LAVATORIES, WHETHER NOTED AS HANDICAP ACCESSIBLE OR NOT.

.1 NOT REQUIRED WHERE LAV IS FED BY TEMPERED WATER AT TEMPERATURE AS PER NBC.

.2 REFRIGERANT SYSTEMS: PRE-FORMED, CLOSED CELL RUBBER (UNICELLULAR TUBULAR ELASTOMER) PIPE INSULATION, WITH LAP SEAL ADHESIVE.

.1 TIAC CODE: A6
.2 EQUAL TO ARMAFLEX OR IMCOLOCK

2.12 JACKETS

.1 POLYVINYL CHLORIDE (PVC):

.1 ONE-PIECE MOULDED TYPE AND SHEET TO CAN/CGSB-51.53 .1 WITH PRE-FORMED SHAPES FOR PIPING AS REQUIRED.
.2 COLOURS: WHITE.
.3 MINIMUM SERVICE TEMPERATURES: -20°C.
.4 MAXIMUM SERVICE TEMPERATURE: 65°C.
.5 MOISTURE VAPOUR TRANSMISSION: 0.02 PERM.
.6 FASTENINGS:
.1 USE SOLVENT WELD ADHESIVE COMPATIBLE WITH INSULATION TO SEAL LAPS AND JOINTS.
.2 TACKS.
.3 PRESSURE SENSITIVE VINYL TAPE OF MATCHING COLOUR.
.7 SPECIAL REQUIREMENTS:
.1 OUTDOOR: UV RATED MATERIAL AT LEAST 0.5 MM THICK.

.2 ABS PLASTIC (FOR OUTDOOR USE ONLY):

.1 ONE_PIECE MOULDED TYPE AND SHEET WITH PRE_FORMED SHAPES AS REQUIRED.
.2 COLOURS: WHITE.
.3 MINIMUM SERVICE TEMPERATURES: -40°C.
.4 MAXIMUM SERVICE TEMPERATURE: 82°C.
.5 MOISTURE VAPOUR TRANSMISSION: 0.012 PERM.
.6 THICKNESS: 0.75 MM.
.7 FASTENINGS:
.1 SOLVENT WELD ADHESIVE COMPATIBLE WITH INSULATION TO SEAL LAPS AND JOINTS.
.2 TACKS.
.3 PRESSURE SENSITIVE VINYL TAPE OF MATCHING COLOUR.

.3 ULC LISTED CANVAS:
.1 220 (HEAVY) AND 120 (LIGHT) GM/M2 COTTON, PLAIN WEAVE, TREATED WITH DILUTE FIRE RETARDANT LAGGING ADHESIVE TO ASTM C921.
.2 LAGGING ADHESIVE: COMPATIBLE WITH INSULATION.

.4 ALUMINUM:
.1 TO ASTM B209.
.2 THICKNESS: 0.50 MM SHEET.
.3 FINISH: SMOOTH.
.4 METAL JACKET BANDING AND MECHANICAL SEALS: STAINLESS STEEL, 19 MM WIDE, 0.5 MM THICK AT 300 MM SPACING.
.5 PIPE JOINING: LONGITUDINAL AND CIRCUMFERENTIAL SLIP JOINTS WITH 50 MM LAPS.
.6 PIPE FITTINGS: 0.5 MM THICK DIE-SHAPED FITTING COVERS WITH FACTORY-ATTACHED PROTECTIVE LINER.

.5 STAINLESS STEEL:
.1 TYPE: 304 OR 316.
.2 THICKNESS:
.1 PIPING: 0.25 MM
.2 DUCTWORK: 0.50 MM SHEET
.3 FINISH:
.1 INTERIOR LOCATIONS: SMOOTH.
.2 EXTERIOR LOCATIONS: DIMPLE FINISH.

.4 PIPE JOINING: LONGITUDINAL AND CIRCUMFERENTIAL SLIP JOINTS WITH 50 MM LAPS.

.5 PIPE FITTINGS: 0.5 MM THICK DIE-SHAPED FITTING COVERS WITH FACTORY-ATTACHED PROTECTIVE LINER.

.6 METAL JACKET BANDING AND MECHANICAL SEALS: STAINLESS STEEL, 19 MM WIDE, 0.5 MM THICK AT 300 MM SPACING.

2.13 INSULATION SECUREMENT

.1 FOR DUCTWORK: PROVIDE STAPLES FOR SECUREMENT OF ALL INSULATION SEAMS. FOIL/ALUMINUM ADHESIVE TAPE WILL NOT BE ALLOWED. REVIEW FINAL REQUIREMENTS WITH HSC FM.
.2 FOR DUCTWORK: TAPE: SELF-ADHESIVE, ALUMINUM, REINFORCED, 50 MM WIDE MINIMUM.
.3 CONTACT ADHESIVE: QUICK SETTING.
.4 CANVAS ADHESIVE: WASHABLE.
.5 TIE WIRE: 1.5 MM DIAMETER STAINLESS STEEL.
.6 BANDS: STAINLESS STEEL, 19 MM WIDE, 0.5 MM THICK.
.7 FASTENERS FOR DUCTWORK: 2 MM DIAMETER PINS WITH 35 MM SQUARE CLIPS, LENGTH TO SUIT THICKNESS OF INSULATION.

