASSOCIATED ACCESSORIES, AND CONNECT TO EXISTING PIPES. EXACT PIPING LAYOUT SHALL BE VERIFIED AT SITE. PROVIDE AUTOMATIC AIR VENT AT THE HIGHEST POINT OF THE PIPING SYSTEM AS REQUIRED. SUPPORT SHALL BE PROVIDED AS PER DETAIL DRAWING.CONTRACTOR TO COORDINATE ENOUGH SPACE FOR MAINTENANCE PURPOSE OF HEATING
- PROVIDE AND INSTALL NEW 75Ø CS & CR CONDENSER PIPING TO AHU AND ASSOCIATED SOLENOID VALVE; TEMPERATURE SENSOR; FLOW SWITCHES AND THERMOMETER.
- 5 EXISTING BAS PANEL (TO BE VERIFIED AT SITE). CONTRACTOR TO REVIEW THE BAS PANEL DURING THE TENDER WALK-THROUGH AND ALLOW FOR ANY MODIFICATION AS REQUIRED INCLUDING ALL CONTROLS AND ELECTRICAL REQUIREMENTS. A NEW PANEL SHALL BE PROVIDED IF REQUIRED TO ACHIEVE THE DESIRED CONTROL. REFER TO CONTROL SCHEMATIC FOR NEW WORK.
- CONTRACTOR TO RE-BALANCE ENTIRE DUCTWORK ASSOCIATED WITH NEW HRV UNIT. AS SHOWN ON THE DRAWING AND EQUIPMENT SCHEDULE.
- NEW HRV SHALL BE ON FURBISHED PAD. THE UNIT TO BE INSTALLED ON NEOPRENE ALL ALONG THE FRAME . FOR MORE DETAIL REFER TO STRUCTURAL DRAWING.
- CONTRACTOR TO VACUUM CLEAN THE EXISTING S/A , R/A AND E/A DUCT.
- GONTROL CONTRACTOR SHALL PROVIDE AND INSTALL DAMPER ACTUATOR, POWER AND ALL REQUIRED ACCESSORIES AS SHOWN ON DRAWING. REFER TO DWG M-500 FOR CONTROL SCHEMATIC. ALL SIZES TO BE VERIFIED ON SITE AND COORDINATED WITH THE ERV SUPPLIER.
- PROVIDE AND INSTALL ALL O/A DUCT TO HRV AND 3150mmx1600mm LOUVER C/W BIRD SCREEN IN THIS MECHANICAL ROOM.
- PROVIDE NEW 1" CONDENSATE DRAIN PIPING AND P-TRAP FOR HRV UNIT TERMINATE NEW DRAIN PIPING ABOVE EXISTING FUNNEL FLOOR DRAIN.

GENERAL NOTES:

- 1. ALL EXISTING SERVICES SHOWN HAS BEEN EXTRACTED FROM AVAILABLE BASE BUILDING DRAWINGS AND RANDOM SITE SURVEYS. NOT ALL EXISTING SERVICES/SITE INFORMATION HAS BEEN SHOWN NOR CAN THE INFORMATION SHOWN BE GUARANTEED FOR PRECISE ACCURACY. CONTRACTOR SHALL THEREFORE VISIT THE SITE PRIOR TO SUBMITTING A BID TO SATISFY THEMSELVES THAT ALL WORK SHOWN AND/OR SPECIFIED CAN BE CARRIED OUT IN ACCORDANCE WITH THE CONTRACT DOCUMENT.
- 2. ALL EXISTING EQUIPMENT TAG NOS. USED ON THIS DRAWING ARE BASED ON EXISTING BASE BUILDING STANDARDS.
- 3. ALL CUTTING/PATCHING/CORING OF WALLS AND FLOORS REQUIRED TO ACCOMMODATE NEW MECHANICAL WORK IS TO BE ARRANGED AND PAID FOR BY MECHANICAL CONTRACTOR. X-RAY FLOORS/CONCRETE WALLS PRIOR TO CORING/CUTTING.
- 4. THE MECHANICAL DRAWINGS DO NOT SHOW ALL THE ARCHITECTURAL AND STRUCTURAL DETAILS. ANY SPECIFIC INFORMATION INVOLVING ACCURATE MEASURING OF THE BUILDING SHALL BE TAKEN FROM THE BUILDING DRAWINGS OR AT THE BUILDING. MAKE WITHOUT ADDITIONAL CHARGE, ANY NECESSARY CHANGES OR ADDITIONS TO THE RUNS OF DUCTS AND PIPES TO ACCOMMODATE THE ABOVE CONDITIONS.
- 5. COORDINATE WITH ALL OTHER TRADES AND SITE SUPERINTENDENT ON ALL WORK.
- 6. ALL ABANDONED PIPING WHICH ARE NO LONGER BEING USED SHALL BE REMOVED FROM THE SITE. CONTRACTOR SHALL ENSURE PRIOR TO REMOVAL OF ANY PIPING THAT THE SYSTEM IS COMPLETELY ISOLATED AND IS NOT ALIVE.
- 7. WORK SHALL INCLUDE STARTUP OF ALL SYSTEMS, FURNISHING OF OPERATING AND MAINTENANCE INSTRUCTIONS, AND ONE (1) YEAR GUARANTEE, COMMENCING ON THE DATE OF ACCEPTANCE BY THE TENANT
- 8. CONNECTIONS BETWEEN DUCTS AND FANS/AHUS SHALL BE MADE WITH 6" LONG FLEXIBLE NEOPRENE.
- 9. SUPPORT ALL NEW DUCTS AND PIPES FROM THE CEILING/ROOF STRUCTURE.
- 10. ALL ROOFING AND PENETRATIONS SHALL BE DONE IN STRICT ACCORDANCE WITH KPRDSB STANDARD DETAILS AND ONLY BY KPRDSB APPROVED ROOFING TRADES. IF THE ROOF IS UNDER WARRANTY, ONLY THE WARRANTY HOLDER SHALL BE RETAINED TO PERFORM THE WORK.
- 11. NEW CONTROL SYSTEM TO BE DDC AS PER KPRDSB STANDARD.
- 12. ALL REDUNDANT WALL / ROOF OPENINGS SHALL BE SEALED AND FIRE-STOPPED AS REQUIRED.





Spectra
Engineering
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Kawartha Pine Ridge

District School Board

250 SHEPPARD AVE. EAST, SUITE #306, TORONTO, ONTARIO, M2N 6M9
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Drawing Overall Scale

AS SHOWN

Project Name & Address

TERRY FOX PUBLIC SCHOOL COBOURG
HRV-HWT-BAS INSTRUMENTATION

1065 RIDDELL AVE, COBOURG, ON K9A5N4

Drawing Title

MECHANICAL SERVICES

NEW WORK HEAT RECOVERY UNIT NEW PLAN

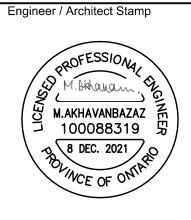
DATE: 11/11/2021

DESIGNED BY: J.L

DRAWN BY: J.L.

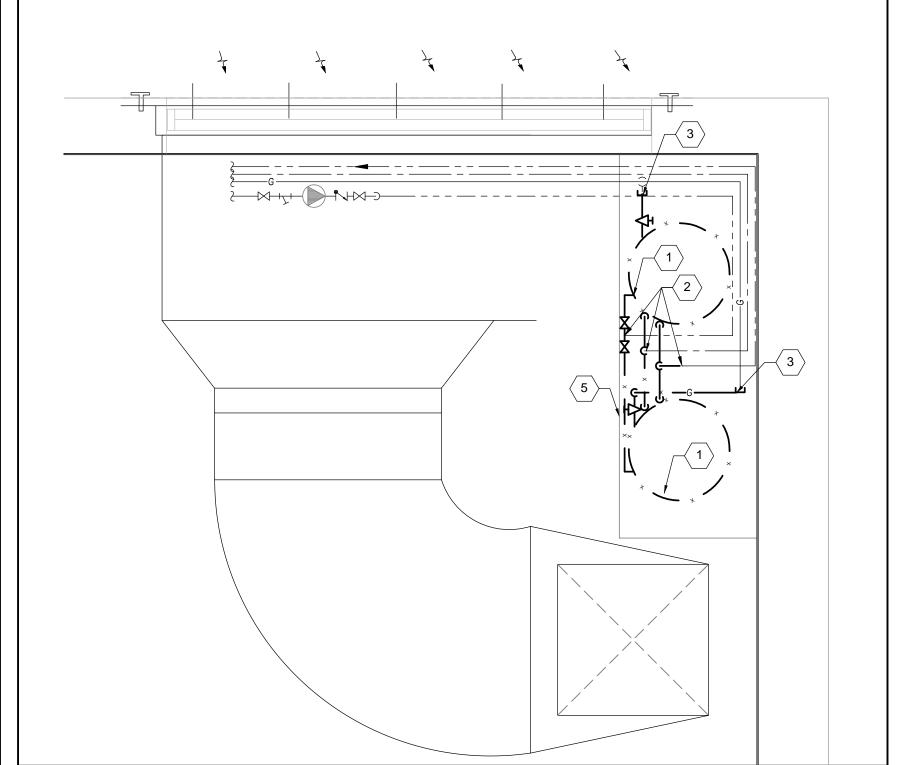
APPROVED BY: M. A

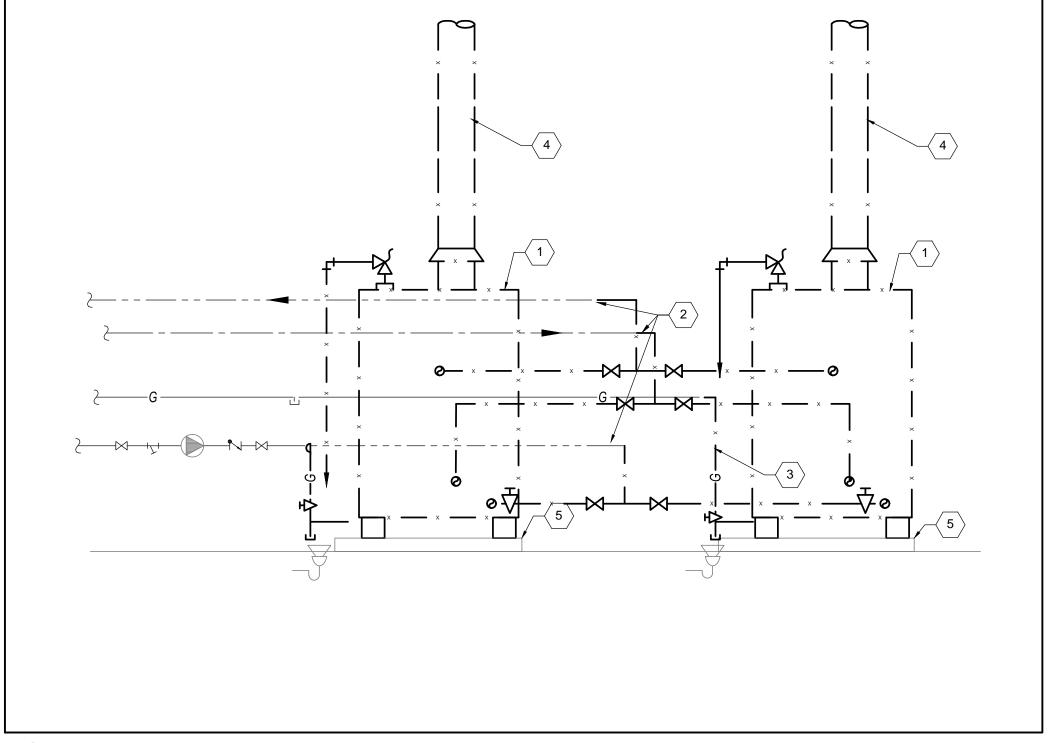
PROJECT NO.: 1021225



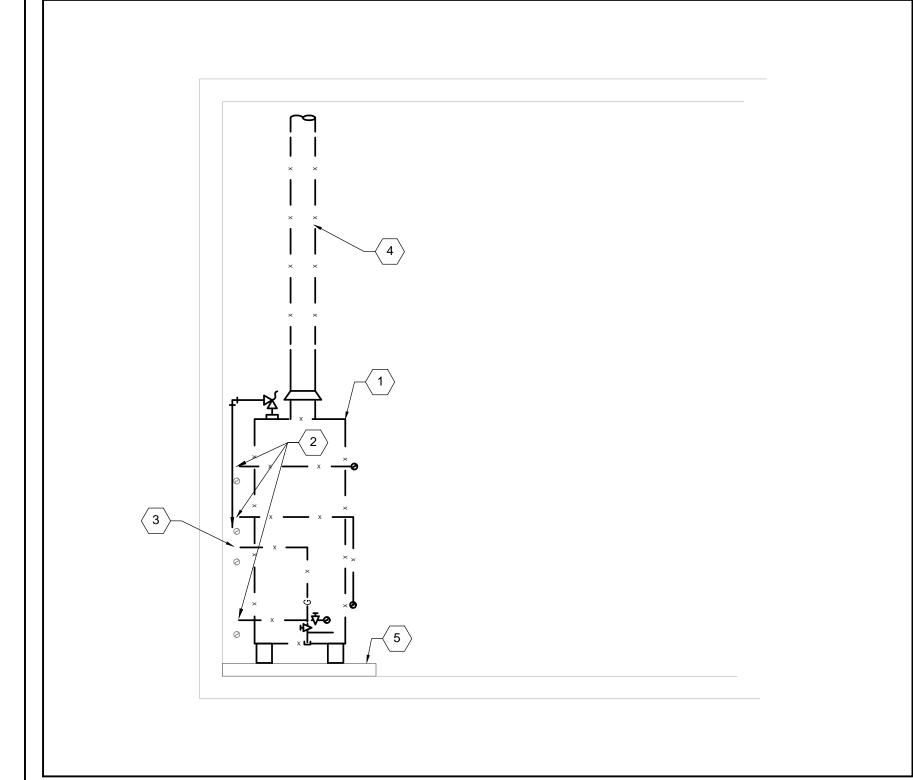
Drawing No. Phase Revision

M-301 T 0





DOMESTIC HOT WATER TANK DEMOLITION PLAN

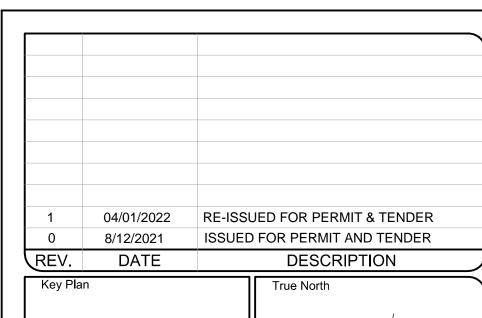


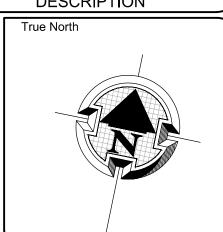
DOMESTIC HOT WATER TANK DEMOLITION DETAIL

DEMOLITION NOTES:

- REMOVE EXISTING DOMESTIC HOT WATER HEATER AT THIS APPROXIMATE LOCATION. REMOVE ASSOCIATED HOT AND COLD WATER PIPES/VALVES AS SHOWN, AND COORDINATE WITH ELECTRICAL CONTRACTOR TO MAKE SAFE POWER.
- \langle 2 angle CUT AND CAPPED EXISTING DHW & DCW AND DHWR PIPES AND VALVES
- $\fbox{3}$ CUT AND CAPPED EXISTING GAS LINE C/W VALVE AND DIRT LEG. DURING RENOVATION PERIOD OF TIME.
- REMOVE AND DEMOLISH FLUE VENTS. COORDINATE WITH GENERAL CONTRACTOR TO PATCH AND MAKE GOOD ALL FLUE VENT PENETRATIONS THROUGH THE ROOF OR SLAB.
- UNDERNEATH CONCRETE PAD TO REMAIN. PREPARE FOR INSTALLATION OF NEW UNIT.REFER TO NEW WORK PLAN FOR MORE DETAIL.
- 6 EXISTING FLOOR DRAIN TO REMAIN AND MODIFIED AS REQUIRED FOR CONNECTING TO THE NEW UNIT DRAIN.

