City of Portland, Maine - Building or Use Permit Application

389 Congress Street, 04101 Tel: (207) 874-8703, Fax: (207) 874-8716

PERMIT ISSUED
JUN 26 2001
CITY OF PORTLAND

Permit No:	Issue Date:	CBL:
01-0736	JUN 26 2001	219 A013001

Location of Construction:	Owner Name:	Owner Address:	Phone:
1685 Congress St	Dead River Stroudwater Llc	49 Atlantic Pl South Portland ME 04106	774-1531
Business Name:	**Contractor Name:**	**Contractor Address:**	**Phone**
n/a	Dead River Stoudwater LLC	49 Atlantic Place South Portland	2077741531
Lessee/Buyer's Name	**Phone:**	**Permit Type:**	**Zone:**
n/a	n/a	HVAC	

Past Use:	Proposed Use:	Permit Fee:	Cost of Work:	CEO District:
Single Family	Same: HVAC		$0.00	3

FIRE DEPT: ☑ Approved ☐ Denied

Signature:

INSPECTION: Use Group: B3 Type: 5B

BOCA/each./1993

Signature:

Proposed Project Description:
Install a Heating System

PEDESTRIAN ACTIVITIES DISTRICT (P.A.D.)

Action: ☐ Approved ☐ Approved w/Conditions ☐ Denied

Signature: Date:

Permit Taken By:	Date Applied For:
cih	06/21/2001

1. This permit application does not preclude the Applicant(s) from meeting applicable State and Federal Rules.
2. Building permits do not include plumbing, septic or electrical work.
3. Building permits are void if work is not started within six (6) months of the date of issuance. False information may invalidate a building permit and stop all work..

Zoning Approval

Special Zone or Reviews	Zoning Appeal	Historic Preservation
☐ Shoreland	☐ Variance	☐ Not in District or Landmark
☐ Wetland	☐ Miscellaneous	☐ Does Not Require Review
☐ Flood Zone	☐ Conditional Use	☐ Requires Review
☐ Subdivision	☐ Interpretation	☐ Approved
☐ Site Plan	☐ Approved	☐ Approved w/Conditions
Maj ☐ Minor ☐ MM ☐	☐ Denied	☐ Denied
Date:	Date:	Date:

CERTIFICATION

I hereby certify that I am the owner of record of the named property, or that the proposed work is authorized by the owner of record and that I have been authorized by the owner to make this application as his authorized agent and I agree to conform to all applicable laws of this jurisdiction. In addition, if a permit for work described in the application is issued, I certify that the code official's authorized representative shall have the authority to enter all areas covered by such permit at any reasonable hour to enforce the provision of the code(s) applicable to such permit.

SIGNATURE OF APPLICANT ADDRESS DATE PHONE

RESPONSIBLE PERSON IN CHARGE OF WORK, TITLE DATE PHONE

FILL IN AND SIGN WITH INK

APPLICATION FOR PERMIT
HEATING OR POWER EQUIPMENT

PERMIT ISSUED
JUN 26 2001
CITY OF PORTLAND

219-A-013

To the INSPECTOR OF BUILDINGS, PORTLAND, ME.

The undersigned hereby applies for a permit to install the following heating, cooking or power equipment in accordance with the Laws of Maine, the Building Code of the City of Portland, and the following specifications:

Location / CBL 1685 Congress St. Use of Building Comm./Rentals Date 6-21-01

Name and address of owner of appliance Dead River Stroudwater LLC
49 Atlantic Place, South Portland, ME

Installer's name and address Mechanical Services, Inc.
400 Presumpscot St, Portland Telephone 774-1531

Location of appliance:

- ☐ Basement
- ☐ Floor
- ☐ Attic
- ☑ Roof

Type of Fuel:

- ☒ Gas
- ☐ Oil
- ☐ Solid

Appliance Name: Trane

U.L. Approved ☐ Yes ☐ No

Will appliance be installed in accordance with the manufacture's installation instructions? ☒ Yes ☐ No

IF NO Explain:

The Type of License of Installer:

- ☐ Master Plumber #
- ☐ Solid Fuel #
- ☐ Oil #
- ☐ Gas # PNT 2372
- ☐ Other

Type of Chimney: N/A

- ☐ Masonry Lined
  Factory built
- ☐ Metal
  Factory Built U.L. Listing #
- ☐ Direct Vent
  Type UL#

Type of Fuel Tank NATURAL

- ☐ Oil
- ☐ Gas

Size of Tank

Number of Tanks

Distance from Tank to Center of Flame feet.

Cost of Work: $ 71,404.00

Permit Fee: $ 30.00

$30 ck 6/21

Approved

Fire: UHF

Ele.:

Bldg.:

Approved with Conditions

☐ See attached letter or requirement

Inspector's Signature Date Approved

Signature of Installer

White - Inspection Yellow - File Pink - Applicant's Gold - Assessor's Copy

Submittal

TRANE®

The Trane Company
A Division of American Standard Inc.

Engineer: AWM

Date: January 23, 2001

Prepared For:
Mechanical Services
400 Presumpscot Street
Portland, ME 04103
Customer P.O. Number: 01-0006001

Job Name:
Stroudwater Crossing
Trane Job Number: A2-15119

The Trane Company is pleased to provide the enclosed submittal for your review and approval.

