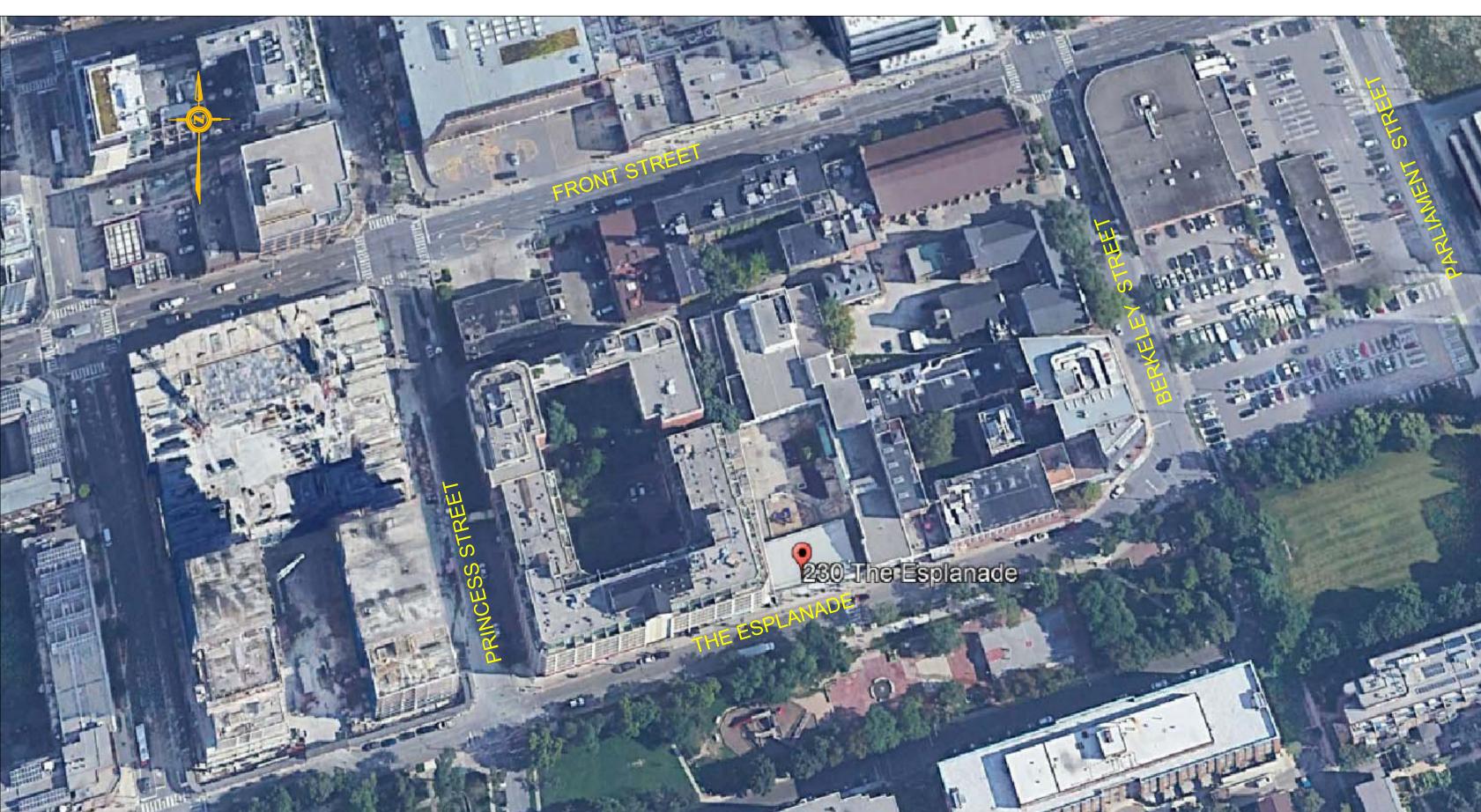
CITY OF TORONTO - PARKS & RECREATION ST. LAWRENCE COMMUNITY RECREATION CENTER & DAYCARE

ROOFING & CHILLER REPLACEMENT

230 THE ESPLANADE, TORONTO, ON



\bigcirc 1	KEY	PLAN
A1	N.T.S.	

DRAWING INDEX:

ARCHITECTURAL:

A1 - KEY PLAN, OBC MATRIX & DRAWING INDEX A2 – SITE PLAN

STRUCTURAL:

S1 - GROUND FLOOR PLAN

S2 - ROOF PLAN

S3 — DETAILS

<u>ROOFING:</u>

R1 - ROOFING REPLACEMENT - NOTES R2 - ROOFING REPLACEMENT - ROOF PLANS

R3 - ROOFING REPLACEMENT - DETAILS

MECHANICAL:

M1 - MECHANICAL SPECIFICATIONS & SITE PLAN

M2 - MECHANICAL SPECIFICATIONS CONT'D

M3 - ROOF PLAN & MECHANICAL PENTHOUSE DEMO

M4 - ROOF PLAN & MECHANICAL PENTHOUSE RENO

M5 - GYM. MECHANICAL ROOM DEMO

M6 - GYM. MECHANICAL ROOM RENO

M7 - COOLING TOWER & CHILLER SCHEMATIC DEMO

M8 - COOLING TOWER & CHILLER SCHEMATIC RENO M9 - CONTROL SEQUENCE DIAGRAM

M10 - CONTROL SPECIFICATION

M11 - MECHANICAL DETAILS & SCHEDULE

ELECTRICAL:

E1 - ELECTRICAL SPECIFICATION AND LEGEND

E2 - ELECTRICAL DEMOLITION PLAN

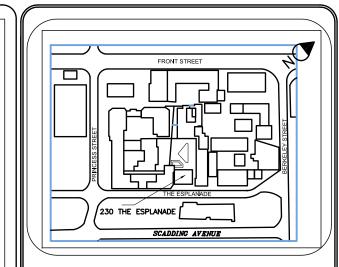
E4 - SINGLE LINE DIAGRAM

E3 – ELECTRICAL POWER PLAN



			ING CODE DATA MATRIX RENOVATION OF EXISTING BUILDING		
•		EXISTING BUILDING	DESCRIBE EXISTING USE: COMMUNITY	Y CENTER	11.2.1
		CLASSIFICATION	LOW RISE: (COMBUSTIBLE AND NOT	N-COMBUSTIBLE)	T 11.2.1.1A T 11.2.1.1B TO
			CONSTRUCTION INDEX: EIGHT (8)		
			HAZARD INDEX: FIVE (5)		
	11.2	ALTERATION TO EXISTING	BASIC RENOVATION:		11.3.3.1
		BUILDING IS	EXTENSIVE RENOVATION:		11.3.3.2
	11.3	REDUCTION IN PERFORMANCE			11.4.2
		LEVEL	STRUCTURAL:	NO YES	11.4.2.1
			BY INCREASE IN OCCUPANT LOAD:	NO YES	11.4.2.2
			BY CHANGE IN MAJOR OCCUPANCY:	NO YES	11.4.2.3
			PLUMBING:	NO YES	11.4.2.4
			SEWAGE SYSTEM:	NO YES	11.4.2.5
	11.4	COMPENSATING CONSTRUCTION	STRUCTURAL:	NO YES	11.4.3 11.4.3.2
			INCREASE IN OCCUPANT LOAD:	NO YES	11.4.3.3
			CHANGE IN MAJOR OCCUPANCY:	NO YES	11.4.3.4
			PLUMBING:	NO YES	11.4.3.5
			SEWAGE SYSTEM:	NO YES	11.4.3.6
	11.5	COMPLIANCE ALTERNATIVES PROPOSED	NO YES		11.5.1
			1		ĺ

2	OBC	MATRIX	
A1	N.T.S.		



5		
4		
3	FOR TENDER/ PERMIT	FEB.26,25
2	FOR CLIENT REVIEW @100%	JAN.31,25
1	FOR CLIENT REVIEW @ 60%	JAN.15,25
NO.	REVISION	DATE



PARKS & RECREATION CAPITAL PROJECTS METRO HALL 55 JOHN STREET, 24th FLOOR TORONTO, ONTARIO, M5V 3C6



494 McNicoll Avenue, Suite # 201 Toronto, Ontario, M2H 2E1 Tel.: (647) 974-7006 Web Site : www.tabcon.com

Project Name :

ST. LAWRENCE CRC & DAYCARE

Project Address : 230 THE ESPLANADE

TORONTO, ON Job Descript. :

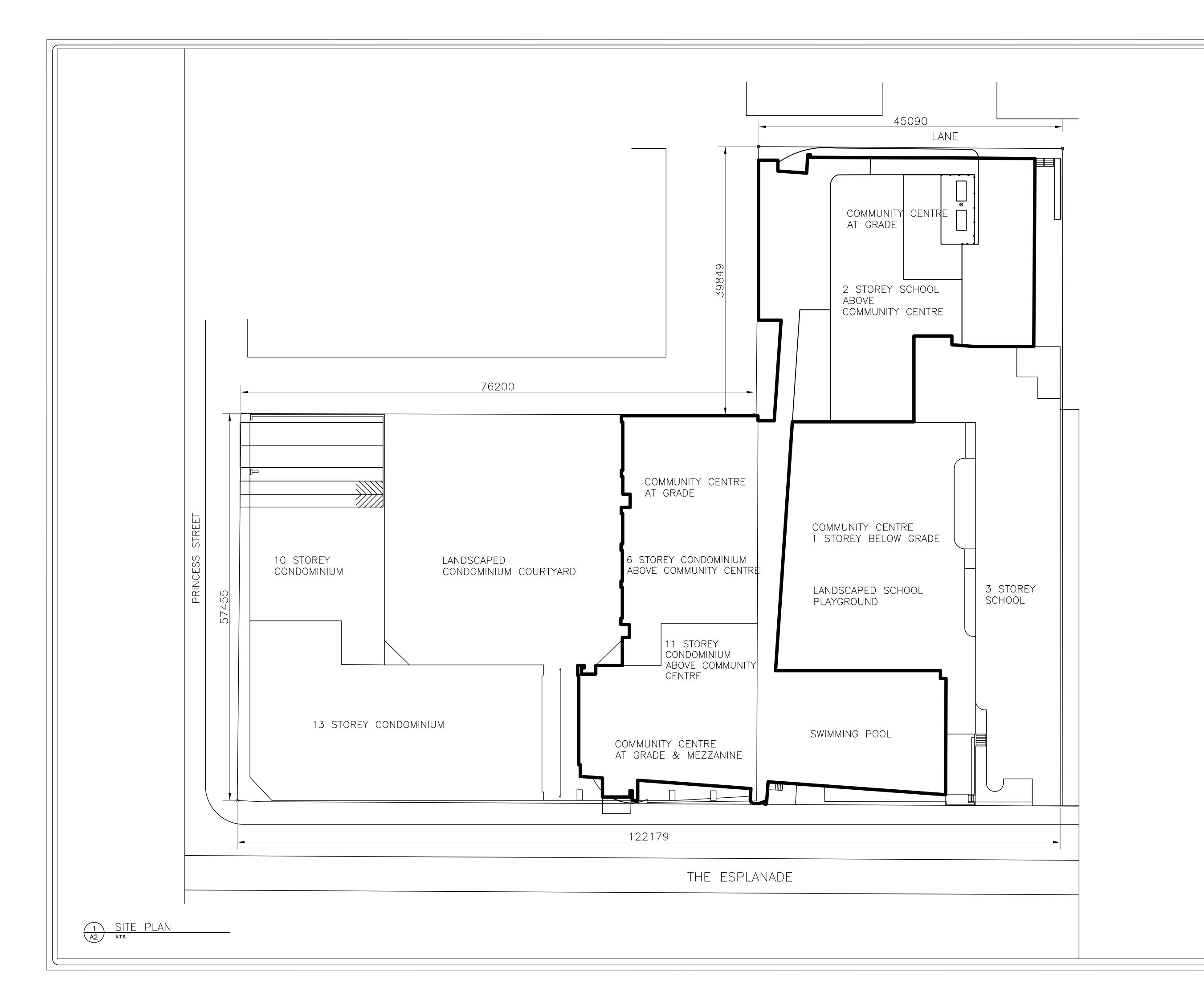
KEY PLAN, OBC MATRIX & DRG. INDEX

ROOFING & CHILLER REPLACEMENT

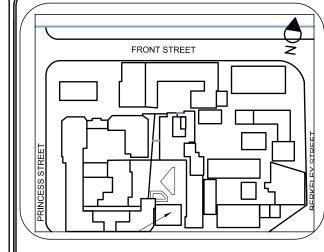
Design:	R.A.
DRAWN:	R.A.
Approv.:	A.T.
Scale:	As Shown
Date:	JANUARY 15, 2025

Project No.	
Job No.	









KEY PLAN

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ABCON TABCON CONSULTING INC.

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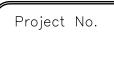
SITE PLAN

(H. Tabrizi)

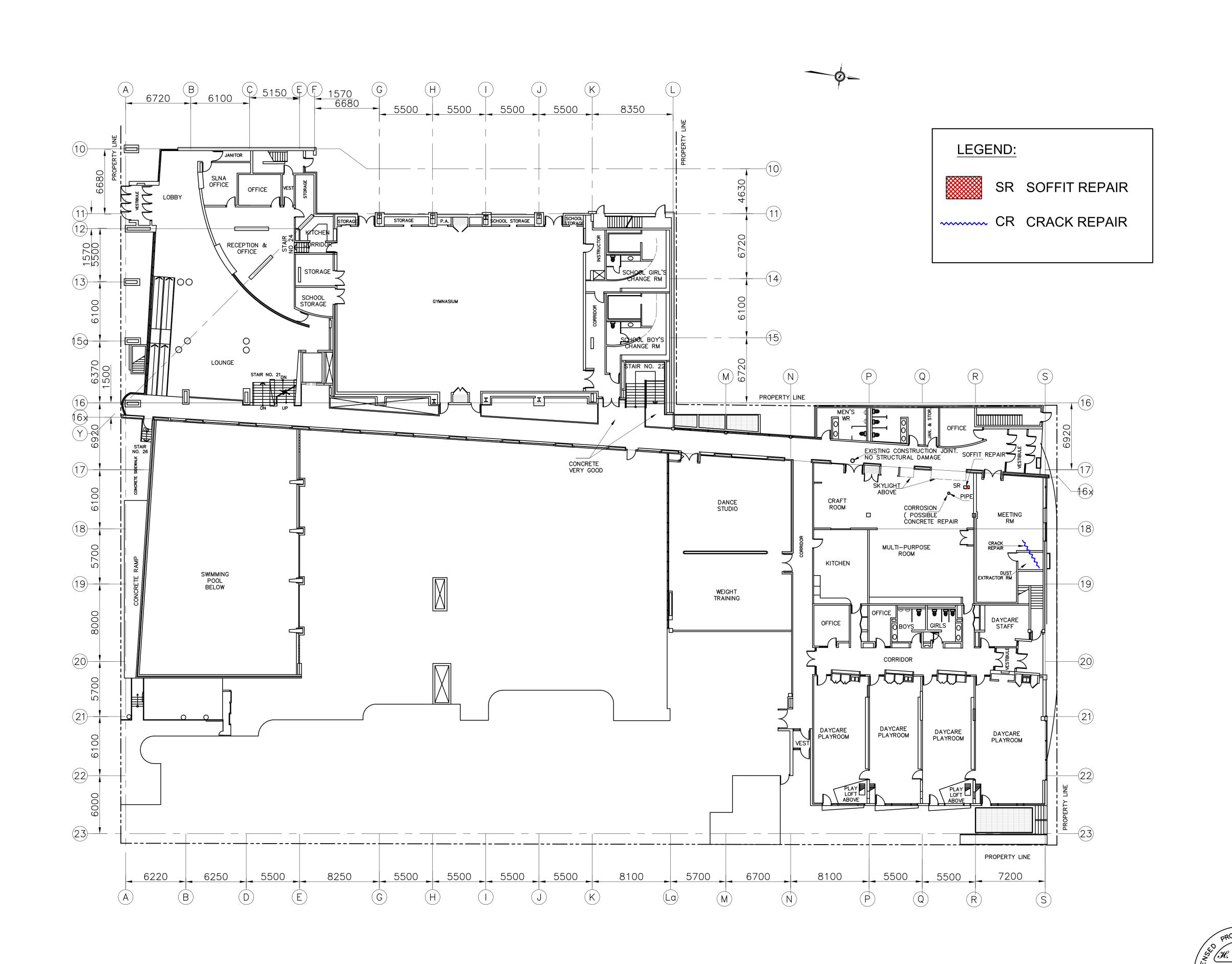
H. TABRIZI

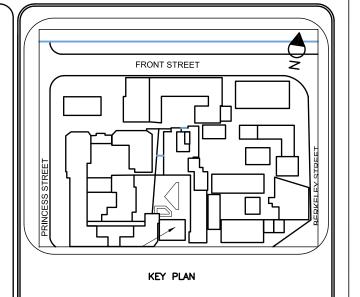
FEB. 26, 2025

	Design:	R.A.
	DRAWN:	R.A.
	Approv.:	A.T.
	Scale:	As Shown
	Date:	JANUARY 15, 2025



Job No.





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TORONTO, ONTARIO, M5V 3C6



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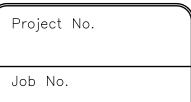
230 THE ESPLANADE TORONTO, ON
Job Descript.:

ROOFING & CHILLER REPLACEMENT STRUCTURAL REPAIRS

GROUND FLOOR PLAN

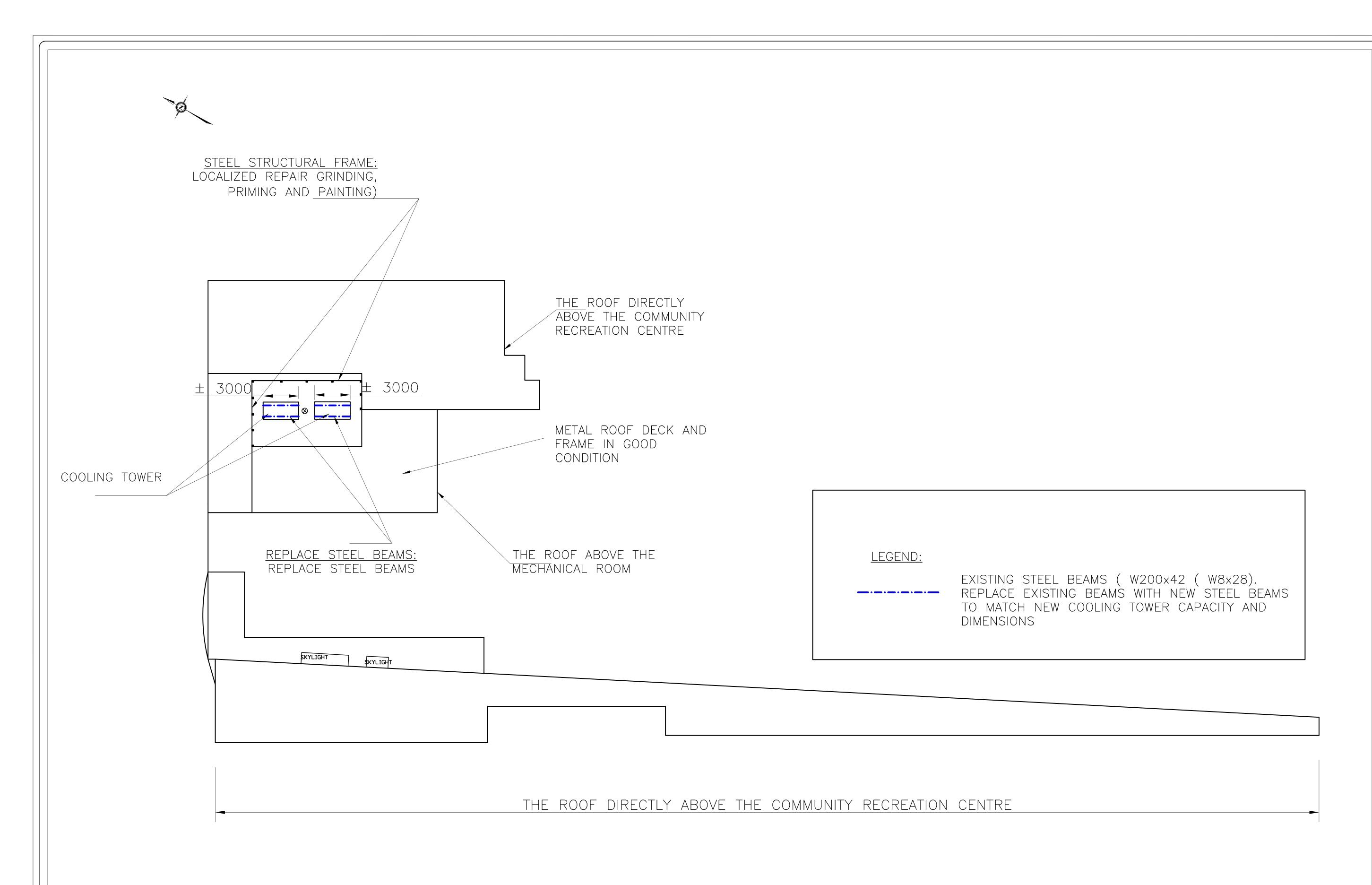
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<u></u>	Design:	R.A.
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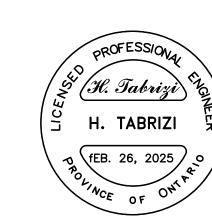
Dwg.No.

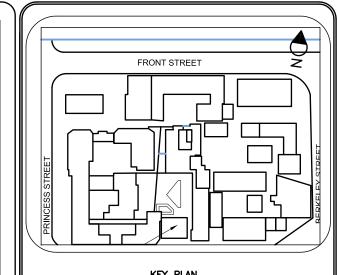


H. TABRIZI

GROUND FLOOR PLAN
1:150







5		
4		
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Project Nan

ST. LAWRENCE CRC & DAYCARE

Project Address : 230 THE ESPLANADE

TORONTO, ON

Job Descript. :

ROOFING & CHILLER REPLACEMENT

STRUCTURAL REPAIRS

ROOF PLAN

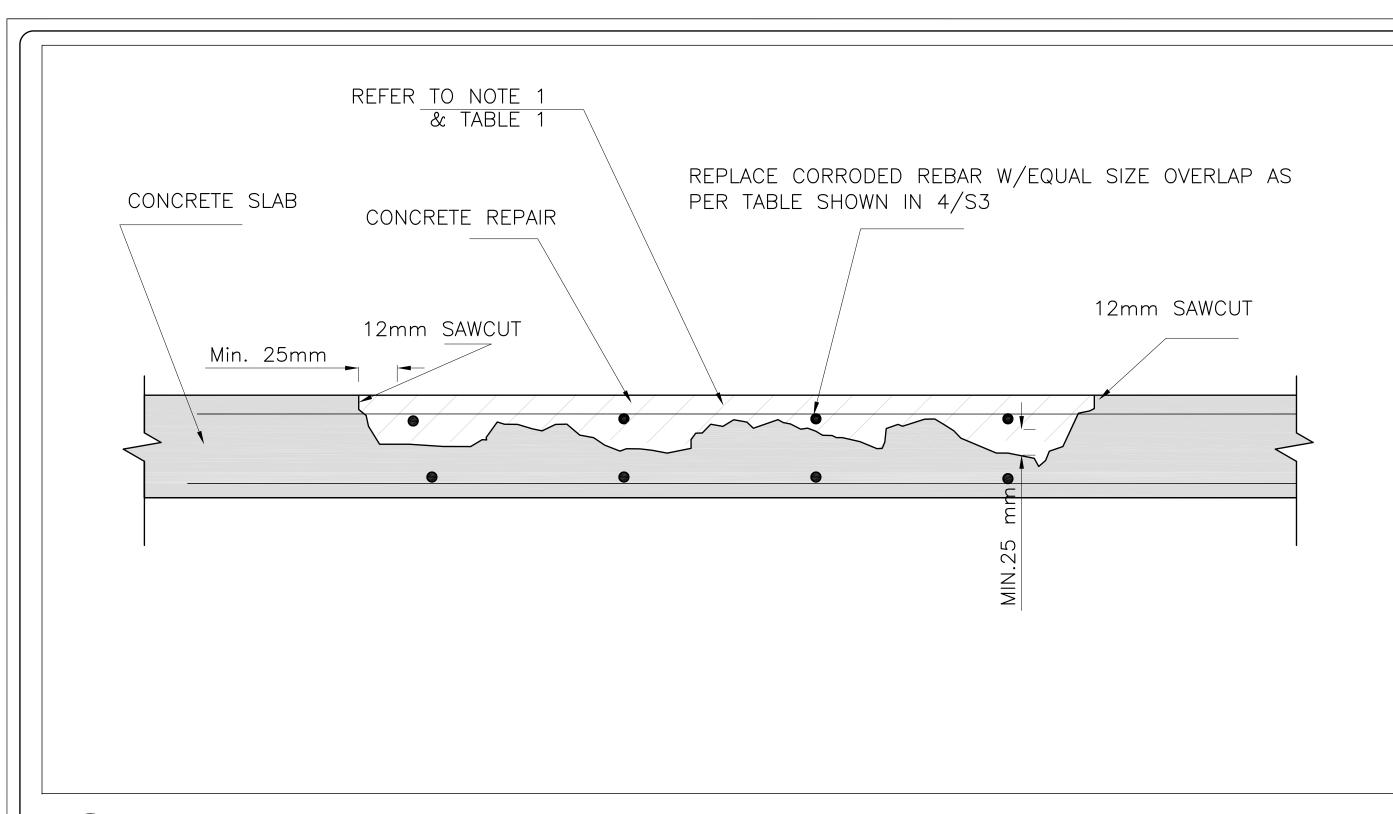
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Job No.

S 2





1 TOP SURFACE CONCRETE REPAIR DETAIL S3 N.T.S.

NOTE:

- 1. PROVIDE TEMPORARY SHORING/BRACING PRIOR TO CONCRETE REMOVAL.
 2. SAW CUT PERIMETER OF THE REPAIR AREA TO A DEPTH OF 12 mm.
- 3. CHIP AND BREAK DELAMINATED CONCRETE.
- 4. REMOVE CONCRETE AROUND REBAR UNTIL RUST FREE REBAR ARE ENCOUNTERED.
- 5. SPLICE NEW REBARS TO ALL EXISTING REBARS W/ 15% OR MORE LOSS OF SECTIONAL AREA.
- 6. REMOVE CONCRETE MINIMUM 25 mm BEYOND FACE OF REBAR AS SHOWN.
- 7. SANDBLAST AND CLEAN CONCRETE SURFACE AND REINFORCEMENT.
- 8. REINFORCEMENT SHALL BE CLEANED TO "NEAR WHITE SURFACE". 9. APPLY BONDING AGENT AND CORROSION INHIBITOR PER SPEC.
- 10. FORM AND POUR POLYMER MODIFIED MORTAR OR CONCRETE
- W/ MIN. 35Mpa COMPRESSIVE STRENGTH @ 28 DAYS
- 11. CONCRETE EXPOSURE CLASS SHALL BE C1

CONCRETE REPAIR	CONCRETE SLAB		TO NOTE 1 & TABLE 1		
		=		MIN.25mm	
12 mm	sawcut			12 mm SAWCUT	
			REPLACE CORRO W/EQUAL SIZE PER TABLE SHO	OVERLAP AS	

- 1. CONTRACTOR TO PROVIDE SHORING SHOP DRAWINGS FOR CONSULTANT'S REVIEW. SHOP DRAWINGS SHALL BE PREPARED, STAMPED AND SIGNED BY A PROFESSIONAL ENGINEER LICENSED IN PROVINCE OF ONTARIO.
- 2. PROTECT FLOOR SLAB WHEN BREAKING DELAMINATED CONCRETE SLAB ABOVE.



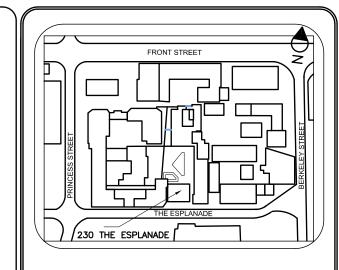
SOFFIT CONCRETE REPAIR DETAIL

S3 N.T.S.

TABLE 1				
REBAR SIZE	LAP LENGTH mm IN f'c (35 Mpa) CONCRETE & REBAR GRADE 400			
1 O M	370 mm			
15M	520 mm			
20M	650 mm			
25M	1000 mm			
30M	1200 mm			



4 TABLE 1 S3 N.T.S.



KEY PLAN

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Project Name :

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Project Address : 230 THE ESPLANADE

TORONTO, ON

Job Descript. :

ROOFING & CHILLER REPLACEMENT STRUCTURAL REPAIRS

NOTES & DETAILS

Design:	R.A.
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Project No. Job No.



NEW CONSTRUCTION

ROOFS A, B, C, E, F, G

REMOVE THE EXISTING ROOF DOWN TO THE DECK AND DISCARD. KEEP FOR REUSE ALL INSULATION AND BALLAST. PRIME THE DECK WITH ASPHALT PRIMER. RAISE THE PERIMETER WITH TWO LAYERS OF WOOD BLOCKING AND A SHIM. TORCH APPLY A MODIFIED BASE SHEET MEMBRANE. INSTALL MODIFIED PEEL AND STICK FLASHING ON ALL PERIMETER WALL DETAILS. TORCH APPLY A MODIFIED CAP SHEET AND CAP SHEET FLASHING. INSTALL A LAYER OF 6 MIL POLYETHYLENE SHEET. INSTALL BACK IN PLACE ORIGINAL INSULATION. ALLOW TO REPLACE UP TO 20% OF INSULATION.ON ROOF A INSTALL A SECONDARY LAYER OF 25.4mm POLYSTYRENE IV INSULATION. ON ALL OTHER ROOFS INSTALL A SECONDARY LAYER OF 51mm POLYSTYRENE IV INSULATION. INSTALL A LAYER OF FILTER FABRIC SHEET. INSTALL BALLAST BACK IN PLACE. INSTALL 24 GAUGE SHEET METAL. INSTALL ALL SEALANTS. ON ROOF A REPLACE ALL CONCRETE PAVERS AS SHOWN. AT LOCATION OF DOOR DO NOT INSTALL SECONDARY INSULATION LAYER. INSTALL NEW DRAIN INSERTS WITH U FLOW SEALS. PROVIDE A VIDEO INSPECTION OF ALL DRAINS PRIOR TO CONSTRUCTION AND UPON COMPLETION OF CONSTRUCTION. SUPPLY AND INSTALL A NEW LADDER COMPLETE WITH SAFETY RAILINGS TO ROOF D. ALLOW TO REMOVE ALL TREES GROWING ON ROOFS. ALLOW TO TRIM EXISTING TREES WHICH OVERHANG THE ROOF. SUPPLY AND INSTALL A SAFETY RAILING AS SHOWN ON ROOF A. SUPPLY AND INSTALL A NEW RAILING AROUND THE ROOF HATCH ON ROOF A

ROOF D

REMOVE THE EXISTING ROOF DOWN TO THE DECK AND DISCARD. RAISE THE PERIMETER WITH THREE ROWS OF WOOD BLOCKING. INSTALL A NEW LAYER OF 12.7mm DENS DECK PRIME MECHANICALLY FASTENED TO THE DECK. TORCH APPLY A MODIFIED BASE SHEET MEMBRANE. INSTALL MODIFIED PEEL AND STICK FLASHING. TORCH APPLY A MODIFIED CAP SHEET AND CAP SHEET FLASHING. INSTALL A LAYER OF 101.6mm POLYSTYRENE IV INSULATION. INSTALL A SECONDARY LAYER OF 51.0mm POLYSTYRENE IV INSULATION. INSTALL A FILTER FABRIC SHEET. INSTALL BALLAST BACK IN PLACE. INSTALL 24 GAUGE SHEET METAL FLASHING. INSTALL NEW DRAIN INSERT WITH U FLOW SEAL. INSTALL CONCRETE PAVERS AT LADDER. PROVIDE VIDEO INSPECTION OF THE DRAIN PRIOR TO CONSTRUCTION AND UPON COMPLETION OF CONSTRUCTION.

SITE SAFETY & COORDINATION

THE CONTRACTOR SHALL WEAR SAFETY HARD HATS, BOOTS AND GLASSES ON SITE AT ALL TIMES. THE CONTRACTOR SHALL USE POWER AND WATER SOURCES AS DESIGNATED BY THE ENGINEER, HE SHALL KEEP THESE SOURCES FREE FROM DEFECTS AND SHALL REPAIR ANY EQUIPMENT WHICH SHALL BECOME DAMAGED DURING CONSTRUCTION. THE CONTRACTOR SHALL ABIDE BY ALL SAFETY RULES AND REGULATIONS OF THE PLANT. THE CONTRACTOR SHALL ALSO ABIDE BY ALL SECURITY REGULATIONS OF THE SITE. THE CONTRACTOR SHALL STORE ALL HIS EQUIPMENT IN A SAFE PLACE AND MANNER. THE OWNER SHALL NOT BE RESPONSIBLE FOR ANY STOLEN OR LOST GOODS. DO NOT STORE MATERIALS ON THE ROOF WITHOUT THE PERMISSION OF THE ENGINEER. DO NOT OVERLOAD THE INSTALLATION OF ANY NEW ROOF. ENSURE THAT THE ROOF IS DRY AND FREE FROM ANY RAIN AND MOISTURE.

PARKING IN AREAS AROUND THE BUILDING IS PROHIBITED EXCEPT FOR LOADING AND UNLOADING OF ALL MATERIALS. PARK ALL VEHICLES IN DESIGNATED AREAS AND AS ARRANGED WITH THE SITE ENGINEER. COORDINATE ALL MECHANICAL AND ELECTRICAL DISCONNECT OF HVAC EQUIPMENT WITH THE ENGINEER. LEAVE ALL PARKING AREAS, GROUNDS AND ROOFS AREAS CLEAR OF DEBRIS. STORE ALL MATERIALS UNDER TARPS EACH NIGHT. USE PROPER WEIGHTS FOR LIFTING DEVICES. INSTALL SAFETY BARRIERS AROUND ROOFS UNDER CONSTRUCTION IN ACCORDANCE WITH OHSA. ALL CONTRACTOR STAFF MEMBERS SHALL BE TIED OFF WHILE WORKING AT THE EDGE OR WHILE USING THE HOIST. ROPE OFF ALL AREAS AROUND THE GARBAGE BOX. ERECT SIGNS "DANGER MEN WORKING OVERHEAD" AROUND ROOFS UNDER CONSTRUCTION. USE WASHROOM FACILITIES AS DESIGNATED BY THE BUILDING OPERATIONS MANAGER. TEAR OFF ONLY THOSE SECTIONS OF ROOF WHICH CAN BE COMPLETED EACH DAY.

NO WORK SHALL BE CARRIED OUT DURING INCLEMENT WEATHER OR IF INCLEMENT WEATHER IS FORECAST. TAKE ALL PRECAUTIONS TO PREVENT LEAKS INTO THE BUILDING. ENSURE THAT ALL MATERIALS ARE COVERED WITH APPROPRIATE TARPS. ALL ROLLS SHALL BE STORED ON VERTICAL ENDS. ALL INSULATION NOT USED SHALL REMAIN IN PLASTIC COVERING. PROVIDE ONE FIRE EXTINGUISHER FOR EVERY TORCH APPLICATOR. KEEP ALL AREAS OF CONSTRUCTION IN A TIDY MANNER. TAKE ALL MATERIALS TO AN APPROVED DUMP SITE. PROVIDE CONTINUOUS SUPERVISION AND MONITORING OF THE SITE FOR SAFETY AND LOGISTICS

ENTRY INTO THE BUILDING SHALL BE IN STREET SHOES ONLY. PROTECT ALL FLOORS FROM ASPHALT STAINS. PROTECT ALL WALLS FROM ASPHALT STAINS. THE CONTRACTOR SHALL WORK ON SITE FROM 07:00 TO 18:30 HOURS EACH DAY. NO WORK WILL BE ALLOWED ON WEEKENDS UNLESS PRIOR APPROVAL HAS BEEN OBTAINED FROM THE PROJECT MANAGER OF THE CITY AND OPERATIONS MANAGER OF THE SITE. PROTECT ALL PEDESTRIANS FROM THE WORK. CLEAN THE SITE EVERY NIGHT AND SECURE ALL MATERIALS THAT COULD BLOW OFF THE ROOF.

ROOF CONSTRUCTION

ROOFS A, B, F, G

CONCRETE DECK, PROTECTION SHEET, 45 MIL EPDM MEMBRANE, 101.6mm POLYSTYRENE TYPE IV INSULATION, FILTER FABRIC SHEET, RIVER STONE BALLAST

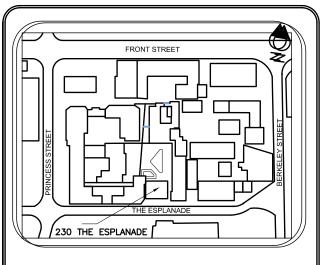
ROOFS C, E

CONCRETE DECK, HOT RUBBERIZED ASPHALT MEMBRANE, POLYETHYLENE SHEET, 101.6mm POLYSTYRENE TYPE IV INSULATION, FILTER FABRIC SHEET, RIVER STONE BALLAST

OOF D

STEEL DECK, 12.7mm DENS DECK BOARD, PROTECTION SHEET, 45 MIL EPDM MEMBRANE, 101.6mm POLYSTYRENE TYPE IV, INSULATION, FILTER FABRIC SHEET, RIVER STONE BALLAST

	LEGEND
⊕ _{DR}	DRAIN
Q	SOIL VENT
Q	STACK
	SCUPPER
	EXHAUST DUCT
	SQUARE VENT
H	ROOF HATCH
	CONCRETE PAVERS
	LADDER
	CONCRETE SLEEPER



KEY PLAN

5		
4		
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PARKS & RECREATION
CAPITAL PROJECTS
METRO HALL
55 JOHN STREET, 24th FLOOR
TORONTO, ONTARIO, M5V 3C6

ROOFING CONSULTANT:

THERMACO ENGINEERING SERVICES (1986) LTD.

P.O. BOX 202 MALTON CSC MISSISSAUGA, ONTARIO, L4T 3B6 TEL: (905) 565-0650 FAX: (905) 565-7412



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Project Name :

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Project Address:
230 THE ESPLANADE
TORONTO, ON

Job Descript.:

ROOFING & CHILLER REPLACEMENT
ROOFING REPLACEMENT

NOTES

Design:	B.F. TESSLER
DRAWN:	H.S.
Approv.:	B.F. TESSLER
Scale:	AS SHOWN
Date:	January 15, 2025

Project No.

