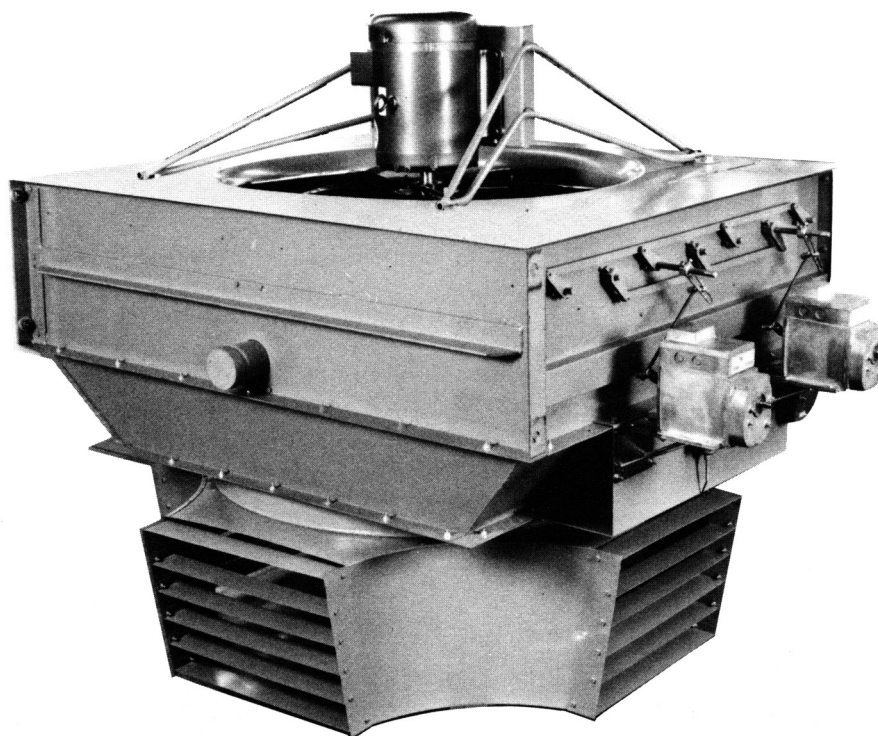



**MESTEK, INC.**

# INSTALLATION, OPERATION & MAINTENANCE MANUAL

## MESTEK COMBUSTION AIR SUPPLY UNIT

### Steam & Hot Water



#### INDEX

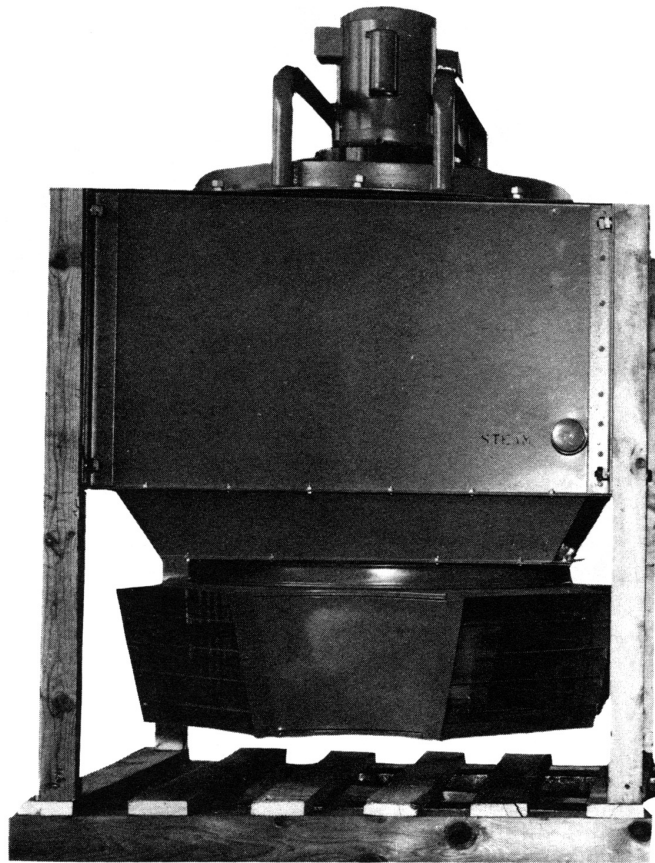
	Subject	Page No.
I.	RECEIVING YOUR MESTEK CAS HEATER.....	2
II.	UNCRATING YOUR MESTEK CAS HEATER.....	2
III.	INSPECTING YOUR MESTEK CAS HEATER.....	2
IV.	ASSEMBLY OF YOUR MESTEK CAS HEATER.....	3
V.	LIFTING HEATER INTO MOUNTING POSITION.....	4
VI.	SUGGESTED METHODS FOR SUPPORTING HEATER.....	5
VII.	CONTROLS.....	6
VIII.	PIPING.....	10
IX.	START-UP PROCEDURE.....	12
X.	OPERATION.....	12
XI.	SHUT-DOWN PROCEDURE.....	13
XII.	MAINTENANCE.....	13
XIII.	EMERGENCY REPAIRS.....	13
XIV.	SPARE PARTS DRAWING.....	16

# I. RECEIVING YOUR MESTEK GAS HEATER

- A. Units have been factory crated for safe shipment. However, **damage to the unit may occur in transit. Check unit carefully and if damage is obvious, report it at once to the transportation company.**
- B. Accessories, such as thermostats, starters, etc., may be shipped separately.
- C. All claims must be made within (5) days of receipt of shipment.

# II. UNCRATING YOUR MESTEK GAS HEATER

- A. Vertical heaters are shipped on "stilts".
- B. Do not remove wooden stilts (shipping legs) or skid when uncrating except on units where discharges are shipped separately. (See page 3.)



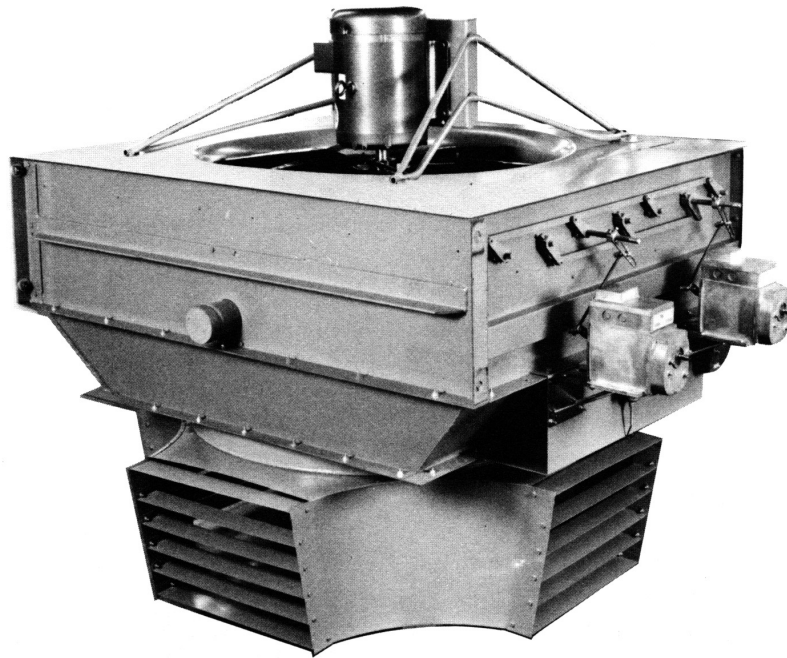
# III. INSPECTING YOUR MESTEK GAS HEATER

- A. Check unit nameplate to be sure that the capacity is correct, and that it is designed for use with available steam pressure or hot water temperature.
- B. Check motor nameplate for voltage, cycles and phase.

