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PART 1 - GENERAL

1.1 GENERAL

- .1 All drawings and all sections of the specification shall apply to and form an integral part of this section.
- .2 All air distribution systems shall meet Manitoba Building Code, ASHRAE and SMACNA Standards.

1.2 WORK INCLUDED

- .1 Work shall include but not limited to the following:
 - .1 Heating, outside air, exhaust, supply, return air, ventilation air ductwork c/w acoustic duct liner.
 - .2 Grilles, diffusers, louvres and filters, fire dampers, fire flaps.
 - .3 Assistance to air balance contractor.
 - .4 Fans: Gas Fired AHU.

1.3 RELATED WORK SPECIFIED ELSEWHERE

- | | | |
|----|--------------------------------|---------------|
| .1 | Mechanical General Provisions: | Section 15010 |
| .2 | Insulation: | Section 15100 |
| .3 | Plumbing: | Section 15430 |
| .4 | Testing & Balancing: | Section 15990 |
| .5 | Electrical General Conditions: | Section 16000 |

1.4 REFERENCE STANDARDS

- .1 SMACNA: HVAC Duct Construction Standards, Metal and Flexible HVAC Duct Leakage Test Manual.
 - .1 Low velocity duct construction standards.
 - .2 Balancing and adjustment of air handling systems.
 - .3 Fire damper guide for air handling systems.
 - .4 NFPA 90A-Latest Revision: National Fire Protection Association -Installation of Air Conditioning and Ventilating.
 - .5 UL-151: Underwriters' Laboratories Air Duct.
 - .6 ADC 106R2: Air Diffusion Equipment Test Code.
 - .7 AMCA 201-73, AMCA 300-67, AMCA 301-77, AMCA 302-73, AMCA 303-73, AMCA 2408-69.
 - .8 Ashrae: Handbook, Fundamentals and Systems Volumes.
 - .1 Air duct design.
 - .2 Duct construction.
 - .9 ASHRAE 52- (76), "Method of Testing Air Cleaning Devices Used in General Ventilation for removing Particulate Matter".

1.5 REQUIREMENTS OF REGULATORY AGENCIES

- .1 Manitoba Building Code, local Authority having Jurisdiction.

PART 2 - PRODUCTS**2.1 DUCT SEALING**

- .1 Seal all joints on all supply, return and exhaust ductwork with high pressure duct sealant. All joints exposed to exterior are to be water tight.
 - .1 Foster 30-02 Duro-Dyne S-2 (UV protected)
- .2 Cover all joints with high pressure duct tape polyvinyl treated, open weave fibreglass, 50mm (2")
 - .1 Duro-Dyne FT-2 (UV protected)

2.2 LOW PRESSURE DUCTWORK

- .1 Ductwork: Galvanized Steel
 - .1 Lock forming quality: to ASTM A525M, Z90 zinc coating.
 - .2 Thickness: to SMACNA, ASHRAE
 - .3 Fabrication: to SMACNA, ASHRAE
- .2 Joints: Galvanized Steel
 - .1 SMACNA or proprietary manufactured duct joint. Proprietary manufactured flanged duct joint shall be considered to be a class A seal.
 - .1 Ductmate Canada Ltd. system for propriety joints; Exanno Nexus.
- .3 Fittings: Galvanized Steel
 - .1 Fabrication: SMACNA
 - .2 Radiused elbows: standard radius.
 - .3 Square elbows: to 400mm (16") with single thickness vanes.
 - .4 Square elbows: over 400mm (16") with double thickness vanes.
 - .5 Provide branch and main duct balancing dampers.
 - .6 Sub branch duct with 45° entry and balancing damper on branch and or Sub branch duct with square connection, volume extractor and branch duct balancing damper.
 - .7 Transitions:
 - .1 Diverging: 20° maximum included angle.
 - .2 Converging: 30° maximum included angle.
 - .8 Offsets: radiused elbows.
 - .9 Obstruction deflectors: maintain full cross sectional area. Maximum included angles as transitions.

2.3 DUCT OPENINGS

- .1 Use 1.2 mm (18 ga.) galvanized sleeves where ductwork passes through rated floor assemblies. Sleeves to extend 150 mm (6") above floor. Use watertight mastic between sleeved and floor material. (See Section 15010, OPENINGS IN FIRE SEPARATIONS).
- .2 Seal area between ducts and openings with mineral wool and ULC firestop system. Testing to meet ASTM E814: Fire Test of Through-Penetration Firestops. UL 1479: Through-Penetration Firestop Systems. (See Section 15010, OPENINGS IN FIRE SEPARATIONS).

