

1.1 RELATED REQUIREMENTS

- .1 Section 01 00 10 General Instructions.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop drawings to show:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
- .3 Shop drawings and product data accompanied by:
 - .1 Points of operation on performance curves.
 - .2 Manufacturer to certify current model production.
 - .3 Certification of compliance to applicable codes.
- .4 In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.
- .5 Closeout Submittals:
 - .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
 - .2 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
 - .3 Operation data to include:
 - .1 Description of systems and their controls.
 - .2 Operation instruction for systems and component.
 - .4 Maintenance data to include:
 - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.
 - .5 Performance data to include:
 - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
 - .6 Approvals:
 - .1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
 - .2 Make changes as required and re-submit as directed by Departmental Representative.
 - .7 As-built drawings:

- .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
- .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
- .3 Submit to Departmental Representative for approval and make corrections as directed.
- .4 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

1.3 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 – Testing and Quality Control.
- .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29 - Health and Safety Requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Waste Management and Disposal:
- .2 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.5 GRILLES

- .1 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity as indicated.
- .2 Frames:
 - .1 Full perimeter gaskets.
 - .2 Plaster frames where set into plaster or gypsum board and as specified.
 - .3 Concealed fasteners.
- .3 Concealed manual volume control damper operators.
- .4 Colour: standard as directed by Departmental Representative.
- .5 Types and capacities: as indicated on the drawings.

1.6 CLEANING

- .1 Clean interior and exterior of all systems including strainers.

1.7 FIELD QUALITY CONTROL

- .1 Site Tests: conduct following tests in accordance with Section 01 45 00 – Testing and Quality Control and submit report as described in PART 1 - SUBMITTALS.
- .2 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

1.8 DEMONSTRATION

- .1 Departmental Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .3 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.
- .4 Instruction duration time requirements as specified in appropriate sections.

1.9 PROTECTION

- .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

END OF SECTION

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and requirements for the identification of piping systems, duct work, valves and controllers, including the installation and location of identification systems.
 - .2 Sustainable requirements for construction and verification.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal
- .3 Section 09 91 23 - Interior Painting.

1.3 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-24.3, Identification of Piping Systems.

1.4 SUBMITTALS

- .1 Product Data:
 - .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Samples:
 - .1 Submit samples in accordance with Section 01 33 00 – Submittal Procedures.
 - .2 Samples to include nameplates, labels, tags, lists of proposed legends.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with Section 01 61 00 – Common Product Requirements.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

1.6 MANUFACTURER'S EQUIPMENT NAMEPLATES

- .1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.
- .2 Lettering and numbers to be raised or recessed.
- .3 Information to include, as appropriate:
 - .1 Equipment: Manufacturer's name, model, size, serial number, capacity.

- .2 Motor: voltage, Hz, phase, power factor, duty, frame size.

1.7 SYSTEM NAMEPLATES

- .1 Colours:

- .1 Black letters, white background (except where required otherwise by applicable codes).

- .2 Construction:

- .1 3 mm thick laminated plastic or white anodized aluminum, matte finish, with square corners, letters accurately aligned and machine engraved into core.

- .3 Sizes:

- .1 Conform to following table:

| Size # mm | Sizes (mm) | No. of Lines | Height of Letters (mm) |
|-----------|------------|--------------|------------------------|
| 1 | 10 x 50 | 1 | 3 |
| 2 | 13 x 75 | 1 | 5 |
| 3 | 13 x 75 | 2 | 3 |
| 4 | 20 x 100 | 1 | 8 |
| 5 | 20 x 100 | 2 | 5 |
| 6 | 20 x 200 | 1 | 8 |
| 7 | 25 x 125 | 1 | 12 |
| 8 | 25 x 125 | 2 | 8 |
| 9 | 35 x 200 | 1 | 20 |

- .2 Use maximum of 25 letters/numbers per line.

1.8 EXISTING IDENTIFICATION SYSTEMS

- .1 Apply existing identification system to new work.
- .2 Where existing identification system does not cover for new work, use identification system specified this section.
- .3 Before starting work, obtain written approval of identification system from Owner's Representative.

1.9 PIPING SYSTEMS GOVERNED BY CODES

- .1 Identification:

- .1 Propane gas: to CSA/CGA B149.1 authority having jurisdiction.