**NOTE: If discrepancies exist, contact your local representative.**

# IV. ASSEMBLY OF YOUR MESTEK GAS HEATER

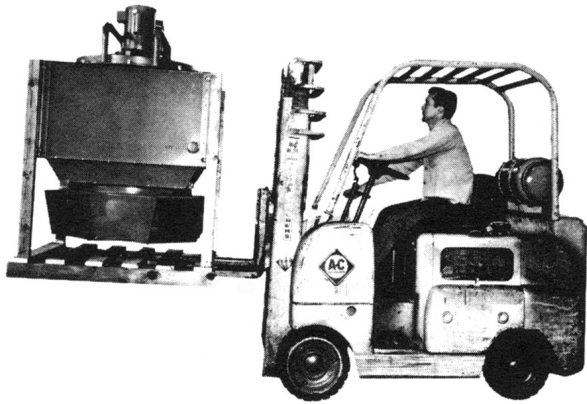
- A. Accessory items such as filter boxes, intake hoods, intake louvers and curbs are shipped separately.
- B. Base units and accessories are shipped completely assembled where shipping limitations allow. Any optional accessory shipped separately are shipped as assembled sections.
- C. On models where shipping limitations require the discharge section to be shipped separately, the discharge must be fastened to the casing as follows:
  - 1. Units furnished with revolving discharges have the discharge drive assembly mounted to the discharge transition flange. **The complete discharge drive assembly must be removed prior to mounting the discharge to the unit.** The discharge drive is to be replaced, as originally positioned, after discharge is mounted.
  - 2. **Remove skid.**
  - 3. **Lift unit a sufficient amount to allow discharge clearance.**
  - 4. **Fasten discharge plate to transition flange using cap screws and nuts shipped in cloth bag with unit.**



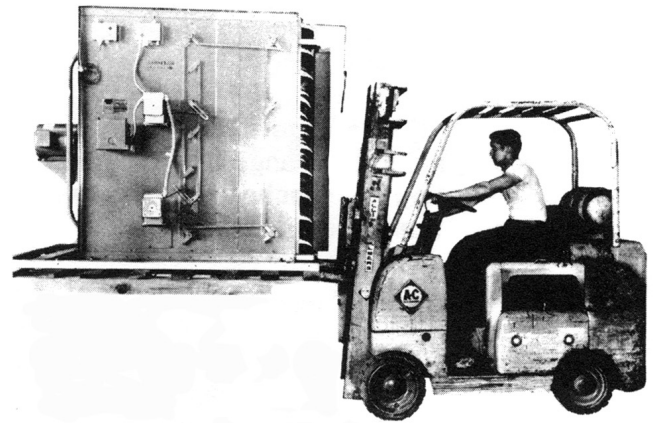
**NOTE:** Units provided with fan units arranged **for roof curb mounting** are shipped with fan assembly secured to the heater casing flange with eight bolts for shipping convenience. **Remove fan assembly from heater and install in roof curb.**

Mounting controls- See instruction VII, Page 6.

## V. LIFTING HEATER INTO MOUNTING POSITION

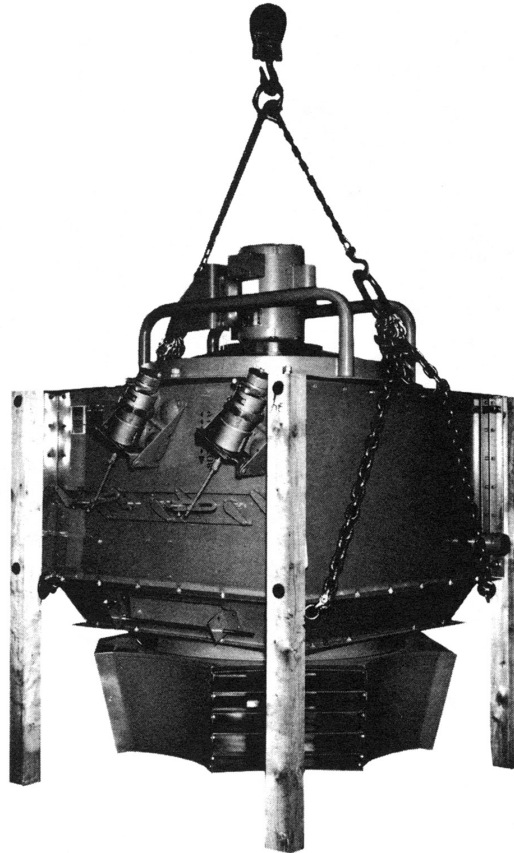


CAS-HC



CAS-U

For low mounting heights, heater may be raised into position by use of a fork lift truck.

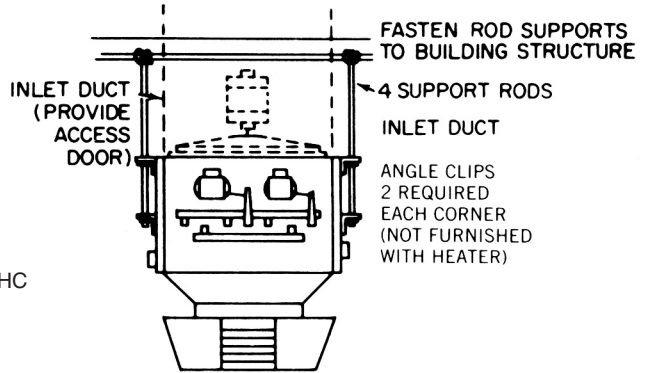
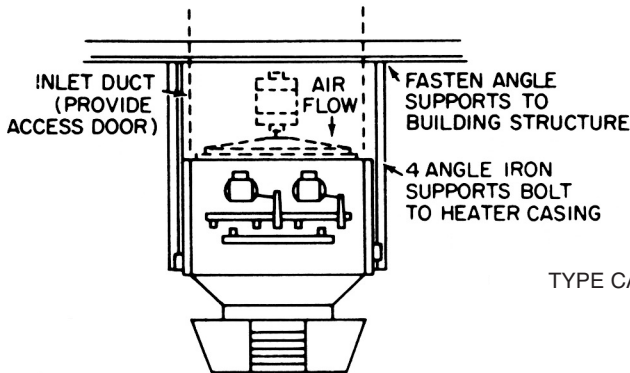
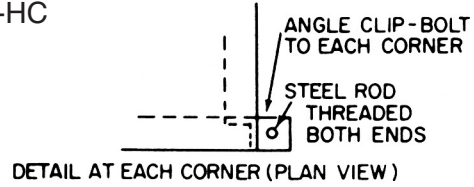
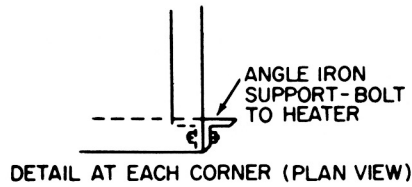


For high mounting heights a double sling, block and tackle or crane should be used.