Qty	Description	Tag(s)
	100% Outside Air Makeup Air Unit	
1	Trane Model FAUA450 100% Outside Air Rooftop Makeup Air Unit	AHU-1

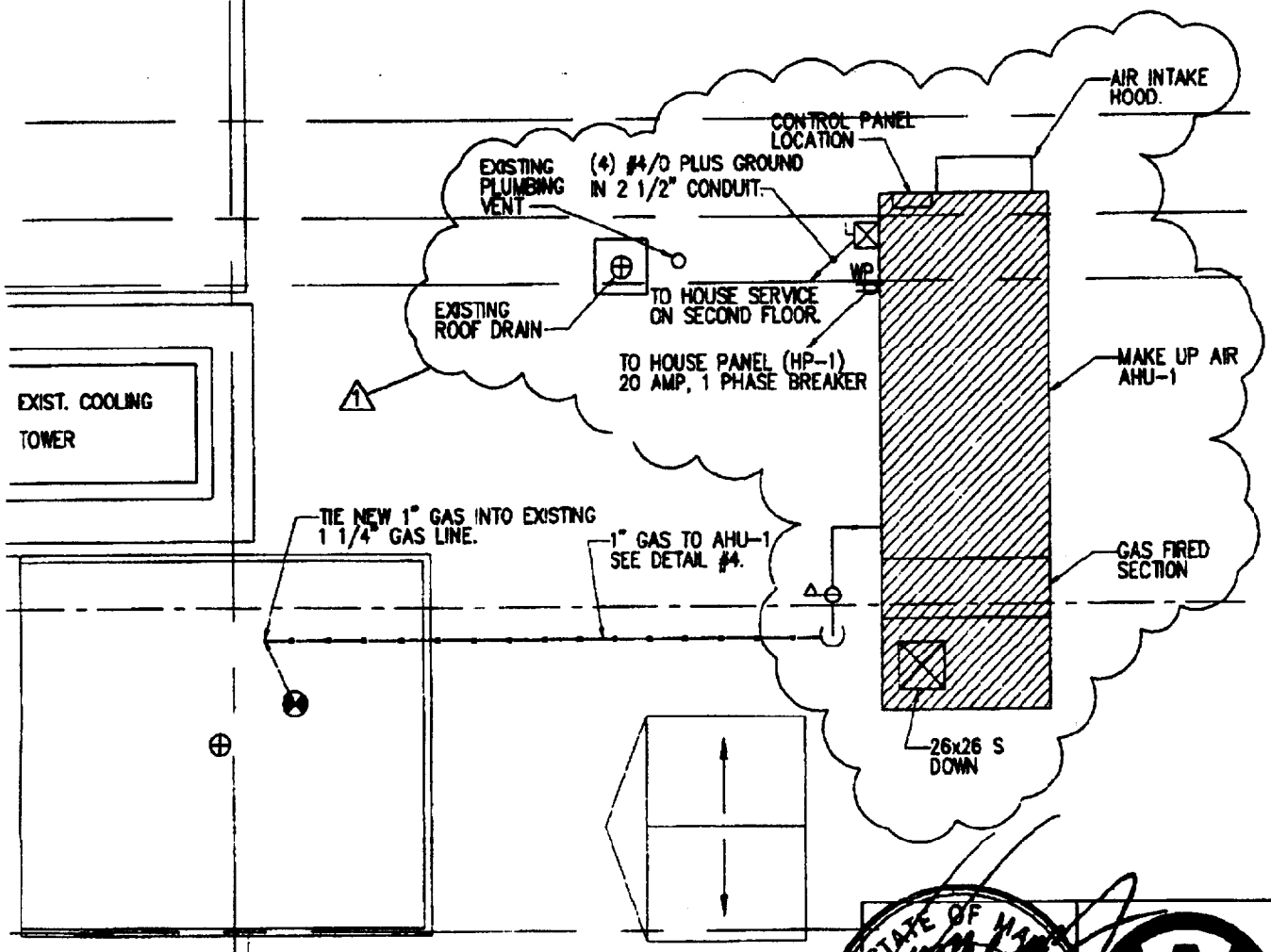
- 208v/3ph/60hz
- 4500cfm nominal size
- DX coil dehumidification system
- 500MBh input gas heat dual heaters
- Natural gas fuel type
- 409 stainless steel heat exchanger
- Two-stage intermittent pilot ignition
- Orifices for elevation 0 to 2000 feet
- Standard spring return intake air damper
- 7.5hp high efficiency fan motor
- 2" Farr 30/30 filters
- Hot gas reheat method

The attached information describes the equipment we propose to furnish for this project, and is submitted for your approval.

Portland, ME - Rick Heikkinen
30 Thomas Drive
WESTBROOK, ME 04092
Phone: 207-828-1777
Fax: 207-828-1511

GENERAL NOTES

1. FIELD VERIFY EXISTING CONDITIONS AND LOCATION OF NEW DUCTWORK IN THE WORK AREAS PRIOR TO BEGINNING ANY WORK. PROVIDE ALL RISES, DROPS, OFFSETS, ETC. AS REQUIRED TO AVOID ALL EXISTING LIGHTING, WIRING, STRUCTURE, PIPING, ETC.
2. ALL ITEMS ARE NEW UNLESS LABELED OR INDICATED AS EXISTING.
3. ALL OPENINGS IN WALLS, FLOORS AND CEILINGS RESULTING FROM THE INSTALLATION OF NEW EQUIPMENT ARE TO BE PATCHED OR REPLACED TO MATCH ADJACENT SURFACE.
4. MITERED DUCT ELBOWS SHALL BE CONSTRUCTED WITH FACTORY FABRICATED TURNING VANES AS INDICATED.
5. ALL DUCTWORK TO BE CONCEALED, EXCEPT IN JANITOR'S ROOM . ALL SUPPLY DUCTWORK TO BE EXTERNALLY INSULATED AND LINED 20FT FROM DICSHARGE OF UNIT .



