1. GENERAL

1.01 SECTION INCLUDES

.1 This Section specifies products, criteria and characteristics, and methods and execution that are common to one or more Sections of Mechanical Divisions. It is intended as a supplement to each Section and is to be read accordingly.

1.02 REFERENCES

.1 Division 00 and Division 01 apply to and are a part of each Mechanical Division:

.1 Division 20 – Common Mechanical Requirements;

.2 Division 21 – Fire Suppression;

.3 Division 22 – Plumbing;

.4 Division 23 – Heating, Ventilating, and Air Conditioning;

.5 Division 25 – Integrated Automation.

.2 The provisions of this Section also apply to the following sections:

.1 Section 08 31 00 – Access Doors and Panels.

.2 Section 10 44 16 – Fire Extinguishers.

1.03 SUBMITTALS

.1 Submit shop drawings/product data sheets for:

.1 pressure gauges and thermometers;

.2 electric motors (submit with equipment they are associated with).

.2 Submit weight loads for selected equipment (upon request).

.3 Submit copy of architectural reflected ceiling plan drawings and elevation drawings to indicate proposed access door locations.

.4 Submit a list of equipment identification nameplates indicating proposed wording and sizes.

.5 Submit a list of pipe and duct identification colour coding and wording.

.6 Submit a proposed valve tag chart and a list of proposed valve tag numbering and identification wording.

.7 Submit drawings indicating size and location of required sleeves, recesses and formed openings in poured or precast concrete work.

.8 Submit any other submittals specified in this Section or other Sections of Mechanical Divisions.

1.04 MAINTENANCE MATERIAL SUBMITTALS

.1 As specified in Part 2 of this Section, submit a spare belt set, tagged, and identified, for each belt driven piece of equipment.

2. PRODUCTS

2.01 FIRESTOPPING AND SMOKE SEAL MATERIALS

.1 Firestopping and smoke seal system materials for mechanical penetrations through fire rated construction are specified in Section 20 05 17 - Sleeves and Sleeve Seals for Mechanical Piping, and work is to be done as part of mechanical work unless otherwise specified in Division 07.

2.02 ACCESS DOORS

.1 Refer to Section 08 31 00.

.2 Provide all access doors required for Mechanical work unless otherwise specified in Division 08. Coordinate consistency of look and finish of access doors on project with each Division of Work. Coordinate exact requirements with General Trades Contractor.

.3 Access doors to be rust resistant steel door panels, with concealed hinges and positive locking and self-opening screwdriver operated lock. Wall type frame to be suitable for wall installation and have integral keys for plaster walls. Doors in tile wall to be stainless steel and in ceilings to be suitable for plaster covering with only frame joint showing. Other doors to be prime painted steel.

.4 Size access doors to suit the concealed work for which they are supplied, and wherever possible they are to be of standard size for all applications, but in any case they are to be minimum 300 mm x 300 mm (12" x 12") for hand entry and 600 mm x 600 mm (24" x 24") for body entry.

.5 Lay-in type tiles, properly marked, may serve as access panels. Coordinate marking of ceiling tiles with the Consultant. Panels in glazed tile walls to be 12 gauge, 304 alloy stainless steel, No. 4 finish, with recessed frame secured with stainless steel counter-sunk flush head screws.

.6 Panels in plaster surfaces to have dish-shaped door and welded metal lath, ready to take plaster. Provide a plastic grommet for door key access.

.7 Other access doors to be welded 12 gauge steel, flush type with concealed hinges, lock and anchor straps, complete with factory prime coat. Submit to Consultant for review, details of non-standard door construction details.

.8 Access doors in fire rated ceilings, walls, partitions, structures, etc., to be ULC listed and labelled and of a rating to maintain fire separation integrity.

.9 Where access doors are located in surfaces where special finishes are required, they are to be of a recessed door type capable of accepting finish in which they are to be installed so as to maintain final building surface appearance throughout.

.10 Manufacturers:

.1 SMS.

