MECHANICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

1.1.1 The general conditions, drawings, supplementary conditions and Division 1 are a part of this section and the contract for this work and apply to this section as fully as if repeated hereia. This section, 15050, applies to all Division 15 categories, including but not limited to:

Section 15050 Mechanical General Requirements 15100 Meating Ventilating and Air Cenditioning 15150 Piping and Accessories

These Division 15 specifications and the accompanying drawings are intended to comprise the furnishing of all labor, and the furnishing and installing of all materials, equipment and supplies as specified herein and required for the satisfactory completion by the Contractor of all work pertaining to mechanical trades.

1.3 EXPLANATION AND REFERENCE OF DRAWINGS

1.3.1 The drawings and these specifications are complementary to each other in that all materials and equipment outlined in the drawings and/or specified herein shall be considered essential to the contract.

1.3.2 The specifications are intended to describe the quality and character of the materials, equipment and methods of installation. All miscellaneous items of work and materials necessary for the completion of the installation shall be provided, whether or not mentioned in the specifications or shown on the drawings.

1.1.3 Speco allocations, clearances, access, electrical data, structural supports, etc., on drawings, is for equipment models and sizes shown on plans and/or described in specifications. The Contractor shall be responsible for the coordination with other trades required in the use of equal or substitute equipment or materials and pay all difference in cost arising from such substitutions, regardless of approval.

1.3.4 Contractor shall review electrical drawings and specifications to assure all necessary electrical work is called for to accompany work under division 15. Nacessary electrical work shall incluie, but not limited to, starters, conduits, disconnects etc. Contractor shall netify the architect 10 days prior to the hid due date if any electrical work is needed to provide or assure a fully functional operating system for all work under division 15. Submittal of bid shall indicate that all necessary electrical work is shown or the contractor has allocated for the above requirements in the bid.

1.3.5 For purposes of clearness and legibility, drawings are essentially disgrammatic and, although size and location of equipment are drawn to scale wherever possible. Contractor shall make use of all data in all the contract documents and shall verify this information at building site.

1.4.1 All work and materials shall be in full accordance with the latest rules and regulations of the State Fire Marshal; the Safety Orders of the Division of Industrial Safety, California Administrative Code, Title 24; National Fire Protection Assoc.; National Electrical Code; Uniform Plumbing Code;

Uniform Mochanical Code; Uniform Building Code; Local Building Codes; and other applicable codes, laws or regulations of bodies lastfully empowered and having jurisdiction over this project. He requirement of these drawings or specifications is to be construed to permit work not conforming to these codes.

1.5 PERMITS AND PEES

1.5.1 This Contractor shall obtain all permits, patent rights and licenses that are required for the performing of his work by all laws, ordinances, rules and regulations, or orders of any office and/or body, shall give all notices necessary in connection therewith, and may all fees relating thereto and all costs and expenses incurred on account thereof.

1.6.1 Coordinate installation of all equipment, ductwork and plping with other trades prior to installation. Ensure that all fire dampets, control devices, manual values dampers, abut-off valves, etc. are accessible for maintenance. Where access panels in finished spaces, other than that above, contractor shall coordinate exact location of panels with architect prior to installation.

Coordinate routing of pipng with General Contractor and Architect. Contractor shall field verify existing conditions and points of connections. Contractor shall include all cost in the bid for coring, piping and everything necessary for a complete operating plumbing system and heating, ventilating and air conditioning system.

2.1 The specification of the mechanical products is detailed in the individual specification section of Division 15.

Air intakes/openings to be installed a minimum of 10 feet from all flue vents, plumbing vents, exhaust fans and exhaust air openings. 3.1 ACCESS DOORS AND PANELS

3.1.1 Wherever volume dampers, fire dampers, equipment, controls, valves or other items or parts of the installation which require periodic inspection maintenance or adjustment are concealed by permanent son-remuvable construction, an access panel shall be provided. Contractor shall allow for in his/her bid for access doors and panels whether they are shown on plans or not.