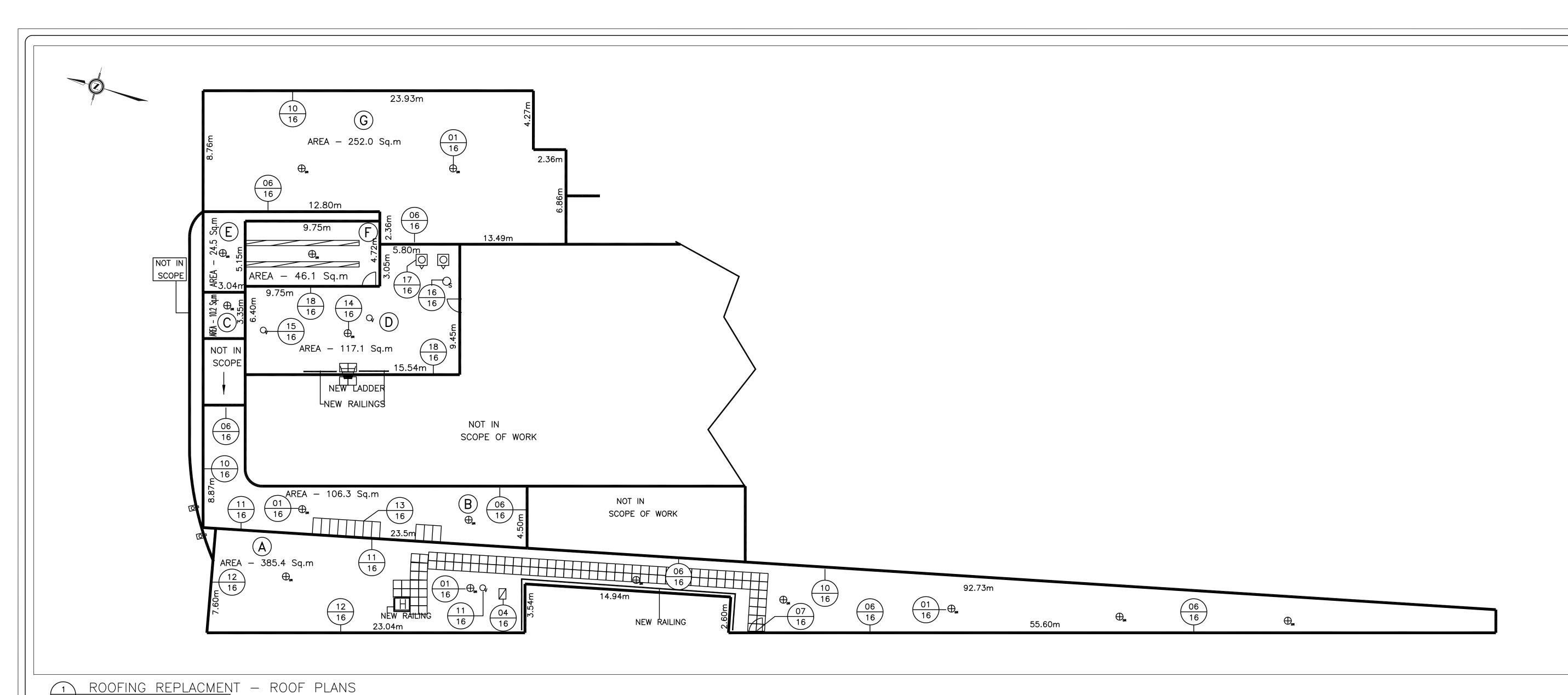
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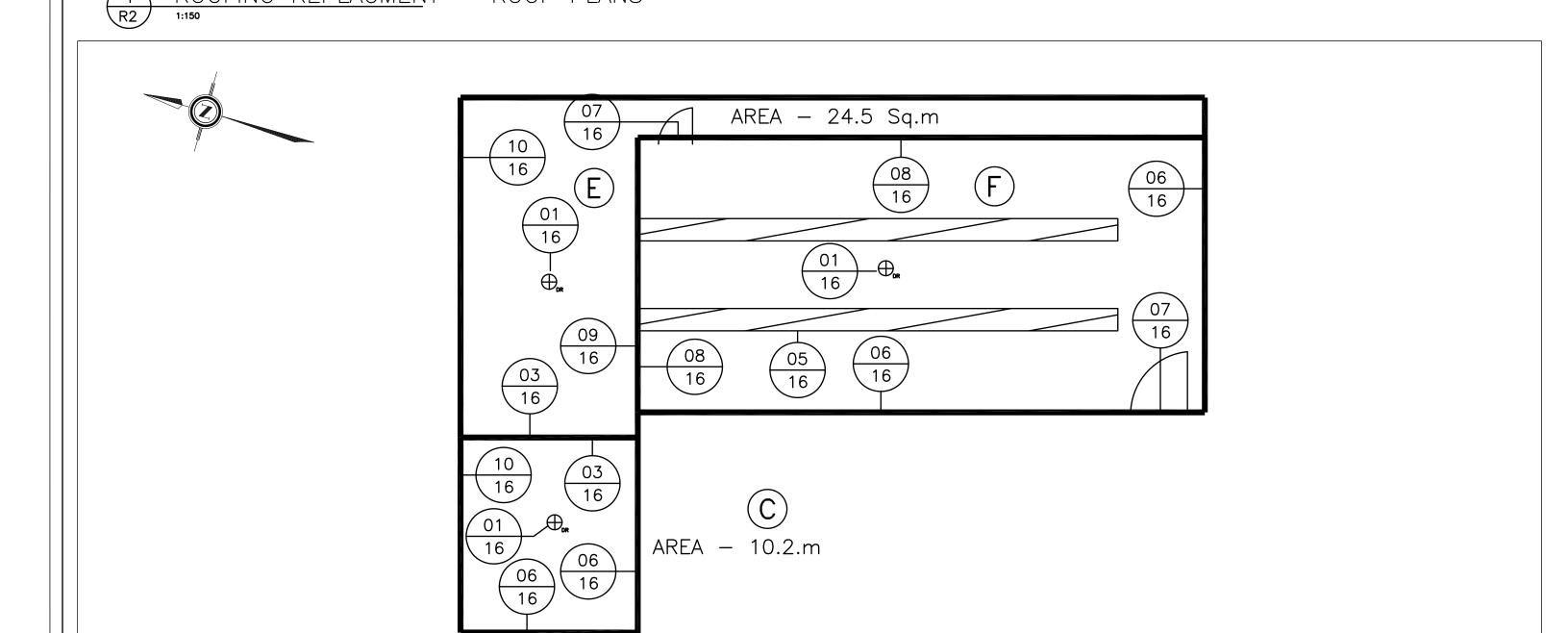
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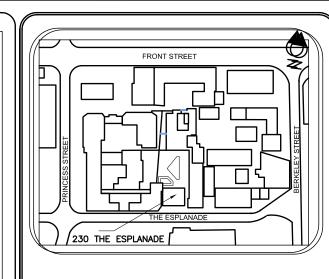
ROOFING REPLACMENT - NOTES

7//2025





2 ROOFING REPLACMENT — ROOF PLANS R2 N.T.S.



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ROOFING REPLACEMENT

ROOF PLAN

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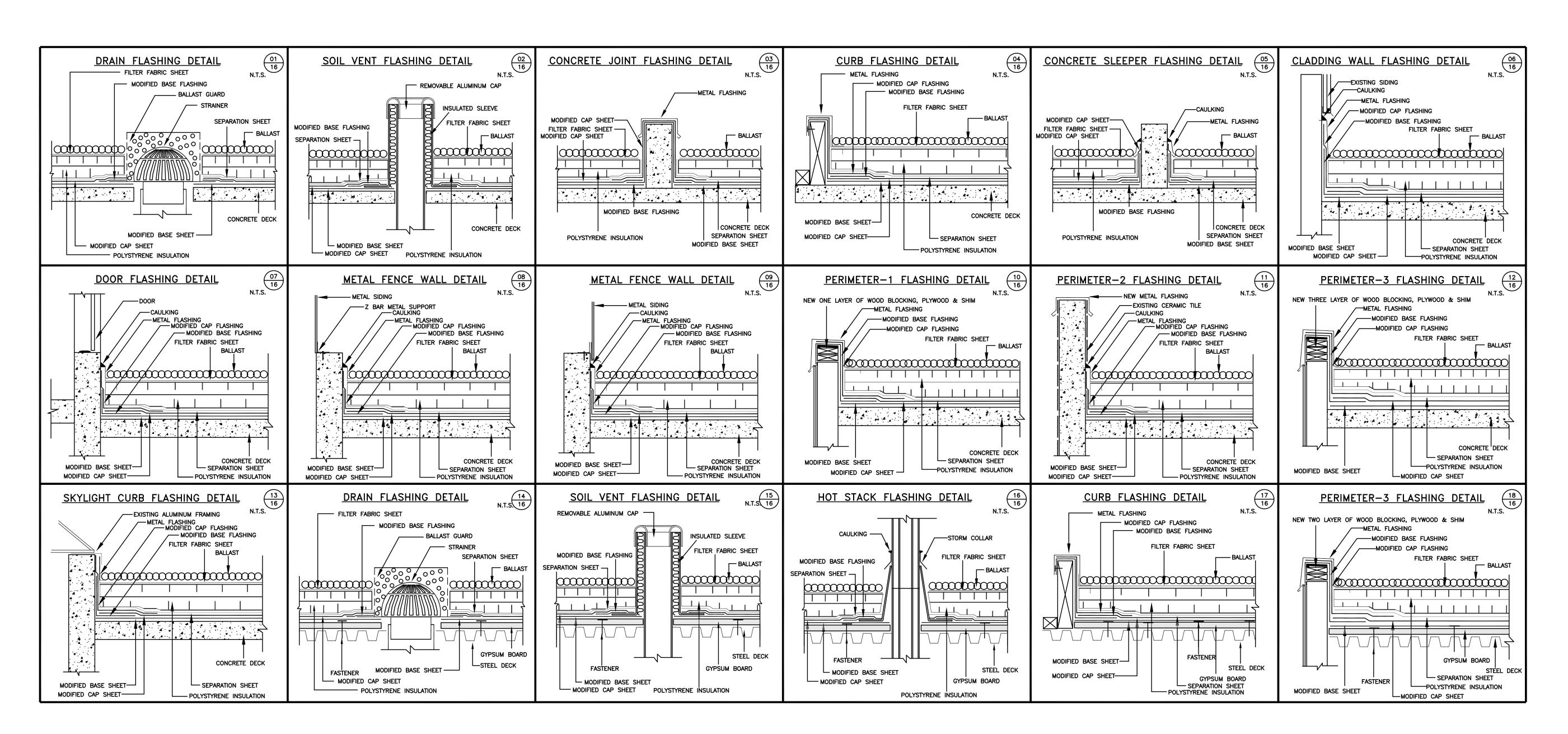
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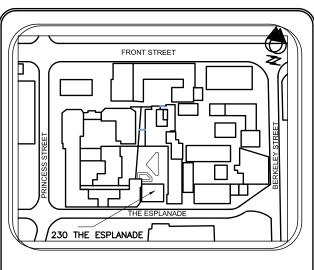
R2

OF 03

7/1/2025







KEY PLAN

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		5						
		4						
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ROOFING CONSULTANT:

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Project Name :

ST. LAWRENCE CRC & DAYCARE

Project Address:

230 THE ESPLANADE TORONTO, ON
Job Descript.:

ROOFING & CHILLER REPLACEMENT ROOFING REPLACEMENT

DETAILS

Design: B.F. TESSLER

DRAWN: H.S.

Approv.: B.F. TESSLER

Scale: AS SHOWN

Date: January 15, 2025

Project No.

Job No.

Dwg.No.

R3

ROOFING REPLACMENT - DETAILS

N.T.S.

GENERAL CONDITIONS

I. SUPPLY AND INSTALL ALL ITEMS, ARTICLES, MATERIALS, AND OPERATIONS. INCLUDE ALL LABOUR, EQUIPMENT, MATERIALS, TOOLS NECESSARY TO COMPLETE ALL SYSTEMS SHOWN ON THE DRAWINGS RENDERING A COMPLETE INSTALLATION.

2. VISIT AND INSPECT THE SITE AND ALL OTHER DRAWINGS. BECOME FAMILIAR WITH THE BUILDING CONSTRUCTION AND DETAILS. NO ALLOWANCE WILL BE MADE FOR FAILURE TO DO SO.

3. BE RESPONSIBLE FOR CARE OF THE BUILDING. DO ALL CUTTING. PATCHING, AND PAINTING REQUIRED FOR THE WORK OF THIS TRADE. WORKS TO BE PERFORMED BY THE GENERAL CONTRACTOR'S FORCES AT THE MECHANICAL CONTRACTOR'S EXPENSE.

4. THIS CONTRACTOR IS TO ALLOW FOR CUTTING AND PATCHING PERTAINING TO THE MECHANICAL SYSTEMS INSTALLATION.

UNLESS NOTED OTHERWISE. THIS SHALL INCLUDE ALL CUTTING AND PATCHING OF ROOFS, PARTITION WALLS, CEILINGS, AND FLOORS AND OUTSIDE WALLS. ALL CUTTING AND PATCHING SHALL BE PERFORMED BY WORKERS SPECIALIZED IN THIS TYPE OF WORK AND CAPABLE OF PERFORMING TO GOOD COMMERCIAL STANDARDS

ALL PATCHING SHALL BE DONE SO AS TO MAINTAIN ANY FIRE SEPARATIONS, SOUND TRANSMISSION CLASS RATINGS, VAPOR RETARDED PERFORMANCE, INSULATION VALUES, ETC.

5. CLEAN ALL DEBRIS DAILY AND UPON COMPLETION OF CONTRACT.

6. COOPERATE WITH ALL OTHER TRADES. COORDINATE WORK WITH ALL OTHER TRADES. PATCH AND SEAL ALL FLOOR AND WALL OPENINGS WITH FIRE RESISTANT INSULATION AND MASTIC.

PROVIDE SLEEVES FOR PIPING AS FOLLOWS:

-FOR ALL PENETRATIONS OF POURED CONCRETE STRUCTURES. SLEEVES ARE NOT REQUIRED PROVIDED THE MECHANICAL CONTRACTOR CLITS ALL REQUIRED OPENINGS AFTER THE CONCRETE INSTALLATION AND PROVIDED ALL OPENINGS COMPLY WITH THE FIRESTOP MANUFACTURERS REQUIREMENTS.

-FOR ALL COPPER PIPE PENETRATIONS OF MASONRY AND POURED CONCRETE STRUCTURES WHERE REQUIRED TO PREVENT DIRECT CONTACT OF THE MASONRY/POURED CONCRETE WITH THE COPPER PIPING. SLEEVES ARE NOT REQUIRED PROVIDED THAT DIRECT CONTACT OF COPPER AND MASONRY / POURED CONCRETE IS PREVENTED AND PROVIDED THE OPENINGS COMPLY WITH THE FIRESTOP MANUFACTURERS REQUIREMENTS.

8. SLEEVES SHALL BE SCHEDULE 40 STEEL. PLASTIC PIPE SLEEVES MAY BE USED IN POURED CONCRETE STRUCTURES PROVIDED OPENINGS CAN BE PROVIDED WHICH COMPLY WITH THE REQUIREMENTS OF THE FIRESTOP MANUFACTURER AND THE LOCAL AUTHORITY.

SLEEVES SHALL BE SIZED LARGE ENOUGH TO ALLOW FOR ANY LATERAL MOVEMENT OF PIPING DUE TO EXPANSION/CONTRACTION, PIPE INSULATION, FIRE STOPPING AND SOUND PACKING.

FIRESTOPPING SHALL BE PRO SET SYSTEMS OR APPROVED EQUAL FIRE STOP SEALANT/DEVICES OF A TYPE TO SUIT PIPING, BUILDING CONSTRUCTION, OPENING SIZE. ETC. INSTALL ACCORDING TO MANUFACTURERS DETAILED INSTALLATION INSTRUCTIONS. NOTE: REFER TO MANUFACTURERS DETAILED INSTALLATION DRAWINGS AND PROVIDE SHOP DRAWINGS OF ALL FIRE STOP SYSTEMS PRIOR TO APPLICATION OF FIRE STOPPING. SHOP DRAWINGS SHALL SHOW APPROVALS OF ALL GOVERNING AGENCIES.

ALL FIRE STOP SYSTEMS SHALL MEET THE F AND T RATINGS OF THE WALL CONSTRUCTION IN WHICH THEY ARE INSTALLED. ALL SYSTEMS SHALL BE IDENTIFIED WITH APPROPRIATE SP NUMBERS

10. ONE SET OF OWNER'S APPROVED DRAWINGS AND PERMIT DRAWINGS SHALL BE KEPT ON SITE AND AVAILABLE FOR CHECKING AT ALL TIMES DURING CONSTRUCTION.

11. ALL MATERIALS TO MEET FLAME SPREAD RATING REQUIREMENTS OF AUTHORITIES HAVING JURISDICTION.

12. OBTAIN ALL PERMITS REQUIRED, ARRANGE FOR INSPECTION OF THE WORK BY INSPECTION AUTHORITY AND PAY ALL FEES. PROVIDE FINAL CERTIFICATE TO THE OWNER.

13. MECHANICAL CONTRACTORS SHALL COMPLY WITH ALL RULES AND REGULATIONS SET FORTH BY THE OWNER.

14. SUBMIT 5 COPIES OF SHOP DRAWINGS FOR APPROVAL OF ALL EQUIPMENT

15. PROVIDE A CERTIFICATE OF GUARANTEE OF WORKMANSHIP AND MATERIAL FOR ONE YEAR FROM DATE OF ACCEPTANCE.

16. IDENTIFY ALL EQUIPMENT WITH LAMICOID PLATES.

17. ANY WORK NOT SHOWN ON THE DRAWINGS OR SPECIFICALLY MENTIONED IN THE SPECIFICATIONS BUT CONSIDERED NECESSARY FOR THE COMPLETION OF THE WORK IN PROPER MANNER SHALL BE PROVIDED BY THIS CONTRACTOR WITHOUT ADDITIONAL CHARGE.

18. BEFORE FABRICATION AND INSTALLATION OF DUCTWORK AND PIPING. MAKE CERTAIN THAT SUCH ITEMS CAN BE INSTALLED AS SHOWN ON THE DRAWINGS WITHOUT INTERFERENCE WITH THE STRUCTURE OR THE WORK OF OTHER TRADES. IF ANY MATERIALS ARE FABRICATED OR INSTALLED PRIOR TO THE INVESTIGATION AND REACHING OF A SOLUTION TO POSSIBLE INTERFERENCE PROBLEMS, NECESSARY CHANGES SHALL BE MADE AT THE CONTRACTOR'S EXPENSE.

19. NOTE: THIS CONTRACTOR SHALL VERIFY EXACT LOCATION AND ARRANGEMENT OF EXISTING MECHANICAL SERVICES AND EQUIPMENT PRIOR TO FABRICATION AND INSTALLATION OF DUCTWORK. THIS CONTRACTOR SHALL PROVIDE ALL REQUIRED ELBOWS, DUCTWORK, PIPING, PIPE FITTINGS, ETC., TO COMPLETE THE INTENT OF THIS DRAWING. NO EXTRA WILL BE ALLOWED FOR THIS WORK.

20. NOTHING CONTAINED HEREIN SHALL BE CONSTRUED TO RELIEVE THIS CONTRACTOR FROM MAKING GOOD AND PERFECT IN ALL USUAL DETAILS OF CONSTRUCTION AND HE WILL BE HELD RESPONSIBLE TO PROVIDE AND FURNISH MATERIAL, TO DO ALL WORK AND LABOUR, AND BEAR EXPENSES INCIDENTAL TO THE SATISFACTORY COMPLETION OF THE WORK EMBRACED IN THESE SPECIFICATIONS.

21. VERIFY VOLTAGE ON SITE BEFORE ORDERING EQUIPMENT.

22. SUBMIT ONE SET OF MARKED UP SEPIAS TO THE OWNER SHOWING AS-BUILT CONDITIONS AT COMPLETION OF THE PROJECT.

23. MECHANICAL CONTRACTOR SHALL PROVIDE TO OWNER 3 BOUND SETS OF MAINTENANCE AND OPERATING INSTRUCTIONS FOR ALL MECHANICAL

24. COMPLETE MECHANICAL INSTALLATION SHALL BE PERFORMED IN ACCORDANCE WITH ALL APPLICABLE CODES, BY-LAWS AND AUTHORITIES HAVING JURISDICTION.

25. PROVIDE ACCESS DOORS (WHERE REQUIRED) FOR NEW AND EXISTING CONCEALED VALVES, DAMPERS, ETC.. HAVE THESE INSTALLED BY THE TRADES IN WHOSE WORK THE DOORS ARE REQUIRED. FINISH DOORS TO MATCH WALL AND CEILING FINISHES. CONSULT WITH CONSTRUCTION MANAGER FOR LOCATIONS. CEILING ACCESS DOORS SHALL BE MARCRAFT MODEL NO. DW-5040 WITH A FINISH TO MATCH CEILING.

26. SUPPLY AND INSTALL HANGERS TO INCLUDE ALL MISCELLANEOUS STEEL SUCH AS ANGLE IRON, BANDS, C-CLAMPS WITH RETAINING CLIPS, CHANNELS, HANGER RODS, ETC., NECESSARY FOR THE INSTALLATION OF

27. HANGERS SHALL BE FASTENED TO BUILDING STEEL, CONCRETE, OR MASONRY, BUT NOT TO PIPING. HANGING FROM METAL DECK IS NOT PERMITTED. HANGERS MUST BE ATTACHED TO UPPER CHORD OF BAR JOIST. WHERE INTERFERENCES OCCUR. AND IN ORDER TO SUPPORT DUCTWORK OR PIPING. THE CONTRACTOR MUST INSTALL TRAPEZE TYPE HANGERS OR SUPPORTS WHICH SHALL BE LOCATED WHERE THEY DO NOT INTERFERE WITH ACCESS TO FIRE DAMPERS, VALVES, AND OTHER EQUIPMENT. HANGERS FOR AIQ INSULATED PIPING SHALL BE SIZED AND INSTALLED FOR THE OUTER METER OF INSULATION. INSTALL 6" LONG SPLIT CIRCLE GALVANIZED SADDLE BETWEEN THE HANGER AND THE PIPE INSULATION.

28. HANGERS AND PIPING OF DISSIMILAR METALS SHALL BE DI-FLECTRICALLY SEPARATED.

29. UNLESS NOTED OTHERWISE, ALL POWER WIRING TO MECHANICAL EQUIPMENT SHALL BE PERFORMED BY ELECTRICAL CONTRACTOR, AND LOW VOLTAGE CONTROL WIRING AND ASSOCIATED CONTROL ITEMS, INCLUDING STARTERS AND DISCONNECT SWITCHES SHALL BE SUPPLIED AND INSTALLED BY MECHANICAL CONTRACTOR.

PLUMBING AND DRAINAGE

. ALL PLUMBING WORK, MATERIALS AND INSTALLATIONS SHALL MEET THE REQUIREMENTS OF THE LATEST EDITION OF LOCAL PLUMBING CODES AND AUTHORITIES HAVING JURISDICTION.

2. WHERE BELOW GRADE SANITARY DRAINAGE SYSTEM IS SHOWN ON DRAWINGS AND/OR REQUIRED, THIS MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SAW CUTTING OF THE FLOOR SLAB, DO ALL EXCAVATIONS, PROVIDE CRUSHED STONE BED AND INSTALL PIPE COMPACTED BACKFILL TO UNDERSIDE OF CONCRETE FLOOR. POURING OF THE FLOOR SHALL BE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR.

3. FOR UNDERGROUND SANITARY, USE X H CAST IRON CLASS 4000, C.S.A. B-70 OR ABS PLASTIC PIPE.

4. FOR ABOVE GRADE SANITARY DRAINS OF SIZES 2 1/2" (65MM) AND SMALLER, USE GALVANIZED IRON C.S.A. B-63 OR COPPER

5. FOR SANITARY VENT PIPES, USE COPPER TUBING (DWV).

6. FOR DOMESTIC COLD AND HOT WATER PIPING AND FITTINGS, USE TYPE "L" HARD COPPER PIPE WITH SOLDER FITTINGS.

7. FOR CONDENSATE DRAINS AND PUMPED SANITARY PIPING, USE TYPE 'M' COPPER PIPE.

8. FOR GAS PIPING, USE ASTM A-53 SCHEDULE 40 PIPING. 9. PLASTIC PIPES (ABS AND PVC) WILL NOT BE ACCEPTED FOR ABOVE

10. ALL STEEL PIPING UNLESS INDICATED OTHERWISE SHALL HAVE THREADED CONNECTIONS AND ALL COPPER PIPING SHALL HAVE SOLDERED JOINTS OF 300 LBS. PRESSURE.

11. ALL CONNECTIONS BETWEEN DISSIMILAR METALS SHALL UTILIZE DIELECTRIC INSULATING FITTINGS, COUPLINGS AND UNIONS.

12. SUPPORT PIPES AS PER CODE REQUIREMENTS.

GROUND INSTALLATIONS.

3. PROVIDE SHUT-OFF VALVES OR SCREWDRIVER STOPS ON WATER SERVICE TO ALL FIXTURE AND EQUIPMENT. USE BACKFLOW PREVENTERS ON EQUIPMENT CONNECTIONS, WATTS MODEL 9DM3. USE CGA APPROVED GAS COCKS WITH QUARTER STOPS.

.1 FOR DOMESTIC WATER, CHILLED, CONDENSER AND HEATING WATER: a) BALL VALVES IN LIEU OF GATE AND GLOBE VALVES OF SIZES 2" AND

SMALLER, USE CRANE 9302 OR 9322 (600 PSI). b) BUTTERFLY VALVES IN LIEU OF GATE AND GLOBE VALVES OF SIZES 2 1/2" AND LARGER, USE CRANE 44 LUG WAVER, CAST IRON BODY, DUCTILE IRON OR LUMINUAM BRONZE DISC, STAINLESS STEEL STEM, EPDM SEAT. LEAVER ACTUATED UP TO AND INCLUDING SIZE 6", 8" AND ABOVE TO BE

c) GATE VALVES, USE CRANE 431, 437 (300 PSI) FOR 2" VALVES AND SMALLER AND CRANE CLASS 150 CAST STEEL NO. 33XUF (300 PSI) FOR 2 1/2" VALVES AND LARGER.

d) GLOBE VALVES, USE CRANE 7 (300 PSI) FOR 2" VALVES AND SMALLER AND CRANE 143 CAST STEEL (300 PSI) FOR 2 1/2" VALVES AND LARGER. e) CHECK VALVES, USE CRANE 137 OR 1342 (300 PSI) FOR 2" VALVES AND SMALLER AND CRANE 147 (300 PSI) FOR 2 1/2" VALVES AND LARGER.

f) CHECK VALVES WITH PUMPS: USE WAVER CHECK, CENTERLINE SERIES 800, DUAL CHECK AND MISSION CHECK.

g) STRAINERS: USE Y STRAINER CAST IRON CLASS 125 WITH S.S STANDARD

14. PROVIDE WATER HAMMER ARRESTORS, SMS INC. #SC SERIES WATER HAMMER ARRESTORS WITH BRASS PISTON IN A TYPE 'K' COPPER CASING SIZE ACCORDING TO MANUFACTURER'S RECOMMENDATIONS CHART BELOW TO ELIMINATE WATER HAMMER AND SHOCK FROM PIPING SYSTEM. PROVIDE WATER HAMMER ARRESTORS ON HOT AND COLD WATER SUPPLIES TO ALL QUICK VALVES, SOLENOIDS, AND PLUMBING FIXTURES, AND LOCATE IN AN UPRIGHT POSITION BETWEEN THE LAST TWO FIXTURES ON A LINE. OR HORIZONTALLY AT THE END OF LINE CLOSEST TO SUPPLY SOURCE. ON PROJECTS EXCEEDING FIVE STORIES IN HEIGHT, PROVIDE WATER HAMMER ARRESTORS ON DOMESTIC WATER RISERS AS FOLLOWS. LOCATE ARRESTORS AT THE END OF RISER OPPOSITE SUPPLY SOURCE. ARRESTOR SHALL BE TWO PIPE SIZES LARGER THAN THE RISER IS AT THE CONNECTION POINT, NOT EXCEEDING THE

15. INSULATE ALL DOMESTIC COLD WATER PIPES AND FITTINGS WITH 1" (25 MM) PRE-FORMED LOW PRESSURE FIBREGLASS INSULATION WITH VAPOUR BARRIER JACKET. SEAL ALL JOINTS OF VAPOUR BARRIER. INSULATION SHALL CONFORM TO ASHRAE 90.1 REQUIREMENTS.

LARGEST PIPE SIZE DIAMETER IN THE RISER WATER HAMMER ARRESTORS.

16. INSULATE ALL DOMESTIC HOT WATER PIPES AND FITTINGS (105F-140F) WITH FIBRE GLASS INSULATION (PRE-FORMED), COMPLETE WITH VAPOUR BARRIER. SEAL ALL JOINTS OF VAPOUR BARRIÉR. INSULATION THICKNESS TO CONFORM TO ASHRAE 90.1 REQUIREMENTS AND SHALL BE AS FOLLOWS:

a) USE 1" (25MM) THICK INSULATION FOR PIPE SIZES UP TO 1 1/4" b) USE 1 1/2" (38MM) THICK INSULATION FRO PIPES SIZES OF 1 1/2" (38MM) AND LARGER.

17. INSTALL A SANITARY VENT SYSTEM TO COMPLY WITH ALL APPLICABLE CODES, AND AUTHORITIES HAVING JURISDICTION. ENSURE THAT PLUMBING VENT PENETRATIONS THROUGH ROOF ARE MINIMUM 10'-0" (3.05 M) FROM

18. INSTALL CHROME PLATED ESCUTCHEONS PLATES AT ALL EXPOSED PIPE PENETRATIONS THROUGH WALLS AND CEILINGS.

19. INSTALL PVC JACKET ON ALL INSULATED PIPING IN EXPOSED AREAS (NO CEILINGS).

20. ALL GAS PIPING UP TO 2" (50 MM) IN SIZE SHALL HAVE THREADED JOINTS AND PIPING OF 2 1/2" (65 MM) IN SIZE AND LARGER SHALL HAVE WELDED JOINTS. COMPLY WITH AUTHORITIES HAVING JURISDICTION. 21. ALL GAS PIPING SHALL BE PAINTED YELLOW AND BE WELDED WITH SHUT-OFF VALVES AT EACH APPLIANCE.

22. VAPOUR SEAL WITH 1/8" (3 MM) WET COATS OF VAPOUR BARRIER MASTIC, REINFORCED WITH GALSS FABRIC

23. PRESSURE TEST PIPING SYSTEMS IN ACCORDANCE WITH LOCAL AND PROVINCIAL CODES FOR LEAKS BEFORE INSULATION IS APPLIED. SUBMIT REPORT TO OWNER AND A COPY TO THE ENGINEER.

MECHANICAL NOTES:

1. THE REMOVAL OF PART OF MECHANICAL WORK IS NOT SHOWN ON PLANS. CONTRACTOR SHALL VISIT THE SITE AND CONFIRM ALL OF THE EXISTING MECHANICAL ITEMS TO BE REMOVED, AND THE REMOVAL WORK SHALL BE INCLUDED IN THE TENDER PRICE.

. PROTECT FINISHED OR UNFINISHED WORK AND OPERATING WORK AREAS BY TARPAULINS. OR OTHER COVERING FROM DAMAGE DUE TO EXECUTION OF WORK. REPAIR DAMAGE TO BUILDING RESULTING FROM THE WORK TO THE SATISFACTION OF CONSULTANTS AT NO EXPENSE TO THE OWNER.

3. UNLESS NOTED OTHERWISE, ALL SANITARY DRAIN PIPES OF SIZE 3" (75 MM) AND SMALLER SHALL BE SLOPED AT 2 % AND DRAIN PIPES OF SIZE 4" (100 MM) AND LARGER SHALL BE SLOPED AT 1 %.

4. ALL EXISTING SERVICES SHOWN ON PLAN ARE APPROXIMATE AND BASED ON BASE BUILDING DRAWINGS / SITE SURVEY. CONTRACTOR SHALL VERIFY ALL CONNECTIONS, DUCT SIZES AND LOCATIONS ON SITE AND REPORT ANY DISCREPANCIES TO THE ENGINEER.

5. ANY SERVICES NOT SHOWN ON THE DRAWINGS THAT ARE EXPOSED DURING CONSTRUCTION SHALL BE VERIFIED BY THE CONTRACTOR AS TO THE SOURCE AND ROUTING. REPORT TO THE ENGINEER WITH PROPOSED RESOLUTIONS FOR THE SERVICES THAT HAVE BEEN EXPOSED AT NO EXTRA COST TO CLIENT.

6. LAYOUT SHOWN FOR CLARITY, COORDINATE INSTALLATION WITH ALL OTHER TRADES AND PROVIDE ADDITIONAL ELBOWS AND FITTINGS FOR OFFSETS AS REQUIRED, NOT ONLY TO FACILITATE THE INSTALLATION OF SERVICES IDENTIFIED HERE, BUT TO PERMIT COMPLETE INSPECTION AND MAINTENANCE OF ALL SERVICES.

7. SHUT-DOWNS OF EXISTING SYSTEMS REQUIRED FOR THIS INSTALLATION SHALL BE FULLY COORDINATED WITH THE BUILDING MANAGEMENT AND THIS WORK PERFORMED AS DIRECTED IN WRITING BY THE BUILDING MANAGEMENT. CONNECTION TO EXISTING SERVICES SHALL BE PERFORMED DURING OFF-WORK HOURS OR ON WEEKENDS IN PREMIUM TIME.

8. ENSURE A MINIMUM HORIZONTAL CLEARANCE OF 10'-0" (3.05 M) IS MAINTAINED BETWEEN AIR INTAKES AND EXHAUST AIR OUTLETS.

1. COVER ALL DOMESTIC HOT AND COLD WATER, AND HEATING AND CHILLED WATER PIPING WITH 1 IN. (25 MM) FINISHED THICKNESS, PRE-MOULDED LOW PRESSURE GLASS FIBRE INSULATION (5.5 LBS. DENSITY). FOR DOMESTIC COLD WATER AND CHILLED WATER PIPING USE A VAPOUR BARRIER JACKET.

2 PROVIDE PIPE SIZE HANGERS AND INSULATE OVER HANGERS AND 4 IN

UP HANGER RODS ON COLD AND CHILLED WATER LINES. PROVIDE OVER-SIZED HANGERS WITH HANGERS POSITIONED OVER THE INSULATION ON PIPES LARGER THAN 2 IN. DIA. WHERE CONDENSER WATER LINES ARE PROVIDED WITH CITY WATER BACK-UP, INSULATE ALL SUPPLY LINES EXPOSED TO CITY WATER. 3. COVER ALL FITTINGS, VALVES, WATER METERS AND APPURTENANCES WITH

1 IN. (25 MM) BLANKET INSULATION OR ARMAFLEX. SEAL INSULATION FOR

GLASS OPEN WEAVE FIBRE TAPE AND FINISH SMOOTH WITH A COAT OF MASTIC. 4. ALL HORIZONTAL INDIRECT CONDENSATE DRAINAGE PIPING SHALL BE COVERED WITH 1 IN. (25 MM) FINISHED THICKNESS FIBREGLASS DUAL TEMPERATURE INSULATION. WITH FACTORY APPLIED. FIRE RESISTIVE FIBREGLASS REINFORCED KRAFT PAPER AND ALUMINIUM FOIL VAPOUR BARRIER OR EQUAL. WHERE CONDENSATE LINES ROUTE INTO A DIRECT DRAIN, INSULATE THE TRAP

COLD WATER FITTINGS WITH A VAPOUR BARRIER ADHESIVE AND REINFORCE WITH

MAKE GOOD ALL EXISTING INSULATION, WHERE DAMAGED, WHEN CONNECTING TO EXISTING SERVICES. WHERE EXISTING INSULATION HAS BEEN PREVIOUSLY REMOVED, OR IS IN A STATE OF DISREPAIR, BRING THIS ITEM TO THE CONSULTANT'S ATTENTION.

AND FIRST 20 FFFT OF DIRECT DRAIN.

WHERE INSULATED PIPING IS EXPOSED, PROVIDE PVC JACKETING CONFORMING WITH THE FLAME AND SMOKE SPREAD RATINGS REQUIRED BY CODE AND AS SUPPLIED BY ACWIL INSULATIONS LTD. AS AN ALTERNATIVE, PROVIDE CANVAS COVERING WITH TWO APPLICATIONS OF SIZING.

THERMALLY INSULATE SUPPLY AIR DUCTWORK WITH 1 IN. (25 MM, MIN R-VALUE OF 5.0) FINISHED THICKNESS FIBREGLASS REINFORCED FOIL-FACED RIGID VAPOUR SEAL DUCT INSULATION. FLEXIBLE DUCT INSULATION WITH VAPOUR BARRIER MAY BE USED IN CONCEALED SPACES. INSULATION SHALL BE INSTALLED USING BOTH PINS AND ADHESIVE. ADHESIVE TO BE APPLIED COMPLETELY OVER ALL SURFACES OF THE DUCTWORK. PINS SHALL BE ON MAXIMUM 18 IN. CENTRES. PINS SHALL BE TACK WELDED, AND CLIPPED

AFTER SPEED WASHERS ARE INSTALLED. SEAL ALL JOINTS OF VAPOR BARRIER. WHERE SUPPLY AIR DUCT IS EXPOSED INSIDE BUILDING, DUCTWORK SHALL BE ACOUSTICALLY LINED, AND EXTERIOR THERMAL INSULATION IS NOT REQUIRED UNLESS SPECIFICALLY NOTED.

9. INSULATE ALL EXHAUST AND OUTSIDE AIR INTAKE PLENUMS AT LOUVRES OR HOODS. INSULATE ALL DUCTWORK FOR A MINIMUM LENGTH OF 10 FEET ON THE BUILDING SIDE OF THE ASSOCIATED MOTORIZED EXHAUST DAMPERS AND THE ENTIRE LENGTH OF THE OUTSIDE AIR INTAKE DUCT. USE 1 IN. (25 MM) FINISHED THICKNESS RIGID INSULATION BOARD WITH VAPOUR BARRIER, AND WHERE EXPOSED TO VIEW COVER WITH CANVAS.

10. DIESEL EXHAUST SHALL HAVE TWO LAYERS OF 2 IN. (50 MM) FINISHED THICKNESS CALCIUM SILICATE INSULATION APPLIED WITH STAGGERED JOINTS, SECURELY WIRE THE ENTIRE LENGTH OF THE INSULATION, COVERED WITH HIGH TEMPERATURE CEMENT AND CANVAS JACKET. INSULATION SHALL BE CONTINUOUS OVER MUFFLER AND EXTEND FOR ENTIRE RUN WITHIN THE

11. ALL PIPING, CARRYING FLUIDS SUBJECT TO FREEZING, ROUTING OUTSIDE

THE BUILDING OR IN SPACES SUBJECT TO FREEZING TEMPERATURES. SHALL BE

ELECTRICALLY TRACED BY DIVISION 16 AND INSULATED WITH 2 IN. THICKNESS FIBREGLASS INSULATION AND COVERED WITH A WEATHERPROOF PVC OR WHERE SUPPLY, RETURN, OR KITCHEN EXHAUST DUCTS ARE LOCATED ON THE ROOF OR EXPOSED TO THE ELEMENTS, INSULATE WITH 2 IN. OF RIGID

WITH TWO APPLICATIONS OF AN ASPHALT BASED INSULATION WEATHER 13. INSULATION AND VAPOUR BARRIER SHALL BE CONTINUOUS AT ALL

FIBERGLASS INSULATION. INSULATION IS TO BE CANVAS COVERED AND SEALED

FITTINGS, HANGERS AND THROUGH WALLS OR FLOORS. 14. TAPE ALL JOINTS AND SEAMS AND BAND AT 16 IN. (350MM) INTERVALS.

15. STAPLES SHALL NOT BE USED FOR SECURING INSULATION.

SITE PLAN

SCALE: NTS

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16. TEST ALL PIPING AND SEAL ALL DUCT JOINTS WITH DUCT SEALER BEFORE APPLYING INSULATION. (WHERE DUCTS ARE NOT 100% AIR TIGHT, INSULATION WILL PRESSURIZE, AND OPEN AT JOINTS AND SEPARATE FROM THE DUCT.)