.2 Bauco.

.3 Acudor.

2.03 FLEXIBLE PIPING CONNECTORS

.1 Double wall stainless steel flexible connectors for piping connections to vibration isolated equipment, each selected by manufacturer to suit the application. Shop drawings or product data sheets must indicate construction and performance requirements that suit the application.

.2 Manufacturers:

.1 Hyspan Precision Products Inc.;

.2 Senior Flexonics Ltd.;

.3 The Metraflex Co.

3. EXECUTION

3.01 GENERAL PIPING AND DUCTWORK INSTALLATION REQUIREMENTS

.1 Unless otherwise specified, locate, and arrange horizontal pipes and ducts above or at ceiling on floors, arranged so that under consideration of all other work in area, maximum ceiling height and/or usable space is maintained. If required to maintain ceiling heights, reroute and/or resize ductwork, with Consultant's approval.

.2 Unless otherwise specified, install work concealed in finished spaces, and concealed to degree possible in partially finished and unfinished spaces.

Refer to and examine Architectural drawings and room finish schedules to determine finished, partially finished, and unfinished areas. Walls which are painted are considered finished.

.3 Install pipes and ducts parallel to building lines and to each other.

.4 Neatly group and arrange exposed work.

.5 Locate work to permit easy access for service or maintenance as required and/or applicable. Locate valves, dampers and any other equipment which will or may need maintenance or repairs and which are to be installed in accessible construction so as to be easily accessible from access doors. Where valves, dampers and similar piping or ductwork accessories occur in vertical services in shafts, pipe spaces or partitions, locate accessories at floor level.

.6 Make connections between pipes of different materials using adapters suitable for application. Provide cast brass dielectric type adapters/unions at connections between ferrous and copper pipe.

.7 Comply with equipment and material manufacturer's installation instructions unless otherwise specified herein or on drawings, and unless such instructions contradict governing codes and regulations.

.8 Carefully clean ducts, pipe and fittings prior to installation. Temporarily cap or plug ends of pipe, ducts and equipment which are open and exposed during construction.

.9 Install piping and ductwork which are to be insulated so that they have sufficient clearance to permit insulation and finish to be applied continuously and unbroken around pipe or duct, except for ductwork at fire barriers, in which case insulation will be terminated at each side of the duct fire damper.

.10 Inspect surfaces and structure prepared by other trades before performing work. Verify surfaces or structure to receive work has no defects or discrepancies which could result in poor application or cause latent defects in installation and workmanship. Report defects in writing. Installation of work will constitute acceptance of such surfaces as being satisfactory.

.11 Any ferrous piping that exhibits in excess of 5% surface rust, either inside or outside or both, is to be wire brush cleaned to bare metal and coated with suitable primer. Steel pipe, fittings and accessories are to be free of corrosion and dirt when work is complete or prior to being concealed from view. Where dirt is evident, clean piping prior to being concealed.

.12 For factory applied finishes, repaint or refinish surfaces damaged during shipment and installation. Quality of repair work is to match original finish. This requirement also applies to galvanized finishes.

.13 Where mechanical work is located in high humidity areas where ferrous metal products will be subject to corrosion and protection for such products is not specified, provide finishes on products to protect against corrosion or provide products which will not corrode in the environment, i.e. aluminium ductwork, copper or stainless steel pipe, etc.

.14 Provide screwed unions or flanges in piping connections to equipment and in regular intervals in long (in excess of 12 m (40')) piping runs to permit removal of sections of piping.

.15 Unless otherwise specified and except where space limitations do not permit, piping elbows are to be long radius. Eccentric reducers are to be installed with straight side at top of piping.

3.02 PIPE JOINT REQUIREMENTS

.1 Do not make pipe joints in walls or slabs.

.2 Ream piping ends prior to making joints.

.3 Properly cut threads in screwed steel piping and coat male threads only with Teflon tape or paste, or an equivalent thread lubricant. After pipe has been screwed into fitting, valve, union, or piping accessory, not more than 2 pipe threads are to remain exposed.

