#### SECTION 15005 MECHANICAL SCOPE OF WORK

- .1 INCLUDE IN MECHANICAL SECTION, PROVISION OF LABOUR, NEW MATERIALS, TOOLS, TRANSPORTATION, SERVICES AND FACILITIES FOR A COMPLETE MECHANICAL INSTALLATION. THE INSTALLATION SHALL BE LEFT COMPLETE IN ALL RESPECTS AND READY FOR OPERATION. FINAL INSTALLATION SHALL BE INSTALLED TO COMPLETE SATISFACTION OF THE RESPONSIBLE CONTRACT ADMINISTRATOR.
- .2 THE MECHANICAL SCOPE OF WORK INCLUDES, BUT IS NOT NECESSARILY LIMITED TO THE FOLLOWING PROVISION: PROVISION OF ALL PIPING, VALVES, FLUSH VALVES, PIPE SLEEVES, LABOUR AND MISCELLANEOUS MATERIALS AS REQUIRED TO COMPLETE THE PROJECT.
- .2 FAMILIARIZE CREW WITH SITE IN ORDER TO DETERMINE APPROPRIATE LOCATIONS, SITE CONDITIONS, ETC. THAT MAY
- .3 WORK MAY NEED TO BE PERFORMED AT NON-STANDARD HOURS. MAINS, ETC. DETERMINE SCHEDULE WITH CONTRACT ADMINISTRATOR.
  - SECTION 15010 GENERAL CONDITIONS
- 1. PROVIDE ALL LABOUR, MATERIALS, AND EQUIPMENT NECESSARY TO COMPLETE THE WORK SHOWN ON DRAWINGS AND AS SPECIFIED HEREIN.
- 2. ALL NECESSARY PERMITS SHALL BE OBTAINED AND ALL FEES SHALL BE PAID TO CARRY OUT THE SPECIFIED WORK.
- 3. ALL WORK SHALL BE GUARANTEED FOR ONE YEAR FROM DATE OF COMPLETED WORK ACCEPTANCE BY THE CONTRACT ADMINISTRATOR. SUBMIT DOCUMENTATION IDENTIFYING ADDITIONAL EQUIPMENT WARRANTY COVERAGE AND TIME FRAMES.
- 4. ALL WORK SHALL COMPLY IN EVERY RESPECT WITH ALL NATIONAL, PROVINCIAL AND LOCAL CODES AND BY-LAWS, WHICH SHALL BE CONSIDERED PART OF THIS SPECIFICATION. IN THE CASE OF CONFLICTING REQUIREMENTS, BE GOVERNED BY THE MOST STRINGENT
- 5. ALL CUTTING, PATCHING, FLASHING FOR WORK AS REQUIRED HEREIN SHALL BE BY THE CONTRACTOR.
- 6. THE CONTRACTOR SHALL INSTALL PLUMBING, HEATING, VENTILATION AND AIR CONDITIONING SYSTEMS IN COMPLETE ACCORDANCE WITH THE RECOMMENDATIONS OF THE NATIONAL/PROVINCIAL BUILDING CODE, ASHRAE, SMACNA LATEST EDITION DUCT STANDARDS, AND LOCAL PLUMBING CODES.
- 7. COORDINATE WORK WITH WORK OF OTHER TRADES TO AVOID CONFLICT.
- 8. ALTER THE LOCATION OF DUCTS OR PIPES AT THE DIRECTION OF THE CONTRACT ADMINISTRATOR WITHOUT CHARGE TO THE CONTRACT ADMINISTRATOR. PROVIDED THE CHANGE IS MADE BEFORE INSTALLATION AND DOES NOT NECESSITATE ADDITIONAL MATERIALS.
- 9. QUOTATIONS SHALL BE BASED ON THE USE OF SPECIFIED MANUFACTURERS OR APPROVED EQUAL IN ACCORDANCE WITH B6. THE USE OF AN EQUAL OR ALTERNATE MANUFACTURERS (APPROVED IN ACCORDANCE WITH B6) SHALL IN NO WAY RELIEVE THE CONTRACTOR FROM THE RESPONSIBILITY OF PROVIDING ALL WORK IHAI MAY BE REQUIRED BY REASON OF DIFFERENT SPACE WEIGHT, ELECTRICAL, OR OTHER REQUIREMENT FROM THAT OF THE SPECIFIED MANUFACTURER. ALTERNATES SHALL BE APPROVED PRIOR TO THE CLOSE OF TENDERS IN ACCORDNACE WITH B6. NO SUBMITTALS RECEIVED AFTER BID CLOSING WILL BE ACCEPTED.
- 10. THE CONTRACTOR SHALL PROVIDE SIX (6) SETS OF SHOP DRAWINGS FOR ALL EQUIPMENT FOR REVIEW AND APPROVAL BY CONTRACT ADMINISTRATOR. CONTRACTOR SHALL STAMP SHOP DRAWINGS REVIEWED BY CONTRACTOR PRIOR TO SUBMISSION, FAILURE TO COMPLY WILL RESULT IN SHOP DRAWINGS BEING RETURNED "UNREVIEWED" BY CONTRACT ADMINISTRATOR.
- 11. FURNISH TO THE CONTRACT ADMINISTRATOR THREE (3) HARD-COVERED LOOSE-LEAF BINDERS CONTAINING THEREIN ONE (1) COMPLETE SET OF MANUFACTURERS' OPERATING AND MAINTENANCE INSTRUCTIONS SHOWING ALL MAJOR EQUIPMENT AND APPARATUS REQUIRING MAINTENANCE. INSTRUCTIONS SHALL BE COMPLETE FOR INSTALLATION, OPERATION AND MAINTENANCE AND SHALL INCLUDE PERTINENT INFORMATION SUCH AS DETAILED DRAWINGS AND OPERATION CURVES. SPARE PARTS, SUPPLIER LISTS AND ADDRESSES SHALL BE SUPPLIED. INSTRUCTION SHALL BE REQUIRED WITH THE CONTRACT ADMINISTRATORS' REPRESENTATIVE TO ENSURE A THOROUGH UNDERSTANDING OF THE EQUIPMENT AND ITS OPERATION.
- 12. ALL WIRING, SUPPLY AND INSTALLATION OF DISCONNECT SWITCHES FOR EQUIPMENT SPECIFIED HEREIN SHALL BE PERFORMED BY THE CONTRACTOR, UNLESS OTHERWISE NOTED.
- 13. CONTRACTOR SHALL EXAMINE THE SITE AND CONDITIONS AFFECTING WORK, METHODS OF CONNECTION AND LOCATION OF ALL SERVICES INVOLVED UNDER THIS CONTRACT. FAILURE TO MAKE THIS VISIT IN NO WAY ALLEVIATES THE CONTRACTOR FROM RESPONSIBILITY FOR COMPLETING THE MECHANICAL WORK OF THIS CONTRACT IN A WORKMANLIKE MANNER. NO ALLOWANCE WILL BE MADE AFTER CONTRACT AWARD FOR ANY EXPENSE INCURRED THROUGH A FAILURE TO MAKE THIS EXAMINATION AND INVESTIGATION.
- 14. SCHEDULING OF ALL WORK SHALL BE ARRANGED WITH THE CONTRACT ADMINISTRATOR, AND THEY SHALL BE NOTIFIED AND APPROVAL OBTAINED PRIOR TO SHUTTING OFF EXISTING SERVICES FOR PURPOSES OF CONNECTING NEW WORK. WORK WITHIN THE BUILDING MAY HAVE TO BE PERFORMED DURING NON-REGULAR WORKING HOURS AND MUST CONFORM TO WORK RULES OF THE BUILDING AS DIRECTED BY THE CONTRACT ADMINISTRATOR.
- 15. AS-BUILT DRAWINGS:
- OBTAIN SETS OF WHITE PRINTS (ONE FOR EACH SYSTEM IE. PLUMBING, HVAC, FIRE PROTECTION) AND KEEP AT JOB SITE AT ALL TIMES.
- 2. RECORD ALL ADDITIONS OR DEVIATIONS FROM THE CONTRACT DOCUMENTS INCLUDING ALL CHANGES INCURRED BY ADDENDA, CHANGE ORDERS, FIELD CHANGES, JOB CONDITIONS, ETC. CONTRACTORS SHALL BE RESPONSIBLE FOR THE PRODUCTION OF AS-BUILT RECORD DRAWINGS WHICH SHALL PROVIDE A COMPLETE AND ACCURATE RECORD OF THE ACTUAL MECHANICAL INSTALLATION. ALL PRINCIPLE BELOW GRADE OR INACCESSIBLE PIPING OR DUCT SYSTEMS, ETC. SHALL BE