17. ALL INSULATION MATERIALS TO BE SUPPLIED BY OWENS-CORNING, CERTAINTEED-MASON, KNAUF OR PARTEK.

 INSULATE ALL EXTERIOR CONDENSER WATER PIPES AND FITTINGS WITH 2' (50 MM) PRE-FORMED LOW PRESSURE FIBREGLASS INSULATION WITH VAPOUR BARRIER JACKET. SEAL ALL JOINTS OF VAPOUR BARRIER. INSULATION SHALL CONFORM TO ASHRAE 90.1 REQUIREMENTS. ALL EXPOSED INSULATED PIPE SHALL BE COVERED IN WATERPROOF CANVAS JACKET. PIPES ON ROOFS SHALL BE COVERED IN AN EMBOSSED ALUMINUM JACKET.

E) CHILLED WATER & CONDENSER WATER PIPES , VALVES AND FITTINGS

1. CHILLED WATER AND CONDENSER WATER PIPES, VALVES AND FITTINGS

1.1. CHILLED WATER AND CONDENSER WATER PIPING SHALL BE STANDARD BLACK STEEL SCHEDULE 40 PIPE TO ASTM-A53 WITH SCREWED JOINTS AND FITTINGS. BRANCH PIPING TWO SIZES SMALLER THAN THE MAIN MAY BE CUT DIRECTLY INTO MAIN AND WELDED IN AN APPROVED MANNER. USE LONG RADIUS ELBOWS AT ALL TURNS.

ONLY USE 'O' FLEX VICTAULIC COUPLINGS WHERE USED IN BASE BUILDING SYSTEMS. DO NOT LOCATE OVER COMPUTER ROOMS, ETC. 1.2. PIPE FITTINGS 2-1/2 IN. (65 MM) AND LARGER SHALL BE VICTAULIC GROOVED PIPING AND 2 IN. (50 MM) AND SMALLER, 300 PSI CAST IRON

1.3. AUTOMATIC AIR VENTS SHALL BE INSTALLED AT ALL HIGH POINTS IN THE WATER PIPING SYSTEM AND SHALL BE EQUAL TO SARCO OR MAID-O-MIST. PROVIDE DRAINS AT ALL LOW POINTS.

1.4. INSTALL PRESSURE GAUGES EQUAL TO TRERICE OR WINTERS AT THE SUCTION AND DISCHARGE OF ALL PUMPS, HIGH AND LOW SIDE OF ALL PRESSURE REDUCING OR REGULATING STATIONS, SUPPLY LINES OF CHILLED WATER AND CONDENSER WATER SYSTEM IN EACH MECHANICAL EQUIPMENT ROOM AND AT EACH PIECE OF EQUIPMENT SERVED.

1.5. ISOLATING GATE VALVES, BALANCING GLOBE VALVES, AUTOMATIC CONTROL VALVES, CONTROL SENSORS, ETC., SHALL BE INSTALLED AS INDICATED ON PLANS AND/OR REQUIRED FOR OPERATION AND SERVICING OF EQUIPMENT. ALL VALVES SHALL BE SUITABLE FOR THE OPERATING PRESSURE OF THE SYSTEM IN WHICH THEY ARE INSTALLED. MAKE AND MODEL SHALL CONFORM TO THE BASE BUILDING STANDARDS AND SPECIFICATIONS.

1.6. PROVIDE ISOLATION VALVES AND DRAIN VALVES FOR ALL NEW COILS AND

1.7. HYDRAULICALLY TEST ALL PIPING SYSTEMS AT NOT LESS THAN 12 TIMES THE WORKING PRESSURE OF FINAL SYSTEM PRESSURES (BUT NOT LESS THAN 75 PSI) FOR A PERIOD OF NOT LESS THAN 12 HOURS. FLUSH PIPING AND SUBMIT A TEST REPORT TO THE CONSULTANT AND LANDLORD.

1.8. FLUSHING AND TESTING TO BE DONE PRIOR TO CONNECTION TO BUILDING SYSTEM. PROVIDE A TEMPORARY ISOLATION LOOP. CO-ORDINATE WITH THE LANDLORD, AND THE LANDLORD'S CHEMICAL TREATMENT SUPPLY COMPANY FOR ALL REQUIRED CHEMICALS, FLUSHING ARRANGEMENT, TREATMENT, TESTING AND PROCEDURE IN OPENING THE SYSTEM UP TO THE BASE BUILDING CIRCUIT.

1.9. FLOW BALANCING VALVES FOR EACH SUPPLEMENTARY UNIT TO BE EQUAL TO TOUR AND ANDERSON LIMITED, MODEL STA-D, SEE EQUIPMENT SPECIFICATION FOR FLOW RATES.

GENERAL NOTES

ALL EXISTING SERVICES SHOWN ARE APPROXIMATE AND BASED ON EXISTING RECORD DRAWINGS. CONTRACTOR WILL VERIFY ALL CONNECTIONS, DUCT SIZES, AND LOCATIONS ON SITE AND REPORT ANY DISCREPANCY TO THE CONSULTANT.

ANY SERVICES NOT SHOWN ON THE DRAWINGS THAT ARE EXPOSED DURING CONSTRUCTION WILL BE VERIFIED BY THE CONTRACTOR AS TO THE SOURCE AND ROUTING, REPORT TO THE CONSULTANT WITH PROPOSED RESOLUTIONS FOR THE SERVICES THAT HAVE BEEN EXPOSED AT NO EXTRA COST TO

PROJECT CLOSEOUT AND COMPLETION

THE FOLLOWING INFORMATION MUST BE PROVIDED TO THE ENGINEER PRIOR TO FINAL SITE INSPECTION AND ISSUANCE OF THE ENGINEERS FINAL SIGN OFF LETTER TO OBTAIN OCCUPANCY.

THE FOLLOWING INFORMATION MUST BE PROVIDED TO THE OWNER UPON PROJECT COMPLETION;

AIR BALANCING REPORT. LETTERS OF WARRANTY FROM THE MECHANICAL AND FLECTRICAL CONTRACTORS AS BUILT DRAWINGS IN HARD COPY (24"X36" D-SIZE)

AS BUILT DRAWINGS IN SOFT COPY ON CD IN AUTOCAD 2010 (.DWG AND .PDF) ONE COPY OF BUSINESS LICENSE ONE COPY OF BUILDING PERMIT FINAL (RECORD OF

INSPECTION SIGN OFF) ONE COPY REVIEW FOR GENERAL COMMITMENT

ONE COPY STATUTORY DECLARATION ONE COPY OF CONTRACTOR'S CURRENT W.S.I.B. ONE COPY SPRINKLER VERIFICATION

DUCTWORK

ALL ROUND DUCTWORK SHALL BE SPIRAL. EXPOSED SPIRAL DUCTWORK SHALL BE EQUAL TO ALPHA FREE FLOW SPIRAL DUCT, SINGLE WALL ROUND DUCT MADE FROM G60 GALVANIZED STEEL CONFORMING TO ASTM A525-8. PROVIDE MATCHING MANUFACTURED FITTINGS. DUCT GAUGES TO CONFORM TO ASHRAE, SMACNA AND SPIDA STANDARDS. SUBMIT SHOP DRAWINGS FOR DUCTS AND FITTINGS. PROVIDE A SEALANT ON ALL JOINTS.

NOTE THE REMOVAL OF MECHANICAL WORK IS NOT SHOWN ON PLANS, CONTRACTOR SHALL VISIT THE SITE AND CONFIRM ALL OF THE EXISTING MECHANICAL ITEMS TO BE REMOVED, AND THE REMOVAL WORK SHALL BE INCLUDED IN THE TENDER PRICE. PROTECT FINISHED OR UNFINISHED WORK AND OPERATING WORK AREAS BY TARPAULINS, OR OTHER COVERING FROM DAMAGE DUE TO EXECUTION OF WORK. REPAIR DAMAGE BUILDING RESULTING FROM THE WORK TO THE SATISFACTION OF CONSULTANTS AT NO EXPENSE TO THE

UNLESS NOTED OTHERWISE, ALL SUPPLY, RETURN AND EXHAUST AIR DUCTS PERTAINING TO THIS PROJECT SHALL BE

ALL ROUND DUCTWORK SHALL BE SPIRAL. ALL FLEXIBLE ROUND DUCT CONNECTIONS TO RIGID DUCTWORK

AND EQUIPMENT SHALL BE SCREWED AND TAPED. MECHANICAL CONTRACTOR SHALL COORDINATE INSTALLATION OF

FRAMING MEMBERS. SHUT-DOWNS OF EXISTING SYSTEMS REQUIRED FOR THIS INSTALLATION SHALL BE FULLY COORDINATED WITH THE BUILDING MANAGEMENT AND THIS WORK PERFORMED AS DIRECTED IN WRITING BY THE BUILDING MANAGEMENT. CONNECTION TO EXISTING SERVICES SHALL BE PERFORMED DURING OFF-WORK HOURS OR ON WEEKENDS IN PREMIUM

ALL DUCTWORK AND DIFFUSERS WITH CEILING AND ROOF

SPIN-ON DUCT FITTINGS SHALL BE KERR-HUNT MODEL NO. SO-2, COMPLETE WITH BALANCING DAMPER, OF SIZE EQUAL TO BRANCH DUCT DIAMETER.

FLEXIBLE DUCTWORK IS PERMISSIBLE IN LAY-IN OR DRYWALL CEILINGS ONLY. MAXIMUM 5'-0" LENGTH ALLOWED.

EQUIVALENT DUCT SIZES MAY BE SUBSTITUTED, IN LIEU OF THOSE SHOWN, IN ORDER TO AVOID INTERFERENCE WITH THE STRUCTURAL MEMBERS. OBTAIN ENGINEER'S APPROVAL BEFORE

10. INSTALL TURNING VANES IN ALL 90 DEGREE DUCT ELBOWS IN SUPPLY AIR SYSTEMS, (AND RETURN AIR SYSTEMS ONLY WHERE SHOWN).

11. RUN ALL DUCTWORK AND PIPING AS HIGH AS POSSIBLE.

12. SUPPLY AND INSTALL FIRE DAMPERS WHERE SHOWN, OR WHERE REQUIRED BY LOCAL CODES AND AUTHORITIES HAVING JURISDICTION. RATE FIRE DAMPERS TO MATCH THE RATING OF THE SEPARATION CROSSED. PROVIDE ONLY ULC RATED DAMPERS. INSTALL AS SPECIFIED IN NFPA CUA 90A.

13. IT IS THIS MECHANICAL CONTRACTOR'S RESPONSIBILITY TO ENSURE CLEAR PASSAGE OF RETURN AIR BACK TO ALL RESPECTIVE AIR CONDITIONING SYSTEMS RELATED TO THIS

ALL EXPOSED DUCTWORK IN OCCUPIED SPACES SHALL BE

PAINTED. CLEAN AND PREPARE DUCT SURFACES FOR PAINTING. COLOR AS SELECTED BY INTERIOR DESIGNER. 15. ALL SUPPLY AIR DUCTWORK SHALL HAVE JOINTS SEALED WITH

17. ENSURE A MINIMUM HORIZONTAL CLEARANCE OF 10'-0" (3.05

APPROVED DUCT SEALANT.

16. FABRICATE ALL DUCTWORK AND HANGERS TO ASHRAE AND SMACNA RECOMMENDATIONS.

18. FIRE DAMPERS AT CEILING PENETRATION SHALL BE RUSKIN CFD2 C/W STANDARD FRAME STYLE RATED FOR 1-1/2

M) IS MAINTAINED BETWEEN AIR INTAKES AND EXHAUST AIR

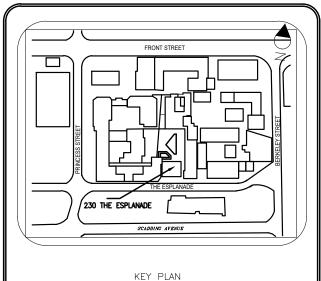
HOURS. INSTALL TO MEET MANUFACTURER'S REQUIREMENTS. 19. VERTICAL FIRE DAMPERS AT WALL PENETRATIONS SHALL BE RUSKIN DIBD2 STYLE 'B' RATED FOR 1-1/2 HOURS.

20. HORIZONTAL FIRE DAMPERS AT FLOOR PENETRATIONS SHALL BE RUSKIN DIBD2 STYLE 'B' RATED FOR 1-1/2 HOURS. RUSKIN

DIBD23 STYLE 'A' RATED FOR 3 HOURS. 21. DUCT DIMENSIONS ARE CLEAR INSIDE DIMENSIONS.

DRAWING LIST MECHANICAL SPECIFICATION AND SITE PLAN MECHANICAL SPECIFICATION CONT'D M2 ROOF PLAN AND MECHANICAL PENTHOUSE DEMO М3 ROOF PLAN AND MECHANICAL PENTHOUSE RENO М5 GYM MECHANICAL ROOM DEMO М6 GYM MECHANICAL ROOM RENO М7 COOLING TOWER AND CHILLER SCHEMATIC DEMO М8 COOLING TOWER AND CHILLER SCHEMATIC RENO М9 CONTROL SEQUENCE DIAGRAM CONTROL SPECIFICATION MECHANICAL DETAILS AND SCHEMATIC

LEGEND	
SYMBOL	DESCRIPTION
<u> </u>	
	ACOUSTICALLY LINED DUCTWORK
∏ F/D	FIRE DAMPER
∏an_BD	SPIN-ON FITTING WITH BALANCING DAMPER
UP DN	SUPPLY/FRESH AIR DUCT RISER
UP DN	RETURN/EXHAUST AIR DUCT RISER RETURN AIR GRILLE
	THE TOTAL PAIN STATES
	PLAQUE TYPE SUPPLY AIR DIFFUSER
	SUPPLY AIR ROUND CONE DIFFUSER
⊕ F.E.	FIRE EXTINGUISHER
	DUCT ELBOW WITH TURNING VANES
- F/C	FLEXIBLE CONNECTOR
(−u/c	DOOR UNDERCUT (SIZE AS NOTED)
T)	THERMOSTAT
<u> </u>	CONCEALED RECESSED TYPE SPRINKLER HEAD
•	PENDANT/SEMI-RECESSED TYPE SPRINKLER HEAD UPRIGHT TYPE SPRINKLER HEAD
⊗	EXISTING SPRINKLER HEAD
E⊗ ⊚E	SIDE WALL TYPE SPRINKLER HEAD
<u> </u>	
	EXISTING/NEW DOMESTIC COLD WATER PIPE
	EXISTING/NEW DOMESTIC HOT WATER PIPE
CAN	DOMESTIC HOT WATER RECIRC. PIPE
SAN	EXISTING SANITARY LINE (BELOW GRADE) NEW SANITARY LINE (BELOW GRADE)
SAN	NEW SANITARY LINE (BELOW GRADE)
—— SAN —— —— GHR——	GLYCOL HEATING RETURN PIPE
—— GHS——	GLYCOL HEATING NEPOKKY THE
v	NEW VENT LINE
v	EXISTING VENT LINE
CHS	CHILLED WATER SUPPLY LINE
—— CHR ——	CHILLED WATER RETURN LINE
CWS	CONDENSER WATER SUPLLY LINE
CWR	CONDENSER WATER RETURN LINE
—— HTS ——	HEATING SUPPLY LINE
—— HTR ——	HEATTING RETURN LINE
DTS	DUAL TEMPERATURE SUPPLY LINE
—— DTR ——	DUAL TEMPERATURE RETURN LINE
Ŕ	THREE WAY CONTROL VALVE
	CHECK VALVE
<u> — ф </u>	BALL VALVE
	BALANCING VALVE
	CIRCUIT SETTER
──────────────────────────────	STRAINER
ß PRV	PRESSURE RELIEF VALVE
	UNION
——II C.O.AI—	
UP O DN	
	PRESSURE GAUGE THERMOMETER
CTE	CONNECT TO EXISTING
BD	BALANCING DAMPER
FFD	FUNNEL FLOOR DRAIN
FD	FLOOR DRAIN
L	LAVATORY
WC	WATER CLOSET
SAD	SUPPLY AIR DUCT
AFF	ABOVE FINISHED FLOOR
R/A	RETURN AIR
TAD	TRANSFER AIR DUCT
RWL	RAIN WATER LEADER
R	RELOCATE
E	EXISTING
N	NEW



	ISSUED FOR TENDER/PERMIT	26	FEB	25
	ISSUED FOR 100%	04	FEB	25
	ISSUED FOR REVIEW	14	JAN	25
٥.	REVISION	D	ATE	<u>-</u>

ONTRACTOR MUST CHECK AND VERIFY ALL DIMENSIONS AND BE RESPONSIBLE FOR SAME, REPORTING ANY DISCREPANCIES TO THE OWNER, BEFORE TENDER CLOSING.

LATEST APPROVED DRAWINGS ONLY O BE USED FOR CONSTRUCTION.

PRINTS ARE NOT TO BE SCALED.



PARKS & RECREATION CAPITAL PROJECTS METRO HALL 55 JOHN STREET, 24th FLOOR TORONTO, ONTARIO, M5V 3C6



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Project Name:

ST. LAWRENCE CRC & DAYCARE Project Address 230 THE ESPLANADE

TORONTO, ON Job Descript. :

ROOFING & CHILLER REPLACEMENT

MECHANICAL SPECIFICATIONS AND

Design: AN DRAWN: AN Approv.: BZ Scale: AS SHOWN

February 26, 25

Project No.

Date:

SITE PLAN

Dwg.No.



Job No.



COOLING TOWER SPECIFICATION

SECTION 23 65 00 COOLING TOWERS

PART 1 - GENERAL

- 1.1 RELATED DOCUMENTS DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 01 SPECIFICATION SECTIONS, APPLY TO THIS SECTION.
- 1.2 SUMMARY THIS SECTION INCLUDES FACTORY ASSEMBLED AND TESTED, OPEN CIRCUIT MECHANICAL FORCED-DRAFT VERTICAL DISCHARGE COOLING TOWER.
- 1.3 SUBMITTALS PRODUCT DATA: FOR EACH TYPE OF PRODUCT INDICATED. INCLUDE RATED CAPACITIES, PRESSURE DROP, PERFORMANCE CURVES WITH SELECTED POINTS INDICATED, FURNISHED SPECIALTIES, AND
- ACCESSORIES. SHOP DRAWINGS: COMPLETE SET OF MANUFACTURER'S PRINTS OF EQUIPMENT ASSEMBLIES, CONTROL PANELS, SECTIONS AND ELEVATIONS, AND UNIT ISOLATION. INCLUDE THE FOLLOWING:
- ASSEMBLED UNIT DIMENSIONS.
- WEIGHT AND LOAD DISTRIBUTION. REQUIRED CLEARANCES FOR MAINTENANCE AND
- SIZES AND LOCATIONS OF PIPING AND WIRING
- CONNECTIONS. WIRING DIAGRAMS: FOR POWER, SIGNAL, AND CONTROL WIRING. DIFFERENTIATE BETWEEN
- OPERATION AND MAINTENANCE DATA: EACH UNIT TO 1. INCLUDE OPERATION AND MAINTENANCE MANUAL.
- 1.4 QUALITY ASSURANCE
- VERIFICATION OF PERFORMANCE:
- THE THERMAL PERFORMANCE SHALL BE CERTIFIED 2.5 MOTORS AND DRIVES BY THE COOLING TECHNOLOGY INSTITUTE IN ACCORDANCE WITH CTI CERTIFICATION STANDARD STD-201. LACKING SUCH CERTIFICATION, A FIELD ACCEPTANCE TEST SHALL BE CONDUCTED WITHIN B. THE WARRANTY PERIOD IN ACCORDANCE WITH CTI 1. ACCEPTANCE TEST CODE ATC-105, BY A LICENSED CTI THERMAL TESTING AGENCY.
- UNIT SOUND PERFORMANCE RATINGS SHALL BE TESTED ACCORDING TO CTI ATC-128 STANDARD. SOUND RATINGS SHALL NOT EXCEED SPECIFIED 1.5 WARRANTY
- SUBMIT A WRITTEN WARRANTY EXECUTED BY THE MANUFACTURER, AGREEING TO REPAIR OR REPLACE 2. COMPONENTS OF THE UNIT THAT FAIL IN MATERIALS AND WORKMANSHIP WITHIN THE SPECIFIED WARRANTY PERIOD. THE ENTIRE UNIT SHALL HAVE A COMPREHENSIVE 1.
- FIVE (1) YEAR WARRANTY AGAINST DEFECTS IN MATERIALS AND WORKMANSHIP FROM START UP. NOT TO EXCEED EIGHTEEN(18) MONTH FROM SHIPMENT OF THE UNIT.
- FAN MOTOR/DRIVE SYSTEM: WARRANTY PERIOD SHALL BE FIVE (5) YEARS FROM DATE OF UNIT SHIPMENT FROM FACTORY (FAN MOTOR(S), FAN(S), FAN SHAFT(S), BEARINGS, MECHANICAL SUPPORT, SHEAVES, BUSHINGS AND BELT(S).

PART 2 - PRODUCTS

- 2.1 MANUFACTURERS
- MANUFACTURERS: SUBJECT TO COMPLIANCE WITH 1. REQUIREMENTS, PROVIDE COOLING TOWERS MANUFACTURED BY ONE OF THE FOLLOWING: EVAPCO MODEL LSTE-5212
- APPROVED SUBSTITUTE 2.2 THERMAL PERFORMANCE
- A. EACH UNIT SHALL BE CAPABLE TO COOL 483.0 1. FAN SCREENS SHALL BE REMOVABLE FOR FAN GPM OF WATER ENTERING AT 96.1° F LEAVING AT 86.1° F AT A DESIGN ENTERING WET BULB OF
- 2.3 IBC COMPLIANCE
- A. THE STRUCTURE OF THIS PRODUCT SHALL BE DESIGNED, ANALYZED, AND CONSTRUCTED IN ACCORDANCE WITH THE WIND AND SEISMIC LOAD REQUIREMENTS OF THE FOLLOWING: 2009 IBC, 2012 IBC, 2015 IBC, 2018 IBC, ASCE/SEI 7-05, ASCE/SEL 7-10, ASCE/SEL 7-16, NFPA 5000, FOR a IMPORTANCE FACTOR (IP) = 1.0, SDS = 0.67 (@ Z/H = 0) AND P = 288 PSF.
- 2.4 COMPONENTS

7INC-RICH COMPOUND.

- DESCRIPTION: FACTORY ASSEMBLED AND TESTED, FORCED DRAFT COUNTERFLOW COOLING TOWER. MATERIALS OF CONSTRUCTION
- ALL PANELS INCLUDING THE FAN SNOUTS, HOUSINGS AND SUPPORTS SHALL BE CONSTRUCTED OF HEAVY GAUGE MILL HOT-DIP GALVANIZED STEEL ALL GALVANIZED STEEL SHALL BE COATED WITH A MINIMUM OF 2.35 OUNCES OF ZINC PER SQUARE FOOT OF ZINC PER SQUARE FOOT OF AREA (G-235 HOT-DIP GALVANIZED STEEL DESIGNATION). DURING FABRICATION, ALL GALVANIZED STEEL PANÉL EDGES SHALL BE COATED WITH A 95% PURE
- ALL EVAPORATIVE COOLING EQUIPMENT UTILIZING GALVANIZED CONSTRUCTION REQUIRE INITIAL PASSIVATION TO MAXIMIZE THE SERVICE LIFE OF THE EQUIPMENT. THE SITE'S WATER TREATMENT VENDOR SHOULD BE CONTACTED SEVERAL WEEKS PRIOR TO ADDING ANY WATER TO THE SYSTEM TO PROVIDE A PASSIVATION PLAN ALONG WITH ASSOCIATED PASSIVATION PLAN COSTS.

FAN HOUSING

- FAN(S): FANS SHALL BE FORWARD CURVED CENTRIFUGAL OF EPOXY COATED STEEL CONSTRUCTION. THE FANS SHALL BE FACTORY INSTALLED, AND STATICALLY AND DYNAMICALLY BALANCED FOR VIBRATION FREE OPERATION.
- THE COMPLETE DRIVE SYSTEM, INCLUDING THE ELECTRIC MOTOR, BELTS, BEARINGS, FAN, AND DRIVES SHALL BE COMPLETELY ENCLOSED IN A PROTECTIVE HOUSING WHICH COVERS THE DRIVE SYSTEM AND PROVIDES SOUND REDUCTION.
- DRIFT ELIMINATORS DRIFT ELIMINATORS SHALL BE CONSTRUCTED ENTIRELY OF POLYVINYL CHLORIDE (PVC) IN EASILY HANDLED SECTIONS. DESIGN SHALL INCORPORATE THREE CHANGES IN AIR DIRECTION AND LIMIT TH WATER CARRYOVER TO A MAXIMUM OF 0.001% OF THE RECIRCULATING WATER RATE. DRIFT ELIMINATORS SHALL BE SELF-EXTINGUISHING, HAVE A FLAME SPREAD OF LESS THAN 25 UNDER ASTM E84, AND SHALL BE RESISTANT TO ROT, DECAY AND BIOLOGICAL ATTACK.
- WATER DISTRIBUTION SYSTEM SPRAY NOZZLES SHALL BE PRECISION MOLDED ABS WITH LARGE ORIFICE THREADED INTO BRANCH

- PIPING WITH INTERNAL SLUDGE RING TO ELIMINATE CLOGGING. SPRAY HEADER AND BRANCHES SHALL BE SCHEDULE 40 POLYVINYL CHLORIDE (PVC) FOR CORROSION RESISTANCE.
- G. HEAT TRANSFER MEDIA FILL MEDIA SHALL BE CONSTRUCTED OF POLYVINYL CHLORIDE (PVC) OF CROSS-FLUTED DESIGN AND SUITABLE FOR ÍNLET WATER TEMPERATURES UP TO 130° F. THE BONDED BLOCK FILL SHALL BE
- BOTTOM SUPPORTED AND SUITABLE AS AN INTERNAL WORKING PLATFORM. FILL SHALL BI SELF-EXTINGUISHING, HAVE A FLAME SPREAD OF LESS THAN 25 UNDER ASTM E84, AND SHALL BE RESISTANT TO ROT, DECAY AND BIOLOGICAL ATTACK. AIR INLET SCREENS
- PROTECTIVE SCREENS SHALL BE PROVIDED OVER AIR INLET
- ELECTRONIC WATER LEVEL CONTROL ELECTRONIC WATER LEVEL CONTROL PACKAGE SHALL HAVE THREE (3) STAINLESS STEEL WATER LEVEL SENSORS (ONE (1) HIGH LEVEL, ONE (1) LOW LEVEL AND ONE (1) GROUND) WITH A NEMA 4X ENCLOSURE MOUNTED IN A CLEANABLE SCHEDULE 40 PVC EXTERNAL STANDPIPE WITH SLOW CLOSING SOLENOID VALVE(S) AND "Y" STRAINER(S). WIRING IS NOT INCLUDED AND COMPONENTS MUST BE FIELD MOUNTED. VALVES SHALL BE SIZED FOR 25 PSI MINIMUM TO 125 PSI
- MAXIMUM PRESSURE. STANDPIPE MAY REQUIRE HEAT TRACING BY OTHERS IN COLD WEATHER APPLICATIONS. PAN STRAINER
- PAN STRAINER(S) SHALL BE ALL TYPE 304 STAINLESS STEEL CONSTRUCTION WITH LARGE AREA MANUFACTURER INSTALLED AND FIELD INSTALLED REMOVABLE PERFORATED SCREENS. PIPE CONNECTION TYPE
 - ANY CONNECTIONS PROVIDED WITH A GROOVE (GVD) OR BEVELED FOR WELDING/GROOVED (BFW/GVD) SHALL CONFORM TO STANDARD GROOVE SPECIFICATION (SGS).
 - GENERAL REQUIREMENTS FOR MOTORS ARE SPECIFIED IN DIVISION 23 SECTION "MOTORS"
 - FAN MOTOR(S) SHALL BE TOTALLY ENCLOSED, BALL BEARING TYPE ELECTRIC MOTOR(S) SUITABLE FOR MOIST AIR SERVICE, MOTOR(S) ARE PREMIUM EFFICIENT, CLASS F INSULATED, 1.15 SERVICE FACTOR DESIGN. INVERTER RATED PER NEMA MG1 PART 31.4.4.2 AND SUITABLE FOR VARIABLE TORQUE APPLICATIONS AND CONSTANT TORQUE SPEED RANGE WITH PROPERLY SIZED AND ADJUSTED VARIABLE FREQUENCY DRIVES.
 - FAN MOTOR(S) SHALL INCLUDE STRIP-TYPE SPACE HEATERS WITH SEPARATE LEADS BROUGHT TO THE MOTOR CONDUIT BOX. FAN DRIVE THE FAN DRIVE SHALL BE V-BELT TYPE WITH QD TAPERED BUSHINGS DESIGNED FOR 150% OF THE
 - MOTOR NAMEPLATE POWER. THE BELT MATERIAL SHALL BE NEOPRENE REINFORCED WITH POLYESTER CORD AND SPECIFICALLY DESIGNED FOR EVAPORATIVE EQUIPMENT SERVICE. BELT ADJUSTMENT SHALL BE ACCOMPLISHED FROM THE EXTERIOR OF THE UNIT.
 - FAN SHAFT FAN SHAFT SHALL BE TUBULAR, GROUND AND POLISHED STEEL WITH FORGED BEARING JOURNALS. EXPOSED SURFACE SHALL BE COATED WITH RUST **PRFVFNTATIVF**
 - FAN SHAFT BEARINGS FAN SHAFT BEARINGS SHALL BE HEAVY-DUTY, SELF-ALIGNING BALL TYPE BEARINGS WITH EXTENDED LUBRICATION LINES TO GREASE FITTINGS LOCATED ON EXTERIOR OF UNIT.

2.6 MAINTENANCE ACCESS

- A. FAN SECTION MOTOR AND DRIVE ACCESS AT GRADE.
- BASIN SECTION CIRCULAR ACCESS DOOR SHALL BE LOCATED ABOVE THE BASIN TO ALLOW FOR EASY ACCESS TO PAN INTERIOR
- LADDER A VERTICAL ALUMINIUM LADDER SHALL BE PROVIDED FOR ACCESS TO THE WATER DISTRIBUTION AND HEAT TRANSFER MEDIA. SAFETY CAGE(S) SHALL BE PROVIDED ON ALL VERTICAL LADDER(S) AND SHIP MOUNTED. SAFETY CAGE(S) SHALL BEGIN BETWEEN 7 FEET (MINIMUM) AND 8 FEET (MAXIMUM) ABOVE GRADE.

CHILLER SPECIFICATION

- PART 2 PRODUCTS 2.01 OPERATING CONDITIONS
- A. PROVIDE WATER-COOLED LIQUID CHILLER WITH THE CAPACITY AS SCHEDULED ON DRAWINGS.
- B. CHILLER SHALL BE DESIGNED TO OPERATE USING R-454B REFRIGERANT.
- EVAPORATOR WATER FLOW. D. THE LIQUID TO BE CHILLED WILL BE WATER CONTAINING CORROSION INHIBITORS.

C. CHILLER SHALL BE DESIGNED FOR PARALLEL

- E. CHILLER SHALL BE DESIGNED TO OPERATE USING 575 VOLT, 3 PHASE, 60 HZ ELECTRICAL POWER SUPPLY.
- 2.01 WATER-COOLED PACKAGED CHILLER

28 LB. OF R-454B REFRIGERANT.

A. APPROVED MANUFACTURER IS MULTISTACK. B. SYSTEM DESCRIPTION: CHILLER SHALL INCORPORATE SCROLL-TYPE COMPRESSORS AND CAN CONSIST OF MULTIPLE 85 TON MODULES. EACH REFRIGERANT CIRCUIT SHALL CONSIST OF AN INDIVIDUAL COMPRESSOR, COMMON DUAL CIRCUITED CONDENSER. DUAL CIRCUITED EVAPORATOR, THERMAL EXPANSION VALVES, AND CONTROL SYSTEM. EACH CIRCUIT SHALL BE CONSTRUCTED TO BE INDEPENDENT OF OTHER CIRCUITS FROM A REFRIGERATION AND ELECTRICAL STAND-POINT. THE MULTI-CIRCUIT CHILLER MUST BE

ABLE TO PRODUCE CHILLED WATER EVEN IN THE

EVENT OF A FAILURE OF ONE OR MORE REFRIGERANT

CIRCUITS. CIRCUITS SHALL NOT CONTAIN MORE THAN

C. GENERAL

- . CHILLER MODULES SHALL BE ETL LISTED IN ACCORDANCE WITH UL STANDARD 1995, CSA CERTIFIED PER STANDARD C22.2#236
- 2. CHILLER MODULES SHALL BE AHRI CERTIFIED.
- 3. MODULES SHALL SHIP WIRED AND CHARGED WITH REFRIGERANT. ALL MODULES SHALL BE FACTORY RUN 6. TESTED PRIOR TO SHIPMENT ON AN AHRI CERTIFIED OR 3RD PARTY VERIFIED TEST STAND.
- 4. COMPRESSORS, HEAT EXCHANGERS, PIPING AND CONTROLS SHALL BE MOUNTED ON A HEAVY GAUGE, POWDER COATED STEEL FRAME. ELECTRICAL CONTROLS, CONTACTORS, AND RELAYS FOR EACH MODULE SHALL BE MOUNTED WITHIN THAT MODULE.
- D. SOUND REDUCTION PANEL PACKAGE EACH MODULE SHALL BE SUPPLIED WITH A LIGHT WEIGHT ALUMINUM FRAME WITH SOUND REDUCTION PANELS. PANELS ARE POWDER COATED 20 GAUGE STEEL WITH 1" OF FIBERGLASS INSULATION TO REDUCE SOUND LEVELS. OPTIONAL SOUND PACKAGE WILL REDUCE SOUND PRESSURE LEVELS MEASURED AT 1 METER AT A MINIMUM OF 12 DBA.
- E. CHILLED AND CONDENSER WATER MAINS: EACH MODULE SHALL INCLUDE SUPPLY AND RETURN MAINS FOR BOTH CHILLED AND CONDENSER WATER. CUT GROOVED END CONNECTIONS ARE PROVIDED FOR INTERCONNECTION TO SIX (EIGHT) INCH STANDARD (6.625") (8.625") OUTSIDE DIAMETER) PIPING WITH GROOVED TYPE COUPLINGS. ROLLED GROOVED SHALL 2.03 SAFETIES, CONTROLS AND OPERATION BE UNACCEPTABLE. CHILLED WATER MAINS SHALL BE INSULATED WITH 3/4" CLOSED CELL INSULATION. WATER A. CHILLER SAFETY CONTROLS SYSTEM SHALL BE MAINS SHALL BE INSTALLED SUCH THAT THEY ARE BENEATH ANY POWER OR CONTROL WIRING SO AS TO INSURE FOR SAFE OPERATION IN THE EVENT OF CONDENSATION OR MINOR PIPING LEAKS.
- F. EVAPORATORS AND CONDENSERS: EACH EVAPORATOR 5. HIGH COMPRESSOR MOTOR TEMPERATURE AND CONDENSER SHALL BE BRAZED PLATE HEAT EXCHANGERS CONSTRUCTED OF 316 STAINLESS STEEL: 7. LOW LEAVING EVAPORATOR WATER TEMPERATURE DESIGNED, TESTED, AND STAMPED IN ACCORDANCE WITH UL 1995 CODE FOR 650 PSIG REFRIGERANT SIDE WORKING PRESSURE AND 150 PSIG WATER SIDE WORKING PRESSURE. BOTH THE CONDENSER AND EVAPORATOR HEAT EXCHANGER SHALL BE MOUNTED BELOW THE COMPRESSOR, TO ELIMINATE THE EFFECT OF MIGRATION OF REFRIGERANT TO THE COLD EVAPORATOR WITH CONSEQUENT LIQUID SLUGGING ON
- G. ISOLATION VALVES CHILLED WATER (EVAPORATOR) BUTTERFLY TYPE ISOLATION VALVES SHALL INCORPORATE APPROPRIATE ACCESSORIES AND CONTROLS TO ALLOW THE CHILLER TO OPERATE EFFICIENTLY IN A VARIABLE PRIMARY FLOW SYSTEM. VALVE SHALL MODULATE VIA A MOTORIZED ACTUATOR FOR LEAVING WATER TEMPERATURE CONTROL, CHILLER MINIMUM FLOW BYPASS, CHILLER NO LOAD BYPASS, OR HEAD PRESSURE CONTROL COMPRESSOR STAGING BASED OFF OF RETURN WATER TEMPERATURE IS NOT ACCEPTABLE FOR TEMPERATURE CONTROL. THE MOTORIZED ACTUATORS SHALL BE MODULATING NEMA 2, IP-54 WITH A STROKE TIME OF NO MORE
- THAN 35 SECONDS H. TOTAL ACCESS DESIGN. ISOLATION VALVES SHALL BE INSTALLED BETWEEN THE HEAT EXCHANGERS AND WATER SUPPLY MAINS FOR HEAT EXCHANGER ISOLATION AND REMOVAL WITHOUT THE REQUIREMENT TO REMOVE A MODULE OR SHUT DOWN THE ENTIRE CHILLER ALLOWING FOR TOTAL ACCESS TO ALL SERVICEABLE COMPONENTS.
- I. COMPRESSOR: EACH MODULE SHALL CONTAIN TWO HERMETIC SCROLL COMPRESSORS INDEPENDENTLY CIRCUITED AND WITH INTERNAL SPRING ISOLATION MOUNTED TO THE MODULE WITH RUBBER-IN-SHEAR ISOLATORS. EACH SYSTEM ALSO INCLUDES HIGH DISCHARGE PRESSURE AND LOW SUCTION PRESSURE MANUAL RESET SAFETY CUT-OUTS.

J. CENTRAL CONTROL SYSTEM

- 1. SCHEDULING OF THE VARIOUS COMPRESSORS SHALL BE PERFORMED BY A MICROPROCESSOR BASED CONTROL SYSTEM (MASTER CONTROLLER). A NEW LEAD COMPRESSOR IS SELECTED EVERY 24 HOURS TO ASSURE EVEN DISTRIBUTION OF COMPRESSOR RUN
- 2.THE MASTER CONTROLLER SHALL MONITOR AND REPORT THE FOLLOWING ON EACH REFRIGERATION SYSTEM: a. DISCHARGE PRESSURE FAULT
- b. SUCTION PRESSURE FAULT COMPRESSOR WINDING TEMPERATURE d. SUCTION TEMPERATURE e. EVAPORATOR LEAVING CHILLED WATER TEMP.
- 3. THE MASTER CONTROLLER SHALL BE POWERED BY THE CHILLERS SINGLE POINT POWER CONNECTION AND SHALL MONITOR AND REPORT THE FOLLOWING SYSTEM PARAMETERS: a. CHILLED WATER ENTERING AND LEAVING TEMPERATURE b. CONDENSER WATER ENTERING AND LEAVING
- TFMPFRATURF c. CHILLED WATER AND CONDENSER WATER FLOW 4. AN OUT OF TOLERANCE INDICATION FROM THESE

- CONTROLS OR SENSORS SHALL CAUSE A "FAULT" INDICATION AT THE MASTER CONTROLLER AND SHUTDOWN OF THAT COMPRESSOR WITH THE TRANSFER OF LOAD REQUIREMENTS TO THE NEXT AVAILABLE COMPRESSOR. IN THE CASE OF A SYSTEM FAULT THE ENTIRE CHILLER WILL BE SHUT DOWN. WHEN A FAULT OCCURS. THE MASTER CONTROLLER SHALL RECORD CONDITIONS AT THE TIME OF THE FAULT AND STORE THE DATA FOR RECALL. THIS INFORMATION SHALL BE CAPABLE OF BEING RECALLED THROUGH THE KEYPAD OF THE MASTER CONTROLLER AND DISPLAYED ON THE MASTER CONTROLLER'S 2 LINE BY 40 CHARACTER BACK-LIT LCD. A HISTORY OF FAULTS SHALL BE MAINTAINED INCLUDING DATE
- 5. INDIVIDUAL MONITORING OF LEAVING CHILLED WATER TEMPERATURES FROM EACH REFRIGERATION SYSTEM SHALL BE PROGRAMMED TO PROTECT AGAINST FREEZE-UP.