**CAUTION: Do not lift unit by Motor Support.**

# VI. SUGGESTED METHODS FOR SUPPORTING HEATER

TYPE CAS-HC



TYPE CAS-HC

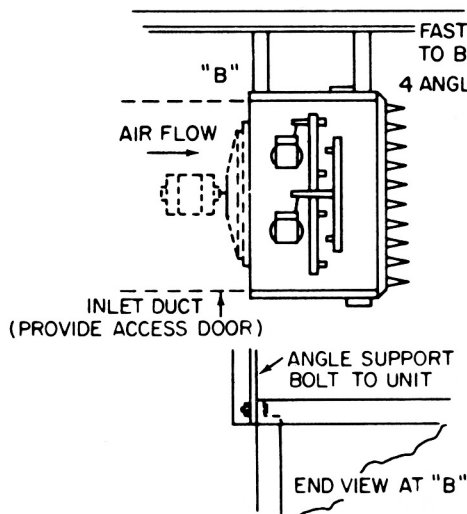
ANGLE IRON SUPPORTS  
 1 1/2" X 1 1/2" X 1/8" ANGLES - UP TO SIZE 24  
 2" X 2" X 1/4" ANGLES - SIZE 25 THRU 44

ROD SUPPORTS  
 1/2" DIA. RODS - UP TO SIZE 26  
 5/8" DIA. RODS - SIZES 28 THRU 44

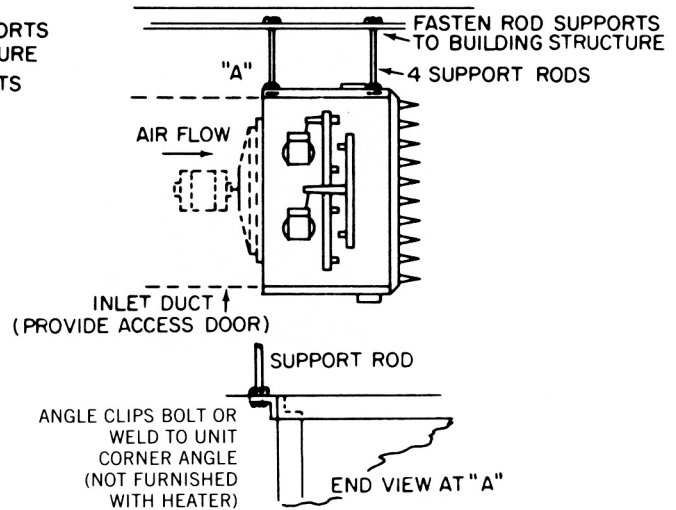
**NOTE:** Do not pitch casing on installation. Casing must be installed level. Tubes are pitched in casing for proper drainage. Set casing level with spirit level. Do not level by measuring from building structure.

Vibration isolators not required.

TYPE CAS-U

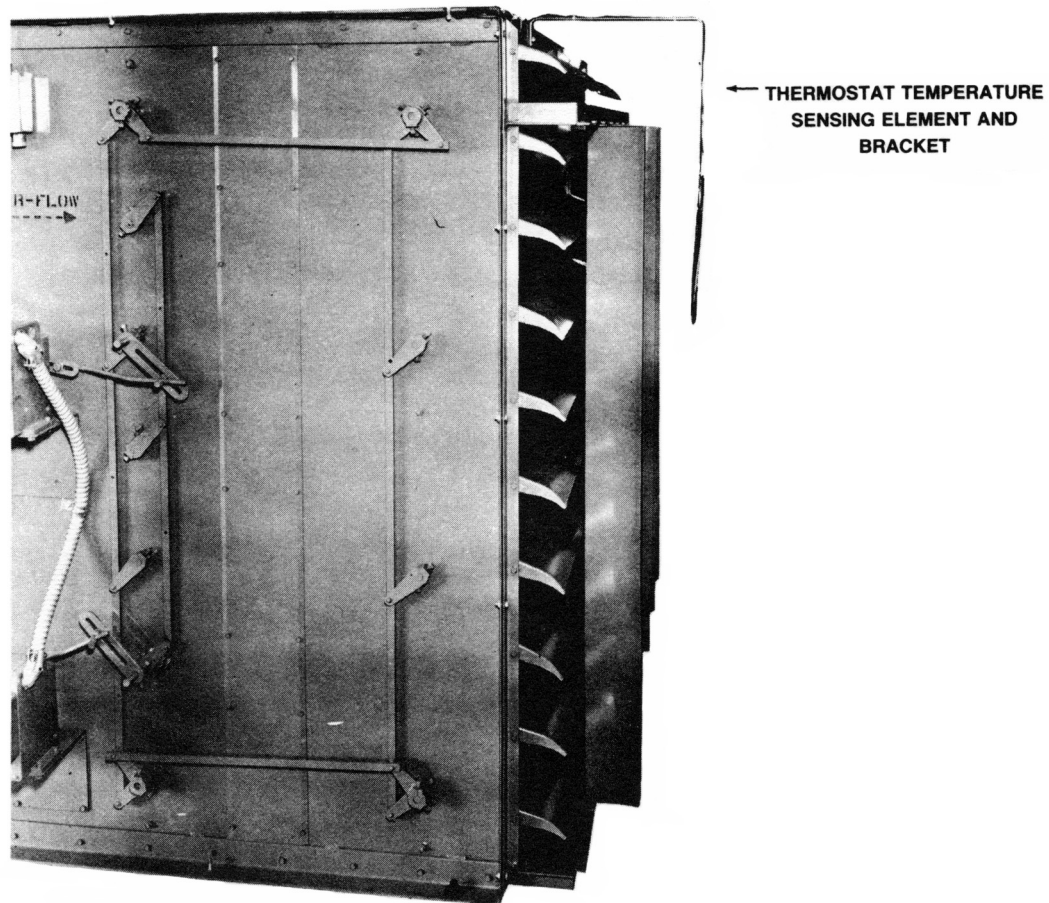


TYPE CAS-U

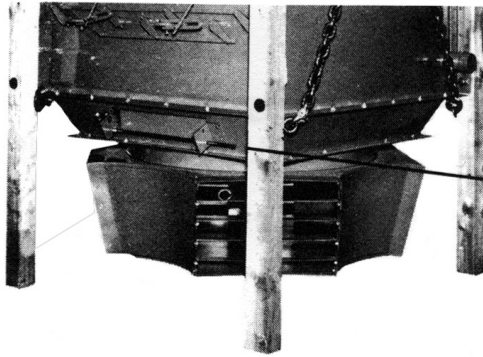


## VII. CONTROLS

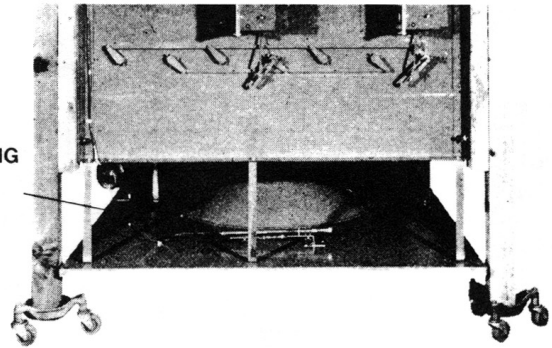
- A. Electric Airstream Controls are factory wired and mounted. The discharge sensing element is also factory wired.
- B. Electric Room and Low-limit Controls are factory mounted and wired with exception of the room thermostat. The room thermostat is shipped separately for mounting in the space being served. The low-limit thermostat is also factory mounted and wired.
- C. Pneumatic controls are shipped with damper motor mounted. Airstream Thermostats are shipped mounted except on CAS-U units. All other components are shipped separately for field mounting, piping and wiring by installer.