DIMENSIONED AT EACH CHANGE IN DIRECTION. INCLUDE ALL

ROUTING OF SERVICES NOT INDICATED ON ORIGINAL DRAWINGS.

- 4. PROJECT RECORD DRAWINGS SHALL BE TRANSFERRED BY CONTRACTOR TO REPRODUCIBLE BOND DRAWINGS AND LABELLED "AS-BUILT".
- 5. SUBMIT REPRODUCIBLE BOND DRAWINGS TO CONTRACT ADMNISTRATOR FOR REVIEW UPON COMPLETION IF CORRECTIVE MEASURES ARE REQUIRED AFTER THE SECOND CONTRACT ADMINISTRATOR REVIEW (DUE TO MISSING INFORMATION AND/OR IMPROPER DRAFTING STANDARDS), THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CONTRACT ADMINISTRATORS TIME COSTS FOR CORRECTIVE MEASURES, COURIER AND PRINTING COSTS. 6. CONTRACTOR SHALL EMPLOY CONTRACT ADMINISTRATOR(OR CAD DRAFTING SERVICE) TO PRODUCE ELECTRONIC COPY AS-BUILT DRAWINGS.
- 7. COPY OF FINAL "AS-BUILT" DRAWING SHALL BE SUBMITTED TO CONTRACT ADMINISTRATOR. 8. ALL COSTS OF "AS-BUILT" DRAWINGS PRODUCTION SHALL BE BORNE BY THE CONTRACTOR.
- 16. THE CONTRACTOR SHALL, AT HIS OWN EXPENSE, PROVIDE TEMPORARY HEATING AND HOARDING AS REQUIRED FOR THE PROPER PROGRESS OF THE WORK.

CONTRACTOR SHALL BEAR ALL COSTS OF PRODUCTION.

- 17. VERIFY SIZES, INVERTS AND LOCATIONS OF ALL SERVICES PRIOR TO COMMENCEMENT OF WORK. THIS SHALL INCLUDE, BUT NOT BE LIMITED TO SANITARY SEWER, STORM SEWER, DOMESTIC WATER MAINS, FORCE
- 18. HOISTING OF ALL MECHANICAL EQUIPMENT SHALL BE BY THE CONTRACTOR.
- 19. ASSUME FULL RESPONSIBILITY FOR LAYING OUT ALL WORK AND ENSURING THAT NO DAMAGE IS CAUSED TO THE CONTRACT ADMINISTRATORS EQUIPMENT AND PREMISES DUE TO IMPROPER LOCATION AND EXECUTION OF WORK IN THIS CONTRACT. PROTECT AND MAINTAIN ALL WORK UNTIL WORK HAS BEEN COMPLETED AND ACCEPTED BY THE CONTRACT ADMINISTRATOR. STORE ALL MATERIALS AS REQUIRED, AND CLEAN UP REFUSE CAUSED BY ALL
- 20. IDENTIFY ALL NEW PIPING WITHIN BUILDING INSTALLED IN THIS CONTRACT SHOWING SERVICE, PIPE SIZE, AND FLOW DIRECTION. USE CAPITAL LETTERS USING EITHER FIRE RESISTANT HIGH GLOSS INTERIOR ENAMEL PAINT OR WATERPROOF, HEAT RESISTANT PLASTIC MARKER TAGS (SIMILAR TO: W.H. BRADY IDENTIFICATION TAPES, BANDS, MARKERS.) IDENTIFY AT MAXIMUM OF EVERY 50 FT. AND AT LEAST ONCE IN EACH ROOM. LOCATE AND SIZE LETTERING SUCH THAT IT CAN BE SEEN FROM FLOOR.
- 22. IN THE CASE OF DISCREPANCY BETWEEN ARCHITECTURAL AND MECHANICAL DRAWINGS TO NUMBER, TYPE, OR LOCATION OF HVAC EQUIPMENT AND SYSTEMS COMPONENTS, OBTAIN WRITTEN RULING.
- 23. ALL TIME/DATE SENSITIVE ELECTRONIC EQUIPMENT AND SOFTWARE PROVIDED ON THIS PROJECT SHALL BE 4 DIGIT YEAR INPUT COMPATIBLE AND SHALL BE BASED ON THE USE OF FULL, UNABBREVIATED, UNAMBIGUOUS DISCRETE TIME AND DATE CODES.
- 24. CONTRACTOR SHALL COORDINATE PROVISION OF POWER TO BUILDING CONTROL TRANSFORMERS WITH DIVISION 16 AND CARRY ALL INCREMENTAL COSTS.
- 25. COORDINATE THE ELECTRICAL REQUIREMENTS OF ALL MECHANICAL EQUIPMENT WITH DIVISION 16. DIVISION 16 SHALL PROVIDE THE
- ALL POWER WIRING TO EQUIPMENT. .2 ONE 15 AMP 120V/1PH/60HZ FUSED POWER SUPPLY TO EACH MECHANICAL EQUIPMENT AND/OR JANITOR ROOM.
- 26. PROVIDE FIRE STOPPING AT ALL PIPING. CONDUIT (CONTROLS) AND DUCTWORK PENETRATIONS OF ALL REQUIRED FIRE SEPARATIONS WITH APPROVED MATERIAL SYSTEMS. ACCEPTABLE MATERIALS: 3M, DOW, CORNING, APS.