REVISIONS

1 05-16-00 – RELOCATE AHU-1 AS SHOWN

STATE OF MAINE ROBERT W. MELASAUSKAS 3177 REGISTERED PROFESSIONAL ENGINEER

VENTILATION MODIFICATIONS TO
STROUDWATER CROSSING
1685 CONGRESS STREET
PORTLAND, MAINE

REVISIONS TO DRAWING M-4
ROOF PLAN - MECHANICAL

PROJECT NO:	SCALE:	DATE:	SHEET NO:
00-080	1/8"=1'-0"	05-16-00	SK2 of 2

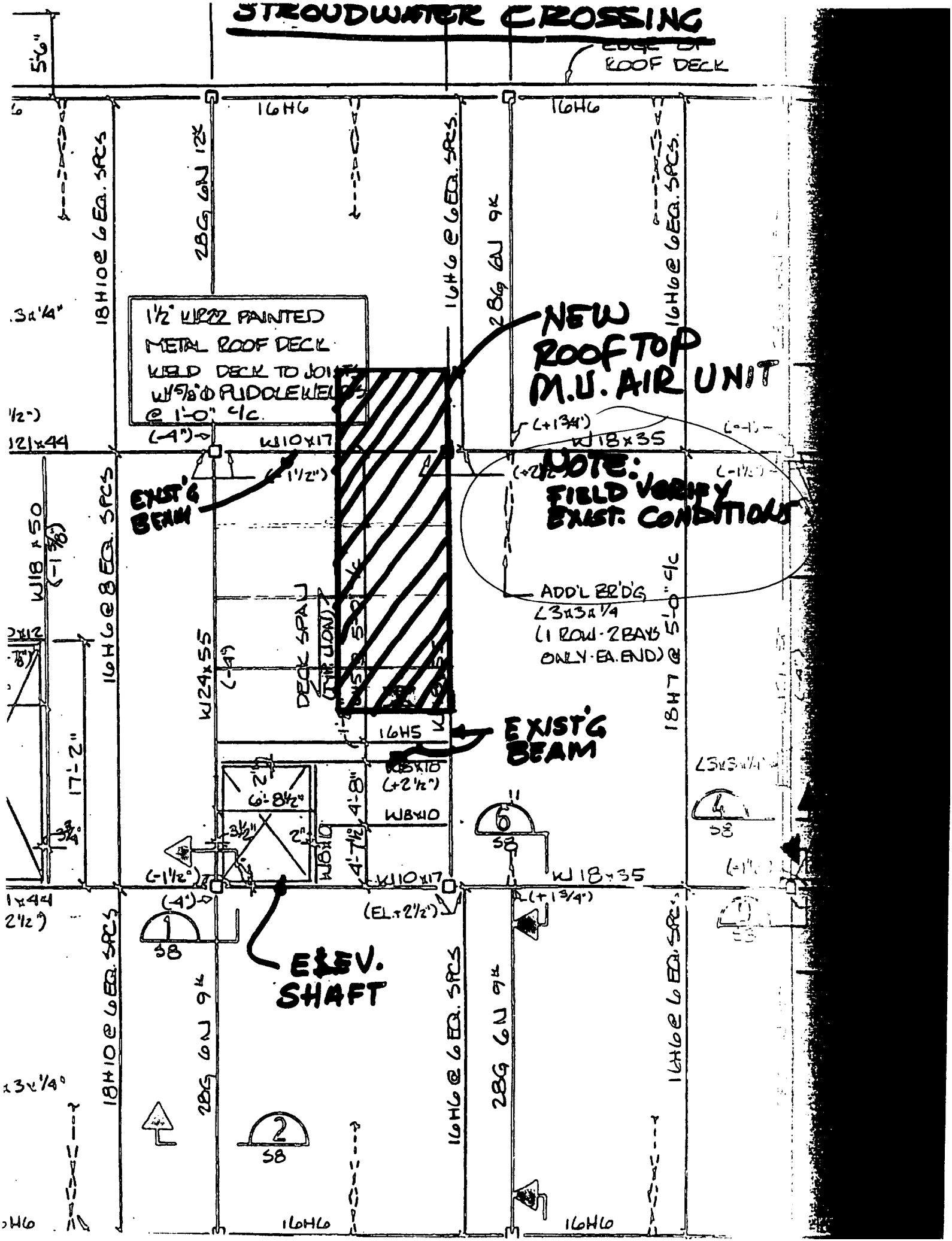
AWM engineering, inc.

CONSULTING ENGINEERS

Mechanical • Environmental • Construction Management

42 Main Street Gorham, Maine 04038

Telephone: (207)839-2167 • E-mail: stu@awmeng.com


STROUDWATER CROSSING
EDGE OF ROOF DECK
16HG
16HG
18H10@6EQ. SPCS.
28G 6N 12K
16HG@6EQ. SPCS.
28G 6N 9K
16HG@6EQ. SPCS.
1½" WIDE PAINTED METAL ROOF DECK WELD DECK TO JOISTS W/5/8" Ø PUDDLE WELDS @ 1'-0" c/c.
NEW ROOFTOP M.U. AIR UNIT
W10x17
W18x35
EXIST'G BEAM
NOTE: FIELD VERIFY EXIST. CONDITIONS
ADD'L BR'DG. L3x3x1/4 (1 ROW - 2 BAYS ONLY - EA. END) @ 5'-0" c/c
W18x50
W24x55
DECK SPAN
16HG@8EQ. SPCS.
18H7@6EQ. SPCS.
16H5
EXIST'G BEAM
W8x10
W8x10
W10x17
W18x35
ELEV. SHAFT
18H10@6EQ. SPCS.
28G 6N 9K
16HG@6EQ. SPCS.
28G 6N 9K
16HG@6EQ. SPCS.
16HG
16HG
S8
S8
S8
S8

Exterior Wall Alterations
Stroudwater Crossing
1685 Congress Street
Portland, Maine

May 15, 2000

PROJECT MANUAL

Wed 2pm

Owner:	Dead River Stroudwater LLC 49 Atlantic Place South Portland, Maine 04106
Construction Manager:	Northeast Building Consultants, Inc. P.O. Box 1095 Auburn, Maine 04211
Architect:	Thomas J. Spugnardi 187 Washington Street P.O. Box 776 Auburn, Maine 04212-0776
Engineer:	AWM Engineering, Inc. 42 Main Street Gorham, Maine 04038

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SECTION 15010 - BASIC MECHANICAL REQUIREMENTS

PART 1: GENERAL

1.01 WORK INCLUDED

A. The work of this section consists of furnishing all labor, equipment and materials, and performing all operations necessary to complete ventilation work in accordance with these specifications.