20 OCCURRENCES).

AND TIME OF DAY OF EACH FAULT (UP TO THE LAST

- 6. THE CONTROL SYSTEM SHALL MONITOR ENTERING AND LEAVING CHILLED WATER TEMPERATURES TO DETERMINE SYSTEM LOAD AND SELECT THE NUMBER OF COMPRESSOR CIRCUITS REQUIRED TO OPERATE. RESPONSE TIMES AND SET POINTS SHALL BE ADJUSTABLE. THE SYSTEM SHALL PROVIDE FOR VARIABLE TIME BETWEEN COMPRESSOR SEQUENCING AND TEMPERATURE SENSING, SO AS TO FINE TUNE THE CHILLER TO DIFFERENT EXISTING BUILDING
- 7. THE CHILLER SHALL BE CAPABLE OF INTERFACING TO A BUILDING AUTOMATION SYSTEM. INTERFACE SHALL BE ACCOMPLISHED USING AN INTEROPERABILITY WEB PORTAL AND SHALL BE CAPABLE OF COMMUNICATION OVER BACNET, MODBUS OR LON. K. CHILLER SHALL HAVE A SINGLE POINT POWER
- CONNECTION AND EXTERNAL INPUTS AND OUTPUTS TO BE COMPATIBLE WITH THE BUILDING MANAGEMENT SYSTEM. INPUTS/OUTPUTS INCLUDE: REMOTE START/STOP CUSTOMER ALARM RELAY
- CUSTOMER CHILLED/LOAD LIMIT RESET SIGNAL ECW TO MECHANICAL COOLING MODULE LCW FROM MECHANICAL COOLING MODULE ECHW TO MECHANICAL COOLING MODULE LCHW FROM MECHANICAL COOLING MODULE POWER PHASE MONITOR CHILLED WATER FLOW SWITCH INPUT CONDENSER WATER FLOW SWITCH INPUT
- FULL LOAD INDICATOR RELAY CONDENSER PUMP RELAY DDRS CONDENSER MULTIFLUSH RELAY CHILLED WATER PUMP RELAY
- L. EACH INLET WATER HEADER SHALL INCORPORATE A BUILT IN 30-MESH (MAXIMUM) IN-LINE STRAINER SYSTEM TO PREVENT HEAT EXCHANGER FOULING AND 5. ACCOMMODATE 100% FLOW FILTRATION WITH A MINIMUM SURFACE AREA OF 475 SQ INCHES PER MODULE. CONDENSER-SIDE STRAINER SYSTEM SHALL 3.03 WARRANTY AND START-UP INCORPORATE AN AUTOMATIC DEBRIS BLOW-DOWN SYSTEM FOR SELF-CLEANING OF THE STRAINER SYSTEM THAT IS CONTROLLED AND POWERED BY THE
- M. SINGLE POINT POWER: CHILLER WITH HOFFMAN STYLE ELECTRICAL SYSTEM FOR SINGLE POINT POWER AT A 5.000 AMP SCCR.
- PROVIDED WITH THE UNIT (MINIMUM) AS FOLLOWS: LOW EVAPORATOR REFRIĞERANT PRESSURE LOSS OF FLOW THROUGH THE EVAPORATOR LOSS OF FLOW THROUGH THE CONDENSER HIGH CONDENSER REFRIGERANT PRESSURE 6. LOW SUCTION GAS TEMPERATURE
- B. FAILURE OF CHILLER TO START OR CHILLER SHUTDOWN DUE TO ANY OF THE ABOVE SAFETY CUTOUTS SHALL BE ANNUNCIATED BY DISPLAY OF THE APPROPRIATE DIAGNOSTIC DESCRIPTION AT THE UNIT CONTROL PANEL. THIS ANNUNCIATION WILL BE

IN PLAIN ENGLISH. ALPHANUMERIC CODES SHALL BE

- THE CHILLER SHALL BE FURNISHED WITH A MASTER CONTROLLER AS AN INTEGRAL PORTION OF THE CHILLER CONTROL CIRCUITRY TO PROVIDE THE FOLLOWING FUNCTIONS:
- PROVIDE AUTOMATIC CHILLER SHUTDOWN DURING PERIODS WHEN THE LOAD LEVEL DECREASES BELOW THE NORMAL OPERATING REQUIREMENTS OF THE CHILLER. UPON AN INCREASE IN LOAD, THE CHILLER SHALL AUTOMATICALLY RESTART.
- PROVISIONS FOR CONNECTION TO AUTOMATICALLY ENABLE THE CHILLER FROM A REMOTE ENERGY MANAGEMENT SYSTEM.
- THE CONTROL PANEL SHALL PROVIDE ALPHANUMERIC DISPLAY SHOWING ALL SYSTEM PARAMETERS IN THE ENGLISH LANGUAGE WITH NUMERIC DATA IN ENGLISH UNITS.
- EACH MODULE SHALL CONTAIN A SLAVE CONTROLLER THAT WILL ALLOW ANY MODULE TO RUN IN THE EVENT OF A MASTER CONTROLLER FAILURE OR LOSS OF COMMUNICATION WITH THE MASTER CONTROLLER VIA AN ON/OFF/MANUAL TOGGLE SWITCH. D. NORMAL CHILLER OPERATION
- WHEN CHILLER IS ENABLED. THE FACTORY SUPPLIED MASTER CONTROLLER STAGES THE CHILLER CAPACITY FROM MINIMUM TO MAXIMUM AS REQUIRED BY BUILDING LOAD.
- 2. THE CHILLER CONTROL SYSTEM SHALL RESPOND TO ENTERING WATER TEMPERATURE AND WILL HAVE AN INTEGRAL RESET BASED ON ENTERING WATER TEMPERATURE TO PROVIDE FOR EFFICIENT OPERATION AT PART-LOAD CONDITIONS

E. POWER PHASE MONITOR

- PROVIDE A POWER PHASE MONITOR ON THE INCOMING POWER SUPPLY TO THE CHILLER. THIS DEVICE SHALL PREVENT THE CHILLER FROM OPERATING DURING PERIODS WHEN THE INCOMING POWER IS UNSUITABLE FOR PROPER OPERATION.
- 2. THE POWER PHASE MONITOR SHALL PROVIDE PROTECTION AGAINST THE FOLLOWING CONDITIONS:
- a. LOW VOLTAGE (BROWN-OUT) b. PHASE ROTATION
- c. LOSS OF PHASE d. PHASE IMBALANCE
- PART 3 INSTALLATION 3.01 PIPING SYSTEM FLUSHING PROCEDURE
- A. PRIOR TO CONNECTING THE CHILLER TO THE CONDENSER AND CHILLED WATER LOOP, THE PIPING LOOPS SHALL BE FLUSHED WITH A DETERGENT AND

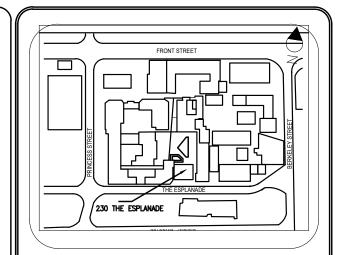
- HOT WATER (110-130° F) MIXTURE TO REMOVE PREVIOUSLY ACCUMULATED DIRT AND OTHER ORGANICS. IN OLD PIPING SYSTEMS WITH HEAVY ENCRUSTATION OF INORGANIC MATERIALS CONSULT A WATER TREATMENT SPECIALIST FOR PROPER PASSIVATION AND/OR REMOVAL OF THESE
- B. DURING THE FLUSHING, A 30 MESH (MAX.) Y-STRAINERS (OR ACCEPTABLE EQUIVALENT) SHALI BE IN PLACE IN THE SYSTEM PIPING AND EXAMINED PERIODICALLY AS NECESSARY TO REMOVE COLLECTED RESIDUE. THE USE OF ON BOARD CHILLER STRAINERS SHALL NOT BE ACCEPTABLE. THE FLUSHING PROCESS SHALL TAKE NO LESS THAN 6 HOURS OR UNTIL THE STRAINERS WHEN EXAMINED AFTER EACH FLUSHING ARE CLEAN. OLD SYSTEMS WITH HEAVY ENCRUSTATION SHALL BE FLUSHED FOR A MINIMUM OF 24 HOURS AND MAY TAKE AS LONG AS 48 HOURS BEFORE THE FILTERS RUN CLEAN. DETERGENT AND ACID CONCENTRATIONS SHALL BE USED IN STRICT ACCORDANCE WITH THE RESPECTIVE CHEMICAL MANUFACTURER'S INSTRUCTIONS. AFTER FLUSHING WITH THE DETERGENT AND/OR DILUTE ACID CONCENTRATIONS THE SYSTEM LOOP SHALL BE PURGED WITH CLEAN WATER FOR AT LEAST ONE HOUR TO ENSURE THAT ALL RESIDUAL CLEANING CHEMICALS HAVE BEEN FLUSHED OUT.
- C. PRIOR TO SUPPLYING WATER TO THE CHILLER THE WATER TREATMENT SPECIFICATION SHALL BE CONSULTED FOR REQUIREMENTS REGARDING THE WATER QUALITY DURING CHILLER OPERATION. THE APPROPRIATE CHILLER MANUFACTURER'S SERVICE LITERATURE SHALL BE AVAILABLE TO THE OPERATOR AND/OR SERVICE CONTRACTOR AND CONSULTED FOR GUIDELINES CONCERNING PREVENTATIVE MAINTENANCE AND OFF-SEASON SHUTDOWN PROCEDURES

3.02 WATER TREATMENT REQUIREMENTS

- A. SUPPLY WATER FOR BOTH THE CHILLED WATER AND CONDENSER WATER CIRCUITS SHALL BE ANALYZED AND TREATED BY A PROFESSIONAL WATER TREATMENT SPECIALIST WHO IS FAMILIAR WITH THE OPERATING CONDITIONS AND MATERIALS OF CONSTRUCTION SPECIFIED FOR THE CHILLER'S HEAT EXCHANGERS. HEADERS AND ASSOCIATED PIPING. CYCLES OF CONCENTRATION SHALL BE CONTROLLED SUCH THAT RECIRCULATED WATER QUALITY FOR MODULAR CHILLERS USING 316 STAINLESS STEEL BRAZED PLATE HEAT EXCHANGERS AND CARBON STEEL HEADERS IS MAINTAINED WITHIN THE FOLLOWING PARAMETERS:
- GREATER THAN 7 AND LESS THAN 9
- TOTAL DISSOLVED SOLIDS (TDS) LESS THAN 30 TO 500 PPM HARDNESS AS CACO3 30 TO 500 PPM ALKALINITY AS CA CO3 CHLORIDES LESS THAN 200 PPM

LESS THAN 200 PPM

- A. MANUFACTURER'S WARRANTY: MANUFACTURER SHALL PROVIDE FULL PARTS-ONLY WARRANTY COVERAGE FOR ENTIRE CHILLER FOR A PERIOD OF ONE YEAR. ALL PARTS SHALL BE WARRANTED AGAINST DEFECTS IN MATERIAL AND WORKMANSHIP. SIMILAR PARTS-ONLY COVERAGE SHALL BE PROVIDED FOR THE CHILLERS COMPRESSORS FOR A PERIOD OF FIVE YEARS. THE WARRANTY PERIOD SHALL COMMENCE EITHER ON THE EQUIPMENT START-UP DATE OR SIX MONTHS AFTER SHIPMENT, WHICHEVER IS EARLIER.
- . MANUFACTURER SHALL PROVIDE THE SERVICES OF A FACTORY AUTHORIZED SERVICE ENGINEER TO PROVIDE COMPLETE START-UP SUPERVISION. FACTORY AUTHORIZED SERVICE ENGINEER SHALL ALSO BE RESPONSIBLE FOR ASSEMBLY OF THE CHILLERS CABINETRY PACKAGE AND ELECTRICAL HOFFMAN CONNECTION. AFTER START-UP A MANUFACTURER'S REPRESENTATIVE SHALL PROVIDE A MINIMUM OF 8-HOURS OF OPERATOR TRAINING TO THE OWNER'S DESIGNATED REPRESENTATIVE(S).



KEY PLAN

3 ISSUED FOR TENDER/PERMIT 26 FEB : 2 ISSUED FOR 100% 104 FEB 2 1 ISSUED FOR REVIEW |14 JAN 2

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REVISION

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PARKS & RECREATION CAPITAL PROJECTS METRO HALL 55 JOHN STREET, 24th FLOOR TORONTO, ONTARIO, M5V 3C6



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JOB NO. 24111

ABCO N TABCON CONSULTING INC

494 McNicoll Avenue, Suite # 201 Toronto, Ontario, M2H 2E1 Tel.: (647) 974-7006 Web Site: www.tabcon.com

Project Name:

ST. LAWRENCE CRC & DAYCARE Project Address 230 THE ESPLANADE

TORONTO, ON Job Descript. : ROOFING & CHILLER REPLACEMENT

MECHANICAL SPECIFICATIONS

Design: AN DRAWN: AN Approv.: BZ Scale: AS SHOWN

February 26, 25

Project No.

Date:

Job No.

Q.P. ZHANG.

100119933



CODED MECHANICAL DEMO NOTES

- 1. EXISTING COOLING TOWER 1 CT-1 AND COOLING TOWER 2 CT-2 TO BE DISASSEMBLED TO PIECES AND REMOVED.
- 2. DISCONNECT AND REMOVE ALL ASSOCIATED OUTDOOR PIPING.
- 3. EXISTING CONDENSER WATER PUMP TO BE REMOVED AND REPLACED.
- 4. EXISTING CONDENSER WATER SUPPLY AND RETURN TO BE REMOVED.
- 5. EXISTING COMMUNITY CENTRE CHILLED WATER PUMPS P-1 AND SCHOOL CHILLED WATER PUMP P-2 C/W VFD TO BE REMOVED AND REINSTALLED AFTER CHILLER INSTALLATION.
- 6. EXISTING CHILLED WATER SUPPLY AND RETURN PIPE TO BE REMOVED TO CEILING LEVEL.
- 7. EXISTING CHILLER TO BE DISASSEMBLED TO PIECES AND REMOVED. DISCONNECT EXISTING CONTROLS AND RECONNECT
- 8. EXISTING CHILLER WATER SUPPLY PIPE TO BE REMOVED TO CEILING LEVEL.
- 9. EXISTING MAKE UP WATER PIPE TO COOLING TOWER TO BE REMOVED.
- 10. EXISTING REFRIGERANT MONITOR SYSTEM TO REMAIN.

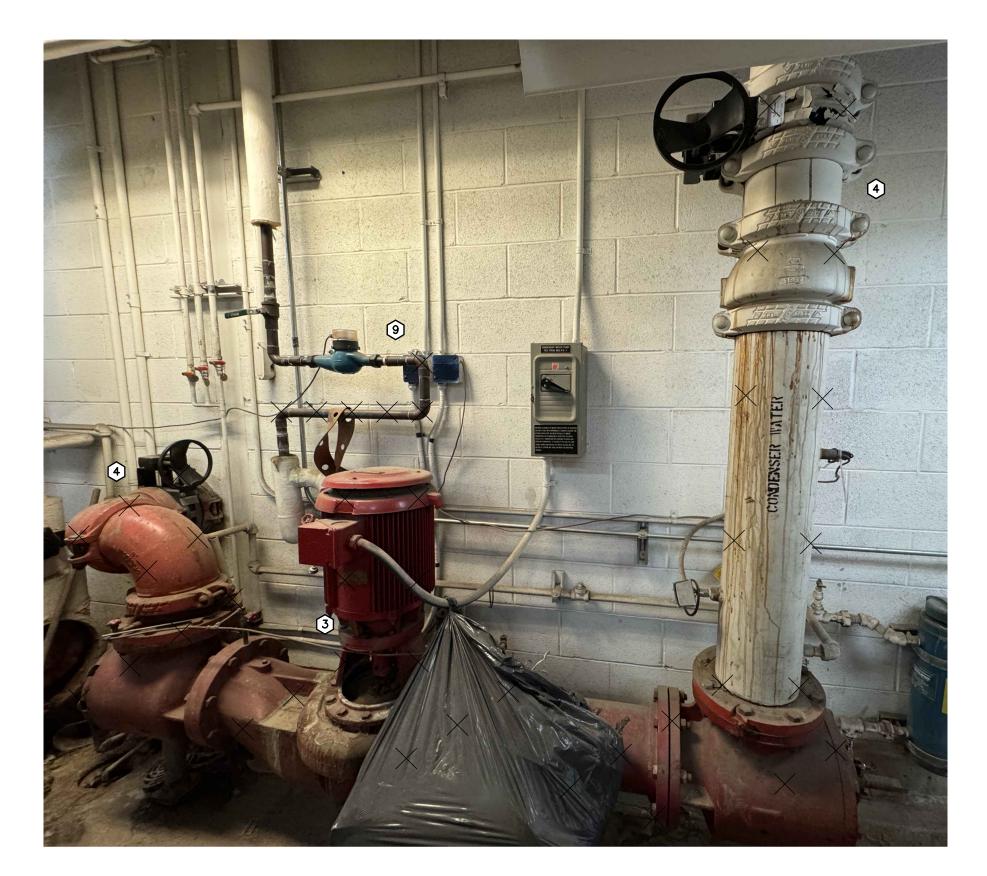
TO NEW UNIT.

DEMOLITION NOTES

- CONTRACTOR SHALL VISIT THE SITE PRIOR TO BID AND SHALL BE FAMILIAR WITH THE LIMITS OF DEMOLITION REQUIRED FOR ALL TRADES. COORDINATE DEMOLITION WITH REQUIREMENTS OF NEW CONSTRUCTION PRIOR TO INITIATING WORK.
- . CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING COMPLETE REMOVAL AND DISCARDING OF ALL DEMOLITION WASTE INCLUDING ANY UNFORESEEN ITEMS WITHIN THE SCOPE OF THE PROJECT.
- CONTRACTOR SHALL COORDINATE DEMOLITION OPERATIONS WITH CONTINUING OWNER OCCUPATION OF ADJACENT SPACES. ALL DEMOLITION WORK TO BE COORDINATED WITH OWNER AND CONDUCTED UNDER CONTROLLED CONDITIONS.
- REPAIR/PATCH AS REQUIRED FOR DEMOLITION OF VARIOUS CONSTRUCTION ITEMS. VERIFY AND COORDINATE ANY REQUIRED OPENING WITH RESPECTIVE TRADES. FOR ANY WORK THAT SHALL OCCUR OUTSIDE OF DEMOLITION AREA, CONTRACTOR SHALL RETURN SPACE TO ORIGINAL CONDITION.
- 5. PROPERLY CAP, PLUG AND CONCEAL ANY PIPING LEFT IN PLACE. CAP ABANDONED SEWER PIPING A MINIMUM OF 8" BELOW FINISH FLOOR PATCH AND REPAIR SLAB.
- 5. CONTRACTOR SHALL BE RESPONSIBLE TO REMOVE ALL NOT USED WATER PIPING, WASTE AND VENT, DUCTWORK EQUIPMENT IN THE REMODEL AREA.
- DEMOLISH EXISTING AS REQUIRED PER NEW CONSTRUCTION AS DIRECTED BY ARCHITECT AND/OR AS NOTED ON DRAWINGS. AVOID DISRUPTION OF SERVICES DURING BUSINESS HOURS (IF APPLICABLE). ALL SYSTEM SHUT-DOWNS AND DISRUPTION OF SCHEDULED AFTER NORMAL BUILDING HOURS OR AS OTHERWISE APPROVED BY OWNER.
- PRIOR TO DEMOLITION FIELD VERIFY AND IDENTIFY ANY EXISTING EQUIPMENT TO REMAIN IN SERVICE THAT IS SERVED BY SYSTEMS TO BE DEMOLISHED. NOTIFY ENGINEER OF ANY SUCH CONDITIONS AND REMOVE AND/OR RELOCATE THE SERVICES AS DIRECTED.
- 9. MEET WITH OWNER REPRESENTATIVE AND LANDLORD PRIOR TO DEMOLITION TO IDENTIFY WHETHER EXISTING MATERIALS SYSTEMS, EQUIPMENT, ETC. ARE CONSIDERED SALVAGE OR DEBRIS. REMOVE DEBRIS FROM SITE AND DISPOSE OF IN AND APPROVED MANNER AS DIRECTED BY OWNER.
- 10. TERMINATE DEMOLISHED SYSTEM SERVICES IN A CONCEALED LOCATION IN AN APPROVED MANNER. COORDINATE WITH NEW AND EXISTING CONSTRUCTION.
- 11. FIELD VERIFY EXISTING PIPING LOCATIONS PRIOR TO WORK.
- 12. WHERE REQUIRED, COORDINATE EQUIPMENT ELECTRICAL TERMINATION REQUIREMENTS WITH ELECTRICAL



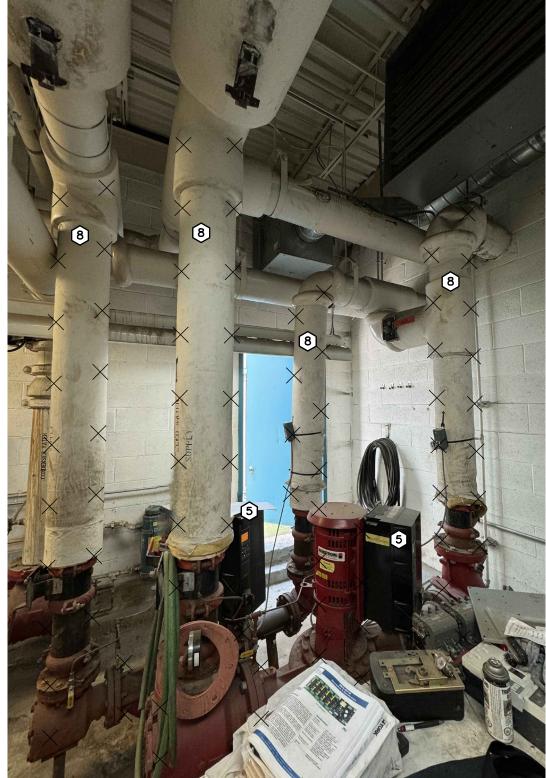


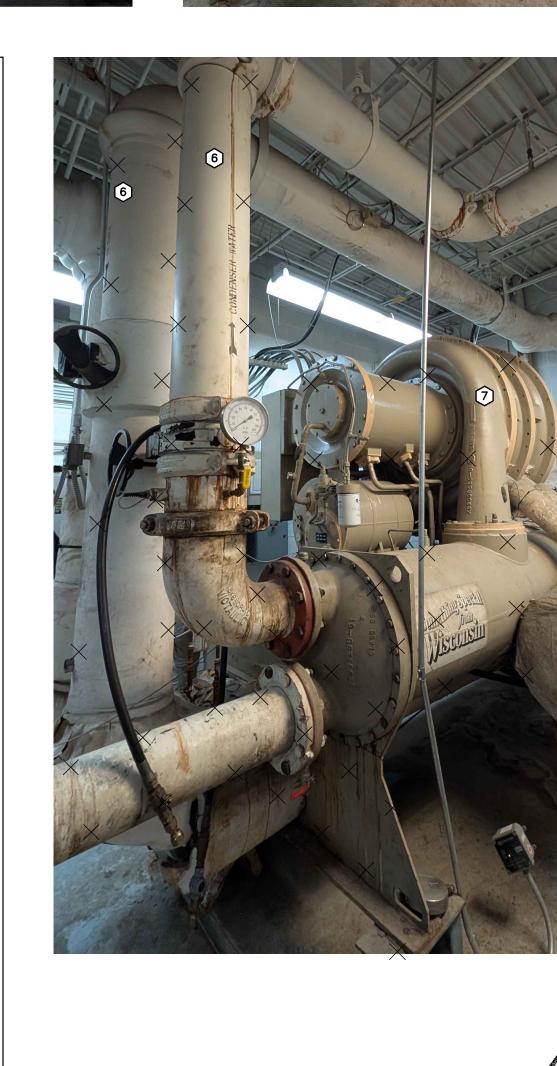


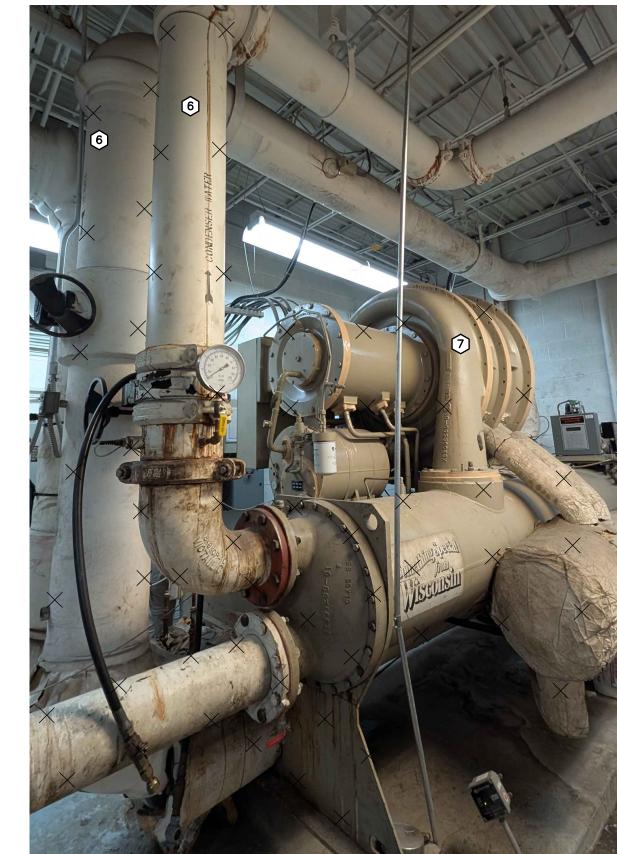
CONDENSER WATER PUMP -

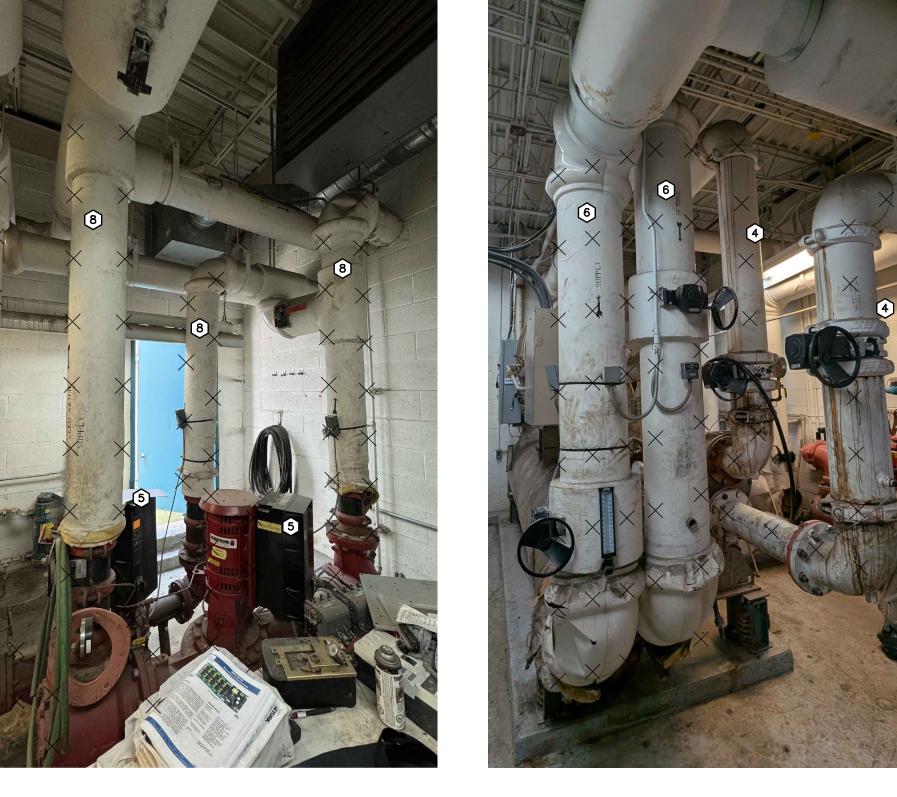
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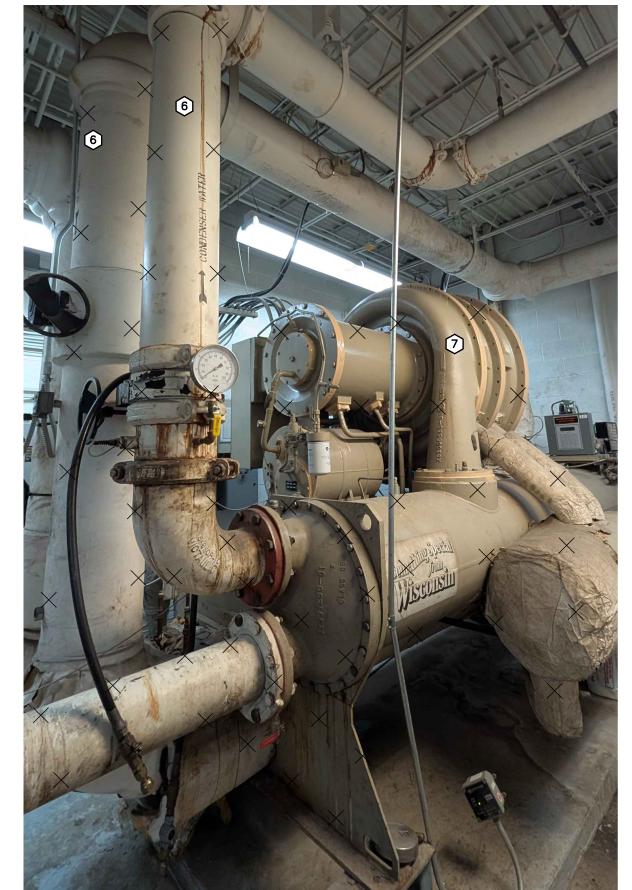
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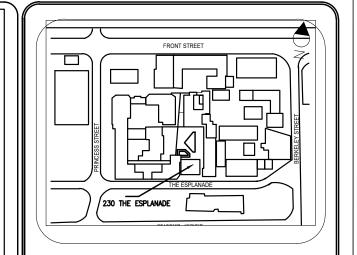












KEY PLAN

3 ISSUED FOR TENDER/PERMIT 26 FEB 25 2 ISSUED FOR 100% 1 ISSUED FOR REVIEW 14 JAN 2

REVISION

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PARKS & RECREATION CAPITAL PROJECTS METRO HALL 55 JOHN STREET, 24th FLOOR TORONTO, ONTARIO, M5V 3C6



TABCON CONSULTING INC.

494 McNicoll Avenue, Suite # 201 Toronto, Ontario, M2H 2E1 Tel.: (647) 974-7006 Web Site : www.tabcon.com

Project Name :

ST. LAWRENCE CRC & DAYCARE

Project Address: 230 THE ESPLANADE

TORONTO, ON Job Descript. :

ROOFING & CHILLER REPLACEMENT

ROOF PLAN AND MECHANICAL PENTHOUSE DEMO

Design: AN DRAWN: AN Approv.: BZ

Scale: AS SHOWN Date: February 26, 25

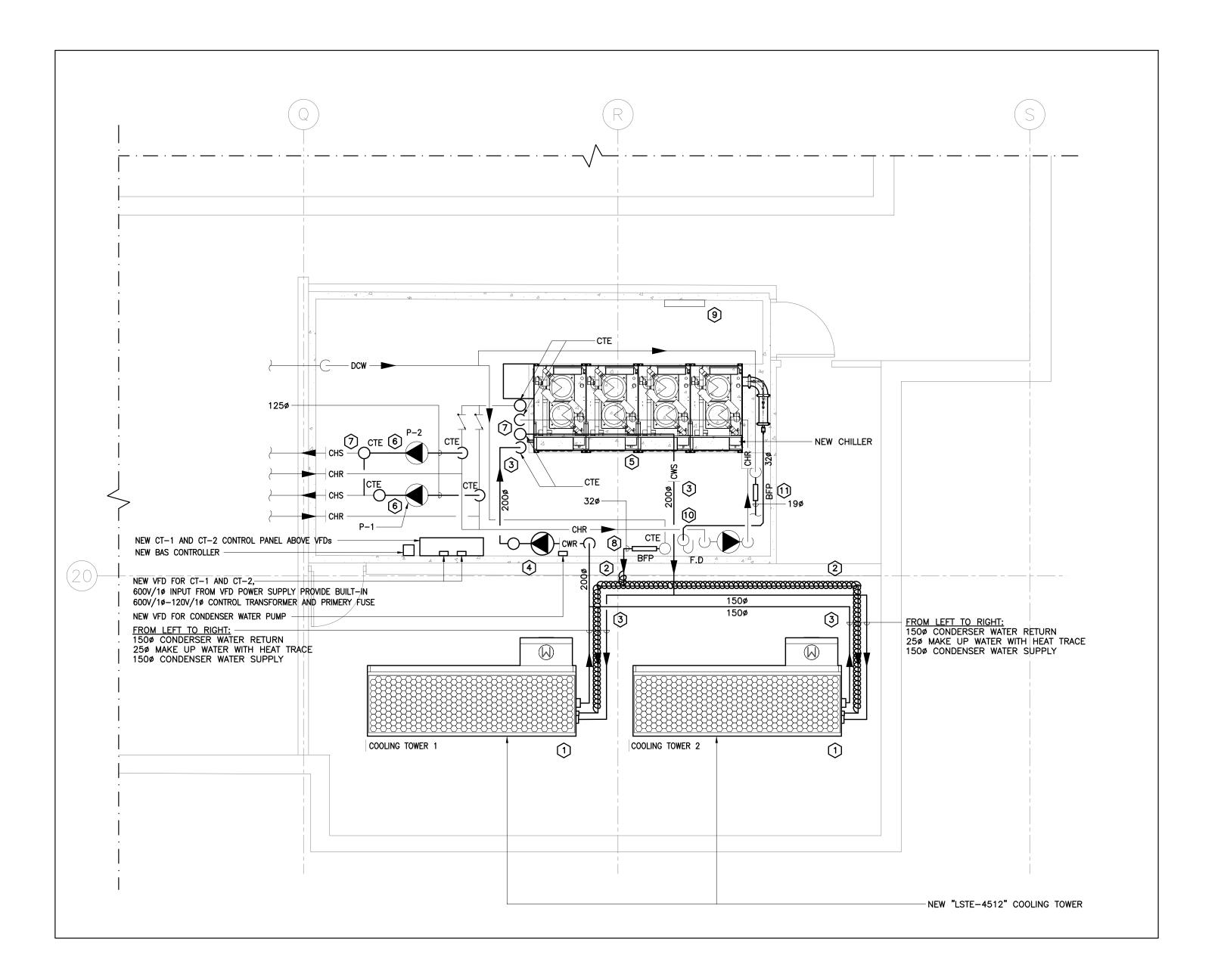
Project No.

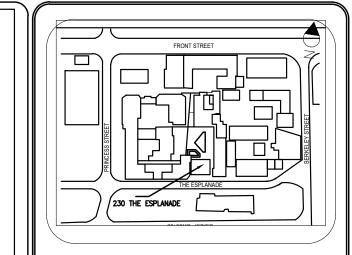


- 1. SUPPLY AND INSTALL NEW COOLING TOWER CT-1 AND CT-2 C/W NEW SPRING MOUNTED ISOLATORS. CONNECT TO EXISTING BAS SYSTEM, EXACT LOCATION TO BE VERIFIED ON SITE.
- 2. SUPPLY AND INSTALL NEW 250 HEAT TRACED MAKE-UP DCW PIPE TO COOLING TOWER.
- 3. SUPPLY AND INSTALL NEW CONDENSER WATER SUPPLY AND RETURN AS SHOWN ON PLAN.
- 4. SUPPLY AND INSTALL NEW CONDENSER WATER PUMP.
- 5. SUPPLY AND INSTALL NEW CHILLER AND RECONNECT TO EXISTING CONTROL AS SHOWN ON PLAN AND DRAWING.
- 6. REINSTALL EXISTING PUMPS P-1 AND P-2 AND RECONNECT TO EXISTING CONTROL.
- 7. SUPPLY AND INSTALL NEW CHILLED WATER SUPPLY AND RETURN PIPE AND CONNECT TO EXISTING AS SHOWN ON PLAN.
- 8. EXTEND EXISTING WATER PIPE, SUPPLY AND INSTALL NEW WATTS-LF007M2QT BACKFLOW PREVENTER AS SHOWN ON PLAN.
- 9. EXISTING REFRIGERANT MONITOR SYSTEM TO REMAIN.
- 10. NEW 320 DRAIN PIPE TO EXISTING FLOOR DRAIN.
- 11. SUPPLY AND INSTALL NEW WATTS-LF007M1QT BACKFLOW PREVENTER AS SHOWN ON PLAN

GENERAL NOTES-MECHANICAL PLAN

- 1. CONFIRM DUCT SIZE ON SITE. ENSURE SYSTEM IS OPERATIONAL UPON COMPLETION.
- 2. ANY DISCREPANCIES OCCURRING BETWEEN ARCHITECT & ENGINEER'S DRAWINGS SHOULD BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE DESIGNER.
- 3. MECHANICAL CONTRACTOR TO INSPECT CONDITION OF ALL EXISTING EQUIPMENT AND PERFORM ALL NECESSARY REPAIRS TO PROVIDE A COMPLETE WORKING SYSTEM.





KEY PLAN

5 | 4 | 26 FEB 25 | 2 | ISSUED FOR TENDER/PERMIT 26 FEB 25 | 2 | ISSUED FOR 100% | 04 FEB 25 | 1 | ISSUED FOR REVIEW | 14 JAN 25 |

DATE

NOTE:

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PARKS & RECREATION
CAPITAL PROJECTS
METRO HALL
55 JOHN STREET, 24th FLOOR
TORONTO, ONTARIO, M5V 3C6



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IOD NO 24111

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494 McNicoll Avenue, Suite # 201 Toronto, Ontario, M2H 2E1 Tel. : (647) 974—7006 Web Site : www.tabcon.com

Project Name :

ST. LAWRENCE CRC & DAYCARE

Project Address :

230 THE ESPLANADE

TORONTO, ON
Job Descript. :

ROOFING & CHILLER REPLACEMENT

ROOF PLAN AND MECHANICAL PENTHOUSE RENO

Design: AN

DRAWN: AN

Approv.: BZ

Scale: AS SHOWN

Date: February 26, 25

Project No.

