1 GENERAL REQUIREMENTS

1.1 INTENT

.1 THE INTENT OF THIS SPECIFICATION AND THE DRAWINGS IS TO PROVIDE A COMPLETE AND FULLY OPERATIONAL MECHANICAL SYSTEM IN COMPLETE ACCORD WITH APPLICABLE CODES. THE MECHANICAL CONTRACTOR SHALL MAKE PROVISIONS FOR LABOUR, MATERIAL, AND EQUIPMENT NECESSARY TO COMPLETE THE MECHANICAL WORK.

.2 THE WORD "PROVIDE" SHALL MEAN "SUPPLY AND INSTALL" THE PRODUCTS AND SERVICES SPECIFIED. "AS INDICATED" MEANS THAT THE ITEM(S) SPECIFIED ARE SHOWN ON THE DRAWINGS.

.3 DRAWINGS AND SPECIFICATIONS ARE COMPLEMENTARY TO EACH OTHER AND WHAT IS CALLED FOR IN ONE IS BINDING AS IF CALLED FOR IN BOTH. SHOULD ANY DISCREPANCY APPEAR BETWEEN DRAWINGS AND SPECIFICATIONS WHICH LEAVES DOUBT AS TO THE TRUE INTENT AND MEANING, OBTAIN A RULING FROM THE ENGINEER TEN (10) DAYS BEFORE SUBMITTING TENDER. FAILING THIS, ALLOW FOR MOST EXPENSIVE ALTERNATIVE.

.4 CONTRACT DOCUMENTS ARE DIAGRAMMATIC ONLY. THEY ARE TO ESTABLISH SCOPE, MATERIAL AND QUALITY. THEY ARE NOT DETAILED INSTALLATION DRAWINGS. MINOR DETAILS USUALLY NOT SHOWN OR SPECIFIED AND ANY INCIDENTAL ACCESSORIES REQUIRED FOR PROPER INSTALLATION OF THE SYSTEM ARE TO BE INCLUDED IN THE WORK.

.5 CONTRACTOR IS TO ENSURE THAT ALL INTENDED EQUIPMENT WILL FIT WITHIN GIVEN SPACES. MAKE REFERENCE TO THE ELECTRICAL, MECHANICAL, ARCHITECTURAL AND STRUCTURAL DRAWINGS, WHEN SETTING OUT WORK AND BEFORE ORDERING EQUIPMENT.

.6 THE CONTRACTOR SHALL VISIT THE SITE BEFORE TENDERING. EXAMINE ALL LOCAL AND EXISTING CONDITIONS ON WHICH THE WORK IS DEPENDENT. NO CONSIDERATION WILL BE GRANTED FOR ANY MISUNDERSTANDING, OF WORK TO BE DONE, RESULTING FROM FAILURE TO VISIT THE SITE. NEW PIPING, DUCTWORK AND INSULATION STANDARDS SHALL AT LEAST MATCH THE EXISTING INSTALLATION OR BE HIGHER IF SPECIFIED HEREIN.

1.2 CODES, REGULATIONS AND STANDARDS

.1 ALL WORK SHALL CONFORM TO CURRENT EDITION OF NATIONAL, PROVINCIAL AND MUNICIPAL CODES, STANDARDS AND OTHER LEGAL REGULATIONS AND BYLAWS APPLICABLE TO THE WORK AND WILL MEET THE REQUIREMENTS OF AUTHORITIES HAVING JURISDICTION.

1.3 RESPONSIBILITIES

.1 ASSUME RESPONSIBILITY FOR LAYOUT OF WORK; AND FOR ANY DAMAGE CAUSED TO THE OWNER OR OTHER TENANTS BY IMPROPER EXECUTION OF WORK.

.2 PROTECT ALL NEW AND EXISTING WORK FROM DAMAGE.

.3 TAKE RESPONSIBILITY FOR CONDITION OF MATERIALS AND EQUIPMENT SUPPLIED AND PROTECT UNTIL WORK IS COMPLETED AND ACCEPTED. COORDINATE DELIVERIES WITH THE GENERAL CONTRACTOR.

.4 COORDINATE WORK WITH ALL TRADES AND MAKE CHANGES TO FACILITATE A SATISFACTORY INSTALLATION. MAKE NO DEVIATIONS TO THE DESIGN INTENT INVOLVING EXTRA COST TO THE OWNER, WITHOUT THE CONSULTANT'S WRITTEN APPROVAL.