2.14 CEMENT

.1 THERMAL INSULATING AND FINISHING CEMENT:
.1 HYDRAULIC SETTING OR AIR DRYING ON MINERAL WOOL, TO ASTM C449/C449M.

2.15 VAPOUR RETARDER LAP ADHESIVE
.1 WATER BASED, FIRE RETARDANT TYPE, COMPATIBLE WITH INSULATION.

2.16 INDOOR VAPOUR RETARDER MASTIC
.1 VINYL EMULSION TYPE ACRYLIC, COMPATIBLE WITH INSULATION.

2.17 OUTDOOR VAPOUR RETARDER MASTIC
.1 VINYL EMULSION TYPE ACRYLIC, COMPATIBLE WITH INSULATION.
.2 REINFORCING FABRIC: FIBROUS GLASS, UNTREATED 305 G/M2.

PART 3 INSTALLATION AND EXECUTION

3.1 INSTALLATION – GENERAL

.1 INSTALL USING MANUFACTURERS RECOMMENDED INSTRUCTIONS
.2 INSTALL IN ACCORDANCE WITH TIAC NATIONAL STANDARDS.
.3 PRE-INSTALLATION REQUIREMENTS
.1 PRESSURE TESTING OF PIPE AND DUCTWORK SYSTEMS AND ADJACENT EQUIPMENT IS COMPLETE, WITNESSED AND CERTIFIED.
.2 DO NOT INSULATE DUCTWORK PRIOR TO DUCT SEALANT BEING APPLIED.
.3 SURFACES TO BE CLEAN, DRY, AND FREE FROM FOREIGN MATERIAL.
.4 WHEN TWO OR MORE LAYERS ARE USED, INSTALL WITH STAGGERED JOINTS.
.5 USE TWO LAYERS WITH STAGGERED JOINTS WHEN REQUIRED NOMINAL THICKNESS EXCEEDS 50 MM.
.6 MAINTAIN UNINTERRUPTED CONTINUITY AND INTEGRITY OF VAPOUR RETARDER JACKET AND FINISHES.
.1 HANGERS, SUPPORTS TO BE OUTSIDE VAPOUR RETARDER JACKET.

3.2 INSTALLATION – PIPING

.1 PROVIDE STAPLES FOR SECUREMENT OF ALL INSULATION SEAMS. FOIL/ALUMINUM ADHESIVE TAPE WILL NOT BE ALLOWED.

.2 APPLY INSULATION AT A TEMPERATURE OF APPROXIMATELY 18°C (65°F) OVER CLEAN, DRY SURFACES. BUTT ADJOINING SECTIONS OF INSULATION FIRMLY TOGETHER WITH THE LONGITUDINAL SEAM OF THE JACKET LOCATED ON THE BOTTOM HALF OF THE PIPE.

.3 ON PLUMBING COLD & HOT PIPING, INSULATE & FINISH ALL VALVES/VALVE BODIES, ELBOWS, FITTINGS AND FLANGES IN THE SAME MANNER AND SAME THICKNESS AS THE PIPING. USE MITRED SECTIONS OF THE SPECIFIED PIPE COVERING.

.4 ON HYDRONIC CHILLED/HOT/GLYCOL WATER PIPING, INSULATE & FINISH ALL VALVES/VALVE BODIES, ELBOWS, FITTINGS AND FLANGES IN THE SAME MANNER AND SAME THICKNESS AS THE PIPING. PROVIDE PRE-MANUFACTURED VALVE, ELBOW, & FITTING INSULATION COVERS WHERE REQUIRED; PROVIDE SHOP DRAWING SUBMITTAL TO THE CONTRACT ADMINISTRATOR FOR APPROVAL.

.5 FOR COLD PIPING INSULATION, SEAL LONGITUDINAL LAP JOINTS WITH SUITABLE VAPOUR BARRIER ADHESIVE.

.1 PROVIDE BAKELITE 120-12 VAPOR BARRIER COATING.

.6 FOR HOT PIPING INSULATION, SEAL LONGITUDINAL LAP JOINTS WITH A SUITABLE ADHESIVE/CEMENT CAPABLE OF WITHSTANDING THE SERVICE TEMPERATURE. COVER BUTT JOINTS WITH A STRIP OF THE SAME MATERIAL AS THE JACKET, AND CEMENT AS REQUIRED.

.1 PROVIDE BAKELITE 120-18 WHITE FIRE RESISTIVE LAGGING.

.7 LAG ALL OPEN ENDS.

.8 CONCEALED INSULATED ITEMS REQUIRE NO FURTHER FINISH THAN PROVIDED IN FACTORY APPLIED JACKET.