B. Work includes, but is not limited to:

1. Natural Gas Piping, Etc.
2. Gas Piping System Specialties.
3. Roof-top Make-up Air Unit.
4. Ductwork, Materials, and Specialties
5. Controls: (DDC)

1.02 GENERAL CONDITIONS

A. Related Documents: The General Conditions and other documents of the contract apply to the work specified in this section.

B. Guarantee: All work executed under this section shall be guaranteed for one (1) year as stated in the General Conditions.

C. Permits and Laws:

1. Obtain and pay for all required permits, inspections, licenses, etc.
2. Execute all work to conform to the requirements of all local, state and federal laws, regulations, etc., applicable to the work.

D. Drawings:

1. The general location of the apparatus and the details of the work are shown on the drawings, which form a part of this specification. Exact locations are to be determined at the building as the work progresses, and shall be subject to the Architect/Engineer's approval.
2. Anything shown on the drawings and not mentioned in the specifications, or vice versa, shall be furnished as if it were both shown and specified.
3. It is not intended that the drawings shall show every pipe, fitting, or appliance, but it shall be a requirement to furnish, without additional expense, all material and labor necessary to complete the system in accordance with the best practices of the trade.

E. Electrical Work:

1. Controls: Wiring, etc. for controls shall be under this division.

F. Equipment Requirements:

1. Installation Directions: Obtain manufacturer's printed installation directions to aid in properly executing work on all major pieces of equipment.

2. Objectionable Noise and Vibrations:

   a. Mechanical and electrical equipment shall operate without objectionable noise or vibration, as determined by the Engineer.

   b. If such objectionable noise or vibration should be produced and transmitted to occupied portions of the building by apparatus, piping, ducts, or by other part of mechanical and electrical work, make necessary changes and additions, as approved, without extra cost to the Owner.

3. Equipment Design and Installation:

   a. Uniformity: Unless otherwise specified, equipment or material of same type of classification, used for same purpose shall be the product of same manufacturer.

   b. Design: Equipment and accessories not specifically described or identified by manufacturer's catalog numbers shall be designed in conformity with ASHRAE, ASME, IEEE, or other applicable technical standards, suitable for maximum working pressure and shall have neat and finished appearance.

   c. Installation: Erect equipment in neat and workmanlike manner; align, level and adjust for satisfactory operation; install so that connecting and disconnecting of piping and accessories can be made readily, and so that all parts are easily accessible for inspection, operation, and maintenance and repair. Minor deviation for indicated arrangements may be made as approved.

   d. Welding: Before any welder performs any welding, submit a copy of the welder's certification as a certified welding mechanic. All welding shall be executed using the best practices of the trade.

4. Site Visit: The Contractor estimating and submitting a bid for the work covered by this section of the specifications shall visit the site, and view conditions as they exist prior to submission of a bid. The submission of a bid shall be taken as evidence that the bidder has examined the existing conditions and has satisfied himself as to the various requirements, obstacles and advantages of performing the work. No subsequent allowances will be made in this respect due to failure of the Contractor to meet the full requirements of this specification.

5. Protection of Equipment and Materials: Responsibility for care and protection of all materials and mechanical work rests with the Contractor at all times until the entire project has been completed, tested, and the project is accepted.

6. Foundations:

   a. Ceiling Mounting: Where ceiling mounting is indicated or specified, use suspended platform or strap hangers, bracket or shelf, whichever is most suitable for equipment and its location. Construct of structural steel members, steel plates, rods, as required, brace and fasten to building structure or to ensure as approved.

   b. Structural steel required to support equipment shall be furnished.

7. Shop Drawings: The Contractor shall, after the award of Contract, and before installation, submit for approval shop drawings and Owner's manuals and operating instructions of equipment to be furnished under this Contract. After shop drawings have been given final approval, three (3) copies of shop drawings shall be retained by the Architect/Engineer. The following items of equipment shall be submitted for approval:

   a. Gas Specialties.

   b. Roof Mounted Make-up Air Unit

   c. Fire Dampers, Volume Dampers, etc.

   d. Controls.

   e. Other equipment as the Architect/Engineer may require.

8. Substitutions:

   a. The bid shall be based on the materials or products as specified. Whenever in the specifications a particular article is specified by proprietary name, names, or "approved equal", the bidder shall base his bid on one of the above.

   b. Any materials or products not herein specified, but worthy of consideration shall be so noted in a separate letter attached to his Proposal Form, stating supplier, manufacturer or name and the amount to be added to or deducted from base bid and his reasons for the suggested substitution. He shall also assume the costs necessary for revision in other trades due to this substitution.

PART 2: PRODUCTS

2.01 ROOF TOP UNIT

A. General: Furnish and install, where indicated, roof top unit of sizes and capacities as scheduled on the drawings and as manufactured by Trane, McQuay or Carrier.

1. Summary: This Section includes the following:

   a. Rooftop air handling units.

   b. Roofcurbs.

