



**MECHANICAL GENERAL REQUIREMENTS**  
**20 01 01**

1. GENERAL REQUIREMENTS
  - 1.1. EXAMINATION
    - 1.1.1. EXAMINE ANY EXISTING BUILDINGS, LOCAL CONDITIONS, BUILDING SITE, SPECIFICATIONS, AND DRAWINGS AND REPORT ANY CONDITION, DEFECT OR INTERFERENCE THAT WOULD PREVENT EXECUTION OF THE WORK.
    - 1.1.2. NO ALLOWANCE WILL BE MADE FOR ANY EXPENSE INCURRED THROUGH FAILURE TO MAKE THESE EXAMINATIONS OF THE SITE AND THE DOCUMENTS PRIOR TO TENDER OR ON ACCOUNT OF ANY CONDITIONS ON SITE OR ANY GROWTH OR ITEM EXISTING THERE WHICH WAS VISIBLE OR KNOWN TO EXIST AT TIME OF TENDER.
    - 1.1.3. EXAMINE WORK OF OTHER DIVISIONS BEFORE COMMENCING THIS WORK, AND REPORT ANY DEFECT OR INTERFERENCE.
  - 1.2. STANDARD OF MATERIAL AND EQUIPMENT
    - 1.2.1. MATERIALS AND EQUIPMENT:
      - 1.2.1.A. OF CANADIAN MANUFACTURE WHERE OBTAINABLE.
      - 1.2.1.B. STANDARD PRODUCTS OF APPROVED MANUFACTURE.
      - 1.2.1.C. LABELLED OR LISTED AS REQUIRED BY CODE AND/OR INSPECTION AUTHORITIES.
      - 1.2.1.D. IN COMPLIANCE WITH STANDARDS AND REGULATIONS WITH RESPECT TO:
        - 1.2.1.D.A. DESIGN,
        - 1.2.1.D.B. PERFORMANCE CHARACTERISTICS, AND
        - 1.2.1.D.C. METHODS OF CONSTRUCTION AND INSTALLATION.
      - 1.2.1.E. IDENTICAL UNITS OF EQUIPMENT TO BE OF SAME MANUFACTURE.
      - 1.2.1.F. IDENTICAL COMPONENT PARTS OF SAME MANUFACTURE IN SIMILAR UNITS OF EQUIPMENT, BUT VARIOUS COMPONENT PARTS OF EACH UNIT NEED NOT BE FROM ONE MANUFACTURER.
    - 1.2.2. MATERIALS AND EQUIPMENT ARE DESCRIBED TO ESTABLISH STANDARDS OF CONSTRUCTION AND WORKMANSHIP:
      - 1.2.2.A. WHERE MANUFACTURERS OR MANUFACTURERS PRODUCTS ARE IDENTIFIED IN LISTS WITH THE PHRASE "STANDARD OF ACCEPTANCE", THESE ARE MANUFACTURERS AND/OR PRODUCTS WHICH MEET REQUIRED STANDARDS WITH REGARD TO PERFORMANCE, QUALITY OF MATERIAL AND WORKMANSHIP.
      - 1.2.2.B. MANUFACTURERS AND OR PRODUCTS USED ARE TO BE CHOSEN FROM THESE LISTS.
      - 1.2.2.C. SELECT MATERIALS AND EQUIPMENT IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
      - 1.2.2.D. MATERIALS AND EQUIPMENT NOT SATISFYING THESE SELECTION CRITERIA WILL BE CONSIDERED UNSUITABLE.
      - 1.2.2.E. REMOVE CONDENSED MATERIALS FROM JOB SITE AND PROVIDE PROPERLY SELECTED AND APPROVED MATERIALS.
  2. SUBMITTALS
    - 2.1. SHOP DRAWINGS AND PRODUCT DATA SHEETS
      - 2.1.1. SUBMIT SHOP DRAWINGS IN THE SAME UNIT OF MEASURE AS ARE USED ON THE DRAWINGS. BOTH METRIC AND IMPERIAL MEASURES MAY BE INCLUDED.
      - 2.1.2. SUBMIT SHOP DRAWINGS BY EMAIL TO: SHOPDRAWINGS@HHANGUS.COM
      - 2.2. INCLUDE A H.H. ANGUS SHOP DRAWING COVER SHEET FOR EACH ITEM ON THIS PROJECT AS A SEPARATE PDF.
      - 2.3. SUBMIT SHOP DRAWINGS IN PDF FORMAT:
        - 2.3.1. IF SUBMITTED IN HARDCOPY FORMAT, SUBMIT IN 8.5 X 11 OR 11 X 17 SIZE, BLACK AND WHITE ORIGINALS OF GRAPHIC QUALITY SUITABLE FOR PHOTOCOPIING. ALLOW ONE ADDITIONAL WEEK FOR PROCESSING OF SHOP DRAWINGS SUBMITTED IN HARDCOPY FORMAT.
        - 2.3.2. SUBMIT SHOP DRAWINGS FOR EACH ITEM OF EQUIPMENT:
          - 2.4.1. PLUMBING FIXTURES,
          - 2.4.2. PUMPS,
          - 2.4.3. AIR-MOVING UNITS,
          - 2.4.4. HEATING UNITS,
          - 2.4.5. COILS,
          - 2.4.6. MOTOR CONTROL CENTRES,
          - 2.4.7. MOTOR STARTERS, AND
          - 2.4.8. SPECIAL SYSTEMS.
    3. REFERENCE CODES, STANDARDS, AND REGULATIONS
      - 3.1. PERMITS, TESTS, AND CERTIFICATES
        - 3.1.1. ARRANGE AND PAY FOR PERMITS, TESTS, AND CERTIFICATES OF INSPECTION REQUIRED BY JURISDICTION.
        - 3.1.2. SUBMIT APPLICATIONS REQUIRING OWNER'S SIGNATURE BEFORE COMMENCING WORK.