- D. The bulbs for CAS-HC units are factory mounted in a slot in the discharge transition as pictured on page 7. Units furnished with plate discharge are not provided with a transition and the bulbs are secured to the discharge plate.



THERMOSTAT SENSING  
BULB



**CAS-HC WITH DISCHARGE TRANSITION**

**CAS-HC WITH PLATE DISCHARGE**

**E. Two damper motor operation.**

Two separate sets of linkage are provided. One set controls all face dampers; the other, all by-pass dampers. Both face and by-pass dampers are to assume a closed position when motors are de-energized.

1. Two damper motor, discharge airstream control- the primary control is a proportioning airstream thermostat sensing discharge air. When maximum temperature rise is required, dampers in the coil passage are opened fully and the by-pass dampers fully closed. For less temperature rise, by-pass dampers open until positioned to allow the desired temperature rise. If, after the by-pass dampers are full open, and a lesser temperature rise is still required, the face dampers begin to close until desired temperature is reached.
2. Two damper motor, room and low limit control- the primary control is a proportioning room thermostat located in the space served. Basic damper sequencing is the same as "E.1." above except a proportioning low-limit thermostat is introduced to control discharge air temperature to a pre-set minimum.

**F. One damper motor operation. (optional)**

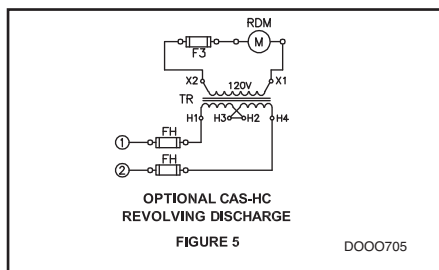
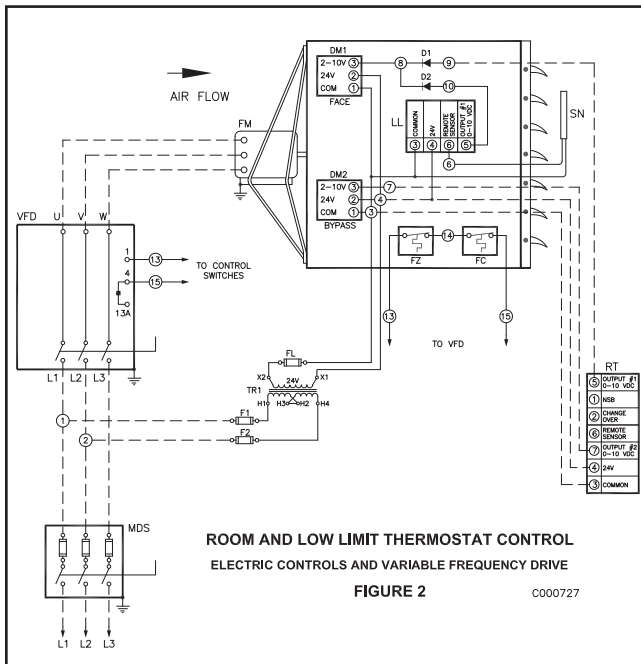
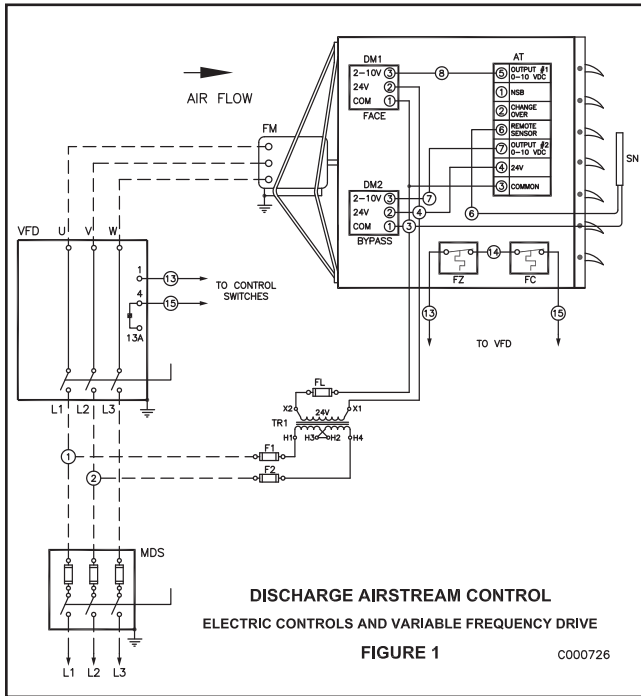
Face dampers are mechanically linked, 90 deg. opposed to by-pass dampers. Face dampers to fully close and by-pass fully open when motor is de-energized.

One damper motor, airstream or room and low limit control- Same as E-1 and E-2 above for specific control arrangements except when by-pass dampers open, face dampers close an equal amount. Conversely, as face dampers open, by-pass dampers close.

**G. Optional Protection Controls.**

Aquastats, pressuretrols, fan cut-off thermostats, etc., can be incorporated in the control system. These devices shut down fan operation in the event of steam pressure or hot water flow failure.

If mixing box or special controls are provided, see submittal drawings or wiring diagrams.



## STANDARD ELECTRIC CONTROLS

AT AIRSTREAM THERMOSTAT

DM1 FACE DAMPER MOTOR

DM2 BYPASS DAMPER MOTOR

F1, F2 FUSE

F3 FUSE-REVOLVING DISCHARGE MOTOR

FC FAN CUT-OFF THERMOSTAT

FH FUSE

FL FUSE

FZ FREEZESTAT

LL LOW LIMIT THERMOSTAT

MDS FUSED MAIN DISCONNECT SWITCH

MS MOTOR STARTER

RDM REVOLVING DISCHARGE MOTOR

RT ROOM THERMOSTAT

SN AIR DISCHARGE SENSOR

TP1 PRESSURETROL

TA1 AQUASTAT

TR1 24 VOLT TRANSFORMER

TR 120 VOLT TRANSFORMER

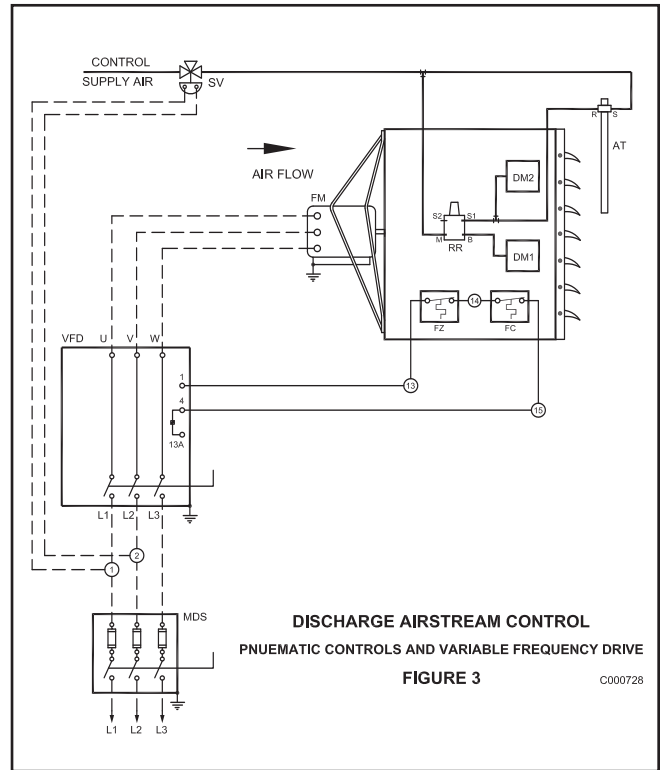
## NOTES:

1. PRESSURETROL IS TO BE LOCATED IN STEAM SUPPLY LINE. (OPTIONAL)
2. AQUASTAT BULB IS TO BE LOCATED IN HOT WATER SUPPLY LINE. (OPTIONAL)
3. FAN CUT-OFF THERMOSTAT BULB IS LOCATED ON DOWNSTREAM SIDE OF HEATING COILS. (OPTIONAL)
4. FREEZESTAT IS CAPILLARY TYPE WITH SENSOR STRAPPED TO FINS OF HEATING COIL. (OPTIONAL)
5. THE PRESSURETROL, AQUASTAT, FREEZESTAT AND FAN CUT-OFF THERMOSTAT ALL FUNCTION TO DE-ENERGIZE THE FAN AND THE DAMPER MOTORS. ALL DAMPERS GO TO THE CLOSED POSITION.
6. CONTROLS SHOWN ARE FOR "U" TYPE HEATER; HOWEVER, CONTROLS FOR "HC" TYPE ARE IDENTICAL.



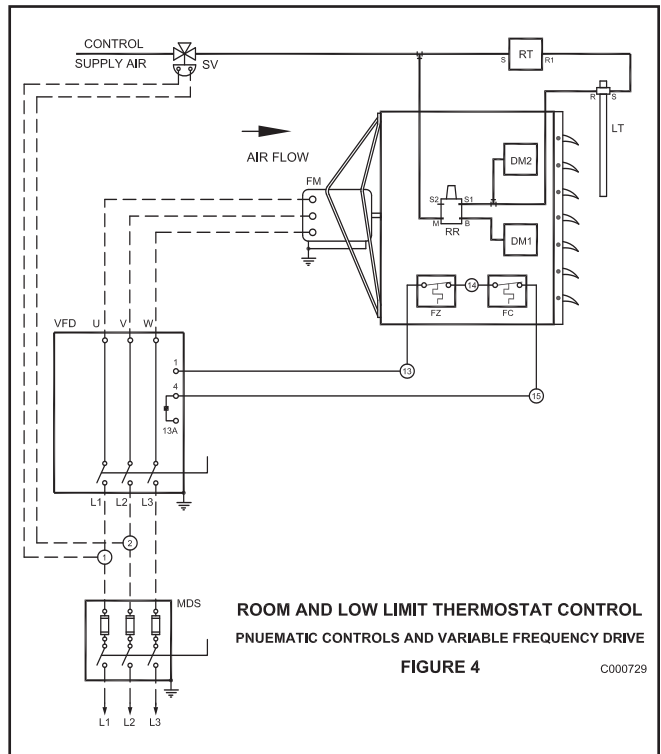
**STANDARD PNEUMATIC CONTROLS**

- AT      AIRSTREAM THERMOSTAT
  
- DM1    FACE DAMPER MOTOR
- DM2    BYPASS DAMPER MOTOR
  
- F3      FUSE-REVOLVING DISCHARGE MOTOR
- FC      FAN CUT-OFF THERMOSTAT
- FH      FUSE
- FL      FUSE
- FZ      FREEZESTAT
  
- LL      LOW LIMIT THERMOSTAT
  
- MDS    FUSED MAIN DISCONNECT SWITCH
- MS    MOTOR STARTER
  
- RDM    REVOLVING DISCHARGE MOTOR
- RT      ROOM THERMOSTAT
  
- TP1    PRESSURETROL
- TA1    AQUASTAT
- TR      120 VOLT TRANSFORMER



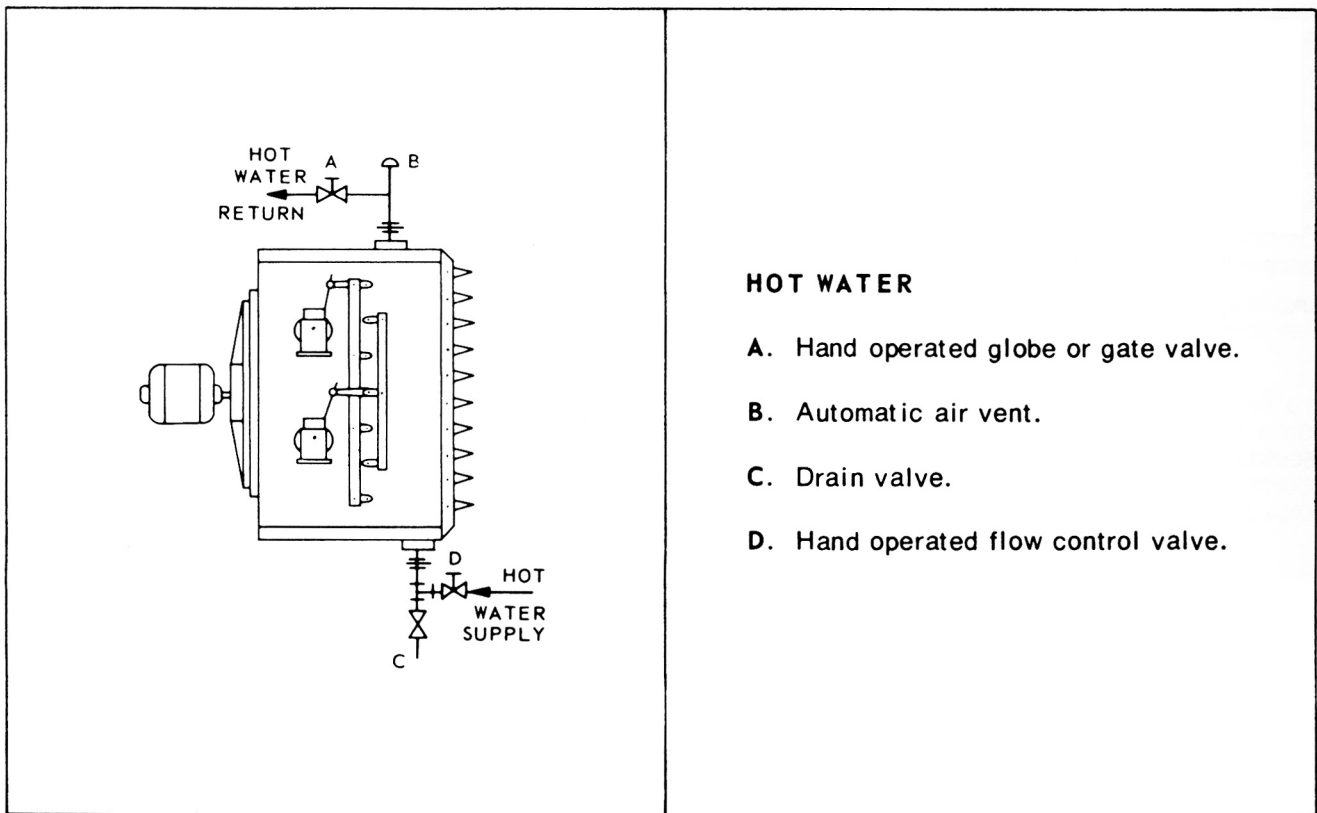
8. FAN MOTOR, MAGNETIC STARTER AND MAIN DISCONNECT SWITCH ARE SELECTED ACCORDING TO HEATER SIZE AND WHETHER EXPLOSION PROOF EQUIPMENT IS REQUIRED.
9. MAGNETIC STARTER TO HAVE INTEGRAL 120V CONTROL TRANSFORMER.
10. AT, LT, AND RT BULBS TO BE MOUNTED BY FACTORY WHERE FEASIBLE OTHERWISE CUSTOMER TO MOUNT ON BRACKET FURNISHED BY FACTORY. TP1 AND TA TO BE MOUNTED BY CUSTOMER.
11. ALL PNEUMATIC PIPING AND WIRING IS BY INSTALLER.
12. MIXING BOX OR OTHER SPECIAL CONTROLS WILL BE SHOWN ON SUBMITTAL WIRING DIAGRAMS.