#### SECTION 15180 INSULATION

- A. ALL INSULATING MATERIALS, METHODS, SIZES AND TYPES OF INSULATION FOR ALL PIPING AND DUCT WORK SHALL BE INSTALLED TO THE REQUIREMENTS OF THE ASHRAE STANDARDS 90.1-2004 "ENERGY STANDARD FOR BUILDING EXCEPT LOW-RISE RESIDENTIAL BUILDING", STANDARD 90.2-2001 "ENERGY EFFICIENT DESIGN OF LOW-RISE RESIDENTIAL BUILDINGS" AND THERMAL INSULATION ASSOCIATION OF CANADA (TIAC) STANDARDS.
- 1. PROVIDE 1/2" (12 MM) ON PIPING LESS THAN 1 1/2"(38MM) OR 1" (25MM) ON PIPING 2"(50MM) OR GREATER THICK RIGID PIPE INSULATION ON ALL DOMESTIC WATER PIPES. INSULATION C/W VAPOUR BARRIER.
- 2. PROVIDE 1" (25 MM) THICK PIPE INSULATION ON ALL PLUMBING VENTS PASSING THROUGH ROOF FOR A DISTANCE OF 10'-0" (3 M) INSIDE FROM POINT OF COLD TO WARM SURFACE PENETRATION. INSULATION C/W VAPOUR BARRIER.
- 3. PROVIDE 1 1/2" (38 MM) THICK FLEXIBLE DUCT INSULATION C/W RFFRK FACING ON EXHAUST DUCTWORK & ALL SUPPLY DUCTWORK FROM ALL AIR HANDLING EQUIPMENT. EXHAUST DUCTWORK SHALL BE INSULATED FOR A MINIMUM DISTANCE OF 10'-0" (3 M) FROM PENETRATION OF BUILDING THERMAL ENVELOPE. REFER TO DRAWINGS FOR ADDITIONAL INSULATION REQUIREMENTS. ALL SUPPLY AIR DUCTWORK CONVEYING AIR-CONDITIONED AIR SHALL BE INSULATED.
- 6. PROVIDE 2" (50 MM)THICK RIGID THERMAL FACED INSULATION ON ALL DUCTWORK CONVEYING OUTSIDE AIR COMPLETE WITH RFFRK FACING. DUCTWORK SHALL BE INSULATED OVER ENTIRE RUN FROM PENETRATION OF BUILDING THERMAL ENVELOPE TO UNIT CONNECTION.
- ACOUSTICALLY INSULATE DUCTWORK WITH 1" (25 MM) FLEXIBLE DUCT INSULATION WITH FLAME - ATTENUATED FIBRES BONDED WITH THERMOSETTING RESIN: BLACK PLASTIC-COATED MAT FINISH. PROVIDE WHERE NOTED ON DRAWINGS OR AS SHOWN AS HATCHED DUCTWORK OR ALLOW FOR UP TO 10 FT. (3 M) FROM SUPPLY AND RETURN AIR OPENINGS OF ROOF MOUNTED EQUIPMENT.
- 8. DO NOT EXTERNALLY INSULATE ANY DUCTWORK WHICH IS SPECIFIED OR SHOWN TO BE INTERNALLY INSULATED UNLESS NOTED OTHERWISE.
- 9. INSULATION COVERINGS: DUCTWORK RUNNING OUTSIDE BUILDING THERMAL ENVELOPE AND EXPOSED TO THE WEATHER:

- .1 MASTIC FINISH OVER INSULATION SHALL BE VI-CRYL CP-10 WHITE WEATHER BARRIER COATING AS MANUFACTURED BY CHILDERS PRODUCTS COMPANY. IT SHALL BE APPLIED IN TWO COATS, THE FIRST COAT BEING A TACK COAT APPLIED AT A RATE OF TWO GALLONS PER 100 SQ. FT. (.81 L/SQ.M), AND WHILE STILL WET A LAYER OF CHIL-GLAS #5 OPEN WEAVE GLASS CLOTH MEMBRANE SHALL BE EMBEDDED WITH ALL FABRIC COAT AT A COVERAGE OF FOUR GALLONS PER 100 SQ. FT. (1.6 1/SQ.M) SHALL BE APPLIED, FULLY COVERING THE CLOTH MEMBRANE, SO THAT THE MINIMUM DRY FILM THICKNESS IS 1/16" (0.63") (1.6 MM). THERE SHALL BE NO VOIDS OR HOLES AND THE MASTIC SHALL BE TOWELLED, SPRAYED OR WET-BRUSHED TO A SMOOTH EVEN FINISH. PROVIDE ALUMINUM
- .2 ALL ADJOINING UNINSULATED SURFACES MUST BE COMPLETELY WATER-PROOFED AND FLASHED EITHER BY EXTENDING THE VI-CRYL CP-10/11 WEATHER BARRIER COATING AND FABRIC MEMBRANE A MINIMUM OF 4" (102 MM) ONTO THE ADJOINING SURFACE, OR, IF THAT SURFACE WILL ATTAIN TEMPERATURES IN EXCESS OF 180 DEGREES F (82 DEGREES C), USE CHIL-JOINT CP-70 SEALANT AS THE FLASHING COMPOUND.
- .3 ALL INSULATION IN EXPOSED LOCATIONS, AND ALL DUCTWORK IN FAN ROOMS, SERVICE ROOMS, GARAGES, ETC., SHALL BE COVERED WITH CANVAS WRAP. INSULATION EXPOSED TO THE MOISTURE SHALL BE COMPLETE WITH COVER PER 9.1/9.2 ABOVE.
- 10. PIPE INSULATION: .1 ALL PIPING IN EXPOSED LOCATIONS SHALL BE COVERED WITH CANVAS WRAP. THIS SHALL INCLUDE PIPING IN FAN ROOMS,
- .2 INSULATION EXPOSED TO MOISTURE SHALL BE PROVIDED WITH PVC JACKET (PROTO, OR EQUAL IN ACCORDANCE WITH B6).
- .3 ALL PIPING EXPOSED TO OUTDOOR CONDITIONS SHALL BE PROVIDED WITH ALUMINUM JACKETING.

#### SECTION 15400 PLUMBING

SERVICE ROOMS, GARAGES, ETC.