1.7.1 Contractor shall review all architectural drawings to determine the location of all fire rated structures. Contractor shall include in his/her bid all fire and/or smoke dampers, pipe bleeves or any other necessary items or materials needed to protect pipes or ducts passing through fire rated structures. Contractor shall include all necessary items or materials for fire protection weather shown on plans or not.

1.1 ACCESSIBILITY:

1.3.1 All equipment shall be installed so as to be accessible for maintenan , adjustments, manufactures and code requirements. Special atten on shall be given to motors, belts, air filters, manual valves and control valves, operating dampers, coils, etc. 3.4 NOISE AND VIBRATION:

14.1 It is the specific intent of the specification and design conditions that the entire system. Including equipment, air ducts, piping and all other parts, shall be free of excessive vibrations and transmission. If excessive vibration occurs in the building as a result of installation, it shall be the responsibility of the Contractor to correct these conditions at no cost to the owner.

3.5 VIBRATION ISOLATION:

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3.5.1 Rotating or reciprocating mechanical equipment shall be mounted on or suspended from spring vibration isolators to prevent vibration and structural borne noise transmission to the building. Unless otherwise noted, flexible duct cornectors shall be used between all fan openings and metal ducts or plenums, and flexible piping connectors shall be used between all rotating mechanical equipment and piping systems.

3.6 OPERATING INSTRUCTIONS AND SERVICE MANUALS

3.6.1 The Contractor shall carefully prepare five (5) operating instruction and service manuals for the entire system including all equipment, except Owner-furnished equipment.

3.7.1 All carthquake resistant designs for mechanical equipment, such as air handling units, blower motors and ductwork and plping, shall conform to Uniform Building Code (UBC) Chapter 23 "Earthquake Regulations".

Contractor shall be responsible for installation and anchorage of all mechanical equipment to conform to code seismic requirements.

3.8.1 All piping shall be secured by bracing at every fourth hanger transversely and every eighth hanger longitudinally. Bracing shall be done in accordance with the MPPA Code, and as described in paragraph "Sway Bracing for Protection Against Earthquakes," of that code.

3.8.2 The SMACNA "Guidelines for Seismic Restraints of Mechanical Systems" may be used as a guide.

3.9 IDENTIFICATION OF EQUIPMENT, PIPING, VALVES AND THERMOSTATS 3.9.1 Identify all mechanical equipment and thermostats shown on plans with nameplate bearing equipment name and number, using 1-1/2" white Bakelite with 1/2" black letters permanently mounted by screws in a conspicuous place on equipment and next to thermostats.

Each individual pipe line shall be marked for quick and casy identification in accordance with AMSI specifications as to content, direction of flow and character of material carried in the pipes by method of stenciling black letters and flow arrows on the colored background. Prefabricated pipe markers may be used in lieu of stenciling.

Markers shall be installed and spaced at not more that eight foot intervals and so located that two markers shall be visible where piping system is exposed.

SECTION 15100 NEATING, VENTILATING AND AIR CONDITIONING PART 1 - GENERAL

1.1.1 The general conditions, supplementary conditions and Division One are hereby made a part of this Section.

1.2.1 Furnish all labor, materials, equipment, appliances and necessary incidentals for the complete installation of all heating, ventilating and air conditioning systems as shown on the drawings and as specified herein. This is intended to describe, generally, the scope of work but shall not be considered as a lint of work to be performed under this contract. All work necessary for the complete operation of all systems with all fixtures and equipment shall be provided.

1.3 WORK INCLUDED

1.3.1 The work includes, but necessarily limited to:

- Duct work and Accessories.
 Fire Dampers.
 Air Distribution.
 Insulation.
 Equipment.
 Tost and Balance.

1.4.1 The applicable requirements from the following Sections, but limited to shall form a part of this section and the Contractor shall consult them in detail for general and specific requirements.