.9 ALL ADHESIVES AND FINISHES: FIRE RETARDANT OR FIRE RESISTANT WHEN DRY, AND ACCEPTABLE TO THE AUTHORITIES HAVING JURISDICTION.

.10 FOR COLD PIPING, SEAL END JOINTS AND PERFORATIONS WITH FACTORY FURNISHED 100 MM (4") WIDE VAPOUR BARRIER STRIPS APPLIED WITH THE SAME ADHESIVES AND CEMENTS AS PREVIOUSLY SPECIFIED.

.11 SEAL VALVES, FITTINGS AND FLANGES ON COLD PIPING IN A MANNER AS SPECIFIED FOR END JOINTS.

.12 SUPPORTS, HANGERS:

.1 USE OVERSIZED HANGERS ON DCW PIPING DN 32 (NPS 1.25) AND LARGER.

.2 ON ALL COLD PIPING WHERE OVERSIZED HANGERS ARE USED: PROTECT INSULATION WITH A SHEET METAL SADDLE INSTALLED OVER THE VAPOUR BARRIER.

.3 FOR PIPING DN 32 (NPS 1.25) AND LARGER, PROVIDE A SECTION OF RIGID INSULATION OR NON-COMPRESSIBLE MATERIAL UNDER THE VAPOUR BARRIER, THE SAME LENGTH AS THE SADDLE.

.13 REFRIGERANT PIPING:

.1 THE INSULATION SHALL BE INSTALLED AS EACH SECTION OF THE PIPEWORK IS COMPLETED AND EACH SECTION OF INSULATION SHALL BE GLUED TOGETHER.

.2 AT EACH JOINT IN THE PIPEWORK, THE INSULATION SHALL BE NEATLY DRAWN BACK AND SECURED TO ALLOW INSPECTION OF THE JOINT DURING PRESSURE/VACUUM TESTS AND SYSTEM CHARGING. UPON COMPLETION THE INSULATION SHALL BE RELEASED, JOINTED AND VAPOUR SEALED.

.3 WHEN THE INSTALLATION IS COMPLETE, IDENTIFICATION BANDS/TAGS COMPLETE WITH INTERNAL SYSTEMS AND INDOOR UNIT REFERENCE, SHALL BE FITTED AT A MAXIMUM OF 4 METRE CENTRES.

3.3 INSTALLATION – DUCTWORK

.1 DO NOT INSULATE DUCTWORK PRIOR TO DUCT SEALANT BEING APPLIED.

.2 EXPOSED RECTANGULAR DUCTWORK: IMPALE FIBREGLASS BOARD ON WELD PINS AND SPEED WASHERS 300 MM (12") O.C. WITH A MINIMUM OF TWO ROWS PER SIDE ON ANY SIDE GREATER THAN 300 MM (12"). CUT PINS FLUSH WITH SURFACE OF INSULATION AND COVER WITH FOIL FACED TAPE. COVER ALL JOINTS WITH FOIL FACED ADHESIVE TAPE.

.3 CONCEALED DUCTWORK AND EXPOSED ROUND: APPLY FLEXIBLE BLANKET INSULATION WITH AN APPROVED ADHESIVE BRUSHED ON IN 100 MM (4") WIDE STRIPS 300 MM (12") O.C. AND AT ALL JOINTS. SEAL ALL JOINTS AND PERFORATIONS WITH FOIL FACED ADHESIVE TAPE.

.4 WHERE INTERIOR LINED DUCTWORK IS REQUIRED TO BE INSULATED, THE THICKNESS OF THE LINER MAY BE DEDUCTED FROM THE TOTAL THICKNESS OF THE EXTERIOR INSULATION. THIS IS WITH THE EXCEPTION OF SPECIFIC ITEMS SUCH AS EXHAUST PLENUMS DETAILED ON THE DRAWINGS.

.5 SUPPORTS, HANGERS:

.1 APPLY HIGH COMPRESSIVE STRENGTH INSULATION WHERE INSULATION MAY BE COMPRESSED BY WEIGHT OF DUCTWORK.
.2 MAINTAIN UNINTERRUPTED CONTINUITY AND INTEGRITY OF VAPOUR RETARDER JACKET AND FINISHES.
.3 HANGERS, SUPPORTS TO BE OUTSIDE VAPOUR RETARDER JACKET.

3.4 EQUIPMENT AND MISCELLANEOUS APPLICATIONS

.1 WATER METERS, ROOF DRAIN BODIES, AND PUMP CASINGS: APPLY FLEXIBLE BLANKET WITH SUITABLE ADHESIVE. SEAL JOINTS AND EDGES WITH FOIL FACED TAPE.
.2 P-TRAPS: REFER TO 'MISCELLANEOUS APPLICATIONS' IN PART TWO OF THIS SPECIFICATION SECTION.
.3 REFRIGERANT PIPING: INSTALL USING SELF-LOCKING PLASTIC TIES. SEAL JOINTS WITH SUITABLE MASTIC.