---FIELD WIRING BY INSTALLER  
 \_\_\_FACTORY WIRED  
 - - -PNEUMATIC PIPING BY INSTALLER  
 \*NOT SUPPLIED BY FACTORY UNLESS REQUESTED  
 \*\*OPTIONAL EQUIPMENT



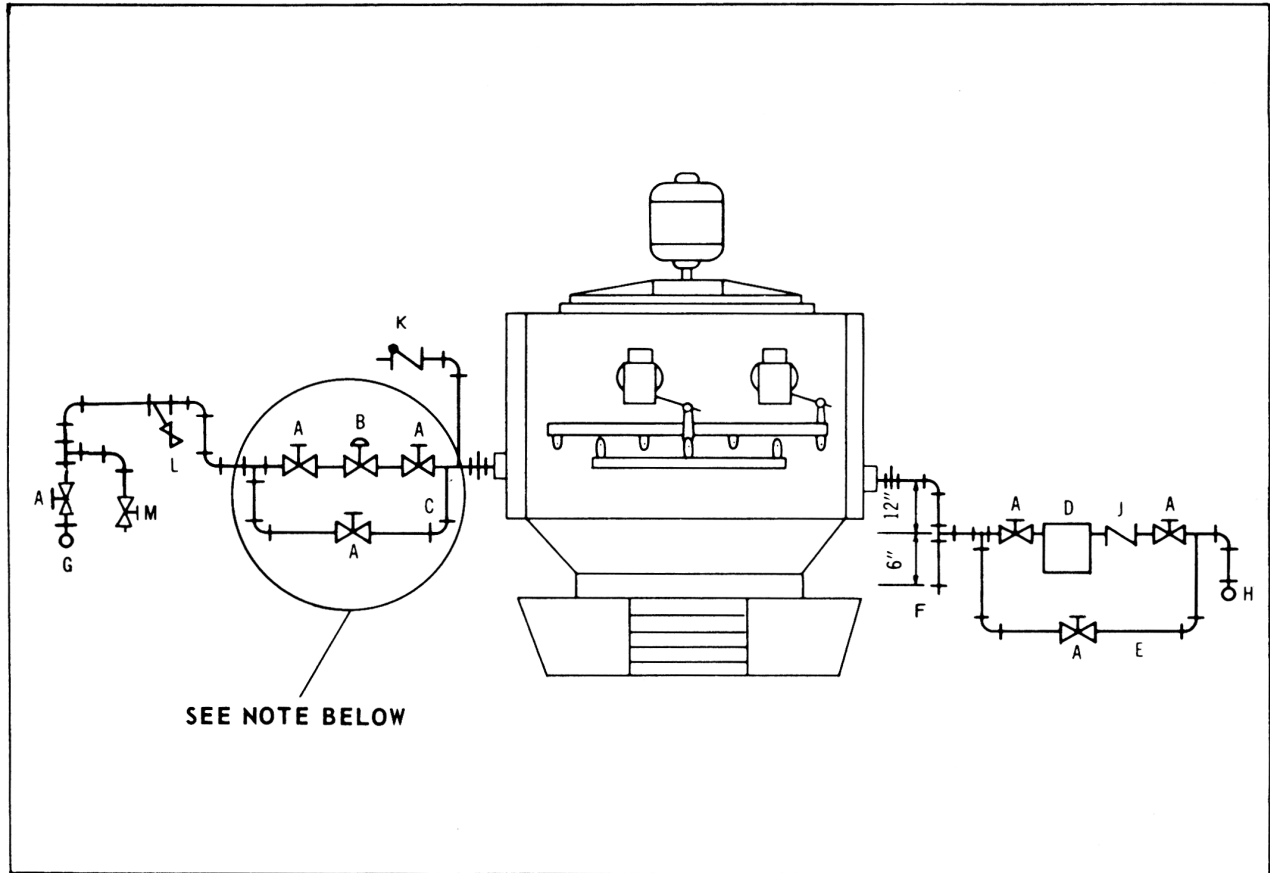
# VIII. PIPING

- A. Casing must be installed level for proper drainage. Tubes are already pitched in the casing.
- B. Piping supports: Steam mains, return mains and traps must be anchored and supported independently of the CAS unit. Piping should incorporate swing joints to isolate piping expansion strains from the unit.
- C. Steam Line Drips: Do not drip steam mains into heating section or into line between heating section and trap. Steam mains should be dripped from the pressure side of the heating section shut-off valve to the return line through a drip trap.
- D. Steam traps should be seized for three times the calculated condensate loading at the maximum coil capacity, based on the pressure differential across the trap, NOT the boiler pressure. Traps should be of the type which passes condensate and air at saturated steam temperature. Inverted bucket traps should incorporate thermostatic air vents.
- E. Make return connection full size of coil header and reduce at trap. Do not use reducing bushing on coil return connection.
- F. Strainers should be installed ahead of traps to prevent dirt and sludge from affecting trap operation especially with F & T traps.
- G. Install valved by-pass around the trap on steam installations to allow coil operation during trap maintenance, also for use in coil start-up in below freezing conditions.



## HOT WATER

- A. Hand operated globe or gate valve.
- B. Automatic air vent.
- C. Drain valve.
- D. Hand operated flow control valve.



**STEAM PIPING:** (For gravity atmospheric return systems)

- |  |   |
|--|---|
| A. Hand operated globe or gate valve.  | G. Steam main.  |
| B. Optional motorized shut-off valve (see Note 1).   | H. Return main.   |
| C. By-pass allows servicing motorized valve. By-pass same size as B (see Note 2).                  | J. 15° swing check valve.   |
| D. Bucket Trap.  | K. 15° swing check valve vacuum breaker to atmosphere.            |
| E. By-pass permits servicing trap. By-pass to be one pipe size larger than trap orifice inlet (D). | L. Steam strainer with blow down valve.                           |
| F. Dirt pocket and drip leg—to be same size as heater return pipe.                                 | M. 1/2" Drain Valve—to be opened when adjacent valve A is closed. |

**NOTES:**

1. Motorized valve and by-pass (circled above) are suggested if automatic valve operation is desired to meet application requirements.
2. Trap Bypass to be at higher elevation than trap. Use long branches or double elbows between mains and heater to absorb expansion of mains.