        - 3.1.3. OBTAIN AND SUBMIT INSPECTION CERTIFICATES.
        - 3.1.4. CERTIFICATES TO BE RENEWED AS TO REMAIN IN FORCE FOR GUARANTEE PERIOD.
        - 3.1.5. CO-ORDINATE AND PERFORM TESTING REQUIRED BY AUTHORITIES HAVING JURISDICTION IN ACCORDANCE WITH CLAUSE TESTING IN THIS SECTION.
    4. EQUIPMENT
      - 4.1. MANUFACTURERS NAMEPLATES
        - 4.1.1. PROVIDE METAL NAMEPLATE WITH RAISED OR RECESSED LETTERING, MOUNTED ON EACH PIECE OF EQUIPMENT.
      - 4.2. FACTORY APPLIED FINISH PAINTING
        - 4.2.1. APPLY PRIME AND FINAL PAINT COATS TO EQUIPMENT AND MATERIALS WHERE SPECIFICALLY DETAILED IN SECTIONS OF THESE DIVISIONS.
      - 4.3. FACTORY APPLIED PRIME PAINTING
        - 4.3.1. HAVE PRIME PAINT FACTORY-APPLIED TO OTHER EQUIPMENT FABRICATED FROM IRON OR STEEL INCLUDING ACCESS DOORS, REGISTERS, GRILLES, DIFFUSERS, DAMPERS, METAL RADIATION ENCLOSURES AND FIRE HOSE CABINETS.
      - 4.4. FIELD PAINTING
        - 4.4.1. AFTER EQUIPMENT HAS BEEN INSTALLED AND PIPING AND INSTALLATION IS COMPLETED, CLEAN RUST AND OIL FROM EXPOSED IRON AND STEEL WORK PROVIDED UNDER THIS DIVISION, WHETHER OR NOT IT HAS BEEN FACTORY PRIME PAINTED.
    5. OFFICE, STORAGE AND TOOLS
      - 5.1. OFFICE AND STORAGE
        - 5.1.1. PROVIDE TEMPORARY OFFICE, WORKSHOP AND TOOLS AND MATERIAL STORAGE SPACE.
        - 5.1.2. ASSUME RESPONSIBILITY FOR SECURITY OF THESE FACILITIES AND PROVIDE HEAT, LIGHT AND TELEPHONE.
      - 5.2. APPLIANCES AND TOOLS
        - 5.2.1. PROVIDE TOOLS, EQUIPMENT, SCAFFOLDING, EXTENSION CORDS, LAMPS AND MISCELLANEOUS CONSUMABLE MATERIALS REQUIRED TO CARRY OUT WORK.
    6. CO-ORDINATION
      - 6.1. GENERAL
        - 6.1.1. CONSULTANT DRAWINGS ARE DIAGRAMMATIC AND ILLUSTRATE THE GENERAL LOCATION OF EQUIPMENT, AND INTENDED ROUTING OF DUCTWORK, PIPING, ETC. AND DO NOT SHOW EVERY STRUCTURAL DETAIL. IN CONGESTED AREAS DRAWINGS AT GREATER SCALE MAY BE PROVIDED TO IMPROVE INTERPRETATION OF THE WORK, WHERE THEY ARE DONE SO EITHER TO IMPROVE "DOUBLE LINE" EQUIPMENT OR SYSTEMS ARE SHOWN AS UNDERSTANDING OF THE WORK, OR SIMPLY AS A RESULT OF THE USE OF A CAD DRAWING TOOL, AND IN EITHER CASE SUCH DRAWINGS ARE NOT REPRESENTED AS FABRICATION OR INSTALLATION DRAWINGS.
        - 6.1.2. LOCATION OF PIPES, DUCTWORK, RACEWAYS AND EQUIPMENT MAY BE ALTERED WITHOUT EXTRA COST PROVIDED INSTRUCTION IS GIVEN OR APPROVAL IS OBTAINED, IN ADVANCE OF INSTALLATION OF ITEMS INVOLVED. CHANGES WILL BE AUTHORIZED BY SITE INSTRUCTIONS AND ARE TO BE SHOWN ON RECORD DRAWINGS.
        - 6.1.3. LOCATION OF FLOOR DRAINS, HUB DRAINS, COMBINATION DRAINS, PLUMBING FIXTURES, CONNECTORS, UNIT HEATERS, DIFFUSER, REGISTERS GRILLES AND OTHER SIMILAR ITEMS MAY BE ALTERED WITHOUT EXTRA COST PROVIDED INSTRUCTION IS GIVEN PRIOR TO ROUGHING IN. NO CLAIM WILL BE PAID FOR EXTRA LABOUR AND MATERIALS FOR RELOCATING ITEMS UP TO 3 M (10 FT) FROM ORIGINAL LOCATION NOR WILL CREDITS BE ANTICIPATED WHERE RELOCATION UP TO 3 M (10 FT) REDUCES MATERIAL AND LABOUR.
      - 6.2. REQUEST FOR INTERPRETATION PROCEDURES
        - 6.2.1. CONTRACTOR MAY SUBMIT WRITTEN REQUESTS FOR INTERPRETATION OF THE CONTRACT DOCUMENTS (RFI) TO REQUEST CLARIFICATION OF DESIGN INTENT OR DESIGN REQUIREMENTS.
        - 6.2.2. CONSULTANT SHALL REVIEW EACH RFI AND PROVIDE A WRITTEN RESPONSE TO THE CONTRACTOR.
        - 6.2.3. IF CONSULTANT DETERMINES THAT THE RESPONSE WILL REQUIRE A CHANGE TO THE WORK, THE CONSULTANT SHALL INDICATE THIS AND ISSUE SEPARATELY A CHANGE INSTRUCTION IN ACCORDANCE WITH SPECIFICATION SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURE.