2.4 WALL OPENINGS

- .1 Provide 1.2 mm (18 ga.) galvanized sleeve 50 mm (2") wider than wall thickness. Opening located in fire rated walls to have sleeve c/w louvred fire damper to meet code requirements. (See Section 15010, OPENINGS IN FIRE SEPARATIONS).
- .2 Provide 300 mm (12") duct extension in mechanical room openings, where smoke detectors are noted on Electrical drawings, to support detector and provide proper sensing plenums.

2.5 HANGERS AND SUPPORTS

- .1 Fabricate strap hangers to same material as duct but next sheet metal thickness heavier than duct. Maximum size duct supported by strap hanger 500mm (20"). Hanger configuration to SMACNA details. Hanger not to interrupt exterior duct insulation (See Section 15100 WORKMANSHIP).
- .2 Support vertical ducts at every floor with angle iron collar sized to provide proper bearing. Provide intermediate vertical support at ¼ and ¾ points in addition to angle iron collar at each floor.
- .3 Support horizontal ducts on maximum 2.4 m (80") centres by non-perforated galvanized steel.
- .4 Riveted strap for ductwork 900 mm (36") (either dimension) or less, and minimum 25 mm x 25 mm x 3 mm (1" x 1" x 1/8") galvanized angle iron passing under ducts 925 mm (37") or over (either dimension) with 9.4 mm Ø (3/8"Ø) threaded rods suspending angles from structure.
- .5 Use universal concrete type inserts of black malleable iron, for threaded connection with lateral adjustment, top slot for reinforcing rods and lugs for attaching to forms.
- .6 Hangers shall be galvanized steel angles with galvanized steel rods, locking nuts and washers to SMACNA following table:

Duct Size		Angle Size		Rod Size		Spacing	
Mm	In.	Mm	In.	Mm Ø	In. Ø	M	Ft.
up to 750	up to 30	25x25x3	1x1x1/8	6	1/4	3	10
775 to 1050	31 to 41	40x40x3	2x2x1/8	6	1/4	3	10
1075 to 1500	42 to 59	40x40x3	2x2x1/8	10	3/8	3	10
1525 to 2100	60 to 83	50x50x3	2x2x1/8	10	3/8	2.5	8
2125 to 2400	84 to 94	50x50x5	2x2x3/16	10	3/8	2.5	8
2425 and over	95 and over	50x50x6	2x2x1/4	10	3/8	2.5	8

2.6 FLEXIBLE COLLARS

- .1 Provide flexible non-combustible neoprene connectors between "All" fans "each side" air moving devices, ducts or casings where required to prevent excessive movement of long ducts, at building expansion joints.
 - .1 Shall be galvanized sheet metal frame with fabric clenched by means of double locked seams. Fire resistant, self extinguishing neoprene coated glass fabric density of 1.3 kg/m². Insulated for exterior application.

2.7 TURNING VANES

- .1 For duct dimensions 456 mm (18") or less:
In the plane of turn, Junior Vane Rails shall be supplied having the rails 57 mm (2 1/4") wide and vanes spaced on 50 mm (2") centres.
- .2 For ducts larger than 456 mm (18"):
Duro Vane Rails shall be supplied having the rails 114 mm (4 1/2") Wide and vanes spaced on 114 mm (4 1/2") centres.
- .3 Double thickness turning vanes shall be Duro-Dyne Vane Rails.

- .4 Factory or shop fabricated single thickness and double thickness with trailing edge to recommendation of SMACNA.

2.8 INSTRUMENT TEST PORTS

- .1 1.6mm (1/16") thick steel zinc plated after manufacture
- .2 Cam lock handles with neoprene expansion plug and handle chain.
- .3 28mm \varnothing (1 1/8" \varnothing) minimum inside diameter. Length to suit insulation thickness.
- .4 Neoprene mounting gasket.

2.9 DUCT ACCESS DOORS

- .1 Insulated ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6mm (1/4) thick complete with sheet metal angle frame and rigid glass fibre insulation to match ductwork insulation thickness.
- .2 Gaskets: neoprene or foam rubber.
- .3 Acudor, Air-O-Metal, Lehage, Milcor, Titus, Controlled Air.

2.10 DUCT LINER

- .1 General:
 - .1 For extent of liner:
 - .1 See schedule Section 15100 for work description.
 - .2 Cleanable and have a zero perm rating and zero water absorption.
 - .3 Installation shall not include any tapes, fabrics, cements or other materials which are not cleanable or which offer opportunity for mold growth.
 - .4 To Manufacturer's standards and shall withstand air velocities of 12.7 m/s (2500 feet per minute).
 - .5 Flame spread rating shall not exceed 25.
 - .6 Smoke development rating shall not exceed 50 when tested in accordance with CAN/ULC-S102.
 - .7 Duct liner to meet UL 181, ASTM C1338.
 - .2 Fasteners:
 - .1 Weld pins 2.0mm (1/8") dia., length to suit thickness of insulation. Metal speed washers, 32mm (1 1/4") square.