1.4 CERTIFICATES

.1 GIVE NOTICES, OBTAIN ALL REQUIRED PERMITS AND APPROVALS, AND PAY ALL FEES SO WORK SPECIFIED MAY BE CARRIED OUT. FURNISH CERTIFICATES IF REQUESTED, AS EVIDENCE THAT WORK CONFORMS WITH LAWS AND REGULATIONS OF THE AUTHORITIES HAVING JURISDICTION.

1.5 STANDARD OF MATERIALS AND WORKMANSHIP

.1 WORKMANSHIP SHALL BE IN ACCORDANCE WITH WELL ESTABLISHED PRACTICE AND STANDARDS ACCEPTED AND RECOGNIZED BY THE CONSULTANT AND THE TRADE.

.2 THE CONSULTANT SHALL HAVE THE RIGHT TO REJECT ANY ITEM OF WORK THAT DOES NOT CONFORM TO THE CONTRACT DOCUMENTS AND ACCEPTED STANDARDS OF PERFORMANCE, QUIETNESS OF OPERATION, FINISH AND APPEARANCE.

.3 EMPLOY ONLY TRADESMEN HOLDING VALID PROVINCIAL TRADE QUALIFICATION CERTIFICATES. TRADESMEN SHALL PERFORM ONLY WORK THAT THEIR CERTIFICATE PERMITS.

.4 MAKE AND QUALITY OF MATERIALS USED ARE SUBJECT TO APPROVAL BY THE ENGINEER. REMOVE UNACCEPTABLE MATERIALS AND INSTALL SUITABLE MATERIALS IN THEIR PLACE.

.5 MATERIALS SHALL BE NEW AND OF UNIFORM PATTERN THROUGHOUT, UNLESS NOTED OTHERWISE.

1.6 CORE DRILLING AND CUTTING

.1 ALL WORK SHALL BE CO-ORDINATED WITH OTHER TRADES ESPECIALLY THAT RELATED TO CUTTING AND PATCHING OF REQUIRED OPENINGS; AND LOCATIONS AND INSTALLATION OF SLEEVES, INSERTS, SUPPORT, AND ACCESS DOORS.

.2 ALL OPENINGS THROUGH EXISTING CONCRETE STRUCTURE SHALL BE CORE DRILLED. LAY OUT REQUIREMENTS FOR REVIEW AND APPROVAL BY THE OWNER AND STRUCTURAL ENGINEER PRIOR TO CORING.

.3 PROVIDE X-RAY OF ALL REQUIRED PENETRATIONS OF THE FLOOR AND WALLS. X-RAY USE FOR LOCATING IN FLOOR REBAR AND CONDUIT TO BE DONE AFTER NORMAL WORKING HOURS. TAKE NECESSARY PRECAUTIONS TO PROTECT COMPUTER EQUIPMENT WHEN X-RAYING FLOORS. CO-ORDINATE WITH OWNER. REPAIRS TO EXISTING SERVICES DAMAGED AS A RESULT OF CORE DRILLING IS INCLUDED IN THIS SECTION OF THE WORK.

1.7 ALTERNATIVE MATERIALS AND EQUIPMENT

.1 CONTRACT PRICE SHALL BE BASED ON MATERIALS AND EQUIPMENT SPECIFIED. APPROVAL BY ENGINEER OF EQUIPMENT SUBMITTED BY THE MECHANICAL TRADE AS EQUAL TO THAT SPECIFIED DOES NOT RELIEVE THE MECHANICAL TRADE OF ANY RESPONSIBILITY. MATERIAL/PRODUCTS CONSIDERED TO SATISFY THE SPECIFICATION, BUT OF A MANUFACTURER OTHER THAN THOSE NAMED, MAY BE SUBMITTED TO THE CONSULTANT FOR CONSIDERATION NOT LATER THAN FIVE (5) WORKING DAYS PRIOR TO CLOSING OF TENDER.

.2 REVISIONS REQUIRED TO ADAPT ACCEPTED EQUALS AND ALTERNATIVES SHALL BE INCLUDED IN THE CONTRACT PRICE. NO INCREASE IN THE CONTRACT PRICE WILL BE CONSIDERED TO ACCOMMODATE EQUIPMENT OTHER THAN THAT SPECIFIED.

.3 CERTAIN ITEMS OF EQUIPMENT AND ITEMS OF WORK (SUCH AS WATER TREATMENT, BALANCING) MAY NOT HAVE AN APPROVED EQUAL DUE TO THE NEED TO HAVE A CONSISTENT TYPE OR SOURCE OF MAINTENANCE. REFER TO SPECIFIC CLAUSES IN THIS SPECIFICATION.