SECTION A-A





Spectra E**NGINEEFING Ltd.**50 SHEPPARD AVE. EAST, SUITE #306, TORONTO, ONTARIO, M2N 6M9
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Kawartha Pine Ridge

District School Board

Drawing Overall Scale

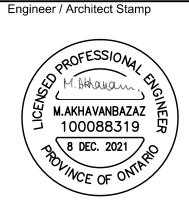
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Project Name & Address

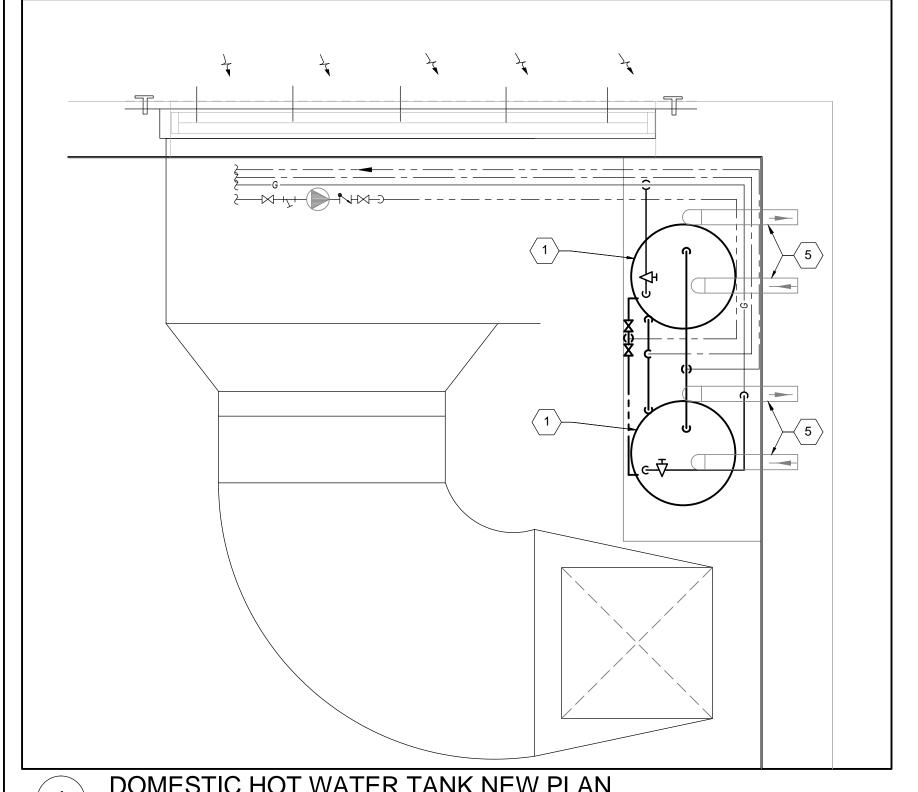
TERRY FOX PUBLIC SCHOOL COBOURG HRV-HWT-BAS INSTRUMENTATION 1065 RIDDELL AVE, COBOURG, ON K9A5N4

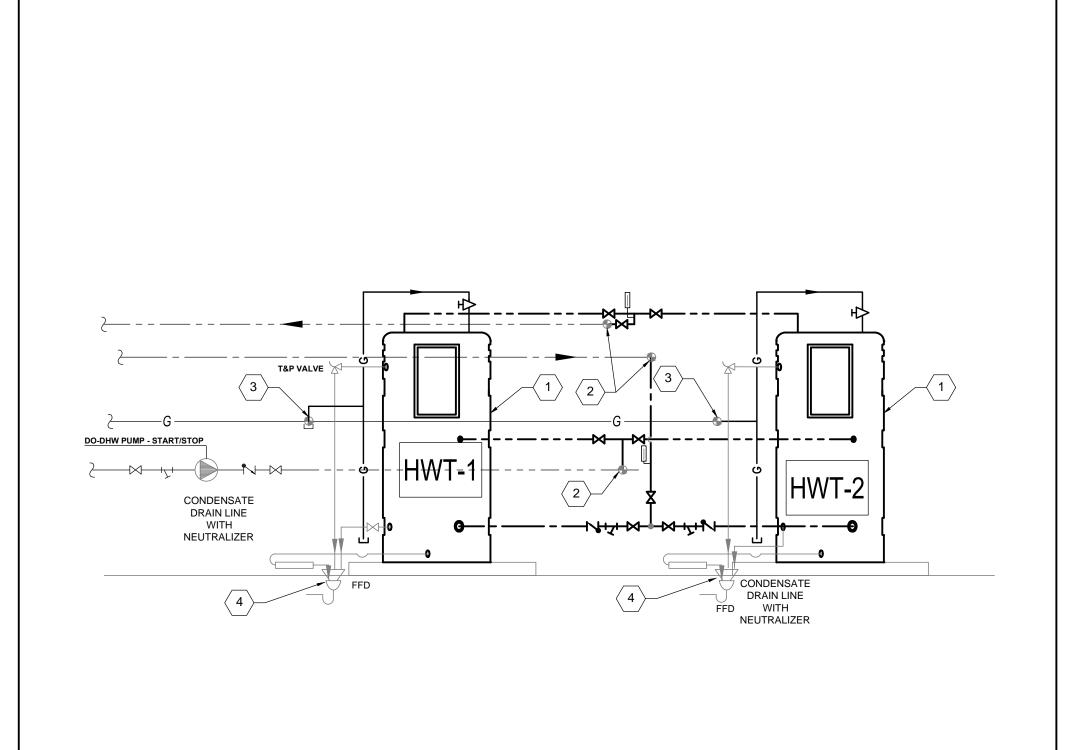
MECHANICAL SERVICES **DEMOLITION WORK** DOMESTIC HOT WATER TANK DEMOLITION PLAN

DESIGNED BY: J.L DRAWN BY: J.L. APPROVED BY: M. A PROJECT NO.: 1021225



Drawing No. Phase Revision M-302 T 0



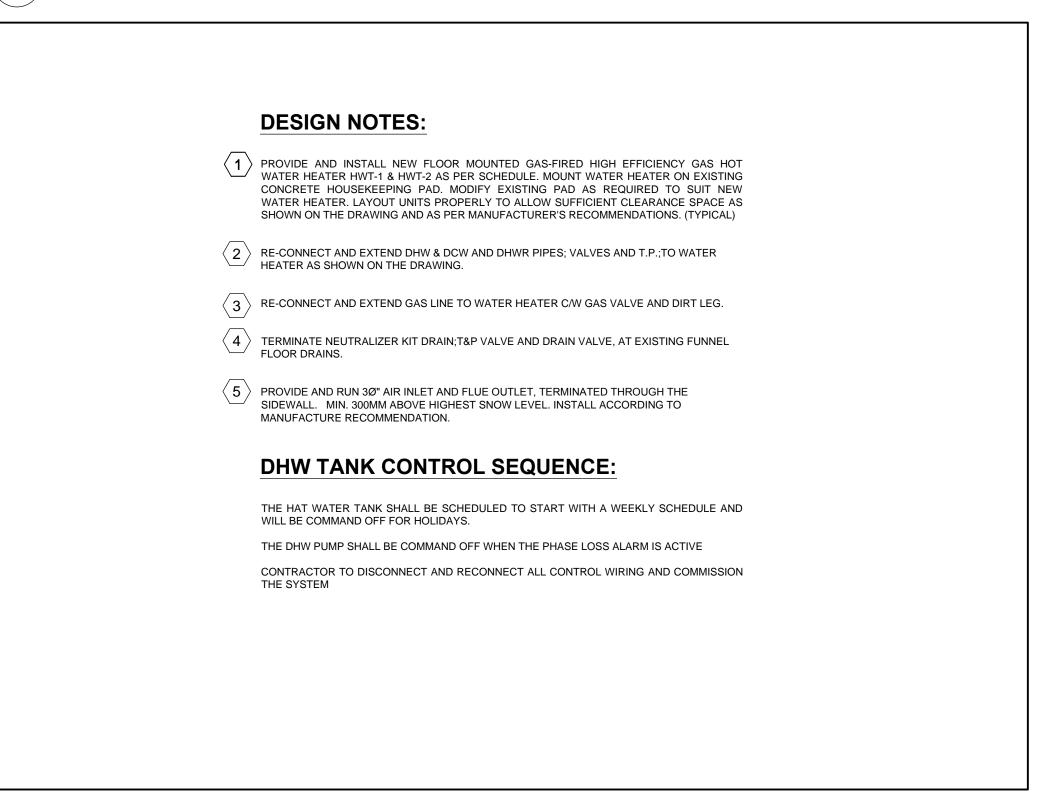


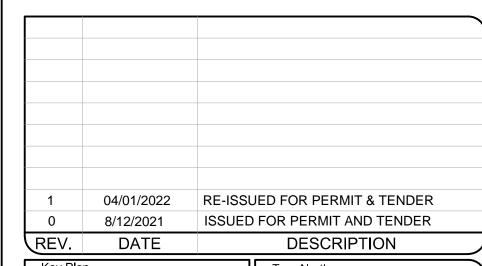
DOMESTIC HOT WATER TANK NEW PLAN
SCALE: 1:25

2 DOMESTIC HOT WATER TANK NEW DETAIL
SCALE: N.T.S

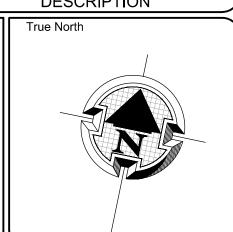
3 SECTION A-A

SCALE: 1:25





Key Plan



Engineer Logo

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Engineering
Ltd.

D SHEPPARD AVE. EAST, SUITE #306, TORONTO, ONTARIO, M2N 6M9
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Client

Kawartha Pine Ridge

District School Board

Drawing Overall Scale

AS SHOWN

Project Name & Address

TERRY FOX PUBLIC SCHOOL COBOURG
HRV-HWT-BAS INSTRUMENTATION
1065 RIDDELL AVE, COBOURG, ON K9A5N4

Drawing Title

MECHANICAL SERVICES

DEMOLITION WORK
DOMESTIC HOT WATER TANK NEW PLAN

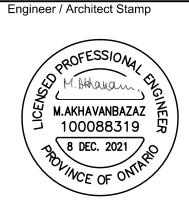
DATE: 11/11/2021

DESIGNED BY: J.L

DRAWN BY: J.L.

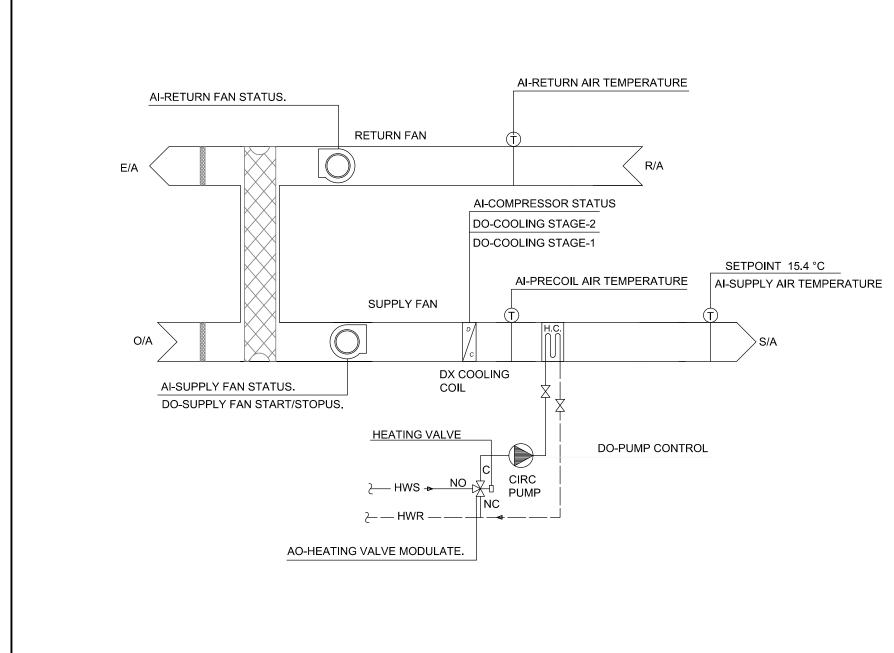
APPROVED BY: M. A

PROJECT NO.: 1021225



Drawing No. Phase Revision

M-303 T



CLASSROOM HRV CONTROL SEQUENCES

- 1. THE HRV SHALL BE SCHEDULED TO START BY A WEEKLY SCHEDULE AND WILL BE COMMANDED OFF FOR HOLIDAYS.
- 2. THE BAS SHALL MONITOR THE SUPPLY FAN STATUS AND THE SUPPLY AIR TEMPERATURE.
- 3. THE HRV SHALL BE COMMANDED OFF IF THE PHASE LOSS ALARM IS ACTIVE.
- 4. WHEN THE HRV IS STARTED BY THE WEEKLY SCHEDULE IT WILL HAVE A START UP RAMPING. TIME OF 5 MINUTES BEFORE REACHING NORMAL OPERATION.
- 5. THE SUPPLY AIR TEMPERATURE SETPOINT CAN BE SET BETWEEN 12.7°C AND
- 6. THE DX COOLING SHALL BE COMMANDED OFF, THE MIXED AIR DAMPERS AND THE HEATING VALVE SHALL BE CONTROLLED TO MAINTAIN SUPPLY AIR TEMPERATURE SETPOINT.
- 7. THE BAS SHALL ENABLE THE DX COOLING WHEN THE OUTDOOR TEMPERATURE
- 8. THE BAS SHALL ENABLE FREE COOLING MODE WHEN THE OUTDOOR
- TEMPERATURE IS BELOW 21°C.
- 9. THE HEATING VALVE SHALL BE COMMANDED CLOSED, THE BAS SHALL STAGE THE DX COMPRESSORS TO MAINTAIN THE SUPPLY AIR TEMPERATURE SETPOINT.
- 10. THE DX COOLING STAGES SHALL HAVE A MINIMUM OFF TIME OF 5 MINUTES AND A MINUMUM RUN TIME OF 4 MINUTES.
- 11. THE BAS SHALL STOP ALL DX COOLING STAGES IF THE SUPPLY AIR TEMPERATURE DROPS BELOW 7°C.
- 12. WHEN AN HRV IS COMMANDED OFF, IT WILL NOT BE STARTED AGAIN FOR A MINIMUM OF 5 MINUTES, THE DX COOLING WILL BE OFF, MIXED AIR DAMPERS SHALL RETURN TO THEIR RESPECTIVE NORMAL POSITIONS AND THE HEATING VALVE SHALL BE CONTROLLED TO PROTECT THE HEATING COIL FROM FREEZING.
- 13. THE BAS SHALL MONITOR THE AIR TEMPERATURE IN RETURN DUCT AND BEFORE HEATING COIL.

DESIGN NOTE

CONTROL CONTRACTOR SHALL MODIFY EXISTING BAS PANEL AS REQUIRED FOR CONNECTION TO NEW TERMINAL CONTROL PANELS OR ADD NEW BAS PANEL C/W POWER PANELS AS NEEDED. CONTRACTOR SHALL SUPPLY AND INSTALL ANY NEW EQUIPMENT AND INSTRUMENT TO INTEGRATE NEW EQUIPMENT TO EXISTING BASE BUILDING BAS SYSTEM. UPGRADE THE GRAPHIC ON THE BAS AND RE-COMMISSION THE NEW SYSTEM.

CONTROL CONTRACTOR TO RECONNECT THE EXISTING POINTS TO THE NEW HRV UNITS AND RE-COMMISSION THE SYSTEM.

DECOMMISSION THE POINTS ASSOCIATED WITH STEAM HUMIDIFIER.

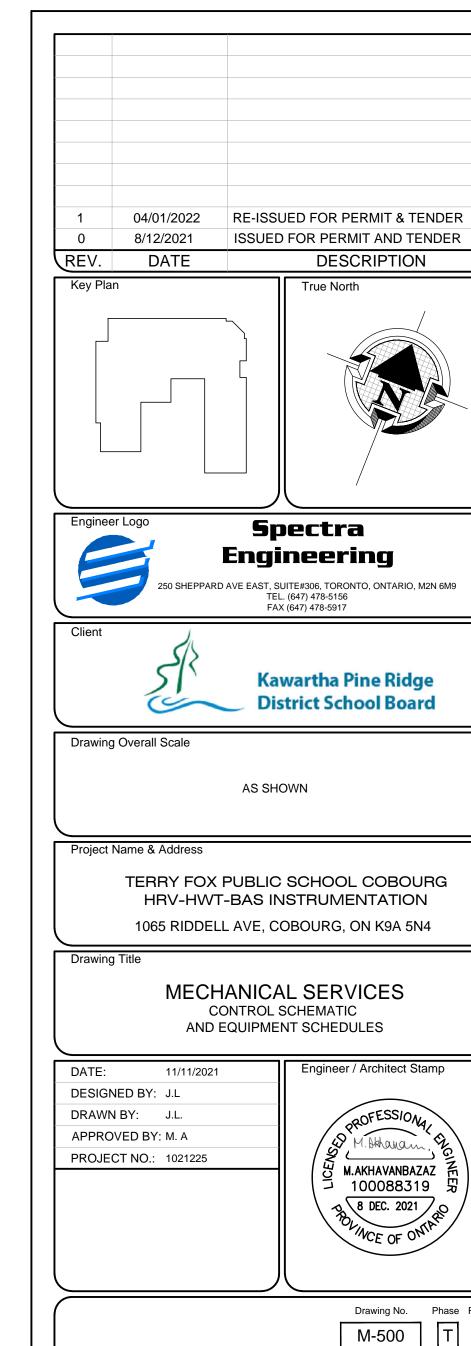
HEAT RECOVERY UNIT CONTROL SCHEMATIC AND SEQUENCE OF OPERATION

GENERAL NOTES:

- 1. ALL EXISTING SERVICES SHOWN HAS BEEN EXTRACTED FROM AVAILABLE BASE BUILDING DRAWINGS AND RANDOM SITE SURVEYS. NOT ALL EXISTING SERVICES/SITE INFORMATION HAS BEEN SHOWN NOR CAN THE INFORMATION SHOWN BE GUARANTEED FOR PRECISE ACCURACY. CONTRACTOR SHALL THEREFORE VISIT THE SITE PRIOR TO SUBMITTING A BID TO SATISFY THEMSELVES THAT ALL WORK SHOWN AND/OR SPECIFIED CAN BE CARRIED OUT IN ACCORDANCE WITH THE CONTRACT DOCUMENT.
- 2. ALL EXISTING EQUIPMENT TAG NOS. USED ON THIS DRAWING ARE BASED ON EXISTING BASE BUILDING STANDARDS.
- 3. ALL CUTTING/PATCHING/CORING OF WALLS AND FLOORS REQUIRED TO ACCOMMODATE NEW MECHANICAL WORK IS TO BE ARRANGED AND PAID FOR BY MECHANICAL CONTRACTOR. X-RAY FLOORS/CONCRETE WALLS PRIOR TO CORING/CUTTING.
- 4. COORDINATE WITH ALL OTHER TRADES AND SITE SUPERINTENDENT ON ALL WORK.
- 5. WORK SHALL INCLUDE STARTUP OF ALL SYSTEMS, FURNISHING OF OPERATING AND MAINTENANCE INSTRUCTIONS, AND ONE (1) YEAR GUARANTEE, COMMENCING ON THE DATE OF ACCEPTANCE BY THE
- 6. CONNECTIONS BETWEEN DUCTS AND FANS/AHUS SHALL BE MADE WITH 6" LONG FLEXIBLE NEOPRENE.
- 7. REMOVE ALL EXISTING PNEUMATIC CONTROL DEVICES. NEW CONTROL SYSTEM TO BE DDC AS PER KPRDSB STANDARD.
- 8. ALL REDUNDANT WALL / ROOF OPENINGS SHALL BE SEALED AND
- 9. CONTROL CONTRACTOR SHALL MATCH ALL NEW AHU AND FAN CONTROL WITH EXISTING BAS PANEL(S) AS REQUIRED (FOR CONNECTION TO NEW TERMINAL CONTROL PANELS OR ADD NEW BAS PANEL C/W POWER AS NEEDED FOR THE NEW POINTS). CONTRACTOR SHALL SUPPLY AND INSTALL ANY NEW EQUIPMENT AND INSTRUMENT TO INTEGRATE ALL NEW CONTROL WORK INTO THE EXISTING BASE BUILDING BAS SYSTEM, UPGRADE THE GRAPHICS ON THE BAS BUILDING CONTROLS SYSTEM AND COMMISSION ALL NEW WORK.
- 10. CONTRACTOR SHALL HIRE THE BASE BUILDING CONTROL CONTRACTOR TO CONNECT NEW EQUIPMENT TO BAS, UPDATE THE SYSTEM GRAPHICS, AND PROVIDE THE SEQUENCE OF OPERATION AS PER DRAWING. BAS COMMISSIONING REPORT SHALL BE SUBMITTED TO KPRDSB AND CONSULTANT FOR REVIEW AND APPROVAL.
- 11. UPDATE GRAPHICS AND FIRMWARE VERSION OF ALL BAS CONTROLLERS. (IF APPLICABLE)
- 12. INCORPORATE SCHEDULING STANDARDS OF KPRDSB.