        - 6.2.4. WHERE CONTRACTOR BELIEVES THE RESPONSE RESULTS IN A CHANGE TO THE WORK, CONTRACTOR SHALL NOTIFY CONSULTANT IN WRITING TO REQUEST A

- CHANGE INSTRUCTION, UPON WHICH TIME CONSULTANT SHALL REVIEW THE REQUEST AND DETERMINE IF A CHANGE TO THE WORK IS WARRANTED.
- 6.2.5. ALLOW [10] WORKING DAYS FOR CONSULTANT'S REVIEW OF EACH RFI. ALLOW ADDITIONAL [5] WORKING DAYS WHERE SUB-CONSULTANT REVIEW IS REQUIRED.
- 6.3. REQUEST FOR INTERPRETATION SUBMITTAL
  - 6.3.1. RFI SUBMITTALS SHALL INCLUDE
    - 6.3.1.A. PROJECT TITLE AND NUMBER,
    - 6.3.1.B. CONTRACTOR'S NAME AND ADDRESS,
    - 6.3.1.C. APPLICABLE DRAWING OR SPECIFICATION REFERENCE,
    - 6.3.1.D. APPLICABLE TRADE SUB-CONTRACTOR RAISING THE QUERY,
    - 6.3.1.E. DETAILED DESCRIPTION OF THE QUERY,
    - 6.3.1.F. PROPOSED RESOLUTION OF THE QUERY.
    - 6.3.1.G. AS THE PROPOSED RESOLUTION PROVIDES ADDITIONAL INFORMATION FOR CONSULTANT TO UNDERSTAND THE CONTRACTOR'S QUERY, RFI'S SUBMITTED WITHOUT A PROPOSED RESOLUTION MAY BE RETURNED BY CONSULTANT WITHOUT REVIEW OR MAY REQUIRE ADDITIONAL TIME FOR CONSULTANT TO PROVIDE A RESPONSE, DEPENDING ON THE CLARITY OF CONTRACTOR'S INFORMATION PROVIDED IN THE RFI.
    - 6.3.1.H. REQUEST FOR INTERPRETATION - EXCESSIVE QUERIES
      - 6.4.1. WHERE, IN CONSULTANT'S OPINION, THE QUANTUM OF RFI'S IS EXCESSIVE AND/OR THE NATURE OF THE QUERIES INDICATES THAT CONTRACTOR OR THEIR SUBCONTRACTOR MAY HAVE FAILED TO USE COMPETENT STAFF WITH SUFFICIENT KNOWLEDGE AND/OR EXPERIENCE TO FULLY UNDERSTAND THE CONTRACT DOCUMENTS AND SCOPE OF WORK, THEN CONSULTANT MAY REVIEW THE SITUATION WITH OWNER. OWNER MAY TAKE ACTIONS PERMITTED UNDER THE CONSTRUCTION CONTRACT CONCERNING CONTRACTOR'S AND SUBCONTRACTORS QUALIFICATIONS OF THEIR COMPETENT REPRESENTATION.
7. PROTECTION OF WORK AND PROPERTY
  - 7.1. GENERAL
    - 7.1.1. PROTECT THIS WORK AND WORK OF OTHER TRADES FROM DAMAGE.
    - 7.1.2. COVER FLOORS WITH TARPULINS AND PROVIDE PLYWOOD AND OTHER TEMPORARY PROTECTION.
    - 7.1.3. ASSUME RESPONSIBILITY FOR REPAIRING DAMAGE TO FLOOR AND WALL SURFACES RESULTING FROM FAILURE TO PROVIDE ADEQUATE PROTECTION.
    - 7.1.4. PROTECT EQUIPMENT, PIPE AND DUCT OPENINGS FROM DIRT, DUST AND OTHER FOREIGN MATERIALS.
8. WORK IN EXISTING BUILDING
  - 8.1. GENERAL
    - 8.1.1. WORK INCLUDES CHANGES TO EXISTING BUILDING.
    - 8.1.2. ROUTE PIPES, DUCTS, CONDUITS AND OTHER SERVICES TO AVOID INTERFERENCE WITH EXISTING INSTALLATION.
    - 8.1.3. RELOCATE EXISTING PIPES, DUCTS, CONDUITS, BUS DUCTS AND ANY OTHER EQUIPMENT OR SERVICES REQUIRED FOR PROPER INSTALLATION OF NEW WORK, INCLUDING AS REQUIRED FOR TEMPORARY REMOVAL AND RE-INSTALLATION TO SUIT NEW INSTALLATION WORK.
    - 8.1.4. REMOVE EXISTING PLUMBING FIXTURES, LIGHTING FIXTURES, PIPING, DUCTWORK, WIRING, AND EQUIPMENT TO SUIT NEW CONSTRUCTION, CUT BACK AND CAP DRAIN, VENT AND WATER OUTLETS, CONDUITS AND ELECTRICAL OUTLETS, NOT BE USED.
    - 8.1.5. PLUMBING FIXTURES, PIPING, DUCTWORK, CONDUIT AND WIRING SHOWN TO BE REMOVED AND NOT SHOWN RELOCATED, TO BECOME PROPERTY OF CONTRACTOR AND TO BE TAKEN FROM SITE.
    - 8.1.6. LIGHTING FIXTURES SHOWN TO BE REMOVED WILL REMAIN OWNER'S PROPERTY AND WILL BE TURNED OVER TO OWNER'S REPRESENTATIVE AS DIRECTED.
    - 8.1.7. WHERE OWNER WISHES TO TAKE OVER RENOVATED AREAS AHEAD OF PROJECT COMPLETION DATE AND THESE AREAS ARE TO BE FED FROM NEW DISTRIBUTION SYSTEMS, MAKE TEMPORARY CONNECTIONS TO EXISTING SERVICES IN THESE AREAS, RECONNECT TO PERMANENT SERVICES, AT LATER DATE, WHEN NEW DISTRIBUTION SYSTEMS ARE AVAILABLE.