1.8 GUARANTEE

.1 PROVIDE THE OWNER WITH A WRITTEN GUARANTEE THAT THE EQUIPMENT INSTALLED AND THE WORK PERFORMED SHALL REMAIN IN A SERVICEABLE CONDITION FOR A PERIOD OF ONE (1) YEAR FROM THE DATE OF FINAL ACCEPTANCE BY THE OWNER. THE WARRANTY SHALL COVER MATERIAL AS WELL AS LABOR.

1.9 BUILDING OPERATION DURING CONSTRUCTION

.1 IN ORDER TO MINIMIZE OPERATIONAL DIFFICULTIES FOR THE BUILDING STAFF, THE VARIOUS TRADES MUST COOPERATE WITH THE OWNER THROUGHOUT THE ENTIRE CONSTRUCTION PERIOD AND PARTICULARLY ENSURE THAT NOISE IS MINIMIZED. INCLUDE FOR THE COST OF ALL WORK THAT MAY BE REQUIRED OUT OF REGULAR HOURS.

.2 BEFORE INTERRUPTING MAJOR SERVICES NOTIFY THE OWNER WELL IN ADVANCE AND ARRANGE AN ACCEPTABLE SCHEDULE FOR THE INTERRUPTIONS. COMPLETE ALL PREPARATORY WORK AS FAR AS REASONABLY POSSIBLE AND HAVE ALL NECESSARY MATERIALS ON SITE AND PREFABRICATED (WHERE PRACTICAL). WORK CONTINUOUSLY TO KEEP THE LENGTH OF INTERRUPTION TO A MINIMUM. SHUTDOWNS, TO PERMIT CONNECTIONS, WILL BE CARRIED OUT BY MAINTENANCE STAFF.

1.10 SHOP DRAWINGS/PRODUCT DATA

.1 SUBMIT THREE (3) SETS OF DETAILED EQUIPMENT AND PLUMBING FIXTURE SHOP DRAWINGS FOR REVIEW PRIOR TO ORDERING. DO NOT ORDER EQUIPMENT OR MATERIALS UNTIL ENGINEER HAS REVIEWED SHOP DRAWINGS.

.2 SHOP DRAWINGS SHALL BE SPECIFIC AND REFLECT ALL SPECIFIED AND SCHEDULED REQUIREMENTS.

1.11 OPERATION AND MAINTENANCE MANUALS

.1 PROVIDE FOUR (4) COPIES OF MANUALS PREPARED BY QUALIFIED AND EXPERIENCED PERSONNEL FOR USE BY THE OWNER. MANUALS FORM PART OF THE CONTRACT AND MUST BE DELIVERED TO THE ENGINEER BEFORE WORK WILL BE CONSIDERED COMPLETE. EACH MANUAL SHALL PROVIDE THE FOLLOWING:

.1 LAYMAN'S DESCRIPTION OF ALL MECHANICAL SYSTEMS INCLUDING OPERATING, MAINTENANCE AND LUBRICATION INSTRUCTIONS,
.2 CERTIFICATION OF ALL EQUIPMENT WHERE REQUIRED BY LOCAL CODES AND AUTHORITIES,
.3 SHOP DRAWINGS AND MAINTENANCE BULLETINS,
.4 LIST ADDRESSES AND TELEPHONE NUMBERS OF ALL EQUIPMENT SUPPLIERS AND CONTRACTORS,
.5 PERFORMANCE DETAILS FOR ALL EQUIPMENT INCLUDING CURVES FOR FANS AND PUMPS WITH ACTUAL OPERATING POINTS NOTED.

1.12 RECORD DRAWINGS

.1 MAINTAIN ONE SET OF CONTRACT DRAWING WHITE PRINTS, INCLUDING ALL SUPPLEMENTARY AND REVISION DRAWINGS ON SITE, SOLELY FOR THE PURPOSE OF RECORDING, IN RED, ANY CHANGE AND / OR DEVIATION FROM THE CONTRACT DRAWINGS AS IT OCCURS. INCLUDE ELEVATIONS AND DETAILED LOCATIONS OF BURIED SERVICES.