FIRE-STOPPED AS REQUIRED.

- 13. BACNET INTEGRATION FOR BOTH SF AND RF VFD TO READ STATUS.
- 14. 2 BI TO MONITOR SECURITY SYSTEM.(IF APPLICABLE)

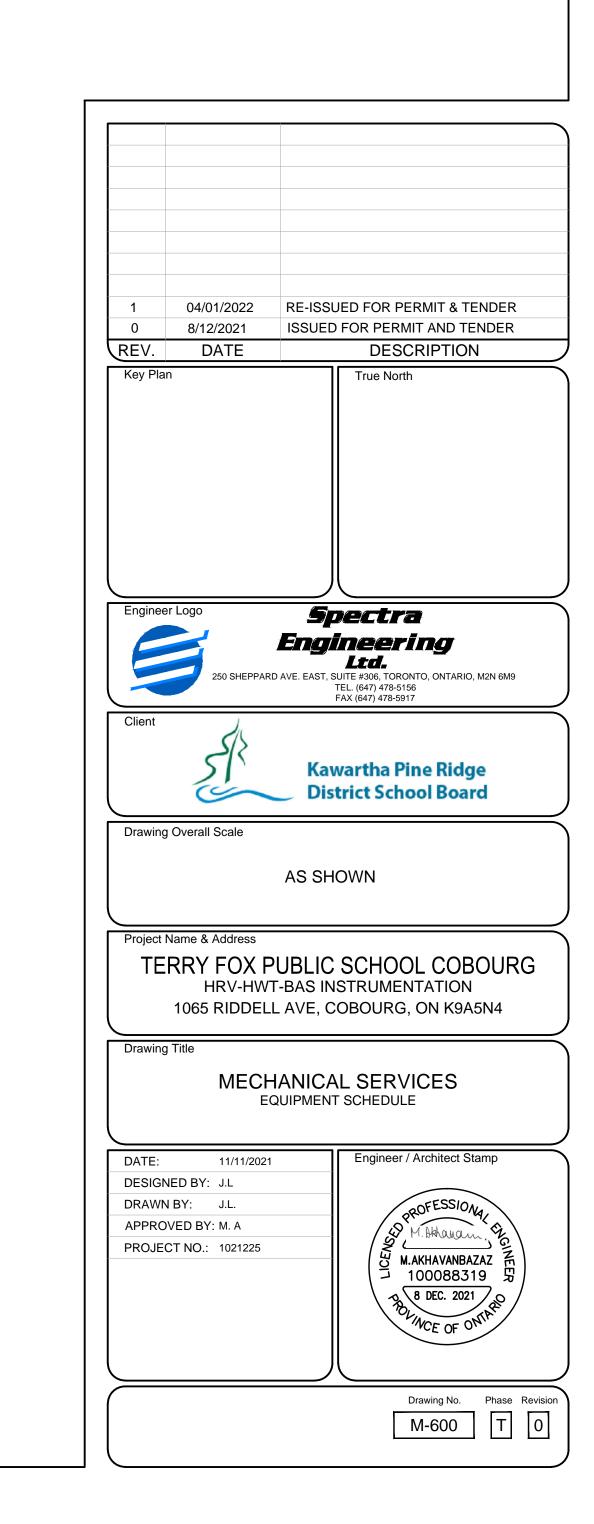


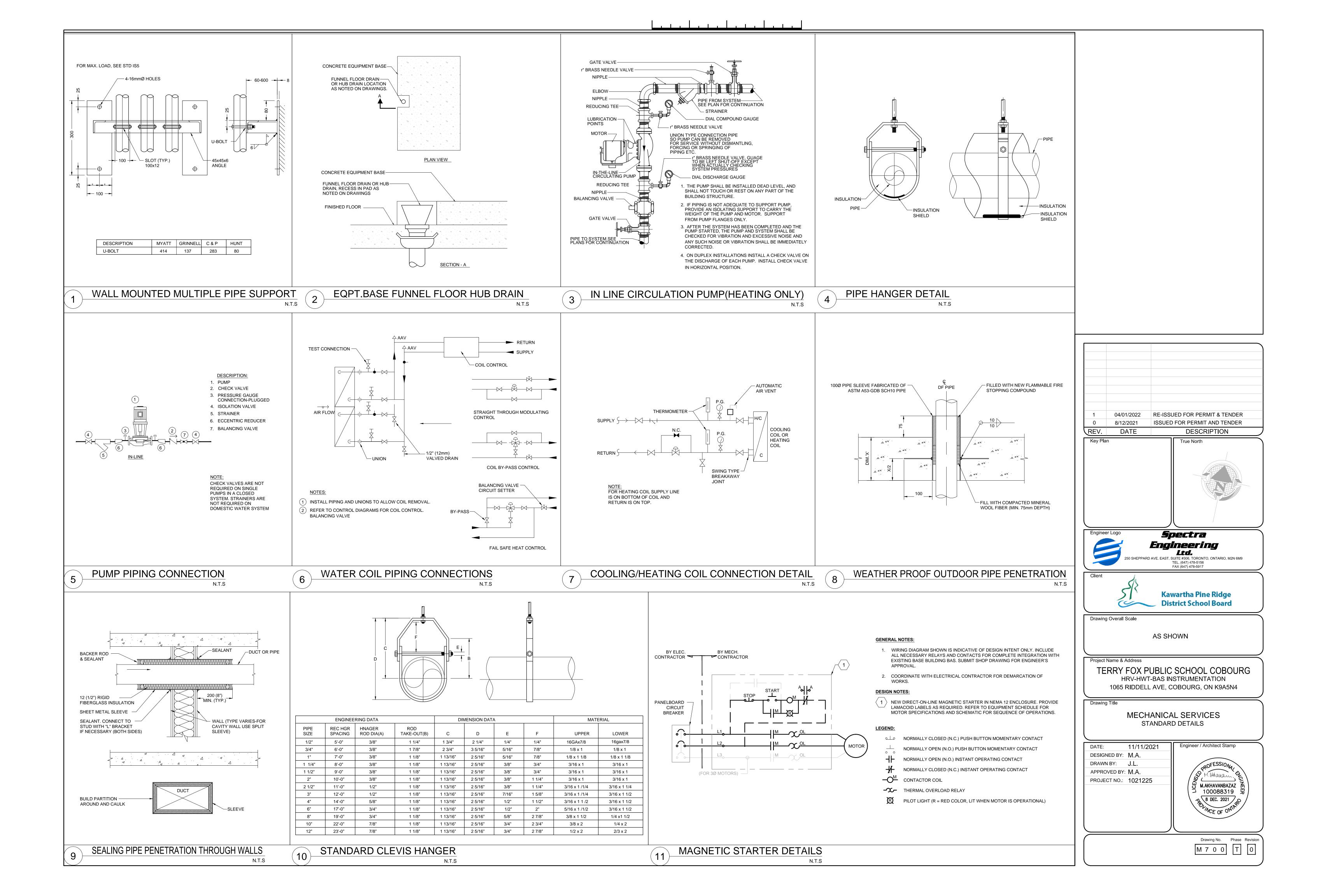
Drawing No. Phase Revisio

	SCHEDULE OF HVAC HEAT RECOVERY UNIT																											
	TAG SERVICES LOCATION MAKE			MODEL	KE MODEL	KE MODEL	KE MODEL	MODEL	MODEL	FAN					HEAT RECOVERY WHEEL				HEATING COIL CAPACITY		COOLING			CONDENSER		ELECTRICAL		
TAG		MAKE	MODEL							MODEL	MODEL		SUPPLY	AIR		RETURN A	AIR		SUF	PPLY		EXH	HAUST		E) A / T /		CAPACITY	
				L/S (CFM)	ESP/TSP "WC	MOTOR (BHP/HP)	L/S (CFM)	ESP/TSP "WC	MOTOR (BHP/HP)	ENTER TEMP. DB/WB (°F)	LEAV TEMP. DB/WB (°F)	ENERGY RECOVER Y (MBH)	ASHRAE EFFICIEN CY	ENTER TEMP. DB/WB (°F)	LEAV TEMP. DB/WB (°F)	МВН	EWT/L WT (F°)		TOTAL/SENSIBL E (MBH)	EDB/EW B (°F)	LDB/LW B (°F)	EWT/LWT (F°)	GPM	POWER SUPPLY	CIRCUIT AMPACITY			
HRV	SCHOOL CLASSROOM	MECH. NO. 201	ENGA	UPEW253/HR P/MV/C	6326 13405	1 / 3.8	13.1 / 20	6244 13231	1/3.3	11.4 / 15	-15.0/-16.0°	38.3/26.0	771	62.1%	72	18.0/14.5°	812	190/162	67	303 / 225	89.6/75.2	74/69.5	90/ 100	69	208 / 3 / 60	202.7 AMPS	16000	
NOTE																												

NAT. GAS HOT WATER TANK (HWT)													
MARK/TYPE	INPUT (MBH) VOLTS (V) MANUFACT MODEL SIZE (in) WEIGHT (LB) REMARKS												
HWT-1	T-1 300 120 (1) PVI 30 L 100A-GCL Ø28"x75-3/4" 1470 REFER TO NOTES												
HWT-2	30.1 REFER TO												
NOTES: 1- REFER TO	NOTES: 1- REFER TO FLOOR PLAN FOR LOCATION												

2- PROVIDE WITH TEMPERATURE AND PRESSURE RELIEF VALVE





PART A - GENERAL ELECTRICAL SPECIFICATIONS

1. CODES & REGULATIONS

BUILDING STANDARDS.

4 PERMITS & INSPECTIONS

- 1.1. ALL WORK SHALL COMPLY WITH THE LATEST EDITIONS OF THE BUILDING CODE. ELECTRICAL CODE, C.S.A. STANDARDS, UNDERWRITERS' LABORATORIES, ALL APPLICABLE LOCAL CODES, 8. CUTTING AND PATCHING AND ALL OTHER AUTHORITIES HAVING JURISDICTION. THESE CODES AND REGULATIONS CONSTITUTE AN INTEGRAL PART OF THE SPECIFICATIONS.
- 2.1. COMPLETE ALL ELECTRICAL WORK IN ACCORDANCE WITH THE RELEVANT SECTIONS OF THE BASE BUILDING SPECIFICATIONS, DRAWINGS, AND STANDARDS TO THE SATISFACTION OF THE CONSULTANT AND/OR THE BUILDING OWNER. THE BASE BUILDING DOCUMENTS WILL BE MADE AVAILABLE FOR REVIEW BY THE BUILDING OWNER IF SO REQUIRED. SITE VISIT
- 3.1. THE CONTRACTOR SHALL VISIT THE SITE AND EXAMINE ALL DRAWINGS CAREFULLY TO DETERMINE THE EXTENT OF WORK AFFECTING THE EXISTING BUILDING. DETERMINE AND INCLUDE IN THE TOTAL PRICE, THE TOTAL COST OF LABOUR AND MATERIAL TO DISCONNECT, REMOVE, RELOCATE, BLANK OFF, REROUTE OR MAKE SAFE ALL EXISTING SERVICES. CONDUITS, WIRE, BOXES, LUMINAIRES AND EQUIPMENT AS REQUIRED.
- 4.1. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE TO OBTAIN AND PAY FOR ALL
- NECESSARY PERMITS AND INSPECTIONS AS REQUIRED OR REQUESTED. 4.2. ONCE THE ELECTRICAL WORK HAS BEEN COMPLETED AND ACCEPTED BY THE OWNER, THE | 12. GROUNDING ELECTRICAL CONTRACTOR SHALL PROVIDE THE OWNER WITH CERTIFICATES VERIFYING THAT THE WORK HAS BEEN COMPLETED IN ACCORDANCE WITH ALL CODES, BUILDING STANDARDS AND ALL AUTHORITIES HAVING JURISDICTION.
- 5.1. PROVIDE INSURANCE FOR THE DURATION OF THE PROJECT TO PROTECT THE BUILDING OWNER, TENANT, AND TRADES FROM ALL CLAIMS. SUBMIT, AT THE TIME OF THE BID, PROOF
- OF AN AMOUNT ACCEPTABLE TO BUILDING OWNER AND TENANT. CONTRACT DOCUMENTS
- 6.1. THE DRAWINGS FOR THE WORK OF THIS DIVISION ARE IN PART DIAGRAMMATIC INTENDED TO 14. DISRUPTION OF EXISTING SERVICES CONVEY THE SCOPE OF WORK, GENERAL ARRANGEMENT, APPROXIMATE SIZES AND LOCATIONS OF THE EQUIPMENT AND OUTLETS.
- 6.2. REPORT ANY DISCREPANCIES BETWEEN THE ARCHITECTURAL, INTERIOR DESIGNER, MECHANICAL. STRUCTURAL, SECURITY, AUDIO VISUAL, KITCHEN LADNSCAPE DRAWINGS, ETC, AND THE ENGINEER'S DRAWING TO THE ENGINEER PRIOR TO INSTALLATION.
- 6.3. WHENEVER DIFFERENCES OCCUR BETWEEN PLANS AND DIAGRAMS, SCHEMATICS, AND BETWEEN SPECIFICATIONS AND DRAWINGS, THE MAXIMUM CONDITION SHALL GOVERN AND THE TENDER SHALL BE BASED ON WHICHEVER IS THE GREATER AMOUNT.
- 7.1. SUBMIT SHOP DRAWINGS OF LUMINAIRES, PANELBOARDS, AND OTHER MAJOR ELECTRICAL EQUIPMENT, AS REQUESTED BY THE ENGINEER, UNLESS OTHERWISE NOTED. EACH SHOP DRAWING SHALL BE CHECKED AND STAMPED AS BEING CORRECT BY THE GENERAL CONTRACTOR AND THE APPROPRIATE TRADE BEFORE SUBMISSION TO THE ENGINEER FOR APPROVAL 8. RECORD DRAWINGS
- 8.1. KEEP A RECORD SET OF DRAWINGS ON THE SITE ON WHICH SHALL BE CLEARLY INDICATED, THE EXACT LOCATION OF ALL OUTLETS, FIXTURES, FEEDER RUNS, PANELS, CONDUITS, JUNCTION BOXES, PULL BOXES, ETC. INFORMATION ON THESE DRAWINGS SHALL BE INCORPORATED IN THE AS-BUILT DRAWINGS UPON COMPLETION OF THE PROJECT. EXTRA WORK
- 9.1. IN CASES WHERE EXTRA WORK OF ANY KIND IS REQUIRED. OBTAIN WRITTEN INSTRUCTIONS FROM THE ARCHITECT/DESIGN CONSULTANT BEFORE PROCEEDING. PAYMENTS WILL BE MADE FOR AUTHORIZED CHANGES ONLY.
- 9.2. QUOTATION WITH BREAKDOWN OF MATERIAL, LABOUR, OVERHEAD, PROFIT, ETC. SHALL BE SUBMITTED FOR EACH CHANGE. LABOUR UNITS SHALL BE BASED ON LATEST NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION (NECA) LABOUR UNITS COLUMN ONE FOR THE COMPLETE DURATION OF THE PROJECT. MATERIAL PRICES SHALL BE BASED ON THE CURRENT NATIONAL PRICE SYSTEM WITH TRADE DISCOUNTS. HOURLY LABOUR RATE SHALL INCLUDE RELATED CHARGES FOR SUPERVISION, HYDRO INSPECTION, HAND TOOLS, PARKING, CLEAN-UP, AS-BUILT DRAWINGS AND ADDITIONAL BONDING.
- 10.1.THE CONTRACTOR SHALL PROVIDE THE TENANT WITH A WRITTEN ONE-YEAR WARRANTY, COMMENCING ON THE DATE OF ACCEPTANCE. THE WARRANTY SHALL COVER THE COMPLETE ELECTRICAL INSTALLATION. THE ELECTRICAL CONTRACTOR SHALL REPAIR AND/OR REPLACE ANY DEFECTS IN MATERIALS OR WORKMANSHIP THAT OCCUR DURING THE

WARRANTY PERIOD AT A TIME CONVENIENT TO THE TENANT/BUILDING OWNER, AND AT NO

11. AS-BUILTS

WARRANTY

- 11.1.PROVIDE AS-BUILT DRAWINGS OF THE ACTUAL INSTALLATION AS ELECTRONICS FILES IN AUTOCAD 2001 FORMAT AND IN PDF.
- 11.2.AS-BUILT DRAWINGS SHALL INCORPORATE ALL CHANGES AND DEVIATIONS FROM TENDER DRAWINGS, INCLUDING ALL MAIN CONDUIT RUNS, CABLE TRAYS, JUNCTION BOXES, AND INFORMATION RECORDED ON RECORD DRAWINGS DURING CONSTRUCTION.
- 11.3.ENGINEER'S STAMP AND COMPANY LOGO SHALL BE REMOVED FROM DRAWINGS. DRAWINGS SHALL BE MARKET "AS-BUILT" ALONG WITH ELECTRICAL CONTRACTOR'S NAME 12. CLOSE-OUT DOCUMENTS
- 12.1.AFTER COMPLETION OF THE PROJECT, PROVIDE THE FOLLOWING DOCUMENTS TO THE BUILDING OWNER, THE TENANT, AND THE ENGINEER, 12.1.1. THREE USBS (ELECTRONIC COPY) AND 1 3-RING BINDER (HARD COPY) OF THE
- CLOSEOUT DOCUMENTS. 12.1.2. INCLUDE AS BUILT DRAWINGS (CAD 2001 FILE AND PDF) AS PART OF THE CLOSEOUT
- 12.1.3. HYDRO ELECTRICAL INSPECTION REPORT.
- 12.1.4. FIRE ALARM VERIFICATION REPORT AND CERTIFICATE.
- 12.1.5. WRITTEN WARRANTY