.4 Site bevel steel pipe to be welded or supply mill bevelled pipe. Remove scale and oxide from bevels and leave smooth and clean. Use factory made welding tees or welding outlet fittings for piping branches off mains. Do not use shop or site fabricated fittings unless written approval has been obtained.

.5 Welded joints are to be made by CWB certified licensed journeyman welders qualified in accordance with CSA B51, Boiler Pressure Vessel and Pressure Piping Code, and who are in possession of a proper certificate of qualification for each procedure to be performed. Each weld is to be identified with the welder's identification symbol, and welds are not to be concealed until they have been inspected and approved. Electrodes are to be in accordance with CSA W48 Series, Electrodes, and requirements of CAN/CSA W117.2, Safety in Welding, Cutting and Allied Processes are to be followed.

.6 Unless otherwise specified, make flanged joints with Garlock 5500 or equivalent gasket materials to suit the application, and bolts and nuts. Bolts are not to be longer than length necessary to screw nut up flush to the end of bolt. Bolts used for flanged connections in piping with a working pressure of 690 kPa (100 psi) and greater are to be ASTM A-193 Grade B-7, with heavy hexagon nuts to ASTM A-194 CL-2H. Provide suitable washers between each bolt head and flange and between each nut and flange.

.7 A random check of bolted flanged connections will be made to verify flanged connections are properly mated with no shear force acting on bolts. Supply labour to disconnect and reconnect selected flanged joints. If improperly mated joints are found, remove and reinstall affected piping so flanges mate properly. If improperly mated joints are found, additional joints will be checked, and you will be responsible for the repair of any other improper joints discovered.

.8 Unless otherwise specified make soldered joints in copper piping using flux suitable for and compatible with type of solder being used. Clean the outside of pipe end and inside of fitting, valve, or similar accessory prior to soldering.

.9 Install mechanical joint fittings and couplings in accordance with manufacturer's instructions.

.10 Grooves are to be rolled. Make arrangements with coupling and fitting manufacturer for shop and/or site instructions and demonstrations as required, and adhere to manufacturer's instructions with respect to pipe grooving, support, type of gasket required, anchoring and guiding the grooved piping system.

.11 If pressure crimped couplings and fittings are used, ensure gaskets are fully compatible with piping fluid, and valves and piping accessories are suitable. Use only fitting manufacturer supplied crimping equipment. Comply with manufacturer’s latest published specification, instructions, and recommendations with respect to pipe, coupling, and fitting preparation and installation, and support, anchoring and guiding of the piping system.

.12 Solvent weld PVC piping in 2 parts, primer stage and cementing stage, in accordance with manufacturer’s recommendations, ASTM D2855, and CSA requirements.

.13 Install PVC piping with gasketed joints in accordance with manufacturer’s current published specifications, instructions and recommendations, and CSA requirements.

3.03 DUCT OPENINGS

.1 Duct openings, air inlet and outlet openings, fire damper and similar openings will be provided in new poured concrete work, masonry, drywall and other building surfaces by trade responsible for particular construction in which opening is required.

.2 Size openings for fire dampers to suit damper arrangement with folding blade out of air stream.

.3 For duct openings except where fire dampers are required, pack and seal space between duct or duct insulation and duct opening as specified above for pipe openings in non-fire rated construction.

3.04 SLEEVE AND FORMED OPENING LOCATION DRAWINGS

.1 Prepare and submit for review, drawings indicating size and location of required sleeves, recesses and formed openings in poured or precast concrete work.

.2 Such drawings are to be completely and accurately dimensioned and relate sleeve, recesses, and formed openings to suitable grid lines and elevation datum, and are to take into account structural items such as grade beams, column caps, and column drop slabs.

.3 Begin to prepare such drawings immediately upon notification of acceptance of bid and award of Contract.

