PART 1: GENERAL

1.1 SCOPE OF WORK

.1 This section to be read in conjunction with Bid Documents General Requirements. This Section applies to and governs each mechanical section in Division 15 of this Project Manual.

.2 All drawings and all sections of the specifications apply to and form an integral part of this section.

.3 Provide fully operational mechanical systems in complete accordance with applicable codes and bylaws.

.4 The drawings for mechanical work are performance drawings. They are generally diagrammatic and are not to scale unless detailed otherwise. They establish scope, material and installation quality and are not detailed installation instructions showing every offset, fitting, valve or every difficulty encountered during execution of work and will not be used as an excuse for deficiencies or omissions.

.5 Follow Manufacturers' recommendations for installation supplemented by contract documents, unless otherwise specified by the Contract Administrator.

.6 Connect to equipment specified in other sections and to equipment supplied and installed by other Contractors or by the Contract Administrator.

1.2 RELATED WORK

.1 Electrical wiring and connections to motors, equipment, controls, and motor starting switches and alarm devices shall be by Division 15.

1.3 BID DOCUMENTS

.1 Equipment, materials and work shall comply with the requirements of generally recognized agencies, including but not limited to CSA, ULC, CGA, NBFU, NFPA and the requirements of authorities having jurisdiction.

.2 Be completely responsible for the acceptable condition and operation of systems and equipment components forming part of the installation or associated with it. Promptly replace defective materials, parts and equipment and repair related damage.

.3 The drawings are intended to convey the scope of work and indicate general arrangement and approximate location of apparatus and fixtures, and indicate the general location and route to be followed by pipes and ducts. Where required installations are not shown on plans or are only shown diagrammatically, install in such a way as to conserve headroom and interfere as little as possible with free use or space through which they pass, while there adequate space is allowed for service, maintenance, repair, or replacement for all equipment.

1.4 SITE EXAMINATION

.1 Visit site to determine existing conditions and requirements for protection of adjacent work and accept site and existing work as it exists at time of commencement of work. Verify all dimensions at the site.

1.5 SHOP DRAWINGS AND SUBMITTALS

.1 After award of contract provide and submit shop drawings at least 15 working days before the reviewed submission will be needed. Clearly identify with references to recognized design standards used, and indicate layouts, quantity, details of equipment, control wiring diagrams, sizes, capacities and roughing in and exact requirements for concrete pits, bases and other supporting members. Until the submission is reviewed the work involving relevant products must not proceed.

.2 Each shop drawing must be certified by manufacturer and as such shall indicate that all product engineering has been performed to ensure the product will meet the requirements of the intended installation.

.3 Specified products, and/or products listed as equivalent or alternate will not be accepted by the Contract Administrator unless the shop drawings are accompanied by this list.

.4 Guarantee of delivery, when required, is not conditional on approval of shop drawings unless they are submitted within one month after Contract award.

.5 All work and equipment shown on shop drawings is taken as part of mechanical section unless specifically excluded.

.6 Secure and verify all field dimensions and where fabrication must proceed before these are available, ensure that field dimensions are followed to suit.

.7 Each shop drawing shall include name of job, mechanical subcontractor, equipment supplier and specification clause under which equipment is specified.

.8 Checking of shop drawings by the Contract Administrator does not constitute acceptance of responsibility. Such checking constitutes assistance only to the Mechanical Division in the proper execution of their work.

.9 Prior to submittal of shop drawings the Contractor shall check and verify that all details have been included and then indicate so by signing each drawing to this effect.

.10 Submittal requirements: **One copy only** of each shop drawing shall be submitted to the Contract Administrator by fax, as a pdf document by email attachment, or delivered as a hard copy. This copy shall bear all the required marks of certification and approval by the manufacturer and contractor(s) as indicated above. The Contract Administrator will review and mark up one copy of the shop drawing, and return to the contractor by fax or email attachment. The contractor shall then make copies as required for ordering and documentation purposes. Multiple copies of shop drawings will not be returned.

NOTE:. ANY SHOP DRAWINGS SUBMITTED THAT DO NOT MEET THE ABOVE REQUIREMENTS WILL BE RETURNED WITHOUT APPROVAL FOR COMPLIANCE AND SHALL BE RESUBMITTED.