- 1. PROVIDE COMPLETE FUNCTIONAL PLUMBING SYSTEM COMPRISED OF DOMESTIC WATER PIPING, VENTS, SANITARY AND DRAINAGE PIPING, RAIN WATER LEADERS, ETC.
- 2. ALL WATER PIPING ABOVE GROUND INSIDE BUILDING SHALL BE TYPE "L" HARD COPPER; 3RD PARTY CERTIFIED. ALL PIPING BELOW GROUND SHALL BE TYPE "K" SOFT COPPER; 3RD PARTY CERTIFIED.
- 3. DRAINS AND VENT PIPING UNDERGROUND INSIDE BUILDING SHALL BE CAST IRON CLASS 4000, OR PVC PLASTIC. FITTINGS SHALL BE MECHANICAL JOINT FOR CAST IRON OR SOLVENT CEMENT FOR PVC.
- 4. SANITARY WASTE STACKS, HORIZONTAL WASTE, VENT AND RAIN WATER LEADERS, ABOVE GROUND INSIDE BUILDING, SHALL BE CAST IRON CLASS 4000. VENT PIPING AND FIXTURE RUN-OUTS MAY ALSO BE DWV COPPER OR PVC PLASTIC. FITTINGS SHALL BE MECHANICAL JOINT FOR CAST IRON, SOLDER FOR DWV COPPER AND SOLVENT CEMENT FOR
- 5. ALL PVC PLASTIC PIPING USED FOR HIGH-RISE BUILDINGS SHALL HAVE A FLAME SPREAD RATING OF O, AND A SMOKE DEVELOPED RATING OF 35. PIPING AND FITTINGS SHALL BE OF ONE MANUFACTURE: IPEX SYSTEM 15XFR.
- 6. CONTRACTOR SHALL VERIFY ON SITE ALL CONNECTION POINTS TO EXISTING BUILDING SERVICES. COORDINATE ALL NEW PIPING RUNS WITH CONTRACT ADMINISTRATOR.
- 7. USE 95/5 TIN-ANTIMONY BRAZING SOLDER ON ALL HOT AND COLD WATER PIPING. USE NON-CORROSIVE NON-LEADED FLUX.
- ACCEPTANCE: JENKINS BROS. LTD. 9. MANUFACTURED SHOCK ABSORBERS, AUTOMATIC AIR VENTS, AND PARTITION STOPS SHALL BE INSTALLED AT THE TOP OF ALL RISERS.

8. ALL VALVES TO BE BY ONE MANUFACTURER. STANDARD OF

- AND ON ALL FIXTURES OR BATTERY OF FIXTURES. 10. CONTRACTOR SHALL ALLOW FOR IN TENDER QUOTATION ANY ADDITIONAL LABOUR, MATERIALS, ETC. DEEMED NECESSARY DUE TO EXACT SITE CONDITIONS WHICH HAVE NOT BEEN REFLECTED IN MECHANICAL DRAWING OR IN MECHANICAL SPECIFICATION. NOTIFY
- CONTRACT ADMINISTRATOR OF ALL DISCREPANCIES PRIOR TO TENDER CLOSE. 11. ON COMPLETION, ALL PIPING SYSTEMS SHALL BE CLEANED & FLUSHED OUT TO REMOVE ANY FOREIGN MATERIAL IN THE PIPING.
- 12. GAS PIPING 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. B149.1-00 "NATURAL GAS AND PROPANE INSTALLATION 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 OF MANITOBA.
- 13. VALVES IN GAS PIPING SHALL BE GRINNELL FIG. C.G.A. OR EQUAL IN ACCORDANCE WITH B6.
- 14. RUN GAS PIPING TO SERVE CONTRACT ADMINISTRATOR'S EQUIPMENT. TAKE OUT PERMITS AND CONNECT EQUIPMENT READY FOR USE. PROVIDE GAS REGULATORS TO SERVE NEW GAS FIRED EQUIPMENT. GAS REGULATORS SHALL BE C.G.A APPROVED AS MANUFACTURED BY FISHER, OR EQUAL IN ACCORDANCE WITH B6. PROVIDE GAS COCK DIRT LEG AND FLEXIBLE CONNECTIONS AT EACH PIECE OF EQUIPMENT.
- 15. CONTRACTOR SHALL COORDINATE SERVICE INSTALLATIONS AND/OR MODIFICATIONS WITH LOCAL UTILITY PRIOR TO COMMENCEMENT OF WORK. PAY ALL COSTS AND/OR FEES.
- PRESSURE RELIEF REGULATORS AND VENT ASSEMBLIES ON ALL PROPANE AND NATURAL GAS PIPING SYSTEMS GREATER THAN 7" W.C., INSTALLED AT EACH APPLIANCE AND/OR EQUIPMENT. INSTALLATION AND REQUIREMENTS TO MEET THE CAN/CSA-B149.1-05 AND TSSA/MB. DEPT. OF LABOUR REQUIREMENTS.
- 17. PROVIDE DIELECTRIC COUPLINGS WHEREVER PIPES OF DISSIMILAR METALS ARE JOINED.

PIPE SIZE	ROD DIA.	STEEL		COPPER	
UP TO 3/4"	3/8"	6'		6'	
1" TO 1 1/4" 1 1/2" & 2"	3/8" 3/8"	8' 10'	6'	8'	
2 1/2" & 3"	1/2"	12'		8'	
4" & 5"	5/8"	12'		8'	

- 19. PIPE HANGERS WHERE REQUIRED SHALL BE GRINNEL FIG.65 FOR STEEL PIPE AND FIG.117 EXPANSION CASE SET IN HOLES DRILLED IN CONCRETE OR ATTACHED TO FIG.225 OR 227 CLAMP ATTACHED TO FLOOR JOIST AND ROOF JOIST. FOR INSULATED PIPING, PROVIDE PROTECTION FIG.167 SADDLES SIZE HANGER TO ACCOMMODATE INSULATION WHERE APPLIED.
- PLUMBING FIXTURES AND EQUIPMENT:

## WC-1 TOILET - FLOOR MOUNTED FLUSH VALVE (BARRIER FREE DESIGN)

AMERICAN STANDARD'MADERA ELONGATED 16-1/8" (410MM) HIGH' #2305.100 'LOW CONSUMPTION' TOILET, FLOOR MOUNTED FOR FLUSH VALVE, VITREOUS CHINA, ELONGATED SYPHON JET FLUSH ACTION BOWL, FULLY GLAZED 2" (50MM) BALL PASS INTERNAL TRAPWAY, 10" X 12" (254MM X 304MM) LARGE WATER SURFACE, 1.3 GAL. (6L) FLUSH. 1-1/2" (38MM) TOP SPUD AND BOLT CAPS. PROVIDE FLOOR FLANGE, FLANGE BOLTS AND GASKET. SLOAN 'REGAL' #111-YG-XL FLUSH VALVE, C.P. LOW CONSUMPTION, FACTORY SET FLOW, QUIET ACTION DIAPHRAGM TYPE WITH NON-HOLD OPEN FEATURE, VACUUM BREAKER AND EXTENDED SEAT BUMPER ON BACK-CHECK ANGLE STOP. CENTOCO #820STS SEAT, ELONGATED HEAVY DUTY SOLID PLASTIC OPEN FRONT WITH COVER, REINFORCED STAINLESS STEEL CHECK HINGE, POSTS, WASHERS AND NUTS.