3.5 REMOVABLE, PRE FABRICATED, INSULATION AND ENCLOSURES

.1 APPLICATION: AT EXPANSION COMPENSATORS, VALVES, PRIMARY FLOW MEASURING ELEMENTS, AND FLANGES AND UNIONS AT EQUIPMENT.
.2 DESIGN: TO PERMIT MOVEMENT OF EXPANSION COMPENSATOR AND TO PERMIT PERIODIC REMOVAL AND REPLACEMENT WITHOUT DAMAGE TO ADJACENT INSULATION.
.3 INSULATION:
.1 INSULATION, JACKETS, FASTENINGS AND FINISHES: SAME AS SYSTEM.

3.6 INSTALLATION OF ELASTOMERIC INSULATION
.1 INSULATION TO REMAIN DRY AT ALL TIMES. OVERLAPS TO MANUFACTURER'S INSTRUCTIONS. ENSURE TIGHT JOINTS.
.2 PROVIDE VAPOUR RETARDER AS RECOMMENDED BY MANUFACTURER.

3.7 RECOMMENDED INSULATION THICKNESS SCHEDULE GUIDE: (REFER TO PART 2 ABOVE FOR MINIMUM ACCEPTABLE REQUIREMENTS AS PER MECB. ALL FINAL THICKNESS & INSULATION VALUES SHALL BE AS PER THE MECB, THE VALUES LISTED BELOW ARE TO BE USED AS A GUIDE ONLY.)
.1 PIPING:
.1 ANY PIPE WITHIN 2400MM (10'-0") OF A PENETRATION THROUGH AN EXTERIOR WALL OR ROOF, OR A PENETRATION TO ANOTHER SPACE OF DIFFERING TEMPERATURE.
25 MM (1")
.2 DOMESTIC COLD WATER PIPING:
25 MM (1")
.3 DOMESTIC HOT OR TEMPERED WATER SUPPLY AND RECIRC PIPING:
25 MM (1") FOR UP TO AND INCLUDING 50 MM (2 ") SIZE
40 MM (1.5 ") FOR PIPE SIZES OVER 50 MM (2 ")
.4 HEATING WATER OR GLYCOL SUPPLY AND RETURN PIPING:
FOR TEMPERATURES OF 13-40°C (55-104°F): NOT REQUIRED
FOR TEMPERATURES OF 41-60°C (105-140°F):
25 MM (1") FOR UP TO AND INCLUDING 100 MM (4") SIZE
40 MM (1.5") FOR PIPE SIZES OVER 100 MM (4")
FOR TEMPERATURES OF 61-93°C (141-200°F):
25 MM (1") FOR UP TO AND INCLUDING 50 MM (2 ") SIZE
40 MM (1.5 ") FOR PIPE SIZES OVER 50 MM (2 ")
.5 STEAM AND STEAM CONDENSATE PIPING:
FOR TEMPERATURES OF 94-121°C (201-250°F):
25 MM (1") FOR RUNOUTS UP TO & INCLUDING 50 MM (2") SIZE AND 3.7M (12') LONG
40 MM (1.5 ") FOR PIPE SIZES UP TO AND INCLUDING
50 MM (2") 50 MM (2 ") FOR PIPE SIZES OVER 50 MM (2 ")

.6 CHILLED WATER SUPPLY AND RETURN PIPING:
FOR TEMPERATURES OF 5-13°C (41-55°F)
25 MM (1")
FOR TEMPERATURES BELOW 5°C (41°F)
25 MM (1") FOR RUNOUTS UP TO 50 MM (2") SIZE AND 3.7M (12') LONG
25 MM (1 ") FOR PIPE SIZES UP TO AND INCLUDING 25 MM (1 ")
40 MM (1.5") FOR PIPE SIZES OVER 25 MM (1")

.7 WELL/GROUND WATER SUPPLY AND RETURN PIPING (INSIDE BUILDING):
25 MM (1")
.8 PLUMBING VENTS IN ATTIC SPACE
25 MM (1")
.9 CONDENSATE DRIP DRAINS:
12 MM (1/2")

.2 DUCTWORK:
.1 GENERAL NOTE: WHERE DUCT SECTIONS ARE LINED WITH 25 MM (1") THICK ACOUSTIC DUCT LINER, 25 MM (1") MAY BE DEDUCTED FROM THE SPECIFIED REQUIREMENT FOR EXTERNAL THERMAL INSULATION
.2 SUPPLY DUCTWORK: (ON ALL NEW DUCTWORK WHETHER SPECIFICALLY NOTED ON THE DRAWINGS OR NOT):
25 MM (1")
.3 FRESH AIR INTAKE DUCTS TO AIR UNITS:
75 MM (3")
.4 COMBUSTION AND VENTILATION AIR DUCTS FOR GAS-FIRED EQUIPMENT ROOMS:
25 MM (1")
.5 MIXED AIR DUCTS FROM FRESH AIR DUCT TO HEATING COIL:
50 MM (2")
.6 EXHAUST/RELIEF AIR DUCTS (FROM HRV'S TO OUTDOORS):
50 MM (2")
.7 EXHAUST AIR DUCTS (FROM EXHAUST FAN BACK DRAFT OR MOTORIZED DAMPER TO OUTDOORS):
50 MM (2")
.8 DUCTS PENETRATING AN EXTERIOR BUILDING SURFACE [FOR THE LAST 3000 MM (10'-0")]:
50 MM (2")
.9 DUCTS IN ATTIC SPACE AND OUTDOORS:
50 MM (2")
.10 RELIEF AIR DUCTS:
50 MM (2")
.11 DRIP PANS:
25 MM (1")