1.6 PERMITS, INSPECTION AND TESTING

.1 File all necessary notices and approved layouts, obtain and pay for all Local Authority and Fire Underwriters Inspections, approvals and permits applicable to each Mechanical Section. Make changes required to secure Local Authorities approval, without extra cost. Where conflicting requirements occur, comply with most stringent regulation. Note that requirements shown or specified may exceed minimum standards set by Local Authorities.

.2 The Regulations of the A.S.M.E. Code and the Provincial Labour Department shall cover the design, manufacture, installation, welding and tests of piping and other equipment as specified hereafter.

.3 Obtain Registration Certificates for all pressure vessels, with suitable metal-framed glass covers installed where directed. Furnish all certificates required by Local Authorities before acceptance of building by Contract Administrator.

.4 The Contract Administrator may request Mechanical Section to operate device or material installed for such time as Contract Administrator may require, as a thorough test, before final acceptance. Such tests shall not be construed as evidence of acceptance, and no claim for cost of such operation for test, or damage due to inadequacy or defect will be recognized.

.5 Note that site reviews by the Contract Administrator are for the purpose of determining in general if the work is proceeding in accordance with the Contract Documents, and to endeavour to guard the Contract Administrator against defects and deficiencies and not to superintend the execution of the work, which is the Contractor's and their Subcontractors' responsibility.

1.7 DELIVERY AND STORAGE

.1 Check and do not deliver finished equipment to job until weatherproof dry storage is available.

.2 Continuously check and expedite delivery of equipment and materials. If necessary, inspect at the source of manufacture.

.3 Ensure that materials and equipment are delivered to the site at the proper time and in such assemblies and sizes so as to enter into the building and to be moved into the spaces where they are to be located without difficulty. Perform any cutting and patching involved in getting assemblies into place.

.4 Continuously check and expedite the flow of necessary information to and from all parties involved.

.5 Immediately inform the Contract Administrator of any difficulties in delivery of equipment or if any information is required.

1.8 SPECIAL PROTECTION

.1 Protect all finished and unfinished work from soiling or damage, cover floors with tarpaulins or plywood as necessary, and repair any damage resulting from work of Mechanical Section.

.2 Protect finished surfaces to remain exposed, by paper, polyethylene or other satisfactory removable protective covering using paste acceptable to fixture manufacturer to prevent possible damage to finishes, until all reason for construction damage has passed and until acceptance by Contract Administrator, and make good any such damage.

.3 Cover open ends of pipes, fixtures, ductwork, etc. to prevent entry of building rubbish.

1.9 SPECIAL CLEANING

.1 Maintain tidiness within work of Mechanical Sections and at completion remove protective paper, labels, etc. and tools and waste materials. Leave clean and in perfect operating condition.

.2 At the end of construction all systems shall be left ready for operation.

.3 Operate, drain and flush out bearings and refill with new charge of lubricant, before final acceptance.

.4 Thoroughly clean piping, ducts and equipment of dirt, cuttings and other foreign substances within the scope of work area. Disconnect, clean and reconnect whenever necessary for purpose of locating and removing obstructions. Repair work damaged in course of removing obstructions.

.5 Clean exposed surfaces of mechanical equipment, ductwork, piping, etc., and polish plated work.

.6 Protect bearings and shafts during installation. Grease shafts and sheaves to prevent corrosion. Supply and install extended nipples to outside of bearing enclosures for lubrication purposes.

.7 Remove tools, surplus, and waste material from the building site upon completion of work. Clean grease, dirt, and excess material from walls, floors, ceilings, surfaces, and fixtures for which this Contractor was responsible, and leave the premises suitable for immediate use.

.8 This Section shall be responsible for repair work as may be necessary to remove dents and touch-up of factory finishes.

1.10 MAINTENANCE AND OPERATING INSTRUCTIONS

.1 Obtain from each Mechanical Section one month before take-over date three sets of all brochures or literature supplied by manufacturers of each piece of equipment for inclusion in Maintenance and Operating Manuals.

