Indirect Fired Duct Furnaces

Technical Guide for:

- IFD Two Pass
- IFX Four Pass

Applied Air

Keeps You Warm

Applied Air
In the business of industrial heating, efficient and low-cost operation is essential. Applied Air keeps you warm for less.

Since 1975, Applied Air has been providing cost-effective, reliable heating solutions. Our proven Indirect Fired Duct Furnaces adds warm clean air to your work environment, but without the products of combustion in the airstream.

This Technical Guide will help you choose an Applied Air Indirect Fired Gas Duct Furnace to provide efficient, cost-effective heating and ventilation for your facility. The Guide covers:

• Technical Specifications — Configure the right system components (e.g., motors, drive, filter, options, etc.) to meet your needs.
  – Model “IFD” for two pass units
  – Model “IFX” for four pass units

• Installation Information — Plan details of on-site installation (dimensions, gas piping, etc.).

If you have questions, please contact Applied Air’s Customer Service Department at 214-638-6010. We’ll be glad to help.
### Capacity and Internal Data

<table>
<thead>
<tr>
<th>Model Size</th>
<th>SIZE &amp; CAPACITY</th>
<th>FIRING RATE &amp; MANIFOLD SIZE</th>
<th>POWER SUPPLY</th>
<th>INTERNAL DATA OF HEAT EXCHANGER (A)</th>
<th>AMP DRAW</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Input B.T.U./Hour (Maximum)</td>
<td>Natural Gas at 1,000 B.T.U./C.F.</td>
<td>115 Volt, 1 Phase</td>
<td>Primary Heating Surface — Sq. Feet</td>
<td>115 Volt, 1 Phase</td>
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<tr>
<td></td>
<td>Output B.T.U./Hour (B)</td>
<td>Nat. Gas Std. Pipe Size (7” W.C.)</td>
<td>230 Volt, 1 Phase</td>
<td>Secondary Heating Surface (Tubes &amp; Headers) — Sq. Feet</td>
<td>230 Volt, 1 Phase</td>
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<tr>
<td></td>
<td>Input B.T.U./Hour (Minimum)</td>
<td>Manifold Pressure</td>
<td>200 Volt, 3 Phase</td>
<td>Primary Combustion Volume — Cu. Feet</td>
<td>460 Volt, 3 Phase</td>
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<tr>
<td></td>
<td></td>
<td>Orifice Size</td>
<td>230 Volt, 3 Phase</td>
<td>Secondary Combustion Volume — Cu. Feet</td>
<td>575 Volt, 3 Phase</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Total Combustion Chamber Volume — Cu. Feet</td>
<td></td>
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</table>

### Pricing and Specifications

- **Model Size**: Input B.T.U./Hour (Maximum)
- **Output B.T.U./Hour**: (B)
- **Input B.T.U./Hour (Minimum)**
- **Firing Rate & Manifold Size**: Natural Gas at 1,000 B.T.U./C.F.
- **Manifold Pressure**
- **Orifice Size** #4 NR NR NR NR
- **Supplies Air Capacity**: Minimum Airflow
- **Maximum Airflow**
- **Combustion Air & Venting Requirements**: Combustion Air Requirements (CFM)
- **Recommended Minimum Stack Size Diameter**
- **Maximum Vent Length - Equivalent Length (Ft)**
- **Internal Data of Heat Exchanger (A)**

#### Additional Information

- **Standard Construction**: 400 series stainless steel primary and secondary material.
- **Operating Efficiency**: Based on 80% operating efficiency.
## Dimensions