2. Submittals:

   a. Product Data: Include rated capacities, furnished specialties, and accessories.

   b. Shop Drawings:

      1. Include plans, elevations, sections, details, and attachments to other Work. [redacted].

      2. Wiring Diagrams: Power, signal, and control wiring.

3. Quality Assurance:

   a. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration."

   b. Comply with AGA Z223.1 for gas-fired furnace section.

   c. Power supply to switches, fused switches, outlets, motor starters, to line terminals of equipment, and all related wiring and fuses to properly connect and operate all electrical equipment specified shall be furnished and installed under "ELECTRICAL" (Electrical Contractor). Coordinate all wiring between Mechanical and Electrical to provide a complete and operating system.

   d. NRCA Compliance: Roof curbs for roof-mounted equipment shall be constructed according to recommendations of NRCA.

4. Extra Materials: Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

   a. Filters: Furnish one installed and one spare set of each type of filter specified.

   c. Fan Belts: Furnish one installed and one spare set of belts for each belt-driven fan in energy recovery units.

B. Main Components and Features: Units shall be complete, including the following:

1. Rooftop Units, 7-1/2 to 35 Tons: Factory assembled and tested; designed for; and consisting of compressors, condensers, evaporator coils, condenser and evaporator fans, refrigeration and temperature controls, filters, and dampers.

   a. Casing: Manufacturer's standard construction with corrosion-protection coating and exterior finish, removable panels or access doors with neoprene gaskets for inspection and access to internal parts, minimum 1/2-inch-thick thermal insulation, knockouts for electrical and piping connections, exterior condensate drain connection, and lifting lugs.

b. Evaporator Fans: Forward curved, centrifugal, belt driven with adjustable and with permanently lubricated motor bearings.

c. Condenser Fans: Propeller type, directly driven with permanently lubricated motor bearings.

d. Refrigerant Coils: Aluminum-plate fin and seamless copper tube in galvanized steel casing with equalizing-type vertical distributor.

e. Compressors: Serviceable, semihermetic, or fully hermetic compressors with integral vibration isolators and crankcase heaters.

1. Safety Controls: Manual-reset type for low pressure, high pressure, and compressor motor overload protection.

2. Five year warranty on compressors.

f. Heat Exchangers: Manufacturer's standard construction for gas-fired heat exchangers and burners with the following controls:

1. Redundant, dual gas valves (2-stage heating) or modulating per drawing schedule.

2. Electronic-spark ignition system.

3. High-limit cutout.

4. Forced-draft proving switch.

g. Smoke Detectors: Photoelectric detector located in supply-air plenum, to de-energize unit. Detector shall be furnished and installed by Electrical Section.

h. Operating Controls: Factory-installed microprocessor controls and monitors unit and communicates and is controlled by Control Section of this Division for D.D.C..

1. Control Outputs: stage heating, and stage cooling; per drawing schedule and automatic or continuous fan operation.

2. Control Sensors: Fan airflow-proving switch, dirty-filter switch, discharge-air-temperature sensor.

2. Roof Curbs: Factory-fabricated 20 gauge galvanized bottom pan, lined with 2 layers of ¾" Armaflex listed for duct lining use. Duct opening shall be located as shown on the drawings and arranged for flexible type duct connections. Conform with other requirements indicated.

3. Motors:

a. Motor Construction: NEMA MG 1, general purpose, continuous duty, Design B.

b. Enclosure Type: Open, drip proof.

c. Shall be used with frequency drive speed controllers where scheduled.

C. Other Requirements:

1. Install units according to manufacturer's written instructions.

2. Install units level and plumb, maintaining manufacturer's recommended clearances.

3. Curb Support: Install roof curb on roof structure, level, according to NRCA's written installation instructions. Install and secure rooftop units on curbs and coordinate roof penetrations and flashing with roof construction. Locate curb for proper discharge of exhaust fans.

4. Unit Support: Install unit on structural curbs and level. Coordinate wall penetrations and flashing with wall construction.

5. Install piping to allow service and maintenance.

6. Gas Piping: Conform to applicable requirements of Section "Natural Gas Piping." Connect gas piping to burner, full size of gas train inlet, and provide union with sufficient clearance for burner removal and service.

7. Install ducts to termination in roof mounting frames. Where indicated, terminate air duct through roof structure and insulate space between roof and bottom of unit.

8. Electrical: Conform to applicable requirements in Electrical Sections.

9. Ground equipment.

a. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

2.02 DUCT ACCESSORIES

A. General: Provide and install all ductwork accessories of sizes and design as shown on the drawings or specified.

B. Main Components and Features:

1. Fire Dampers shall be factory fabricated with UL label equal to Air Balance, Inc., or approved equal.

2. Duct Insulation - (External): 1 1/2" - 3/4 lb. density fiberglass with FRK facing.

3. Flexible Connections shall be neoprene coated glass fabric with sewed seams equal to Vent Glass.

C. Other Requirements: See Part 3 - Execution for additional items.

2.03 NATURAL GAS PIPING AND ACCESSORIES

A. General: Provide all piping and accessories for a complete system.

B. Main Components and Features: Piping to handle natural gas shall be complete, including the following:

1. Above Ground Piping shall be schedule 40 carbon steel conforming to ASTM A106 or Type K, annealed, seamless copper tube complying with ASTM B88.

2. Fittings shall be malleable iron type on steel piping or on copper piping shall be copper, brass, or bronze with minimum 80 percent copper content where exposed to soil.

3. Valves 1/2" through 2" shall be conventional part, bronze or brass ball, screwed ends, bronze or brass body, teflon seat, lever handle, 400 lb. wog. ball valves.

PART 3: EXECUTION

3.01 SHEET METALWORK AND MATERIALS

A. General: Furnish and install all required sheet metalwork, including: manual dampers, fire dampers, turning vanes, deflectors, manual operators, collars, sleeves, baffles, acoustic linings, access doors, flexible connections, supports, etc., for the complete installation in accordance with the intent of the drawings and specifications.