PART B - EXECUTION

- 1.1. ALL WORK SHALL BE CARRIED OUT AND PERFORMED IN A WORKMANLIKE MANNER TO THE SATISFACTION OF THE ARCHITECT/DESIGN CONSULTANT. ANY UNSATISFACTORY WORK BY THIS DIVISION SHALL BE REPLACED WITHOUT EXTRA COST TO THE OWNER. 1.2. THE CONSTRUCTION SITE SHALL BE KEPT CLEAN AND ANY DEBRIS AND CONSTRUCTION MATERIAL SHALL BE REMOVED FROM THE SITE THROUGHOUT THE CONSTRUCTION PERIOD AND ON COMPLETION OF THE WORK.
- SCHEDULING 2.1. ALL WORK SHALL BE SCHEDULED AND COORDINATED TO AVOID ANY CONFLICTS WITH OTHER TRADES, BUILDING OWNER AND TENANT(S) DURING OR AFTER CONSTRUCTION.
- ALLOW FOR ALL NECESSARY PREMIUM TIME, ALL ALLOWANCE FOR THIS SHALL BE INCLUDED IN NE TENDER PRICE. 3. DELIVERY OF EQUIPMENT
- 3.1. DELIVERY SCHEDULE OF ALL MAJOR ITEMS OF EQUIPMENT SUPPLIED UNDER THIS CONTRACT SHALL BE SUBMITTED IN WRITING TO THE GENERAL CONTRACTOR AT THE START OF THE PROJECT. FAILURE TO IDENTIFY DELIVERY PROBLEMS MAY RESULT IN DELAY
- 4. TEMPORARY POWER
- 4.1. PROVIDE TEMPORARY ELECTRICAL POWER FOR THE WORK OF THIS TRADE AND OTHER TRADES AS REQUIRED BY THE GENERAL CONTRACTOR OR THE TENANT. LOCATION OF OUTLETS
- 5.1. THE ARCHITECT/DESIGN CONSULTANT SHALL HAVE NE RIGHT, AT ANY TIME, TO CHANGE THE LOCATION OF ANY OUTLET UP TO TEN FEET WITHOUT EXTRA COST TO THE TENANT, PROVIDED THAT NOTIFICATION OF SUCH CHANGES ARE ISSUED PRIOR TO NE INSTALLATION

OF NE OUTLET. ROUTING OF EQUIPMENT

- 6.1. NEW CONDUITS AND OTHER NEW SERVICES SHALL BE CAREFULLY ROUTED SO THAT THEY DO NOT INTERFERE WITH ANY EXISTING INSTALLATIONS. ROUTING OF EQUIPMENT IN BUILDING COMMON AREAS AND RISER ROOMS SHALL BE REVIEWED AND APPROVED BY BUILDING OWNER PRIOR TO INSTALLATION. ANY EXISTING CONDUITS, CABLE TRAYS, BUS DUCTS OR OTHER SERVICES NAT INTERFERE WITH NE NEW INSTALLATION SHALL BE
- RELOCATED UNDER THIS CONTRACT. 7. FLOOR PENETRATION
- 7.1. X-RAY AND OBTAIN WRITTEN APPROVAL FROM BUILDING OWNER PRIOR TO PENETRATING ANY STRUCTURAL SURFACES OR FLOOR SLABS AND CARRY OUT THE WORK IN ACCORDANCE WITH THE BUILDING STANDARDS. THE CONTRACTOR SHALL REPLACE OR

SPECIFICATIONS

- REPAIR ANY ITEMS WHICH ARE DAMAGED DUE TO THIS WORK AT NO EXTRA COST TO NE BUILDING OWNER.
- 7.2. ALL NEW SERVICES NAT PENETRATE THE FLOOR SLAB OR ARE RATED WALLS OR CEILINGS SHALL BE IN CONDUIT AND SHALL BE SEALED WITH AN APPROVED, NON-SHRINK, WATERPROOF AND FIREPROOF SEALANT.
- 8.1. ALL CUTTING AND PATCHING REQUIRED TO THE BUILDING STRUCTURE FOR THE WORK SHALL BE INCLUDED AS PART OF THIS CONTRACT, UNLESS OTHERWISE ADVISED BY THE
- 9.1. ACCESS PANELS SHALL BE PROVIDED IN CEILINGS WHERE JUNCTION BOXES AND OTHER ELECTRICAL EQUIPMENT CAN NOT BE LOCATED IN ACCESSIBLE LOCATIONS PROVIDED THAT APPROVAL HAS BEEN OBTAINED FROM THE ARCHITECT/DESIGN CONSULTANT.
- 10.1.ALL ELECTRICAL EQUIPMENT SHALL OPERATE WITHOUT OBJECTIONABLE NOISE OR VIBRATION TO THE OWNER'S SATISFACTION. 1. MECHANICAL WIRING
- 11.1.CONTROL WIRING FOR ALL MECHANICAL EQUIPMENT TO BE SUPPLIED AND INSTALLED BY DIV.25. ALL STARTERS, INCLUDING FAN SWITCHES TO BE SUPPLIED BY DIV.25 AND INSTALLED BY DIV.26 UNLESS OTHERWISE NOTED. DIV.26 TO PROVIDE ALL POWER HIRING AND REQUIRED DISCONNECT SWITCHES.
- 12.1.ALL GROUNDING SHALL CONFORM TO NE ELECTRICAL SAFETY CODE AND LOCAL
- 12.2.PROVIDE SEPARATE GREEN INSULATED GROUND CONDUCTOR IN EVERY POWER CONDUIT TO ALL DEVICES, LUMINAIRES, EQUIPMENT, AND WIN ALL FEEDERS.
- 13.1.PROVIDE TYPEWRITTEN DIRECTORIES FOR NEW AND EXISTING PANELBOARDS WITHIN THE AREA OF WORK, TO REFLECT THE LATEST REVISIONS. LABELING TO BE BASED ON ROOM NUMBERS AND/OR LOCATION AND LOAD TYPES.
- 14.1 THE CONTRACTOR SHALL ASSUME FULL RESPONSIBILITY FOR ANY DISRUPTION TO THE EXISTING SERVICES. THE EXISTING BUILDING MUST BE KEPT IN OPERATION AT ALL TIMES ARRANGE WORK IN SUCH A MANNER THAT INTERRUPTIONS IN SERVICES OCCUR ONLY AT SCHEDULED TIMES. INTERRUPTIONS SHALL BE SCHEDULED WIN NE ARCHITECT/DESIGN CONSULTANT AT LEAST 48 HOURS IN ADVANCE. OVERTIME WORK NAT MAY BE REQUIRED TO TIE-IN SERVICES AT NIGHT OR ON WEEKENDS SHALL BE INCLUDED IN THE TENDER AMOUNT.
- 15.1.EXAMINE THE WORK OF THE OTHER TRADES, AS THEY AFFECT THIS DIVISION, REPORT AT ONCE TO NE ARCHITECT/DESIGN CONSULTANT ANY DEFECT OR INTERFERENCE NAT MAY AFFECT NE WORK OF THIS DIVISION OR NE GUARANTEE OF THIS WORK.
- 16.1.THE CONTRACTOR SHALL BE RESPONSIBLE FOR DISCONNECTING AND REMOVING ALL ELECTRICAL EQUIPMENT FROM AREAS BEING ALTERED OR DEMOUSHED. WIRING, CONDUIT AND EQUIPMENT WHICH IS REQUIRED TO MAINTAIN SERVICE IN OTHER PARTS OF THE BUILDING SHALL BE TEMPORARILY SUPPORTED, REROUTED, SERVICED OR RELOCATED AS
- 16.2.EQUIPMENT TO BE RELOCATED SHALL BE VERIFIED FOR WORKING CONDITION. PROVIDE NEW IF NECESSARY AND FEASIBLE. EXTEND WIRING/CONDUIT AND RECONNECT TO SUIT 16.3.OBSOLETE CONDUITS AND CABLES SHALL BE DISCONNECTED FROM THEIR SOURCE OF SUPPLY, CUT BACK AS FAR AS POSSIBLE, AND SHALL BE REMOVED. ALL EXISTING WIRING NOT REMOVED SHALL BE DISCONNECTED, BLANKED-OFF AND MADE SAFE.
- 16.4.UNLESS OTHERWISE ADVISED. ALL BASE BUILDING LUMINAIRES. TRANSFORMERS. PANELBOARDS AND DISCONNECT SWITCHES WHICH ARE REMOVED SHALL BE HANDED OVER
- 16.5.ALL REMOVED EQUIPMENT AND MATERIALS WHICH ARE NO LONGER REQUIRED, UNLESS OTHERWISE NOTED, SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND SHALL BE REMOVED FROM THE SITE UPON COMPLETION OF THE WORK
- 16.6.PROVIDE BLANK COVER PLATE WHERE OUTLETS ARE REMOVED FROM EXISTING WALLS TO 16.7 BE RESPONSIBLE AND PAY FOR ANY DAMAGE TO THE BASE BUILDING INCURRED BY WORK
- OF THIS DIVISION, OR REPAIR TO THE SATISFACTION OF THE CONSULTANT. 16.8.CARRY OUT THE WORK WITH MINIMUM OF NOISE, DUST AND DISTURBANCE.
- 17.1 PROVIDE 4 (FOUR) SETS OF OPERATION AND MAINTENANCE MANUALS SUBMITTED IN USBS ALSO INCLUDE 1 COPY IN PDF FORMAT CONTRACTOR RED LINES AND O&M MANUAL. INCLUDE THE FOLLOWING INFORMATION IN THE OPERATIONS AND MAINTENANCE MANUALS:
 - NAMES AND ADDRESS OF LOCAL SUPPLIERS FOR THE ITEMS INCLUDES. TECHNICAL DATA, PRODUCT DATA, SUPPLEMENTED BY BULLETINS, COMPONENT ILLUSTRATIONS, EXPLODED VIEWS, TECHNICAL DESCRIPTIONS OF ITEMS, AND PARTS LISTS. ADVERTISING OR SALES LITERATURE IS NOT ACCEPTABLE.
 - THE CONSULTANT'S REVIEWED SHOP DRAWINGS. CERTIFICATE(S) OF ACCEPTANCE FOR ANY NEW FIRE ALARM COMPONENTS OF TIE-INS AND ANY BASE BUILDING TIE-INS FOR MISCELLANEOUS SYSTEMS (IE.
- LOAD BALANCE REPORT WRITTEN GUARANTEE.

REMOVAL OF EXISTING EQUIPMENT

17.2. REVIEW INFORMATION PROVIDED IN THE MAINTENANCE INSTRUCTIONS AND MANUAL WITH THE TENANT'S OPERATING PERSONNEL AND LANDLORD'S OPERATING PERSONNEL WHERE BASE BUILDING SYSTEMS ARE REVISED, TO ENSURE A COMPLETE UNDERSTANDING OF THE ELECTRICAL EQUIPMENT AND SYSTEMS AND THEIR OPERATION.

SECURITY, LIGHTING CONTROL, DIGITAL METERING).

- 18.1.COMPLETE THE INSTALLATION OF THE WORK IN ACCORDANCE WITH LATEST EDITIONS OF THE ONTARIO BUILDING CODE, PROVINCIAL ELECTRICAL SAFETY CODE, CSA, ANSI/TIA/EIA. ULC. NFPA. O.S.H.A. AND OTHER CODES AS REQUIRED. ALSO . ALL COMMUNICATION WORK
- SHALL COMPLY WITH LANDLORD'S REQUIREMENTS AND BASE BUILDING STANDARDS. 18.2.PROVIDE CABLE SUPPORTS, HARNESSES AND SLEEVES AS REQUIRED. ALL FREE RUNNING CABLES SHALL BE SECURELY FASTENED TO APPROPRIATE CABLE SUPPORTS AND HARNESS WITH A MAXIMAL INTERSUPPORT CABLE SAG OF 6". ALL CABLES SHALL BE COMPLETELY SUPPORTED BY THE HARNESSES SO THAT NO WEIGHT IS TRANSFERRED TO ANY OTHER EXISTING NON-STRUCTURAL FIXTURE OR CEILING CABLE STRUCTURE.
- 18.3.IT IS THE INTENT OF THESE DRAWINGS AND SPECIFICATIONS THAT THE CONTRACTOR PROVIDE COMPLETE AND OPERATIONAL SYSTEMS AS REQUIRED. 18.4.PROVIDE AND INSTALL ALL HORIZONTAL DATA COMMUNICATIONS CABLING AS INDICATED.
- HORIZONTAL DATA COMMUNICATIONS CABLES SHALL BE 4-PAIR UNSHIELDED TWISTED PAIR, CSA FT6/CMP FIRE RATED. CERTIFIED TO FIA/TIA CATEGORY 6 SPECIFICATIONS COMMUNICATIONS CABLES SHALL BE BELDEN, SIEMON OR APPROVED EQUIVALENT.
- 18.5.ANY HORIZONTAL CABLES THAT ARE NOT RUN IN A PLENUM SPACE FOR ANY DISTANCE MAY BE CSA FT4 RATED OR CMR RATED CABLES. 18.6.PROVIDE AND INSTALL FLEX FOR PROTECTION OF HORIZONTAL CABLES FROM WALL/FLOOR FEED POINT TO SYSTEMS FURNITURE/WIREMOLD. FLEX TO BE BLACK SPIRAL
- WRAP TUBING SIZED TO FIT FURNITURE CABLE BUNDLE. 18.7.PROVIDE AND INSTALL ALL MODULAR JACKS AS INDICATED. THE MODULAR JACKS FOR DATA AND VOICE SHALL BE 8-POSITION IN EIA/TIA-A 568A CONFIGURATION.
- 18.8.PROVIDE NEW TERMINATION PATCH PANELS AND BIX 1A4 IDC STRIPS. 18.9.DATA PATCH PANELS ARE TO BE CATEGORY 6 48-PORT MODULAR JACK PANELS AND FULLY LOADED WITH IDENTIFIED MODULES.
- 18.10. PROVIDE AND INSTALL PLYWOOD BACKBOARD AS REQUIRED. PLYWOOD BACKBOARD SHALL BE 19mm (3/4") THICK, OF HIGHEST QUALITY FIRE RETARDANT.
- 18.11. ALL DATA/VOICE CABLES SHALL BE TESTED AFTER COMPLETE INSTALLATION FROM TERMINATION END TO TERMINATION END. DEFECTS AND DEFICIENCIES WHICH ORIGINATE OR BECOME EVIDENT DURING THE WARRANTY PERIOD MUST BE REPAIRED OR REPLACED,
- 18.12. THE COMMUNICATIONS CABLING CONTRACTOR/INSTALLER MUST BE A CERTIFIED WITH THE IDENTIFIED MANUFACTURER'S CABLING SYSTEM. CERTIFICATION BY THIRD PARTY OR ANY OTHER MEANS IS NOT ACCEPTABLE.
- 19.1.ALL FIRE ALARM SYSTEM INSTALLATION SHALL BE ACCORDING TO THE LATEST EDITION OF 'CAN-ULC S524-06 - INSTALLATION OF FIRE ALARM SYSTEMS' AND THE REQUIREMENTS OF
- THE LOCAL AUTHORITIES HAVING JURISDICTION. 19.2.ALL WIRING SHALL BE INSTALLED IN CONDUIT AND TO CONFORM TO THE REQUIREMENT OF
- THE 'ONTARIO ELECTRICAL SAFETY CODE, 26TH EDITION' OR LOCAL CODE HAVING JURISDICTION. PROVIDE A GROUND WIRE IN ALL CONDUITS. 19.3.FINAL LOCATION OF SYSTEM COMPONENTS AND DEVICES TO BE COORDINATED WITH THE ARCHITECTURAL CONSULTANT PRIOR TO ROUGHING-IN.
- 19.4.ONLY A CERTIFIED FIRE ALARM TECHNICIAN IS ALLOWED TO WORK ON ANY FIRE ALARM SYSTEM INSTALLATION.
- 19.5.UPON COMPLETION OF WORKS AS PER CONTRACT DRAWINGS, OBTAIN THE SERVICES OF

- BASE BUILDING FIRE ALARM MANUFACTURER TO MAKE A COMPLETE INSPECTION AND VERIFICATIONS OF ALL INSTALLED FIRE ALARM EQUIPMENT AND DEVICES.
- 19.6.PERFORM ANY CHANGES NECESSARY AS A RESULT OF THE ABOVE VERIFICATION AND INSPECTION IN ACCORDANCE WITH THE MANUFACTURER'S DIRECTIONS.
- 19.7.ON COMPLETION OF THE VERIFICATION, INSPECTION AND TESTING OBTAIN THE VERIFICATION CERTIFICATE AND INSPECTION REPORTS FROM THE MANUFACTURER AND FORWARD TO THE OWNER.
- 19.8.FIRE ALARM SIGNALING DEVICES TO BE INSTALLED AND TESTED IN COMPLIANCE WITH 2012 ONTARIO BUILDING CODE SECTION 3.2.4.20 AUDIBILITY. INCLUDE FOR ALL COSTS IN TENDER 19.9.ENSURE THAT ALL COSTS FOR THE ABOVE TESTING, VERIFICATION, INSPECTION ARE INCLUDED IN THE TENDER PRICE.
- 19.10. WHERE THE INTEGRITY OF THE EXISTING LIFE SAFETY INPUT AND OUTPUT DEVICES ARE AFFECTED DUE TO RELOCATIONS, CEILING DEMOLITIONS AND/OR RE-INSTALLATIONS ONTO NEW SUSPENDED CEILING, ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE TO MAINTAIN THE SYSTEM OPERATION AT ALL TIMES, ALL SUSPENSION ACCESSORIES REQUIRED FOR THE INSTALLATION (E.G., MOUNTING CHANNELS AND FRAMES, ETC.) AND VERIFICATION OF THE SYSTEM SHALL BE INCLUDED IN THE TENDER PRICES.