#### L-1 BASIN - WALL HUNG (BARRIER FREE DESIGN AND GENERAL USE) FOR TIGHT SPACE AREAS

- AMERICAN STANDARD 'MURRO' #0954.000 BASIN, 4" (102MM) CENTRES, 22" X 21"X 5 - 7-1/2" (559MM X 533MM X 127-191MM) DEEP, WALL HUNG, VITREOUS CHINA, REAR OVERFLOW, FOR CONCEALED ARM SUPPORT. CHICAGO FAUCETS #802-V-XK FAUCET, C.P. 4" (102MM) C.C., SOLID CAST BRASS LEAD-FREE BODY, 1/4 TURN CERAMIC DISC VALVE CARTRIDGES, WITH VANDAL-RESISTANT 1.84 GPM (8L) FLOW AERATOR OUTLET AND CAST BRASS LEVER HANDLES. MCGUIRE #155A DRAIN, C.P. OPEN GRID. MCGUIRE #H170BVRB SUPPLIES, C.P., POLISHED, SHORT HORIZONTAL INTEGRAL SWEAT TUBES WITH V.P. COMBINATION WHEEL HANDLE/LOOSE KEY BALL VALVE ANGLE STOPS, ESCUTCHEONS AND BRAIDED FLEXIBLE RISERS. MCGUIRE #8872C 'P' TRAP, C.P., POLISHED, CAST BRASS 1-1/4" (32MM) WITH CLEANOUT AND ESCUTCHEON. SMITH SERIES #0700-M CARRIER, WITH STEEL PIPE LEGS, BLOCK BASE FEET SUPPORT, CONCEALED ARMS AND PEDESTAI PLATE. (FOR NARROW WALL INSTALLATION PROVIDE 'Z' TYPE SLEEVE FOR ARMS.) AMERICAN STANDARD #0059.020 SEMI-CHINA PEDESTAL TO COVER EXPOSED PIPING AS PER LOCAL CODES.
- FD-1 FLOOR DRAINS FIN. AREAS
- SMITH SERIES 2005A FLOOR DRAIN, ALL DUCO COATED CAST IRON BODY. REVERSIBLE FLASHING CLAMP WITH SEEPAGE OPENINGS AND ADJUSTABLE 5" (127MM) DIAMETER NICKEL BRONZE 1/4" (6.35MM) THICK STRAINER, SECURED WITH S.S. SCREWS, 4" (100MM) THROAT ON STRAINER. (WHERE REQUIRED BY LOCAL CODE PROVIDE TRAP PRIMER CONNECTION 'P'.)
- CO-1 FLOOR CLEANOUT (UNFINISHED AND OUTSIDE AREAS)
- SMITH 'TWIS-TO-FLOOR' SERIES 4220 FLOOR CLEANOUT, DUCO COATED CAST IRON BODY AND REMOVABLE POSITIVE GASKET SEAL CLOSURE PLUG AND HEAVY DUTY 6" (150MM) ROUND ADJUSTABLE SCORIATED CAST IRON COVER SECURED WITH STAINLESS STEEL SCREWS, C.O. CAST IN COVER. (FOR WATER-PROOFED AREAS PROVIDE 'FC' FLANGE WITH FLASHING CLAMP).
- CO-2 STACK CLEANOUT
- SMITH SERIES 4510 STACK CLEANOUT, IN BASE OF CAST IRON STACKS WITH NEOPRENE GASKETED PLUG. WHERE CLEANOUTS ARE CONCEALED BEHIND FINISHED WALLS ACCESS SHALL BE MADE BY SMITH 4530 ROUND STAINLESS STEEL PLATE AND SLOTTED FLAT HEAD STAINLESS STEEL SCREW.
- TP-1 TRAP SEAL PRIMER SERVING 1 TO 2 DRAINS
- .1 P.P.P. INC. MODEL PR-500 AUTOMATIC TRAP SEAL PRIMER VALVE. CAST BRASS BODY, SERVING 1 OR 2 INDIVIDUAL OR REMOTE AREA DRAINS (PRIMER AUTOMATICALLY ACTIVATED WHEN THERE IS A PRESSURE DROP IN THE SYSTEM) WITH 1/2" (12.7MM) NPT (MTOF) CONNECTIONS WITH STRAINER AND INTEGRAL BACK FLOW PREVENTER & VACUUM BREAKER. (FOR TWO DRAIN PRIMER PROVIDE UNIT WITH ASSEMBLY #DU-2/SS8)

## WHA WATER HAMMER ARRESTORS

- .1 SMITH 'HYDROTROL' WATER HAMMER ARRESTORS SERIES #5000, STAINLESS STEEL, PRESSURIZED CHAMBERS, BELLOWS, 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
- SIZE FIXTURE UNITS MODEL NO. CONN. SIZE
- 1 11

- 16. CONTRACTOR SHALL PROVIDE PRE-ASSEMBLED AND PRE-TESTED OVER-
- 18. USE THE FOLLOWING ROD DIAMETER AND SPACING SCHEDULE TO
- ESTABLISH MINIMUM HANGING STANDARDS FOR HORIZONTAL PIPING:

PIPE SIZE	ROD DIA.	SIEEL		COPPER
UP TO 3/4"	3/8"	6'		6'
1" TO 1 1/4" 1 1/2" & 2"	3/8" 3/8"	8' 10'	6'	8'
2 1/2" & 3"	1/2"	12'		8'
4" & 5"	5/8"	12'		8'

- SECTION 15800 HEATING, VENTILATION & AIR CONDITIONING PROVIDE SUPPLY. RETURN AND EXHAUST AIR DUCT SYSTEMS FROM AIR
- HANDLING EQUIPMENT AND FANS AS SHOWN. . ALL DUCTWORK INSTALLATION SHALL BE PERFORMED IN ACCORDANCE
- WITH ASHRAE, SMACNA LATEST EDITION DUCT STANDARDS. 3. THIS CONTRACTOR SHALL SUPPLY AND INSTALL ALL DUCTWORK INCLUDING APPURTENANCES, HANGERS, DAMPERS, ETC.
- 4. DUCT CONSTRUCTION: RECTANGULAR DUCTWORK SHALL BE CONSTRUCTED FROM GALVANIZED SHEET METAL OF THE FOLLOWING U.S. STANDARD DUCTS UP TO 12" ON LONGEST DIMENSION 26 GA. DUCTS 13" TO 28" ON LONGEST DIMENSION 24 GA. DUCTS 29" TO 54" ON LONGEST DIMENSION 22 GA.

DUCTS 55" TO 84" ON LONGEST DIMENSION 20 GA.