.2 CAD DRAFTING:

.1 PURCHASE A SET OF CAD FILES FROM THE CONSULTANT. ALLOW A SINGLE PER PROJECT COST OF $200.00 PLUS $20.00 PER DRAWING. OBTAIN THE SERVICES OF AN APPROVED CAD DRAFTSPERSON TO TRANSFER ALL CHANGES TO AMEND THE CAD FILES IN THE LATEST VERSION OF AUTOCAD.
.2 INCLUDE ALL DETAILS FROM REVISION DRAWINGS, ADDENDA, AND CHANGE ORDERS. LABEL EACH DRAWING IN THE LOWER RIGHT CORNER IN LETTERS OF AT LEAST 12 MM [1/2"] HIGH AS FOLLOWS: "AS BUILT DRAWINGS", CONTRACTORS NAME AND DATE.
.3 PROVIDE ONE SET OF CHECK PRINTS FOR REVIEW BY CONSULTANT.
.4 UPON ACCEPTANCE BY THE CONSULTANT, PROVIDE COMPUTER CAD FILES AND ONE SET OF PLOTS.
.5 NOTE: THE CONTRACTOR WILL BE REQUIRED TO SIGN A STANDARD STANTEC/CONTRACTOR AGREEMENT ENTITLED "AUTHORIZATION TO USE CAD DRAWING FILES". THE AGREEMENT RESTRICTS THE USE OF THE CAD FILES TO THE PURPOSE OF "AS-BUILT" ONLY AND DETERMINES THE EDITING PROCEDURES.

1.13 COORDINATION WITH ELECTRICAL DIVISION

.1 CONTRACTOR SHALL REVIEW ALL EQUIPMENT REQUIRING ELECTRICAL HOOK-UP WITH ELECTRICAL CONTRACTOR AND ELECTRICAL DRAWINGS PRIOR TO ORDERING EQUIPMENT. ENSURE PROPER ELECTRICAL CHARACTERISTICS ARE DETERMINED FOR ALL AFFECTED AND RELATED WORK.

1.14 SERVICE PENETRATIONS IN RATED FIRE SEPARATIONS

.1 ALL PIPING, TUBING, DUCTS, WIRING, CONDUITS, ETC. PASSING THROUGH RATED FIRE SEPARATIONS SHALL BE SMOKE AND FIRE PROOFED WITH ULC APPROVED MATERIALS IN ACCORDANCE WITH CAN4-S115-M85 AND ASTM E814 STANDARDS AND WHICH MEET THE REQUIREMENTS OF THE BUILDING CODE IN EFFECT. THIS INCLUDES NEW SERVICES WHICH PASS THROUGH EXISTING RATED SEPARATIONS AND ALSO ALL EXISTING SERVICES WHICH PASS THROUGH A NEW RATED SEPARATION OR EXISTING SEPARATIONS WHOSE RATING HAS BEEN UPGRADED.

.2 FIRE RESISTANCE RATING OF INSTALLED FIRESTOPPING ASSEMBLY SHALL NOT BE LESS THAN FIRE RESISTANCE RATING OF SURROUNDING ASSEMBLY INDICATED ON ARCHITECTURAL DRAWINGS.

.3 ALL SMOKE AND FIRE STOPPING SHALL BE INSTALLED BY A QUALIFIED CONTRACTOR WHO SHALL SUBMIT A LETTER CERTIFYING THAT ALL WORK IS COMPLETE AND IN ACCORDANCE WITH THIS SPECIFICATION.

.4 INSTALL FIRE STOPPING AND SMOKE SEAL MATERIAL AND COMPONENTS IN ACCORDANCE WITH ULC CERTIFICATION AND MANUFACTURER'S INSTRUCTIONS IN FORMED, SLEEVED OR CORED PENETRATIONS.

.5 AT ALL FIRE DAMPERS USE ULC APPROVED FIRE STOP SEALANT TO CAULK ALL JOINTS:

.1 BETWEEN FIRE DAMPER SLEEVE ANGLES AND THE SLEEVES AND
.2 BETWEEN FIRE DAMPER SLEEVE ANGLES AND THE FIRE SEPARATION.

.6 FIRESTOP MATERIALS:

.1 FIRESTOPPING AND SMOKE SEAL SYSTEMS: ASBESTOS-FREE MATERIALS AND SYSTEMS CAPABLE OF MAINTAINING AN EFFECTIVE BARRIER AGAINST FLAME, SMOKE AND GASES IN COMPLIANCE WITH REQUIREMENTS OF ULC CAN4-S115-M85, OR ULI 1479 AND ASTM 814, AND NOT TO EXCEED OPENING SIZES FOR WHICH THEY ARE INTENDED.
.2 FIRE RESISTANCE RATING OF INSTALLED FIRESTOPPING ASSEMBLY SHALL BE NOT LESS THAN THE FIRE RESISTANCE RATING OF SURROUNDING FLOOR AND WALL ASSEMBLY.
.3 ACCEPTABLE PRODUCTS:
.1 DOW CORNING, FS2000 SILICONE.
.2 HILTI FIRESTOP CS2400.
.3 TREMCO FYRE-SIL.
.4 3M, CP25WB.