.3 EQUIPMENT AND MISCELLANEOUS APPLICATIONS:
.1 WATER METERS, ROOF DRAIN BODIES, AND PUMP CASINGS:
25 MM (1")
.2 P-TRAPS: REFER TO 'MISCELLANEOUS APPLICATIONS' IN PART 2 OF THIS SPECIFICATION SECTION.
.3 REFRIGERANT PIPING:
25 MM (1") FOR COLD PIPING
25 MM (1 ") FOR HOT PIPING, EXCEPT OUTDOORS
.4 BREECHINGS: 50 MM (2")

3.8 FINISHES
.1 PIPING (CONCEALED):
FACTORY APPLIED JACKET.
.2 PIPING (EXPOSED):
170 G/M2 (6 OZ/YD2) U.L. LABELED CANVAS WITH PVC FITTING COVERS.

-OR-

PVC, STAINLESS STEEL OR ALUMINUM PIPE AND FITTING COVERS
.3 DUCTWORK (CONCEALED): FACTORY APPLIED JACKET.
.4 DUCTWORK (EXPOSED): 170 G/M2 (6 OZ/YD2) U.L. LABELED CANVAS.
.5 DUCTWORK (EXPOSED OUTDOORS):
.1 TWO LAYERS OF FELT PAPER, TARRED AND SEALED TO MAKE WEATHERPROOF

- OR -

'BLUESKIN' POLY-TYPE BITUMEN MEMBRANE.

.2 DIMPLE FINISH 016 ALUMINUM JACKET.

.6 WATER METERS AND PUMP CASINGS: FACTORY APPLIED JACKET.
.7 ROOF DRAIN BODIES (EXPOSED): 170 G/M2 (6 OZ/YD2) U.L. LABELED CANVAS.
.8 ROOF DRAIN BODIES (CONCEALED): FACTORY APPLIED JACKET.
.9 REFRIGERANT PIPING: NONE.
.10 BREECHINGS: CEMENT LAYER

SECTION 22 05 05 - PLUMBING:

1. PROVIDE COMPLETE FUNCTIONAL PLUMBING SYSTEM COMPRISED OF DOMESTIC WATER PIPING, VENTS, SANITARY, AND DRAINAGE PIPING, ETC. MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROVISION OF COMPLETE HYDRONIC HEATING SYSTEM INCLUDING IN-SLAB HEATING, HEATERS, BOILER, PUMPS, CONTROLS, PIPING AND MISC. EQUIPMENT.

2. EXTEND BUILDING SEWERS TO 3'-0" (1.0 M) OUTSIDE OF BUILDING LINE, UNLESS NOTED OTHERWISE. BEYOND THIS POINT SHALL BE THE RESPONSIBILITY OF AN OUTSIDE SERVICES CONTRACTOR. 33 31 00.

3. FOR THIS SECTION SHALL COMMENCE FROM WHERE SHOWN ON THE DRAWINGS.

4. CONFIRM EXACT LOCATIONS AND INVERT ELEVATIONS OF SERVICES PRIOR TO COMMENCING WORK. IF ANY DISCREPANCIES SHOULD BE DISCOVERED, THEN NOTIFY THE CONTRACT ADMINISTRATOR IMMEDIATELY.

5. CONFORM WITH THE REQUIREMENTS OF THE PLANS AND SPECIFICATION, AND THE LOCAL AUTHORITIES HAVING JURISDICTION. IN THE CASE OF CONFLICTING REQUIREMENTS, BE GOVERNED BY THE MOST SEVERE REGULATIONS.

6. ALL WATER PIPING ABOVE GROUND INSIDE BUILDING SHALL BE TYPE L HARD COPPER.

7. DRAINS AND VENT PIPING ABOVE GROUND INSIDE BUILDING SHALL BE DWV COPPER, CAST CAST IRON OR PVC PLASTIC PIPE (WHERE ACCEPTABLE BY CODE). JOINTS SHALL BE SOLDERED FOR COPPER AND SOLVENT CEMENT FOR PVC PIPE.

8. DRAINS AND VENT PIPING BELOW GROUND INSIDE BUILDING SHALL BE CAST IRON CLASS 4000, OR PVC PLASTIC. FITTINGS SHALL BE MECHANICAL JOINT FOR CAST IRON OR SOLVENT CEMENT FOR PVC.

9. MECHANICAL CONTRACTOR SHALL VERIFY ON SITE ALL CONNECTION POINTS TO EXISTING BUILDING SERVICES. COORDINATE ALL NEW PIPING RUNS WITH THE CONTRACT ADMINISTRATOR.