15050 General Requirementa 15150 Flying and Accessories

PART 2 - PRODUCTS

2.1.1 The Contractor shall furnish and install all sheet metal plenums and ductwork shown on plans (round rigid, square and rectangular); except where otherwise noted sheet metal shall be galvanized steel conforming to the requirements of Uniform Mechanical Code.

2.1.2 Construction, gauges and installation of ducts shall conform to Uniform Mechanical Code, unless more restrictive within this specification, and shall have smooth interiors and all seams, braces, stiffeners and hangers shall be on the outside. Cross crimp all rectangular ducts regardless of sire.

2.1.3 Soal all ductwork soams and joints with Versa Orip VG-102 duct sealant.

 $2.1.4\,$ Duct connections to mechanical equipment shall be made with canvas flex connectors.

2.1.5 All supply and return air plenlums and ducts exterior of the building shall be lined with duct liner insulation.

2.2.1 Flexible duct shall be factory fabricated assembly consisting of a galvanized spring steel wire helix, covered with a continuous non-perforated air scaled liner, wrapped with glass

fiber insulation, 1-1/2" thick (R = .25 @ 75 degrees F). All insulation material shall have a flame spread or not more than 25 and smoke developed rating of 50. The assembly shall be enclosed in a class 1 fire remistive vapor barrier jacket, factory soaled at both ends. Flexible duct shall be installed on the end of each duct at the air terminal device. Individual lengths of flexible duct shall be a maximum of seven feet long and shall include factory fabricated steel collars French (ACT Short and Section 23) TURNING VAMES

2.3.1 Turning vanes shall be installed in all right angle turns in rectangular or square ducts. Vanes shall be double thickness airfoil type, 1.5 inches apart on embossed vane runner.

2.4.1 Provide balancing volume dampers in each branch duct and in each main duct to provide for complete air balancing. All motorized dampers shall be opposed blade.

a. Install 1" wide X 12" long rod flourescent ribbon on all damper handles above celling. Ribbon shall be Allstate U-RFRI5 or approved equal.

2.4.2 Install all backdraft dampers in all outdoor air intakes and exhaust air ducts to allow air flow as shown on plans. 2.5 FIRE DAMPERS

2.5.1 Fire Daspers. Furnish and install approved Type "B" fusible link fire dampers in all ducts passing through fire walls, ceilings, floors, and required separations. Access doors shall be provided with approved steel sleeves.

Ceiling: California State Fire Marshal Listing No. 3225-295:101. Ruskin CFD5. Provide blankets.

- Mall: California State Fire Marshal Listing No. 3325:265:005. Ruskin IBD2.
- Fire smoke dampers. California State Fire Marshal Listing No. 3225-245:102 furnish and install in all ducts passing through fire rated corridor/hallway walls. Damper shall be Ruskin FSD 60 class.
- Access doors shall be provided with approved steel sleeves.

2.6 AIR DISTRIBUTION

2.6.1 Ceilings diffusers shall be perforated plate 24 x 24 lay in tee bar type and surface mounted with integral opposed blade volume control and removable and rearrangable multi-deflection core. Diffusers shall be Krueger Mf 1240P or approved equal. Finish to be baked white enamel.

2.6.2 Ceilings return, exhuast and relief registers shall be perforated plate tee bar type and surface mounted Krueger M#1190 or approved equal with integral opposed blade damper volume control. Finish shall be baked white enamed.

2.6.3 Supply registers shall be bar type Kruegar 5880H or approved equal blade damper. Finish to be baked white enamel. 2.6.4 Wall return, exhaust and relief registers shall be Kruegar S580M or approved equal with opposed blade damper. Finish to be baked white enamel. 2.6.5 Transfer grills shall be Krueger M#SBON or approved equal.