2. ROUND AND OVAL DUCTWORK SHALL BE SPIRAL CONDUIT CONSTRUCTION OF ZINC COATED STEEL OF THE FOLLOWING U.S GAUGES:

GAUGE OF METAL

8" AND SMALLER	26
9" TO 22"	24
24" TO 36"	22
38" TO 50"	20

CONDUIT SIZE

38 IU 30 5. ALL SUPPLY/RETURN DUCTWORK WITHIN THE INDOOR EXHIBIT ENCLOSURE SERVING THE INDOOR PAVILION SHALL BE WELDED STAINLESS STEEL, WATER TIGHT CONSTRUCTION, INTERNALLY INSULATED. DUCT SIZES INDICATED ON DRAWINGS REFERENCE INTERNAL DIMENSIONS.

- ALL SEAMS AND JOINTS IN ROUND OR OVAL DUCT FITTINGS SHALL BE CONTIGUOUSLY WELDED. RE-COAT ZINC COATING DAMAGED BY WELDING
- 5. BALANCING DAMPERS SHALL BE CONSTRUCTED FROM GALVANIZED STEEL 2 GAUGES HEAVIER THAN THE DUCTWORK IN WHICH THEY ARE
- INSTALLED C/W LOCKING QUADRANT AND INDICATING DEVICE. 6. TURNING VANES SHALL BE CONSTRUCTED TO THE FOLLOWING
- REQUIREMENTS: - USE DUCT ELBOWS WHICH HAVE A THROAT RADIUS OF 1-1/2 TIMES THE DUCT DIAMETER. - WHERE SPACE IS LIMITED, USE DUCT ELBOWS FABRICATED WITH
- SPACE THROATS AND BACKS AND FITTED WITH ROVANE TURNING
- 7. THE FOLLOWING DUCT JOINING METHODS SHALL BE USED: - PITTSBURGH LOCK OR DOUBLE SLIDE LOCK HAMMERED FLAT FOR LONGITUDINAL JOINTS ON STRAIGHT DUCTWORK. - PITTSBURGH LOCK FOR CORNER LOCK OF FITTING.
- FLAT DRIVE CLEAT JOINT ON ALL SIDE JOINTS 18" (450MM) AND UNDER IN LENGTH. - FLAT SLIP CLEAT JOINT ON ALL TRANSVERSE JOINTS 18" (450MM) AND UNDER IN LENGTH. - ANGLE "S" OR STANDING DRIVE CLEATS ON ALL SIDE JOINTS 19"(475MM) TO 30"(750MM) ON HEIGHT.
- STANDING "S" OR STANDING DRIVE CLEATS ON ALL TRANSVERSE JOINTS 19"(475MM) TO 30"(750MM) IN LENGTH. - ANGLE "S" OR STANDING DRIVE CLEATS ON ALL TRANSVERSE AND SIDE JOINTS 31"(725MM) TO 72"(1800MM) STANDING "S" OR STANDING DRIVE CLEATS REINFORCED WITH 1 1/2"(38MM) X 4.5MM MILD STEEL BAR ON ALL TRANSVERSE AND SIDE JOINTS 73"(1825MM) AND OVER.
- 8. PROVIDE FIRE DAMPERS WHICH CONFORM TO NFPA REGULATIONS. BEAR ULC LABEL, AND HAVE APPROVAL OF AUTHORITY HAVING JURISDICTION. DAMPERS TO BE TYPE 'B' AND 'C' (UNLESS OTHERWISE NOTED)AND INSTALLED IN DUCTWORK AT FIRE SEPARATIONS WHETHER SHOWN OR NOT. VERIFY LOCATIONS ON ARCHITECTURAL DRAWINGS.
- 9. ALL NEW DUCTWORK SHALL BE SEALED USING DUCT BOND II HIGH PRESSURE, NON-TOXIC, DUCT SEALER THROUGHOUT ALL SEAMS AND
- 10. SUPPORT HORIZONTAL DUCTS ON MAXIMUM 8'-0" (2.4 M)CENTERS BY PERFORATED GALV. STEEL RIVETTED STRAP FOR DUCTWORK 36" (915 MM) (EITHER DIMENSION) OR LESS, AND MINIMUM 1" X 1" X 1/8" (25 X 25 X 2 MM) GALV. IRON UNDER DUCTS OVER 36" (915 MM) (EITHER DIMENSION) WITH 3/8" (6 MM) DIAM. THREADED RODS SUSPENDING ANGLES FROM STRUCTURE.
- 11. PROVIDE ACCESS DOORS WHERE REQUIRED FOR SERVING OF EQUIPMENT AND FIRE DAMPERS.
- 12. PROVIDE 4" (100 MM) FLEXIBLE DUCT CONNECTIONS ON BOTH INLET AND OUTLET DISCHARGE SIDES OF EACH FAN.
- 13. PROVIDE ONE SPARE SET OF FILTERS FOR EACH AIR HANDLING UNIT. 14. ALL DUCT MOUNTED MOTORIZED DAMPERS SHALL BE INSULATED LOW
- 15. PROVIDE VIBRATION ISOLATORS FOR ALL MECHANICAL EQUIPMENT, INCLUDING PUMPS, UTILITY FANS, AND VENT SETS, AIR HANDLERS. ROOF-TOPS UNITS, CONDENSING UNITS, COMPRESSED, ETC. AS APPLICABLE. SUBMIT SHOP DRAWINGS PRIOR TO INSTALLATION.

LEAKAGE TYPE TO TAMCO 9000 OR EQUAL IN ACCORDANCE WITH B6.

- 16. BACK-DRAFT DAMPERS SHALL BE PROVIDED WITH THE FOLLOWING MINIMUM REQUIREMENTS: - 16 GA. GALVANIZED STEEL OR ALUMINUM CHANNEL FRAME; 16 GA. GALVANIZED BLADES C/W STIFFENERS. FULL BLADE-LENGTH SHAFT: BRASS, BALL OR NYLON BUSHING; FELT OR NEOPRENE ANTI-CHATTER
- BLADE STRIPS; ADJUSTABLE COUNTER-BALANCE. 17. CHIMNEYS AND BREECHING SHALL BE LABORATORY TESTED AND LISTED BY THE UNDERWRITERS LABORATORIES INC. FOR USE WITH BUILDING HEATING EQUIPMENT BURNING NATURAL GAS OR PROPANE GAS. AS DESCRIBED IN NFPA 211, SECTION 60. THE DOUBLE WALL STACK SHALL HAVE AN OUTER JACKET OF GALVANIZED STEEL CONFORMING TO ASTM A525. THERE SHALL BE AN AIR SPACE BETWEEN THE WALLS. THE INNER GAS CONVEYING PIPE SHALL BE AN ALUMINUM ALLOY -
- 18. PROVIDE CHIMNEYS AND/OR BREECHING FOR:

JOINTS TO BE SECURED WITH SHEET METAL SCREWS.