10. USE 95.5 TIN ANTINONY BRAZING SOLDER ON ALL HOT AND COLD WATER PIPING. USE NON-CORROSIVE NON-LEADED FLUX.

11. ALL VALVES TO BE BY ONE MANUFACTURER. STANDARD OF ACCEPTANCE: TOYO/RED & WHITE.

12. MECHANICAL CONTRACTOR SHALL ALLOW FOR IN TENDER QUOTATION ANY ADDITIONAL LABOUR, MATERIALS, ETC. DEEMED NECESSARY DUE TO EXACT SITE CONDITIONS WHICH HAVE NOT BEEN REFLECTED ON MECHANICAL DRAWING OR IN MECHANICAL SPECIFICATION. NOTIFY CONTRACT ADMINISTRATOR OF ALL DISCREPANCIES PRIOR TO TENDER CLOSE. ONUS IS ON THE CONTRACTOR, TO FULFILL THE INTENDED SCOPE OF WORK AS DIRECTED BY THE CONTRACT ADMINISTRATOR.

13. ON COMPLETION, ALL PIPING SYSTEMS SHALL BE FLUSHED OUT TO REMOVE ANY FOREIGN MATERIAL IN THE PIPING INCLUDING PITS AND PUMPS.

14. GAS PIPING:

.1 SHALL BE BLACK STEEL PIPE, EQUAL TO ASTM A-53 SCH. 40 WITH 150 LBS. STANDARD BLACK MALLEABLE IRON SCREWED FITTINGS. ALL WORK SHALL COMPLY WITH C.G.A. B149.1-2000 CODE, COMPLETE WITH DEPARTMENT OF LABOUR GAS NOTICES AND SHALL BE PERFORMED BY FULLY QUALIFIED GAS FITTERS AND/OR WELDERS LICENSED TO PRACTICE IN THE PROVINCE.

.2 VALVES IN GAS PIPING SHALL BE GRINNELL FIG. C.G.A. OR EQUAL.

.3 TAKE-OUT PERMITS AND CONNECT EQUIPMENT READY FOR USE. PROVIDE GAS REGULATORS AND GAS COCKS AT EACH PIECE OF EQUIPMENT.

SECTION 23 05 93 - TESTING AND BALANCING:

1. GENERAL SCOPE OF WORK

1.1. PROVIDE PERSONNEL FOR THE PURPOSE OF MAKING SITE VISITS, PREPARING REPORTS AND TAKING RESPONSIBILITY FOR ENSURING THAT THE SPECIFIED AIR AND WATER SYSTEMS OPERATE IN ACCORDANCE WITH SPECIFIED REQUIREMENTS, WITHIN A TOLERANCE OF PLUS OR MINUS 5%.

1.2. REVIEW AND CHECK THE CONTRACT DRAWINGS AND SPECIFICATIONS, AND INSTALLED WORK, TO ENSURE THAT MODIFICATIONS, IF REQUIRED, ARE IMPLEMENTED PRIOR TO THE EXECUTION OF THE WORK. PROVIDE A REPORT TO THE CONTRACT ADMINISTRATOR AS REQUIRED, MAKING WHATEVER RECOMMENDATIONS ARE NECESSARY IN THE INTERESTS OF ENSURING PROPER SYSTEM BALANCE.

1.3. AFTER THE INSTALLATION IS ADEQUATELY COMPLETED, INSPECT, TEST AND BALANCE THE SPECIFIED AIR AND WATER SYSTEMS. CO-OPERATE WITH THE CONTROLS CONTRACTOR TO ACHIEVE REQUIRED AIR QUANTITIES WHERE MODULATING DAMPERS ETC., ARE INSTALLED.

1.4. AFTER INSPECTING, TESTING AND BALANCING THE SYSTEMS, PROVIDE A PRELIMINARY WRITTEN REPORT TO THE CONTRACT ADMINISTRATOR.

1.5. MAKE ANY MODIFICATIONS TO THE SYSTEMS AS RECOMMENDED BY THE CONTRACT ADMINISTRATOR, RETEST AND REBALANCE THE SYSTEM(S) AS REQUIRED, AND SUBMIT A FINAL REPORT TO THE CONTRACT ADMINISTRATOR.

2. BALANCE EACH FAN AND EACH AIR OUTLET AND INLET TO THE AIR QUANTITY NOTED.

3. TEST EACH FIRE DAMPER TO ENSURE PROPER ACCESS AND PERFORMANCE. TAG EACH FIRE DAMPER WITH THE DATE OF TESTING.

4. BALANCE/RE-BALANCE [EXISTING] HYDRONIC LOOP & PUMP SYSTEMS AS REQUIRED.

5. PROVIDE A WRITTEN REPORT TO THE CONTRACT ADMINISTRATOR AND CONTRACT ADMINISTRATOR REGARDING THE TESTING AND BALANCING. MAKE ANY REQUESTED CHANGES TO THE REPORT BEFORE DELIVERING THREE FINAL COPIES TO THE CONTRACT ADMINISTRATOR.