2.11 DAMPERS

- .1 Single blade:
 - .1 One sheet metal thickness heavier than duct with V-grade stiffened size and configuration to recommendations of SMACNA, locking quadrants with inside and outside end bearings.
- .2 Multi bladed:
 - .1 Factory manufactured or material compatible with duct. Opposed blade configuration to recommendation of SMACNA. Bearings: self-lubricating nylon. Linkage: Shaft extension with locking quadrant. Channel frame c/w angle stop.
- .3 Splitter:
 - .1 One sheet metal thickness heavier than duct with appropriate stiffening. Double thickness air foil shape construction. Control rod with locking device and position indicator. Rod configuration to prevent end from entering duct. Pivot, piano hinge. Fold leading edge.

- .4 Backdraft/ Relief:
 - .1 Multi leaf, aluminium, flexible sealing edges (maximum blade width) 150mm (6") counter-weighted.

2.12 FIRE DAMPERS

- .1 List and bear label of ULC and shall meet requirements of Fire Commissioner of Canada, and NFPA 90A and Warnock Hersey.
 - .1 Provide thermal blanket assembly (indicate UL/ULC index arrangement number) when used in conjunction with square, rectangular, round, square to round ceiling diffuser.
- .2 Mild steel, factory fabricated for fire rating requirement to maintain integrity of fire wall and/or fire separation and breakaway duct connections.
- .3 Top hinged: offset single damper, round or square, multi-blade hinged or interlocking type, roll door type, guillotine type, sized to maintain full duct cross section as indicated.
- .4 Fusible link acuated, weighted to close and lock in closed position when released or having negator-spring-closing operator for multi-leaf type or roll door type in horizontal position with vertical air flow.
- .5 40mm x 40 x 3mm (1 5/8" x 1 5/8" x 1/8") angle iron frame on full perimeter of fire damper, on both sides of fire separation being pierced.
- .6 Ruskin, Controlled Air, Nailor-Hart

2.13 GRILLES/ DIFFUSER

- .1 General:
 - .1 Provide standard product to meet capacity, throw, noise level, throat and outlet velocity.
 - .2 At ceiling diffusers, provide independent suspension from the basic structure and/or ceiling when indicated to maintain fire protection membrane integrity.
 - .1 Provide thermal blanket assembly (indicate UL/ULC index arrangement number) when used in conjunction with square, rectangular, round, square to round ceiling diffuser (FR designation.).
 - .3 Where grilles, penetrate fire walls and fire partitions, provide approved steel sleeve secured to structure in accord with NFPA 90A Latest Edition.
- .2 Grilles & Registers:
 - .1 Louvered Face Supply:
 - .1 Double deflection type: Aluminium/Steel two sets of fully adjustable deflection airfoil blades. Blades shall run parallel to the long or short dimension.
 - .1 Where indicated provide integral volume control damper of the opposed blade type operable from the register face.
 - .2 Louvered Face Return/Exhaust/Relief/Transfer:
 - .1 45° Deflection Fixed: Steel/Aluminium blades shall run parallel to the long or short dimension.
 - .1 Where indicated provide integral volume control damper of the opposed blade type operable from the register face.
 - .2 0° Deflection Fixed: Aluminium grid core/14 gauge steel with steel support bars/Extruded aluminium.
 - .1 Where indicated provide integral volume control damper of the opposed blade type operable from the register face.
 - .3 Frames:
 - .1 Steel: (See Schedule) standard with exposed welded joints and mitered corners.
 - .2 Aluminium: (See Schedule) extruded satin finish with mechanical fasteners and mitered corners.

- .3 Provide concealed fasteners and operators.
- .4 Screws:
 - .1 Install with flat head cadmium plated screws in countersunk holes where fastenings are visible.

PART 3 - EXECUTION

3.1 STANDARDS

- .1 Maintain all standards of constructing and suspending ductwork as set forth in the 'ASHRAE' and SMACNA standards.
- .2 Duct sizes are inside dimensions. If ducts are acoustically lined, outside duct size to be increased as required.
- .3 Single thickness partitions between ducts is not acceptable.
- .4 All ductwork shall seams and joints sealed with Duro-Dyne S2 duct sealers. Apply duct sealer in strict accordance with manufacturers recommendations, to joints and seams to provide a air-tight, water-tight installation. Prior to application, ductwork to be dry and free of greases, etc.
- .5 All fans to be base mounted or hung using spring vibration isolators.
- .6 Duct connections to be made using 101 mm (4") neoprene, each side of fan.