2.7.1 Liner shall be 1" thick comented to duct with MMM# EC-104 adhesive and mechanically fastened with adhered fasteners. Exposed edges shall be securely taped to prevent freying. Duct dimensions shown are not clear inside dimensions after liner has been installed. Fiberglass 1-1/2 lb. densisty, .26 R at 75 degrees P, matfaced duct liner shall be manufactured by Ownes-Corning C-S-G, Manuille or eugal. Flame spread, etc. to be same as wrapping below. Use 2" thick liner in all ducts installed exterior of the building.

2.7.2 Thermal duct wrap: All supply and return ductwork not specified to be lined shall be insulated with fiberglass blanket 3/4 lb. density with joints lapped not less than 1-1/2" secured with 916 soft galvanized iron wire spaced approximately 12" on centers. Ductwork insulation shall be 1" thick. Flame spread not over - 25, fuel contributed and smoke developed not over 50.

PART 3 - EXECUTION

3.1 SHEET METAL AND DUCTHORK INSTALLATION

3.1.1 All ductwork and plenums exposed to weather shall be sealed watertight. 3.2 TEST AND AIR SYSTEMS BALANCE:

3.2.1 General Requirements of Balancing Systems.

All work shall be done under direct supervision of a qualified independent test and balance contractor. Contractor shall be certified by Associated Air Balance Council (A.A.B.C.) or Batlonal Environmental Balancing Bursau (B.B.B.).) This Contractor shall balance, adjust and test the air moving equipment and air distribution, and exhaust systems as herein specified.

3.2.2 Upon completion of the air conditioning system, the air balance agency shall perform the following tests, complie the test data, and submit five copies of the complete certified test data to the owner for evaluation and approval.

3.2.3 Testing and Balancing Procedure: The air balance agency shall perform the following tests, and balance each system in accordance with the following requirements.

1. Test and adjust blower RPM design requirements.

2. Test and record moter load amperes.

3. Test and record system pressures, suction and discharge. Test and adjust system for design CFM of recirculating air.

5. Test and adjust system for design CFM of outside air. Tost and record untoring air temperature (D.B. Heating and Cooling).

7. Test and record entering air to: persture (W.B. Cooling). Test and record leaving air temperature (D.B. Heating and Cooling).

9. Test and record leaving air temperature (M.B. Cooling). 10. Adjust all main supply and roturn air duct to proper design CFN.

Test and adjust all diffusors and registers for design CFM.

12. Test exhaust fens for design CFM and motor amperage draw. 13. In cooperation with the centrol manufacturer's representative, set adjustment of automatically operated dampers to operate as specified, indicated and/or noted. Testing agency shall check all controls for proper calibrations and list all controls requiring adjustment by control installers.

14. As part of the work of this contract, the Air Conditioning Contractor shall make any changes in the pulleys, belts and dampers or the addition of dampers required for correct balance for all new and existing equipment as recommended by Air Balance Agency, at no additional charge to the Owner.

SECTION 15150 PIPING AND ACCESSORIES

PART 1 - GENERAL

1.1 GENERAL CONDITIONS:

1.1.1 The general conditions, supplementary conditions and Division One are hereby made a part of this Section.

1.2.1 Furnish all labor, materials, equipment, appliances and necessary incidentals for the complete installation of all heating, ventilating and air conditioning piping systems as shown on the drawings and as specified herein. This is intended to describe, generally, the scope of work but shall not be considered as a list of work to be performed under this contract. All work necessary for the complete operation of all systems with all fixtures and equipment shall be provided.

1.7 The work includes, but necessarily limited to:

Piping Valves Hangers and Supports Equipment Insulation

1.4 REFERENCE TO OTHER SECTIONS:

1.4.1 The applicable requirements from the following Sections, but limited to shall form a part of this section and the Contractor shall consult them in detail for general and specific requirements.

15050 General Requirements
15100 Heating, Ventilating and Air Conditioning

PART 2 - PRODUCTS

2.1.1 Hot Water Piping:

Piping 7" and smaller shall be type "L" copper tubing conforming to ASTM B88.

Piping 2-1/2" and larger shall be Schedule 40 black steel conforming to ASTM ASJ Grade A or B standard weight seamless.