3.05 INSTALLATION OF PIPE ESCUTCHEON PLATES

.1 Provide escutcheon plates suitably secured over exposed piping passing through finished building surfaces. A finished building surface is any surface with a factory finish or that receives a site applied finish.

.2 Install plates so they are tight against building surface concerned, completely covering pipe sleeves and/or openings, except where waterproof sleeves extend above floors, in which case fit plate tightly around sleeve.

3.06 SUPPLY OF ACCESS DOORS

.1 Supply access doors to give access to mechanical work which may need maintenance or repair but which is concealed in inaccessible construction, except as otherwise specified herein or on drawings.

.2 Before commencing installation of mechanical work, coordinate with other trades and prepare on a set of reflected ceiling plans and wall elevations, complete layouts of access doors. Submit these layouts for Consultant's review and show exact sizes and locations of such access doors. Locate and arrange mechanical work to suit.

.3 Access doors will be installed by trade responsible for particular type of construction in which doors are required. Supply access doors to trade installing same at proper time.

.4 Wherever possible, access doors to be of a standard size for each application. Confirm exact dimensions and minimum size restrictions with the Consultant prior to ordering.

.5 Group piping and ductwork to ensure minimum number of access doors is required.

.6 Coordinate with Electrical Contractor and General Trades Contractor to ensure access doors on project are provided by a single manufacturer, installed as part of work of General Trades Contractor and work involving both mechanical and electrical services should, where possible, be accessible from common access door. Coordinate work to ensure common location access doors are not supplied by both Mechanical Divisions and Electrical Divisions.

3.07 INSTALLATION OF VALVES

.1 Generally, valve locations are indicated or specified on drawings or specified in Sections of the Specification where valves are specified, however, regardless of locations shown or specified, following requirements apply:

.1 provide shut-off valves to isolate systems, at base of vertical risers, in branch take-offs at mains and risers on floors, to isolate equipment, to permit work phasing as required, and wherever else required for proper system operation and maintenance;

.2 install shut-off valves with handles upright or horizontal, not inverted, and located for easy access;

.3 unless otherwise specified, provide a check valve in discharge piping of each pump;

.4 valve sizes are to be same as connecting pipe size;

.5 valves are to be permanently identified with size, manufacturer's name, valve model or figure number and pressure rating, and wherever possible, valves are to be product of same manufacturer;

.6 for valves in insulated piping, design of valve stem, handle and operating mechanism is to be such that insulation does not have to be cut or altered in any manner to permit valve operation.

3.08 FINISH PAINTING OF MECHANICAL WORK

.1 Finish paint exposed mechanical work as specified and/or scheduled in accordance with requirements of Division 09.

.2 Touch-up paint damaged factory applied finishes on mechanical work products.

3.09 PIPE LEAKAGE TESTING

.1 Before piping has been insulated or concealed, and before equipment, fixtures and fittings have been connected, test piping for leakage.

.2 Tests are to be witnessed by the Consultant and/or Owner's representative, and, where required, representatives of governing authorities. Give ample notice of tests in writing and verify attendance. Have completed test report sheets dated and signed by those present to confirm proper test results.

.3 When circumstances prevent scheduled tests from taking place, give immediate and adequate notice of cancellation to all who were scheduled to attend.

.4 Gravity Drainage and Vent Piping

.1 Test piping in accordance with local governing building code.

.2 After fixtures and fittings are set and pipes are connected to building drain or drains, turn on water into pipe, fixtures, fittings and traps in order to detect any imperfect material or workmanship. Perform a smoke test if required by local governing authorities.

.5 Pumped Drainage Piping

.1 Test piping with cold water at a pressure of 1-½ times normal working pressure and maintain pressure for a minimum of 2 hours.

.6 Domestic Water Piping

.1 Test piping with cold water at a pressure of 1-½ times normal working pressure and maintain pressure for a minimum of 2 hours.

.7 Sprinkler System Piping

.1 Test system piping in accordance with requirements of NFPA No. 13, "Installation of Sprinkler Systems", and in accordance with any additional requirements of governing authorities.