PART C - MATERIAL

WIRE AND CABLE

- 1.1. ALL ELECTRICAL EQUIPMENT SHALL BE C.S.A. APPROVED AND BEAR NE C.S.A. STAMP. ALL EQUIPMENT SHALL BE NEW UNLESS OTHERWISE NOTED.
- 2.1. ALL WIRE AND CABLE SHALL BE COPPER WITH TYPE R-90, X-LINK INSULATION, AND MINIMUM NO.12 AWG WIRE SIZE. NO.10 AND 12 TO BE SOLID, AND NO.8 AND LARGER TO BE STRANDED. 2.2. SIZE ALL WIRE FOR MAXIMUM 3% VOLTAGE DROP AT 80% LOAD AND 90% POWER FACTOR.
- 3.1. ALL WIRING IN CEILINGS AND PARTITIONS SHALL BE IN EMT CONDUIT WITH STEEL SETSCREW COUPLING AND CONNECTORS.
- 3.2. ALL WIRING IN SLABS SHALL BE IN RIGID PVC CONDUIT.
- 3.3 AC-90 CABLE MAY BE PERMITTED FOR DOWN-DROPS FROM JUNCTION BOXES TO LUMINAIRES AND IN PARTITIONS UNLESS PROHIBITED BY CODE OR BUILDING STANDARDS. AC-90 CABLE SHALL NOT BE USED IN ANY EXPOSED AREAS UNLESS OTHERWISE NOTED. AC-90 CABLE RUNS IN CEILING SPACE SHALL NOT EXCEED 3048MM (10') IN LENGTH. DO NOT TERMINATE AC-90 CABLE DIRECTLY TO PANEL BOARDS.
- ${\it 3.4.} \ \ {\it PROVIDE FLEXIBLE METAL CONDUIT FOR CONNECTION TO TRANSFORMERS AND MOTORS,}$ MINIMUM 1M (3') LENGTH.
- 3.5. ALL CONDUITS FOR COMMUNICATION WIRING SHALL BE INSTALLED WITH BUSHINGS AT EACH END. CONDUITS SHALL BE TERMINATED ON EQUIPMENT RACK, BACKBOARD OR CABLE TRAY 3.6. ALL EMPTY CONDUITS SHALL BE COMPLETE WIN NYLON PULL STRING. DO NOT CADDIE CLIP
- CONDUITS TO CEILING HANGERS. 3.7. PROVIDE GLAND WATERTIGHT CONNECTORS WITH FACTORY-INSTALLED INSULATED
- THROATS AND COMPRESSION TYPE COUPLINGS (CAST FITTINGS /SET -SCREWS NOT ACCEPTABLE) TO BE FORGED STEEL WHERE EMT CONDUITS ARE REQUIRED.
- 4.1. A MINIMUM OF ONE PULL BOX SHALL BE INSTALLED FOR EVERY 303.1 (100') OF CONDUIT (EACH 90 DEGREE BEND SHALL EQUATE TO A 9M (30') LENGTH OF CONDUIT). NO MORE THAN TWO 90 DEGREE BENDS SHALL BE INSTALLED BETWEEN TWO PULL BOXES.
- 5.1. LOCAL SNITCHES SHALL BE 20 AMP, SPECIFICATION GRADE, AND VOLTAGE, AS INDICATED. VERIFY EXACT LOCATION. MOUNTING HEIGHT AND COLOUR WITH ARCHITECT/DESIGN CONSULTANT PRIOR TO INSTALLATION.
- 5.2. MANUFACTURER 120V- P&S 2621 SERIES (UNLESS OTHERWISE NOTED) 347V- P&S 2621 SERIES (UNLESS OTHERWISE NOTED)
- RECEPTACLES 6.1. DUPLEX RECEPTACLES SHALL BE 120 VOLT. 15 AMP AND SPECIFICATION GRADE UNLESS
- OTHERWISE NOTED. VERIFY EXACT LOCATION, MOUNTING HEIGHT AND COLOUR WIN ARCHITECT/DESIGN CONSULTANT PRIOR TO INSTALLATION. 6.2 MANUFACTURER: - P&S 26252 SERIES (UNLESS OTHERWISE NOTED)
- 7.1. EXPOSED COVERPLATES SHALL BE MADE OF UNBREAKABLE NYLON AND INSTALLED AFTER FINAL PAINTING, FLUSH WITH THE WALL. COLOUR TO MATCH DEVICES UNLESS OTHERWISE NOTED
- 7.2. MANUFACTURER: P&S 7 26 SERIES (UNLESS OTHERWISE NOTED) DIMMERS
- 8.1. ALL DIMMERS SHALL BE SIZED TO SUIT LOADS IN WATTAGE AND TYPES (FLUORESCENT, LOW VOLTAGE MAGNETIC, LOW VOLTAGE ELECTRONIC, ETC.)
- 8.2. PROVIDE LAMP DE-BUZZING COILS FOR ALL INCANDESCENT AND LOW VOLTAGE DIMMING
- 8.3. ALL DIMMING CIRCUITS ARE TO HAVE SEPARATE NEUTRAL CONDUCTOR. 8.4. MANUFACTURER: - LUTRON NOVA-T SERIES (UNLESS OTHERWISE NOTED)

SERVICE EQUIPMENT

- 9.1. ALL NEW PANELBOARDS, DISCONNECT SWITCHES, SPLITTERS, ETC, TO BE OF THE SAME MANUFACTURER. RATING AND TYPE TO COMPLY WITH BASE BUILDING EQUIPMENT WHERE POSSIBLE. MOULDED CIRCUIT BREAKERS SHALL BE BOLT-ON TYPE. ALL PANELBOARDS SHALL HAVE LOADS BALANCED ON THE FEEDERS (OPERATING AT NORMAL BUSINESS HOURS), ADJUST BRANCH CIRCUITS AS REQUIRED. DISCONNECT SWITCHES SHALL BE OF QUICK-MAKE/QUICK-BREAK TYPE.
- 9.2. MANUFACTURER: FEDERAL PIONEER, SIEMENS, SQUARE D. CUTLER-HAMMER, WESTINGHOUSE

- 10.1.FUSES SHALL BE BUSSMAN 'FUSETRON' DUAL ELEMENT SLOW BLOW TYPE, SIZED AS TRANSFORMERS
- 11.1.ALL DRY TYPE TRANSFORMERS SHALL BE MINIMUM K13 RATED AND WITH ELECTRO STATICALLY SHIELDED WINDINGS. TRANSFORMER TO HAVE DOUBLE LUGS TO ACCOMMODATE DOUBLE NEUTRALS. MANUFACTURER: (TO MATCH BASE BUILDING WHERE POSSIBLE) - HAMMOND, POLYGON, REX.
- 11.2. WHERE INDICATED ON NE DRAWINGS USE HARMONIC MITIGATION TRANSFORMERS. MANUFACTURER: (TO MATCH BASE BUILDING WHERE POSSIBLE) - HARMONY SERIES FROM MIRUS POWERSMITHS. 11.3.ALL TRANSFORMERS UP TO AND INCLUDING 75 KVA ARE TO BE CEIUNG MOUNTED WITH
- SUSPENSION RODS UNLESS OTHERWISE NOTED.
- 12.1.ALL NEW LUMINAIRES SHALL BE AS SPECIFIED ON DRAWINGS. ALTERNATES ARE NOT ACCEPTABLE WITHOUT APPROVAL BY ENGINEER AND CLIENT.
- 12.2.ALL LUMINAIRES INSTALLED IN OR ON BASE BUILDING CEILINGS SHALL BE INDEPENDENTLY SUPPORTED FROM BUILDING STRUCTURE WITH CHAIN UNLESS OTHERWISE NOTED. 12.3.NEW AND RELOCATED EXISTING BASE BUILDING LUMINAIRES SHALL BE INSTALLED WITH CHAIN SUPPORTS UNLESS BASE BUILDING CEILING SYSTEM IS DESIGNED AND CONSTRUCTED TO SUPPORT THE ADDITIONAL WEIGHT OF NE BASE BUILDING LUMINAIRES. PROVIDE WRITTEN CONFIRMATION FROM CEILING MANUFACTURER.
- 13.1.ALL LUMINAIRES SHALL BE COMPLETE WITH SUITABLE LAMPS AS RECOMMENDED BY MANUFACTURER COLOUR TEMPERATURE BEAM ANGLE CRL FROSTED/CLEAR ETC. SHALL BE CONFIRMED WITH ENGINEER AND ARCHITECT/DESIGN CONSULTANT PRIOR TO ORDERING
- 13.2.COMPACT FLUORESCENT, FLUORESCENT, AND H.I.D. LAMPS SHALL BE GUARANTEED FOR A PERIOD OF TWELVE MONTHS FROM THE DATE OF ACCEPTANCE. 13.3.LOW VOLTAGE, HALOGEN, AND INCANDESCENT LAMPS SHALL BE GUARANTEED FOR A

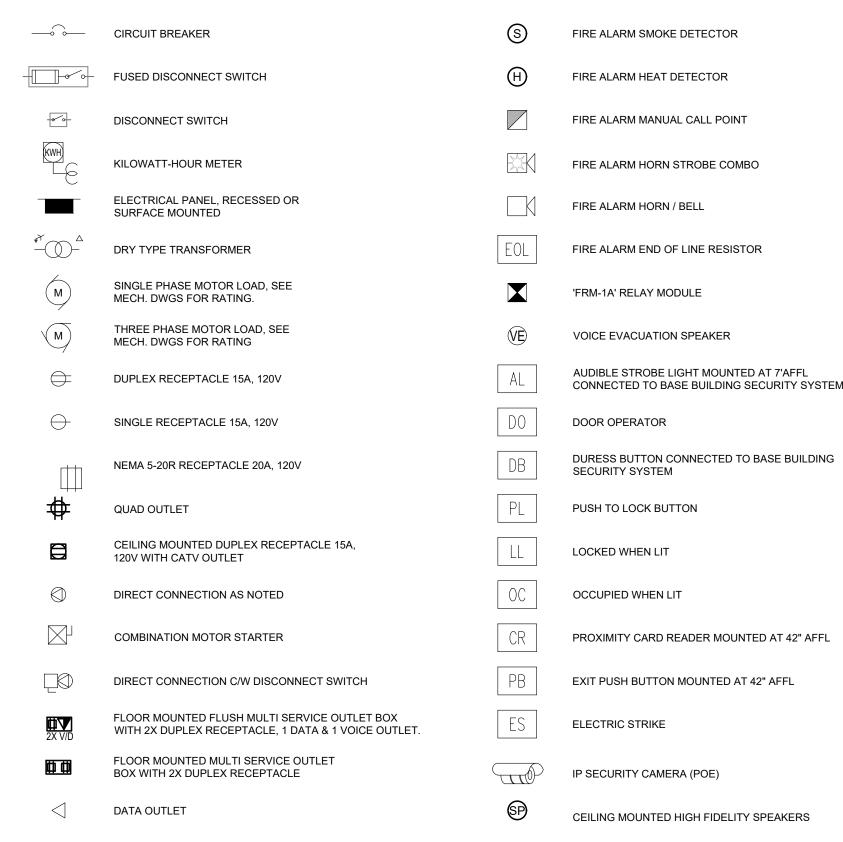
PERIOD OF SIX MONTHS FROM NE DATE OF ACCEPTANCE. 13.4.MANUFACTURER - PHILIPS, G.E.CANADA, OSRAM/SYLVANIA

PLYWOOD BACKBOARDS

15. NAMEPLATE

14.1.PLYWOOD BACKBOARDS SHALL BE FIRE RETARDANT VENEER CORE FIR, 19MM(3/4") NICK AND SIZED AS INDICATED ON DRAWINGS. BACKBOARDS COLOUR AS SPECIFIED BY ARCHITECT/DESIGN CONSULTANT. SHALL BE PRIMED AND PAINTED WITH APPROVED FIRE RETARDANT PAINT

15.1.PROVIDE ENGRAVED LAMICOID NAMEPLATE ON ALL MAJOR ELECTRICAL EQUIPMENT IDENTIFYING NAME. VOLTAGE, PHASE, CURRENT RATING, "FED FROM " AND USE. LETTERING SHALL BE MINIMUM ,4" HIGH, WHITE ON BLACK BACKGROUND.



TELEPHONE/VOICE OUTLET

VOICE/DATA OUTLET. 1 VOICE & 1 DATA

EXISTING BASE BUILDING LIGHT FIXTURE

EXISTING BASE BUILDING EMERGENCY

(SEE LUMINAIRE SCHEDULE FOR DETAILS)

(SEE LUMINAIRE SCHEDULE FOR DETAILS)

CEILING MOUNTED OCCUPANCY SENSOR

RECESSED LINEAR SLOT LED LIGHT FIXTURE

(SEE LUMINAIRE SCHEDULE FOR DETAILS)

(SEE LUMINAIRE SCHEDULE FOR DETAILS)

(SEE LUMINAIRE SCHEDULE FOR DETAILS)

SINGLE POLE LINE VOLTAGE LIGHT SWITCH

SWITCH WITH LIGHT LEVEL INDICATOR

15A, 120V, SINGLE POLE LIGHT SWITCH

PICTOGRAM EXIT LIGHT, LIGHTED SURFACE

AND/OR DIRECTIONAL ARROW AS SHOWN.

EMERGENCY LIGHTING BATTERY UNIT C/W

SMART DIMMER, SINGLE POLE LINE VOLTAGE LIGHT

RJ11 OUTLET FOR ANALOG LINE

WITH PARABOLIC LOUVERS

NIGHT LIGHT FIXTURE

RECESSED DOWNLIGHT

PENDANT LIGHT FIXTURE

LED TAPE LIGHT

(a) = SWITCH ASSIGNMENT

(a) = SWITCH ASSIGNMENT

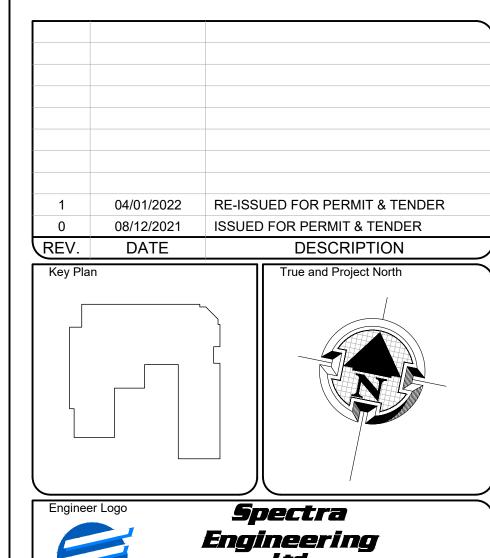
(a) = SWITCH ASSIGNMENT

NUMBER OF HEADS SHOWN

ABBREVIATIONS EXISTING TO REMAIN EXISTING TO BE REMOVED/RELOCATED ITEM IN RELOCATED POSITION REMOVE AND RE-INSTALL ABOVE FINISHED FLOOR GROUND FAULT INTERRUPTER **OVER COUNTER EXHUAST FAN** HAND DRYER FAN COIL UNIT HOT WATER CYLINDER MOTORIZED DAMPER TO BE CONFIRMED VARIABLE AIR VOLUME

WEATHERPROOF

NOTE: NOT ALL SYMBOLS USED





District School Board

Drawing Overall Scale

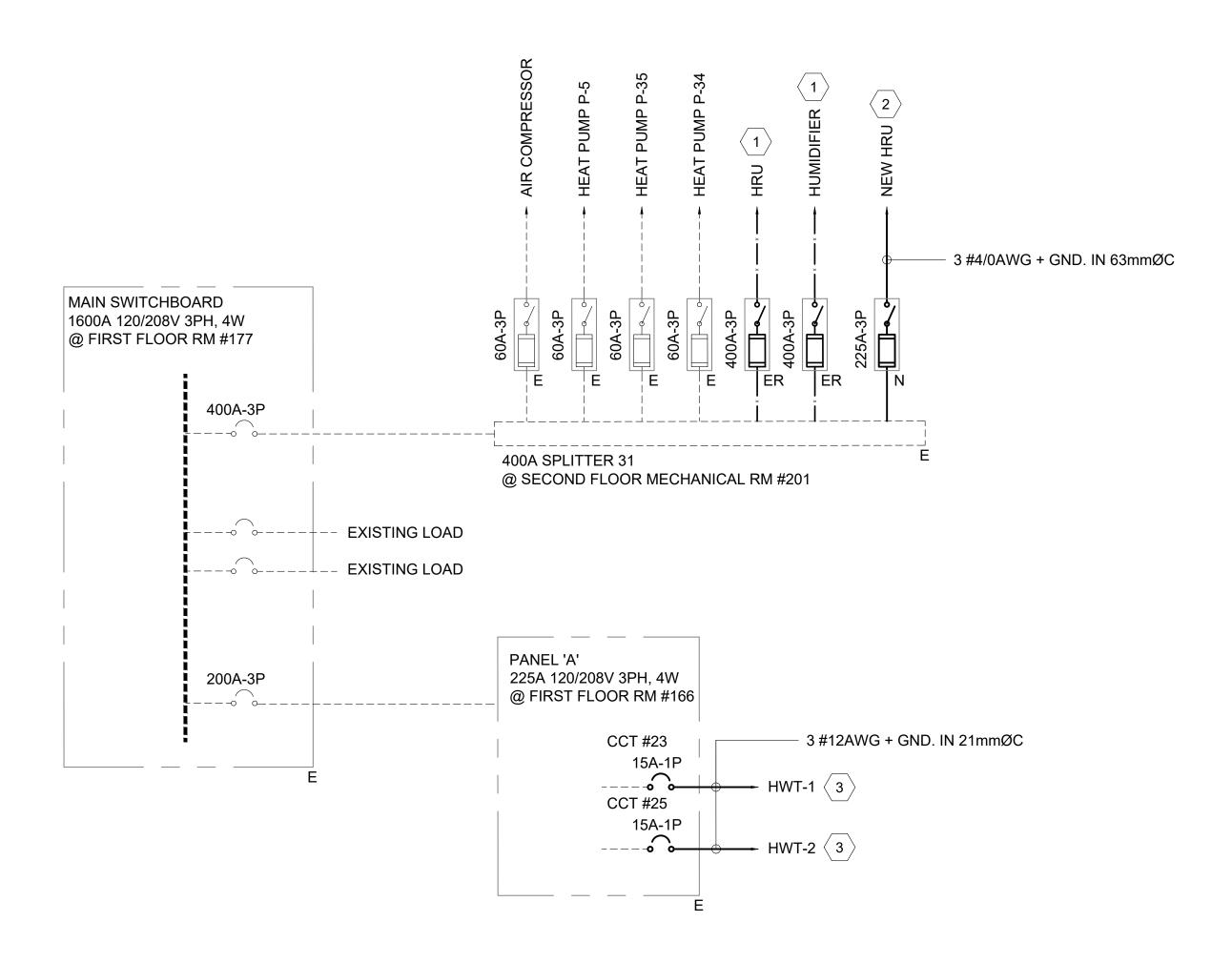
TERRY FOX PUBLIC SCHOOL HRV-HWT-BAS INSTRUMENTATION 1065 RIDDELL AVE, COBOURG, ON K9A5N4

AS SHOWN

ELECTRICAL SERVICES LEGEND & SPECIFICATIONS

Engineer / Architect Stamp DATF: 02/12/2021 DESIGNED BY: S.ZHU DRAWN BY: S.ZHU APPROVED BY: J. ELOWE PROJECT NO.: 1021225 O. ELOWE 100143577

> Drawing No. Phase Revis E-001



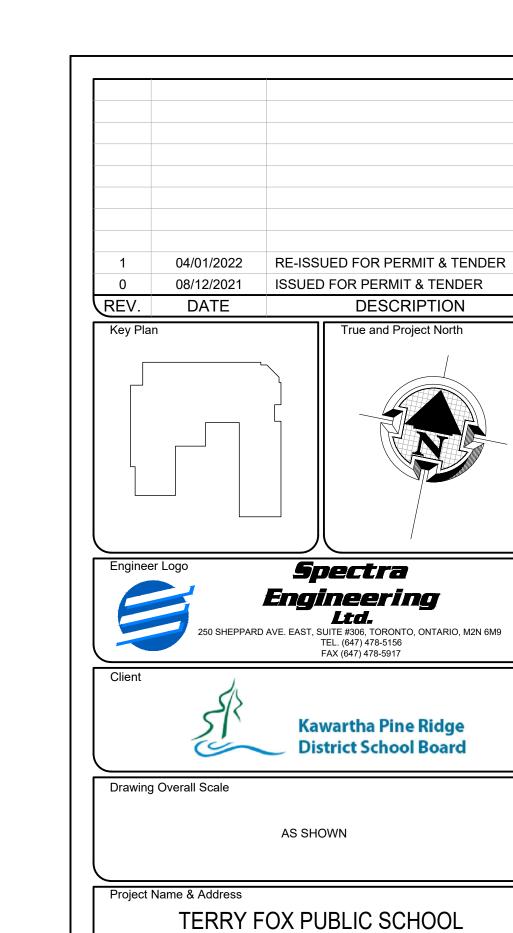
1 SINGLE LINE DRAGRAM
Scale: N.T.S.