- .1 GAS-FIRED (INDIRECT) MAKE-UP AIR UNITS. 19. PROVIDE BASE TEE WITH CLEANOUT, ROOF FLASHING AND VENT CAP FOR ALL EQUIPMENT AS REQUIRED.
- 20. ALL AIR SYSTEMS SHALL BE BALANCED AND TESTED BY A CERTIFIED A.A.B.C. INDEPENDENT BALANCING AGENCY TO PROVIDE QUANTITIES AS SHOWN. PROVIDE THREE(3) SETS OF BALANCE REPORTS FOR REVIEW BY THE CONTRACT ADMINISTRATOR. ALL BALANCING REPORTS SHALL INCLUDE FIRE DAMPER TESTING AND CERTIFICATION.

## MECHANICAL EQUIPMENT SCHEDULES:

- .1 DIFFUSERS AND GRILLES: (BASED ON PRICE)
  - DESCRIPTION
- LBP/15A/1000 LINEAR BAR SUPPLY GRILLE, DUCT MOUNTED. PROVIDE ACOUSTIC LINED DUCT BOOT. (BOOT SIZE (I.D.): FACE AREA OF GRILLE X 12HIGH"). ALUMINUM FINISH.
- 530/F/L/A/B12 SIDEWALL RETURN/TRANSFER GRILLE.
- 720/F/L/A STAINLESS STEEL SUPPLY GRILLE, DUCT MOUNTED. PROVIDE DUCT MOUNT STAINLESS STEEL BALANCING DAMPER AT EACH GRILLE.
- 520/F/L/A/B12 SIDEWALL SUPPLY GRILLE, DUCT MOUNTED.

## 15900 CONTROLS

- 1. THE POINTS BELOW DESCRIBE THE CONTROL SEQUENCE OF THE H.V.A.C. EQUIPMENT SPECIFIED IN THE SCHEDULES. ALL CONTROLS TO BE SUPPLIED BY DIV. 15 AND WIRED BY DIV.15., AND SHALL BE THE COMPLETE RESPONSIBILITY OF THIS DIVISION. PROVIDE LOCKABLE COVERS FOR ALL THERMOSTATS. NEW OR EXISTING. ALL CONTROL WIRING SHALL BE RUN IN WEATHERPROOF PVC CONDUIT.
- .1 MAKE-UP AIR UNIT (MUA-1) .1 PROVIDE INDOOR CONTROL PANEL WITHIN BASEMENT SERVICE AREA FOR AIR TEMPERATURE SELECTOR. AND DISCHARGE AIR TEMPERATURE SENSOR. HEATING SECTION SHALL CYCLE AS REQUIRED TO MAINTAIN DISCHARGE AIR TEMPERATURE SENSOR. ALL HEAT RECOVERY/DEFROST
- CONTROLS SHALL REMAIN INTEGRAL TO THE EQUIPMENT. .2 PROVIDE MANUAL HI-LOW SELECTOR SWITCH FOR MANUAL CONTROL OF FAN SPEED.

- .3 MUA-1 TO OPERATE VIA WALL MOUNT HUMIDITY SENSOR WITHIN INDOOR EXHIBIT AND HUMIDISTAT IN BASEMENT SERVICE AREA. UPON DETECTION OF ELEVATED HUMIDITY LEVELS, MUA-1 SHALL ENERGIZE AT FAN SPEED AS DETERMINED BY FAN SELECTOR SWITCH. MUA-1 SHALL DE-ENERGIZE ONCE HUMIDITY LEVELS FALL BELOW
- .4 PROVIDE MANUAL 0-6 HOUR OVERRIDE TIMER TO ENERGIZE MUA-1 AT FAN SPEED AS DETERMINED BY FAN SELECTOR SWITCH. MUA-1 SHALL DE-ENERGIZE ONCE MANUAL TIMER DURATION HAS
- .5 ALL DAMPERS SHALL FULLY CLOSE IN UNOCCUPIED MODE.
- .2 ROOF TOP UNIT (RT-1):
- .1 PROVIDE PROGRAMMABLE THERMOSTAT C/W NIGHT SETBACK, OCCUPIED /UNOCCUPIED SCHEDULE. DURING UNOCCUPIED MODE, ALL OUTDOOR AIR DAMPERS SHALL REMAIN CLOSED.
- .2 IAQ (CO2) SENSOR AT RETURN PLENUM INLET SHALL OPERATE TO ECONOMIZER DAMPERS BASED ON OCCUPANT DEMAND.
- .3 ROOFTOP UNIT (RT-2) ITEMIZED PRICE: .1 PROVIDE PROGRAMMABLE THERMOSTAT C/W REMOTE SPACE SENSOR; THERMOSTAT MOUNTED IN BASEMENT SERVICE