.8 Standpipe System Piping

.1 Test system piping in accordance with requirements of NFPA No. 14, "Standpipe and Hose Systems", and in accordance with any additional requirements of governing authorities.

.9 CO2 Fire Extinguishing System Piping

.1 Test system piping in accordance with requirements of NFPA No. 12, "Standard on Carbon Dioxide Extinguishing Systems", and in

accordance with any additional requirements of governing authorities.

.10 Clean Agent Fire Extinguishing System Piping

.1 Test system piping in accordance with requirements of NFPA No. 2001, "Standard on Clean Agent Extinguishing Systems", and in accordance with any additional requirements of governing authorities.

.11 Heat Transfer (HVAC) System Piping

.1 Test piping with cold water at a pressure of 1035 kPa (150 psi) for a minimum of 2 hours.

.12 Steam and Condensate Piping

.1 Test piping with cold water for a minimum of 2 hours at following pressures:

.1 0 kPa to 105 kPa (0 psi to 15 psi) low pressure piping – 690 kPa (100 psi);

.2 110 kPa to 690 kPa (16 psi to 100 psi) medium pressure piping – 1035 kPa (150 psi);

.3 greater than 690 kPa (100 psi) high pressure piping – 1380 kPa (200 psi).

.13 Natural Gas Piping

.1 Test piping in accordance with requirements of CAN/CSA B149.1 and any additional requirements of local governing authorities.

.2 After completion of the verification test, locate required tag stating results of the verification test at the point of entry of gas main into building, affixed to the pipe in a secure manner.

.3 Check piping joints and connections for leaks with a water/soap solution while piping is under pressure.

.14 Propane Gas Piping

.1 Test piping in accordance with requirements of CAN/CSA B149.2 and any additional requirements of local governing authorities.

.2 After completion of the verification test, locate required tag stating results of the verification test at the point of entry of gas main into building, affixed to the pipe in a secure manner.

.3 Check piping joints and connections for leaks with a water/soap solution while piping is under pressure.

.15 Compressed Air Piping

.1 Test piping with dry compressed air or nitrogen at 690 kPa (100 psi) for a minimum of 2 hours.

.2 Test piping joints with a water-soap solution while piping is under pressure to detect leaks.

.16 Fuel Oil Piping

.1 Test piping (not tanks) with dry compressed air or nitrogen for a minimum period of 2 hours at 1035 kPa (150 psi).

.2 Check piping joints and connections for leaks with a water/soap solution while piping is under pressure.

.17 Gasoline Piping

.1 Test piping (not tanks) with dry compressed air or nitrogen for a minimum period of 2 hours at 1035 kPa (150 psi) in accordance with TSSA requirements.

.2 Check piping joints and connections for leaks with a water/soap solution while piping is under pressure.

.18 Refrigerant Piping

.1 Test refrigerant piping for leakage and dehydrate in accordance with requirements of Chapter 18 of ASHRAE Handbook - Fundamentals.

.19 Control Air Piping and Tubing

.1 Test control air piping and tubing with dry compressed air or nitrogen before concealing and again before connection of instruments.

.2 Rough-in test pressure is to be 345 kPa (50 psi) maintained over 24 hours with a pressure drop not to exceed 35 kPa (5 psi).

.3 Test joints for leaks with a soap solution.

.4 Finish test is to be 205 kPa (30 psi) with a permissible loss of 7 kPa (1 psi) over a 4 hour period. Prior to connecting instruments, blow systems clean and dry, and test component connections for leaks with a water/soap solution.

.20 Pure Water Piping

.1 When piping has been properly flushed and cleaned, test at 690 kPa (100 psi) for 2 hours with only distilled water or filtered dry compressed air. If distilled water is used, drain system when testing is complete.