GENERAL NOTES:

- UNLESS OTHERWISE INDICATED, ALL EXISTING EQUIPMENT TO REMAIN.
- 2. SINGLE LINE DRAWING BASED ON AS-BUILT DWG. PROVIDED BY CLIENT AND UPDATED AS WE SEE FIR BASED ON AVAILABLE INFORMATION ON-SITE. ANY DISCREPANCY BETWEEN ACTUAL INSTALLATION AND INFORMATION CONTAINED IN THIS DRAWING RELEVANT TO PROJECT SCOPE OF WORKS TO BE HIGHLIGHTED TO THE ENGINEER FOR CLARIFICATION.
- 3. CONTRACTOR TO RETAIN SERVICES OF C-INTECH FOR SHORT CIRCUIT, PROTECTIVE DEVICE COORDINATION AND ARC FLASH STUDY. REFER TO SPECIFICATIONS FOR DETAILS. UPDATE ARC FLASH LAMACOID LABELS ON PANEL BASED ON NEW FIGURES FROM STUDY.
- 4. ALL NEW CIRCUIT BREAKERS TO MATCH MAKE, MODEL AND KAIC OF EXISTING.
- MOUNTING AND ROUTING OF ELECTRICAL EQUIPMENT AND DISTRIBUTION SHALL BE COORDINATED WITH ALL OTHER SERVICES.
- NEW TYPES AND UPDATED PANEL DIRECTORY AND/OR LAMACOID LABELS TO REPLACE EXISTING OF AFFECTED PANELS.

DESIGN NOTES:

- EXISTING WIRING, CONDUIT, DISCONNECT SWITCH, ETC. TO BE REMOVED IN COORDINATION WITH DEMOLITION OF HEAT RECOVERY UNIT AND HUMIDIFIER.
- NEW HEAT RECOVERY UNIT TO BE FED FROM SPLITTER #1. SUPPLY AND INSTALL NEW 225A FUSED DISCONNECT SWITCH.
- NEW HOT WATER TANKS HWT-1 & HTW-2 TO BE FED FROM PANEL 'HA' CCT #23 & CCT #25 SPARE SPACE. SUPPLY AND INSTALL NEW 15A-1P CIRCUIT BREAKERS.



HRV-HWT-BAS INSTRUMENTATION 1065 RIDDELL AVE, COBOURG, ON K9A5N4

ELECTRICAL SERVICES
SINGLE LINE DIARGAM

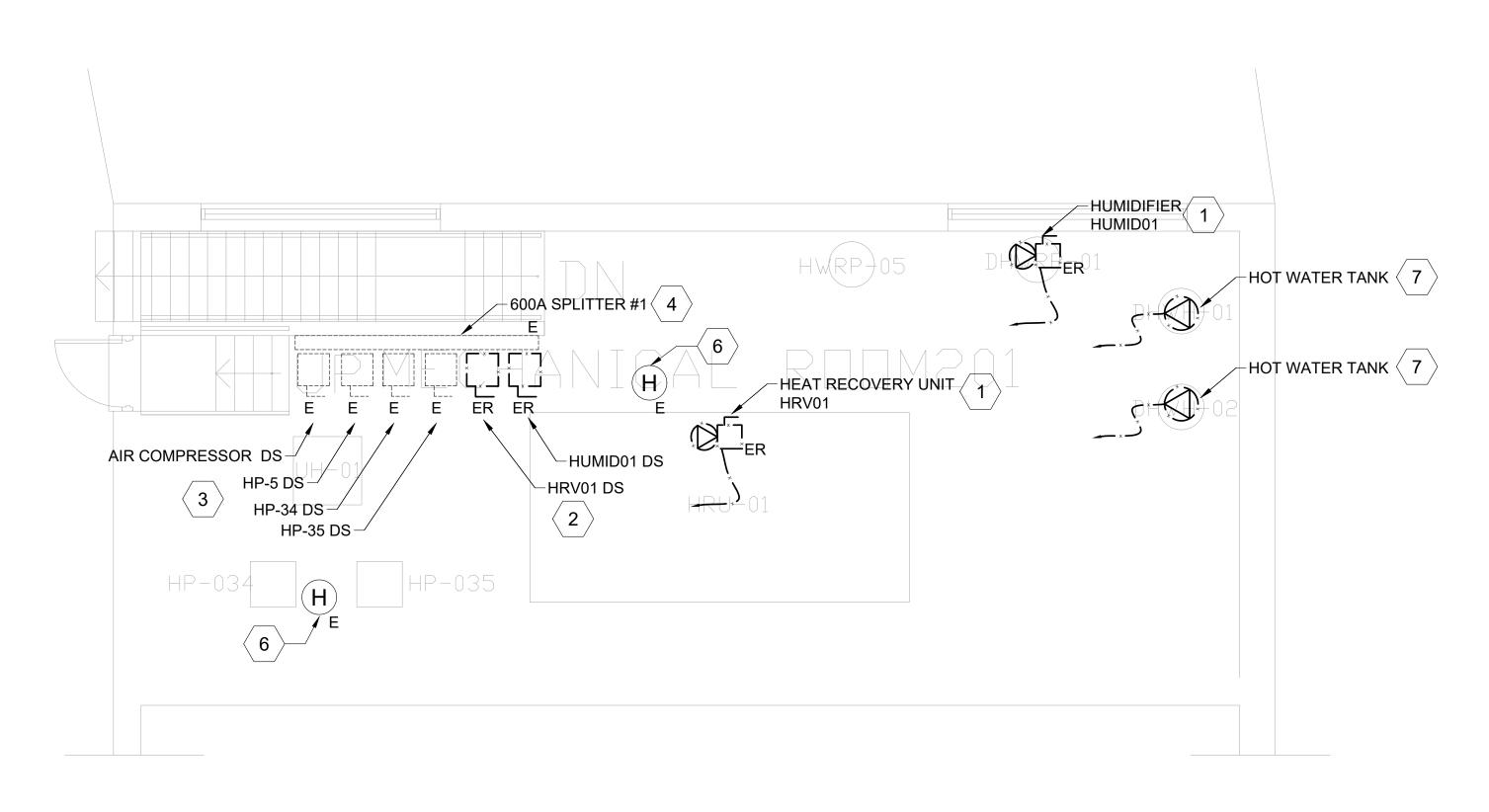
DATE:

DESIGNED BY: S.ZHU
DRAWN BY: S.ZHU
APPROVED BY: J. ELOWE
PROJECT NO.: 1021225

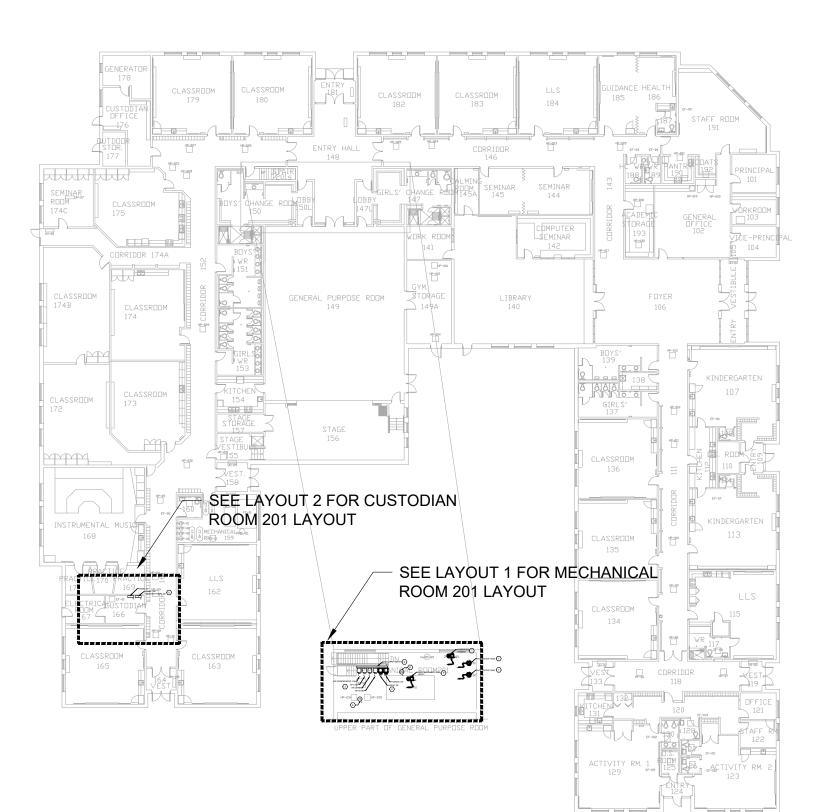
Engineer / Architect Stamp

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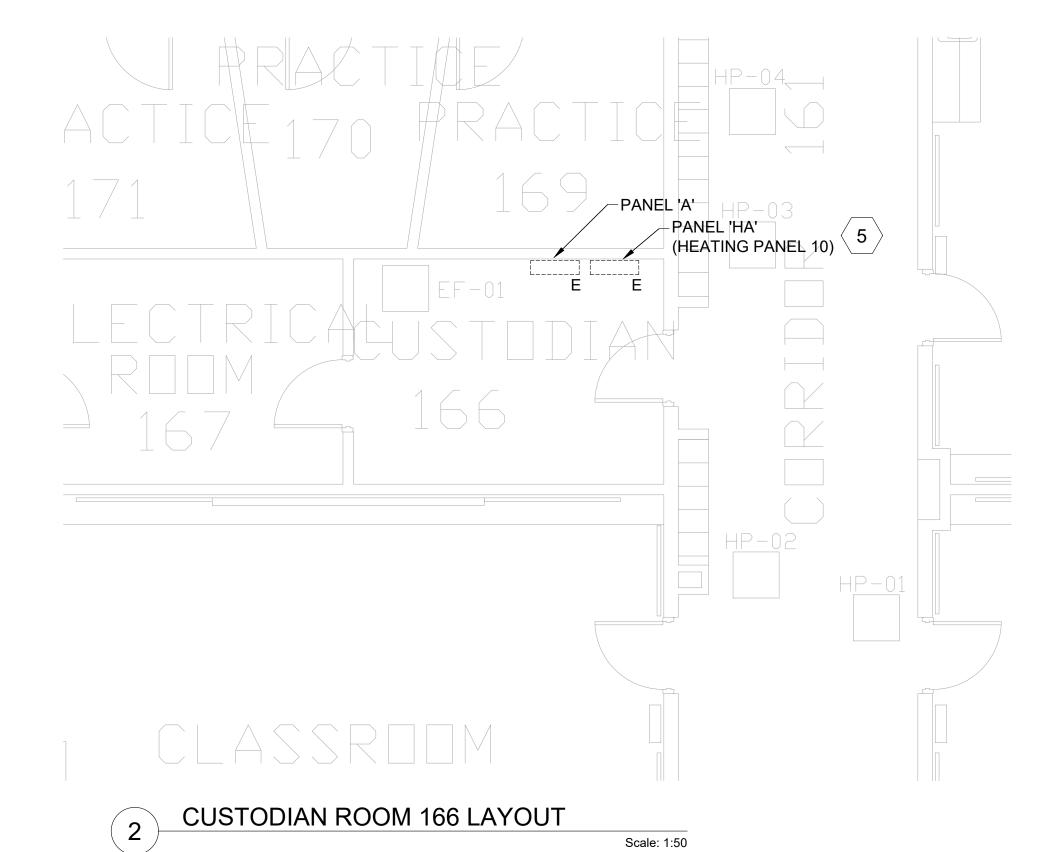


MECHANICAL ROOM 201 - DEMOLITION WORK
Scale: 1:50



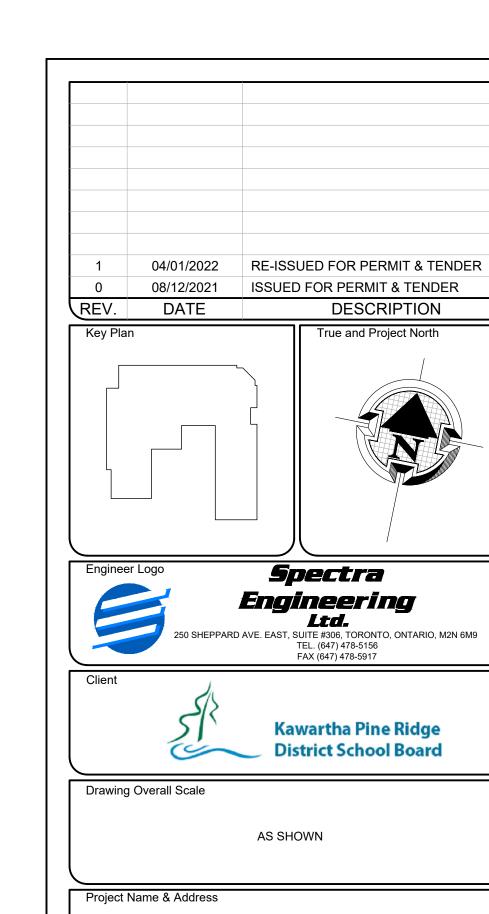
DESIGN NOTES:

- EXISTING WIRING, CONDUIT, DISCONNECT, ETC. TO BE REMOVED IN COORDINATION WITH DEMOLITION OF HEAT RECOVERY UNIT AND HUMIDIFIER.
- 2 EXISTING FUSED DISCONNECTION SWITCHES OF HRV AND HUMIDIFIER TO BE REMOVED C/W ALL ASSOCIATED CONDUIT, WIRING AND CONTROL RELAY.
- EXISTING POWER CONNECTIONS, DISCONNECT SWITCHES TO EXISTING FANS AND COMPRESSOR IN MECHANICAL ROOM 201 TO REMAIN.
- 4 EXISTING 600A SPLITTER #1 IN MECHANICAL ROOM 201 TO REMAIN.
- EXISTING PANEL HA (HEATING PANEL 10) IN CUSTODIAN ROOM #166 TO REMAIN.
- \langle 6 \rangle EXISTING CEILING MOUNTED HEAT DETECTORS TO REMAIN.
- The existing wiring, conduit, disconnect, etc. to be removed in coordination with demolition of hot water tanks.



GENERAL NOTES:

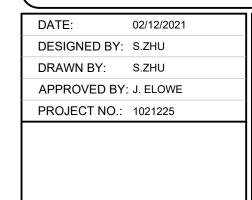
- UNLESS OTHERWISE INDICATED, ALL EXISTING EQUIPMENT TO REMAIN.
- 2. SINGLE LINE DRAWING BASED ON AS-BUILT DWG. PROVIDED BY KPRDSB AND SITE SURVEY. ANY DISCREPANCY BETWEEN ACTUAL INSTALLATION AND INFORMATION CONTAINED IN THIS DRAWING RELEVANT TO PROJECT SCOPE OF WORKS TO BE HIGHLIGHTED TO THE ENGINEER FOR CLARIFICATION.
- MOUNTING AND ROUTING OF ELECTRICAL EQUIPMENT AND DISTRIBUTION SHALL BE COORDINATED WITH ALL OTHER SERVICES.
- 4. COORDINATE ELECTRICAL CONNECTIONS FOR MECHANICAL EQUIPMENT WITH MECHANICAL TRADE PRIOR TO INSTALLATION.
- PENETRATION THROUGH FIRE RATED WALL AND ROOF TO BE SEALED WITH NON-SHRINK, WATERPROOF AND FIREPROOF SEALANT AND APPROVED BY THE DESIGNER OWNER PRIOR TO INSTALLATION.
- 6. ALL WORKS THAT WILL REQUIRE THE SHUT DOWN OF ELECTRICAL POWER TO BE COORDINATED WITH OWNER PRIOR TO COMMENCEMENT OF WORK. ANY LOSS OF REVENUE FROM FAILURE TO DO SO WILL BE SOLE RESPONSIBILITY OF CONTRACTOR.
- 7. INCLUDE IN TENDER PRICE FOR PROTECTION, REMOVAL, RELOCATION & VERIFICATION OF EXISTING, PANELS, DISCONNECT SWITCHES, CONTROLLERS, SPLITTERS, LIGHT FIXTURES, ELECTRICAL DEVICES, HEAT DETECTORS, AND CONDUITS AS PRESENT IN THE ROOM TO ALLOW FOR DEMOLITION AND PROPOSED SCOPE OF WORK. PROVIDE NEW CONDUIT AND WIRING AS REQUIRED TO SUIT SCOPE OF WORK. LIGHT FIXTURES SHALL BE POSITIONED TO SUSPEND JUST BELOW MECHANICAL PIPING/DUCTWORK AND TO PROVIDE OPTIMUM ILLUMINATION.