.2 Each manual shall be a 8 ½" x 11" capacity heavy-duty catalogue binder indexed and containing at a minimum the following sections:

.1 Tab 1.0 "Title Page"

.1 Job name

.2 Mechanical Contract Administrator: name, address and telephone number
.3 Electrical Contract Administrator: name, address and telephone number
.4 Plumbing Contractor: name, address and telephone number
.5 Control Contractor: name, address and telephone number
.6 Balancing Agency: name, address and telephone number

.2 Tab 1.5 “Maintenance and Lubrication Division”
.1 Provide a preventive maintenance schedule for each of the major components to include monthly, semi-annual, and yearly checks and tasks. Include this information as a separate preventative maintenance schedule. Copies of manufacturer’s shop drawings will not be accepted as the required preventative maintenance schedule. Provide lubrication information and instructions that will explain the varied bearings and lubrication procedures.

.3 Tab 1.6 “List of Equipment Suppliers and Contractors”
.1 Provide a complete list of equipment suppliers and contractors, including address and telephone number, separate from that which is indicated in ‘Tab 1.2”.

.4 Tab 2.0, 2.1 etc. “Certification”
.1 Include copy of test data, equipment alignment certificates, copy of balancing data for air and water systems, copy of valve tag identification and pipe colour code, inspection approval certificates for plumbing system, hydronic heating and ventilation systems and operation tests on gas fired equipment.
.2 The building contractor is responsible for supplying all of the above material to the commissioning agency.

.5 Tab 3.0, 3.1 etc. “Manufacturer’s Shop Drawings and Maintenance Bulletins”
.1 Include materials as received in compliance with clause “Shop Drawings”. Material to be provided by building contractor and is to contain only installed equipment.

.6 The divider tabs shall be laminated mylar plastic.

.3 Provide two manuals complete for system description two weeks prior to turn over seminar. These are for Contract Administrator’s and Contract Administrator’s review.

.4 Upon completion of performance tests and debugging, provide system description and correct differences in manuals noted by Contract Administrator and Contract Administrator.

1.11 TRAINING

.1 Instruct Contract Administrator's designated employees in proper care, operation, use and maintenance of all systems and equipment, and provide general explanatory literature required and start up supervision and instructions.

.2 Training must be arranged with the Contract Administrator, and may not be arranged directly with pool staff.

.3 Contractor will provide a minimum of 8 hours of training.

.4 If in Contract Administrator’s opinion, this is not done satisfactorily, Contract Administrator may direct such instruction, and charge all costs involved to relevant section.

1.12 GUARANTEES

.1 Provide written guarantee that complete installation including materials, work and operation of all equipment provide under Mechanical Sections are first class in every respect, subject only to improper usage by Contract Administrator, and make

good forthwith when reported all defects which develop within one year from date of acceptance of building by Contract Administrator at no additional cost to the Contract Administrator.

.2 In addition, guarantee heating and cooling systems through one complete heating or cooling season, as applicable.

.3 Deliver to the Contract Administrator all equipment manufacturer's guarantees specified in excess of one year.

1.13 FABRICATION AND WORKMANSHIP

.1 Employ skilled mechanics in their respective trades, under competent supervision, and where required by Provincial or Local regulations holder of acceptable qualification certificates.

1.14 INSTALLATION AND ERECTION

.1 Mechanical drawings do not show all the architectural, structural and electrical features. Check by site measurement.

.2 Drawings show general location and route to be followed by pipes, ducts, etc. Make necessary changes or additions to runs to accommodate structural conditions as built. Location of pipes and other equipment shall be altered without charge, provided change is made before installation. This does not necessitate a change in quantity of materials.

.3 Where required pipes and ducts are not shown, or are shown diagrammatically, install to conserve headroom with minimum interference to free use of space through which they pass.

.4 Assume full responsibility for layout of own work and for any damage caused to property of others through improper location or poor workmanship.

.5 Check levels shown before commencement to ensure adequate falls for sewers and pipes and report discrepancies immediately. Failure to so check and report does not relieve this section from responsibility for consequent extra expenditures.

.6 Before installation of fixtures, fittings and equipment which may interfere with interior treatment and use of building, confer with the Contract Administrator and obtain detail drawings or instructions for each location.