3.2 AIR BALANCING

- .1 Shall be done as part of section 15990.
- .2 Section 15800 shall provide initial alignment and tension of all fan pulleys and belts supplied by them.
- .3 Section 15800 shall work in co-ordination with the Air Balance and Testing Agency to assure the installation of all manual adjusting dampers and pitot tube enclosures are as required to allow proper adjustment of the air system.
- .4 Section 15800 shall make any changes in the pulleys and belts, and any additional manual dampers for correct balance as recommended by the Air Balance Agency, at no additional cost to The City.

3.3 LOW PRESSURE DUCTWORK

- .1 Duct Sizes shown on plans are a guide for duct runs only. Transition and change duct sizes and provide fittings at no extra cost to contract. Confirm site conditions and confer with Architectural, Structural and Electrical drawings.

3.4 DUCT ACCESS DOORS

- .1 Locate properly for inspection and servicing. Doors and frame to be rigid, close-fitting, with rubber gaskets, galvanized hinges with brass pins and at least two galvanized cam locks. Rivet frame and hardware to ducts.

3.5 DAMPERS

- .1 Manual:
 - .1 Install in manner acceptable to manufacturer where noted on drawings.
 - .2 Manual balancing dampers with quadrants and locks shall be installed in all branch ducts to facilitate a complete air balance for all systems including supply air, exhaust air and relief (except where grilles are specified to be supplied with key operated dampers).
 - .3 Balancing dampers shall generally be installed as far up-stream as possible and shall match the pressure rating of the duct system.
- .2 Backdraft:

- .1 Backdraft dampers shall be installed in all relief air outlets and exhaust outlets except where motorized dampers are specified. Where relief of exhaust air outlets terminate in a roof hood the dampers shall be installed at the top of the roof hood curb frame.
- .2 Backdraft dampers shall be leaf-lite c/w neoprene tip.

3.6 FIRE DAMPERS

- .1 Fire dampers in walls to be firmly friction fitted to walls. Fire dampers in floor to be firmly friction fitted to floor. Install fire dampers only in positions for which they have been tested.
- .2 Fire Dampers and fusible links shall be tested and approved by ULC or other Testing Agency recognized by the authorities having jurisdiction.
- .3 Construction and arrangement of fire dampers shall be approved in each, prior to installation. Provide access door for replacement of fusible links.
- .4 Fire dampers shall be installed where directed by the local Building Inspection branch an/or the Fire Marshal and the Contractor shall be guided by the drawings as to location.

3.7 FANS

- .1 All fans to be base mounted or hung using spring vibration isolators.
- .2 Duct connections to be made using 101 mm (4") neoprene, each side of fan.
- .3 Fans mounted outdoors to be weatherproof.
- .4 Allow for drive change to obtain final air quantity.

PART 4 - SCHEDULES

TABLE 9 - GRILLES

Mark	Mfr.	Model	Core	Frame	Border	Blade	Fast	Finish	Remarks
SG-1	Price	520			N	L	A	B12	
R-1	Price		90		N	L	A	B12	

Remarks:

A Extend border. Anodized aluminium. Colour selection by Architect.

TABLE 10 – AIR HANDLING UNIT –GAS FIRED DX COOLING

Mark	AHU-1
Mfr.	Engineered Air
Model	FWA93/DJ40/0
CFM	6,500
Motor	10 Hp
ESP	2"
Top Discharge	✓
Bottom Return	✓
Powered Relief	✓
Mixed Air	✓
Make up Air	✓
Filter	
Summer Filter	✓
Summer/Winter Filter	✓
Heating	Natural Gas
% of O/A	46
Input	1,044,000
Output	900,000
Cooling Coil	36.5"H x 72"W 4 Row 12 FPI (Alternate) Velocity 354, Pressure Drop .41", LDBT: 60.3°F, LWBT: 59.1°F,
DX	✓
Chilled Water	X
Capacity	300.7 MBH
Compressors	4
Remarks	A, B

Remarks:

A Factory Authorized site start up. Control Panel is by the equipment supplier c/w all wiring diagrams..

- B** Contractor shall provide the services for all control wiring. All existing control panes/wiring that is associated with the unit being removed is to be removed also. The new make up air unit shall have it's own stand-alone control panel with the following features: Time clock, Occupied/Unoccupied setting, heating cooling set point, remote sensor with guard in space, filter alarm, each system light. Change control of existing exhaust fan to the same panel as the makeup air unit.

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