1.15 SERVICE PENETRATIONS IN NON-RATED SEPARATIONS

.1 ALL PIPING, TUBING, DUCTS, WIRING, CONDUITS, ETC. PASSING THROUGH NON-RATED FIRE SEPARATIONS AND NON-RATED WALLS AND FLOORS SHALL BE TIGHTLY FITTED AND SEALED ON BOTH SIDES OF THE SEPARATION WITH SILICON SEALANT TO PREVENT THE PASSAGE OF SMOKE AND/OR TRANSMISSION OF SOUND. REFER TO "PIPE SLEEVE" CLAUSE IN THIS SECTION FOR PACKING AND SEALING OF PIPE SLEEVES.

1.16 PIPE SLEEVES

.1 PROVIDE PIPE SLEEVES FOR ALL PIPING PASSING THROUGH WALLS AND FLOORS. SLEEVES TO BE CONCENTRIC WITH PIPE.

.2 PIPE SLEEVES FOR FLOORS AND INTERIOR WALLS SHALL BE MINIMUM 0.61 [24 GA] THICK GALVANIZED SHEET STEEL WITH LOCK SEAM JOINTS.

.3 PIPE SLEEVES SHALL EXTEND 6 MM [1/4"] ABOVE FLOORS IN FINISHED AREAS.

1.17 ESCUTCHEONS AND PLATES

.1 PROVIDE ON PIPES PASSING THROUGH FINISHED WALLS, PARTITIONS, FLOORS AND CEILINGS.

.2 PLATES SHALL BE STAMPED STEEL, SPLIT TYPE, CHROME PLATED, OR STAINLESS STEEL, CONCEALED HINGE, COMPLETE WITH SPRINGS, SUITABLE FOR EXTERNAL DIMENSIONS OF PIPING/INSULATION. SECURE TO PIPE OR FINISHED SURFACE. FOR ALL PIPES PASSING THROUGH SUSPENDED CEILINGS AND UNINSULATED PIPING PASSING THROUGH WALLS. OUTSIDE DIAMETER SHALL COVER OPENING OR SLEEVE.

.3 WHERE PIPE SLEEVE EXTENDS ABOVE FINISHED FLOOR, ESCUTCHEONS OR PLATES SHALL CLEAR SLEEVE EXTENSION. DO NOT INSTALL ESCUTCHEONS AND PLATES IN CONCEALED LOCATIONS.

1.18 SALVAGE

.1 ALL PIPING, DUCTING AND EQUIPMENT WHICH BECOMES REDUNDANT AND IS NO LONGER REQUIRED DUE TO THE WORK IN THIS CONTRACT SHALL BE COMPLETELY REMOVED FROM THE SITE.

.2 ALL EXISTING ITEMS WHICH NEED TO BE REMOVED, AND WHICH HAVE A REASONABLE SALVAGE VALUE, SUCH AS FANS AND MOTORS, AIR TERMINALS, PLUMBING FIXTURES, AND VALVES, SHALL BE CAREFULLY REMOVED AND HANDED OVER TO THE OWNER. THESE ITEMS SHALL NOT BECOME THE PROPERTY OF THE CONTRACTOR. OBTAIN A WRITTEN RECEIPT FROM THE OWNER DETAILING EACH OF THE ITEMS HANDED OVER.

2 TESTING, BALANCING & COMMISSIONING

2.1 COOPERATE WITH THE COMMISSIONING AGENCY AS FOLLOWS:

.1 MAKE CORRECTIONS AS REQUIRED BY THE COMMISSIONING AGENCY.

.2 ALLOW COMMISSIONING AGENCY FREE ACCESS TO SITE DURING CONSTRUCTION PHASE. INFORM COMMISSIONING AGENCY OF ANY MAJOR CHANGES MADE TO SYSTEMS DURING CONSTRUCTION AND PROVIDE A COMPLETE SET OF RECORD DRAWINGS FOR THEIR USE.

.3 OPERATE AUTOMATIC CONTROL SYSTEM AND VERIFY SETPOINTS DURING COMMISSIONING.

.4 PROVIDE COMMISSIONING AGENCY A COMPLETE SET OF MECHANICAL DRAWINGS AND SPECIFICATIONS.