.7 As work progresses and before installing piping, ductwork, fixtures or equipment interfering with interior treatment and use of building, contact Contract Administrator for comment. If the Contractor fails to perform above checking and fails to inform Contract Administrator of such interference, the Contractor to bear all subsequent expense to make good the installation.

.8 Install piping, ductwork, etc., generally in the locations and routes shown on the drawings, close to the building structure to minimize furring and interference with other services or free space.

.9 Where work is to be concealed, install close to structure, so that furred spaces are minimum.

.10 Where space is indicated as reserve for future equipment, leave clear and install piping and other work so that connections can be made to future equipment.

.11 Become familiar with work required of other sections, and the progress schedule. Co-operate with others whose work adjoins, to minimize delays and avoid confliction.

.12 Excavate as required to accommodate mechanical work and remove surplus excavated material from site. Backfill with approved granular fill as required over all service lines, thoroughly compact to 300 mm (12") below finished grade, and fill to line with adjoining levels to match.

.13 Secure approval where necessary to cut holes in either finished or unfinished work, employ section whose work is involved, cut openings no larger than necessary and without damage to adjoining work and carefully repair all damage to match adjacent work. Note the Mechanical Division is responsible for all required cutting and patching relating to this Contract, except as specifically noted otherwise.

.14 Provide and set bolts, templates, sleeves and fixing materials for fixing work under this section securely to work provided under other sections, in advance of other work, where required.

.15 All serviceable items, such as valves, controls, bearings, filters and similar items, must be installed is such a manner as to be accessible for service, maintenance, repair and replacement without the removal of other material or equipment, and without the need for specialized equipment such as lifts, harnesses, or other safety items. All work to be installed to allow easy equipment isolation and servicing functions while all surrounding systems continue to operate.

.16 Spaces reserved for equipment noted as future or allowances made for future extension to buildings, to be left clear so that future connections can be made. Provide adequate clear space for Contract Administrator supplied equipment and connections for such equipment. Provide detailed layouts for checking and approval by Contract Administrator before commencing work.

.17 Locate all openings in walls, partitions, beams, etc. required for installation of ducts, pipes and equipment, etc. specified in this section of the specifications and frame all openings as required.

1.15 MATERIALS

.1 As specified under respective sections.

.2 Materials of same general type shall be of same manufacturer, i.e., centrifugal fans, in-line fans, condensate pumps, heating coils, etc.

.3 Submit copies of orders for all materials and equipment as evidence of purchase within 30 days of contract award.

1.16 ELECTRICAL REQUIREMENTS

.1 Motors and electrical equipment supplied under Mechanical Division shall comply with Electrical Section and electrical characteristics scheduled or shown.

.2 See "Installation and Wiring Controls" in Electrical Section for equipment supplied under Electrical Section.

.3 The Electrical section shall provide starters for all motors and wire from starters to motors, unless otherwise indicated.

.4 The Electrical section shall wire between starters and switching components such as relays, float switches, and pressure switches.

.5 Supply to Electrical Section within four (4) weeks after contract award, fully detailed diagrams of power and control wiring required for equipment supplied by Division 15.

.6 Motors shall be squirrel cage induction type 1800 RPM unless otherwise noted. Where dampness occurs, all motors and electrical apparatus such as float switches, etc. supplied integrally with any piece of apparatus, shall be totally enclosed.

.7 All motors 1 hp and larger shall be high efficiency as defined in CSA C390.

1.17 AS-BUILT DRAWINGS

.1 Refer to Division 1 – Contract Close-out for Project Record Documents submission.

.2 An extra set of clean prints will be issued to each Mechanical Section by the General Contractor. Mark up as job progresses, and provide to Contract Administrator one full-size set of “As-built” prints as a complete and accurate record "As-Built" of all mechanical work. Drawings should be signed and dated by the contractor. As-built drawings shall be complete with invert elevations for all new underground services.

1.18 SUPPORTS, BASES AND PITS

.1 Supply and erect all special structural work required for installation of tanks, pumps, motors and other apparatus and supply and install all anchor bolts and fasteners for building in and instruct and direct exact sized and locations for bases required. Each Mechanical Section shall provide and install 50 mm (2") thick machinery vibration isolation pads wherever required, whether particularly shown or not. Unless otherwise indicated on drawings, mount all major pieces of equipment such as pumps, fans, etc. on 100 mm (4") high concrete pads, generally in accordance with standard details and to suit.