1. Furnish and install all duct work connected to make-up air unit and other equipment furnished under these specifications.

B. Installation: Fabricate and install in accordance with applicable requirements of the ASHRAE Guide and SMACNA Manual. Ductwork shall conform to 2" SMACNA Pressure Class except where SMACNA requirements are exceeded by these specifications. Ductwork shall be neat, accurate, rigidly constructed and mechanically tight, as well as substantially airtight and shall provide quiet system of air transportation. Offsets of exposed ductwork shall be made on sides opposite to walls and ceilings, unless otherwise shown on the drawings or specified. Sizes, as marked on the drawings, shall be adhered to as closely as possible. The right is reserved to vary the size of ducts and flues to accommodate structural conditions during the progress of the work, without additional cost to the Owner.

C. Materials: Ductwork shall be of galvanized sheet metal or aluminum where indicated. Galvanized sheet metal shall be new copper bearing (or prime grade) galvanized steel sheets of lock-forming quality. Zinc coating that will flake or peel under any forming operation, or laminated sheets will not be allowed.

1. Thickness of metal for rectangular ducts, including elbows and other details, shall be as follows:

Longest Rectangular Dimension of Duct Inches	Thickness of Galvanized Steel USS Gauge	Thickness of Aluminum Alloy Inches

Up thru 12	26	.032
13 thru 30	24	.040
31 thru 54	22	.050

2. Thickness of metal for round ducts, including elbows and other details, shall be as follows.

Duct Diameter Inches	Galvanized Steel USS Gauge	Aluminum Inches
Up thru 10	26	.040
11 thru 20	24	.050

D. Construction: Seams, joints, bracing angles and stiffeners.

1. Longitudinal Seams: Longitudinal joints in ducts not exceeding 60" in either dimension, and ducts exceeding 60" in the larger dimension but not exceed 18" in the smaller dimension, shall be either Pittsburgh lockseams or grooved seams.

2. Round Ducts: The downstream end of each section of round duct shall be crimped and beaded. Assembly shall be made by inserting the crimped end into the upstream end of the adjoining section. The joints shall be fastened in place by three or more sheet metal screws spaced not over eight inches apart.

3. Transverse Joints and Bracing Angles of Rectangular Duct shall be as follows:

Duct Size Long Side Inches	Minimum Rigidity Class	Transverse Joints	Bracing Angles Size - Inches	Flat Bar
18 or less	A	Plain, "S" or Drive Slip	None	--------
19 thru 26	B	Standing Drive Slip Reinforced Drive Slip Reinforced Hemmed "S" Slip	3/4 x 3/4 x 1/8	1-1/2 x 1/8
27 thru 30	C	Standing Drive Slip Reinforced Drive Slip Reinforced Hemmed "S" Slip	3/4 x 3/4 x 1/8	1-1/2 x 1/8
31 thru 36	D	Reinforced Standing "S"	1 x 1 x 1/8	1-1/2 x 1/8
37 thru 48	E	Reinforced Standing "S	1-1/2 x 1-1/2 x 16 gauge	1-1/2 x 1/8

Alternative joint/reinforcement methods may be used, subject to approval by the Engineer, provided that the rigidity classification is met.

Lock type as described in SMACNA Low Velocity Duct Manual.

a. Transverse Joints: Drive slips shall be used on short sides of transverse duct joints if side is less than 18". Metal and thickness of S slips and drive slips shall be same as duct. Ends of drive slips shall be bent over at least 1/2" at corners. Bar slips shall be fastened with sheet metal screws on 12" centers. Corners of all bar slip joints shall be folded over and riveted. Where intermediate type reinforcements are used as supplements for joints, they shall be attached to duct wall within 3" of the joint.

b. Stiffeners: All ducts over 18" wide shall be provided with stiffeners which may be either transverse joints or angle bracing, as indicated above. The center-to-center spacing of stiffeners shall not be over four feet for ducts not exceeding 60" (long side) and shall not be over two feet for ducts not exceeding eight feet in any case. Flat area of uninsulated ducts over 18" wide shall be stiffened by cross-breaking. Uninsulated exposed ducts shall have flat bar reinforcement and flush seams in lieu of bracing angles and projecting seams.

c. Bracing Angles shall be of the same metal as the duct. Angles shall be riveted to the ducts on 6" centers, and shall be applied on all four sides. On vertical ducts, set of bracing angles shall be located with heel down at the floor line wherever duct passes through floor. End of two opposite angles shall extend as required to catch floor construction.

E. Duct Turns: Long radius elbows shall be provided, except as indicated hereinafter:

1. Long Radius Elbows shall be constructed with a throat radius equal to not less than the dimension to the duct width in the plane of the duct turn. Where space does not permit the use of a long radius elbow, vaned mitered elbows shall be provided.

2. Mitered Elbows: All mitered elbows shall be constructed with factory-fabricated, turning vanes equal to Barber-Colman "Ducturns".

F. Flexible Connections: Furnish and install flexible connections between all fans and ducts or casings where required to prevent excessive movement of long ducts and wherever ducts cross building expansion joints. Material shall be fabricated with sewed seams. Connections shall be approximately 4" long and installed with sufficient slack to prevent transmission of vibration.

G. Duct Hangers:

1. Ducts up to and including 20" in width shall be hung by 1" x 1/8" flat straps bent under bottom of duct a minimum of 2" and securely fastened to duct.

2. Ducts larger than 22" in width shall be hung using 3/8" steel rods and 1-1/2" x 1-1/2" x 1/4" angle trapeze hanger. Rods shall be supported by 2" x 2" x 1/4" minimum steel angles secured to two or more structural supports.