2.2 COMMISSIONING AND DEMONSTRATION

.1 BE RESPONSIBLE FOR THE PERFORMANCE AND COMMISSIONING OF ALL EQUIPMENT SUPPLIED AND RE-USED UNDER THE H.V.A.C. SECTIONS OF DIVISION 15.

.2 CONFIRM OPERATION AND REVIEW CONDITION OF ALL EXISTING AND NEW INFRARED HEATERS AND ASSOCIATED CONTROL DEVICES. SUBMIT REPORT NOTING ANY REMEDIAL WORK REQUIRED.

.3 AT THE CONCLUSION OF COMMISSIONING, DEMONSTRATE THE OPERATION OF THE SYSTEMS TO THE CONSULTANT AND THEN TO THE OWNER'S OPERATING STAFF.

.4 AT THE COMPLETION OF THE COMMISSIONING, TESTING, AND DEMONSTRATION SUBMIT TO THE CONSULTANT A LETTER CERTIFYING THAT ALL WORK SPECIFIED UNDER THIS CONTRACT IS COMPLETE, CLEAN AND OPERATIONAL IN ACCORDANCE WITH THE SPECIFICATION AND DRAWINGS.

2.3 DEFICIENCY HOLDBACKS AND DEFICIENCY INSPECTIONS

.1 WORK UNDER THIS DIVISION WHICH IS STILL OUTSTANDING WHEN SUBSTANTIAL PERFORMANCE IS CERTIFIED WILL BE CONSIDERED DEFICIENT AND A SUM EQUAL TO AT LEAST TWICE THE ESTIMATED COST OF COMPLETING THAT WORK WILL BE HELD BACK.

.2 IT IS EXPECTED THAT OUTSTANDING WORK WILL BE COMPLETED IN AN EXPEDITIOUS MANNER AND THE ENTIRE HOLDBACK SUM WILL BE RETAINED UNTIL THE REQUIREMENTS FOR TOTAL PERFORMANCE OF DIVISION 15 WORK HAVE BEEN MET AND VERIFIED.

3 SEISMIC RESTRAINTS

3.1 SCOPE

.1 PROVIDE SEISMIC RESTRAINTS ON ALL NEW AND RELOCATED PIPING, DUCTS AND EQUIPMENT. RESTRAINTS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE SEISMIC RESTRAINT MANUAL MECHANICAL SYSTEMS PRODUCED BY SMACNA (SEISMIC HAZARD LEVEL B) AND THE ASHRAE HANDBOOK APPLICATIONS CHAPTER 49 SEISMIC RESTRAINT DESIGN.

3.2 PRODUCTS

.1 MASON TYPE SCB (SEISMIC CABLE BRACE) SLACK CABLE RESTRAINTS SUPPLIED BY VIBRA-SONIC CONTROL.

.2 RESTRAINT SYSTEMS AS INDICATED IN 1991 SMACNA "SEISMIC RESTRAINT MANUAL GUIDELINES FOR MECHANICAL SYSTEMS", SEISMIC HAZARD LEVEL SHL A. IF LESSER RESTRAINT THAN RECOMMENDED BY SMACNA SHL A IS PROPOSED TO MEET LOCAL CODE SEISMIC REQUIREMENTS, PROVIDE SHOP DRAWINGS OF DETAILS CERTIFIED BY A B.C. REGISTERED STRUCTURAL CONSULTANT.

3.3 EQUIPMENT - SEISMIC RESTRAINT

PROVIDE SEISMIC RESTRAINTS IN ACCORDANCE WITH DETAILS IN SMACNA GUIDELINES OR ALTERNATIVELY SLACK CABLES MAY BE USED. ORIENT RESTRAINT CABLES AT APPROXIMATELY 90° TO EACH OTHER (IN PLAN), AND TIE BACK TO THE CEILING SLAB AT AN ANGLE NOT EXCEEDING 45° TO THE SLAB.

4 THERMAL INSULATION

4.1 GENERAL

.1 AS APPLICABLE, USE THE LATEST EDITION OF THE "B.C. INSULATION CONTRACTORS ASSOCIATION (BCICA) STANDARDS MANUAL" AS A REFERENCE STANDARD IF SUFFICIENT DETAIL/INFORMATION IS NOT SPECIFIED HEREIN.