1.10 IDENTIFICATION OF PIPING SYSTEMS

- .1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.
- .2 Legend:
 - .1 Block capitals to sizes and colours listed in CAN/CGSB 24.3.
- .3 Arrows showing direction of flow:
 - .1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.
 - .2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.
- .4 Extent of background colour marking:
 - .1 To full circumference of pipe or insulation.
 - .2 Length to accommodate pictogram, full length of legend and arrows.
- .5 Materials for background colour marking, legend, arrows:
 - .1 Pipes and tubing 20 mm and smaller: Waterproof and heat-resistant pressure sensitive plastic marker tags.
 - .2 All other pipes: Pressure sensitive plastic-coated cloth or vinyl with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100%RH and continuous operating temperature of 150°C and intermittent temperature of 200°C.
- .6 Colours and Legends:
 - .1 Where not listed, obtain direction from Owner's Representative.
 - .2 Colours for legends, arrows, to following table:

| Background colour | Legend, arrows |
|-------------------|----------------|
| Yellow | BLACK |
| Green | WHITE |
| Red | WHITE |

- .3 Background colour marking and legends for piping systems:

| Contents | Background colour marking | Legend |
|----------------------------|---------------------------|----------------|
| Domestic hot water supply | Green | DOM. HW SUPPLY |
| Domestic cold water supply | Green | DOM. CWS |
| Storm water | Green | STORM |
| Sanitary | Green | SAN |
| Plumbing vent | Green | SAN. VENT |
| Propane | to Codes | |

1.11 VALVES

- .1 Brass tags 12 mm diameter with stamped identification data filled with black paint.

1.12 LANGUAGE

- .1 Identification to be in English.

1.13 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

1.14 TIMING

- .1 Provide identification only after all painting specified in Section 09 91 23 - Interior Painting has been completed.

1.15 INSTALLATION

- .1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.
- .2 Provide ULC and/or CSA registration plates as required by respective agency.

1.16 NAMEPLATES

- .1 Locations:
 - .1 In conspicuous location to facilitate easy reading and identification from operating floor.
- .2 Protection
 - .1 Do not paint, insulate or cover in any way.

1.17 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

- .1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: At not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.
- .2 Adjacent to each change in direction.
- .3 At least once in each small room through which piping or ductwork passes.
- .4 On both sides of visual obstruction or where run is difficult to follow.
- .5 On both sides of separations such as walls, floors, partitions.

- .6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.
- .7 At beginning and end points of each run and at each piece of equipment in run.
- .8 At point immediately upstream of major manually operated or automatically controlled valves, dampers, etc. Where this is not possible, place identification as close as possible, preferably on upstream side.
- .9 Identification to be easily and accurately readable from usual operating areas and from access points.
- .1 Position of identification to be approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

END OF SECTION

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation of low-pressure metallic ductwork, joints and accessories.
- .2 Related Requirements
 - .1 Section 23 05 00 Common Results for HVAC.

1.2 REFERENCES

- .1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).
- .2 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM A 480/A 480M-03c, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
 - .2 ASTM A 635/A 635M-02, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot Rolled.
 - .3 ASTM A 653/A 653M-03, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .4 National Fire Protection Association (NFPA).
 - .1 NFPA 90A-02, Standard for the Installation of Air-Conditioning and Ventilating Systems.
 - .2 NFPA 90B-02, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
 - .3 NFPA 96-01, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.
- .5 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
 - .1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2nd Edition 1995 and Addendum No. 1, 1997.
 - .2 SMACNA HVAC Air Duct Leakage Test Manual, 1985, 1st Edition.
 - .3 IAQ Guideline for Occupied Buildings Under Construction 1995, 1st Edition.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

1.4 QUALITY ASSURANCE

- .1 Certification of Ratings:
 - .1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Protect on site stored or installed absorptive material from moisture damage.

1.6 SEAL CLASSIFICATION

- .1 Classification as follows:

| Maximum Pressure Pa | SMACNA Seal Class |
|---------------------|-------------------|
| 500 | C |
| 250 | C |
| 125 | C |
| 125 | Unsealed |

- .2 Seal classification:
 - .1 Class A: longitudinal seams, transverse joints, duct wall penetrations and connections made airtight with sealant and tape.
 - .2 Class B: longitudinal seams, transverse joints and connections made airtight with sealant tape or combination thereof.
 - .3 Class C: transverse joints and connections made air tight with gaskets sealant tape or combination thereof. Longitudinal seams unsealed.
 - .4 Unsealed seams and joints.