    - 8.1.8. CONTRACTOR TO PREPARE AND PROVIDE DOMESTIC WATER PRESSURE TEST ON INCOMING SERVICE TO THE TENANT SPACE.
9. RECORD DRAWINGS
  - 9.1. SITE RECORDS
    - 9.1.1. A SET OF DESIGN DRAWINGS IN AUTOCAD 2008 ON CD OR DVD ROM WILL BE PROVIDED BY THE CONSULTANT. MAKE SETS P.
    - 9.1.2. OF WHITE PRINTS FOR EACH PHASE OF WORK, AND AS WORK PROGRESSES AND CHANGES OCCUR MARK WHITE PRINTS IN COLOURED INKS TO SHOW REVISIONS. DISCARD AND DESTROY ALL WHITE PRINTS, DUCTS, CONDUITS, MANHOLES, FOUNDATIONS AND SIMILAR BURIED ITEMS WITHIN THE BUILDING, WITH RESPECT TO BUILDING COLUMN CENTRES. MARK LEVEL WITH RESPECT TO AN ELEVATION WHICH WILL BE PROVIDED.
    - 9.1.3. RETAIN THESE DRAWINGS AND MAKE AVAILABLE TO CONSULTANT FOR PERIODIC REVIEW.
  - 9.2. AS-BUILT DRAWINGS
    - 9.2.1. PRIOR TO TESTING, BALANCING AND ADJUSTING, TRANSFER SITE RECORD DRAWING INFORMATION TO AUTOCAD 2008 (CAD) FILES. TO RECORD FINAL AS-BUILT CONDITION, OBTAIN A CURRENT SET OF CAD FILES FROM THE CONSULTANT.
    - 9.2.1.A. DRAWINGS ARE TO REMAIN SET TO AND FOLLOW CONSULTANTS AUTOCAD STANDARDS. DO NOT ALTER DRAWING SCALES, X-REFS, COLOURS, LAYERS OR TEXT STYLES.
    - 9.2.1.B. THE CONSULTANT'S CAD FILES MAY NOT REFLECT ALL OR ANY CONSTRUCTION CHANGES.
    - 9.2.2. WHERE CHANGES HAVE BEEN DETECTED, MOVED, RENUMBERED OR OTHERWISE CHANGED FROM CONTRACT DRAWINGS, THESE REVISIONS, AND PLACE THESE ANNOTATIONS "BUBBLE" REVISE THE CAD FILES TO RECORD THESE CHANGES. ON A SEPARATE, AND EASILY IDENTIFIED DRAWING LAYER.
  - 9.2.3. SHOW ON MECHANICAL AS-BUILT DRAWINGS FINAL LOCATION OF PIPING, DUCTWORK, SWITCHES, STARTERS, MOTOR CONTROL CENTRES, THERMOSTATS, AND EQUIPMENT.
  - 9.2.4. SHOW ON SITE SERVICES AS-BUILT DRAWINGS SURVEY INFORMATION PROVIDED BY CONTRACTOR AND SURVEYOR (OLS) MONITORING SERVICES INSTALLATION.
  - 9.2.5. SHOW ON ELECTRICAL AS-BUILT DRAWINGS FINAL LOCATION OF CONDUIT, OUTLETS, PANELS, BRANCH WIRING, SYSTEM WIRING, PULL BOXES, BUS DUCTS, AND EQUIPMENT.
  - 9.2.6. IDENTIFY EACH DRAWING IN LOWER RIGHT HAND CORNER IN LETTERS AT LEAST 12 MM (½ IN) HIGH AS FOLLOWS: "AS-BUILT DRAWINGS. THIS DRAWING HAS BEEN REVISED TO SHOW SYSTEMS AS INSTALLED" (SIGNATURE OF CONTRACTOR) (DATE). THE SITE SERVICES DRAWINGS ARE TO INCLUDE (SIGNATURE AND STAMP OF OLS) ATTACHED TO NOTE.
  - 9.2.7. SUBMIT ONE (1) SET OF WHITE PRINTS OF THE DRAFT AS-BUILT CAD FILES FOR CONSULTANTS' REVIEW.
  - 9.2.8. ONCE "AS BUILT DRAWINGS" WHITE PRINTS ARE REVIEWED, TRANSFER CONSULTANTS' COMMENTS TO THE CAD FILES. RETURN AUTOCAD DRAWINGS MODIFIED TO "AS BUILT" CONDITION TO CONSULTANTS ON CD OR DVD ROM.
  - 9.2.9. SUBMIT THREE (3) SETS OF WHITE PRINTS AND THREE (3) COPIES OF CAD FILES WITH OPERATING AND MAINTENANCE MANUALS.
10. OPERATING AND MAINTENANCE INSTRUCTIONS
  - 10.1. START-UP AND TESTING
    - 10.1.1. SUPPLY SERVICES OF SKILLED MECHANIC, TO START SYSTEMS IN PROPER SEQUENCE, AND TEST AND CALIBRATE CONTROLS, PIPES, INSTRUMENTATION AND RELIEF VALVES AND DAMPERS AND TO SET-UP SYSTEMS.
  - 10.2. TRAINING
    - 10.2.1. DURING THIS PROCEDURE THOROUGHLY EXPLAIN OPERATION AND MAINTENANCE OF EACH SYSTEM, INCORPORATING SPECIALIZED INSTRUCTIONS FROM MANUFACTURERS AS DESCRIBED UNDER OTHER SECTIONS IN THESE DIVISIONS.
    - 10.2.2. ARRANGE SUITABLE TIME FOR INSTRUCTIONS WITH OWNER'S OPERATING AND MAINTENANCE PERSONNEL.
  - 10.3. OPERATING AND MAINTENANCE MANUALS
    - 10.3.1. PROVIDE OPERATION AND MAINTENANCE DATA BOUND IN 210 MM X 300 MM X 50MM THICK (8½ IN X 11 IN X 2 IN THICK) SIZE, VINYL COVERED, HARD BACK, THREE-RING COVERS.
      - 10.3.1.A. ORGANIZE MATERIAL IN VOLUMES GENERALLY GROUPED BY TRADE SECTION; SITE SERVICES, PLUMBING, FIRE PROTECTION, HEATING AND COOLING PLANT AND DISTRIBUTION, AIR HANDLING, AND CONTROLS AND INSTRUMENTATION.
      - 10.3.1.B. TITLE SHEET IN EACH VOLUME TO BE LABELED "OPERATING AND MAINTENANCE MANUAL" AND TO BEAR PROJECT NAME, PROJECT NUMBER, DATE, TRADE SECTION, AND LIST OF CONTENTS.
      - 10.3.2. IN ADDITION, PROVIDE Adobe PDF FILES FOR EACH DOCUMENT, PRODUCED FROM ORIGINAL DRAWING TO-DIGITAL FILE CREATIONS.
11. CONSULTANT REVIEWS
  - 11.1. SITE REVIEWS
    - 11.1.1. DEFICIENCY REVIEWS CONDUCTED BY THE CONSULTANT ARE PERFORMED ON A SAMPLING BASIS, AND ANY DEFICIENCY ITEM IS TO BE INTERPRETED AS BEING

- INDICATIVE OF SIMILAR LOCATIONS ELSEWHERE IN THE WORK, UNLESS OTHERWISE SHOWN.
12. CORRECTION AFTER COMPLETION
  - 12.1. GENERAL
    - 12.1.1. SUBMIT SIMILAR GUARANTEE FOR ONE YEAR FROM DATE OF ACCEPTANCE FOR ANY PART OF WORK ACCEPTED BY OWNER, BEFORE COMPLETION OF WHOLE WORK.
  - 12.2. FINAL REVIEW
    - 12.2.1. AT PROJECT COMPLETION, SUBMIT WRITTEN REQUEST FOR FINAL REVIEW OF MECHANICAL AND ELECTRICAL SYSTEMS.
- BASIC MATERIALS AND METHODS**  
**20 05 01**
  1. GENERAL
    - 1.1. SCOPE
      - 1.1.1. ARTICLES THAT ARE OF A GENERAL NATURE, APPLICABLE TO EACH SECTION OF DIVISION 20 AND 26.
    2. ACCESS DOORS
      - 2.1. PROVIDE ACCESS DOORS TO BE INSTALLED AT LOCATIONS WHERE EQUIPMENT REQUIRING INSPECTION, SERVICE, MAINTENANCE OR ADJUSTMENT IS "BUILT-IN" TO WORK OF OTHER TRADES.
    - 2.2. SUBMIT SHOP DRAWINGS SHOWING ACCESS DOOR SIZE, TYPE AND LOCATION.
    - 2.3. CONSTRUCTION:
      - 2.3.1. CONSTRUCTED OF STEEL, PRIME COATED
      - 2.3.2. CONSTRUCTED OF STAINLESS STEEL WITH NEOPRENE GASKETED DOOR IN DAMP AND HIGH-HUMIDITY AREAS
      - 2.3.3. GENERALLY FITTED WITH SCREWDRIVER OPERATED LATCHES, EXCEPT IN AREAS SUBJECT TO SECURITY RISKS (PUBLIC CORRIDORS, PSYCHIATRIC PATIENT AREAS, PUBLIC WASHROOMS). IN THESE AREAS DOORS TO BE FITTED WITH KEYPAD CYLINDER LOCKS WITH SIMILAR KEYS.
  3. SLEEVES
    - 3.1. GENERAL
      - 3.1.1. SLEEVE PIPES, DUCTS AND CONDUITS PASSING THROUGH MASONRY WALLS, CONCRETE FLOORS, AND FIRE RATED GYPSUM BOARD CEILINGS AND PARTITIONS.
      - 3.1.2. MAINTAIN FIRE RATING INTERGHERE WHERE PIPES AND DUCTS PASS THROUGH FIRE RATED WALLS, FLOORS AND PARTITIONS.
    - 3.2. FLOOR AND WALL SLEEVES
      - 3.2.1. SLEEVES IN FIRE SEPARATIONS:
        - 3.2.1.A. SIZED TO SUIT FIRE STOPPING METHODS EMPLOYED FOR BARE PIPES, CONDUITS, INSULATED PIPES, AND BARE AND INSULATED DUCTS WITHOUT FIRE DAMPERS, AND
        - 3.2.1.B. SIZED TO SUIT CONDITIONS OF APPROVAL GIVEN IN MANUFACTURERS INSTALLATION INSTRUCTIONS FOR FIRE AND SMOKE DAMPERS.
      - 3.2.2. SLEEVES IN OTHER CONSTRUCTION:
        - 3.2.2.A. SIZED TO CLEAR INSULATED PIPES AND DUCTS BY 13 MM (2 IN) ALL ROUND, AND
        - 3.2.2.B. SIZED TO CLEAR CONDUITS, BARE PIPES, AND BARE DUCTS BY 6 MM (¾ IN) ALL ROUND.
      - 3.2.3. SLEEVES FOR PIPES, CONDUITS AND DUCTS SMALLER THAN 0.4 MS (4 SQ FT) THROUGH SLOTTED WALLS AND FLOORS:
        - 3.2.3.A. SCHEDULE 40 STEEL PIPE OR 1 MM (20 GA) (MINIMUM) SHEET METAL, LAPPED AND SPOT WELDED.
        - 3.2.3.B. SLEEVES FOR PIPES, CONDUITS AND DUCTS SMALLER THAN 0.4 MS (4 SQ FT) THROUGH GYPSUM BOARD PARTITIONS:
          - 3.1.3.B.A. 1 MM (20 GA) MINIMUM SHEET METAL, LAPPED AND SPOT WELDED WITH 20 MM (¾ IN) LIP FLANGE AT ONE END.