TERRY FOX PUBLIC SCHOOL
HRV-HWT-BAS INSTRUMENTATION
1065 RIDDELL AVE, COBOURG, ON K9A5N4

Drawing Title

ELECTRICAL SERVICES
POWER LAYOUT DEMOLITION WORKS
FIRST & SECOND FLOOR



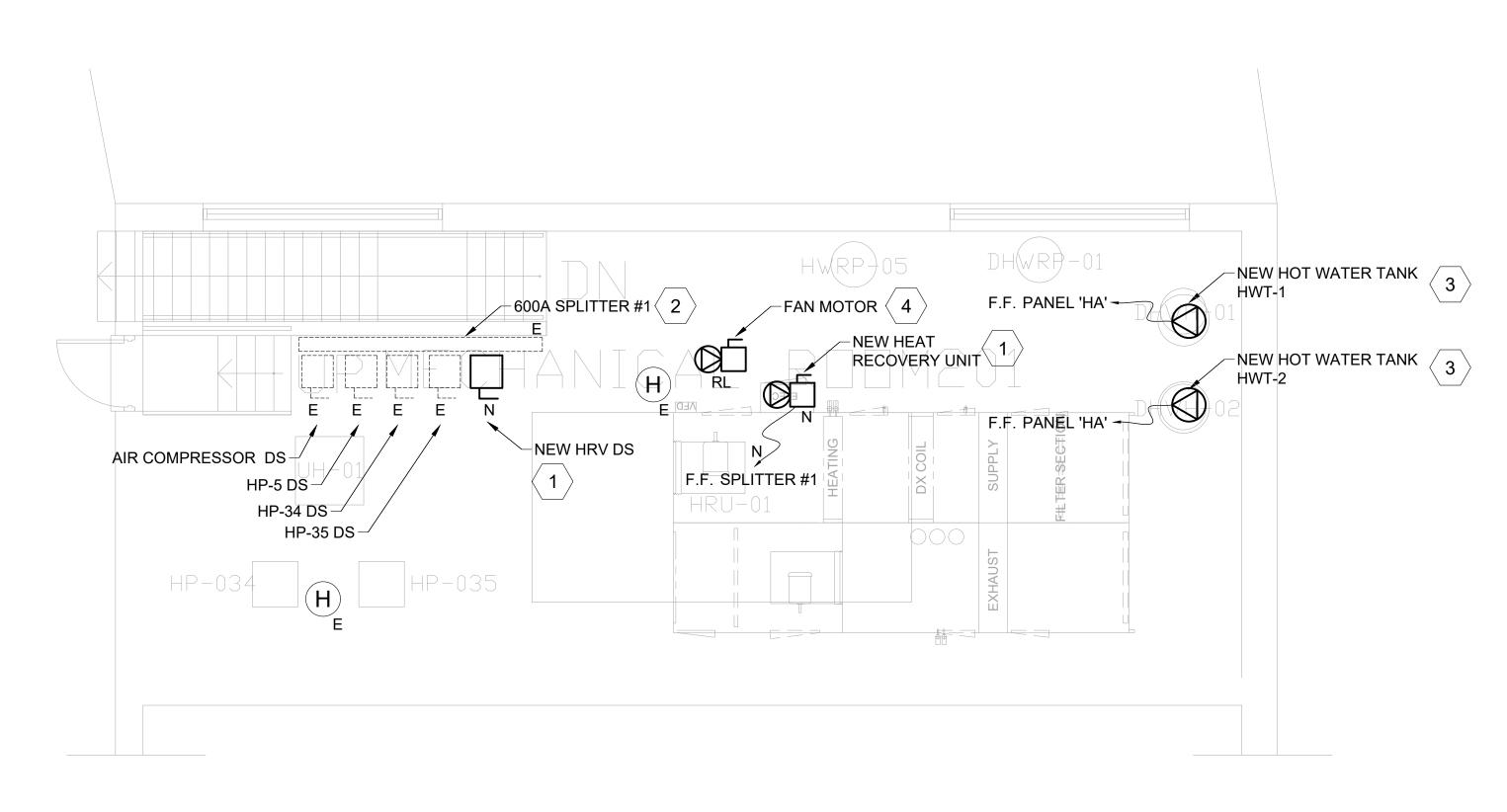
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Engineer / Architect Stamp

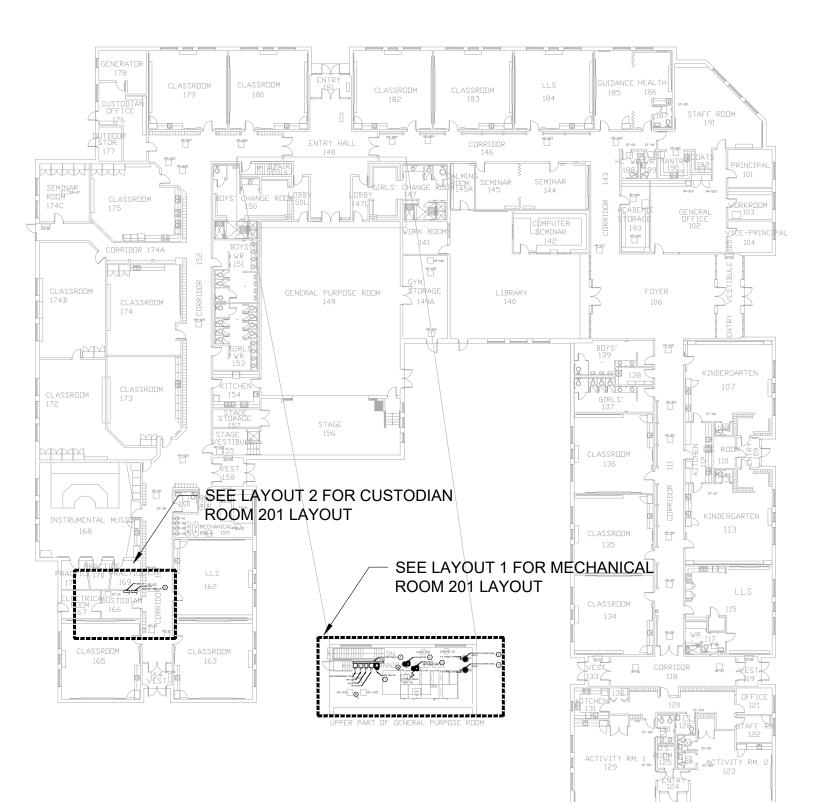
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KEY PLAN - FIRST & SECOND FLOOR

Scale: 1:400

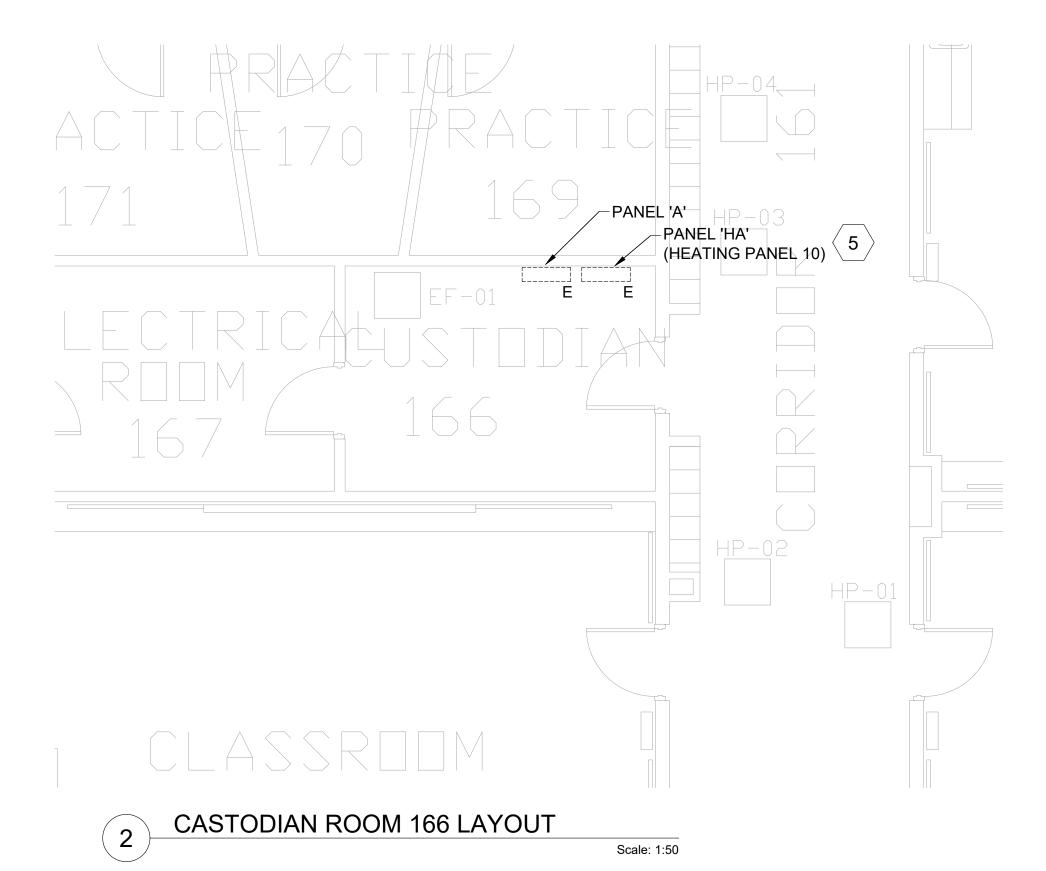






DESIGN NOTES:

- NEW DIRECT CONNECTION POWER FEED FOR HEAT RECOVERY UNIT. NEW MAGNETIC STARTER FOR THE HRV TO BE INSTALLED AND SUPPLIED BY ELECTRICAL CONTRACTOR. EXACT MOUNTING LOCATION TO BE COORDINATED ON SITE. STARTER TO C/W
- \langle 2 \rangle EXISTING SPLITTER #1 TO REMAIN. NEW HRV TO BE FED FROM SPLITTER #1.
- (3) NEW DIRECT CONNECTION POWER FEED FOR HOT WATER TANKS HWT-1 & HWT-2 C/W WIRING AND CONDUIT TO BE FED FROM PANEL 'HA'.
- \langle 4 \rangle EXISTING FAN MOTOR TO BE RELOCATED. REFER TO MECHANICAL DRAWINGS FOR DETAILS.
- EXISTING PANEL 'HA' TO REMAIN. NEW HOT WATER TANKS TO BE FED FROM THIS PANEL. PROVIDE CIRCUIT BREAKER AS REQUIRED.



GENERAL NOTES:

- 1. UNLESS OTHERWISE INDICATED, ALL EXISTING EQUIPMENT TO REMAIN.
- 2. SINGLE LINE DRAWING BASED ON AS-BUILT DWG. PROVIDED BY KPRDSB AND SITE SURVEY. ANY DISCREPANCY BETWEEN ACTUAL INSTALLATION AND INFORMATION CONTAINED IN THIS DRAWING RELEVANT TO PROJECT SCOPE OF WORKS TO BE HIGHLIGHTED TO THE ENGINEER FOR CLARIFICATION.
- 3. MOUNTING AND ROUTING OF ELECTRICAL EQUIPMENT AND DISTRIBUTION SHALL BE COORDINATED WITH ALL OTHER SERVICES.
- 4. COORDINATE ELECTRICAL CONNECTIONS FOR MECHANICAL EQUIPMENT WITH MECHANICAL TRADE PRIOR TO INSTALLATION.
- 5. PENETRATION THROUGH FIRE RATED WALL AND ROOF TO BE SEALED WITH NON-SHRINK, WATERPROOF AND FIREPROOF SEALANT AND APPROVED BY THE DESIGNER OWNER PRIOR TO INSTALLATION.
- 6. ALL WORKS THAT WILL REQUIRE THE SHUT DOWN OF ELECTRICAL POWER TO BE COORDINATED WITH OWNER PRIOR TO COMMENCEMENT OF WORK. ANY LOSS OF REVENUE FROM FAILURE TO DO SO WILL BE SOLE RESPONSIBILITY OF CONTRACTOR.
- 7. INCLUDE IN TENDER PRICE FOR PROTECTION, REMOVAL, RELOCATION & VERIFICATION OF EXISTING, PANELS, DISCONNECT SWITCHES, CONTROLLERS, SPLITTERS, LIGHT FIXTURES, ELECTRICAL DEVICES, HEAT DETECTORS, AND CONDUITS AS PRESENT IN THE ROOM TO ALLOW FOR DEMOLITION AND PROPOSED SCOPE OF WORK. PROVIDE NEW CONDUIT AND WIRING AS REQUIRED TO SUIT SCOPE OF WORK.
- 8. CONTRACTORS TO BE RESPONSIBLE TO COORDINATE LOCATIONS OF ALL NEW WORK WITH ARCHITECTURAL LAYOUT, ACCESS HATCHES IN DRY WALL CEILING AREA, LIGHTING AND CEILING MOUNTED EQUIPMENTS.
- 9. CONTRACTOR TO CARRY COSTS ASSOCIATED WITH RELOCATION OR RE-CIRCUIT OF EXISTING LIGHTING FIXTURES AND CONDUITS TO ALLOW FOR INSTALLATION OF MECHANICAL AND STRUCTURAL WORKS. IF REQUIRED, LOCATIONS TO BE FINALIZED AND COORDINATED ON SITE. LIGHT FIXTURES SHALL BE POSITIONED TO SUSPEND JUST BELOW MECHANICAL PIPING/DUCTWORK AND TO PROVIDE OPTIMUM ILLUMINATION

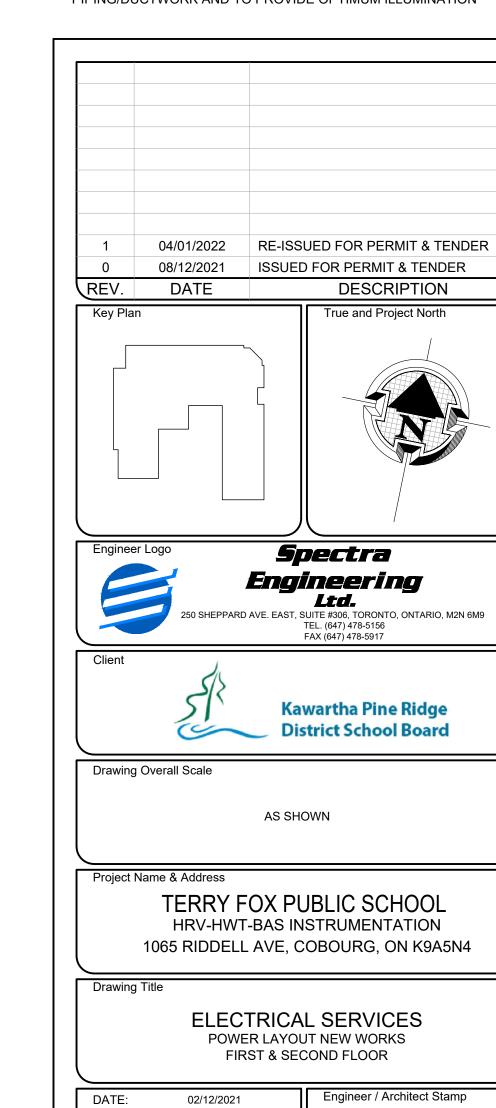
DESCRIPTION True and Project North

Engineer / Architect Stamp

O. ELOWE 100143577

Drawing No. Phase Revision

E-200



DESIGNED BY: S.ZHU DRAWN BY: S.ZHU APPROVED BY: J. ELOWE PROJECT NO.: 1021225



A. GENERAL NOTES

- 1. DESIGN CONFORMS TO THE 2012 ONTARIO BUILDING CODE (OBC), ONTARIO REGULATION 88/19 AND AMENDMENTS.
- THE GENERAL NOTES AND TYPICAL DETAILS ARE APPLICABLE TO ALL PARTS OF THE PROJECT AND SHALL BE READ IN CONJUNCTION WITH
- USE ONLY THE LATEST ISSUES OF ANY GOVERNMENT CODES, STANDARDS OR REGULATIONS MENTIONED IN THE FOLLOWING NOTES, UNLESS NOTED OTHERWISE.
- VERIFY ALL DIMENSIONS AND REPORT ANY DISCREPANCIES TO THE CONSULTANT BEFORE PROCEEDING WITH THE WORK.
- FOR DETAILS AND DIMENSIONS NOT GIVEN ON STRUCTURAL DRAWINGS REFER TO ARCHITECTURAL, MECHANICAL AND ELECTRICAL DRAWINGS. VERIFY LOCATIONS AND DIMENSIONS OF ALL OPENINGS, PIPE SLEEVES, ETC. AS REQUIRED WITH THE MECHANICAL AND
- THE CONTRACTOR IS SOLELY RESPONSIBLE FOR DIMENSIONS AND FOR COORDINATION OF SUB-TRADES.
- 7. DO NOT SCALE THE DRAWINGS, USE FIGURE DIMENSIONS ONLY.
- 8. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO SAFEGUARD ALL EXISTING STRUCTURES AFFECTED BY THIS CONSTRUCTION. ON ANY NEW STRUCTURE, DO NOT EXCEED THE DESIGN LOADINGS INDICATED ON THESE DRAWINGS.
- 9. ALL STRUCTURAL MEMBERS SHOWN ARE NEW UNLESS NOTED OTHERWISE.
- 10. DRAWINGS AND DETAILS ARE INTENDED TO SHOW THE END RESULT OF DESIGN. MODIFICATIONS TO THE DESIGN NECESSARY TO SUIT SITE DIMENSIONS OR CONDITIONS SHALL BE SUBMITTED TO CONSULTANT FOR APPROVAL BEFORE PROCEEDING.
- 11. THE SCHEDULING OF ALL WORK, INCLUDING ACCESSIBILITY AND LOGISTICS SHALL BE COORDINATED AND AGREED WITH THE OWNER PRIOR
- 12. CO-ORDINATE WORK WITH MECHANICAL AND ELECTRICAL TRADES REGARDING ANY EXISTING MECHANICAL AND ELECTRICAL SERVICES ADJACENT TO THE WORK.
- 13. DO NOT CUT THROUGH, CORE-DRILL OR OTHERWISE ALTER ANY EXISTING OR NEW PART OF THE STRUCTURE UNLESS SHOWN ON THE DRAWINGS, OR UNLESS APPROVED BY THE CONSULTANT. PROVIDE ADDITIONAL REINFORCING OR FRAMING AT OPENINGS AS SHOWN OR DIRECTED. PRIOR TO MAKING ANY OPENINGS.
- 14. THE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF THE CONSULTANT AND MAY NOT BE REPRODUCED IN ANY FORM WITHOUT
- 15. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MONITORING EXISTING STRUCTURES ADJACENT TO NEW CONSTRUCTION AND AS OTHERWISE DIRECTED DURING ALL PHASES OF WORK.