H. Fire Dampers shall be designed, constructed, located and installed in accordance with the standards of the National Board of Fire Underwriter's Bulletin 90A and applicable to local codes and ordinances. Fire dampers shall be where indicated on the drawings and include the following:

1. Damper frames shall be large enough so that there will be no obstruction to the air flow when the damper is open.

2. Each fire damper shall be constructed with steel blades and collars, fusible link and access door sized and located to adequately work on fusible links, chains and catches.

3. Fire dampers shall be located within a sleeve or frame of the same gauge as the fire damper, secured by perimeter angles on both sides of the openings through wall or floor.

4. All fire dampers shall be factory fabricated with UL labels.

I. Acoustic Lining and Insulation: Furnish and install Armstrong ½" thick closed cell elastomer sheet-liner or equal (Underwriter's Lab or Factory Mutual approval for interior of ductwork) or equal to the interior of ductwork as indicated and as called for on the drawings and specifications. Ductwork shall be enlarged unless otherwise noted where acoustic linings are installed so that the net inside area of the lined ductwork will not be less than the duct size indicated. Acoustic liner shall be applied to the flat sheet metal with adhesive. Provide stick fastener clips on 12" centers for additional support in ducts over 12" wide. Duct lining shall be where indicated on the drawings and as follows:

1. Supply air ductwork for air handling units as indicated on the drawings.

3.02 INSTALLATION OF GAS SYSTEM

A. General: Install gas systems complete according to these specifications and drawings.

B. Piping and Equipment:

1. General:

a. Install all piping promptly, capping or plugging all open ends and making pipe generally level and plumb, free from traps, and in a manner to conserve space for other work.

b. Inspect each piece of pipe, tubing, fittings, and equipment for defects and obstructions. Promptly remove all defective material from the job site.

c. All risers and off-sets shall be substantially supported.

d. The entire installation should conform to applicable NFPA requirements and local and state codes.

2. Joints and Connections:

a. Smoothly ream all cut pipe.

b. Pipe joints shall either be made with approved gas tubing fittings or be brazed with a material having a melting point in excess of 1000 degrees F. Brazing alloys shall not contain phosphorus.

C. Closing in Uninspected Work:

1. General: Do not cover up or enclose work until it has been properly and completely inspected and approved.

2. Noncompliance: Should any of the work be covered up or enclosed prior to all required inspections and approvals, uncover the work as required and, after it has been completed inspected and approved, make all repairs and replacements with such materials as are necessary to the approval of the Architect/Engineer and at no additional cost to the Owner.

D. Pressure Testing and Inspection:

1. General:

a. Prior to acceptance and initial operation, all piping installations shall be inspected and tested to determine that the materials, design, fabrication and installation practices comply with code requirements.

b. Inspection shall consist of visual examination, during or after manufacture, fabrication, assembly or pressure tests as appropriate.

c. In the event repairs or additions are made following the pressure test, the affected piping shall be retested, except that in the case of minor repairs or additions retest may be omitted, when precautionary measures are taken to assure sound construction.

d. Because it is sometimes necessary to divide a piping system into test sections and install test heads and other necessary appurtenances for testing, it is not required that the tie-in sections of pipe be pressure tested. Tie-in connections, however, shall be tested with soap solution after gas has been introduced and the pressure has been increased sufficiently to give some indications should leaks exist.

e. The test procedure used shall be capable of disclosing all leaks in the section being tested and shall be selected after giving due consideration to the volumetric content of the section and to its location.

f. A piping system may be tested as a complete unit or in sections as the construction progresses. Under no circumstances shall a valve in a line be used as a bulkhead between gas in one section of the piping system and test medium in an adjacent section, unless two valves are installed in series with a valved "telltale" located between these valves. A valve shall not be subject to the test pressure unless it can be determined that the valve, including the valve closing mechanism, is designed to safely withstand the test pressure.

g. Regulator and valve assemblies fabricated independently of the piping system in which they are to be installed may be tested with inert gas at the time of fabrication.

h. The piping system, after isolation, shall hold the test pressure, of not less than 1-1/2 times the proposed maximum working pressure, but not less

than 3 psig, for at least eight hours between times of first and last reading of pressure and temperature.

2. Test Medium: The test medium shall be air or inert gas (e.g., nitrogen, carbon dioxide). OXYGEN SHALL NEVER BE USED.

3. Test Preparation:

   a. Expansion joints shall be provided with temporary restraints, if required, for the additional thrust load under test.

   b. Equipment which is not to be included in the test shall be either disconnected from the piping or isolated by blanks, blind flanges or caps. Flanged joints at which blinds are inserted to blank off other equipment during the test need not be tested.

   c. When the piping system is connected to equipment or components designed for operating pressures of less than the test pressure, such equipment shall be isolated from the piping system by disconnecting them and capping the outlet(s).

   d. When the piping system is connected to equipment or components designed for operating pressures equal to or greater than the test pressures, such equipment shall be isolated from the piping system by closing their individual manual shutoff valve(s).

   e. All testing of piping systems shall be done with due regard for the safety of employees and the public during the test. Bulkheads, anchorage and bracing suitably designed to resist test pressures shall be installed if necessary. Prior to testing, the interior of the pipe shall be cleared of all foreign material.

4. Test Pressure Measurement:

   a. Pressure shall be measured with a manometer or an equivalent device so calibrated as to read in increments of not greater than one-tenth pound. The source of pressure shall be isolated before the pressure tests are made.

5. Detection of Leaks and Defects:

   a. The piping system shall withstand the test pressure specified without showing any evidence of leakage or other defects. Any reduction of test pressures as indicated by pressure gages shall be deemed to indicate the presence of a leak unless such reduction can be readily attributed to some other cause.

   b. The leakage shall be located by means of an approved combustible gas detector, soap and water, or an equivalent nonflammable solution, as applicable. Matches, candles, open flames, or other methods which could provide a source of ignition shall not be used. Caution: Since some leak test solutions, including soap and water, may cause corrosion or stress cracking, the piping shall be rinsed with water after testing, unless it has been determined the leak test solution is noncorrosive. When leakage or

other defects are located, the affected portion of the piping system shall be repaired or replaced and retested.