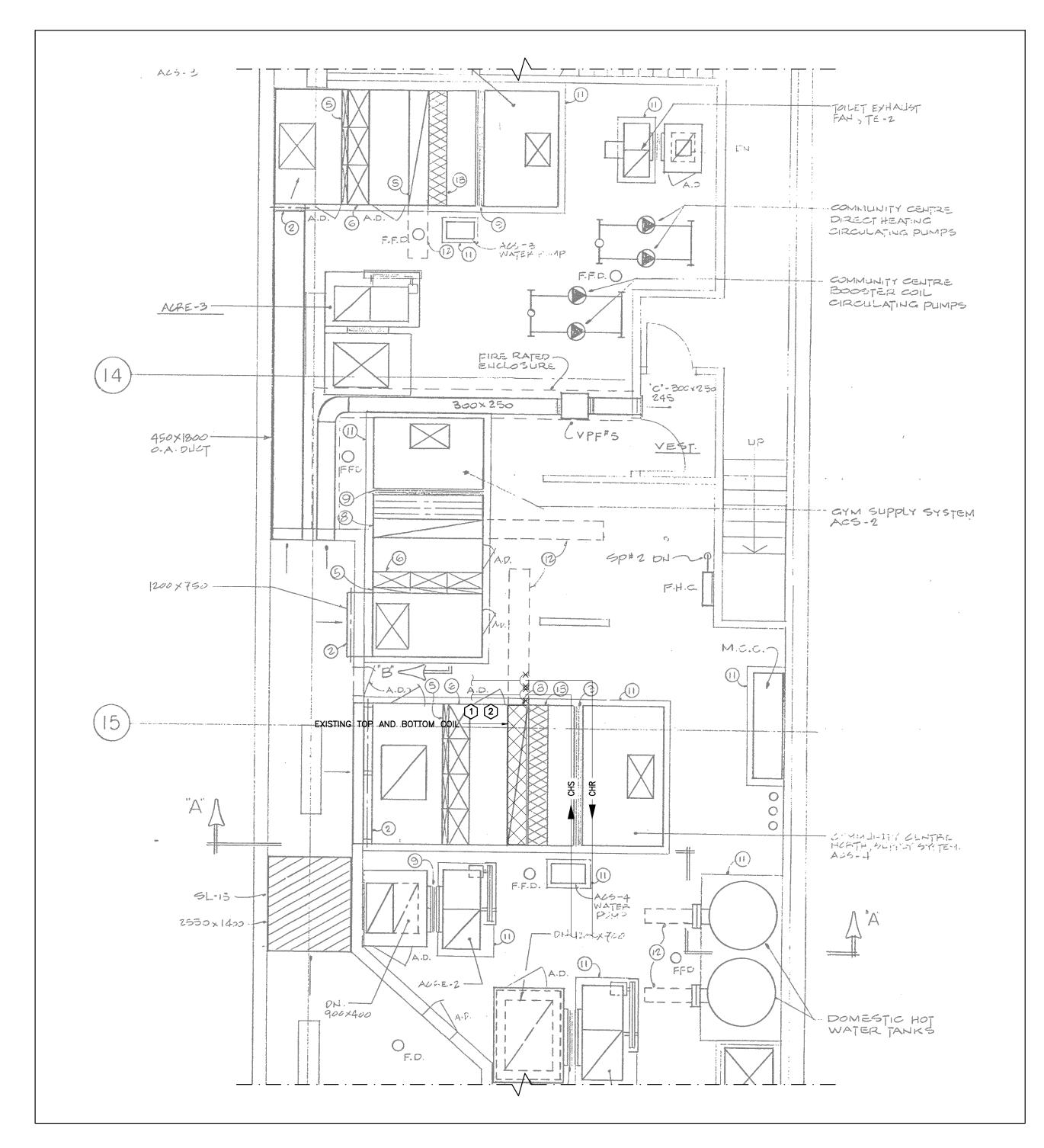
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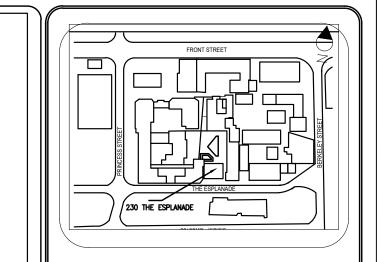
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1. EXISTING CHILLED WATER SUPPLY AND RETURN TO BE REMOVED TO CEILING LEVEL. 2. EXISTING TOP COIL AND BOTTOM COIL FOR ACS-4 TO BE REPLACED AS SHOWN ON PLAN AND SCHEDULE.







KEY PLAN

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Project Name :

ST. LAWRENCE CRC & DAYCARE Project Address :

230 THE ESPLANADE TORONTO, ON Job Descript. :

ROOFING & CHILLER REPLACEMENT

GYM MECHANICAL ROOM DEMO

Design: AN DRAWN: AN Approv.: BZ Scale: AS SHOWN Date: February 26, 25

Project No.

Job No.

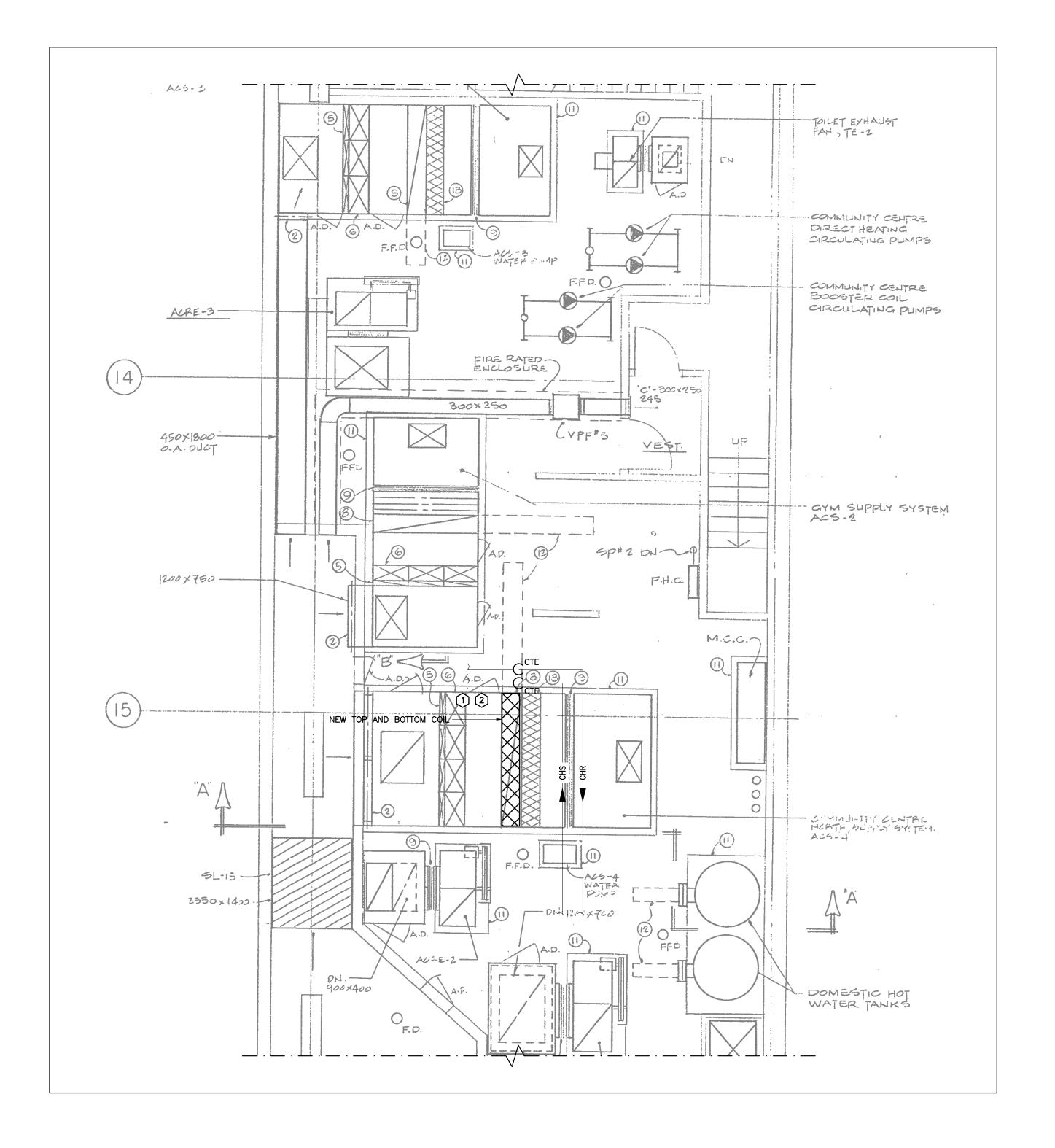
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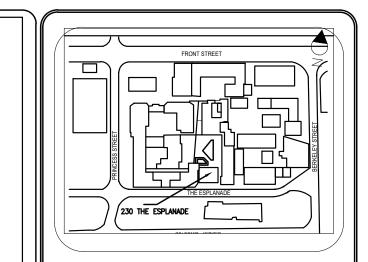
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1. SUPPLY AND INSTALL NEW CHILLED WATER SUPPLY AND RETURN WITH VALVE AND PRESSURE GAUGE. 2. SUPPLY AND INSTALL NEW TOP AND BOTTOM COIL FOR ACS-4 AS SHOWN ON PLAN AND SCHEDULE.





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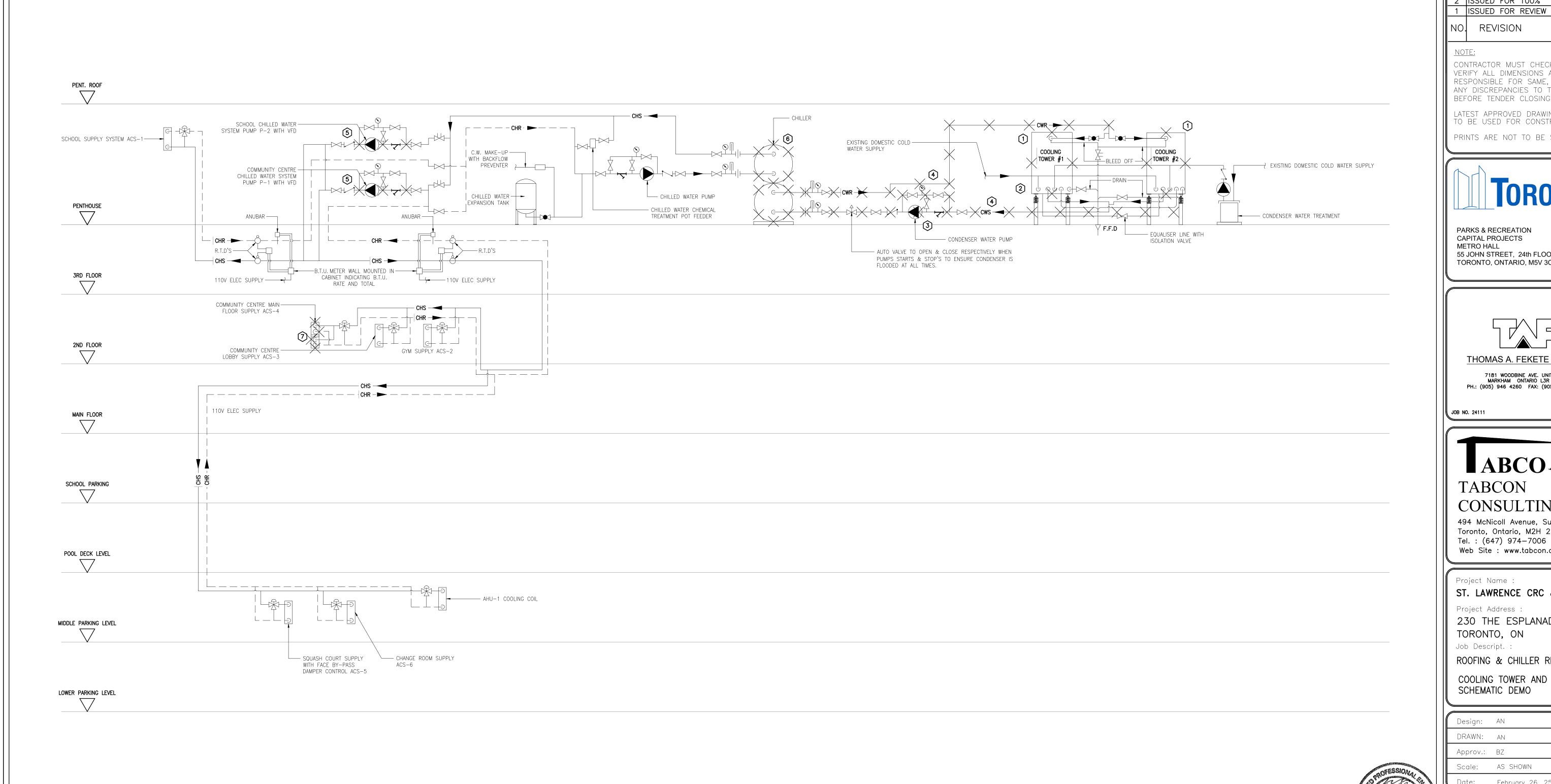
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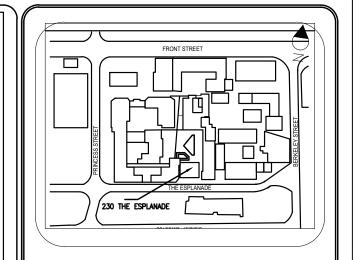
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Project Name :

ST. LAWRENCE CRC & DAYCARE

Project Address : 230 THE ESPLANADE TORONTO, ON

Job Descript. : ROOFING & CHILLER REPLACEMENT

COOLING TOWER AND CHILLER SCHEMATIC DEMO

Design: AN DRAWN: AN Approv.: BZ

Scale: AS SHOWN Date: February 26, 25

Project No.

Job No.

O. P. ZHAMG . 100119933

Dwg.No.

1 COOLING TOWER AND CHILLER SCHEMATIC - DEMO M7 SCALE: NTS

CODED MECHANICAL DEMO NOTES

EXISTING COOLING TOWER 1 CT-1 AND COOLING TOWER 2 CT-2 TO BE DISASSEMBLED TO PIECES AND

5. EXISTING COMMUNITY CENTRE CHILLED WATER PUMPS P-1 AND SCHOOL CHILLED WATER PUMP P-2 C/W

6. EXISTING CHILLER TO BE DISASSEMBLED TO PIECES AND REMOVED AND REPLACED. DISCONNECT EXISTING

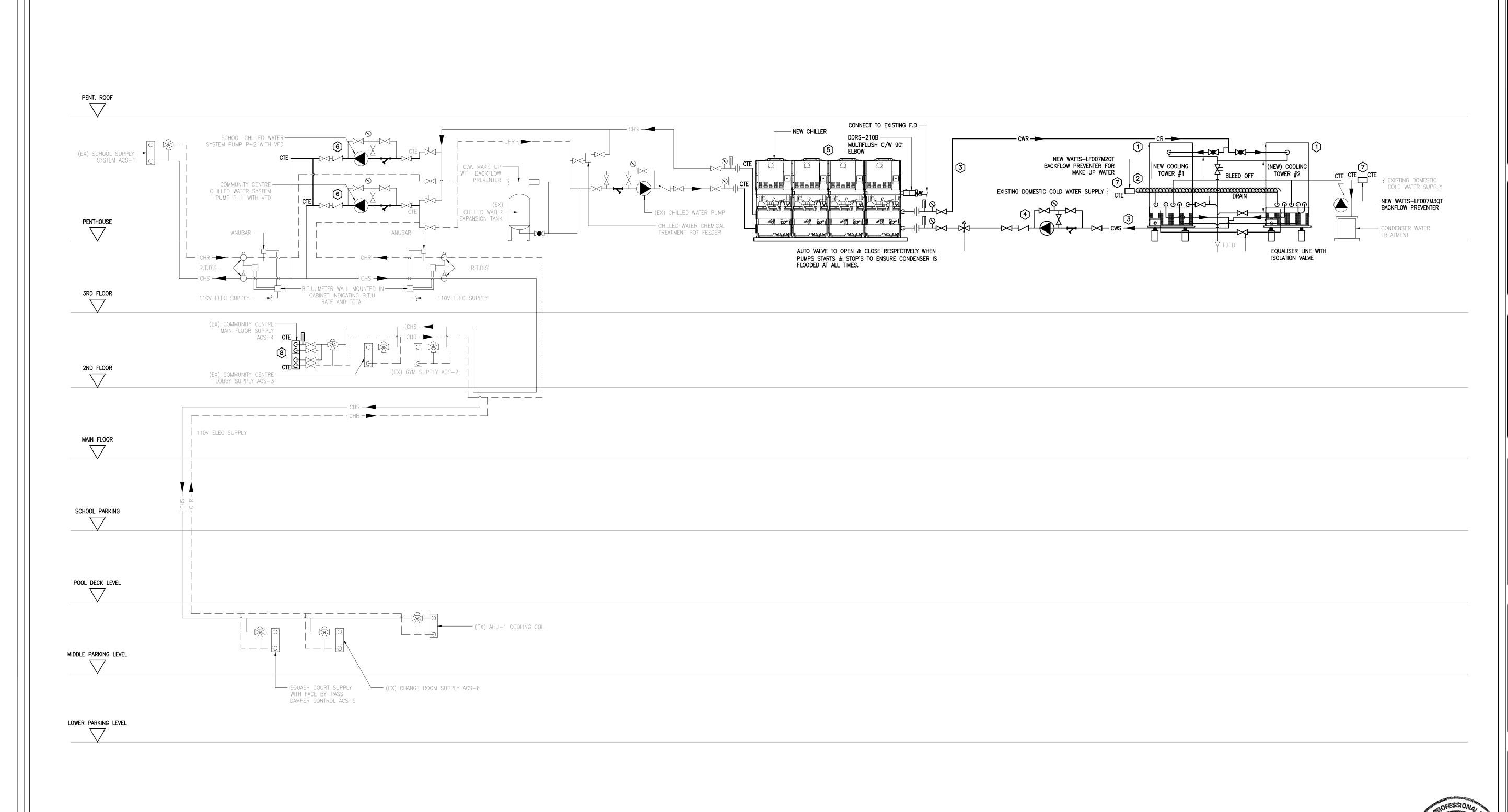
EXISTING TOP COIL AND BOTTOM COIL FOR ACS-4 TO BE REMOVED AND REPLACED WITH NEW.

2. DISCONNECT AND REMOVE ALL ASSOCIATED OUTDOOR PIPING.

CONTROLS AND RECONNECT TO NEW UNIT.

3. EXISTING CONDENSER WATER PUMP TO BE REMOVED AND REPLACED. 4. EXISTING CONDENSER WATER SUPPLY AND RETURN TO BE REMOVED.

VFD TO BE REMOVED AND REINSTALLED AFTER CHILLER INSTALLATION.



1. SUPPLY AND INSTALL NEW COOLING TOWER CT-1 AND CT-2 C/W NEW SPRING MOUNTED ISOLATORS.

5. SUPPLY AND INSTALL NEW CHILLER AND RECONNECT TO EXISTING CONTROL AS SHOWN ON PLAN AND

CONNECT TO EXISTING BAS SYSTEM, EXACT LOCATION VERIFY ON SITE.

4. SUPPLY AND INSTALL NEW CONDENSER WATER PUMP.

SUPPLY AND INSTALL NEW 25Ø HEAT TRACED MAKE—UP DCW PIPE TO COOLING TOWER.
 SUPPLY AND INSTALL NEW CONDENSER WATER SUPPLY AND RETURN AS SHOWN ON PLAN.

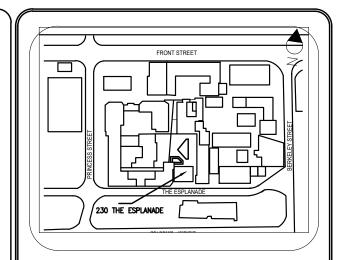
6. REINSTALL EXISTING PUMPS P-1 AND P-2 AND RECONNECT TO EXISTING CONTROL.

1 COOLING TOWER AND CHILLER SCHEMATIC - RENO

M8 SCALE: NTS

7. SUPPLY AND INSTALL NEW BACKFLOW PREVENTER AS SHOWN ON PLAN.

8. SUPPLY AND INSTALL NEW TOP AND BOTTOM COIL FOR ACS-4.



KEY PLAN

14 JAN 2

DATE

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1 ISSUED FOR REVIEW

REVISION

CONTRACTOR MUST CHECK AND VERIFY ALL DIMENSIONS AND BE RESPONSIBLE FOR SAME, REPORTING ANY DISCREPANCIES TO THE OWNER, BEFORE TENDER CLOSING.

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PRINTS ARE NOT TO BE SCALED.



PARKS & RECREATION
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Project Name :

Project Address :

ST. LAWRENCE CRC & DAYCARE

230 THE ESPLANADE TORONTO, ON

Job Descript. :

ROOFING & CHILLER REPLACEMENT

COOLING TOWER AND CHILLER SCHEMATIC RENO

Design: AN

DRAWN: AN

Approv.: BZ

Scale: AS SHOWN

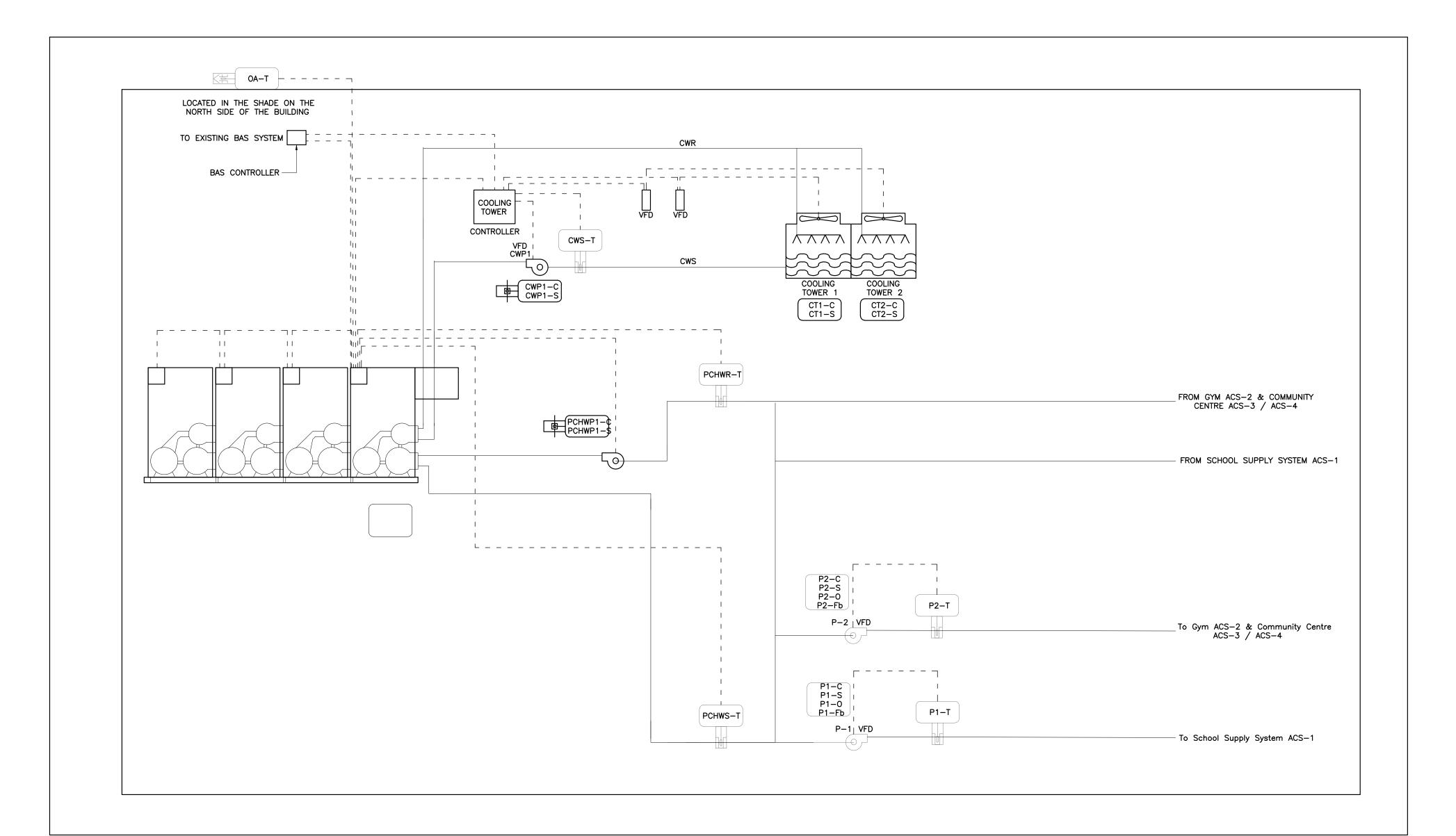
Date: February 26, 25

Project No.

O. P. ZHAMG . 100119933

Job No.

M8



CONTROL SEQUENCE

SYSTEM ENABLE:
THE COOLING SYSTEM WILL AUTOMATICALLY START WHEN THE OUTSIDE AIR TEMPERATURE (OA-T) RISES ABOVE THE SYSTEM ENABLE SETPOINT (CLGOATLOCKOUT-SP) WHILE THE SYSTEM ENABLE (SYSTEM-EN) IS "ON". WHEN THE OUTSIDE AIR TEMPERATURE (OA-T) FALLS BELOW THIS SETPOINT (CLGOATLOCKOUT-SP) OR THE SYSTEM ENABLE (SYSTEM-EN) IS "OFF", THE COOLING SYSTEM WILL BE DISABLED.

CHILLER CONTROL:
THIS SYSTEM CONSISTS OF FOUR MODULAR CHILLERS. ONE MASTER CHILLER SHALL CONTROL OTHER THREE MODULAR CHILLERS WHEN LOW WATER TEMPERATURE IS REQUIRED. EACH CHILLER SHALL BE CONTROLLED VIA ITS OWN INTERNAL CONTROLS TO MAINTAIN A CHILLED WATER SUPPLY TEMPERATURE SETPOINT. BAS SHALL RESET THE SETPOINT BASED ON OUTSIDE AIR TEMPERATURE.

CHILLED WATER PUMP CONTROL:

WHEN ENABLED, THE PRIMARY PUMP (PCHWP1-C) WILL BE STARTED. IF THE PUMP STATUS (PCHWP1-S) DOES NOT MATCH THE COMMAND (PCHWP1-C), AN ALARM WILL BE GENERATED AND THE CHILLER WILL BE STOPPED. THE PUMP (PCHWP1-C) WILL AUTOMATICALLY RESTART ON LOSS OF STATUS (PCHWP1-S), AFTER THE RETRY ATTEMPTS HAVE BEEN EXCEEDED THE PUMP WILL BE LOCKED OUT UNTIL THE SYSTEM RESET (SYS-RESET) IS ACTIVATED. AFTER THE CHILLER IS COMMANDED OFF, THE PUMP (PCHWP1-C) WILL CONTINUE TO RUN FOR A SHORT TIME TO ALLOW THE EQUIPMENT TO COAST DOWN.

CONDENSER WATER PUMP CONTROL:

WHEN ENABLED, THE PUMP (CWP1-C) ASSOCIATED WITH THE CHILLER WILL BE STARTED. IF THE PUMP STATUS (CWP1-S) DOES NOT MATCH THE COMMAND (CWP1-C), AN ALARM WILL BE GENERATED AND THE CHILLER WILL BE STOPPED. THE PUMP (CWP1-C) WILL AUTOMATICALLY RESTART ON LOSS OF STATUS (CWP1-S), AFTER THE RETRY ATTEMPTS HAVE BEEN EXCEEDED THE PUMP WILL BE LOCKED OUT UNTIL THE SYSTEM RESET (SYS-RESET) IS ACTIVATED. AFTER THE CHILLER IS COMMANDED OFF, THE PUMP (CWP1-C) WILL CONTINUE TO RUN FOR A SHORT TIME TO DISSIPATE THE HEAT.

CONDENSER WATER SYSTEM:

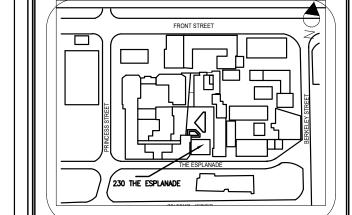
THIS SYSTEM CONSISTS OF TWO SINGLE SPEED (CTX-C) COOLING TOWERS. THE COOLING TOWERS WILL BE STAGED ON AND OFF TO MAINTAIN A CONDENSER SUPPLY WATER TEMPERATURE SETPOINT (CW-SP). WHEN AN ADDITIONAL COOLING TOWER (CTX-C) IS REQUIRED, THE TOWER (CTX-C) WITH THE LOWEST RUNTIME TOTAL SHALL BE ENABLED TO RUN. IF THE TOWER FAN STATUS (CTX-S) DOES NOT MATCH THE COMMAND (CTX-C), AN ALARM WILL BE GENERATED AND THE TOWER FAN WILL BE STOPPED. THE TOWER FAN (CTX-C) WILL AUTOMATICALLY RESTART ON LOSS OF STATUS (CTX-S), AFTER THE RETRY ATTEMPTS HAVE BEEN EXCEEDED THE TOWER FAN WILL BE LOCKED OUT UNTIL THE SYSTEM RESET (SYS-RESET) IS ACTIVATED.

ZONE LOOP CONTROL:

EACH OF THE ZONE CONTROL LOOPS WILL START A PUMP (PX-C) AS THE ZONE BECOMES OCCUPIED. IF THE PUMP STATUS (PX-S) DOES NOT MATCH THE COMMAND (PX-C), AN ALARM WILL BE GENERATED AND THE PUMP WILL BE STOPPED. UPON LOSS OF STATUS (PX-S), THE PUMP (PX-C) WILL RESTART AFTER THE SYSTEM RESET (SYS-RESET) IS ACTIVATED.

ADDITIONAL POINTS MONITORED BY THE FMS:

 CHILLER N STATUS (CHN-S) ZONE SUPPLY WATER TEMPERATURE (PX-T)



KEY PLAN

5				
4				
3	ISSUED FOR TENDER/PERMIT	26	FEB	25
2	ISSUED FOR 100%	04	FEB	25
1	ISSUED FOR REVIEW	14	JAN	25
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Project Name :

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TORONTO, ON Job Descript. :

ROOFING & CHILLER REPLACEMENT

CONTROL SEQUENCE DIAGRAM

Design: AN DRAWN: AN Approv.: BZ Scale: AS SHOWN Date: February 26, 25

Project No.

Job No.

Dwg.No. M9

100119933

BUILDING AUTOMATION SYSTEM

1.1 THE BUILDING AUTOMATION SYSTEM ("BAS") WORK SHALL INCLUDE DESIGN, SUPPLY, INSTALLATION, AND COMMISSIONING A COMPLETE MICROPROCESSOR BASED AUTOMATIC CONTROL SYSTEM TO ACHIEVE THE PERFORMANCE SPECIFIED IN THE FOLLOWING SECTIONS. THE BAS SHALL BE CAPABLE OF TOTAL INTEGRATION OF FACILITY

INFRASTRUCTURE SYSTEMS WITH USER ACCESS TO ALL SYSTEM DATA, EITHER LOCALLY OVER A SECURE INTRANET WITHIN THE BUILDING OR BY REMOTE ACCESS BY A STANDARD WEB BROWSER OVER THE INTERNET. 1.3 THE ENTIRE BAS SHALL BE PEER-TO-PEER NETWORKED, STAND-ALONE, DISTRIBUTED CONTROL IN ACCORDANCE WITH AMERICAN NATIONAL STANDARDS INSTITUTE/AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR CONDITIONING ENGINEERS (ANSI/ASHRAE) STANDARD 135-2004, BACNET - A DATA COMMUNICATION PROTOCOL FOR BUILDING AUTOMATION AND CONTROL NETWORKS. 1.4 ALL LABOUR, MATERIAL, EQUIPMENT AND SOFTWARE NOT SPECIFICALLY REFERRED TO HEREIN OR ON THE PLANS, BUT IS REQUIRED TO MEET THE

COST TO THE OWNER. 1.5 BAS SUBCONTRACTOR SHALL BE MANUFACTURERS OR LICENSED FACTORY REPRESENTATIVES AND INSTALLERS OF THE MANUFACTURERS, SPECIFIED FOR THE LOCAL AREA IN WHICH THE SITE IS LOCATED. THE GENERAL CONTRACTOR SHALL ENSURE THAT THE BAS SUBCONTRACTOR IS FAMILIAR WITH AND WILL COMPLY WITH ALL REQUIREMENTS OF THE CONTRACT DOCUMENTS, INCLUDING THE

FUNCTIONAL INTENT OF THE CONTRACT, SHALL BE PROVIDED WITHOUT ADDITIONAL

REQUIREMENTS OF THIS SECTION. 1.6 THE BAS SUBCONTRACTOR SHALL PROVIDE THE NECESSARY ENGINEERING, INSTALLATION, SUPERVISION, COMMISSIONING AND PROGRAMMING FOR A COMPLETE AND FULLY OPERATIONAL SYSTEM. THE BAS SUBCONTRACTOR SHALL PROVIDE AS MANY TRIPS TO THE SITE FOR INSTALLATION, SUPERVISION, AND COMMISSIONING AS ARE NECESSARY TO COMPLETE THE PROJECT TO THE SATISFACTION OF THE

CONSULTANT AND/OR OWNER 1.7 THE CONTROLS SUBCONTRACTOR WILL SPECIFICALLY READ ALL MECHANICAL AND ELECTRICAL DRAWINGS, SPECIFICATIONS, AND ADDENDA AND DETERMINE THE CONTROLS WORK PROVIDED BY THE MECHANICAL SUBCONTRACTOR. HIS SUBCONTRACTORS, AND THE ELECTRICAL SUBCONTRACTOR. THE CONTROLS SUBCONTRACTOR IS EXPECTED TO HAVE THE EXPERTISE TO COORDINATE THE WORK OF OTHER SUBCONTRACTORS AND TO MAKE A COMPLETELY COORDINATED BUILDING AUTOMATION CONTROL SYSTEM (BAS) FOR THE MECHANICAL SYSTEMS. 1.8 THE BAS SHALL BE COMPATIBLE WITH FUTURE CONTROL PRODUCTS FOR 10 YEARS OR MORE. ANY EQUIPMENT OR CONTROLS SYSTEMS THAT ARE SCHEDULED OR SUSPECTED TO BECOME OUTDATED OR OBSOLETE SHALL NOT BE USED IN THE CONTRACT WORK.

1.9 ENSURE COMPLIANCE WITH ASTM A1008/A1008A. 1.10 THE SYSTEM SHALL BE INSTALLED BY TRADE CERTIFIED ELECTRICIANS REGULARLY EMPLOYED BY THE CONTROLS CONTRACTOR. THE SYSTEM SHALL BE TESTED AND CALIBRATED BY FACTORY CERTIFIED TECHNICIANS QUALIFIED FOR THIS TYPE OF WORK AND IN THE REGULAR EMPLOYMENT OF THE BAS MANUFACTURER OR ITS EXCLUSIVE FACTORY AUTHORIZED INSTALLING CONTRACTING FIELD OFFICE REPRESENTATIVE. THE INSTALLING OFFICE SHALL HAVE A MINIMUM OF FIVE YEARS OF INSTALLATION EXPERIENCE WITH THE MANUFACTURER. SUPERVISION. CALIBRATION AND COMMISSIONING OF THE SYSTEM SHALL BE BY THE EMPLOYEES OF THE FACTORY AUTHORIZED BAS BRANCH OR REPRESENTATIVE 1.11 VISIT THE PREMISES PRIOR TO TENDER TO BECOME FAMILIAR WITH FIELD CONDITIONS AND EXISTING EQUIPMENT.

PRODUCTS BUILDING AUTOMATION SYSTEM SHALL BE ONE OF THE FOLLOWING SYSTEMS: JOHNSON CONTROLS AUTOMATED LOGIC

RELIABLE CONTROLS

SCOPE 3.1 THIS WORK OF THIS SECTION SHALL INCLUDE, BUT NOT BE LIMITED TO, THE FOLLOWING WORK: PREPARATION OF CONTROL SHOP DRAWINGS FOR REVIEW AND APPROVAL. SUPPLY AND INSTALL A NETWORK OF BUILDING AUTOMATION CONTROL SYSTEM (BAS) PANELS AND FIELD DEVICES.

SUPPLY AND INSTALL CUSTOMIZED GRAPHICS SOFTWARE AS SPECIFIED. INSTALL, WIRE AND LABEL ALL BAS CONTROL SYSTEM COMPONENTS. CALIBRATE AND COMMISSION THE INSTALLED CONTROL SYSTEM.

PROVIDE MAINTENANCE MANUALS AND AS-BUILT DRAWINGS. PROVIDE CUSTOMIZED TRAINING FOR OPERATIONS, MAINTENANCE AND TECHNICAL STAFF.

DRAWINGS AND SUBMISSIONS 4.1 SUBMIT FOUR COPIES OF THE FOLLOWING INFORMATION TO THE CONSULTANT AND/OR THE OWNER FOR REVIEW AND APPROVAL: CONTROL SCHEMATICS.

DETAILED SEQUENCE OF OPERATION FOR EACH CONTROL SCHEMATIC OR CONTROLLED SYSTEM. 4.3 SYSTEM ARCHITECTURE INDICATING THE PROPOSED INTERCONNECTION AND LOCATION OF ALL BAS PANELS, NETWORK CONNECTIONS AND KEY PERIPHERAL DEVICES (WORKSTATIONS, MODEMS, PRINTERS, REPEATERS, ETC.) 4.4 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). TERMINAL IDENTIFICATION FOR ALL CONTROL WIRING SHALL BE SHOWN ON THE SHOP DRAWINGS. 4.5 WIRING DIAGRAMS INCLUDING COMPLETE POWER SYSTEM, INTERLOCKS,

CONTROL AND DATA COMMUNICATIONS. 4.6 HARD COPY GRAPHICAL DEPICTION OF THE APPLICATION CONTROL PROGRAMS. 4.7 MANUFACTURERS' DATA / SPECIFICATION SHEETS FOR ALL MATERIAL 4.8 LETTERS OF INSTALLATION CERTIFICATION: SUBMIT A LETTER OR LETTERS FROM THE BAS MANUFACTURER'S REPRESENTATIVE TO CERTIFY THAT THE BAS HAS

BEEN PROPERLY INSTALLED, STARTED, TESTED, ADJUSTED, AND IS IN PROPER OPERATING CONDITION AND READY FOR COMMISSIONING.

4.9 QUALITY ASSURANCE .1 THE BAS HARDWARE AND SOFTWARE SHALL BE INSTALLED BY EXPERIENCED PERSONNEL EMPLOYED AND TRAINED BY THE SYSTEM EQUIPMENT MANUFACTURER/SUPPLIER. ALL SYSTEM WIRING IS TO BE INSTALLED BY JOURNEYMAN ÉLECTRICIANS OR UNDER DIRECT ON-SITE SUPERVISION OF JOURNEYMAN ELECTRICIANS.

.2 THE BAS SUPPLIER/INSTALLER SHALL HAVE A BRANCH FACILITY WITH PARTS WITHIN A 100 KM RADIUS OF THE BUILDING AND PROVIDE COMPLETE MAINTENANCE AND SUPPORT SERVICES ON A 24 HOUR, 7 DAY-A-WEEK BASIS. ALL POINTS SHALL BE AVAILABLE TO BACNET.

5.2 POINTS SHALL BE FIELD RECONFIGURABLE. NO SET POINTS SHALL BE HARD CODED IN THE PROGRAMS. 5.3 ALL CONTROLLERS SHALL BE LOADED TO A MAXIMUM OF 80%. 20% OF EACH OF THE INPUTS, OUTPUTS AND VARIABLES SHALL REMAIN UNUSED TO ALLOW FOR FUTURE GROWTH AND EXPANDABILITY 5.4 THE SYSTEM SHALL CONSIST OF ALL OPERATOR INTERFACES,

MICROPROCESSOR-BASED CONTROLLERS, SENSORS, WELLS, AUTOMATIC CONTROL VALVES, CONTROL DAMPERS, TRANSDUCERS, AND RELAYS, AUTOMATIC CONTROL VALVES. AND DAMPER ACTUATORS. 5.5 ALL EQUIPMENT, POINTS, ETC. SHALL HAVE COMMON LABELLING.