B. STRUCTURAL STEEL

- DESIGN, FABRICATION AND ERECTION SHALL CONFORM TO CAN/CSA-S16 INCL. S16S1 SUPPLEMENT AND CISC CODE OF STANDARD PRACTICE FOR STRUCTURAL STEEL.
- 2. ALL STRUCTURAL STEEL TO CONFORM TO CAN/CSA-G40.20/G2040.21 WITH THE FOLLOWING MIN. GRADES:
- 350W (50 KSI) CLASS C. FOR HSS SECTIONS
- 350W (50 KSI), FOR WELDED OR ROLLED W-SECTIONS
- 300W (44 KSI), FOR CHANNELS, ANGLES AND PLATES
- 350W (50 KSI), FOR ALL OTHER SECTIONS, UNLESS NOTED OTHERWISE
- ALL BOLTS TO BE HIGH STRENGTH TYPE TO ASTM A325 REQUIREMENTS. USE BEARING-TYPE CONNECTIONS, MINIMUM TWO M20 (3/4") BOLTS PER CONNECTION UNLESS OTHERWISE NOTED. THREADS MUST BE EXCLUDED FROM THE BOLT SHEAR PLANES.
- 4. ANCHOR BOLTS: ASTM F1554 GRADE 55 UNLESS OTHERWISE NOTED.
- WELDING:
- a. WELDING WORK TO BE IN ACCORDANCE WITH CSA-W59.
- b. WELDING TO BE UNDERTAKEN ONLY BY WELDERS CERTIFIED TO CSA-W55.
- c. WELDING ONLY TO BE UNDERTAKEN BY A FABRICATOR CERTIFIED TO CSA-W47.1 FOR DIVISION 1 OR 2.
- d. EXPOSED WELDS SHALL BE CONTINUOUS AND GROUND SMOOTH.
- e. REPAIR DAMAGED OR FIELD CUT AREAS OF GALVANIZED SURFACES WITH TWO COATS OF ZINC RICH PAINT. REFER TO FINISHING
- f. ALL NECESSARY PRECAUTIONS SHALL BE UNDERTAKEN TO PREVENT FIRES CAUSED BY WELDING, INCLUDING BUT NOT LIMITED TO THE PRESENCE OF FIRE WATCHERS, USE OF FIRE SHIELDS, AND REMOVAL OF COMBUSTIBLE MATERIALS. SUITABLE FIRE EXTINGUISHING EQUIPMENT SHALL BE PRESENT AND WITHIN REACH OF THE WELDING CREW.
- g. NEARBY SURFACES SCORCHED OR OTHERWISE AFFECTED BY WELDING SHALL BE RESTORED TO ITS ORIGINAL CONDITION PER THE SATISFACTION OF THE CLIENT, UNLESS OTHERWISE AGREED UPON.
- PROVIDE ALL REQUIRED GUSSETS, SPACERS, FILLERS AND SHIM PLATES.
- PROVIDE BUTTER COAT OF NON-SHRINK GROUT BETWEEN SURFACES WHERE CONNECTING STEEL PLATE TO STRUCTURAL CONCRETE OR
- 8. CENTRE BEARING PLATES UNDER BEAMS EXCEPT WHERE NOTED OTHERWISE.
- 9. CONNECT ALL BEAMS TO END BEARING PLATES WITH A MIN. OF 50 mm (1/2") LENGTH OF 6 mm (1/4") FILLET WELD EACH SIDE OF FLANGE.
- 10. PROVIDE 4.8 mm (3/16") THICK CAP PLATES WITH ALL-AROUND SEAL WELD ON OPEN ENDS OF HSS MEMBERS UNLESS NOTED OTHERWISE.
- 11. DO NOT MAKE HOLES IN ANY STRUCTURAL STEEL MEMBER OTHER THAN THOSE SHOWN ON REVIEWED SHOP DRAWINGS WITHOUT THE PRIOR APPROVAL OF THE CONSULTANT.
- 12. MAKE NO HOLES IN ANY STRUCTURAL STEEL MEMBER OTHER THAN THOSE ON REVIEWED SHOP DRAWINGS WITH PRIOR APPROVAL OF
- 13. STRUCTURAL STEEL EXPOSED TO THE WEATHER (INCLUDING ALL MASONRY LINTELS) SHALL BE HOT-DIPPED GALVANIZED IN ACCORDANCE WITH CSA-G164, WITH A MINIMUM ZINC COATING OF 600 GRAMS PER SQUARE METRE. ALL INTERIOR STEEL TO BE PRIME PAINTED OR GALVANIZED, UNLESS NOTED OTHERWISE.

C. WOOD

- 1. ALL FRAMING LUMBER TO BE KILN-DRIED D-FIR OR SPF NO.2 OR BETTER.
- ALL METAL CONNECTORS ARE SIMPSON STRONG-TIE OR APPROVED EQUIVALENT.
- 3. ALL FRAMING NAILS SHALL BE COMMON NAILS. NO BOX NAILS ALLOWED.

D. MASONRY

- 1. ALL MASONRY WORK TO BE IN ACCORDANCE WITH THE LATEST VERSIONS OF CSA-A371 AND CSA-A179.
- 2. STRUCTURAL DRAWINGS SHOW LOAD-BEARING MASONRY WALLS ONLY U.N.O. REFER TO ARCHITECTURAL DRAWINGS FOR ALL NON-LOADBEARING MASONRY WALLS.
- 3. PROVIDE TYPE H/15/A/M UNITS CONFORMING TO CSA A165 SERIES FOR ALL CONCRETE BLOCK MASONRY.
- 4. USE TYPE 'S' MORTAR AND 12.5 MPa 28-DAY STRENGTH GROUT FOR ALL MASONRY WALLS, CONFORMING TO CSA-A179.
- 5. CONSTRUCT WALLS IN RUNNING BOND ONLY. USE FULL MORTAR BEDDING.
- PROVIDE 100% SOLID OR GROUTED MASONRY AT TOP AND BOTTOM COURSES OF WALLS, TWO COURSES DEEP AND TWO BLOCKS WIDE UNDER ALL BEAMS OR LINTEL BEARINGS, GROUTED CELLS CONTAINING VERTICAL STEEL, BOND BEAMS, KEYWAYS AT EACH SIDE OF CONTROL JOINTS, AND CELLS CONTAINING DOWELS, ANCHOR BOLTS OR OTHER EMBEDDED HARDWARE.
- PROVIDE CONTINUOUS 8-GA LADDER-TYPE GALVANIZED HORIZONTAL JOINT REINFORCEMENT AT EVERY SECOND COURSE AND AT THE FIRST COURSE AT THE TOP AND BOTTOM OF THE WALL.
- 8. PROVIDE PREFABRICATED CORNERS AND TEES FOR HORIZONTAL JOINT REINFORCING.
- 9. PROVIDE VERTICAL WALL REINFORCING IN ALL NEW CONCRETE BLOCK WALLS IN ACCORDANCE WITH TYPICAL WALL REINFORCING DETAILS UNLESS NOTED OTHERWISE. VERTICAL WALL REINFORCING TO BE CONTINUOUS BETWEEN FLOORS AND ROOF. PROVIDE FULL CLASS B TENSION LAP SPLICE. INDICATE LOCATION OF ALL PROPOSED LAP SPLICES ON SHOP DRAWINGS FOR APPROVAL.
- 10. PROVIDE BULLNOSE BLOCKS AT EXPOSED CORNERS.
- 11. NEW MASONRY WALLS TO BE TOOTHED INTO EXISTING MASONRY WALLS WHERE SHOWN.
- 12. BOND BEAMS ARE TO BE CONTINUOUS WHERE INDICATED ON PLANS AND OR SPECIFICATIONS.
- 13. REFER TO ARCHITECTURAL DRAWINGS FOR CONTROL JOINT (HORIZONTAL MOVEMENT) LOCATIONS.
- 14. PROVIDE 100% SOLID OR FULLY GROUTED MASONRY AT:
 - a. TOP AND BOTTOM COURSE OF WALLS, b. TWO COURSES DEEP AND TWO BLOCKS WIDE UNDER ALL BEAMS OR LINTEL BEARINGS,
 - c. GROUTED CELLS CONTAINING VERTICAL REINFORCING, d. BOND BEAMS.
 - e. ALL PIERS BETWEEN ADJACENT OPENINGS LESS THAN 800 mm WIDE, FOR FULL HEIGHT OF PIER,
 - ALL BELOW GRADE MASONRY, g. KEYWAYS AT EACH SIDE OF CONTROL JOINTS, AND
 - h. CELLS CONTAINING DOWELS, ANCHOR BOLTS OR OTHER EMBEDDED HARDWARE.
- 17. SOLID MASONRY MEANS GROUT FILL IN HOLLOW MASONRY, OR 100% SOLID UNITS.
- 18. CONTRACTOR TO BE RESPONSIBLE FOR THE DESIGN AND PROVISION OF ADEQUATE TEMPORARY BRACING WHEN INSTALLING MASONRY.

E. SHOP DRAWINGS AND SUBMITTALS

- 1. SUBMIT SHOP DRAWINGS TO CONSULTANT FOR REVIEW BEFORE COMMENCING FABRICATION. ALLOW 7 DAYS FOR RETURN OF SHOP
- 2. SHOP DRAWINGS FOR CONCRETE REINFORCEMENT AND PLACEMENT SHALL BE SUFFICIENTLY DETAILED AND DIMENSIONED TO PERMIT CORRECT PLACEMENT OF REINFORCEMENT AND ACCESSORIES WITHOUT REFERENCE TO ARCHITECTURAL AND STRUCTURAL DRAWINGS.
- 3. NOTIFY CONSULTANT IN WRITING AT TIME OF SUBMISSION OF ANY DEVIATIONS IN SHOP DRAWINGS FROM REQUIREMENTS OF CONTRACT
- 4. CONFIRM CONTRACTOR'S REVIEW OF EACH SHOP DRAWING BY STAMP, DATE AND SIGNATURE OF A RESPONSIBLE PERSON.

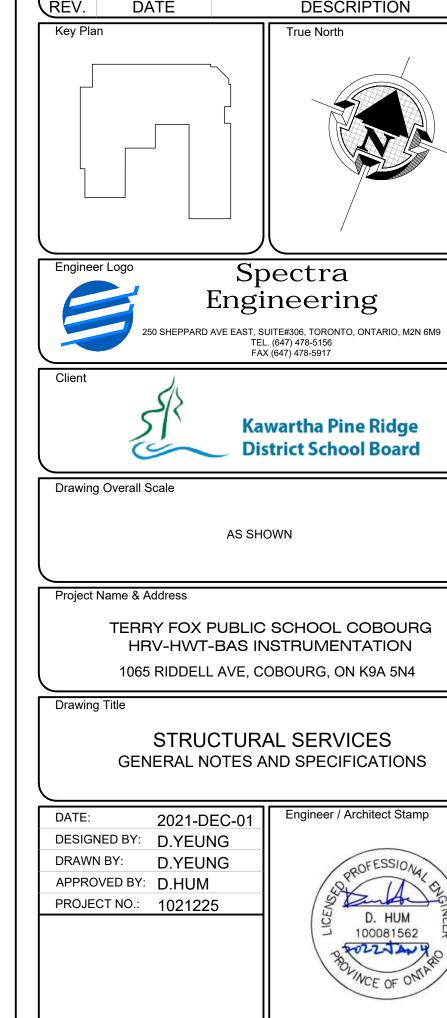
F. DEMOLITION AND REWORK

- ENSURE THAT EXISTING AND NEW STRUCTURE IS AT ALL TIMES MAINTAINED IN A SAFE CONDITION AND THAT THE PUBLIC IS PROTECTED FROM DEMOLITION ACTIVITIES
- 2. DESIGN AND PROVIDE ALL REQUIRED SHORING OR TEMPORARY FALSEWORK REQUIRED FOR SUPPORT OF EXISTING STRUCTURE DURING DEMOLITION REWORK OR INSTALLATION ACTIVITIES. BEFORE UNDERTAKING WORK, SUBMIT TO CONSULTANT FOR REVIEW DRAWING(S) BEARING THE SEAL OF THE LICENSED PROFESSIONAL ENGINEER RESPONSIBLE FOR DESIGN. CONTRACTOR'S ENGINEER IS THE ENGINEER ENSURE COMPLIANCE WITH CONTRACT REQUIREMENTS. REFER TO SPECIFICATIONS.





GENERAL NOTES AND SPECIFICATIONS



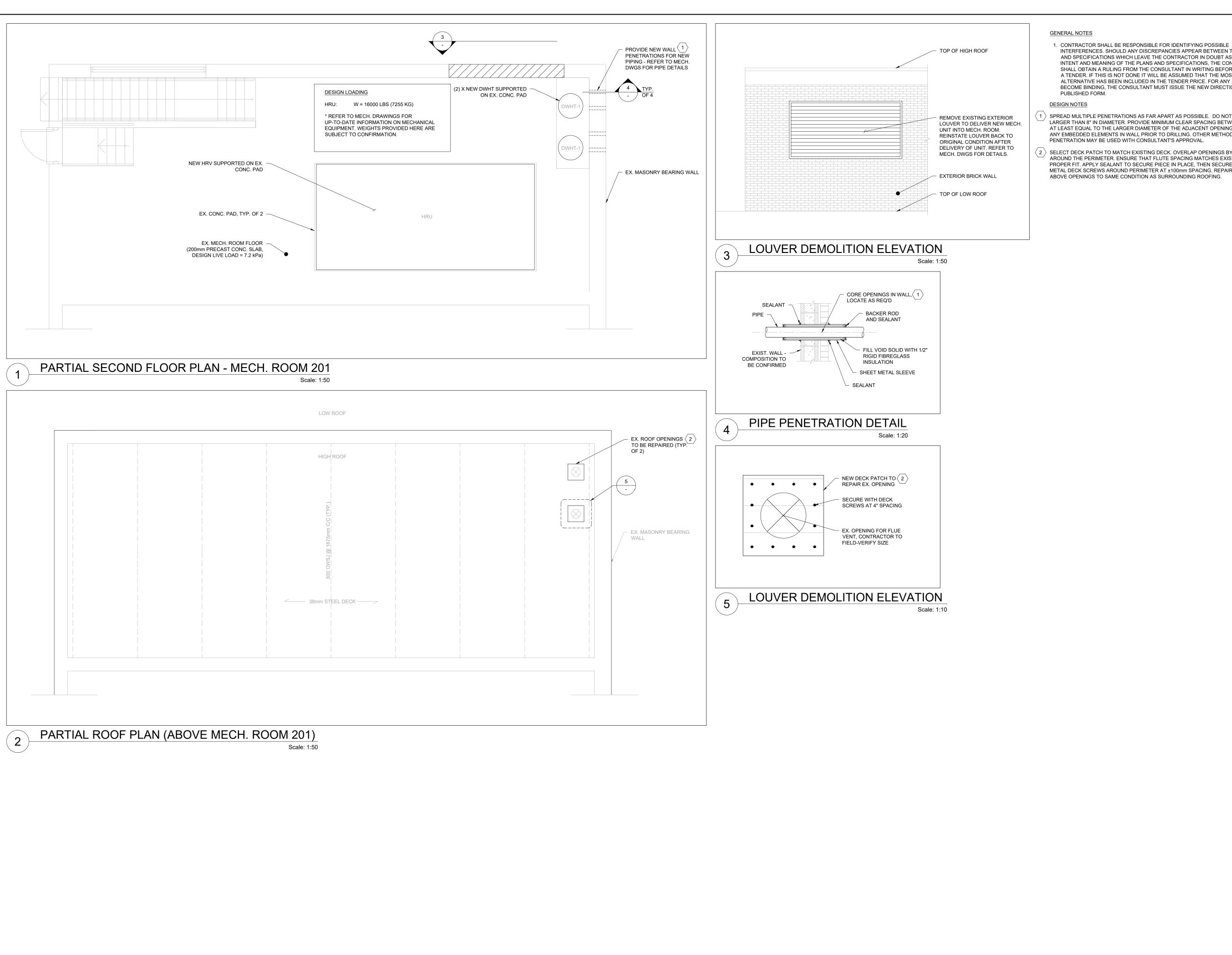
2022-JAN-04

RE-ISSUED FOR PERMIT AND TENDER

Drawing No. Phase Revisi

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2021-DEC-08 ISSUED FOR PERMIT AND TENDER



INTERFERENCES. SHOULD ANY DISCREPANCIES APPEAR BETWEEN THE DRAWINGS AND SPECIFICATIONS WHICH LEAVE THE CONTRACTOR IN DOUBT AS TO THE TRUE INTENT AND MEANING OF THE PLANS AND SPECIFICATIONS, THE CONTRACTOR SHALL OBTAIN A RULING FROM THE CONSULTANT IN WRITING BEFORE SUBMITTING A TENDER. IF THIS IS NOT DONE IT WILL BE ASSUMED THAT THE MOST EXPENSIVE ALTERNATIVE HAS BEEN INCLUDED IN THE TENDER PRICE. FOR ANY RULING TO BECOME BINDING, THE CONSULTANT MUST ISSUE THE NEW DIRECTION IN A PUBLISHED FORM.

DESIGN NOTES

> SPREAD MULTIPLE PENETRATIONS AS FAR APART AS POSSIBLE. DO NOT CUT OPENINGS LARGER THAN 8" IN DIAMETER. PROVIDE MINIMUM CLEAR SPACING BETWEEN OPENINGS AT LEAST EQUAL TO THE LARGER DIAMETER OF THE ADJACENT OPENINGS. CHECK FOR ANY EMBEDDED ELEMENTS IN WALL PRIOR TO DRILLING. OTHER METHODS OF WALL PENETRATION MAY BE USED WITH CONSULTANT'S APPROVAL.

 $race{2}$ SELECT DECK PATCH TO MATCH EXISTING DECK. OVERLAP OPENINGS BY MINIMUM 100mm AROUND THE PERIMETER. ENSURE THAT FLUTE SPACING MATCHES EXISTING FOR PROPER FIT. APPLY SEALANT TO SECURE PIECE IN PLACE, THEN SECURE WITH SHEET METAL DECK SCREWS AROUND PERIMETER AT ±100mm SPACING. REPAIR ROOFING ABOVE OPENINGS TO SAME CONDITION AS SURROUNDING ROOFING.