6. Test Records: Records shall be made of inspection and all tests performed. These records shall indicate which portions of the piping system conform to this code or were pressure tested.

7. Leakage Check After Gas Turn On:

a. Before Turning Gas On: Before gas is turned into a system of new gas piping, or back into an existing system after being shu system shall be checked to determine that there are nc ends and that all valves at outlets and equipment are c

b. Check for Leakage: Immediately after turning on the system shall be checked to ascertain that no gas is esc indicated, the gas supply shall be shut off until the nec been made.

c. Placing Equipment in Operation: Gas utilization equi placed in operation after the piping system has been t to be free of leakage and lines purged.

8. System Purging: After system has been pressure tested and bef operation, purge line in accordance with ANSI B31.2.

E. Cleaning: Prior to acceptance of the buildings, thoroughly clean all expc installation removing all labels and all traces of foreign substance, using o solution approved by the manufacturer of the item being careful to avoid all damage to finished surfaces.

3.03 CONTROLS

A. General:

1. The control system shall be DDC with equipment furnished and guaranteed by Air Handling Equipment Manufacturer.

2. The Contractor shall coordinate, provide, and install a complete system of control as herein specified, including all required controllers, relays, switches, etc., as indicated and required. Work includes, but is not limited to, the following:

a. Discharge Controller

b. Unit Mounted Control Panels

c. Wiring of Control Devices

d. Control Devices

e. Sequence of Operation

B. Equipment:

1. Unit Mounted Control Panels: Wherever three or more manual switches, relays, controllers, or other control devices (not including duct-mounted instruments) are required for a ventilating unit or system, such devices shall be grouped and mounted in a control panel. Panels shall be made of enameled steel. Panels shall be secured to walls or unit casings with sufficient space in the rear of the access to wiring, etc.

C. Execution:

1. Wiring: Under this section provide and install all wiring associated with the temperature control system. Equipment and wiring not provided under Electrical sections shall be furnished and mounted under this section.

   a. Low voltage wiring (24V) shall be No. 16 minimum and run in cable enclosure; Wiremold or approved equal.

   b. Line voltage wiring (120V or higher) shall be No. 12 minimum and run in conduit.

   c. All wiring shall be in accordance to Electrical Section.

2. Description Operation – Air Handling Unit:

   a. Occupied Cycle

      1. Unit shall run continuously.

      2. Fresh air damper shall open to its maximum position (40%) when unit is energized.

      3. Discharge air control shall maintain set point of 70° (adjustable).

      4. A low limit discharge air control shall be set to 55° F.

   b. Unoccupied Cycle:

      1. Unit shall be off and fresh air damper shall remain in the closed position.

D. Completion:

1. Guarantee: The entire system shall be complete in every respect and guaranteed by the Contractor against original defects in workmanship or materials for a period of one year from date of final certificate, to control all valves so as to maintain temperature within one degree above or below any desired point. The Contractor shall maintain the equipment in perfect working order for the guarantee period without additional charge.

2. Instruction and Adjustment: On completion of the job, the Contractor shall completely adjust, ready for use, all controls, and relays provided under his contract. The Contractor shall provide a complete instruction manual covering the

function and operation of all control components on the job and schematic control diagram. This manual shall be furnished to the Owner's operating personnel, and a competent technician shall be provided for instruction purposes. Submit shop drawing for approval before start of installation.

3.09 JOB CLOSING

A. Operating and Performance Tests:

1. Prior to the final inspection perform required tests and submit the test reports and records.

B. Air System:

1. All controls should be checked out by the Contractor and be operating correctly prior to start-up of the system. Final set points and adjustments may be made during or after the balancing. All lubrication, electrical connections, air filters, etc., necessary for proper operation of the system shall be completed prior to start-up of the system.

2. Upon start-up of a system, check fan for the following and record readings as indicated.

a. Check fan drives for rotation and slippage and record fan rpm.

b. Measure and record voltage and actual amperage draw on each phase leg. Determine that motor is not overloaded.

c. Take all necessary airflow or pressure measurements to determine air quantities in ducts and outlets. Make all adjustments necessary to proportion the airflow correctly. Make final adjustments to fan drives to establish correct total airflow.

d. Take final readings and record the following data:

1) Fan rpm, voltage, amperage draw on each phase leg, and calculated BHP all fans, outlets, etc.

e. Submit for approval all initial and final readings as specified. Compare measured readings to design quantities and note deviation.

C. Cleaning:

1. After satisfactory completion of pressure tests, before permanently connecting equipment, strainers, and the like, clean equipment thoroughly, blow and flush piping for a sufficient length of time as directed, so that interiors will be free of foreign matter.

2. The entire system installations including apparatus, motors, etc., shall be left in first-class condition including cleaning, oiling and packing.

D. Instruction and Charts: After completion of the installation work called for in this specification, the Contractor and his Subcontractors shall furnish necessary mechanics or

engineers for the adjustment and operation of the systems, to the end that the systems may be perfectly adjusted and turned over to the Owner in perfect working order. The Contractor shall further instruct the Owner's authorized representative in the care and operation of the installation, providing all required framed instruction charts, directions, etc.

E. Painting:

1. All exposed ironwork, including steel supports, hangers, etc., shall be painted two (2) coats of machine gray or equal.

2. Painting specifically noted on equipment.

F. Nameplates: Furnish and install DYMO, or approved equal, embossed vinyl-plastic nameplates, with white letters on black background to identify equipment, controls, etc., furnished under this section of the specifications.

END OF SECTION