6. TESTING AND BALANCING COMPANY SHALL BE A MEMBER IN GOOD STANDING WITH A.A.B.C., OR SHALL PROVE EQUIVALENCY TO THE CONTRACT ADMINISTRATOR.

7. REPORTS SHALL CONTAIN SPECIFIED DESIGN DATA AND ACHIEVED PERFORMANCE DATA, INCLUDING:

7.1. GENERAL: HP, VOLTAGE, PHASE, CYCLES, AND FULL LOAD AMPS.

7.2. AIR SYSTEMS: TOTAL AIR FLOW, INDIVIDUAL AIR FLOW PER OUTLET WITH SUPPORTING SCHEMATIC DIAGRAMS, FAN TOTAL STATIC PRESSURES WITH BREAKDOWN SHOWING INLET AND DISCHARGE PRESSURES, FAN R.P.M., O/A AND R/A AND REL/A AIR VOLUMES, AND INLET AND OUTLET DRY BULB AND WET BULB TEMPERATURES ACROSS THERMAL TRANSMISSION AND MIXING EQUIPMENT.

7.3. DUCT SYSTEMS: AIR VOLUMES AND VELOCITIES AT EQUIPMENT AND MAIN BRANCHES.

SECTION 23 30 00 - AIR DISTRIBUTION:

1. ALL DUCTWORK AND RELATED ACCESSORIES SHALL BE INSTALLED AS PER THE LATEST SMACNA STANDARDS.

2. DUCTWORK SHALL BE GALVANIZED SHEET METAL UNLESS NOTED OTHERWISE, AND SHALL BE OF THE FOLLOWING GAUGES:

RECTANGULAR
DUCTS UP TO 12" (300 MM) ON LONGEST DIMENSION = 26 GA.
DUCTS 13" TO 28" (325 TO 700 MM) ON LONGEST DIMENSION = 24 GA.
DUCTS 29" TO 48" (725 TO 1200 MM) ON LONGEST DIMENSION = 22 GA.
DUCTS 49" TO 96" (1225 TO 2400 MM) ON LONGEST DIMENSION = 20 GA.

ROUND (EXPOSED SHALL BE SPIRAL, CONCEALED SHALL BE SNAP-LOCK OR SPIRAL)
DUCTS 8" (200 MM) AND SMALLER = 26 GA.
DUCTS 9" TO 22" (225 TO 550 MM) = 24 GA.
DUCTS 24" TO 36" (600 TO 900 MM) = 22 GA.

ALL EXPOSED ROUND DUCTWORK SHALL BE ROUND SPIRAL CONDUIT CONSTRUCTED OF ZINC COATED STEEL: ACCEPTABLE PRODUCTS: UNITED SHEET METAL CO. SHOP FABRICATED DUCTWORK AND FITTINGS CONSTRUCTED IN A MANNER SIMILAR TO THE FACTORY TYPE SPECIFIED WILL BE ACCEPTED.

CONDUIT SIZE	GAUGE OF METAL
8" AND SMALLER	26
9" TO 22"	24
24" TO 36"	22

3. BALANCING DAMPERS SHALL BE PROVIDED FOR EACH SUPPLY AIR OUTLET AND RETURN/EXHAUST AIR INLET. DAMPERS MOUNTED AT GRILLES SHALL BE MULTI-BLADE TYPE. BUTTERFLY DAMPERS IN DUCTWORK SHALL BE CONSTRUCTED OF SHEET METAL, TWO GAUGES HEAVIER THAN THE DUCTWORK. DUCT DAMPERS SHALL HAVE LOCKING QUADRANTS AND POSITION INDICATORS.

4. ALL DUCTWORK SHALL BE SEALED WITH NON TOXIC DUCT SEALANT.

5. PROVIDE 4" (100MM) WIDE FLEXIBLE FABRIC DUCT CONNECTIONS AT INLETS AND OUTLETS OF FANS.

6. WHERE SQUARE ELBOWS ARE SHOWN WITH TURNING VANES THEY SHALL BE ROVANE TURNING VANES. CONSTRUCTION SHALL BE OF SINGLE BLADE THICKNESS OF MINIMUM 24 US STD. GAUGE WITH TRAILING EDGE.

7. CONTRACTOR SHALL ENSURE THAT ALL DUCT SYSTEMS ARE LEFT CLEAN INSIDE AND OUT PRIOR TO TURN-OVER TO CONTRACT ADMINISTRATOR. CLEAN ALL PROP FANS. CLEAN ALL AIR DISTRIBUTION AND VENTILATION SYSTEM COMPONENTS.

8. PROVIDE BURGLAR BARS IN ALL OPENINGS 12"X12" IN SIZE AND OVER. MADE OF 1/2" REBAR AT 6" O.C. IN EACH DIRECTION SECURED TO STRUCTURE.