1.7 SEALANT

- .1 Sealant: oil resistant, water borne, polymer type flame resistant duct sealant. Temperature range of minus 30 degrees C to plus 93 degrees C.

1.8 TAPE

- .1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm wide.

1.9 DUCT LEAKAGE

- .1 In accordance with SMACNA HVAC Air Duct Leakage Test Manual.

1.10 FITTINGS

- .1 Fabrication: to SMACNA.
- .2 Radiused elbows.
 - .1 Rectangular: standard radius short radius with single thickness turning vanes Centre line radius: 1.5 times width of duct.
 - .2 Round: smooth radius. Centre line radius: 1.5 times diameter.
- .3 Mitred elbows, rectangular:
 - .1 To 400 mm: with single double thickness turning vanes.
 - .2 Over 400 mm: with double thickness turning vanes.
- .4 Branches:
 - .1 Rectangular main and branch: with radius on branch 1.5 times width of duct 45 degrees entry on branch.
 - .2 Round main and branch: enter main duct at 45 degrees with conical connection.
 - .3 Provide volume control damper in branch duct near connection to main duct.
 - .4 Main duct branches: with splitter damper.
- .5 Transitions:
 - .1 Diverging: 20 degrees maximum included angle.
 - .2 Converging: 30degrees maximum included angle.
- .6 Offsets:
 - .1 Full short radiused elbows as indicated.
- .7 Obstruction deflectors: maintain full cross-sectional area.
 - .1 Maximum included angles: as for transitions.

1.11 GALVANIZED STEEL

- .1 Lock forming quality: to ASTM A 653/A 653M, Z90 zinc coating.
- .2 Thickness, fabrication and reinforcement: to ASHRAE SMACNA.
- .3 Joints: to ASHRAE SMACNA proprietary manufactured duct joint. Proprietary manufactured flanged duct joint to be considered to be a class A seal.

1.12 HANGERS AND SUPPORTS

- .1 Hangers and Supports: in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
 - .1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.

- .1 Maximum size duct supported by strap hanger: 500.
- .2 Hanger configuration: to ASHRAE and SMACNA.
- .3 Hangers: black galvanized steel angle with black galvanized steel rods to ASHRAE and SMACNA following table:

| Duct Size (mm) | Angle Size (mm) | Rod Size (mm) |
|-------------------|--------------------|------------------|
| up to 750 | 25 x 25 x 3 | 6 |
| 751 to 1050 | 40 x 40 x 3 | 6 |
| 1051 to 1500 | 40 x 40 x 3 | 10 |
| 1501 to 2100 | 50 x 50 x 3 | 10 |
| 2101 to 240 | 50 x 50 x 5 | 10 |
| 2401 and over | 50 x 50 x 6 | 10 |

- .4 Upper hanger attachments:
 - .1 For concrete: manufactured concrete inserts.
 - .2 For steel joist: manufactured joist clamp, steel plate washer.
 - .3 For steel beams: manufactured beam clamps:

1.13 GENERAL

- .1 Do work in accordance with NFPA 90A NFPA 90B ASHRAE SMACNA as indicated.
- .2 Do not break continuity of insulation vapour barrier with hangers or rods.
- .3 Insulate strap hangers 100 mm beyond insulated duct Ensure diffuser is fully seated.
- .4 Support risers in accordance with ASHRAE SMACNA as indicated.
- .5 Install breakaway joints in ductwork on sides of fire separation.
- .6 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.
- .7 Manufacture duct in lengths and diameter to accommodate installation of acoustic duct lining.

1.14 HANGERS

- .1 Strap hangers: install in accordance with SMACNA.
- .2 Angle hangers: complete with locking nuts and washers.
- .3 Hanger spacing: in accordance with ASHRAE SMACNA as follows:

| Duct Size (mm) | Spacing (mm) |
|-------------------|-----------------|
| up to 1500 | 3000 |
| 1501 and over | 2500 |

1.15 SEALING AND TAPING

- .1 Apply sealant to outside of joint to manufacturer's recommendations.
- .2 Bed tape in sealant and recoat with minimum of one coat of sealant to manufacturers recommendations.

1.16 LEAKAGE TESTS

- .1 In accordance with SMACNA HVAC Duct Leakage Test Manual.
- .2 Do leakage tests in sections.
- .3 Make trial leakage tests as instructed to demonstrate workmanship.
- .4 Do not install additional ductwork until trial test has been passed.
- .5 Complete test before performance insulation or concealment Work.