        - 3.2.3.C. SLEEVES FOR DUCTS 0.4 MS (4 SQ FT) AND LARGER THROUGH WALLS AND FLOORS:
          - 3.1.4.A. 1.6 MM (16 GA) MINIMUM SHEET METAL, LAPPED AND SPOT WELDED WITH 20 MM (¾ IN) LIP FLANGE AT ONE END.
    4. FIRE STOPPING AND SMOKE SEALS
      - 4.1. GENERAL
        - 4.1.1. PROVIDE FIRE STOPPING AND SMOKE SEALS WHERE DUCTS, PIPES OR CONDUITS PENETRATE FIRE SEPARATIONS. MATERIALS TO BE SUPPLIED, WORKER TRAINING TO BE ARRANGED, AND INSTALLATION TO BE SUPERVISED, BY A SPECIALIST FIRM WITH AN ESTABLISHED REPUTATION IN THIS FIELD.
      - 4.2. PRODUCTS
        - 4.2.1. MATERIALS TO FORM ULC LISTED OR CUL LISTED/CLASSIFIED ASSEMBLIES.
        - 4.2.2. OTHER MANUFACTURERS HAVING PRODUCTS WITH EXPLICITLY SIMILAR CHARACTERISTICS, LISTINGS OR CLASSIFICATIONS AND APPROVALS ARE ACCEPTABLE.
      - 4.3. INSTALLATION
        - 4.3.1. SEAL SPACE BETWEEN PENETRATING SERVICE AND SLEEVE OR OPENING IN SLAB WITH FIRESTOP AND SMOKE SEALING SYSTEM IN STRICT ACCORDANCE WITH TERMS AND CONDITIONS OF ORIGINAL ULC OR CUL LISTING AND MANUFACTURERS RECOMMENDED PROCEDURES.
        - 4.3.2. CHECK THICKNESS AND ARRANGEMENT OF BACK-UP MATERIALS TO SUIT SIZE OF SERVICE, LENGTH OF SLEEVE, AND ANTICIPATED MOVEMENT.
        - 4.3.3. SELECT FIRESTOPPING SYSTEM TO ALLOW INSULATION AND VAPOUR BARRIER TO PASS UN-BROKEN THROUGH ASSEMBLY.
        - 4.3.4. SURFACES TO BE CLEAN, DRY AND FREE FROM DUST, OIL, GREASE, LOOSE OR FLAKING PAINT AND FOREIGN MATERIALS AT TIME OF APPLICATION OF MATERIALS.
        - 4.3.5. DO NOT APPLY FIRE STOPPING MATERIALS TO FIRE OR SMOKE DAMPERS.
    5. CUTTING AND PATCHING
      - 5.1. FORMING, CUTTING AND PATCHING OF GENERAL TRADES WORK TO ACCOMMODATE WORK OF THIS DIVISION, WILL BE DONE BY GENERAL CONTRACTOR TRADES, AND PAID FOR BY THIS DIVISION.
      - 5.2. EACH TRADE IS RESPONSIBLE FOR PROMPT INSTALLATION OF WORK IN ADVANCE OF CONCRETE POURING, MASONRY, ROOFING, FINISHING TRADES AND SIMILAR WORK.
      - 5.3. SHOULD ANY CUTTING OR REPAIRING OF EITHER UNFINISHED OR FINISHED NEW WORK OF THESE TRADES BE REQUIRED BECAUSE OF FAILURE TO CO-ORDINATE WORK, TRADE RESPONSIBLE FOR THE FAILURE TO EMPLOY AND PAY PARTICULAR TRADE CONTRACTOR WHOSE WORK IS INVOLVED, TO DO CUTTING AND PATCHING.
      - 5.4. REPAIR CUT OR DAMAGED SURFACES WITH MATERIALS AND FINISHES TO MATCH EXISTING.
      - 5.5. NEATLY CUT OR DRILL HOLES IN EXISTING CONSTRUCTION TO ACCOMMODATE PIPING, DUCTWORK OR CONDUITS.
      - 5.6. LAYOUT CUTTING OF STRUCTURAL ELEMENTS, SUCH AS FLOORS SLABS, WALLS, COLUMNS OR BEAMS AND OBTAIN APPROVAL BEFORE STARTING WORK. CONDUCT A ELECTROMAGNETIC SCAN OF REINFORCING RODS, SUCH AS HILTI P5200 FERROSCAN, AND REVIEW WITH STRUCTURAL ENGINEER. BASED ON THESE RESULTS, ARRANGE AND PAY FOR SUPPLEMENTAL X-RAY EXAMINATION TO LOCATE CONCRETE REINFORCEMENT AND EMBEDMENTS. SUBMIT X-RAYS AND OBTAIN APPROVAL BEFORE STARTING WORK.
  - METERS AND GAUGES**  
**20 05 19**
    1. GENERAL
      - 1.1. SCOPE
        - 1.1.1. PROVIDE LIQUID FLOW METERS, AND TEMPERATURE AND PRESSURE MEASURING DEVICES.
      - 1.2. SHOP DRAWINGS / PRODUCT DATA
        - 1.2.1. SUBMIT MANUFACTURER'S CATALOGUE LITERATURE.
      - 1.3. APPLICABLE CODES AND STANDARDS:
        - 1.3.1. ASME B40.200 THERMOMETERS, DIRECT READING AND REMOTE READING
        - 1.3.2. ASME B40.100 PRESSURE GAUGES AND GAUGE ATTACHMENTS
    2. PRODUCTS
      - 2.1. FLOW INDICATORS:
        - 2.1.1. CONSTRUCTION:
          - 2.1.1.A. GIVE VISUAL FLOW INDICATION.