9. ACOUSTIC DUCT LINING:

9.1. PROVIDE ACOUSTIC LINING IN ALL DUCTWORK WHERE INDICATED ON THE DRAWINGS AT A THICKNESS OF 25MM (1").

9.2. DUCT SIZES SHOWN ON THE DRAWINGS ARE CLEAR INSIDE DIMENSIONS. SHEET METAL SIZES SHALL INCREASE AS REQUIRED TO ACCOMMODATE THE THICKNESS OF INTERNAL INSULATION, TO MAINTAIN THE EQUIVALENT FREE AREA NOTED ON THE DRAWINGS.

9.3. INSTALLATION SHALL NOT INCLUDE ANY TAPES, FABRICS, CEMENTS OR OTHER MATERIALS WHICH ARE NOT CLEANABLE OR WHICH OFFER OPPORTUNITY FOR MOLD GROWTH.

9.4. INSTALLATION SHALL BE TO MANUFACTURES STANDARD AND SHALL WITHSTAND AIR VELOCITIES OF 12.7 M/S (2500 FEET PER MINUTE).

9.5. THE USE OF FIBERGLASS LINER IS NOT ALLOWED. PROVIDE ELASTOMERIC DUCT INSULATION SPECIFICALLY DESIGNED FOR DUCT LINER.

9.6. ALL ACOUSTIC DUCT LINER MUST BE CONSTRUCTED OF CLOSED-CELL, POLYMER SHEET INSULATION MATERIALS.

9.7. PRODUCT MUST BE CLEANABLE AND HAVE ZERO PERM RATING AND ZERO WATER ABSORPTION. LOW VOC, FIBER-FREE, NON-PARTICULATING, FORMALDEHYDE-FREE.

9.8. ANTIMICROBIAL PRODUCT PROTECTION TO INHIBIT THE GROWTH OF MOLD AND MILDEW.

10. FIRE DAMPERS SHALL BE INSTALLED AT ALL LOCATIONS WHERE DUCTWORK PASSES THROUGH A RATED SEPARATION, WHETHER SHOWN ON THE DRAWINGS OR NOT. CONFIRM ALL SEPARATION LOCATIONS WITH THE CONTRACT ADMINISTRATORURAL DRAWINGS.

11. PROVIDE FIRE DAMPERS WHICH CONFORM TO NFPA REGULATIONS, BEAR ULC LABEL, AND HAVE APPROVAL OF DFC. DAMPERS TO BE DYNAMIC TYPE 'B' (UNLESS NOTED OTHERWISE) AND INSTALLED IN DUCTWORK AT FIRE SEPARATIONS WHETHER SHOWN OR NOT. FIRE DAMPERS TO BE NO SMALLER THAN 6"X6" (150MMX150MM). THEY SHALL BE FULLY ACCESSIBLE WITH ACCESS DOORS NO LESS THAN 6"X6" (150MMX150MM).

12. PROVIDE DUCT ACCESS DOORS AT ALL LOCATIONS REQUIRED FOR INSTALLATION, MAINTENANCE OR ADJUSTMENT OF EQUIPMENT OR CONTROLS. ACCESS DOORS SHALL HAVE GASKETS, PIANO HINGES AND THUMB LATCHES. DOORS SHALL BE INSTALLED TO ALLOW FOR INSTALLATION OF INTERNAL OR EXTERNAL INSTALLATION AS REQUIRED.

13. SUPPORT HORIZONTAL DUCTWORK AT MAXIMUM 8'-0" (2400MM) ON CENTRE.

13.1. FOR ROUND DUCTWORK UP TO 36" (900MM) DIAMETER, SUPPORT DUCT USING PERFORATED GALVANIZED STEEL STRAP, SUSPENDED USING THREADED RODS ATTACHED TO THE STRUCTURE. USE 3/8" (10MM) RODS FOR DUCTS 12" (300MM) DIAMETER AND LESS. USE 1/2" (12MM) RODS FOR DUCTS 14" TO 22" (350MM TO 550MM) DIAMETER. USE 5/8" (16MM) RODS FOR DUCTS OVER 24" (600MM) DIAMETER.

13.2. FOR ROUND DUCTWORK OVER 36" (900MM) DIAMETER, SUPPORT DUCT USING 1" X 1" X 1/8" (25MM X 25MM X 3MM) GALVANIZED ANGLE IRON TRAPEZE, SUSPENDED BY 5/8" (16MM) DIAMETER THREADED RODS ATTACHED TO THE STRUCTURE.

13.3. FOR RECTANGULAR DUCTWORK 18" (450MM) WIDE OR LESS, SUPPORT DUCT WITH PERFORATED GALVANIZED STEEL STRAP, SUSPENDED USING 1/2" (12MM) THREADED RODS ATTACHED TO THE STRUCTURE.

13.4. FOR RECTANGULAR DUCTWORK OVER 18" (450MM) WIDE, S
1" X 1" X 1/8" (25MM X 25MM X 3MM) GALVANIZED AT
SUSPENDED BY 5/8" (16MM) DIAMETER THREADED RODS
STRUCTURE.

13.