.21 Following requirements apply to all testing:

.1 ensure piping has been properly flushed, cleaned and is clear of foreign matter prior to pressure testing;

.2 temporarily remove or valve off piping system specialties or equipment which may be damaged by test pressures prior to pressure testing systems, and flush piping to remove foreign matter;

.3 when testing is carried out below highest level of the particular system, increase test pressure by the hydrostatic head of 7 kPa (1 psi) for every 600 mm (24") below the high point;

.4 include for temporary piping connections required to properly complete tests;

.5 piping under test pressure is to have zero pressure drop for length of test period;

.6 tighten leaks found during tests while piping is under pressure. If this is impossible, remove and refit piping and reapply test until satisfactory results are obtained;

.7 where leaks occur in threaded joints in steel piping, no caulking of these joints will be allowed under any conditions;

.8 tests are to be done in reasonably sized sections so as to minimize number of tests required;

.9 in addition to leakage tests specified above, demonstrate proper flow throughout systems including mains, connections and equipment, as well as proper venting and drainage, and include for any necessary system adjustments to achieve proper conditions.

3.10 INTERRUPTION TO AND SHUT-DOWN OF MECHANICAL SERVICES AND SYSTEMS

.1 Coordinate shut-down and interruption to existing mechanical systems with Owner. Generally, shut-downs may be performed only between the hours of 12:00 midnight Friday until 6:00 a.m. Monday morning, unless otherwise specified in Division 01. Include for costs of premium time to perform work during nights, weekends or other times outside of normal working hours, which may be necessary to comply with stipulations specified herein this Article. Services for operation of existing non-renovated areas of building are to be maintained.

.2 Upon award of a Contract, submit a list of anticipated shut-down times and their maximum duration.

.3 Prior to each shut-down or interruption, inform Owner and the Consultant in writing 5 working days in advance of proposed shut-down or interruption and obtain written consent to proceed. Do not shut-down or interrupt any system or service without such written consent. Shutdowns of some essential services may require additional advance notification time.

.4 Perform work associated with shut-downs and interruptions as continuous operations to minimize shut-down time and to reinstate systems as soon as possible, and, prior to any shut-down, ensure materials and labour required to complete the work for which shut-down is required are available at site.

.5 Pipe freezing shall be used to connect new piping to existing piping. Alternative methods may be proposed, if site conditions are evaluated and permit, and are approved by the Consultant.

.6 Where existing isolation valves do not hold, pipe freezing shall be used to connect new piping to existing piping.

3.11 MECHANICAL SERVICE REQUIREMENTS FOR FLOATING FLOOR SLABS

.1 Where mechanical services are required to be installed in or through a vibration isolated floating slab, install such services so as not to transmit any vibration to base slab on which floating floor slab is placed.

.2 Wherever possible, arrange mechanical work to avoid penetrating a floating floor slab.

3.12 EXCAVATION AND BACKFILL WORK

.1 Unless otherwise specified in Division 31, provide all excavation and backfill associated with the mechanical scope of work.

.2 Before commencement of excavation for work, determine in consultation with Consultant, Owner, Municipality and utilities, presence, if any, of existing underground services at site. Engage local utilities to locate and mark out such services. Ensure trades concerned are aware of their presence.

.3 Be responsible for any damage done to underground services caused by neglect to determine and mark out location of such services prior to excavation work commences.

.4 Where Work falls under jurisdiction of local governing utility, confirm requirements and comply with utility requirements.

.5 Unless otherwise specified in Division 31, provide excavation, backfill and related work required for mechanical work. Obtain a copy of soil test report if available from the Consultant. Depth of excavations must accommodate local governing requirements and local standard practices to compensate for local frost levels of Place of the Work.

.6 Inverts and locations of existing site services may have been site surveyed and approximate location may be shown on drawings. Confirm inverts and locations are correct, prior to commencing excavation and contact Utilities to accurately locate their services. Where discrepancies are found, immediately inform Consultant, and await a direction. Grade bottom of trench excavations as required.

.7 In firm, undisturbed soil, lay pipes directly on soil, unless otherwise directed.