          - 2.1.1.B. EQUIPPED WITH DUAL FLOW SCALE CALIBRATED IN L/S AND USGPM.
      - 2.2. SPRINKLER AND STANDPIPE VALVES
        - 2.2.1. APPROVALS
          - 2.2.1.A. VALVES TO BE ULC AND FM LISTED FOR FIRE PROTECTION.
        - 2.2.2. GATE VALVES UP TO NPS 2, THREADED
          - 2.2.2.A. 1200 KPA (175 PSI) CLASS 150 BRONZE BODY, SOLID WEDGE BRONZE DISC, RISING STEM, OS & Y, SCREW IN YOKE BONNET.
        - 2.2.3. BUTTERFLY VALVES UP TO NPS 2½, THREADED
          - 2.2.3.A. 1200 KPA (175 PSI), BRONZE BODY, STAINLESS STEEL DISC, WITH SHIELD HANDLES
        - 2.2.4. BUTTERFLY VALVES NPS 2½ AND OVER, GROOVED JOINT STYLE
          - 2.2.4.A. 1200 KPA (175 PSI), CAST IRON BODY, EPDM COATED OR BRASS DISC, EPDM SEAT, "OPEN/SHUT" INDICATOR, WITH SUPERVISORY SWITCH
        - 2.2.5. SWING CHECK VALVES NPS 2½ AND OVER, FLANGED
          - 2.2.5.A. 1200 KPA (175 PSI) TO ASTM A216 CLASS B, 175 CWP, CAST IRON BODY WITH FLAT FLANGE LATCHES, REGRIND, RENEW BRONZE DISC AND SEAT RING, BOLTED COVER.

- 2.1.1.C. PROTECTED AGAINST ANOMALOUS BREAKAGE OF THE GLASS INDICATOR.
- 2.1.1.D. IN-LINE TYPE FOR PIPE SIZES UP TO NPS 1½.
- 2.1.1.E. STANDARD OF ACCEPTANCE: ITT BELL & GOSSETT, BAILEY
- 2.2. FLOW MEASUREMENT SYSTEMS (LIQUIDS)
  - 2.2.1. PRIMARY FLOW ELEMENTS:
    - 2.2.1.A. DIFFERENTIAL PRESSURE TYPE, WITH ISOLATING VALVES.
  - 2.2.2. FLOW ELEMENT IN COMBINATION WITH METER:
    - 2.2.2.A. ACCURACY OF ± 1% OF READING OVER MINIMUM OF 10:1 TURNDOWN. REPEATABILITY OF ± 0.1%.
    - 2.2.2.C. COMPLETE WITH 4-20 MA OR DC OUTPUT DIFFERENTIAL PRESSURE (DP) TRANSMITTER WITH THREE VALVE MANIFOLD FOR ISOLATION AND TESTING.
    - 2.2.2.D. EQUIPPED WITH DUAL FLOW SCALE CALIBRATED IN L/S AND USGPM.
    - 2.2.2.E. USED WITH 4-20 MA OR DC OUTPUT DIFFERENTIAL TEMPERATURE TRANSMITTER, WITH TEMPERATURE RTD'S IN THERMOWELLS WITH EXTENSION NECKS, FOR MEASUREMENT OF ENERGY FLOW IN KW AND BTU/HR.
  - 2.3. THERMOMETERS AND PRESSURE GAUGES - SELECTION CRITERIA
    - 2.3.1. GENERAL
      - 2.3.1.A. NORMAL OPERATING RANGE TO BE BETWEEN HALF AND TWO THIRDS OF FULL SCALE RANGING.
      - 2.3.1.B. EXPECTED MAXIMUM AND MINIMUM READINGS TO BE WITHIN SCALE RANGE.
      - 2.3.1.C. THERMOMETERS TO HAVE BOTH FAHRENHEIT AND CELSIUS SCALES.
      - 2.3.1.D. PRESSURE GAUGES TO HAVE BOTH PSI AND KPA SCALES.
    - 2.3.2. PRODUCT IDENTIFICATION
      - 2.3.2.A. PRESSURE GAUGES AND THERMOMETERS TO BE SELECTED FROM MANUFACTURERS STANDARD PRODUCT LINE.
      - 2.3.2.B. MODEL DESIGNATIONS FROM TRICER CATALOGUE ARE USED TO ESTABLISH QUALITY STANDARDS AND CONSTRUCTION DETAILS TO ALLOW ASSESSMENT OF PRODUCTS FROM OTHER UNLISTED MANUFACTURERS.
  - 2.4. DIRECT READING THERMOMETERS
    - 2.4.1. INDUSTRIAL, VARIABLE ANGLE TYPE, LIQUID FILLED, ALUMINUM 230 MM (9 IN) SCALE LENGTH, TO CGSB 14.4.
  - 2.5. PRESSURE GAUGES
    - 2.5.1. FOR DIFFERENTIAL PRESSURE MEASUREMENT
      - 2.5.1.A. 115 MM (4½ IN) DIAL TYPE, SILICONE-FREE DAMPENING, BLACK SOLID FRONT CASE, ½" ACCURACY, ADJUSTABLE POINTER AND MAXIMUM REGISTERING POINTER TO ASME B40.100 GRADE 2A, COMPLETE WITH IMPULSE SNUBBER AND 3-WAY SWITCHING VALVE.
    - 2.5.2. ACCESSORIES:
      - 2.5.2.A. PRESSURE SNUBBERS, BRASS OR T303 STAINLESS STEEL CONSTRUCTION.
      - 2.5.2.B. NEEDLE VALVES, RISING STEM, BRASS OR T316 STAINLESS STEEL CONSTRUCTION.
      - 2.5.2.C. COIL SYPHONS, SCHEDULE 40 CARBON STEEL.