# MUA-1: GAS FIRED MAKE-UP AIR UNIT/HEAT RECOVERY VENTILATOR

- MAKE-UP AIR UNIT SHALL BE AN OUTDOOR PACKAGED ENGINEERED AIR DESIGN WITH FORWARD CURVE SUPPLY AND RETURN BLOWERS WITH PILLOW BLOCK BEARINGS, HORIZONTAL DISCHARGE, TOP RETURN AIR, HINGED ACCESS DOORS, SUMMER/WINTER FILTER SECTION WITH 2" MERV 7 PLEATED FILTERS, EXHAUST AIR FILTER SYSTEM. INLET DAMPERS C/W 2 POSITION OPERATOR ON INTAKE AND EXHAUST, 1" 1-1/2 LB./CU.FT. INSULATION THROUGHOUT, 18 GA. CONSTRUCTION WITH GREY ENAMEL FINISH COAT. UNIT TO BE BASE MOUNTED. 2. HEATING UNITS SHALL BE INDIRECT NATURAL GAS FIRED APPROVED FOR BOTH SEA LEVEL AND HIGH ALTITUDE AREAS. THE ENTIRE PACKAGE, INCLUDING DAMPER CONTROLS, FAN CONTROLS, AND ALL OTHER MISCELLANEOUS CONTROLS AND ACCESSORIES SHALL BE APPROVED BY AN INDEPENDENT TESTING AUTHORITY AND CARRY THE APPROVAL LABEL OF THAT AUTHORITY AS A COMPLETE OPERATING
- 3. ALL UNITS MUST EXCEED THE ASHRAE 90.1 REQUIREMENT OF STEADY STATE EFFICIENCY AT LOW FIRE. HEAT EXCHANGER SHALL BE A PRIMARY DRUM AND MULTI-TUBE SECONDARY ASSEMBLY CONSTRUCTED OF TITANIUM STAINLESS STEEL WITH MULTI-PLANE METAL TURBULATORS AND SHALL BE OF A FLOATING STRESS RELIEVED DESIGN. HEAT EXCHANGER SHALL BE PROVIDED WITH CONDENSATE DRAIN CONNECTION. USING DUCT TYPE FURNACES AND CLOSED COUPLED BLOWERS ARE NOT ACCEPTABLE. THE HEAT EXCHANGER/BURNER ASSEMBLY SHALL BE A BLOW THROUGH POSITIVE PRESSURE TYPE AND SHALL HAVE AN INTERRUPTED PILOT IGNITION SYSTEM TO PROVIDE INCREASED SAFETY. UNITS USING CONTINUOUS OR INTERMITTENT PILOTS ARE NOT ACCEPTABLE. 4. FLAME SURVEILLANCE SHALL BE FROM THE MAIN FLAME AFTER IGNITION NOT THE PILOT FLAME. ATMOSPHERIC BURNERS OR BURNERS WITH POWER ASSISTED VENTING ARE NOT ACCEPTABLE. 5. THE HEAT EXCHANGER/BURNER ASSEMBLY SHALL INCLUDE 15:1
- TURNDOWN. THE HIGH TURN DOWN HEAT EXCHANGER/BURNER ASSEMBLY MINIMUM INPUT SHALL BE CAPABLE OF CONTROLLING 6.7% OF ITS RATED INPUT. EXCLUDING THE PILOT ASSEMBLY, WITHOUT ON/OFF CYCLING AND INCLUDE BUILT IN ELECTRONIC LINEARIZATION OF FUEL AND COMBUSTION AIR. EFFICIENCY SHALL INCREASE FROM HIGH
- 6. VENTING FOR OUTDOOR UNITS SHALL BE PROVIDED BY THE EQUIPMENT MANUFACTURER AND SHALL INCLUDE A DOUBLE WALL VENT SUITABLE FOR -40 F(-40 C) APPLICATIONS. 7. PROVIDE A MAKE UP AIR REVERSE AIRFLOW HIGH LIMIT SWITCH IN SERIES WITH THE STANDARD HIGH LIMIT SWITCH MOUNTED IN THE
- BLOWER DISCHARGE. 8. PROVIDE AN AIR-TO-AIR HEAT PIPE EXCHANGER WITH PERFORMANCE AS SHOWN IN THE SCHEDULE, TO BE QDT AS MANUFACTURED AND SUPPLIED BY ENGINEERED AIR. ALTERNATIVE HEAT PIPE MANUFACTURERS SHALL PROVIDE AT THE CONTRACT ADMINISTRATOR'S REQUEST, SAMPLES OF TUBES WITH THE INTERNAL WICK BEFORE AND AFTER
- EXPANSION OF THE TUBES. 9. THE TRU SHALL BE MOUNTED ON A CRADLE WITH ACCOMPANYING LINKAGE, FULCRUM, CONTROL ACTUATOR AND Q-TRAC SOLID STATE DEDICATED OPERATING CONTROLLER. 10. PROVIDE ENHANCED RECOVERY: MAXIMUM HEAT RECOVERY IS OBTAINED BY FIRST ALLOWING FROST TO FORM ON THE EXHAUST SIDE OF THE

COIL AND USING A PRESSURE DIFFERENTIAL SWITCH TO SENSE WHEN

THE FROST FORMS, JUST PRIOR TO FROST FORMING MAXIMUM HEAT RECOVERY OCCURS. WHEN FROST IS DETECTED THE FROST CONTROL SETPOINT IS RESET UPWARDS, AND THE HEAT PIPE IS SENT TO DEFROST MODE. RECOVERY IS STILL ACHIEVED BUT AT A LOWER LEVEL UNTIL THE HEAT PIPE IS CLEAR OF FROST. 11. VINYL COATED FLEXIBLE CONNECTORS SHALL BE INSTALLED TO PERMIT THE NECESSARY TILTING MOVEMENT OF THE RECLAIM COIL. PROVIDE THREE (3) FLEX CONNECTORS. ONE FOR EACH FACE OF THE HEAT PIPE EXCHANGER EXCEPT THE EXHAUST LEAVING FACE.

12. TILT MECHANISM TO INCORPORATE A LOW FRICTION PIVOTING BASE

13. PROVIDE A TE6100 MODULATING THERMOSTAT FOR ROOM CONTROL. PROVIDE A REMOTE PANEL C/W UNIT ON/OFF SWITCH & LIGHT, HEAT ON/OFF SWITCH & LIGHT. 14. MUA-1: ENG AIR MODEL DJS40/HRP/O, SUPPLY: 2.000 CFM AT 0.5"ESP, RETURN: 2,200CFM AT 0.5"ESP, 300 MBH INPUT, 246 MBH OUTPUT, 113.4 DEGREE HEATING TEMPERATURE RISE, 5 ROW HEAT PIPE WITH INTERNAL WICKING, 2 H.P. SUPPLY & 2 HP RETURN 240/1/60 ODP MOTOR, 12/12 FORWARD CURVE BLOWERS.

MOTORS SHALL BE DUAL SPEED CAPACILITIES FROM MANUAL SELECTOR

WITH SELF ALIGNING BALL OR ROLLER BEARINGS.

#### SWITCH AS NOTED ABOVE. ROOF TOP UNIT SCHEDULE

Nova 3 Engineering Ltd.

- .1 ALL EQUIPMENT BASED ON CARRIER 48TC SERIES ROOF TOP UNITS OR APPROVED EQUAL IN ACCORDANCE WITH B6. ALL UNITS SHALL BE PACKAGED GAS FIRED/ ELECTRIC COOL, C/W BELT DRIVE, R-410A REFRIGERANT, HIGH EFF. COOLING, WEATHER HOODS, HORIZONTAL DISCHARGE, BASE CURB, FILTER SECTION (PROVIDE CLEAN SET OF FILTERS IN UNITS, AND ONE SPARE SET TO CONTRACT ADMINISTRATOR UPON COMPLETION). STAINLESS STEEL HEAT EXCHANGERS. COORDINATE ALL VOLTAGE REQUIREMENTS W/DIVISION 16 PRIOR TO SHOP DRAWING SUBMISSION.
- .1 RT-1 (PAVILION AREA) CARRIER 48TCE006, NOMINAL 5.0 TONS COOLING, 115MBHI/93MBH OUTPUT HEATING, 2200 CFM AT 0.75" E.S.P., POWER EXHAUST, 100 % MODULATING ECONOMIZER DAMPERS W/IAQ (CO2) SENSOR KIT FOR CONTROL OF MINIMUM OUTDOOR AIR POSITION.
- .2 RT-2 (INDOOR EXHIBIT) CARRIER 48TCE006, NOMINAL 5.0 TONS COOLING, 115MBHI/93MBH OUTPUT HEATING, 2200 CFM AT 0.65" E.S.P., GRAVITY RELIEF, ECONOMIZER DAMPERS (MINIMUM SET AT 0%).

R3C 1C7 Certificate of Authorization

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