.8 Before backfilling, arrange for inspection of work by the Consultant. Do not backfill work unless reviewed with the Consultant. Failure to do so prior to backfilling will require re-excavating work and re-backfill at no additional cost to Owner.

.9 Unless otherwise specified, backfill trenches within building with clean sharp sand in individual layers of maximum 150 mm (6") thickness compacted to a density of 100% Standard Proctor. Hand compact first layers up to a compacted level of minimum 300 mm (12") above top of pipe. Hand or machine compact the balance up to grade.

.10 Unless otherwise specified, backfill trenches outside the building (not under roads, parking lots or traffic areas), up to a compacted level of 450 mm (18") thick above the pipe, hand compacted to a density of 95% Standard Proctor, using granular "A" gravel. Backfill the balance in 150 mm (6") layers with approved excavated material, compacted to 95% Standard Proctor density.

.11 Unless otherwise specified, backfill trenches outside building under roads, parking lots or traffic areas with crushed stone or granular "A" gravel in layers not exceeding 150 mm (6") thickness, compacted to 100% Standard Proctor density up to grade level.

.12 Provide minimum 1.37 m (4.5') of cover for underground piping subject to freezing and located outside building.

.13 Provide minimum 450 mm (18") of cover for underground piping subject to freezing and located inside building.

.14 After first lift of backfill has been compacted, mark entire path of pipe using continuous 75 mm (3") wide detectable identified marking tape equal to SMS Ltd. D-UGMT.

.15 Unless otherwise directed in Division 02 and/or Division 31, store and dispose of excavated materials as follows:

.1 during progress of contract, place material as directed in such a manner to minimize damage or disfigurement of ground and which in no way impedes progress of work;

.2 separately place surplus topsoil and subsoil as directed; leave site clean and unencumbered.

.16 Perform pumping as required to keep excavations free of water.

.17 Engage services of independent soils testing agency to test final backfill compaction density of each backfilled location. Compact backfill to satisfaction of testing agency and in accordance with Specification. Submit a copy of testing agency's report to the Consultant for review.

.18 Fill depressions to correct grade level with appropriate material, after an adequate period has passed to reveal any settlement. Use maximum possible compaction. Pay costs required to make good damages caused by settlement.

.19 Coordinate requirements for final surface toppings (concrete, asphalt, pavers, grass sod, etc.) with General Contractor.

3.13 CUTTING, PATCHING AND CORE DRILLING

.1 Unless otherwise provided by General Trades, perform cutting, patching, and core drilling of existing building required for installation of mechanical work. Perform cutting in a neat and true fashion, with proper tools and equipment to Consultant's approval. Patching is to exactly match existing finishes and be performed by tradesmen skilled in particular trade or application. Work is subject to review and acceptance by the Consultant.

.2 Criteria for cutting holes for additional services:

.1 cut holes through slabs only; no holes to be cut through beams;

.2 cut holes 150 mm (6") diameter or smaller only; obtain approval from Structural Consultant for larger holes;

.3 keep at least 100 mm (4") clear from beam faces;

.4 space at least 3 hole diameters on centre;

.5 for holes that are required closer than 25% of slab span from supporting beam face, use cover meter above slab to clear slab top bars;

.6 for holes that are required within 50% of slab span, use cover meter underside of slab to clear slab bottom bars;

.7 submit sleeving drawings indicating holes and their locations for Structural Consultant's review.

.3 Do not cut or drill any existing work without approval from Owner and Consultant. Be responsible for damage done to building and services caused by cutting or drilling.

.4 Where pipes pass through existing construction, core drill an opening. Size openings to leave 12 mm (½") clearance around pipes or pipe insulation.

.5 Prior to drilling or cutting an opening, determine, in consultation with Consultant and Owner, and by use of non-destructive radar scan (magnetic scan) of slab or wall, presence of any existing services and reinforcement bars concealed behind building surface to be cut and locate openings to suit. Coring is not permitted through concrete beams or girders.