### Models IFD Duct Furnaces

**NOTE:** All dimensions in inches subject to manufacturing tolerances.

<table>
<thead>
<tr>
<th>IFD Model</th>
<th>Approximate Weight</th>
<th>&quot;A&quot;</th>
<th>&quot;B&quot;</th>
<th>&quot;C&quot;</th>
<th>&quot;D&quot;</th>
<th>&quot;E&quot;</th>
<th>&quot;F&quot;</th>
<th>&quot;G&quot;</th>
<th>&quot;H&quot;</th>
<th>&quot;J&quot;</th>
<th>&quot;K&quot;</th>
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<td>30</td>
<td>50</td>
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<td>±4</td>
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<td>15</td>
<td>5</td>
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<tr>
<td>320</td>
<td>685</td>
<td>30</td>
<td>40</td>
<td>58</td>
<td>9</td>
<td>12</td>
<td>±4</td>
<td>54</td>
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<td>480</td>
<td>837</td>
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<td>74</td>
<td>9</td>
<td>15</td>
<td>±4</td>
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<tr>
<td>800</td>
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<td>±4</td>
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<tr>
<td>1120</td>
<td>1713</td>
<td>51</td>
<td>59</td>
<td>86</td>
<td>10</td>
<td>28</td>
<td>±14</td>
<td>82</td>
<td>82</td>
<td>24</td>
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</tbody>
</table>

**NOTE:**
1. Mount discharge sensor in supply air duct a minimum of 38" from unit (by others).
2. Control cabinet shipped temporarily mounted to unit.
3. Junction box with 10 foot wire harness to control cabinet.
Pressure Drop Chart

Model IFD-320

IFD 320 Air Side Pressure Drop - Averaged

Pressure Drop - Inches Water Column

CFM
Model IFD-480

Pressure Drop Chart

IFD 480 Air Side Pressure Drop - Averaged

Pressure Drop - Inches Water Column

CFM
Pressure Drop Chart

Model IFD-800

IFD 800 Air Side Pressure Drop - Averaged

Pressure Drop - inches Water Column

CFM

0 7000 14000 21000

0.2 0.4 0.6 0.8 1 1.2 1.4 1.6

0 11000 17000 23000

0 9000 15000 21000

0
Pressure Drop Chart

Model IFD-1120

IFD 1120 Air Side Pressure Drop - Averaged

Pressure Drop - Inches Water Column
NOTES:
1. Vent limiting devices provided wherever possible, when venting is required the venting to outside is by others on indoor units and furnished by factory on outdoor units.
2. For inlet pressures under 7" W.C. please consult factory.
Base Bid Applied Air Model IFD _________________ Indirect Fired Duct Furnace. The unit shall be factory fabricated, assembled, wired and tested prior to shipment in accordance with the specification and equipment schedule. The unit will include all components herein and as shown on the drawings. Alternate equipment, equal in design, construction, performance and capacity to unit(s) specified, must be shown with price deduct/add, if any. Approval of alternate equipment will be subject to review of shop drawings. The unit shall be capable of handling_______ SCFM. The unit shall be ETL listed.

CASING
The unit casing shall consist of formed 18 gauge galvanized steel panels to ensure rigid construction. Cabinet design shall allow unit(s) to be mounted in the horizontal arrangement with no external framework. The casing enclosing the heat exchanger shall be of double wall construction with a galvanized steel inner wall serving as a radiation shield. Radiation and transmission losses shall not exceed 2% of the rated input. The casing enclosing the heat exchanger shall be insulated with 1", 1 1/2 lb. density fiberglass insulation.

HEAT EXCHANGER
The entire primary and secondary heat transfer surface shall be 400 series stainless steel. The heat exchanger design shall permit unrestricted lateral and peripheral expansion during the heating and cooling cycle. The flue gas travel shall be of two-pass design, with internal baffles in the secondary tubes. The surface temperature of the heat exchanger shall not exceed 75% of its scaling temperature when operating at rated capacity. The heat exchanger shall be rated at a minimum of 80% efficiency throughout complete operating range.

BURNER
The gas burner shall be of the power type, complete with integral combustion air blower and motor, combustion air proving switch, and removable pilot assembly. Burner shall be complete with an observation window to view the flame. The combustion air damper shall be interlocked with the gas control valve to insure a proper gas/air mixture throughout the complete range of operation. Burner and controls shall be capable of delivering ______MBH output firing on (natural gas) (propane) at an inlet pressure of ______ (inches water column) (PSIG). The standard ETL listed unit will meet ANSI, FM, and IRI requirements. Burner and controls shall be arranged for full modulation with low fire start and a _____ turndown ratio. Burner combustion shall be on-ratio throughout the complete operating range. The factory wired and piped valve train shall be complete with:

- low pressure appliance regulator
- motorized gas control valve
- main manual test firing shut-off valve
- main automatic shut-off valve(s)
- pilot manual shut-off valve (Models 480 & larger)
- pilot pressure regulator (Models 480 & larger)
- pilot automatic shut-off valve (Models 480 & larger)
- pilot manual test firing shut-off valve (Models 480 & larger)

ELECTRICAL CONTROLS
A factory wired NEMA 1 control panel complete with hinged access door and 10 foot wiring harness shall be shipped with duct furnace. All control components are to be labeled and individually wired to a numbered terminal strip to aid in servicing. All wiring shall be color coded and number tagged at each end to match the control diagram supplied. Full operating and maintenance instructions shall accompany each unit. All wiring between the controls and valves shall be run in flexible conduit. All electrical components shall bear the U.L. label. The control system shall include but not be limited to the following components required for automatic operation:

- control circuit transformer
- control circuit fuses
- control relays
- electronic flame relay
- high limit switch
- automatic/manual fan switch
- spark generator (Models 160-480)
- heavy duty ignition transformer (Models 800-1120)
## Engineering Data – IFX Series

### Capacity and Internal Data

<table>
<thead>
<tr>
<th>Model Size</th>
<th>25</th>
<th>35</th>
<th>40</th>
<th>50</th>
<th>55</th>
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<td><strong>SIZE &amp; CAPACITY</strong></td>
<td></td>
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<tr>
<td>Input MBH</td>
<td>312</td>
<td>437</td>
<td>500</td>
<td>625</td>
<td>687</td>
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<tr>
<td>Output MBH(A)</td>
<td>250</td>
<td>350</td>
<td>400</td>
<td>500</td>
<td>550</td>
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<tr>
<td><strong>FIRING RATE &amp; MANifold SIZE</strong></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Natural Gas @ 1,000 B.T.U./C.F.</td>
<td>312</td>
<td>437</td>
<td>500</td>
<td>625</td>
<td>687</td>
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<td>Gas Connection @ 7” W.C. (Natural Gas)</td>
<td>1/4”</td>
<td>1/4”</td>
<td>1”</td>
<td>1”</td>
<td>1”</td>
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<tr>
<td>Gas Connection @ 14” W.C. (Natural Gas)</td>
<td>1/4”</td>
<td>1/4”</td>
<td>1”</td>
<td>1”</td>
<td>1”</td>
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### EQUIPMENT DATA

<table>
<thead>
<tr>
<th>Combustion Air Required (C.F.M.)</th>
<th>80</th>
<th>110</th>
<th>130</th>
<th>160</th>
<th>180</th>
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<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
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<td>Exhauster H.P.</td>
<td>1/3</td>
<td>1/3</td>
<td>1/3</td>
<td>1/3</td>
<td>1/3</td>
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<tr>
<td>Burner H.P.</td>
<td>1/3</td>
<td>1/3</td>
<td>1/3</td>
<td>1/3</td>
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<td>Recommended Min. Stack Size — Dia.</td>
<td>8”</td>
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<td><strong>AMP DRAW (B)</strong></td>
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<td></td>
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<tr>
<td>200 Volt, 3 Phase</td>
<td>21.9</td>
<td>21.9</td>
<td>16.3</td>
<td>16.3</td>
<td>16.3</td>
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<tr>
<td>230 Volt, 3 Phase</td>
<td>20.9</td>
<td>20.9</td>
<td>15.1</td>
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<td>460 Volt, 3 Phase</td>
<td>17.7</td>
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<td>11.2</td>
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<td>17.0</td>
<td>17.0</td>
<td>10.4</td>
<td>10.4</td>
<td>10.4</td>
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### Additional Information

- **Capacity and Internal Data**
  - (A) Based on 80% operating efficiency.
  - (B) Based on G-P burners.
## Capacity and Internal Data

<table>
<thead>
<tr>
<th>Model Size</th>
<th>150</th>
<th>175</th>
<th>200</th>
<th>250</th>
<th>275</th>
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<td>2,187</td>
<td>2,500</td>
<td>3,125</td>
<td>3,438</td>
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<td>Input MBH</td>
<td>1,875</td>
<td>2,187</td>
<td>2,500</td>
<td>3,125</td>
<td>3,438</td>
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<td>Output MBH(A)</td>
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<td>1,750</td>
<td>2,000</td>
<td>2,500</td>
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<td>Natural Gas @ 1,000 B.T.U./C.F.</td>
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<td>2”</td>
<td>2”</td>
<td>2”</td>
<td>2”</td>
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<tr>
<td>Gas Connection @ 14” W.C. (Natural Gas)</td>
<td>1½”</td>
<td>1½”</td>
<td>1½”</td>
<td>2”</td>
<td>2”</td>
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<td>480</td>
<td>560</td>
<td>650</td>
<td>800</td>
<td>880</td>
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<td>Combustion Air Required (C.F.M.)</td>
<td>480</td>
<td>560</td>
<td>650</td>
<td>800</td>
<td>880</td>
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<td>1</td>
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<tr>
<td>200 Volt, 3 Phase</td>
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<td>4,000</td>
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<tr>
<td>Natural Gas @ 1,000 B.T.U./C.F.</td>
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<td></td>
<td></td>
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<td>3”</td>
<td>3”</td>
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<td>NA</td>
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<td>3”</td>
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<td>18”</td>
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<td></td>
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<tr>
<td>200 Volt, 3 Phase</td>
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<td>7.5</td>
<td>7.9</td>
<td>11.2</td>
<td>13.5</td>
</tr>
</tbody>
</table>

(A) Based on 80% operating efficiency.
(B) Based on G-P burners.
Dimensions

Model IFX Duct Furnaces

JCT. BOX W/10FT WIRE HARNESS
TO CONTROL BOX

AIR FLOW SWITCH

HIGH LIMIT & FAN SWITCH

INLET OPENING
(B ± 4" ADJ)

INSPECTION & RELIEF DOOR

DISCHARGE OPENING

INDUCED DRAFT FAN

1/2" DIA. CONDENSATE DRAIN

1-1/2

FRONT

CONTROL PANEL & STAND-OFF
(NOT SHOWN IN OTHER VIEW)

J

BURNER

4

K

P

L

FOR BURNER REMOVAL

C

W

RIGHT SIDE

R

S

T

FLOW PANEL

ACCESS FOR TUBE CLEANOUT

REAR

2-1/4" 18 INCH EXHAUSTER

2"- 21 INCH EXHAUSTER

ALTERNATE POSITION

INDUCED DRAFT FAN
# Dimensions

## Model IFX Duct Furnaces

<table>
<thead>
<tr>
<th>Model</th>
<th>Approximate Weight</th>
<th>&quot;A&quot;</th>
<th>&quot;B&quot;</th>
<th>&quot;C&quot;</th>
<th>&quot;D&quot;</th>
<th>&quot;E&quot;</th>
<th>&quot;F&quot;</th>
<th>&quot;G&quot;</th>
<th>&quot;H&quot;</th>
<th>&quot;I&quot;</th>
<th>&quot;J&quot;</th>
<th>&quot;K&quot;</th>
<th>&quot;L&quot;</th>
<th>&quot;M&quot;</th>
<th>Approximate Weight</th>
<th>Dimensions</th>
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**NOTE:** All dimensions in inches subject to manufacturing tolerances.
Pressure Drop Chart

Model IFX-25-40

Static pressure drop (inches w.c.) vs. CFM for Size 25-40
Pressure Drop Chart

Model IFX-45-55

Size 45-55

Static pressure drop (inches w.c.)

CFM

0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
5,000
5,100
5,200
5,300
5,400
5,500
5,600
5,700
5,800
5,900
6,000
6,100
6,200
6,300
6,400
6,500
6,600
6,700
6,800
6,900
7,000
7,100
7,200
7,300
Pressure Drop Chart

Model IFX-85-100

Size 85-100

Static pressure drop (inches w.c.)

CFM

0.50 0.45 0.40 0.35 0.30 0.25 0.20 0.15 0.10

9,000 9,500 10,000 10,500 11,000 11,500 12,000 12,500 13,000
Pressure Drop Chart

Model IFX-200-250

Static pressure drop (inches w.c.)

CFM

Size 200-250
Pressure Drop Chart

Model IFX-275-300

Static pressure drop (inches w.c.)

Size 275-300

CFM
NOTES:
1. *Vent limiting devices provided wherever possible, when venting is required the venting to outside is by others on indoor units and furnished by factory on outdoor units.
2. All models require 7" W.C. minimum inlet pressure. Contact factory for inlet pressures below this minimum.
Base Bid Applied Air Model IFX ______________ Indirect Fired Duct Furnace. The unit shall be factory fabricated, assembled, wired and tested prior to shipment in accordance with the specification and equipment schedule. The unit will include all components herein and as shown on the drawings. Alternate equipment, equal in design, construction, performance and capacity to unit(s) specified, must be shown with price deduct/add, if any. Approval of alternate equipment will be subject to review of shop drawings. The unit shall be capable of handling______SCFM. The unit shall be ETL listed.

CASING
The unit casing is to be panel construction from 16 gauge galvanized steel, suitably reinforced to ensure rigidity. All panels shall be factory sealed with caulking between mating panels. The casing enclosing the heat exchanger shall be of double wall construction with a galvanized steel inner wall serving as a radiation shield. Radiation and transmission losses shall not exceed 1 1/2% of the rated output. This section shall be insulated with 1", 1 1/2 lb. density insulation. The unit shall have an integral milled channel base complete with lifting lugs.

INDIRECT GAS FIRED SECTION
The entire primary heat transfer surface and header shall be of 400 series stainless steel; the secondary heat transfer surface shall be (mild steel) (400 series stainless steel). The heat exchanger design shall permit unrestricted lateral and peripheral expansion during the heating and cooling cycle. The flue gas travel shall be of four-pass design, with no internal baffles. The surface temperature of the heat exchanger shall not exceed 75% of its scaling temperature when operating at rated capacity. The heat exchanger shall be rated at a minimum of 80% efficiency at rated output. A pressure relief door complete with an observation window to view the complete flame and pilot shall be provided.

DIRECT DRIVE INDUCED DRAFT FAN
An integrally mounted, heavy duty, non-clogging radial blade induced draft fan complete with direct drive motor shall be provided. The induced draft fan shall be adequately sized to insure proper draft conditions when operating at rated capacity and equipped with a manual damper complete with locking quadrant to ensure proper draft and extended heat exchanger performance.

BURNER
The gas burner shall be of the power type, complete with integral combustion air blower and motor, combustion air proving switch, and removable pilot assembly. The combustion air damper shall be interlocked with the gas control valve to insure a proper gas/air mixture throughout the complete range of operation. Burner and controls shall be capable of delivering ______MBH output firing on (natural gas) (propane) at an inlet pressure of __________ (inches water column) (PSIG) and in accordance with (manufacturer’s standard) (FM) (IRI) requirements. Burner and controls shall be arranged for (High/Low/Off) (Full Modulation with low fire start and up to a 10:1 turndown ratio). The factory wired and piped valve train shall be mounted inside the unit weatherproof enclosure and be complete with:

- Low pressure appliance regulator
- Motorized gas control valve
- Main manual test firing shut-off valve
- Pilot manual shut-off valve
- Pilot pressure regulator
- Pilot automatic shut-off valve
- Pilot manual test firing shut-off valve

ELECTRICAL CONTROLS
A NEMA 1 control panel complete with hinged access door shall be provided. All control components are to be labeled and individually wired to a numbered terminal strip to aid in servicing. All wiring shall be color coded and number tagged at each end to match the control diagram supplied. Full operating and maintenance instructions shall accompany each unit. All wiring between the controls and valves shall be run in flexible conduit. All electrical components shall bear the U.L. label. The control system shall include but not be limited to the following components required for automatic operation:

- Control circuit transformer
- Control circuit fuses
- Control relays
- Electronic flame relay complete with alarm contacts
- Induced draft fan air proving differential switch
- High limit switch
- Automatic/manual fan switch
- Heavy duty ignition transformer
Choose Applied Air Indirect Gas Duct Furnaces

- Provide space heating or make-up air without products of combustion in the supply air
- Low operating and maintenance costs
- Simple, inexpensive installation
- Applied Air, a leader in research, engineering, and customer service since 1975

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