# IX. START UP PROCEDURE

is an important part of the installation. Care should be taken:

## A. Turning on steam or hot water.

1. Purge all lines of foreign matter before installation of heater. Dirt lodged in the heating element or trap can greatly affect performance and possibly cause freezing of the finned tubes.
2. Steam or hot water should be on the heating coil at least 15 minutes before the fan unit is energized. **DO NOT ENERGIZE THE FAN UNIT UNTIL ENTIRE COIL IS HOT**
3. When starting up a steam unit during sub-freezing temperature conditions, the trap by-pass valve should be opened to allow free flow of steam and condensate until the entire coil is hot.
4. On hot water coil adjust balancing valve for desired flow (GPM) through coil.

## B. Pre-operation Checks (power supply 'off')

1. Make sure all rotating parts spin freely by hand prior to turning on current.
2. On standard two damper motor operation both face and by-pass dampers will be in the closed position.
3. On units equipped with revolving discharges remove the wood shipping block allowing the gear to engage corrugations on the discharge collar.

## C. Operational Checks (power supply 'ON')

1. Check for correct fan rotation. In all cases fan should blow air over the heating coil.
2. If furnished with revolving discharge, check for free discharge rotation.
3. Manipulate thermostat setting to be sure control operation is correct. When thermostat is calling for heat, face dampers open and/or by-pass dampers close.

## D. Adjustments

1. Set damper controls to desired temperature. The controls include the Airstream thermostat or Room and Low-limit thermostat.
2. Set fan cut-off thermostat at 40 deg. F.
3. All discharges except plate design are equipped with adjustable vanes or deflectors to permit adjustment of air flow pattern. Best results are achieved by trial under operating conditions. The most satisfactory adjustment is one which delivers the air just above the heads of the occupants. All adjustment nuts should be thoroughly tightened to prevent rattles.

# X. OPERATION

COMBUSTION AIR SUPPLY UNITS are principally used to supply combustion air. The make-up air is delivered at desired room temperature and is controlled by an Airstream Thermostat.

COMBUSTION AIR SUPPLY UNITS may also serve to make up building heat loss. On these installations a modulating room thermostat is the primary controller. In this system a low-limit thermostat is incorporated, preventing the air from being discharged below room temperature.

For various control arrangement sequences and control connection detail, see Section VII.

# XI. SHUT DOWN PROCEDURE

- A. Shut off fan unit.
- B. Shut off steam or hot water after fan has stopped.
- C. As soon as possible, open drip leg in return main of steam units or drain and air valves of hot water units to drain coil.
- D. Do not expose a shut down coil to sub-freezing air flow as water droplets in tubes may freeze, resulting in coil freeze-up when coil is restarted.

# XII. MAINTENANCE

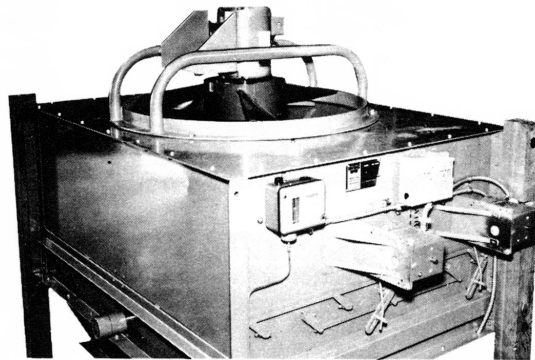
- A. General– Annual
  - 1. The finned tube heater coil should be cleaned by blowing compressed air through the section in the direction opposite normal air flow.
  - 2. The propeller fan blades should be cleaned to avoid unbalance which will damage the motor bearings.
  - 3. Inspect belts annually on belt-driven fan units and grease bearing with any high quality lithium base grease.
  - 4. All nuts and bolts should be checked and tightened if needed.
  - 5. Revolving Discharge motor should be checked, if applicable. This is a sealed prelubricated motor requiring no servicing other than general exterior cleaning. If it fails to operate, it should be replaced.
- B. Damper motors and temperature controls
  - 1. Follow specific manufacturer's recommendations enclosed with these instructions.
- C. Fan Motors
  - 1. Follow specific manufacturer's recommendations attached to the motor or enclosed with these instructions.
- D. Dampers and Linkage
  - 1. Inspect crank arm pivots and damper rods for wear. Replace worn parts.
  - 2. Lubricate damper pivot rod bearings every three months with Silicone spray, Graphite, or equivalent.
- E. Piping– Periodically
  - 1. Steam Traps– check for proper operation and maintain per manufacturers recommendations.
  - 2. Clean– strainers, dirt pockets and drip legs.
  - 3. Check steam or hot water valve. Replace if defective.

# XIII. EMERGENCY REPAIRS

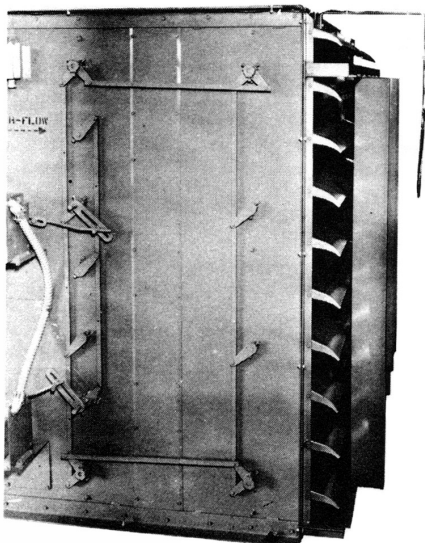
COMBUSTION SUPPLY UNITS use u-bend type finned tubes. The tubes are brazed into the inlet and return distributing headers.

The following procedure should be followed for repairing the coil in an emergency, until such time as the damaged tube can be replaced.

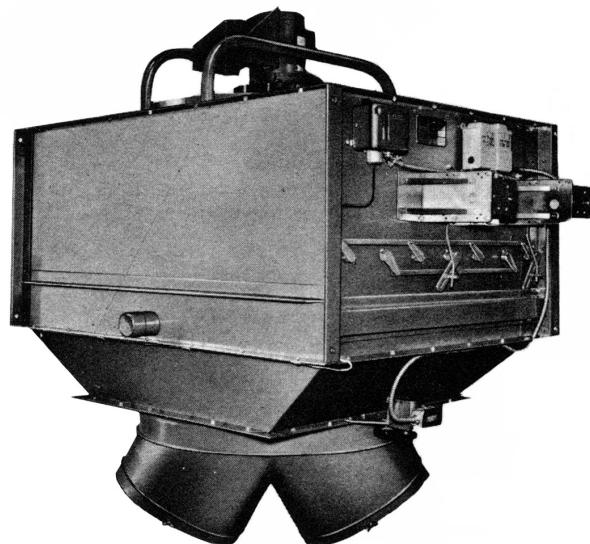
- A. Shut off electric power supply to heater at disconnect switch. Remove fuse to avoid the possibility of anyone energizing the fan unit.
- B. Shut off steam or hot water supply
- C. Open valve to drain heating coil.
- D. In most cases, emergency repairs can be made with the unit installed, by reaching through the fan unit and discharge or by removing the discharge and/or fan unit as follows.
  - 1. Fan unit removal.
    - a. Remove inlet duct work.
    - b. Remove bolts and nuts securing fan to fan plate.



- c. Remove fan assembly and use circular hole in fan plate for access to coil.
  - 2. Discharge removal.
    - a. Remove airstream discharge sensor from bracket.
    - b. Disconnect leads to revolving discharge drive.
    - c. Remove discharge assembly where fastened to casing. If unit is furnished with a transition, remove transition with discharge.