Contractor may use type "L" copper on 2-1/2" and larger at his option.

2.1.2 Gas piping above grade shall be Schedule 40 ASTM A120 black steel pipe. 2.1.3 Condensate piping shall be hard drawn copper tubing type "M" or "DWV". 2.2 UNIONS:

2.2.1 Unions for copper tubing shall be solder joint end type. Provide Dielectric unions at piping connections of dissimilar

2.3.1 Heating Water Systems:

Piping in interior dry locations shall be insulated with 1-1/2" fiberglass Manville Micro-lok with AP-T jacket. Fittings shall be covered with Zeston PVC fittings. An intact vapor barrier shall be maintained on the entire system. Finish exposed insulation ends with 8 oz. canvas sized with Arabol.

Piping in exterior or wet locations shall be insulated as for dry locations and shall receive an additional aluminum jacketing for waterproofing. Jacketing shall be temovable at all valves and other items requiring periodic service.

Hot equipment: Armstrong 3/4" closed cell plastic insulation.

2.3.2 Condensate Lines: Insulation shall be AF Armaflex, Rubatex, Mansville Aerotube or approved equal flexible elastomeric thermal insulation black in color, supplied as unself tubing, in nominal 3/4" wall thicknesses expanded closed-cell structure. AF Armaflex Fipe Insulation shall have flame-spread rating of 25 or less and smoke-developed rating of 50 or less as tested by ASTM E 04.

2.4 METAL JACKETS:

2.4.1 Metal jarkets for piping, fittings, valves and other equipment in wet locations: .016" aluminum jacket, Manville "Metal-Lok" or approved equal.

2.5.1 Provide water treatment equipment and chemicals for flushing and prestart cleanup and feeding equipment for continued treatment and protection of the chilled water and heating hot water systems for one year. Chemical shall be as manufactured by Trident.

2.5.2 Closed hot water system: Preclean system with a thorough flushing followed by a high level startup with an industrial water treating (precleaning and prefilming) compound circulate water for a minimum of twenty four hours, dilute with pumps running until water is clear and neutral. Follow with a non chromate inhibitor which is designed for use in treatment of closed circulating water systems.

3.1.1 Support horizontal to impede disengagement by movement of supported pipe.

Distance Retween Hanger Rod Support (Feet) Diameter (inch) 1/2 thru 1 1-1/4 thru 1-1/2 2 & 2-1/2 3 & 4 3.1.2 Support pipes verically at every floor.

3.2 WATER SYSTEMS BALANCE:

General Requirements for Balancing Systems: All work shall be done under direct supervision of a qualified independent test and balance contractor affiliated with Associated Air Balance Council of National Environmental Balancing Bureau. This contractor shall balance, adjust and test the equipment as herein specified.

3.3 BALANCE REPORT:

3.3.1 Reports shall be completed in the format used by the Associated Air Balance Council with additional data provided as required herein. Five copies of the balance report shall be provided for review.

3.4 CIRCULATING WATER SYSTEMS BALANCE PROCEDURE:

3.4.1 Measure, record and adjust to design flows each of the following parameters for each system. After adjustment, reseasure format previously described. Identify each piece of equipment by the description on the plans, record menufacture and model number on all nameplate data.

Boilers and Other Heat Transfer Equipment:

Adjust flow to within +/-51 of the quantities specified. Measure and record the following:

a. Water pressure drop through unit. b. Water temperature in and out.

c. Water flow quantity. d. Settings of calibrated balance valves.

Adjust flow to within +/- 5% of the quantities specified by throttling at the triple duty value discharge side of the pump. Measure and record the following:

Suction and discharge head at miximum and minimum water flows of system.

b. Water flow quantities, maximum and minimum.

c. Motor amps and BHP at maximum and minimum flows. d. Settings of triple duty valve.

e. Balance organization shall include an extended warranty of 90 days after completion and acceptance resetting of any flow quantities or equipment. The organization shall provide technicians to assist the Market program

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