3. EXECUTION
  - 3.1. METERING DEVICES
    - 3.1.1. INSTALLATION
      - 3.1.1.A. INSTALL FLOW MEASURING DEVICES IN HORIZONTAL STRAIGHT PIPE RUNS, FREE OF VALVES AND FITTINGS.
      - 3.1.2. LENGTH OF STRAIGHT PIPE BEFORE AND AFTER METERING ELEMENTS:
        - 3.1.2.A. NOT LESS THAN 1 M (3 FT) BEFORE AND 1 M (3 FT) AFTER OR,
        - 3.1.2.B. AS RECOMMENDED BY MANUFACTURER.
      - 3.1.3. MOUNT METER READOUT UNITS AND PROVIDE PIPING AND WIRING TO COMPLETE INSTALLATION.
    - 3.2. THERMOMETER AND PRESSURE GAUGES - GENERAL INSTALLATION CRITERIA
      - 3.2.1. INSTALL THERMOMETERS AND GAUGES NOT MORE THAN 3 M (10 FT) FROM FLOOR OR PLATFORM OR INSTALL REMOTE READING THERMOMETERS AND GAUGES, WITH DIAL MOUNTED AT EYE LEVEL, ON STEEL OR ALUMINUM PLATE.

- 2.3. DOMESTIC WATER VALVES
  - 2.3.1. GATE VALVES NPS 2 AND UNDER, SOLDERED
    - 2.3.1.A. 1000 KPA (150 PSI) TO MSS SP-80, CLASS 150, BRONZE BODY, SOLID WEDGE BRONZE DISC, RISING STEM, SCREW IN, OR UNION BONNET.
  - 2.3.2. GLOBE VALVES NPS 2 AND UNDER, SOLDERED
    - 2.3.2.A. 850 KPA (125 PSI) TO MSS SP-80, 300 CWP, BRONZE BODY, RENEWABLE COMPOSITION PIFE DISC, THREADED OVER BONNET, LOCK SHIELD HANDLES AS INDICATED.
  - 2.3.3. GLOBE VALVES NPS 2 AND UNDER, THREADED
    - 2.3.3.A. 1000 KPA (150 PSI) TO MSS SP-80, CLASS 150, BRONZE BODY, RENEWABLE COMPOSITION PIFE DISC, UNION BONNET, LOCK SHIELD HANDLES AS INDICATED.
  - 2.3.4. SWING CHECK VALVES NPS 2 AND UNDER, SOLDERED
    - 2.3.4.A. 850 KPA (125 PSI) TO MSS SP-80, BRONZE BODY, BRONZE SWING DISC, REGRINDABLE SEAT, SCREW-IN CAP.
  - 2.3.5. SWING CHECK VALVES NPS 2 AND UNDER, THREADED
    - 2.3.5.A. 850 KPA (125 PSI), TO MSS SP-80, CLASS 125, BRONZE BODY, BRONZE SWING DISC, REGRINDABLE SEAT, SCREW-IN CAP.
  - 2.3.6. BALL VALVES UP TO NPS 2
    - 2.3.6.A. 1000 KPA (150 PSI), TWO PIECE BRONZE BODY AND CHROME PLATED BRONZE BALL, FIRE SEAT RINGS, SOLDER JOINT OR NPT TO COPPER ADAPTERS, FULL PORT.
  - 2.3.7. DOUBLE REGULATING VALVES (DRV), NPS 2 AND UNDER, THREADED
    - 2.3.7.A. 1000 KPA (150 PSI) COPPER ALLOY BODY, PLUG TYPE STEM WITH FLOW MEASUREMENT PORTS AND TAMPER-PROOF SETTING.
  - 2.3.8. FLOW METER FOR DRVS
    - 2.3.8.A. DIRECT DIGITAL FLOW READOUT TYPE COMPUTERIZED METER WITH HOSES AND FITTINGS.
- 2.4. HEATING AND COOLING WATER VALVES
  - 2.4.1. GATE VALVES NPS 2 AND UNDER, SOLDERED
    - 2.4.2. GLOBE VALVES NPS 2 AND UNDER, THREADED
    - 2.4.3. BALL VALVES NPS 2 AND UNDER, SOLDERED
    - 2.4.4. BUTTERFLY VALVES NPS 2½ TO 12, FOR GROOVED END PIPE:
    - 2.4.5. PLUG VALVES NPS 2 AND UNDER, THREADED
    - 2.4.6. SWING CHECK VALVES NPS 2 AND UNDER, SOLDERED
    - 2.4.7. SILENT CHECK VALVES NPS 2, FOR GROOVED END PIPE
    - 2.4.8. DOUBLE REGULATING VALVES (DRV), NPS 2 AND UNDER, THREADED
    - 2.4.9. FLOW METER FOR DRVS
      - STANDARD OF ACCEPTANCE: KITZ, CRANE, JENKINS, NIBCO
3. EXECUTION
  - 3.1. VALVE INSTALLATION
    - 3.1.1. INSTALL SHUT OFF VALVES AT:
      - 3.1.1.A. BRANCH TAKE-OFFS,
      - 3.1.1.B. TO ISOLATE PIPING TO EACH PIECE OF EQUIPMENT, AND
      - 3.1.1.C. IN LINES OF "DOUBLE LINE" PIPING.
      - 3.1.1.D. INSTALL VALVES IN UPRIGHT POSITION WITH STEM ABOVE HORIZONTAL

**HANGERS AND SUPPORTS**  
**20 05 29**

1. SCOPE
  - 1.1. PROVIDE HANGERS AND SUPPORTS FOR PIPING AND CONDUITS.
  - 1.2. SHOP DRAWINGS
    - 1.2.1. SUBMIT DETAILS FOR SUPPORTS, GUIDES, AND ANCHORS FOR GLASS, FIBRE-REINFORCED PLASTIC, AND PLASTIC PIPING SYSTEMS.</