5.6 SOFTWARE SHALL BE COMPLETELY PROGRAMMABLE AND CAPABLE OF ALL CONTROL AND MATHEMATICAL FUNCTIONS. 5.7 ALL TEMPERATURE UNITS FOR BAS AND CONTROLLED EQUIPMENT SHALL BE

IN DEGREES CELSIUS (O/C). 5.8 OPERATOR ACTIVITY TRACKING - AN AUDIT TRAIL REPORT TO TRACK SYSTEM CHANGES, ACCOUNTING FOR OPERATOR INITIATED ACTIONS, CHANGES MADE BY A PARTICULAR PERSON OR CHANGES MADE TO A SPECIFIC PIECE OF EQUIPMENT DESIGNATED TIME FRAME. SHALL BE PRINTABLE AND ARCHIVED FOR FUTURE USE. THE OPERATOR ACTIVITY TRACKING SHALL BE IN A TAMPER-PROOF BUFFER FILE. 5.9 OPERATOR WORKSTATION INTERFACE SOFTWARE SHALL OPTIMIZE OPERATOR UNDERSTANDING THROUGH THE USE OF ENGLISH LANGUAGE PROMPTING, ENGLISH LANGUAGE POINT IDENTIFICATION AND INDUSTRY STANDARD PC APPLICATION SOFTWARE. THE SOFTWARE SHALL PROVIDE, AS A MINIMUM, THE FOLLOWING

FUNCTIONALITY: A. REAL-TIME GRAPHICAL VIEWING AND CONTROL OF ENVIRONMENT SCHEDULING AND OVERRIDE OF BUILDING OPERATIONS COLLECTION AND ANALYSIS OF HISTORICAL DATA AND DYNAMIC DATA (TREND

DEFINITION AND CONSTRUCTION OF DYNAMIC COLOR GRAPHIC DISPLAYS

EDITING, PROGRAMMING, STORAGE AND DOWNLOADING OF GLOBAL CONTROLLER DATABASES ALARM REPORTING, ROUTING, MESSAGING, AND ACKNOWLEDGMENT

5.10 PROVIDE A GRAPHICAL USER INTERFACE, WHICH SHALL MINIMIZE THE USE OF THE KEYBOARD THROUGH THE USE OF A MOUSE OR A SIMILAR POINTING DEVICE AND A "POINT AND CLICK" APPROACH TO MENU SELECTION. 5.11 BATTERY BACKUP: AUTOMATIC RESTART AFTER POWER FAILURE: UPON RESTORATION OF POWER AFTER AN OUTAGE, THE BAS SHALL AUTOMATICALLY, AND WITHOUT HUMAN INTERVENTION, UPDATE ALL MONITORED FUNCTIONS, RESUME OPERATION BASED ON CURRENT SYNCHRONIZED TIME AND STATUS AND IMPLEMENT SPECIAL START-UP STRATEGIES AS REQUIRED. 5.12 REFRESH RATE — THE MAXIMUM PERMISSIBLE REFRESH RATE IS ONE (1) SECOND. THE REFRESH RATE IS DEFINED AS THE TIME IT TAKES THE CONTROLLER CENTRAL PROCESSING UNIT (CPU) TO SAMPLE ALL INPUTS. CALCULATE ALL VARIABLES, UPDATE ALL TIMERS AND PROPORTIONAL INTEGRAL DERIVATIVE (PID) CONTROLLERS, CHECK ALL SCHEDULES, UPDATE ALL TREND LOGS AND RUNTIME LOGS, EXECUTE ALL PROGRAMS AND ASSIGN VALUES TO ALL

5.13 THE HVAC EQUIPMENT SHALL BE SUPPLIED AS "THERMOSTAT-READY". THE BUILDING AUTOMATION SYSTEM SHALL HAVE DIRECT CONTROL OF DAMPERS. HEATING AND COOLING STAGES WITHOUT THE REQUIREMENT OF BACNET. LONWORKS OR ANY OTHER TYPE OF COMMUNICATION INTERFACE. FACTORY INSTALLED INTERLOCKS, SAFETIES AND ANTI-CYCLE TIMERS SHALL BE PROVIDED AS REQUIRED 5.14 REPORTS SHALL BE GENERATED ON DEMAND OR VIA A PRE-DEFINED SCHEDULE AND DIRECTED TO VIDEO DISPLAYS, PRINTERS OR HARD DRIVE. AS A

MINIMUM, THE SYSTEM SHALL ALLOW THE USER TO EASILY OBTAIN THE FOLLOWING TYPES OF REPORTS: A. A GENERAL LISTING OF ALL OR SELECTED POINTS IN THE NETWORK

LIST OF ALL POINTS CURRENTLY IN ALARM LIST OF ALL POINTS CURRENTLY IN OVERRIDE STATUS

LIST OF ALL DISABLED POINTS LIST OF ALL POINTS CURRENTLY LOCKED OUT

LIST OF USER ACCOUNTS AND ACCESS LEVELS LIST ALL WEEKLY SCHEDULES LIST OF LIMITS AND DEAD-BANDS

EXCEL REPORTS SYSTEM DIAGNOSTIC REPORTS INCLUDING A LIST OF BAS PANELS ON LINE AND COMMUNICATING, AND THE STATUS OF ALL BAS TERMINAL UNIT DEVICE

LIST OF PROGRAMS 5.15 PROVIDE A MEANS FOR THE OPERATOR TO VIEW THE COMMUNICATION STATUS OF ALL CONTROLLERS CONNECTED TO THE SYSTEM. THE STATUS SHOULD SHOW WHETHER THE CONTROLLER IS COMMUNICATING OR NOT. 5.16 PROVIDE A MEANS FOR THE OPERATOR TO RESET THE ERROR COUNT FOR ALL CONTROLLERS TO ZERO. 5.17 PROVIDE A MEANS FOR THE OPERATOR TO DISPLAY AND CHANGE THE SYSTEM CONFIGURATION. THIS SHALL INCLUDE, BUT NOT BE LIMITED TO, SYSTEM TIME. DAY OF THE WEEK. DATE OF DAY LIGHT SAVINGS SET FORWARD/ SET BACK. PRINTER TYPE AND PORT ADDRESSES, MODEM PORT AND SPEED, ETC. ITEMS SHALL BE MODIFIED UTILIZING EASY TO UNDERSTAND TERMINOLOGY USING SIMPLE MOUSE/CURSOR KEY MOVEMENTS. 5.18 PROVIDE A SECURITY SYSTEM THAT PREVENTS UNAUTHORIZED USE UNLESS THE OPERATOR IS LOGGED ON. ACCESS SHALL BE LIMITED TO THE OPERATOR'S TERMINAL FUNCTIONS UNLESS THE USER IS LOGGED ON. 5.19 WHERE POSSIBLE, UTILIZE OPTIMIZED START FEATURES ON EQUIPMENT TO REDUCE HYDRO DEMAND CHARGES. 5.20 DURING THE INITIAL DESIGN. THE OWNER SHALL SUPPLY THE CONTROLS CONTRACTOR A RANGE OF BACNET ADDRESSES THE BAS WILL RUN ON. THE BAS NETWORK WILL RUN EITHER BACNET OVER IP OR BACNET OVER MULTIPLE SPANNING TREE PROTOCOL (MSTP). ALL BAS POINTS WILL BE NETWORK VISIBLE SO THAT OTHER BACNET SYSTEMS CAN AUTO DISCOVER THEM. THE CONTRACTOR SHALL CONSULT WITH THE OWNER'S PROJECT MANAGER DURING THE

DEVELOPMENT OF ADDRESSES. OPERATOR'S WORKSTATION 6.1 SUPPLY AND INSTALL ALL OPERATING SOFTWARE AND DYNAMIC SYSTEM GRAPHICS ON THE OPERATOR'S WORKSTATION. WORKSTATION TO BE SUPPLIED BY BAS SUBCONTRACTOR UNLESS STATED OTHERWISE BY THE OWNER'S PROJECT 6.2 SUPPLY LICENSES FOR ALL SOFTWARE REQUIRED TO MONITOR, CONFIGURE SYSTEM, EDIT GRAPHICS, TREND STORAGE, (DATA EXCHANGE INCLUDING OPEN DATABASE CONNECTIVITY ("ODBC") (IF APPLICABLE)) WITHOUT LIMITATIONS TO

6.3 RELIABLE CONTROLS ("RC") SHALL INCLUDE LICENSING FOR THE FOLLOWING: RC STUDIO, RC WEBVIEW, RC ARCHIVE. 6.4 DELTA CONTROLS SHALL INCLUDE LICENSING FOR THE FOLLOWING: ORCAWEB-LARGE, ILLUSTRATOR, ORCAWEB, OPERATOR WORKSTATION (OWS), ODBC, DYNAMIC DATA EXCHANGE ("DDE"), HISTORIAN LARGE. 6.5 AUTOMATED LOGIC SHALL INCLUDE LICENSING FOR THE FOLLOWING: WEB CTRL, ADVANCED REPORTS. 6.6 THE OPERATOR WORKSTATION INTERFACE SOFTWARE SHALL BE DESIGNED TO OPERATE ON THE LATES WINDOWS PROFESSIONAL PLATFORM.

6.7 THE LAPTOP SHALL BE A DELL (OR OTHER RECOGNIZED MANUFACTURER) PORTABLE NOTEBOOK COMPUTER WITH INTEL® CORE PROCESSOR, COMPLETE WITH WINDOWS 10 - PRO OPERATING SYSTEM AND COMMUNICATIONS SOFTWARE AND HARDWARE. THIS COMPUTER SHALL HAVE AN LCD 1920 X 1080 SCREEN, 15.6-IN. DISPLAY, 8GB RAM, 250GB+ SSD HARD DRIVE, HDMI AND/OR DISPLAYPORT, AND AC ADAPTOR AND GIGA BIT ETHERNET PORT.

7.1 PROVIDE NECESSARY INTERFACE AND CABLING TO CONNECT THIS BAS CONTROLLER TO THE OWNER WAN OR EXISTING BAS SYSTEM. OBTAIN THE PARTICULAR WAN SYSTEM DETAILS FROM THE CONSULTANT OR PROJECT 7.2 THE OWNER SHALL SUPPLY THE WAN IP ADDRESS. GATEWAY AND SUBNET MASK FOR THE BACNET BROADCAST MANAGEMENT DEVICE ("BBMD") ROUTER IN THE NETWORK. THE CONTROLS CONTRACTOR WILL FACILITÀTE INTÉGRATION INTO THE OWNER'S EXISTING BAS BACNET NETWORK 7.3 ON THE NETWORK A BACNET IP DEVICE THAT IS CAPABLE OF BBMD WILL ROUTE INFORMATION FROM OTHER SITES AND THE OPERATOR WORK STATION. IN ADDITION THERE SHALL BE A CAT5 WIRE THAT IS RUN TO THE OWNER'S IT SWITCH WITH A 4' PIGTAIL AND CONNECTOR.

TREND DATA PROVIDE TREND LOGS FOR EVERY HARDWARE INPUT AND OUTPUT. ALL TRENDS SHOULD BE ACCESSIBLE VIA THE GRAPHICAL INTERFACE. 8.3 TRENDS SHOULD CONTAIN ALL RELATED VARIABLES OF A CONTROL LOOP (THAT IS, SETPOINT, MEASURED VARIABLE AND CONTROL OUTPUT) AND HAVE THE ÀBILITY TO BE PLOTTED SIMULTANEOUSLY ON THE SAME GRAPH. FIELD DEVICES INDIVIDUAL TRENDS SHOULD PROVIDE AN APPROPRIATE "SNAPSHOT" OF THE VARIABLE. TRENDS SHOULD CONTAIN A MINIMUM OF 5 DAYS WORTH OF TREND

8.4 PROVIDE TRENDING CAPABILITIES AT 5 MINUTE INTERVALS THAT ALLOW THE USER TO EASILY MONITOR AND PRESERVE RECORDS OF SYSTEM ACTIVITY OVER A ONE YEAR PERIOD. ANY SYSTEM POINT SHALL BE TRENDED AUTOMATICALLY AT TIME-BASED INTERVALS OR CHANGE OF VALUE, BOTH OF WHICH SHALL BE USER-DEFINABLE. TREND DATA SHALL BE STORED ON HARD DRIVE FOR FUTURE DIAGNOSTICS AND REPORTING. ADDITIONALLY, TREND DATA SHALL BE ARCHIVED TO NETWORK DRIVES OR REMOVABLE DISK MEDIA FOR FUTURE RETRIEVAL. TREND LOG ARCHIVING SHALL BE AT LEAST DATA FROM THE LAST 12 MONTHS. 8.5 TRENDING SHALL BE ACCESSIBLE FROM THE GRAPHICS SCREENS FOR EACH POINT. EACH POINT SHALL HAVE ITS ASSOCIATED TREND CAPABILITY ACCESSIBLE FROM THE GRAPHIC VIA AN ICON LOCATED BESIDE THE POINT NAME ON THE GRAPHIC PAGE.

8.6 TREND DATA REPORTS SHALL BE PROVIDED TO ALLOW THE USER TO VIEW ALL TRENDED POINT DATA. REPORTS SHALL BE CUSTOMIZED TO INCLUDE INDIVIDUAL POINT OR PREDEFINED GROUPS OF AT LEAST SIX POINTS. PROVIDE SUFFICIENT CAPACITY TO ALLOW FOR TRENDING A MINIMUM OF 100 POINTS AT 2000 SAMPLES EACH. REPORTS SHOULD BE EASILY TRANSFERABLE ON-LINE TO MICROSOFT EXCEL. THE CONTRACTOR SHALL PROVIDE CUSTOM DESIGNED SPREADSHEET REPORTS FOR USE BY THE OWNER TO TRACK ENERGY USAGE AND COST, EQUIPMENT RUN-TIMES, EQUIPMENT EFFICIENCY, AND/OR BUILDING ENVIRONMENTAL CONDITIONS. 8.7 THE OPERATOR SHALL BE ABLE TO CHANGE TREND LOG SETUP INFORMATION.

THIS INCLUDES INFORMATION TO BE TREND LOGGED AS WELL AS THE INTERVAL AT WHICH THE INFORMATION IS TO BE LOGGED. ALL POINTS IN THE SYSTEM SHALL BE LOGGED. ALL OPERATIONS SHALL BE PASSWORD PROTECTED. SETUP AND VIEWING SHALL BE ACCESSED DIRECTLY FROM ANY AND ALL GRAPHICS

WHERE THE POINT IS DISPLAYED. 8.8 TRENDING SHALL INCLUDE THE ABILITY TO TRACK ENERGY MANAGEMENT ASPECTS INCLUDING, BUT NOT LIMITED TO, THE FOLLOWING:

. DAILY USE MONTHLY USE

DAILY HI AND LOW MONTHLY HI AND LOW

DEMAND LIMITING AND LOAD SHEDDING PROGRAM RUN TIME ACCUMULATION FOR ANY SPECIFIED EQUIPMENT

AFTER HOUR USE LOG 8.9 THE PRIMARY INPUT SENSOR FOR ALL CONTROL LOOPS MUST CONNECT TO THE SAME PANEL CONTAINING THE CONTROL LOOP OUTPUT. 8.10 TREND DATA STORAGE MUST BE IN THE SAME PANEL AS THE HARDWARE OR LOGICAL POINTS BEING TRENDED.

9.1 THE BAS WILL BE CONFIGURED TO PROVIDE FOR REMOTE ALARM

CAPABILITIES. 9.2 ALARMS SHALL BE CAPABLE OF BEING ROUTED TO THE OWNER'S IT SERVER SO THAT THEY CAN BE SENT TO OPERATOR'S EMAIL ADDRESSES. 9.3 THE OPERATOR WORKSTATION SHALL PROVIDE AUDIBLE, VISUAL AND PRINTED MEANS OF ALARM INDICATION. THE ALARM DIALOG BOX SHALL ALWAYS BECOME THE TOP DIALOG BOX REGARDLESS OF THE APPLICATION(S) BEING RUN AT THE TIME (SUCH AS A WORD PROCESSOR). A PRINTOUT OF ALL ALARMS SHALL BE

SENT TO THE ASSIGNED TERMINAL AND PORT. 9.4 PROVIDE A LOG OF ALARM MESSAGES. THE ALARM LOG SHALL BE ARCHIVED TO THE HARD DRIVE OF THE OPERATOR WORKSTATION. EACH ENTRY SHALL INCLUDE A POINT DESCRIPTOR AND ADDRESS, TIME AND DATE OF ALARM OCCURRENCE, POINT VALUE AT THE TIME OF ALARM. TIME AND DATE OF POINT RETURN TO NORMAL CONDITION AND TIME AND DATE OF ALARM ACKNOWLEDGE. 9.5 THE CONTROLS SUBCONTRACTOR SHALL WORK WITH THE OWNER TO DETERMINE THE ALARMS UNLESS SPECIFIED OTHERWISE IN THE CONTRACT

9.6 ALARM MESSAGES SHALL BE IN PLAIN ENGLISH AND SHALL BE USER DEFINABLE ON SITE OR VIA REMOTE COMMUNICATION. FIFLD DEVICES AUTOMATIC CONTROL VALVES

A. VALVES USED FOR THROTTLING APPLICATIONS SHALL HAVE A LINEAR

PERCENTAGE-TO-FLOW CHARACTERISTIC. B. BALL VALVES ARE THE PREFERRED VALVE TYPE FOR ZONE AND HVAC CONTROL VALVES. GLOBE AND BUTTERFLY VALVES SHALL BE USED WHERE REQUIRED TO PROVIDE THE DESIRED PRESSURE DROP AND CV (FLOW COEFFICIENCY

AUTOMATIC CONTROL VALVES SHALL BE MANUFACTURED BY BELIMO GROUP. CONTROL VALVE ACTUATORS SIZE CONTROL VALVE ACTUATORS TO PROVIDE A TIGHT CLOSE OFF AGAINST SYSTEM HEAD PRESSURES AND PRESSURE DIFFERENTIALS VALVE ACTUATORS SHALL ACCEPT A 0-10VDC CONTROL VOLTAGE FOR ALL PROPORTIONAL APPLICATIONS. FLOATING POINT CONTROL OF VALVES IS NOT ACCEPTABLE UNDER ANY

CIRCUMSTANCES. HEATING VALVES SHALL SPRING-RETURN FAIL OPEN AND COOLING VALVES SHALL SPRING-RETURN FAIL CLOSED. NON-SPRING-RETURN CONTROL VALVES SHALL BE USED FOR TERMINAL REHEAT COILS AND LARGE HVAC CONTROL VALVES REQUIRING A HIGHER CLOSE OFF PRESSURE. DAMPER ACTUATORS

ACTUATORS SHALL BE DIRECT COUPLED FOR EITHER MODULATING OR TWO POSITION CONTROL. ACTUATORS SHALL BE POWERED BY AN OVERLOAD-PROOF SYNCHRONOUS MOTOR. PROVIDE 0-10 VDC CONTROL VOLTAGE FOR ALL PROPORTIONAL APPLICATIONS AND EITHER LINE OR LOW VOLTAGE ACTUATORS FOR ALL TWO POSITION APPLICATIONS. DAMPER ACTUATORS ARE TO BE MANUFACTURED BY BELIMO GROUP.

10.4 AUTOMATIC CONTROL DAMPERS ALL AUTOMATIC CONTROL DAMPERS NOT FURNISHED WITH PACKAGED EQUIPMENT SHALL BE SUPPLIED BY THE CONTROLS SUBCONTRACTOR AND INSTALLED BY THE SHEET METAL SUBCONTRACTOR (EXCEPT FOR VAV BOXES WHICH SHALL BE SUPPLIED BY THE MECHANICAL SUBCONTRACTOR). ALL DAMPERS IN A MIXING APPLICATION SHALL BE OPPOSED BLADE, PARALLEL BLADE SHALL BE PERMITTED IN OTHER APPLICATIONS. DAMPERS SHALL BE A TIGHT CLOSING, LOW LEAKAGE TYPE WITH REPLACEABLE EXTRUDED VINYL SEALS ON ALL OUTDOOR AND EXHAUST APPLICATIONS.

10.5 CURRENT SWITCHES (DIGITAL) A. PROVIDE BAS STATUS FOR FAN AND PUMP MOTORS USING A MOSFET TYPE DIGITAL SWITCH. ACCEPTABLE MANUFACTURES ARE AUTOMATION COMPONENTS. INC., ENERCORP INSTRUMENTS LTD, GREYSTONE ENERGY SYSTEMS INC., VERIS, ELKOR TECHNOLOGIES INC., AND APPROVED EQUIVALENT, PRESSURE TRANSMITTERS

TECHNICAL PERFORMANCE - SOLID STATE DESIGN, OPERATING ON CAPACITANCE PRINCIPLE, WITH NON-INTERACTIVE FINE RESOLUTION, ZERO AND SPAN ADJUSTMENTS. END-TO-END ACCURACY +/- 2% OF FULL SCALE PRESSURE RANGE, INCLUDING TEMPERATURE COMPENSATION. 4-20MA OR 0-5 B. ACCEPTABLE MANUFACTURERS: AUTOMATION COMPONENTS INC., ENERCORP INSTRUMENTS LTD, GREYSTONE ENERGY SYSTEMS INC.,

OUTDOOR AIR TEMPERATURE SENSOR TWO OUTDOOR AIR TEMPERATURE SENSORS SHALL BE INSTALLED AND SHALL BE PROGRAMMED TO CHECK EACH OTHER FOR ACCURACY. IN THE EVENT OF SENSOR FAILURE THE SENSOR DEEMED TO BE ACCURATE SHALL BE USED TO CONTROL THE SYSTEMS. THE OUTDOOR AIR SENSORS SHALL BE LOCATED ON A NORTH WALL IF POSSIBLE AND A MINIMUM OF THREE (3) FEET FROM ANY OPENING IN THE BUILDING ENVELOPE WHICH COULD AFFECT THE SENSOR READINGS. THE BACK FACE OF THE SENSOR ENCLOSURE SHALL BE INSULATED TO PREVENT TEMPERATURE PICK UP FROM THE BUILDING WALL. B. TECHNICAL PERFORMANCE, 10 K OHM THERMISTOR -500/C TO 500/C IN A WEATHERPROOF ENCLOSURE MOUNTED ON NORTH EXPOSURE. END ACCURACY OF +/- 0.30/C OVER THE ENTIRE OPERATING RANGE.

10.8 PIPE TEMPERATURE SENSOR WELL - TECHNICAL PERFORMANCE - 10K OHM THERMISTOR SENSOR ENCAPSULATED IN A 6MM OD, 50MM LONG PROBE, WITH SCREW FITTING FOR INSERTION INTO A STANDARD THERMOWELL. OPERATING RANGE -10 - +100 O/C. END-TO-END ACCURACY +/- 0.3 O/C OVER THE ENTIRE OPERATING RANGE. COMPLETE WITH BRASS THERMOWELL. USE HEAT TRANSFER PASTE WHEN MOUNTING THE SENSOR IN THERMOWELL. NO SURFACE MOUNT STRAP ON TEMPERATURE SENSORS SHALL BE USED TO MONITOR FLUID TEMPERATURE UNLESS APPROVED BY THE CONSULTANT.

11 FNCLOSURE THE BAS CONTROL AND POWER SUPPLY CABINETS SHALL CONFORM WITH THE FOLLOWING: 11.1 PANEL ENCLOSURES SHALL BE A LOCKING TYPE, METAL CABINET, WITH COMMON KEYING. 11.2 CSA CERTIFIED 150359 AND UL LISTED E109310. 11.3 16 OR 14 GAUGE STEEL. 11.4 SLIP HINGES ENABLING DOOR REMOVAL FOR EASIER ACCESS AND MOUNTING. DOOR SHALL BE LOCKABLE. 11.5 1/4 TURN KEYED LATCH STANDARDIZED TO G549 KEYSET.

11.6 14 OR 12 GAUGE GALVANIZED STEEL PANEL ON COLLAR STUDS NATURAL 11.7 GROUNDING STUD ON INNER COVER SURFACE. 11.8 GROUNDING HOLE ON MOUNTING PANEL WITH GROUNDING SCREW. 11.9 ANSI/ASA61 GREY POLYESTER - EPOXY TEXTURED POWDER COATING INSIDE

11.10 3" DEEP WIRE DUCT SHALL BE INSTALLED TO NEATLY CONCEAL 11.11 POWER SUPPLY CABINETS SHALL BE PROVIDED WITH AN ESA FIELD **FVALUATION APPROVAL.** 11.12 2-100VA 120/24 TRANSFORMERS CLASS II UL5085-3. OVER CURRENT PROTECTION BY CIRCUIT BREAKER. OUTLET RECEPTACLE FOR SERVICE LAPTOP POWER.

12 BAS DATABASE NAMING CONVENTIONS & PROGRAMS ALL BAS PROGRAMS SHALL BE CREATED IN EACH PANEL IN LOGICAL ORDER AS DETERMINED BY THE EQUIPMENT BEING CONTROLLED BY EACH PANEL ON THE NETWORK. 12.2 ALL PROGRAMS AND PROGRAM CODE IS TO FOLLOW PROPER CODING PRACTICES INCLUDING INTERNAL COMMENTS TO DESCRIBE THE FUNCTION OF THE STATEMENTS AND ALSO ENSURE THE SOURCE CODE IS FORMATTED IN A CONSISTENT AND LOGICAL MANNER. PROGRAMMING CODING SHOULD BE KEPT AS SIMPLE AS POSSIBLE 12.3 SYSTEM SCHEDULES SHALL BE SUBMITTED FOR APPROVAL AND WILL INCLUDE GLOBAL AND LOCAL SCHEDULING. 12.4 THE OUTDOOR AIR TEMPERATURE PROGRAM SHALL BE IN ITS OWN PROGRAM

BUILDING, PANEL LOCATION AND PANEL NUMBER. THE BUILDING NAME CAN BE ABBREVIATED AS NECESSARY TO FIT IN THE SPACE. GRAPHIC DISPLAY SCREENS 13.1 ALL GRAPHIC DISPLAY SCREENS SHALL HAVE THE FOLLOWING COMMON ELEMENTS AND FUNCTIONS REGARDLESS OF SYSTEM MANUFACTURER. EVERY SITE SHALL HAVE A GRAPHIC DISPLAY SCREEN FOR SITE GRAPHIC, SYSTEM ARCHITECTURE, EACH AIR HANDLER, EMERGENCY GENERATOR, LIGHTING, EXHAUST FANS, HEAT RECLAIM, AND FOR EACH ROOM CONTROLLED BY THE BAS SYSTEM.

12.5 NETWORK STATUS PANEL NAMING CONVENTIONS SHOULD INDICATE THE

13.2 ALL OPERATOR ACCESSIBLE POINTS SHALL BE YELLOW TEXT AND ALL INFORMATION POINTS SHALL BE BLUE. 13.3 TRENDING SHALL BE ACCESSIBLE FROM THE GRAPHICS SCREENS FOR EACH POINT. EACH POINT SHALL HAVE ITS ASSOCIATED TREND CAPABILITY ACCESSIBLE FROM THE GRAPHIC VIA AN ICON LOCATED BESIDE THE POINT NAME ON THE GRAPHIC PAGE. 13.4 APPENDIX A, LOCATED AT THE END OF THIS DOCUMENT, SHOWS EXAMPLES OF TYPICAL GRAPHIC SCREENS. THESE ARE EXAMPLES ONLY. GRAPHICS SHALL COMPLY WITH THE FOLLOWING SPECIFIC SCREEN CONTENT. NOT ALL EQUIPMENT

OTHER EQUIPMENT: 13.5 GRAPHIC SCREENS GENERAL ALL SCREENS A. NAVIGATION BUTTONS TO EACH MAJOR SYSTEM IN THE BUILDING WHICH INDICATE CURRENT SCREEN DISPLAY BY A CHANGE IN BUTTON COLOUR

AND SYSTEMS ARE LISTED BELOW BUT THE FORMAT WILL BE THE SAME FOR

BACKGROUND COLOUR SHALL BE BLACK OUTDOOR AIR TEMPERATURE SHALL BE DISPLAYED ON EVERY GRAPHIC 13.6 SITE GRAPHIC

THE OWNER LOGO SHALL BE ON THE SITE OR OPENING GRAPHIC SCREEN ARTIST CONCEPT OR SCANNED IN PICTURE OF THE FRONT OF THE BUILDING ACCESS LINKS TO ALL GLOBAL SCHEDULES OR SPECIFIC SCREENS AFFECTING ENTIRE BUILDING OPERATION D. ACCESS BUTTONS LINKS TO SET TIME, HOLIDAY SCHEDULE, SCHEDULE, ALARMS, POINTS ON MANUAL

13.7 SYSTEM ARCHITECTURE CONTROL PANEL LAYOUT AND NETWORK ARCHITECTURE INDICATING BAS PANELS AND PANEL TYPE(MODEL) PANEL LOCATIONS ROOM NUMBER TEXT ON SCREEN

SYSTEMS CONTROLLED BY EACH PANEL LINKS TO POINTS LIST ACCESSIBLE FROM EACH PANEL 13.8 ARCHITECTURE PANEL LAYOUT (LOCATIONS ON FLOOR PLANS) LOCATIONS OF EACH PANEL ON EACH FLOOR PLAN LEVEL PANEL TYPES INDICATED BY DIFFERENT ICON CONTROLS TRANSFORMERS LOCATIONS

MAIN NETWORK WIRING AND SUB-NETWORK WIRING LAYOUT

EACH AIR HANDLER BY A CORRESPONDING COLOUR

FLOOR PLANS GRAPHICS ROOM NUMBERS ACCURATE AS PER ROOM SIGNAGE MECHANICAL ROOMS LOCATIONS & SIGNAGE TAGS SPACE TEMPERATURES FOR EVERY TEMPERATURE ON EACH FLOOR IN APPROPRIATE ROOM SPACE FOCUS PICK AREA FOR INDIVIDUAL ROOM CONTROL WHERE APPLICABLE SHALL BE YELLOW TEXT AIR HANDLER SYMBOLS INDICATING AREAS OF THE FLOOR PLAN SERVICED BY

STATUS OF AIR HANDLER BY COLOUR CHANGE RED FOR OFF STATUS, OR TEXT INDICATION G. SUPPLY AIR TEMPERATURE FOR EACH AIR HANDLER

14 INSTALLATION 14.1 ALL WIRING LINE AND LOW VOLTAGE SHALL BE INSTALLED IN ELECTRIC METALLIC TUBE (EMT) CONDUIT UNLESS SPECIFICALLY SPECIFIED OTHERWISE IN THE CONTRACT DOCUMENTS. 14.2 ALL WIRING SHALL BE IN ACCORDANCE WITH THE ONTARIO ELECTRICAL CODE AND ANY APPLICABLE LOCAL CODES. ALL BAS WIRING SHALL BE INSTALLED IN CONDUIT UNLESS OTHERWISE ALLOWED BY THE ONTARIO ELECTRICAL CODE OR APPLICABLE LOCAL CODES. WHERE BAS PLENUM-RATED CABLE WIRING IS ALLOWED, IT SHALL BE RUN PARALLEL TO, OR AT RIGHT ANGLES TO, THE STRUCTURE, PROPERLY SUPPORTED AND INSTALLED IN A NEAT AND WORKMANLIKE MANNER. BAS WIRING THAT RUNS IN EXPOSED CEILING SPACES (FOR EXAMPLE. GARAGES, MECHANICAL ROOMS) SHALL BE INSTALLED IN CONDUIT. 14.3 IN ACCESSIBLE CEILINGS, WIRING FROM BAS CONTROLLERS TO SENSORS AND ACTUATORS, CONTROL SYSTEM NETWORK AND LOW VOLTAGE WIRING ONLY MAY BE NSTALLED WITH YELLOW JACKET LVT CABLE. WHERE THE CEILING IS USED AS A RETURN AIR PLENUM INSTALL PLENUM RATED YELLOW JACKET CABLE INSTEAD OF

14.4 BX OR FLEX CONDUIT SHALL ONLY BE USED FOR THE FINAL

(APPROXIMATELY ONE METRE) RUN TO CONTROLS DEVICES, WHERE THE CONTROLS EQUIPMENT IS MOUNTED ON VIBRATING MACHINERY 14.5 INSTALL EMT AND CABLE AT RIGHT ANGLES TO BUILDING LINES. SECURELY FASTENED, AND IN ACCORDANCE WITH THE STANDARDS SET OUT IN DIVISION 16 14.6 NO WIRE SMALLER THAN 18 GAUGE SHALL BE USED IN THE WORK EXCEPT FOR: WIRING BETWEEN TERMINAL COMPUTER DEVICES, WIRE IN STANDARD COMMUNICATION CABLES, SUCH AS PRINTERS AND SHORT HAUL MODEMS. WIRE USED IN COMMUNICATION NETWORKS, THAT IS, ANY CABLE TRANSFERRING DIGITAL DATA, USING TWISTED SHIELDED PAIRS.

14.7 ALL FIELD WIRING INCLUDING SENSOR WIRING AND WIRING FROM PANELS TO DEVICES SHALL BE CONTINUOUS. THE USE OF WIRE CONNECTORS, WIRE NUTS OR SPLICING IS NOT ALLOWED. 14.8 PROVIDE WELLS FOR ALL SPECIFIED TEMPERATURE SENSORS IN HYDRONIC PIPING SYSTEM. STRAP-ON SENSORS SHALL BE ONLY BE USED WHERE A WELL INSTALLATION IS NOT POSSIBLE. OBTAIN THE APPROVAL OF THE CONSULTANT FOR THE USE OF STRAP-ON SENSORS. 14.9 POWER FOR CONTROL SYSTEM SHALL NOT BE OBTAINED BY TAPPING INTO

MISCELLANEOUS CIRCUITS THAT COULD BE INADVERTENTLY BE SWITCHED OFF. 14.10 MOUNT TRANSFORMERS AND OTHER PERIPHERAL EQUIPMENT IN PANELS LOCATED IN SERVICEABLE AREAS. PROVIDE LINE SIDE BREAKERS/FUSES FOR ALL TRANSFORMERS 14.11 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. 14.12 THE CONTROLLER SHALL BE POWERED FROM THE EQUIPMENT THAT IT IS DIRECTLY CONTROLLING (THAT IS, HEAT PUMP, ROOF-TOP UNIT) ONLY IF THE CONTROLLER CONTROLS NO OTHER EQUIPMENT AND THE POWER SUPPLY TO THE CONTROLLER REMAINS ENERGIZED INDEPENDENTLY OF UNIT OPERATION OR

14.13 ALL BAS CONTROL WIRING SHALL BE YELLOW JACKET FOR IDENTIFICATION PURPOSE. 14.14 THE BREAKER OR POWER ISOLATION LOCATION SHALL BE CLEARLY MARKED ON THE INSIDE DOOR OF EACH BAS PANEL ENCLOSURE. 14.15 WIRING IN CEILING SPACES TO BE INSTALLED CLEAR OF CEILING TILES AND LIGHTS TO ALLOW ACCESS AND REMOVAL OF TILES AND LIGHTS. 14.16 CONTRACTOR SHALL PREPARE A WIRING MOCK-UP OF A TYPICAL SYSTEM/DEVICE/MAIN PANEL TO DEMONSTRATE QUALITY AND WORKMANSHIP FOR APPROVAL BY THE OWNER. THIS APPROVED MOCK-UP QUALITY SHALL BE MAINTAINED THROUGHOUT THE ENTIRE INSTALLATION. SYSTEM REQUIRING MOCK-UP TO BE DISCUSSED WITH THE OWNER'S PROJECT MANAGER. 14.17 ALL WIRING SHALL BE ROUTED ORTHOGONALLY AND DROPS SHALL HAVE ADDITIONAL WIRING COILED IN CEILINGS TO FACILITATE FUTURE SENSOR

RELOCATION. 14.18 WIRING IN CEILING SPACES TO BE SECURED/TIED EVERY 48" MINIMUM. 14.19 SURGE SUPPRESSION SHALL COMPLY, AS A MINIMUM, WITH THE MANUFACTURER'S REQUIREMENTS.

ALL EQUIPMENT INCLUDING CONTROLLERS SHALL BE GROUNDED. ALL END-OF-WIRE CONNECTORS SHALL BE CERTIFIED. ALL COMPONENTS SHALL BE LABELLED AND DETAILED IN MANUALS. 14.23 ALL WIRING SYSTEMS SHALL BE COLOUR CODED TO SIMPLIFY MAINTENANCE ALL EQUIPMENT SHALL BE LOCATED FOR EASE OF SERVICE ACCESS. CONTRACTOR SHALL MAINTAIN A LIST OF DEFICIENCIES WHEN CLOSE TO COMPLETION, AND SHALL UPDATE THIS LIST ON A REGULAR BASIS FOR REVIEW BY THE OWNER'S REPRESENTATIVE.

14.26 IF THE PROJECT IS A RETROFIT OF AN EXISTING SYSTEM: A. CONTRACTOR SHALL REMOVE ALL OLD REDUNDANT WIRING FOLLOWING SYSTEM VERIFICATION B. RE-USE OF EXISTING WIRING IS NOT ALLOWED. RUN CONTINUOUS NEW

C. RE-USE OF COMPONENTS (FOR EXAMPLE, ENCLOSURES, TRANSFORMERS) IS NOT ALLOWED UNLESS APPROVED BY THE OWNER'S PROJECT MANAGER 15 EQUIPMENT LOCATION 15.1 ALL DISTRIBUTED EQUIPMENT SUCH AS CHILLER, COOLING TOWER, PUMP, ETC. THAT UTILIZE DEDICATED BAS CONTROLLERS, SHALL HAVE LOCALLY MOUNTED CONTROLLERS, IN ACCESSIBLE LOCATIONS WITHIN THE BUILDING ENVELOPE. ALL LOCALLY MOUNTED CONTROLLERS SHALL BE INSTALLED IN ENCLOSURES SUITABLE FOR THAT LOCATION, BAS CONTROLLERS FOR MECHANICAL EQUIPMENT OTHER

THAN THOSE LISTED ABOVE SHALL BE MOUNTED IN MECHANICAL ROOMS AS

NOTED BELOW, UNLESS SPECIFICALLY APPROVED BY THE CONSULTANT FOR THIS 15.2 ALL OTHER BAS CONTROLLERS, AND INTERFACE DEVICES THAT REQUIRE REGULAR INSPECTION OR THAT SERVE MULTIPLE HVAC SYSTEMS SHALL BE LOCATED IN MECHANICAL ROOMS, OR IN PRE-APPROVED STORAGE ROOMS, OR JANITOR CLOSETS. 15.3 NO BAS PANEL SHALL BE LOCATED INSIDE THE ROOFTOP FAN ENCLOSURE UNDER ANY CIRCUMSTANCES. ALL BAS PANELS SHALL BE LOCATED WITHIN THE BUILDING ENVELOPE, AND SHALL BE ENCLOSED IN A METAL LOCKING ENCLOSURE, AS SPECIFIED IN SUBSECTION 16.4 BELOW.

15.4 ALL EQUIPMENT LOCATED IN MECHANICAL ROOMS, STORAGE ROOMS OR JANITOR CLOSETS SHALL BE INSTALLED IN METAL CABINETS WITH HINGED, LOCKABLE COVERS. 15.5 TRANSFORMERS OR POWER SUPPLIES SHALL NOT BE LOCATED IN CEILING SPACES UNLESS APPROVED BY THE CONSULTANT FOR TERMINAL CONTROL VALVES. ACTUATORS OR ZONE CONTROLLERS. WHEN TRANSFORMERS ARE INSTALLED ABOVE CEILINGS, TRANSFORMERS SHALL BE INSTALLED IN METAL ENCLOSURES, AND THE LOCATION SHALL BE CLEARLY LABELED ON THE T-BAR CEILING TO INDICATE

POWER TRANSFORMER LOCATION. 15.6 A 120 VAC DUPLEX RECEPTACLE FOR LAPTOP POWER SHALL BE PROVIDED IF THE CABINET IS LOCATED FURTHER THAN 5' LATERALLY FROM THE NEAREST

IDENTIFICATION AND LABELLING EQUIPMENT 16.1 ALL PANELS MUST HAVE A LAMACOID TAG (MIN. 3"X1") AFFIXED TO THE FRONT FACE INDICATING PANEL DESIGNATION AND FUNCTION (FOR EXAMPLE, "BAS PANEL 1" OR "RELAY PANEL 3"). 16.2 ALL FIELD SENSORS OR DEVICES MUST HAVE A LAMACOID TAG (MIN. 3"X1") ATTACHED WITH TIE-WRAP OR ADHESIVE INDICATING THE POINT SOFTWARE NAME AND HARDWARE ADDRESS (FOR EXAMPLE, AHU1_MAT, 2.IP4) 16.3 ROOM SENSORS AND OTHER SENSORS IN FINISHED AREAS WILL REQUIRE A

16.4 ALL DEVICES WITHIN A FIELD ENCLOSURE SHALL BE IDENTIFIED VIA A LABEL

16.5 ALL BAS PANEL POWER SOURCES MUST BE IDENTIFIED BY AN ADHESIVE LABEL INDICATING THE SOURCE POWER PANEL DESIGNATION AND CIRCUIT NUMBER ON THE OUTSIDE OF THE ENCLOSURE DOOR (FOR EXAMPLE, "120VAC FED FROM LP-2A CCT #1). 16.6 ALL FIELD EQÜIPMENT PANELS FED FROM MORE THAN ONE POWER SOURCE MUST HAVE A WARNING LABEL ON THE FRONT COVER. 16.7 ALL WIRES SHALL BE IDENTIFIED WITH SELF-ADHESIVE WIRE LABELS OR CLIP-ON PLASTIC WIRE MARKERS AT BOTH ENDS.