.2 FLAME SPREAD RATINGS AND SMOKE DEVELOPED CLASSIFICATIONS SHALL BE AS REQUIRED BY THE 1985 NATIONAL BUILDING CODE AND NFPA 90A-1985. GENERALLY THE FLAME SPREAD RATING THROUGHOUT THE MATERIAL SHALL NOT EXCEED 25 AND THE SMOKE DEVELOPED CLASSIFICATION SHALL NOT EXCEED 50.

4.2 EXTERNAL FLEXIBLE INSULATION WITH VAPOUR BARRIER

.1 DUCT INSULATION TO BE APPLIED TO ALL RELOCATED, REVISED AND NEW DUCTWORK.

.2 PROVIDE 38 MM [1-1/4"] EXTERNAL FLEXIBLE GLASS FIBRE INSULATION WITH INTEGRAL VAPOUR BARRIER AS FOLLOWS: ALL AIR CONDITIONING UNIT SUPPLY DUCTS.

.3 ACCEPTABLE MANUFACTURERS: CERTAINTEED STP DUCTWRAP #75, FIBERGLAS AF300 (TYPE II) RFTRK, KNAUF FSK DUCTWRAP, MANSON ALLEY-WRAP FSK, MANVILLE MICRO LITE FSK.

4.3 PREFORMED PIPE COVERING

.1 GLASS FIBRE PREFORMED PIPE INSULATION:

.1 GLASS FIBRE PREFORMED PIPE INSULATION (TESTED ASTM C-411-61) COMPLETE WITH INTEGRAL REINFORCED VINYL FOIL LAMINATED VAPOUR BARRIER JACKET (THERMAL CONDUCTIVITY AT 24°C - 0.040 W/M/DEG.C.)
.2 ACCEPTABLE PRODUCTS: KNAUF, ASJ, FIBREGLAS ASJ, MANVILLE MICRO-LOK AP.

4.4 ACCESSORIES

.1 FIRESTOP MATERIALS:

.1 FIRESTOPPING AND SMOKE SEAL SYSTEMS: ASBESTOS-FREE MATERIALS AND SYSTEMS CAPABLE OF MAINTAINING AN EFFECTIVE BARRIER AGAINST FLAME, SMOKE AND GASES IN COMPLIANCE WITH REQUIREMENTS OF ULC CAN4-S115-M85, OR ULI 1479 AND ASTM 814, AND NOT TO EXCEED OPENING SIZES FOR WHICH THEY ARE INTENDED.
.2 FIRE RESISTANCE RATING OF INSTALLED FIRESTOPPING ASSEMBLY SHALL BE NOT LESS THAN THE FIRE RESISTANCE RATING OF SURROUNDING FLOOR AND WALL ASSEMBLY.
.3 ACCEPTABLE PRODUCTS: DOW CORNING FS2000 SILICONE, HILTI FIRESTOP CS2400, TREMCO FYRE-SIL, 3M CP25WB.

.2 ADHESIVES:

.1 FLEXIBLE ELASTOMERIC AND FLEXIBLE CLOSED CELL INSULATION ADHESIVE:
.1 ARMSTRONG 520, THERMA-CEL 1590, RUBATEX R-373, ZIPCOAT 8A.

.3 COATINGS:

.1 FLEXIBLE ELASTOMERIC AND FLEXIBLE CLOSED CELL INSULATION FINISH COATING:
.1 ARMSTRONG, BAKELITE 120-13, RUBATEX, ZIPCOAT.

4.5 SCOPE OF PIPING INSULATION

.1 DOMESTIC HOT AND COLD WATER PIPING, FITTINGS AND VALVES:

.1 INSULATE AND VAPOUR SEAL THE FOLLOWING FITTINGS:
.1 ELBOWS, TEES, REDUCERS.
.2 VALVES, (BODIES AND BONNETS) EXCEPT CHECK VALVE COVERS.
.3 STRAINERS.
.4 FLANGES.
.5 UNIONS.

5 PIPE

5.1 GAS PIPING

.1 MODIFY EXISTING GAS PIPING AS INDICATED.

.2 UTILIZE SCHEDULE 4 TO ASTM A53-84A GRADE B AND INSTALL IN ACCORDANCE WITH CAN1-B149.1.

.3 SCREW OR WELD NPS 2 AND UNDER.

.4 INSTALL UNIONS, ISOLATING GAS COCKS, PRESSURE REDUCING VALVES, DRIP LEGS WHEN CONNECTING THE INFRARED HEATERS.

5.2 HANGER SPACING

.1 SPACING AND MIDDLE ATTACHMENT (ROD) DIAMETER AS SPECIFIED IN PARAGRAPHS BELOW OR AS IN TABLE BELOW, WHICHEVER IS MORE STRINGENT.