END OF SECTION

1.1 SUMMARY

- .1 Section Includes:
 - .1 Balancing dampers for mechanical forced air ventilation and air conditioning systems.
- .2 Related Requirements
 - .1 Section 23 05 00 Common Results for HVAC.

1.2 REFERENCES

- .1 Sheet Metal and Air Conditioning National Association (SMACNA)
 - .1 SMACNA HVAC Duct Construction Standards, Metal and Flexible-1985.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.4 QUALITY ASSURANCE

- .1 Health and Safety Requirements:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 22 - Construction/Demolition Waste Management and Disposal.

1.6 GENERAL

- .1 Manufacture to SMACNA standards.

1.7 SINGLE BLADE DAMPERS

- .1 Fabricate from same material as duct, but one sheet metal thickness heavier. V-groove stiffened.
- .2 Size and configuration to recommendations of SMACNA, except maximum height 100 mm as indicated.
- .3 Locking quadrant with shaft extension to accommodate insulation thickness.
- .4 Inside and outside nylon bronze end bearings.
- .5 Channel frame of same material as adjacent duct, complete with angle stop.

1.8 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

1.9 INSTALLATION

- .1 Install where indicated.
- .2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.
- .3 Locate balancing dampers in each branch duct, for supply, return and exhaust systems.
- .4 Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.
- .5 Dampers: vibration free.
- .6 Ensure damper operators are observable and accessible.
- .7 Corrections and adjustments conducted by Engineer.

1.10 FIELD QUALITY CONTROL

- .1 Tests:
 - .1 Tests to cover period of not less than days and demonstrate that system is functioning as specified.

1.11 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1.1 SUMMARY

- .1 Section Includes:
 - .1 Fans, motors, accessories and hardware for commercial use.
 - .2 Air curtains.
- .2 Related Requirements
 - .1 Section 23 05 00 Common Results for HVAC.

1.2 REFERENCES

- .1 Air Conditioning and Mechanical Contractors (AMCA)
 - .1 AMCA Publication 99-2003, Standards Handbook.
 - .2 AMCA 300-1996, Reverberant Room Method for Sound Testing of Fans.
 - .3 AMCA 301-1990, Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
- .2 American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME)
 - .1 ANSI/AMCA 210-1999, Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.3 SYSTEM DESCRIPTION

- .1 Performance Requirements:
 - .1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards in force.
 - .2 Capacity: flow rate, total static pressure, bhp W, efficiency, revolutions per minute, power, model, size, sound power data and as indicated on schedule.
 - .3 Fans: statically and dynamically balanced, constructed in conformity with AMCA 99.
 - .4 Sound ratings: comply with AMCA 301, tested to AMCA 300. Supply unit with AMCA certified sound rating seal.
 - .5 Performance ratings: based on tests performed in accordance with ANSI/AMCA 210. Supply unit with AMCA certified rating seal, except for propeller fans smaller than 300 mm diameter.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
 - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
 - .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
- .3 Provide :
 - .1 Fan performance curves showing point of operation, BHP kW and efficiency.
 - .2 Sound rating data at point of operation.
- .4 Indicate:
 - .1 Motors, sheaves, bearings, shaft details
 - .2 Minimum performance achievable with variable speed controllers and variable inlet vanes as appropriate.
- .5 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .6 Closeout Submittals:
 - .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.5 QUALITY ASSURANCE

- .1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.6 MAINTENANCE

- .1 Extra Materials:
 - .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
 - .1 Spare parts to include:
 - .1 Matched sets of belts.

- .2 Furnish list of individual manufacturer's recommended spare parts for equipment, include:
 - .1 Bearings and seals.
 - .2 Addresses of suppliers.
 - .3 List of specialized tools necessary for adjusting, repairing or replacing.

1.7 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 22 - Construction/Demolition Waste Management and Disposal.

1.8 UTILITY SETS

- .1 Characteristics and construction: for centrifugal fans.
- .2 Preassemble single width centrifugal fan with removable protective hood with vents, and automatic spring loaded back draft dampers and 12 mm mesh birdscreens where indicated.

1.9 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

1.10 FAN INSTALLATION

- .1 Install fans as indicated, flexible electrical leads and flexible duct connection.
- .2 Bearings and extension tubes to be easily accessible.
- .3 Access doors and access panels to be easily accessible.

1.11 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION