Temporary
H-100
Instructions
(New 4/64)

TEMPORARY INSTALLATION AND OPERATING INSTRUCTIONS
ECLIPSE AIR HEAT BURNERS
SERIES "AH" and "RAH"

Eclipse Air Heat Burners are a unique form of nozzle-mixing line burners. They were designed specifically for air heating applications and are normally installed in a duct.

Air Heat Burners are available in two series - Series "AH" for 100% fresh air systems, and Series "RAH" for recirculating systems. In both types of systems the burners will operate dependably with positive pressure or suction ducts.

Combustion air pressure in the burner air manifold can vary from 0.5" w.c. to 1" w.c. with only negligible effect on burner operation.

The Air Heat Burner operates purposely with an excess of air. Each one foot burner section has a maximum input of 800,000 Btu/hr. The combustion air requirements for each foot of burner with a burner manifold pressure of 1" w. c. is 18,400 cfh and at 0.7"w.c. , 15,400 cfh. When installing a complete burner assembly in a single-pass, or air make-up, duct, the combustion blower is part of the assembly so it is not necessary to be concerned about air requirements. However, the significance of these air volume requirements will become more apparent when discussing the pressurized and suction type duct systems.

Controlling the input to the Air Heat Burner is very simple. Only the gas flow to the burner needs to be controlled, while the air flow remains constant at the initial air manifold pressure setting.

With an input of 800,000 Btu/hr. per lineal foot, turndown is at least 30:1.

Air velocity past the burner has little effect on burner operation. However, for best operation, air velocity should be approximately 1500 fpm. With air velocity at 1500 fpm, flame length is 22" to 24". Below this velocity there will be a slight increase in flame length, and with velocities above 1500 fpm, there will be a slight decrease in flame length.

1. GENERAL REQUIREMENTS

1.1 For air make-up service or 100% fresh air past the burner, the air pressure measured at the pressure tap provided should be 0.7" w.c. This pressure can be adjusted with the shutter on the inlet of the combustion air fan. Once the pressure in the manifold is set, the shutter should be securely locked in place with the locknuts provided.

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1.2 Required gas pressure is 2.2" w.c. when using natural gas with a specific gravity of 0.65. This pressure may be measured at the gas inlet to the burner.

1.3 When the Air Heat Burner is enclosed in a duct, the installer should provide an access door in the duct so that it is possible to service the burner assembly components.

1.4 The Air Heat Burner should be located centrally within the duct. Three inches (3") of clearance should be provided between any point on the burner and the closest duct wall.

1.5 Burners over three (3) feet in length (240-AH or RAH) should have a pedestal support from the floor of the duct to a point on the blower motor, or a suspension support from the top of the duct to a saddle around the blower motor.

2. REQUIREMENTS FOR PRESSURIZED DUCT SYSTEMS

2.1 The "RAH" Air Heat Burner can be fired without problem in a pressurized, recirculating duct as long as air temperature past the burners is limited to 500° F. The degree of recirculation is not important as all of the combustion air for the burner is taken from outside the duct.

2.2 The combustion air pressure and the gas pressure at the burner must be equal to the maximum duct pressure, plus the pressure drop in the burner air manifold, gas piping, and valving.

2.3 In a normal recirculating duct, or air heating system, the pressure within the duct changes in direct proportion to the ratio of absolute temperatures, these temperatures being measured during the hottest and coldest conditions within the duct.

2.3 (cont)
(It is normally necessary when using a conventional burner system to have means of compensating for this change in duct pressure. The combustion air pressure to a conventional type air heating burner must be maintained at a constant differential). The Air Heat Burners can be operated with variation in air manifold pressure from 0.5" w.c. to 1" w.c. without affecting burner operation. This makes it possible by suitable choice of combustion air blowers to have, in effect, a self-compensating system regardless of temperature variation within the duct.

2.4 It is recommended that a pressure regulator be installed in the gas line up-stream of the gas control valve. This pressure regulator should be loaded by means of an impulse line running from the duct at the point where the burner is located to the impulse fitting on the diaphragm case of the regulator. This will compensate for the pressure (or suction) condition within the duct (depending upon the system) and will result in a consistent gas pressure to the gas control valve so that it will not have a tendency to "hunt" when called upon to deliver a constant temperature within the duct. An impulse line should also be run from the duct to the impulse fitting on the pilot gas pressure regulator to compensate for variations in pressure within the duct. This should be done whether the system is of the pressure or suction type.

3. REQUIREMENTS FOR SUCTION DUCT SYSTEMS

3.1 The Air Heat Burner as installed in a recirculating suction system must also take its combustion air from outside the duct. Provided the suction at the hot condition is adequate, it is possible to operate the burner without the use of a combustion air blower. In this case, the negative pressure within the duct is used to pull in the fresh air for combustion purposes. The same 500°F. recirculating temperature past the burner prevails whether the system is suction or pressure type.

3.2 To determine that condition which would require the use of a combustion air blower due to relatively low suctions within the duct, use the following information... If the duct suction (disregarding the fact that it is a negative number) at the highest temperature minus the pressure drop through the combustion air duct equals 0.5, or greater, no blower is required.

3.3 An air duct must be provided from the back of the Air Heat Burner to a point outside of the main duct in which the burner is located.

3.4 Depending upon the particular suction conditions within the duct, a restriction or orifice, generally in the form of a blast gate or a guillotine slide damper, is installed in the combustion air duct. This adjustable orifice is then manipulated so the pressure differential between the air manifold of the burner and the duct at the cold, or highest, suction condition reads 1" w.c. (It is necessary in all cases to measure the duct suction, or pressure, at the point in the duct where the burner is installed as this is the actual condition which the burner senses).

As the temperature of the recirculating products increases from the cold condition, there is a corresponding drop in the duct suction. This drop is proportional to the ratio of the absolute temperatures. At the hottest condition, the air pressure in the air manifold of the burner should not go below 0.5" w.c. By a simple manipulation of the damper, or restriction, both the maximum and minimum drop in the air burner manifold can be achieved. This setting should then be locked.

4. PILOT ASSEMBLY AND ADJUSTMENT

4.1 The Air Heat Burner assembly incorporates a blast-type pilot. A #21 mixer body is used as a mixing tee. Gas is fed to the mixer at approximately 3-1/2" w.c. Air for the pilot is taken from the main air manifold. Pilot adjustment consists of moving the mixer adjusting pin in or out to increase or decrease the amount of gas mixing with the air. The jet size used in the #21 mixer body is a #1 MTD drill. This pilot has been found to be very stable under all air flow and burner input conditions, provided the pilot is adjusted for the smallest input consistent with good microamp readings when using a flame rod. The pilot, under normal conditions, will burn only approximately 7000 to 8000 Btu/hr. over-gassing of the pilot should be avoided. When properly adjusted, the pilot flame will hold back within the body of the casting. The pilot flame may be observed by looking at the face of the burner, or through the peepsight provided.

4.2 Installing an ultra-violet scanner in the flame rod hole of the pilot casting necessitates the use of a #32 mixer with a #10 air jet in place of the standard #21 mixer. This is necessary in order to get sufficient pilot flame for the peeper to sight, particularly when an extension tube must be run from the normal flame safety opening in the pilot block to a position outside of the duct wall.

It is also possible to install the ultra-violet scanner in place of the pilot peepsight. In this case, it is then possible to use the standard #21 mixer.

4.3 When it is necessary to use an interrupted pilot, a 3/8" solenoid valve should be installed in the pilot air line to operate simultaneously with the pilot gas solenoid. If the air solenoid is not installed on an interrupted pilot, the air from the pilot tends to wipe out the first two or three flame stools on the main burner, making it difficult to get consistent microamp readings through the flame rod circuit.

5. CHECK VALVE OPERATION

5.1 A check valve, which is installed between the main air manifold and the gas inlet of the burner, is a very important part of the Air Heat Burner Assembly. The check valve must be installed with the arrow on the body pointing toward the gas connection. The function of the check valve is to allow a small amount of air from the main burner manifold to bleed into the gas feed pipe, but only during minimum gas input conditions. Any time that the gas pressure at the burner is higher than the air pressure in the manifold, the check valve will be closed and only raw gas will be fed into the burner gas manifold.

5.2 As the burner is throttled back by means of the gas control valve, the gas pressure at the burner inlet decreases until such time as the air pressure in the air manifold exceeds the inlet gas pressure. At this point, the check valve flapper then permits some air to bleed into the inlet gas. This serves two purposes: (1) It gives a partial premix at the low fire condition, which results in excellent flame stability under very low input conditions. (2) It helps pressurize the gas manifold sufficiently so that flow is uniform from the gas ports.

5.3 The check valve requires little in the way of service. If properly installed, it should function without problem. If the flapper, for some reason, sticks in the closed position, it will be obvious since the flame, as low fire condition is approached, will tend to be more yellow than usual.

5.4 The check valve should always be installed in a horizontal pipe.... not a vertical pipe.

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