16.8 ALL ROTATING EQUIPMENT CONTROLLED BY THE BAS SHALL HAVE A TAG OR LABEL AFFIXED INDICATING THAT THE EQUIPMENT STARTS WITHOUT WARNING. 16.9 ALL BAS PANELS SHALL HAVE A POINTS LIST SHEET (WITHIN A PLASTIC SLEEVE) ATTACHED TO THE INSIDE DOOR. THE POINTS LIST SHALL IDENTIFY THE FOLLOWING FOR EACH POINT: PANEL NUMBER, PANEL LOCATION, HARDWARE ADDRESS, SOFTWARE NAME, POINT DESCRIPTION, FIELD DEVICE TYPE, POINT TYPE (FOR EXAMPLE. AI OR DO). DEVICE FAIL POSITION, DEVICE MANUFACTURER AND MODEL NUMBER OR REFERENCE AND WIRE TAG REFERENCE. FIELD PANELS SHALL HAVE WIRING DIAGRAMS ATTACHED TO THE INSIDE

16. 11 PROVIDE NEW OR MODIFY EXISTING EQUIPMENT WIRING DIAGRAMS (FOR EXAMPLE, AIR HANDLING UNIT, ETC.) WHEREVER THE BAS INTERFACES TO OTHER EQUIPMENT 16.12 PROVIDE BAS INTERFACES BETWEEN EXISTING BAS AND NEW BAS CONTROLLER.

17.1 PERFORM ALL NECESSARY CALIBRATION, TESTING AND DE-BUGGING AND PERFORM ALL REQUIRED OPERATIONAL CHECKS TO ENSURE THAT THE SYSTEM IS FUNCTIONING. 17.2 UPON COMPLETION OF THE PERFORMANCE TESTS, REPEAT THESE TESTS, POINT-BY-POINT IN THE PRESENCE OF THE OWNER'S REPRESENTATIVE, AS REQUIRED. PROPERLY SCHEDULE THESE TESTS SO THAT TESTING IS COMPLETED BY THE TIME DIRECTED BY THE OWNER'S REPRESENTATIVE. 17.3 CONFIRM AND DEMONSTRATE TO THE CONSULTANT AND THE OWNER'S AGENT

7 COMMISSIONING

THAT ALL SYSTEMS ARE PROGRAMMED AND OPERATING CORRECTLY. WHEN PROJECT IS COMPLETE THE CONTRACT SHALL ALLOW SUFFICIENT PROGRAMMING TIME IN ORDER TO CUSTOMIZE THE SEQUENCES TO MEET OPERATIONAL NEEDS, FINE TUNING OF THE SYSTEM AND OTHER DUTIES AS REQUIRED. THE OWNER WILL DETERMINE THE SCHEDULE. 17.4 SUBMIT FOUR (4) COPIES OF THE SYSTEM COMMISSIONING REPORT TO THE

CONSULTANT FOR REVIEW AND APPROVAL. 17.5 EACH ANALOGUE INPUTS (I.E. TEMPERATURES, PRESSURE, ETC.) SHALL BE VERIFIED WITH AN APPROVED CALIBRATION DEVICE. ALL ACTUAL TEMPERATURE READINGS SHOULD BE WITH +/- 10/C OF THE READINGS OBSERVED AT THE 17.6 EACH ANALOGUE OUTPUT SHALL BE VERIFIED BY MANUALLY COMMANDING

THE OUTPUT CHANNEL FROM THE OPERATOR WORKSTATION TO TWO OR MORE POSITIONS WITHIN THE 0-100% RANGE AND VERIFYING THE ACTUAL POSITION OF THE ACTUATOR OR DEVICE. ALL DEVICES SHALL OPERATE OVER THEIR ENTIRE 0-100% RANGE FROM A MINIMUM CONTROL RANGE OF 10-90%. 17.7 DIGITAL OUTPUTS SHALL BE VERIFIED BY WITNESSING THE ACTUAL START/STOP OPERATION OF THE EQUIPMENT UNDER CONTROL. 17.8 DIGITAL INPUTS SHALL BE VERIFIED BY OBSERVING THE STATUS OF THE INPUT POINT AS THE EQUIPMENT IS MANUALLY CYCLED ON AND OFF. 17.9 RECORD ALL OUT-OF-SEASON OR UNVERIFIED POINTS IN THE COMMISSIONING REPORT AS "UNCOMMISSIONED".

THE BAS FIELD PANEL POWER SOURCE SHALL BE TOGGLED ON AND OFF TO ENSURE REBOOT FUNCTIONALITY AND POWER DOWN MEMORY RETENTION OF ALL PARAMETERS. DURING THE POWER DOWN TEST, ALL CONNECTED SYSTEM COMPONENTS SHOULD GO TO THEIR FAIL—SAFE STATE. 17.11 ALL TRENDS SHOULD BE REVIEWED TO ENSURE THAT SETPOINTS ARE BEING MAINTAINED AND EXCESSIVE CYCLING OF EQUIPMENT IS NOT OCCURRING 17.12 CONTROL LOOP TUNING PARAMETERS CAN BE VERIFIED BY APPLYING A CHANGE TO THE CURRENT SETPOINT AND OBSERVING THE RESULTING TREND LOG. SETPOINT SHALL BE REACHED IN A "REASONABLE" PERIOD OF TIME WITHOUT EXCESSIVE CYCLING OR HUNTING OF THE CONTROLLED DEVICE.

18.1 ONCE FIVE (5) CONSECUTIVE DAYS OF ALARM-FREE OPERATION ARE COMPLETE AND DOCUMENTED, OPERATOR TRAINING MAY BEGIN. 18.2 PROVIDE ONE (1) DAY OF INSTRUCTION TO THE OWNER'S DESIGNATED PERSONNEL ON THE OPERATION OF THE BAS AND DESCRIBE ITS INTENDED USE WITH RESPECT TO THE PROGRAMMED FUNCTIONS. OPERATOR ORIENTATION OF THE BAS SHALL INCLUDE, BUT NOT BE LIMITED TO, THE OVERALL OPERATION PROGRAM, EQUIPMENT FUNCTIONS (BOTH INDIVIDUALLY AND AS PART OF THE TOTAL INTEGRATED SYSTEM). COMMANDS, SYSTEMS GENERATION, ADVISORIES, AND APPROPRIATE OPERATOR INTERVENTION REQUIRED IN RESPONDING TO THE SYSTEM'S OPERATION.

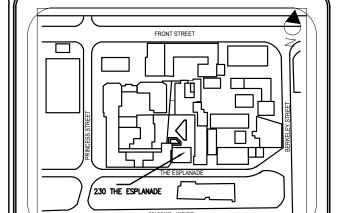
19.1 PROVIDE A WARRANTY FOR ALL COMPONENTS SUPPLIED UNDER THIS CONTRACT FOR A PERIOD OF TWO YEARS FROM SUBSTANTIAL PERFORMANCE OF THE WORK. REPLACE ALL CONTROLS EQUIPMENT THAT FAILS DURING THIS PERIOD WITHOUT COST TO THE OWNER. 19.2 ALL CONTROLLERS SHALL HAVE A 5 YEAR MANUFACTURER'S WARRANTY. 20 AS-BUILT DOCUMENTATION 20.1 WITHIN TWO WEEKS FOLLOWING SUBSTANTIAL PERFORMANCE OF THE WORK. UPDATE THE ORIGINAL SUBMITTAL DOCUMENTS TO REFLECT THE "AS BUILT"

CONDITIONS OF THE PROJECT AND SUBMIT FOUR COPIES AS REQUIRED BY THE CONSULTANT AND/OR THE PROJECT MANAGER. 20.2 PROVIDE A SEPARATE LAMINATED COPY OF THE CONTROL DRAWINGS FOR MOUNTING IN THE MECHANICAL ROOM OR IN THE CONTROLS PANELS. 20.3 PROVIDE FINAL POINT LISTS, SHOP DRAWINGS AND ALL INSTALLED EQUIPMENT DATA AND OPERATIONS SHEETS.

20.4 SUBMIT DISKETTES/CDS (INCLUDING BACK-UP DISKETTES/CDS) CONTAINING UP TO DATE COPIES OF THE PROGRAMS IN EACH CONTROLLER. PROVIDE ORIGINAL PROGRAM DISKS AND DOCUMENTATION PROVING REGISTRATION FOR ALL SOFTWARE PROGRAMS PROVIDED AS A PART OF THIS CONTRACT INCLUDING: THE BAS OPERATOR INTERFACE SOFTWARE, AND THE BAS GRAPHICS (BITMAP FILES). PROVIDE ONE SET OF ORIGINAL DISKS FOR EVERY COMPUTER SUPPLIED UNDER THIS CONTRACT OR THAT THE SOFTWARE HAS BEEN LOADED ONTO. 20.5 SUBMIT FOUR PRINTED COPIES OF THE FINAL PROGRAMS THAT INCLUDE ALL POINT DEFINITIONS, WEEKLY AND ANNUAL SCHEDULE SETTING, CONTROLLER SETPOINTS AND TUNING PARAMETERS. AND DOCUMENTED PROGRAMMED SEQUENCES OF OPERATION.

CONTROL POINTS AND POINTS LIST 21.1 A TYPICAL POINTS LIST FOR SYSTEM CONTROL AND MONITORING IS SHOWN IN APPENDIX B (LOCATED AT THE END OF THIS DOCUMENT) AND SHALL BE USED AS A GUIDE FOR SYSTEM DESIGN. 21.2 THIS POINTS LIST IS NOT INTENDED TO BE COMPLETE. IT IS INTENDED TO BE A TYPICAL LIST TO CAPTURE ALL FORESEEABLE EQUIPMENT TYPES. PROJECT SPECIFIC POINTS LIST MUST BE CREATED ON A PROJECT-BY-PROJECT BASIS BY THE BAS CONTRACTOR AND SHALL BE REVIEWED BY THE OWNER. 21.3 OWNER STAFF SHALL BE CONSULTED TO DEVELOP THE SEQUENCE OF OPERATIONS. OWNER WILL PROVIDE THE BACNET ADDRESS RANGE FOR EACH

21.4 ALL CONTROL POINTS SHALL HAVE BUILT IN TIME DELAYS TO PREVENT 21.5 POINT NAMING CONVENTIONS SHALL BE SUBMITTED FOR REVIEW BY THE OWNER PROJECT TEAM. NAMES MAY BE CHANGED TO COMPLY WITH THE OWNER'S NAMING CONVENTIONS.



KEY PLAN

3 ISSUED FOR TENDER/PERMIT 26 FEB 2 2 ISSUED FOR 100% 04 FEB 25 1 ISSUED FOR REVIEW 14 JAN 2

DATE

ONTRACTOR MUST CHECK AND VERIFY ALL DIMENSIONS AND BE RESPONSIBLE FOR SAME, REPORTING ANY DISCREPANCIES TO THE OWNER, BEFORE TENDER CLOSING.

LATEST APPROVED DRAWINGS ONLY O BE USED FOR CONSTRUCTION.

PRINTS ARE NOT TO BE SCALED.

REVISION



PARKS & RECREATION CAPITAL PROJECTS METRO HALL 55 JOHN STREET, 24th FLOOR TORONTO, ONTARIO, M5V 3C6



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Project Name: ST. LAWRENCE CRC & DAYCARE

Project Address 230 THE ESPLANADE TORONTO, ON

Job Descript. : ROOFING & CHILLER REPLACEMENT

CONTROL SPECIFICATION

Design: AN DRAWN: AN Approv.: BZ Scale: AS SHOWN

February 26, 25

Project No.

Date:

Job No.



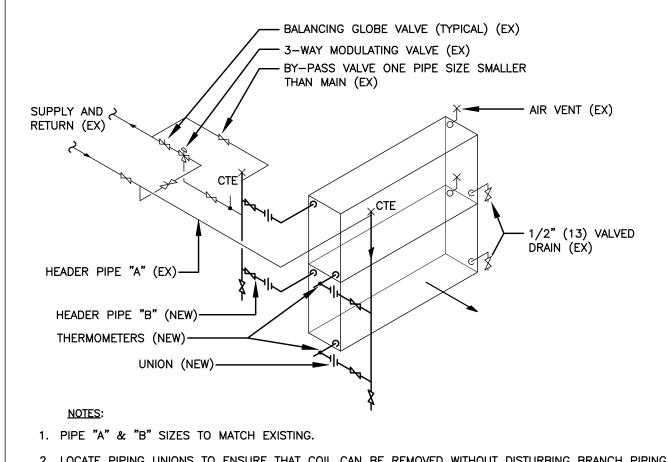
COOI	COOLING TOWER SCHEDULE(NEW)															
TAC	LOCATION	MAKE	MODEL	FL	UID TEMP	(F*)	COOLING CAPACITY	FLOW (GPM)	FAN AIR FLOW	FAN MOTOR	EL ECTRICAL	ПА	OPERATING	DIMENCIONIC	DIMENSIONS	
IAG	LOCATION	MAKE	MODEL	ENTERING	LEAVING	ENERING (WET)	МВН	FLOW (GPM)	(CFM)	(HP)	ELECTRICAL	FLA	WEIGHT (LBS)	DIMENSIONS	REMARK	
CT1, CT2	ROOF	EVAPCO	LSTE-4512	96.1	505.1	76	4830	483	26,000	15	575/3/60	14.4	4740	4'- 5 " x 11'-11 ½" x 10'-10 3 "	1. C/W NEW STEEL SUPPORTS, SPRING MOUNTED ISOLATORS, LADDER/SAFETY CAGE, 304 STAINLESS STEEL BASIN. 2. CONNECT TO EXISTING BAS SYSTEM	

1) HEATING CONTROLS BY MECHANICAL CONTRACTOR, HEATING STEP-DOWN TRANSFORMER BY ELECTRICAL.
2) INTERLOCK IMMERSION HEATER WITH SPRAY PUMP. HEATER ARE ONLY TO BE ON WHEN THE UNIT IS OFF.
3) OR APPROVED EQUIVALENT.

Cl	HILL	ER SCHEDUI	LE(NEW	/)														
U	NIT	MANUFACTURER MODEL No.	CAPACITY		EVAPO	RATOR		CONDENSER				DOWER	MCA	HOD			REFIRGERANT	DEMANA
R	EF.		TONS	FLOW RATE(GPM)	ENTERING (TEMP.*F)	ENERING (WET)	ΔP(FT H20)	FLOW RATE(GPM)	ENTERING (TEMP.*F)	LEAVING (TEMP.*F)	ΔP(FT H2O)	POWER	MCA	MOP	(LBS)	(WxDxH)	REFIRGERANT	REMARK
	H-1 IEW)	MULTISTACK (4) MSS085KCCA	332.9	798.5	54	44	15.55	964.3	86	96	17.76	575/3/60	314	400	10,500	144"X61"X80"	R454B	CONNECT TO EXISTING BAS SYSTEM OR APPROVED EQUIVALENT.

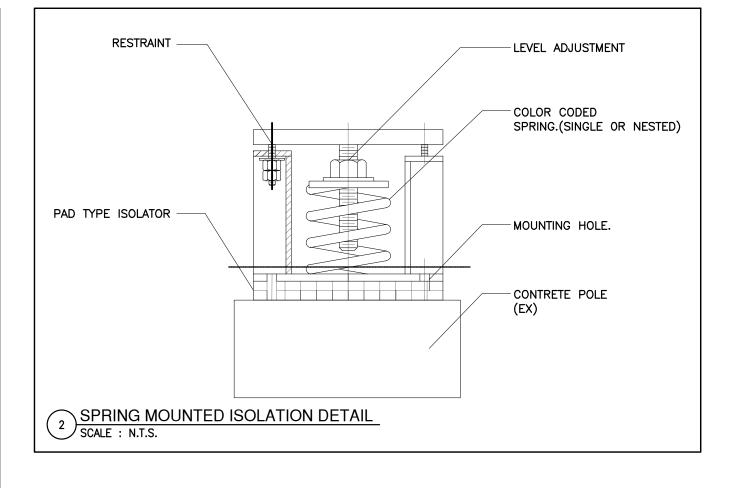
COOL	COOLING COIL SCHEDULE																					
UNIT	MANUFACTURER	L/S	COIL SIZE	N.T.L.	TUBE FACE	SERIES	TUBE FACE	ROWS	TYPE AIR P.D.		TVDE	TVDE	TVDE	AIR P.D.	TOPE AIR P.D.		ar AIR P.D.	ENT AIR °C		LEAV AIR °C		DELIABIA
REF.	MODEL No.	L/3	(M ²)	(MM)	TOBE FACE	SERIES	TOBE FACE	ROWS	TYPE	KPA	D.B	W.B	D.B	W.B	REMARK							
ACS-4	AEROFIN	5899	2.23	2134	30	80	30	6	С	0.25	25.9	18.6	11.7	10.6	CONNECT TO EXISTING BAS SYSTEM OR APPROVED EQUIVALENT.							

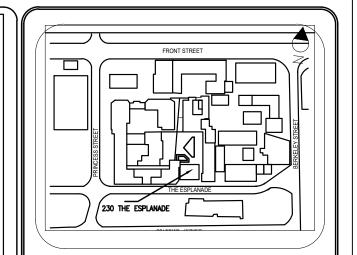
PU	MP	SCHEDULE						
	NIT EF.	MANUFACTURER MODEL No.	USGPM	HD.KPA	RPM	BHP	ELECTRICAL	REMARK
WA ⁻	ND. TER MP	ARMSTRONG 4300 0813-020.0	960	164.5	1133	-	575/3/60	1. C/W VFD 2. WIRED TO NEW CHILLER 3. OR APPROVED EQUIVALENT.



- 2. LOCATE PIPING UNIONS TO ENSURE THAT COIL CAN BE REMOVED WITHOUT DISTURBING BRANCH PIPING.
- 3. FOR NUMBER OF COILS IN EACH BANK SEE EQUIPMENT SCHEDULE.

DETAIL OF COOLING COIL PIPING CONNECTIONS SCALE: N.T.S.





KEY PLAN

5		
4		
3	ISSUED FOR TENDER/PERMIT	26 FEB 25
2	ISSUED FOR 100%	04 FEB 25
1	ISSUED FOR REVIEW	14 JAN 25
10.	REVISION	DATE

CONTRACTOR MUST CHECK AND VERIFY ALL DIMENSIONS AND BE RESPONSIBLE FOR SAME, REPORTING ANY DISCREPANCIES TO THE OWNER, BEFORE TENDER CLOSING.

LATEST APPROVED DRAWINGS ONLY TO BE USED FOR CONSTRUCTION.

PRINTS ARE NOT TO BE SCALED.



PARKS & RECREATION CAPITAL PROJECTS METRO HALL 55 JOHN STREET, 24th FLOOR TORONTO, ONTARIO, M5V 3C6





494 McNicoll Avenue, Suite # 201 Toronto, Ontario, M2H 2E1 Tel. : (647) 974—7006 Web Site : www.tabcon.com

Project Name :

ST. LAWRENCE CRC & DAYCARE

Project Address : 230 THE ESPLANADE

TORONTO, ON Job Descript. :

ROOFING & CHILLER REPLACEMENT

MECHANICAL DETAILS AND SCHEDULE

PLA A Sa		AN BZ AS SHOWN February 26, 25	
0. P. ZHAMG 100119933 26 FEB 25	Project N		Dwg.N

Job No.



ELECTRICAL LEGEND					
POWER					
SINGLE PHASE DIRECT CONNECTION OUTLET. (HARDWIRE DIRECT CONNECTION TO EQUIPMENT TERMINALS).] 1				
THREE PHASE DIRECT CONNECTION OUTLET. (HARDWIRE DIRECT CONNECTION TO EQUIPMENT TERMINALS).					
DISCONNECT SWITCH					
MAGNETIC STARTER					
MANUAL SWITCH, 120V SINGLE POLE.					
DUPLEX RECEPTACLE. (20A,1P, 120V UNLESS OTHERWISE NOTED). 'GFI' DENOTES GROUND FAULT CIRCUIT INTERRUPTER TYPE 'WP' DENOTES WEATHER PROOF					
FIRE ALARM SYSTEM					
AIR DUCT TYPE SMOKE DETECTOR					
	POWER SINGLE PHASE DIRECT CONNECTION OUTLET. (HARDWIRE DIRECT CONNECTION TO EQUIPMENT TERMINALS). THREE PHASE DIRECT CONNECTION OUTLET. (HARDWIRE DIRECT CONNECTION TO EQUIPMENT TERMINALS). DISCONNECT SWITCH MAGNETIC STARTER MANUAL SWITCH, 120V SINGLE POLE. DUPLEX RECEPTACLE. (20A,1P, 120V UNLESS OTHERWISE NOTED). 'GFI' DENOTES GROUND FAULT CIRCUIT INTERRUPTER TYPE 'WP' DENOTES WEATHER PROOF FIRE ALARM SYSTEM				

ABBREVIATIONS

DRAWING LIST

WP WEATHER PROOF

EC EMPTY CONDUIT.

C/W COMPLETE WITH.

SS STAINLESS STEEL

C CONDUIT.

CLG CEILING.

E EXISTING TO REMAIN

R/R REMOVE AND REINSTALL

AFF ABOVE FINISHED FLOOR

JB JUNCTION BOX

ER EXISTING IN RELOCATED POSITION

E1 | ELECTRICAL LEGEND AND SPECIFICATIONS

E4 ELECTRICAL SINGLE LINE DIAGRAM

E2 MECHANICAL PENTHOUSE PLAN — ELECTRICAL DEMOLITION PLAN

E3 MECHANICAL PENTHOUSE PLAN - ELECTRICAL NEW POWER PLAN

R EXISTING TO BE REMOVED AND/OR RELOCATED

ELECTRICAL SPECIFICATIONS

16.1 GENERAL CONDITIONS

- a) PROVIDE ALL LABOR, MATERIAL, EQUIPMENT, ETC. REQUIRED TO COMPLETE ALL WORK SHOWN ON THE DRAWINGS OR HEREIN SPECIFIED. THE WORK SHALL BE IN ACCORDANCE WITH LATEST RULES AND REGULATIONS OF ALL AUTHORITIES HAVING LEGAL JURISDICTION OVER THE WORK. INCLUDE ANY SMALL ITEMS OF WORK NOT SPECIFICALLY CALLED FOR BUT REQUIRED TO COMPLETE THE INTENDED INSTALLATION.
- b) THE ENGINEER RESERVES THE RIGHT TO APPROVE THE QUALITY OF MATERIAL AND WORKMANSHIP, ALSO TO CALL FOR ANY TESTS WHICH ARE DEEMED NECESSARY DURING THE PROGRESS OF THE WORK AND A COMPLETE TEST OF EACH SYSTEM AT THE COMPLETION OF THE WORK. THE COST OF SUCH TESTS ARE NOT TO BE CONSIDERED AS EXTRAS.

ALL ITEMS OR SPECIFICATIONS RELATED TO THE SERVICES INDICATED ON THE DRAWINGS SHALL APPLY TO THE PROJECT. THE BIDDING REQUIREMENTS AND GENERAL REQUIREMENTS (APPLICABLE SECTIONS) OF ARCHITECTURAL SPECIFICATIONS SHALL ALSO GOVERN THE WORK OF THIS DIVISION.

16.2 SCOPE OF WORK

WORK TO BE DONE SHALL INCLUDE FURNISHING OF LABOUR, MATERIALS AND EQUIPMENT REQUIRED FOR INSTALLATION, TESTING AND PUTTING INTO PROPER OPERATION FOR COMPLETE ELECTRICAL SYSTEMS AS SHOWN, AS SPECIFIED AND AS OTHERWISE REQUIRED.

16.3 CODES, STANDARDS, PERMITS AND INSPECTION

- a) WORK TO MEET OR EXCEED THE MINIMUM STANDARDS OF THE FOLLOWING: - CANADIAN ELECTRICAL CODE, CURRENT EDITION, PART 1, CSA STANDARDS AS
 - ADOPTED AND AMENDED BY PROVINCIAL REGULATIONS AND ONTARIO BUILDING
- ONTARIO ELECTRICAL SAFETY CODE, CURRENT EDITION AND ALL
- LOCAL ELECTRICAL SUPPLY UTILITY CODES AND REGULATIONS. LOCAL ELECTRICAL SUPPLY UTILITY CODES AND REGULATIONS. - ALL ELECTRICAL WORK SHALL COMPLY WITH LANDLORD'S REQUIREMENTS
- AND BASE BUILDING STANDARD. b) THE ABOVE CODES AND ANY ADDITIONAL REQUIREMENTS OF THE LOCAL OR
- PROVINCIAL AUTHORITY SHALL FORM AN INTEGRAL PART OF THIS SPECIFICATION AS IF WRITTEN IN FULL. c) BE RESPONSIBLE TO APPLY FOR AND OBTAIN ALL PERMITS, INSPECTIONS, EQUIPMENT
- APPROVALS ETC. AS REQUIRED BY ALL AUTHORITIES HAVING JURISDICTION OVER THIS WORK AND PAY FOR SAME. THESE COSTS SHALL BE INCLUDED IN THE TENDER PRICE.
- d) DELIVER ALL PERMITS TO THE OWNER'S REPRESENTATIVE AS SOON AS THEY BECOME AVAILABLE.

THE OWNER, THE FINAL UNCONDITIONAL CERTIFICATE OF APPROVAL.

e) ARRANGE FOR INSPECTION OF ALL ELECTRICAL WORK BY THE ELECTRICAL SAFETY AUTHORITY INSPECTION DEPARTMENT. ON COMPLETION OF THE WORK, PRESENT, TO

16.4 INSURANCE

CONTRACTOR SHALL MAINTAIN SUCH INSURANCE TO FULLY PROTECT BOTH THE OWNER AND HIMSELF FROM ANY AND ALL CLAIMS UNDER THE WORKMANS COMPENSATION ACT AS WELL AS ALL INSURANCE AS NOTED WITHIN

ARCHITECTURAL GENERAL CONDITIONS. 16.5 CONTRACT DOCUMENT

SPECIFICATIONS AND DRAWINGS ARE INTENDED TO COVER THE EQUIPMENT SPECIFIED. IT IS NOT THE INTENT TO DESCRIBE OR SHOW EVERY DETAIL, AND IT SHALL BE AGREED THAT THE CONTRACTOR PROVIDE ALL WORK AND MATERIAL REQUIRED FOR A COMPLETE AND WORKING SYSTEM ACCORDING TO THE REQUIREMENTS AND INTENT OF THE SPECIFICATIONS AND DRAWINGS.

ANY DISCREPANCIES SHALL BE SUBMITTED TO THE CONSULTANT FOR HIS INSTRUCTIONS

DO NOT SCALE OR MEASURE DRAWINGS, BUT OBTAIN INFORMATION REGARDING ACCURATE DIMENSIONS BY SITE REQUIREMENTS.

16.6 EXAMINATION OF SITE

VISIT THE SITE OF THE PROJECT AND FAMILIARIZE YOURSELF WITH ALL CONDITIONS PERTAINING TO THE WORK PRIOR TO SUBMITTING TENDER. NO ALLOWANCE WILL BE MADE FOR OBVIOUS CONSIDERATIONS WHICH MAY BE OVERLOOKED. THIS INCLUDES THE EXISTING SERVICES ABOVE CEILING.

REPORT ANY DEVIATION OR DISCREPANCY AND/OR CONFLICTS TO THE

SCHEDULE AND PERFORM ALL WORK TO MEET THE COMPLETION DATES AS SET OUT RY THE OWNER'S REPRESENTATIVE. COSTS OF ANY OVERTIME TO MEET THE SCHEDULE SHALL BE DEEMED TO BE INCLUDED IN THE TENDER PRICE.

16.7 SHOP DRAWINGS

SUBMIT PDF FILES OF MANUFACTURER'S SHOP DRAWINGS TO THE CONSULTANT FOR REVIEW. SUBMITTED SHOP DRAWINGS MUST INDICATE DETAILS OF CONSTRUCTION, DIMENSIONS, SCALE, CAPACITIES, WEIGHTS AND ELECTRICAL PERFORMANCE CHARACTERISTICS OF EQUIPMENT OR MATERIALS, AS WELL AS PROJECT NAME.

REVIEW SUBMITTALS PRIOR TO SUBMISSION TO CONSULTANT. THIS REVIEW REPRESENTS THAT NECESSARY REQUIREMENTS HAVE BEEN DETERMINED AND VERIFIED. OR WILL BE. AND THAT EACH SUBMITTAL HAS BEEN CHECKED AND CO-ORDINATED WITH REQUIREMENTS OF THE WORK AND CONTRACT DOCUMENTS.

NO EQUIPMENT SHALL BE DELIVERED TO THE JOB SITE UNLESS THE MANUFACTURER HAS RECEIVED A "REVIEWED" OR "REVIEWED AS NOTED" COPY OF THE PERTINENT SHOP DRAWING.

REVIEW OF SHOP DRAWINGS BY THE CONSULTANT SHALL NOT ALLEVIATE THE ELECTRICAL CONTRACTOR FROM HIS CONTRACTUAL RESPONSIBILITY FOR ITS CORRECTNESS AND COMPLIANCE WITH THE CONTRACT DOCUMENTS, DIMENSIONS AND DESIGN DETAILS.

16.8 AS BUILT DRAWINGS

- a. AT THE COMPLETION OF THE WORK, ONE ELECTRONIC COPY OF LATEST DRAWINGS IN AUTOCAD 2006 FORMAT WILL BE BY PROVIDED BY THE CONSULTANT TO THE ELECTRICAL CONTRACTOR, FOR THE PURPOSE OF PREPARING RECORD DRAWINGS.
- RECORD, AS THE JOB PROGRESSES, ALL APPROVED CHANGES AND DEVIATIONS MADE TO ANY WORK SHOWN ON THE ORIGINAL CONTRACT DRAWINGS WHETHER BY ADDENDA, REQUESTED CHANGES, JOB INSTRUCTIONS, AND CHANGES DUE TO JOB CONDITIONS.
- c. ALL MAIN BRANCH CONDUIT RUNS, JUNCTIONS BOX LOCATIONS, ETC., MUST BE REFLECTED ON THE AS-BUILT DRAWINGS.
- d. CLEARLY INDICATE 'AS-BUILT' IN THE TITLE BLOCK COLUMN OF THE DRAWINGS AS WELL AS THE ELECTRICAL CONTRACTOR'S NAME AND ADDRESS.
- SUBMIT A PRINT TO CONSULTANT FOR REVIEW. WHEN FOUND ACCEPTABLE BY THE CONSULTANT. SUBMIT FIVE (5) SETS OF PRINTS TOGETHER WITH THE CAD-DISK FOR PRESENTATION TO THE LANDLORD AND THE CLIENT.

16.9 OPERATION AND MAINTENANCE MANUAL

PROVIDE THREE (3) SETS OF OPERATION AND MAINTENANCE MANUALS SUBMITTED IN HARD COVER 3-RING BINDERS, INCLUDE THE FOLLOWING INFORMATION IN THE OPERATIONS AND MAINTENANCE MANUALS:

- NAME AND ADDRESS OF LOCAL SUPPLIERS FOR THE ITEMS INCLUDED TECHNICAL DATA AND DESCRIPTION OF ITEMS AND PARTS LISTED
- THE CONSULTANT'S REVIEWED SHOP DRAWINGS. - CERTIFICATE(S) OF ACCEPTANCE FROM THE AUTHORITIES INSPECTION
- DEPARTMENT WRITTEN GUARANTEE

<u>16.10 TESTING</u>

- a) PERFORM TEST ON EACH SYSTEM TO THE SATISFACTION OF THE CONSULTANT AND SUBMIT TEST RESULTS FOR APPROVAL PRIOR TO THE FINAL ACCEPTANCE
 - PANELS SHALL BE BALANCED WITHIN 5% ACROSS PHASES - GROUNDING SHALL BE AS REQUIRED BY ELECTRICAL SAFETY AUTHORITY CODE AND
- LOCAL UTILITY REQUIREMENTS. - TEST ALL SYSTEM GROUNDING CONDUCTORS FOR "PHASE TO GROUND" LOADS, AMMETER SHALL READ LESS THAN ONE AMPERE.

16.11 PRECAUTIONS DURING CONSTRUCTION

- a) THIS PROJECT INCLUDES WORKS IN AREAS WITH SECURITY CONTROL MEASURES. PROVIDE SCHEDULE AND OBTAIN APPROVAL PRIOR TO COMMENCEMENT OF WORK IN THE EXISTING FACILITY. . ALSO OBTAIN INSTRUCTION FROM OWNER REGARDING WHAT TYPE OF WORK CAN BE DONE WITHIN NORMAL HOURS AND WHAT TYPE OF WORK HAVE TO BE DONE AFTER HOURS. TAKE ALL ABOVE MENTIONED RESTRICTIONS INTO CONSIDERATION WHEN SUBMITTING BID. NO ADDITIONAL COST SHALL BE ALLOWED TO COMPENSATE COST ASSOCIATED WITH THESE FACTORS.
- b) CARRY OUT WORK WITH A MINIMUM OF NOISE. DUST AND DISTURBANCE. PROVIDE DAILY CLEAN UP AND PROPER DISPOSAL OF DEBRIS GENERATED BY DAILY OPERATIONS. ON COMPLETION OF THE WORK, ALL TOOLS, SURPLUS MATERIALS AND WASTE MATERIAL SHALL BE REMOVED AND THE PREMISES LEFT IN A CLEAN AND PERFECT CONDITION.
- c) BE RESPONSIBLE AND PAY FOR ANY DAMAGE TO THE BASE BUILDING INCURRED BY WORK OF THIS DIVISION, OR REPAIR TO THE SATISFACTION OF

16.11 PRECAUTIONS FOR WORK IN EXISTING BUILDING.

- a) WHEN DELETING AND/OR MAKING SAFE EXISTING ELECTRICAL WORK. ENSURE THAT IT INCLUDES REMOVAL OF ALL DISCONNECTED WIRING BACK TO SOURCE
- b) DISCONNECT AND REMOVE EXISTING LUMINAIRES, DEVICES WHICH ARE NOT TO BE REUSED. THESE ITEMS SHALL BE CATONED AND RETURN TO LANDLORD AT A PLACE DESIGNATED BY THE LANDLORD. REMOVE ALL REDUNDANT COMMUNICATIONS CABLE IN THE CONSTRUCTION AREA.
- c) ALL ELECTRICAL EQUIPMENT AND DEVICES WHICH ARE NO LONGER REQUIRED SHALL BE REMOVED AND DISPOSED OF, OFF SITE.
- d) WHERE EXISTING OUTLET BOXES ARE REMOVED FROM EXISTING UNDER FLOOR DUCTS, PLUG AND CAP EXISTING HOLES FLUSH WITH FLOOR USING APPORVED FITTING. REMOVE ALL REDUNDANT WIRE AND CABLE BACK TO SOURCE.
- e) ENSURE ALL EXISTING EQUIPMENT WIHICH ARE TO BE REUSED IS THOROUGHLY INSPECTED AND REFURBISHED TO ENSURE PROPER OPERATION AND MEETS THE LOCAL ELECTRICAL SAFETY AUTHORITY'S REQUIREMENTS. CONDUIT OR OUTLET BOXES WHICH ARE CORRODED OR DAMAGED SHALL BE
- e) CLEAN SURFACES, REFLECTOR AND LAMPS OF ALL NEW AND EXISTING LUMINAIRE, CLEAN ALL PANEL BOARD, DEVICES, OUTLETS AT THE END OF
- f) CARRY OUT WORK WITH A MINIMUM OF NOISE, DUST AND DISTURBANCE. PROVIDE DAILY CLEAN UP AND PROPER DISPOSAL OF DEBRIS GENERATED BY DAILY OPERATIONS. ON COMPLETION OF THE WORK, ALL TOOLS, SURPLUS MATERIALS AND WASTE MATERIAL SHALL BE REMOVED AND THE PREMISES LEFT IN A CLEAN AND PERFECT CONDITION.
- g) BE RESPONSIBLE AND PAY FOR ANY DAMAGE TO THE BASE BUILDING INCURRED BY WORK OF THIS DIVISION, OR REPAIR TO THE SATISFACTION OF

16.12 IDENTIFICATION

- a) Provide Lamacoid Identification Nameplates. These shall be white with BLACK ENGRAVED LETTERS AND SHALL BE INSTALLED WITH SCREWS ON ALL EQUIPMENT, NAMEPLATES SHALL BE 3MM (1/8") THICK WITH BEVELLED EDGES.
- b) INFORMATION REQUIRED TO BE SHOWN ON THE NAMEPLATE FOR VARIOUS EQUIPMENT ARE DESCRIBED BELOW:
 - DISCONNECTS, STARTERS AND CONTACTORS: INDICATE EQUIPMENT BEING CONTROLLED AND VOLTAGE. LOCATION, VOLTAGE AND RATING OF UPSTREAM
 - BREAKER OR DISCONNECT SWITCH. - TERMINAL CABINETS AND PULL BOXES: INDICATE SYSTEM AND VOLTAGE. TRANSFORMERS: INDICATE CAPACITY, PRIMARY AND SECONDARY VOLTAGES, - UPSTREAM AND DOWNSTREAM DEVICE OR EQUIPMENT LOCATIONS &
 - DESIGNATION. UPS CABINET: INDICATE CAPACITY, INPUT AND OUTPUT VOLTAGE. UPSTREAM - AND DOWNSTREAM DEVICE/EQUIPMENT LOCATIONS & DESIGNATION. PANELBOARDS: INDICATE MAIN LUG (MAIN BREAKER) SIZE; LOCATION,

VOLTAGE AND RATING OF UPSTREAM BREAKER OR DISCONNECT SWITCH.

EACH NEW PANEL SHALL HAVE TYPEWRITTEN DIRECTORY SHOWING LOADS CONNECTED TO EACH CIRCUIT. DIRECTORIES SHALL BE MOUNTED ON THE INSIDE OF THE PANEL DOOR IN A TRANSPARENT PLASTIC COVER. FOR EXISTING PANELS BEING MODIFIED, UPDATE THE EXISTING DIRECTORIES TO

16.13 RESPONSIBILITY

SUIT NEW WORK.

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

<u>16.14 WARRANTY</u>

- a) WARRANT ALL WORK AND APPARATUS INSTALLED, UNDER THIS CONTRACT, AGAINST ALL DEFECTS IN MATERIAL OR WORKMANSHIP FOR A PERIOD OF ONE YEAR AFTER FINAL ACCEPTANCE OF SAME BY THE OWNER.
- b) THESE GUARANTEE SHALL IN NO WAY SUPPLANT ANY OTHER GUARANTEES OF A LONGER PERIOD, BUT SHALL BE BINDING ON ALL OTHER WORK.