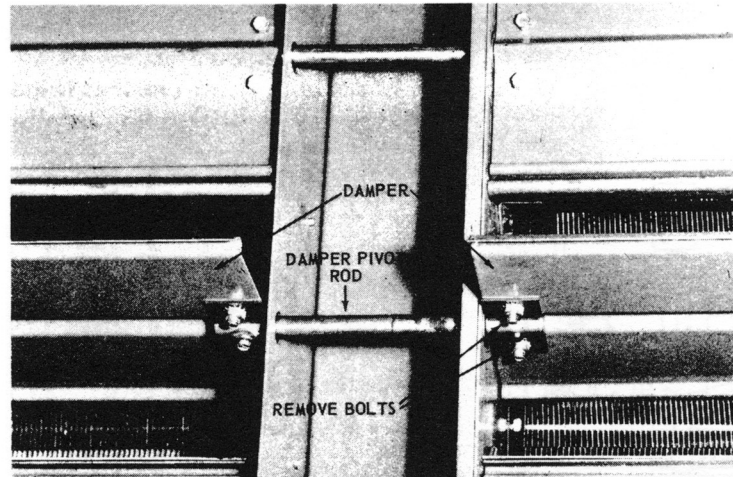


CAS-U



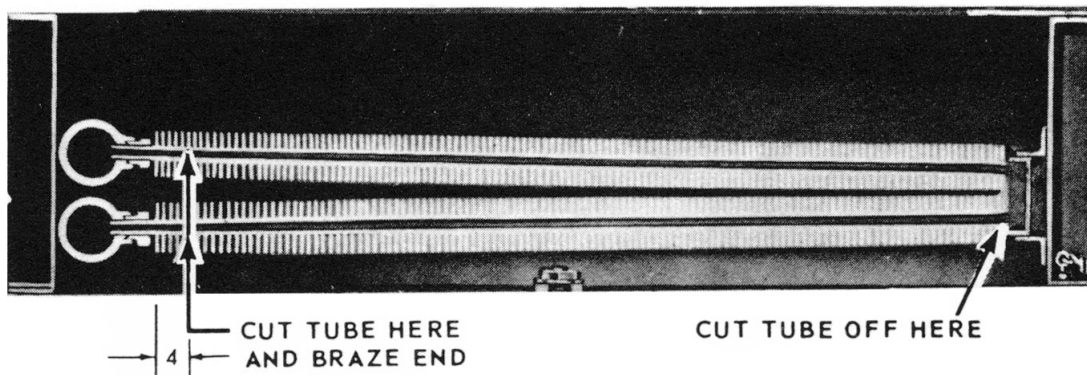
CAS-HC

- E. Remove damper to gain access to damaged tube. Unfasten the bolts and nuts that secure the dampers to the damper pivot rods and lift out the dampers.

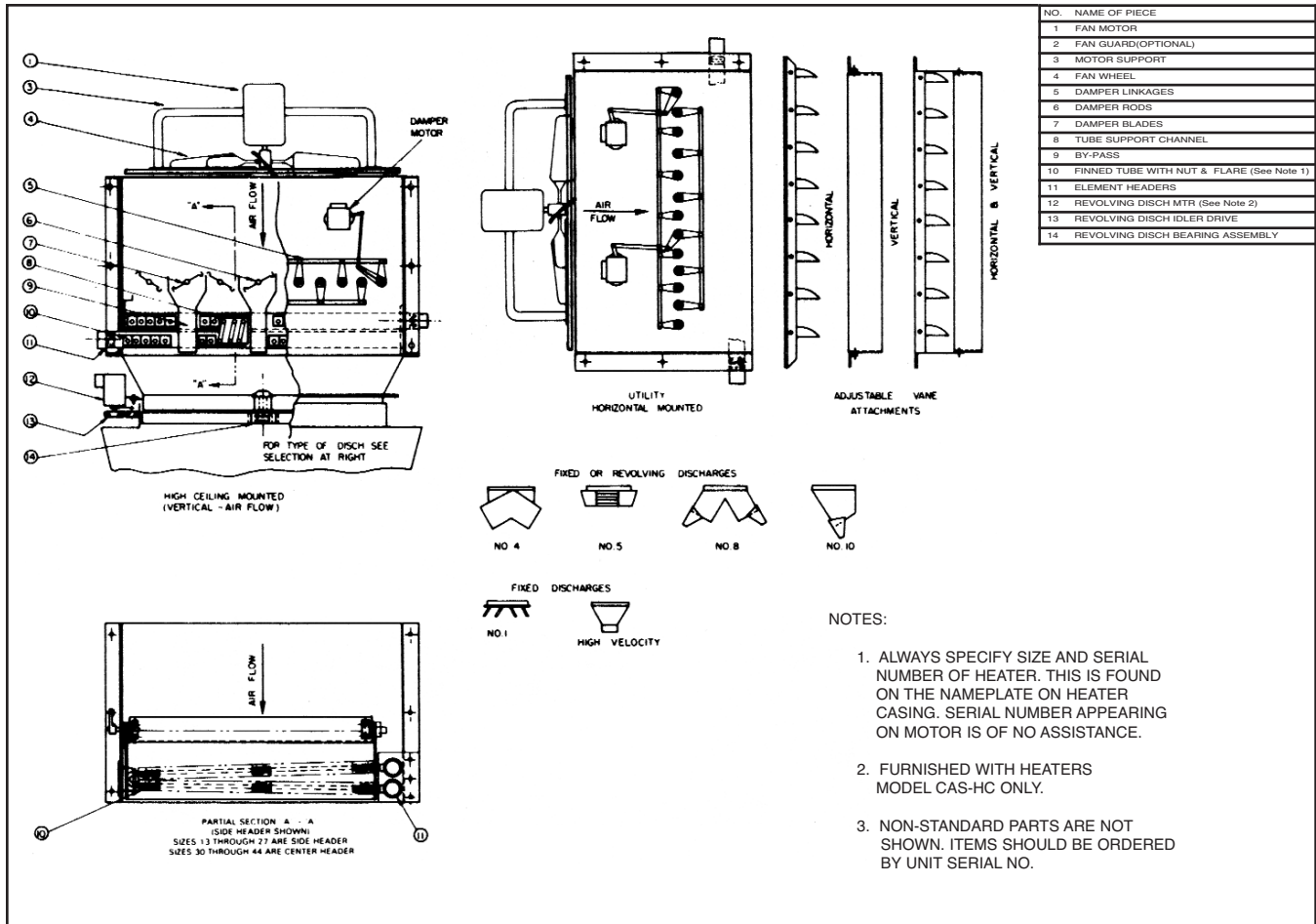


F. Brazing Method of Repair

If the damaged portion of the tube is 4" or more away from the mechanical joint, cut the tube off 4" from the mechanical joint at both headers. Remove the fins, crimp the end and braze end to form leak-proof temporary repair. To remove the remaining portion of the damaged tube, cut it off at the return bend and gently lift it out from between the other tubes. Avoid damaging fins on adjacent tubes.



# XIV. SPARE PARTS DRAWING



**MESTEK, INC.**

4830 Transport Drive • Dallas, TX 75247

General Office: Ph.: (214)638-6010 Fax: (214) 905-0806

Parts : Ph.: (214) 819-5225 Fax: (214) 638-4487