1.19 ACCESS PANELS

.1 Provide in ample time for installation under relevant sections all necessary access panels in walls and ceilings to allow access to dampers, valves, etc., size 300 mm x 300 mm (12" x 12") min. or as required for proper maintenance with steel panel and frame, similar to Acudor, type to suit application. Instruct relevant section for proper location of access panels. Final locations subject to Contract Administrator's approval. ULC approved access panels must be provided where access is through or into a fire partition or assembly.

1.20 TEMPORARY WORK

.1 Supply office, workshop, tools and materials storage as required for work under Mechanical Sections conforming in appearance to Contractor's temporary buildings and be responsible for any loss or damage thereto.

1.21 ALTERATION WORK

.1 Where work is to be done in existing buildings, accurately survey, provide for avoidance of damage and interference to existing work and rectify any such damage due to work under Mechanical Sections. Accept existing work as it exists at time of Bidding.

.2 Carefully dismantle existing mechanical equipment to be removed or relocated. Temporarily disconnect, remove, and reinstall existing equipment, piping, ductwork, conduit, light fixtures, and similar items, which interfere with the new installation after completion of new work. Store equipment and materials on the premises as directed by the Contract Administrator.

.3 All usable salvaged equipment and materials shall remain the property of the Contract Administrator unless specifically noted otherwise. Such material shall be removed from the building and be safely and neatly stored on the site for removal by the Contract Administrator. The Contractor shall remove all rejected salvage from the site and legally dispose of it off site.

.4 Reuse existing equipment in new work after first repairing and reconditioning any defective items where noted. Safely cap and seal disconnected mechanical services within finished surfaces.

.5 The abandonment of existing equipment and material in place is not acceptable. All redundant services are to be removed back to active mains, which shall then be capped at existing point of connection.

.6 All mechanical equipment conflicting with new equipment being installed shall be moved or disconnected, without damage, by Contractor and shall remain property of the Contract Administrator. Remove ducts and piping not required in revised systems and interfering with new installation. This material shall become property of Contractor.

.7 Disconnect existing equipment indicated, intended to be reused, rough-in in new position, and after replacement connect up ready for use.

.8 Removal and relocation of mechanical equipment by relevant Mechanical Sections.

1.22 WORK FOR OTHER TRADES

.1 The Contractor shall rough-in for and/or connect up all equipment requiring mechanical services, as shown on drawings or mentioned elsewhere in the specifications.

.2 Supply other trades with all necessary details, rough-in drawings, wiring diagrams, etc. as required.

1.23 ABBREVIATIONS

A.S.H.R.A.E.	-	American Society of Heating, Refrigerating and Air Conditioning Engineers Inc.
A.S.A.	-	American Standards Association
A.S.M.E.	-	American Society of Mechanical Engineers
A.S.T.M.	-	American Society for Testing Materials
A.W.W.A.	-	American Water Works Association
C.E.M.A.	-	Canadian Electrical Manufacturer's Association
C.F.M.	-	Cubic Feet per Minute
C.F.U.A.	-	Canadian Fire Underwriters Association
C.I.	-	Cast Iron
C.O.	-	Clean Out
C.P.	-	Chromium Plated
C.S.A.	-	Canadian Standards Association
D.B.I.U.	-	Dominion Board of Insurance Underwriters
F.P.M.	-	Feet per Minute
G.P.H.	-	Gallons per Hour
G.P.M.	-	Gallons per Minute
H.P.	-	High Pressure or Horsepower
N.B.F.U.	-	National Board of Fire Underwriters
N.F.P.A.	-	National Fire Prevention Association
O.S. & Y.	-	Outside Screw and Yoke
P.S.I.	-	Pounds per Square Inch
P.S.I.G.	-	Pounds per Square Inch Gauge
R.P.M.	-	Revolutions per Minute
S.P.	-	Static Pressure
U.S.	-	United States (usually combined with other abbreviations)

Other abbreviations will be interpreted as referred to in the American Society of Heating, Refrigerating and Air Conditioning (A.S.H.R.A.E.) Handbook, current edition.