.6 Where drilling is required in waterproof slabs, size opening to permit snug and tight installation of a pipe sleeve sized to leave 12 mm (½") clearance around pipe or pipe insulation. Provide a pipe sleeve, constructed of Schedule 40 galvanized steel pipe with a flange at one end and of a length to extend 100 mm (4") above slab, in opening. Secure flange to the underside of slab and caulk void between sleeve and slab opening with proper non-hardening silicone base caulking compound to produce a water-tight installation.

.7 Firestop and seal openings in fire rated construction. Do not leave openings open overnight unless approved by Owner and Consultant.

3.14 PACKING AND SEALING CORE DRILLED PIPE OPENINGS

.1 Pack and seal void between pipe opening and pipe or pipe insulation for length of opening as follows:

.1 non-fire rated interior construction – pack with mineral wool and seal both ends of opening with non-hardening silicone base caulking compound to produce a water-tight seal;

.2 exterior walls above grade – pack with mineral wool and seal both ends of sleeves water-tight with non-hardening silicone base caulking compound unless mechanical type seals have been specified;

.3 exterior walls below grade (and any other wall where water leakage may be a problem) – seal with link type mechanical seals as specified.

3.15 FLASHING FOR MECHANICAL WORK PENETRATING ROOF

.1 Unless otherwise specified in Division 07, perform required flashing work, including counter-flashing, for mechanical work penetrating and/or set in roof.

.2 Perform flashing work in accordance with requirements of drawing details and/or requirements specified in Division 07.

3.16 CLEANING MECHANICAL WORK

.1 Refer to cleaning requirements specified in Division 01.

.2 Clean mechanical work prior to application for Substantial Performance of the Work.

.3 Include for vacuum cleaning interior of air handling units and ductwork systems.

3.17 CONNECTIONS TO OTHER EQUIPMENT

.1 Carefully examine Contract Documents during bidding period and include for mechanical work piping and/or ductwork connections to equipment requiring such connections.

3.18 SEISMIC RESTRAINT ANCHOR POINTS FOR EQUIPMENT

.1 Where mechanical equipment requires seismic restraint, it is to be complete with manufacturer designed and rated seismic restraint anchor points and attachments, certified by equipment manufacturers, so equipment may be bolted down or restrained in the field.

.2 Equipment to be restrained must be designed such that the strength and anchorage of its internal components exceed force level; used to restrain and anchor the equipment to the supporting structure.

3.19 INSTALLATION OF FLEXIBLE CONNECTORS

.1 Provide flexible connectors in piping connections to seismically restrained equipment, where applicable, and wherever else shown.

.2 Provide flexible connectors in piping connections to vibration isolated equipment.

3.20 FAN NOISE LEVELS

.1 Submit sound power levels with fan shop drawings/product data, with levels measured to AMCA 300 and calculated to AMCA 301.

3.21 EQUIPMENT AND SYSTEM MANUFACTURER'S CERTIFICATION

.1 When equipment/system installation is complete, but prior to start-up procedures, arrange and pay for equipment/system manufacturer's authorized representative to visit site to examine installation, and after any required corrective measures have been made, to certify in writing to the Consultant that equipment/system installation is complete and in accordance with equipment/system manufacturer's instructions.

3.22 SYSTEM STARTUP

.1 When installation of equipment/systems is complete but prior to commissioning, perform start-up for equipment/systems as specified in mechanical work Sections in accordance with following requirements:

.1 Submit a copy of each equipment/system manufacturer's start-up report sheet to the Consultant for review, and incorporate any comments made by the Consultant.

.2 Under direct on-site supervision and involvement of equipment/system manufacturer's representative, start-up equipment/systems, make any required adjustments, document procedures, leave equipment/systems in proper operating condition, and submit to the Consultant complete set of start-up documentation sheets signed by manufacturer/supplier and Contractor.

.3 Commission interconnected life safety systems in accordance with CAN/ULC-S1001-11 and provide written report for Consultant's review.

End of Section