.1 PLUMBING PIPING: MOST STRINGENT REQUIREMENTS OF B.C. PLUMBING CODE, PROVINCIAL CODE, OR AUTHORITY HAVING JURISDICTION.
.2 FIRE PROTECTION: TO APPLICABLE FIRE CODE; TOGGLE HANGERS ARE UNACCEPTABLE.
.3 FOR GAS PIPING REFER TO GAS CODE CAN/CGA-B149.1.
.4 FLEXIBLE JOINT ROLL GROOVE PIPE: IN ACCORDANCE WITH TABLE BELOW, BUT NOT LESS THAN ONE HANGER AT JOINTS.
.5 WITHIN 300 MM [12"] OF EACH HORIZONTAL ELBOW.

.2 MAXIMUM HANGER SPACING TABLE.

PIPE SIZE: NPS	ROD DIAMETER MM [INS]	MAXIMUM SPACING STEEL PIPE M [FT]	MAXIMUM SPACING COPPER PIPE M [FT]
1/2	10 [3/8]	1.8 [6]	1.5 [5]
3/4, 1	10 [3/8]	2.4 [8]	1.8 [6]
1-1/4, 1-1/2	10 [3/8]	3.0 [10]	1.8 [6]
2	10 [3/8]	3.0 [10]	3.0 [10]
2-1/2, 3, 4	12 [1/2]	3.0 [10]	3.0 [10]

6 DUCTWORK

6.1 GALVANIZED STEEL

GALVANIZED STEEL SHALL HAVE A 380 G/SQ.M. [1-1/4 OZ/SQ.FT] GALVANIZING COAT BOTH SIDES TO ASTM A525 G90.

7 CONTROLS

7.1 GENERAL

.1 RELOCATE EXISTING CONTROL DEVICES AS INDICATED.

.2 WHERE EXISTING DEVICES ARE RE-USED, VERIFY OPERATION AND RE-CALIBRATE AS REQUIRED.

.3 VERIFY CORRECT OPERATION OF CONTROLLED DEVICES INCLUDING EXISTING AIR VALVE ACTUATORS, CONTROL VALVES, ETC. WITHIN THE AREA OF RENOVATION.

.4 REPORT ANY EXISTING CONTROL DEVICE WHICH NEED REPLACEMENT. REPLACEMENT WILL BE BY BUILDING MANAGEMENT OR VIA CHANGE ORDER, AT THE DISCRETION OF THE OWNER.

7.2 ROOM THERMOSTATS

.1 MINIMUM REQUIREMENTS

.1 ADJUSTABLE SENSITIVITY AND SET POINT.
.2 NEW THERMOSTATS TO 7-DAY PROGRAMMABLE WITH NON VOLATILE MEMORY.

8 PRODUCTS

8.1 INFRARED HEATERS

.1 INSTALLATION.

.1 INSTALLATION MUST COMPLY WITH MANUFACTURER SUPPLIED INSTRUCTION MANUAL, ALL APPLICABLE LOCAL CODES AND/OR GAS UTILITY REQUIREMENTS. IN THE ABSENCE OF ANY OF THE FORMER, REFERENCE SHOULD BE MADE TO CAN 1-B149.1 AND B149.2 INSTALLATION CODES.

.2 HEATER UNITS MUST BE WIRED IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE AND LOCAL ORDINANCES.

.3 HEATER UNITS SHALL BE SUSPENDED IN ACCORDANCE WITH MANUFACTURERS INSTRUCTION WITH CHAIN AND TURNBUCKLES EXCEEDING 150 LB. PULL TEST. (3/8-4 INCH TURNBUCKLES AND 2/0 CHAIN).

9. SEQUENCE OF OPERATION:

9.1 WINTER MODE:

THE INFRARED HEATERS ARE CONTROLLED BY 2 STAGE PROGRAMMABLE THERMOSTATS LOCATED ON WALLS AT VARIOUS LOCATIONS THROUGH THE BUILDING AS SHOWN ON THE DRAWINGS. THE LOCAL THERMOSTATS ARE USED TO ACTIVATE THE HEATERS OPERATION TO MAINTAIN SPACE TEMPERATURE.

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Permit-Seal

Client/Project
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INFRARED HEATERS

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Title
SPECIFICATIONS

Project No.	Scale
15603054	N.T.S.

Drawing No.	Sheet	Revision
M3	3 of 3	A

ORIGINAL SHEET - ARCH D