16.15 EQUIPMENT AND MATERIAL

a) ALL EQUIPMENT AND MATERIAL, UNLESS SPECIFICALLY NOTED OTHERWISE, SHALL BE NEW AND FREE OF BLEMISH OR DEFECT. ALL MATERIAL AND EQUIPMENT SHALL BE OF THE TYPE SUBJECT TO FACTORY MUTUAL, UNDERWRITERS' LABORATORIES OF CANADA AND/OR CANADIAN STANDARDS ASSOCIATION INSPECTION AND APPROVAL AND SHALL BEAR ULC OR CSA LABELS.

16.16 CUTTING AND PATCHING

CONSULTANT/OWNER.

- a) THE CONTRACTOR SHALL EMPLOY THE PARTICULAR TRADES TO DO ALL REQUIRED CUTTING AND PATCHING AND REPAIRING OF SURFACES FOR HIS WORK.
- b) SUPPORTING MEMBERS OF ANY FLOOR, WALL OR THE BUILDING STRUCTURE SHALL BE CUT ONLY IN SUCH A LOCATION AND MANNER AS DIRECTED BY THE
- ALL HOLES AND SURFACES SHALL BE REPAIRED WITH THE TYPE OF MATERIAL REMOVED BY THE TRADESMEN EXPERT IN THE TYPE OF REPAIR REQUIRED.
- PROVIDE FIRE BARRIERS AROUND ALL COMPONENTS IN HOLES THAT PENETRATE FIRE SEPARATIONS. THE FIRE BARRIER MEDIUM PROVIDED SHALL MAKE THE FIRE SEPARATION EQUAL TO OR BETTER THAN THE ONE WHICH WAS CUT AWAY. ALL MATERIALS SHALL BE CSA APPROVED AND UL LISTED.

16.17 FLOOR CUTTING AND CORE DRILLING

- a) WHERE CORE DRILLING OR FLOOR CUTTING IS REQUIRED, THIS CONTRACTOR SHALL NOTIFY LAND LORD OF THE LOCATION AND OBTAIN ITS APPROVAL PRIOR TO COMMENCING. X-RAY FLOOR OR WALL AS REQUIRED BY
- b) INCLUDE ALLOWANCE IN THE BID PRICE SHOULD CORE DRILLS ARE REQUIRED TO BE CARRIED OUT AFTER NORMAL HOURS.
- ANY DAMAGES AS A RESULT OF CORE DRILLING SHALL BE REPAIRED IMMEDIATELY AT NO COST TO LANDLORD OR CLIENT.

16.18 INTERRUPTION OF SERVICE

- a) CO-ORDINATE ALL REQUIRED POWER SHUTDOWNS TO ESSENTIAL SERVICES WITH THE FACILITIES STAFF. PROVIDE TWO-WEEK NOTICE TO LANDLORD AND TENANTS AFFETED. AND OBTAIN THEIR APPROVAL BEFORE PROCEEDING WITH THE WORK THAT REQUIRES
- SUPPLY ALL NECESSARY LABOUR AND MATERIALS REQUIRED TO INTEGRATE THE NEW SYSTEMS INTO THE EXISTING ONE AND TO FACILITATE THE VARIOUS TRANSITION STAGES. PROVIDE A SCHEDULE TO IMPLEMENT THE TRANSITION STRATEGY.
- THE BID SUBMITTED SHALL INCLUDE ALL ALLOWANCES FOR TIME SPENDED ON COORDINATION OF INTERRUPTION.

16.19 PRICING FOR CHANGES

- a) PROVIDE DETAILED BREAKDOWN FOR MATERIAL, LABOUR REQUIRED. ALL CHANGES SHOULD BE CALCULATED BASED ON THE LATEST ISSUE OF NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION (NECA) MANUAL, COLUMN ONE FOR THE DURATIONS OF THIS CONTRACT.
- b) THE HOURLY LABOUR RATE SHALL INCLUDE ALL CHARGES FOR SUPERVISION, VARIABLE LABOUR FACTORS, HAND TOOLS, STORAGE, RENTALS, ADDITIONAL BONDING, PARKING, CLEAN-UP, AS-BUILT DRAWINGS, FREIGHT AND DELIVERY, BUT EXCLUSIVE OF OVERHEAD AND PROFIT.

16.20 SYSTEM START-UP

- INSTRUCT OWNER AND OPERATING PERSONNEL IN THE OPERATION, CARE AND MAINTENANCE OF SYSTEMS, SYSTEM EQUIPMENT AND COMPONENTS.
- b) ARRANGE AND PAY FOR SERVICES OF MANUFACTURER'S FACTORY SERVICE ENGINEER TO SUPERVISE START-UP OF INSTALLATION, CHECK, ADJUST, BALANCE AND CALIBRATE COMPONENTS AND INSTRUCT OPERATING PERSONNEL.
- PROVIDE THESE SERVICES FOR SUCH PERIOD, AND FOR AS MANY VISITS AS c) NECESSARY TO PUT EQUIPMENT IN OPERATION, AND TO ENSURE THAT OPERATING PERSONNEL ARE CONVERSANT WITH ALL ASPECTS OF ITS CARE AND OPERATION.

16.21 GROUNDING

PROVIDE GROUNDING FOR EQUIPMENT TO THE LATST VERSION OF ELECTRICAL SAFEY CODE AND INSPECTION AUTHORITIES. PROVIDE SEPERATE GREEN ISSULATED GROUND CONDUCTOR IN EVERY CONDUIT TO ALL EQUIPMENT/DEVICES

16.22 TEMPORARY SERVICES

- a) IN ALL CASES, ALL TEMPORARY ELECTRICAL SERVICES, AS REQUIRED, SHALL BE PART OF THIS WORK.
- b) PROVIDE TEMPORARY GENERAL LIGHTING THROUGHOUT CONSTRUCTION SITE. REUSE EXISTING LUMINAIRES AT SUITABLE CENTRES TO CONFORM TO CONSTRUCTION STANDARDS AND ALL AUTHORITIES HAVING JURISDICTION.
- c) PROVIDE TEMPORARY GENERAL POWER SUPPLIES WITH RECEPTACLES FOR ALL TRADES AS DIRECTED BY THE GENERAL CONTRACTOR.
- d) MAINTAIN THE TEMPORARY FACILITIES IN GOOD REPAIR AND SAFE WORKING
- ORDER THROUGHOUT THE DURATION OF THE PROJECT. e) AT THE END OF THE PROJECT, REMOVE THE ABOVE NOTED TEMPORARY

16.23 SUPPORTS AND BASES AND HANGERS

- a) HANGERS FOR ELECTRICAL CONDUITS SHALL BE GALVANIZED AFTER FABRICATION. DO NOT USE PERFORATED STRAPPINGS (GRABBER BARS) TO HANG CONDUITS.
- b) PROVIDE INDEPENDENT SUPPORTS FOR NEW EQUIPMENT, DEVICES AND CONDUITS. DO NOT USE SUPPORTS OR EQUIPMENT INSTALLED FOR OTHER TRADES FOR CONDUIT OR CABLE SUPPORT EXCEPT WITH PERMISSION OF OTHER TRADE AND APPROVAL OF

16.24 CONDUIT AND FITTINGS

- a) CONDUIT SIZES SHALL AS INDICATED ON DRAWINGS AND SHALL NOT BE REDUCED WITHOUT AUTHORIZATION, CONDUITS IN FINISHED AREAS SHALL BE CONCEALED. ALL SURFACE CONDUITS.
- b) EMT TO BE USED FOR GENERAL APPLICATION UNLESS NOTED OTHERWISE, PROVIDED THAT IT IS NOT SUSCEPTIBLE TO MECHANICAL INJURY. PROVIDE RIGID GALVANIZED CONDUIT IN UNFINISHED AREAS WHERE CONDUIT IS SUSCEPTIBLE TO MECHANICAL INJURY. PROVIDE RIGID PVC CONDUIT IN UNDERGROUND (TRENCH) APPLICATIONS AND WHERE EMBEDDED IN CONCRETE.
- c) CONDUITS SHALL BE INSTALLED AT A MINIMUM OF 6" (152mm) FROM UNINSULATED HEATING PIPES AND CONDUITS CARRYING DATA CABLES.

- d) CLEAN INTERIOR OF ALL CONDUITS TO REMOVE ALL DEBRIS AND WATER AND REMOVE ANY BURRS PRIOR TO PULLING WIRES.
- e) PROVIDE SEPARATE INSULATED GROUND CONDUCTOR IN ALL CONDUITS, REGARDLESS OF TYPE.
- FIRESTOPPING IS REQUIRED WHERE HOLES ARE DRILLED THROUGH FLOORS OR WALLS. HOLES SHALL BE PACKED AROUND CONDUIT (OR RACEWAY) WITH AN APPROVED CAULKING COMPOUND. ("CIRAFIBRE 2300" OR "FLAMESEAL" PUTTY) OR EQUIVALENT.
- PROVIDE FLEXIBLE METAL CONDUIT FOR CONNECTIONS TO MOTORS, UPS UNITS AND TRANSFORMERS.
- h) MINIMUM CONDUIT SIZE SHALL BE 1/2" (13mm) UNLESS NOTED
- CONDUITS, ARMOURED CABLES AND OTHER RACEWAYS SHALL BE SUPPORTED INDEPENDANTLY OF ANY SUSPENDED CEILING.
- DO NOT USE ALUMINUM CONDUIT.
- k) PROVIDE LIQUID-TIGHT FLEXIBLE METAL CONDUIT UNDER RAISED FLOOR AREA IN LAN ROOM.

16.25 PULL & JUNCTION BOXES

OTHERWISE

- BOXES SHALL BE CODE GAUGE AND SIZED TO MEET ELECTRICAL CODE REQUIREMENTS. SHEET STEEL BOXES FOR CONCEALED WORK AND CAST BOXES FOR EXPOSED WORK. "THROUGHWALL" AND "UTILITY" TYPE BOXES
- b) PROVIDE BARRIERS IN BOXES WHERE DIFFERENT VOLTAGES ARE USED.
- c) PROVIDE PULL BOXES ON CONDUIT RUNS AT 50ft (15.25m) INTERVALS.
- d) BOXES SHALL BE SUPPORTED INDEPENDANTLY OF CONDUIT.
- e) IDENTIFY ALL ELECTRICAL BOXES OF DIFFERENT SYSTEMS WITH A DIFFERENT COLOUR, THIS SHALL BE ACHIEVED WITH SPRAY PAINT CANS. COLOURS SHALL MATCH BASE BUILDING STANDARD.

16.26 INSTALLATION OF OUTLETS

THE DRAWINGS SHOW APPROXIMATE LOCATION OF OUTLETS ONLY. THE EXACT LOCATION SHALL BE COORDINATED ON SITE WITH OTHER TRADES, OUTLETS LOCATED INACCURATELY SHALL BE READJUSTED OR RELOCATED AT THE CONTRACTORS EXPENSE PROVIDED THAT THE DISTANCE DOES NOT EXCEED 3m (10'-0"). UNLESS OTHERWISE NOTED, RECEPTACLES SHALL BE MOUNTED AT 15.75" (400mm) AFF TO CENTER LINE.

16.27 INSTALLATION OF PLYWOOD BACKBOARDS

PROVIDE 19mm (3/4") THICK, FIRE RETARDANT PLYWOOD BACKBOARDS AS REQUIRED FOR ALL WALL MOUNTED ELECTRICAL EQUIPMENT/DEVICE OF THIS

16.28 WIRE AND CABLE

- a) UNLESS OTHERWISE NOTED, ALL WIRES SHALL BE COPPER RW90 RATING AS REQUIRED ON SITE AND AS DICTATED BY ELECTRICAL SAFETY AUTHORITY CODE. ALUMINUM WIRE SHALL NOT BE USED.
- b) THE MINIMUM PERMISSIBLE SIZE FOR BRANCH CIRCUIT WIRING SHALL BE #12 AWG.

ALL WIRING SHALL BE COLOUR CODED AND SHALL BE IDENTIFIED SHOWING

- c) WIRE #10 AWG AND SMALLER SHALL BE SOLID COPPER, #8 AWG AND LARGER SHALL BE COPPER STRANDED.
- e) COMMON NEUTRALS SHALL NOT BE USED FOR ALL SINGLE PHASE BRANCH CIRCUITS.

SIZE, VOLTAGE RATING AND INSULATION TYPE:

- f) ALL WIRING SHALL BE RUN IN EMT CONDUIT UNLESS NOTED OTHERWISE.
- g) LIQUID-TIGHT METAL FLEXIBLE CONDUIT SHALL BE USED UNDER RAISED FLOOR AREA IN LAN ROOMS. RUN CONDUITS AGAINST FLOOR SLAB AND PARALLEL TO RAISED FLOOR GRID.
- h) PROVIDE METAL FLEXIBLE CONDUIT FOR CONNECTIONS TO MOTORS AND
- BRANCH WIRING SHALL BE NO. 12 AWG UP TO 70 FT. AND NO.10 AWG FROM 70 FT. TO 120 FT. FOR A LONGER DISTANCE, THE VOLTAGE

DROP SHALL BE CALCULATED AT 3%.

- 16.29 WIRING DEVICES a) RECEPTACLES TYPES ARE SHOWN ON FLOOR PLAN OR SINGLE LINE DIAGRAM
- BESIDE RECEPTACLE. b) ACCEPTABLE MANUFACTURER OF RECEPTACLES ARE HUBBELL,

TO OBTAIN OCCUPANCY.

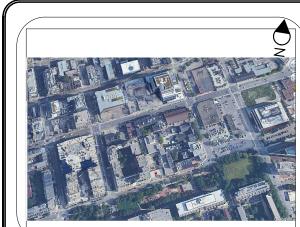
BRYANT OR ARROW HART.

- 16.32 CLOSE OUT DOCUMENTATION THE FOLLOWING INFORMATION MUST BE PROVIDED TO THE ENGINEER PRIOR TO FINAL SITE INSPECTION AND ISSUANCE OF THE ENGINEERS FINAL SIGN OFF LETTER
 - FIRE ALARM VERIFICATION REPORT. 2. LETTER OF ACCEPTANCE FROM THE ELECTRICAL SAFETY AUTHORITY.

THE FOLLOWING INFORMATION MUST BE PROVIDED TO THE OWNER UPON PROJECT

1. LETTERS OF WARRANTY FROM THE ELECTRICAL CONTRACTORS. 2. AS BUILT DRAWINGS AND MANUALS.

> Scale: 1:50 Date: Project No.



KEY PLAN

5		
4		
3		
2	ISSUED FOR TENDER/PERMIT	FEB/26/25
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PARKS & RECREATION CAPITAL PROJECTS METRO HALL 55 JOHN STREET, 24th FLOOR

TORONTO, ONTARIO, M5V 3C6



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PH.: (905) 946 4260 FAX: (905) 946 0901

JOB NUMBER: 24111

TABCON **CONSULTING INC**

494 McNicoll Avenue, Suite # 201 Toronto, Ontario, M2H 2E1 Tel.: (647) 974-7006 Web Site : www.tabcon.com

Project Name: ST. LAWRENCE CRC & DAYCARE

Project Address 230 THE ESPLANADE

TORONTO, ON

Job Descript. :

ROOFING & CHILLER REPLACEMENT

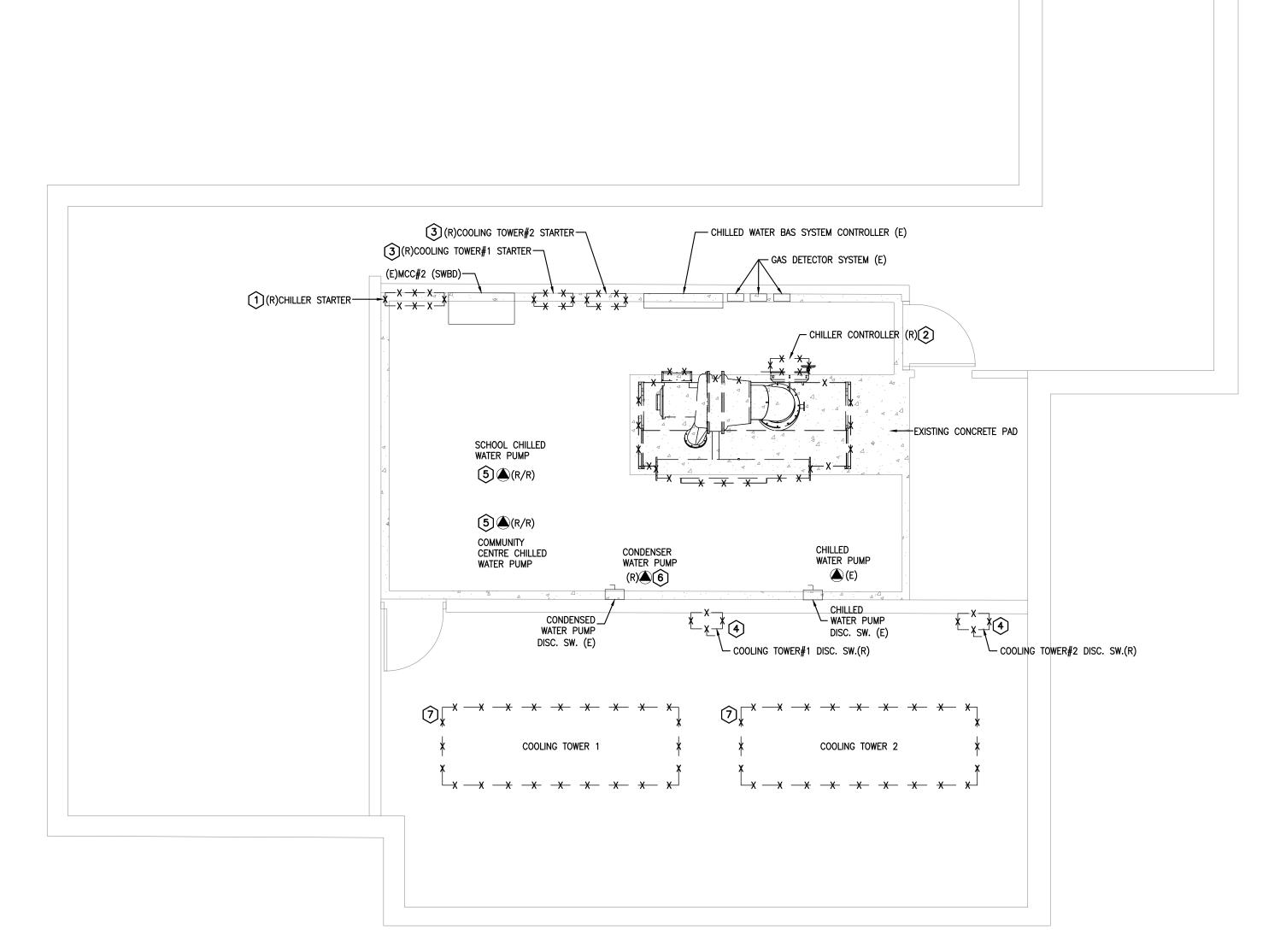
ELECTRICAL SPECIFICATION

AND LEGEND Design: YJ DRAWN: YJ Approv.: JG

February 26, 25

Job No.







(2)(R)CHILLER CONTROLLER

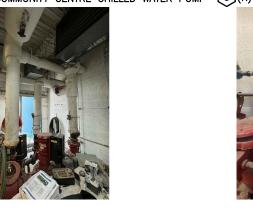
(3)(R)COOLING TOWER#2 STARTER

(R)COOLING TOWER 1 & 2 DISC. SW.









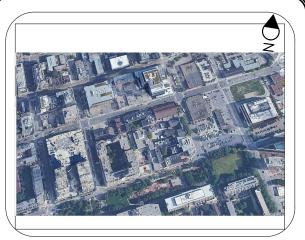


DEMOLITION GENERAL NOTES

- . IN EVERY INSTANCE OF DEMOLITION AND/OR REMODELING, THE E.C. SHALL FIGURE A COMPLETE JOB AS NONE OTHER SHALL BE ACCEPTED.
- 2. THE DRAWINGS ARE TO BE USED ONLY AS A GUIDELINE FOR DEMOLITION. THE E.C. MUST VISIT THE SITE PRIOR TO BIDDING TO VERIFY ALL WORK REQUIRED FOR A COMPLETE JOB & INCLUDE THE COST OF SUCH WORK IN HIS BID.
- 3. THE E.C. SHALL MAINTAIN EXISTING SERVICES TO & IN THE EXISTING AREA AS
- 4. IF NECESSARY, THE E.C. SHALL PROVIDE TEMPORARY SERVICES IN THE EXISTING AREAS. 5. THE E.C. SHALL DISCONNECT & REMOVE ELECTRIC SERVICE TO ALL MECHANICAL EQUIPMENT BEING REMOVED AS A RESULT OF THE REMODELING.
- 6. ELECTRICAL EQUIPMENT & DEVICES SHALL BE REMOVED COMPLETE INCLUDING CONDUIT
- 7. ANY EXISTING CONDUIT, WIRING AND/OR ELECTRICAL & MECHANICAL DEVICES BEING DISTURBED BY THE WORK SHALL BE REWORKED BY THIS CONTRACTOR AS REQUIRED TO RETURN TO ITS FORMER EXISTING OPERATING CONDITION.
- 8. ANY CIRCUITS FEEDING THROUGH DEVICES OR EQUIPMENT BEING RELOCATED, REWORKED, OR ABANDONED & SERVING OTHER ELECTRICAL DEVICES, AND/OR EQUIPMENT SHALL BE MAINTAINED BY PROVIDING J-BOXES OR OTHER ACCEPTABLE
- 9. ALL WALLS, CEILINGS, FLOORS, ETC., BEING DISTURBED BY THE WORK SHALL BE RETURNED TO FINISHED CONDITIONS TO MATCH EXISTING BY THE E.C. & HE SHALL DO HIS OWN CUTTING & PATCHING AS NECESSARY UNDER HIS CONTRACT.
- 10. EXISTING MATERIALS SHALL BE TURNED OVER TO THE OWNER. IF NOT REQUIRED BY OWNER, THE E.C. SHALL REMOVE THESE MATERIALS FROM THE PREMISES.
- 11. NO CONDUIT, BOXES, WIRING, OR CABLES SHALL BE INSTALLED WITHIN 1 1/2" OF THE LOWEST POINT OF THE UNDERSIDE OF THE ROOF DECKING, NOR SHALL THEY BE INSTALLED CONCEALED WITHIN METAL-CORRUGATED ROOF DECKING. THE E.C. SHALL BE RESPONSIBLE TO REPLACE AND/OR REWORK EXISTING CONDUIT, BOXES, WIRING, AND CABLING THAT IS NOT IN COMPLIANCE WITH THIS REQUIREMENT.
- 12. ALL CONDUIT AND CABLING SHALL BE PROPERLY SUPPORTED AS REQUIRED BY THE CANADIAN ELECTRICAL CODE. THE E.C. SHALL BE RESPONSIBLE TO REPLACE AND/OR REWORK EXISTING CONDUIT AND/OR CABLING THAT IS NOT IN COMPLIANCE WITH THIS
- 13. E.C. SHALL FIELD VERIFY SLAB ON GRADE FLOOR CONSTRUCTION TYPE PRIOR TO CUTTING. UNDER NO CIRCUMSTANCES SHALL THE CONTRACTOR CUT A STRUCTURAL FLOOR SLAB THICKER THAN FOUR (4") INCHES WITHOUT PRIOR WRITTEN APPROVAL FROM ENGINEER OF RECORD. NOTIFY ENGINEER OF RECORD OF ANY SLAB THICKNESS GREATER THAN FOUR (4") INCHES PRIOR TO PROCEEDING WITH ANY SAW CUTTING.

#CODED NOTES

- 1. EXISTING CHILLER STARTER TO BE REMOVED BACK TO SOURCE AND MAKE SAFE.
- 2. EXISTING CHILLER CONTROLLER TO BE REMOVED BACK TO SOURCE AND MAKE SAFE.
- 3. EXISTING COOLING TOWER STARTER TO BE REMOVED. KEEP EXISTING FEEDER FOR NEW COOLING TOWER STARTER.
- 4. EXISTING COOLING TOWER DISCONNECT TO BE REMOVED. KEEP EXISTING FEEDER FOR NEW DISCONNECT SWITCH.
- 5. DISCONNECT EXISTING POWER SUPPLY TO SCHOOL CHILLED WATER PUMP & COMMUNITY CENTRE CHILLED WATER PUMP. TO ALLOW REMOVE AND INSTALL EXISTING PUMPS BY MECHANICAL TRADE. REMOVE EXISTING FEEDER BACK TO THE ADJACENT WALL. PROVIDE JUNCTION BOX ON WALL AND EXTEND EXISTING FEEDER TO NEW PUMP VFD USING LIQUID TIGHT FLEXIBLE CONDUIT.
- 6. EXISTING CONDENSER WATER PUMP TO BE REMOVED. KEEP EXISTING FEEDER FOR NEW CONDENSED WATER PUMP.
- 7. EXISTING COOLING TOWER 1 & 2 TO BE REMOVED. REMOVE EXISTING POWER BACK TO DISC. SW. AND MAKE SAFE.



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Project Name :

ST. LAWRENCE CRC & DAYCARE

Project Address : 230 THE ESPLANADE

TORONTO, ON Job Descript. :

ROOFING & CHILLER REPLACEMENT

ELECTRICAL DEMOLITION PLAN

Design: YJ DRAWN: YJ Approv.: JG Scale: 1:50

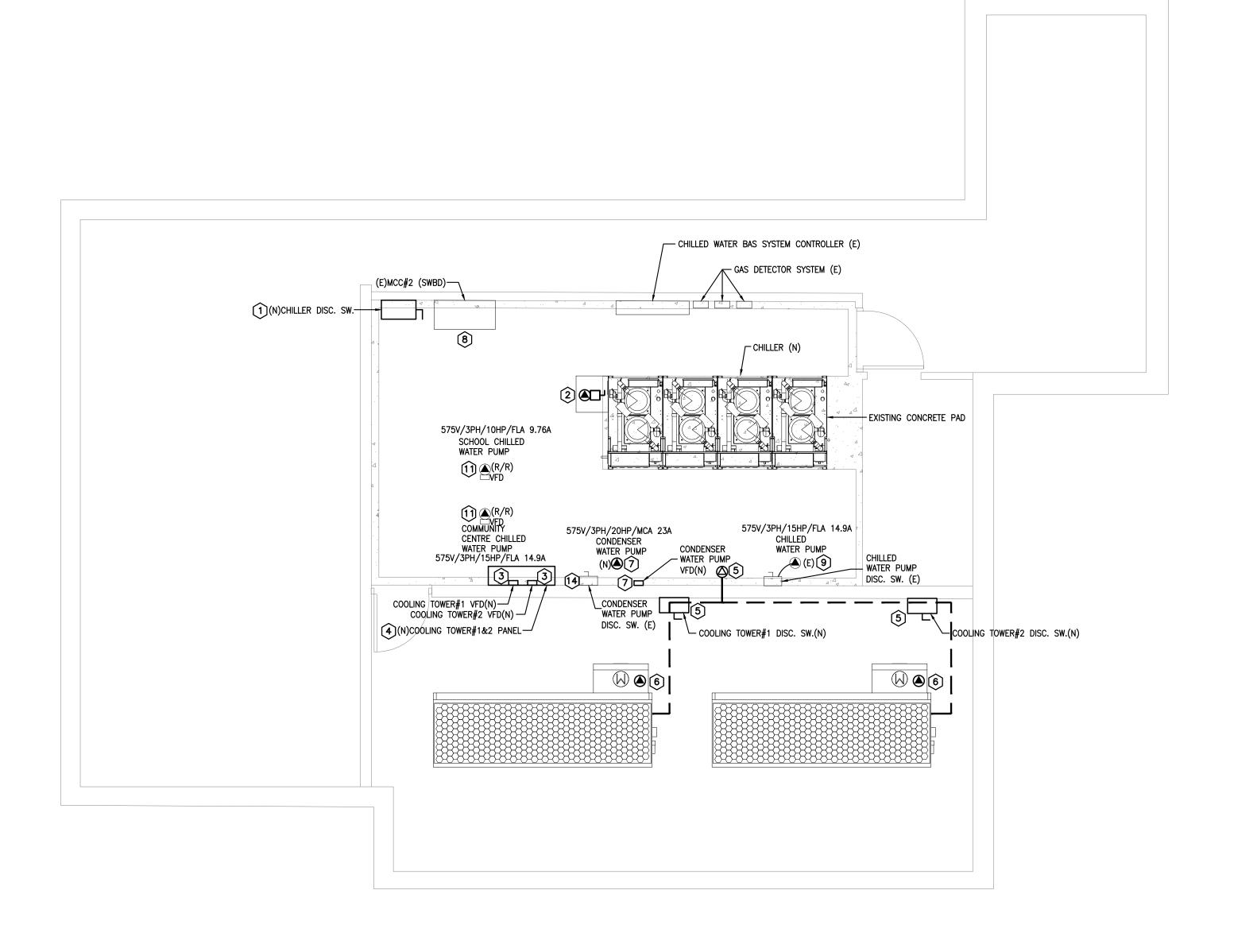
Date: February 26, 25

Dwg.No.

OF 4

Project No. Job No.

1 PENTHOUSE MECHANICAL ROOM - DEMOLITION E2 / SCALE: 1:50

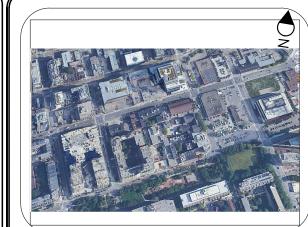


POWER GENERAL NOTES

- 1. EXACT ROUTING OF NEW FEEDER SHALL BE CONFIRMED ON SITE PRIOR TO BID.
- 2. PROVIDE FIRE STOP FOR ANY NEW FEEDER PENETRATIONS THROUGH FIRE RATED FLOOR OR WALLS. SCAN FLOOR PRIOR TO CORE DRILING.
- 3. PROVIDE LIQUID TIGHT FLEXIBLE CONDUIT FOR FINAL CONNECTIONS TO ALL PUMPS AND EXTERIOR HVAC EQUIPMENT.
- 4. ALL NEW POWER FEEDER SHALL BE SUPPORTED BY INDEPENDENT UNISTRUT AT SYSTEM SUPPORTED BY BUILDING STRUCTURE.
- 5. REUSE EXISTING CIRCUIT AND WIRING IF POSSIBLE, PROVIDE NEW AS REQUIRED TO ACHIEVE A COMPLETE OPERATIONAL SYSTEM.

#CODED NOTES

- 1. PROVIDE NEW 600V, 400A CHILLER DISCONNECT SWITCH FUSED AT 400A TIME DELAY FUSE. PROVIDE 2 RUNS OF (3#3/0 + G IN 2"C) BACK TO SWITCHBOARD MCC#2 AND TAP DIRECTLY TO THE MAIN BUS.
- 2. PROVIDE 2 RUNS OF (3#3/0 + G IN 2"C) FROM CHILLER DISC. SW. TO CHILLER CONTROL PANEL. PROVIDE POWER FEEDER TO EACH 4 CHILLER MODULES. EC TO CONFIRM EXACT CONDUCTOR SIZE TO CHILLER MODULES PRIOR TO INSTALLATION.
- 3. RECONNECT TWO EXISTING COOLING TOWER POWER FEEDERS FROM MCC#2 TO NEW COOLING TOWER 1&2 VFDS. VFD IS SUPPLIED BY MECHANICAL TRADE AND INSTALLED BY ELECTRICAL TRADE. EXTEND EXISTING FEEDER AS REQUIRED.
- 4. PROVIDE NEW 2#12 + G IN 3/4"C FROM NEW COOLING TOWER 1 VFD TO NEW COOLING TOWER PANEL. 600V/1PH INPUT FROM VFD POWER SUPPLY C/W BUILT IN 600V/1PH-120V/1PH CONTROL TRANSFORMER AND PRIMARY FUSE. COOLING TOWER PANEL IS SUPPLIED AND INSTALLED BY MECHANICAL TRADE.
- 5. PROVIDE NEW 3#12 + G IN 3/4"C FROM NEW COOLING TOWER 1&2 VFDS TO NEW COOLING TOWER 1&2 DISC. SW. RUN CONDUIT INSIDE THE ROOM AND PENETRATE THE WALL TO THE OUTDOOR DISCONNECT. KEEP ALL CONDUIT INSIDE CHILLER ROOM AS MUCH AS POSSIBLE.
- 6. PROVIDE NEW 3#12 + G IN 3/4"C FROM NEW COOLING TOWER 1&2 DISC. SW. TO NEW COOLING TOWER 1&2. WIRING EXPOSED TO WEATHER SHALL BE RUN IN UV PROOF LIQUID TIGHT FLEXIBLE CONDUIT. ALL CONDUIT SHALL BE SUPPORTED ON WALL OR THROUGH UNISTRUT CHANNELS WITH MINIMUM 6" CLEARANCE FROM THE FLOOR.
- 7. PROVIDE OF 3#10 + G IN 3/4"C FROM CONDENSER WATER PUMP DISC. SW. TO CONDENSER WATER PUMP VIA NEW VFD.
- 8. REPLACE SWBD MCC#2 DISC. SW. EXISTING FUSES AS REQUESTED BELOW.
 -EXISTING CONDENSER WATER PUMP FUSE WITH NEW 60A FUSE.
 -EXISTING COOLING TOWER#1 FUSE WITH NEW 40A FUSE.
 -EXISTING COOLING TOWER#2 FUSE WITH NEW 40A FUSE.
- 9. EXISTING CHILLED WATER PUMP TO REMAIN.
- 10. REUSE EXISTING POWER SUPPLY FOR HEAT TRACING CABLE FOR 25mm MAKE UP DCW PIPE. PROVIDE NEW HEAT TRACING CABLE (CHECK WITH TRM SPEC REQUIRED) PROVIDE EXTERIOR THERMOSTAT FOR SHUTTING DOWN HEAT TRAIN CABLE WHEN EXTERIOR TEMPERATURE IS ABOVE 5 DEGREE CELSIUS. TRACE EXISTING POWER SOURCE, ENSURE EXISTING BREAKER IS GFI PROTECTED. IF NOT, PROVIDE NEW GFI BREAKER.
- 11. DISCONNECT EXISTING POWER SUPPLY TO SCHOOL CHILLED WATER PUMP & COMMUNITY CENTRE CHILLED WATER PUMP. TO ALLOW REMOVE AND INSTALL EXISTING PUMPS BY MECHANICAL TRADE. REMOVE EXISTING FEEDER BACK TO THE ADJACENT WALL. PROVIDE JUNCTION BOX ON WALL AND EXTEND EXISTING FEEDER TO NEW PUMP VFD USING LIQUID TIGHT FLEXIBLE CONDUIT.



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Project Name :

ST. LAWRENCE CRC & DAYCARE

Project Address:

230 THE ESPLANADE

TORONTO, ON

Job Descript. :

ROOFING & CHILLER REPLACEMENT

ELECTRICAL POWER PLAN

Design: YJ

DRAWN: YJ

Approv.: JG

Scale: 1:50

Date: February 26, 25

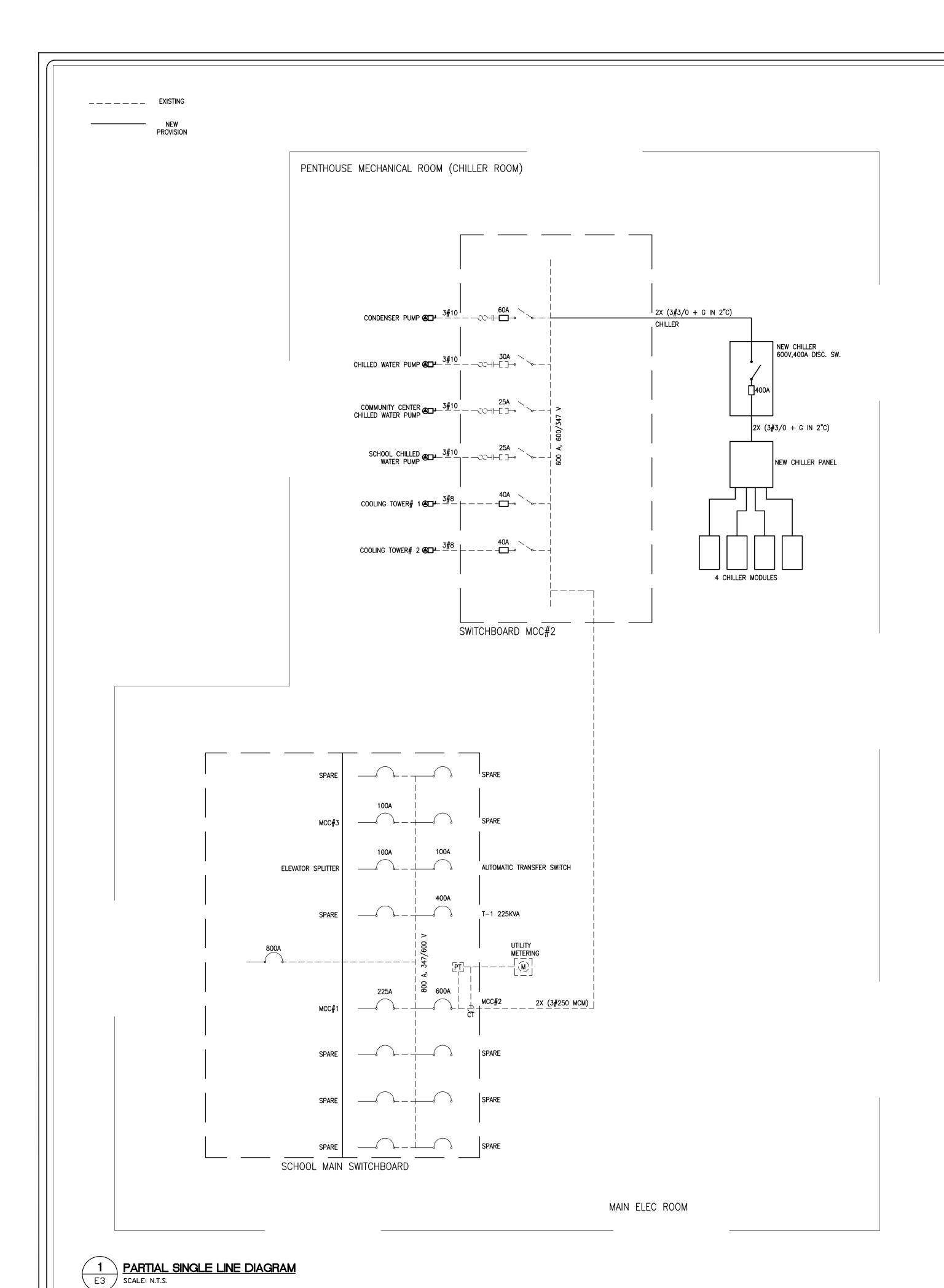
Project No.

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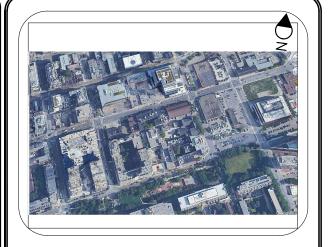
OF 4







MCC-2 SCHEDULE (EXISTING)				
ССТ	LOAD	LOAD	ССТ	
1	CONDENSER PUMP			
2	CHILLED WATER PUMP			
3	COMMUNITY CENTRE CHILLED WATER PUMP			
4	SCHOOL CHILLED WATER PUMP	MAIN LUG		
5	COOLING TOWER#1			
6	COOLING TOWER#2			



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SINGLE LINE DIAGRAM

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