



"IST" SERIES

80% EFFICIENT

INDOOR/OUTDOOR SYSTEMS
For Natural Gas or Propane Gas
HEATING, VENTILATING
MAKE-UP AIR



Power Venter Model

Models from 100 thru 1200 MBH

A MODEL FOR EVERY APPLICATION

"RA"

SPACE HEATING
with room thermostat
control.

"OA"

MAKE UP AIR
with discharge air control. A
modulating gas valve
maintains constant leaving
air temperature regardless of
outdoor conditions.
Modulating Control Systems
— Down to 50% of Rated
Input

"MA"

**HEATING &
VENTILATING**
with room thermostat and
discharge air control.
Generally used where
customer requires both
outdoor and recirculated air.
Modulating Control Systems
— Down to 50% of Rated Input



Hastings Indoor/Outdoor Indirect Gas Fired Heating Systems

Hastings “IST” Indirect gas fired make-up air equipment provide solutions for either indoor or outdoor applications utilizing 100% outside air or 100% return air or a combination of both outside air and return air mix and is design certified by E.T.L. Testing Laboratories. The Hastings “IST” high efficiency tubular design heat exchanger has a wide range of MBH inputs from 100 MBH to 1200 MBH with an output efficiency rating of 80% with selected airflows required to meet desired space temperature requirements based on inlet ambient temperature conditions. Hastings “IST” heater design will have turn down capabilities of 4:1 up to 12:1 based on project specifications.

The Hastings “IST” blower section is designed with a combination of unique fan sets to allow air flow capacities from 741 CFM up to 15,000 CFM at a maximum external static pressure of 3.0” w.c..



Each fan set provided with standard internal 1” rubber vibration isolation pedestals for both fan and blower motor to ensure smooth operation without noise or vibration transmission into the facility being served.

There are (3) basic heating models available to meet the requirements needed for each individual application.

The “RA” model provides the ability for 100% return air from the building space being served and can provide heating operation for single stage on-off, two stage high-low and full modulation down to 50% (2:1) of full rate input (greater turn down abilities with multiple furnaces in series).

The “OA” model provides the ability for 100% outside air to off-set exhaust ventilation air from the building which eliminates negative interior building pressure with heating operation providing full modulation down to 50% (2:1) of full rate input (greater turn down abilities with multiple furnaces in series).

The “MA” model provides the ability for both 100% outside air and outside air with return air mix with heating operation providing full modulation down to 50% (2:1) of full rate input (greater turn down abilities with multiple furnaces in series) along with two position room over-ride control.

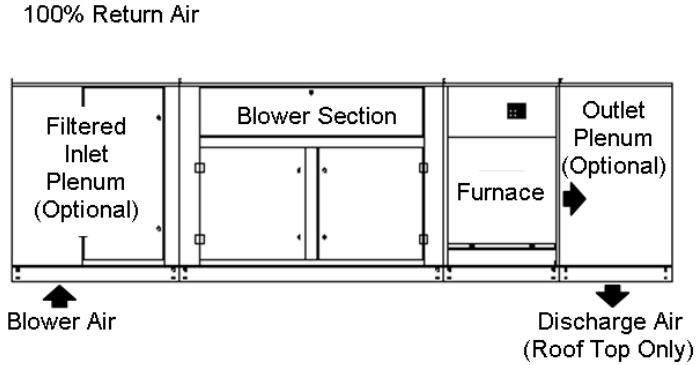
The Hastings “IST” indirect gas fired systems are ideally suited for all commercial and industrial facilities with the ability to add cooling with the addition of “EC” direct evaporative cooling.

BACnet was designed specifically to meet the Building Management System communication needs of building automation and control systems. Typical applications include: heating, ventilating, and air-conditioning control, lighting control, access control, and fire detection systems.

INDOOR/OUTDOOR SYSTEMS

The "IST" series indoor/outdoor systems feature the package concept in commercial and industrial gas heating units. Hastings E.T.L. design certified type gas furnaces are incorporated into factory assembled, wired and tested heating systems. Three temperature control sequences are available to meet the requirements of most heating applications.

"RA" – SPACE HEATING



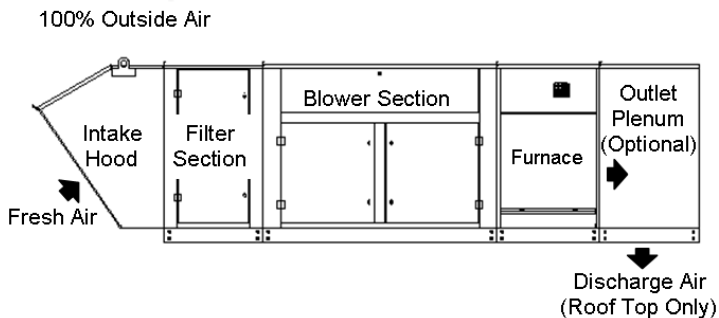
Application and Operating Sequence

The "RA" **Space Heating** unit is designed for 100% return air room heating applications with the air temperature being controlled from the heated space. The RA operating sequence is not recommended for venting applications.

The "On" position of the "On-Off-Auto" blower switch provides continuous blower operation. The "Auto" position allows blower operation whenever the room thermostat calls for heat. The room thermostat cycles the automatic gas valve to maintain the desired space air temperature.

The "OA" **Make-up Air** unit is designed to replace exhausted building air with 100% outside air to prevent the many problems of "air starvation". This replacement air is heated when the outside air temperature is below the desired space air conditions.

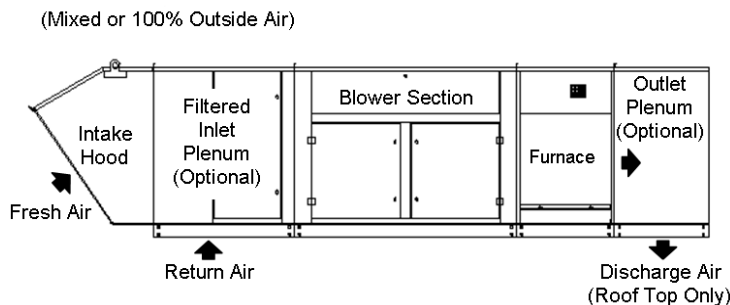
"OA" – MAKE-UP AIR



The "On" position of the "On-Off" blower switch provides continuous blower operation. The "Winter" position of the "Summer-Off-Winter" season switch energizes the gas furnace(s). An electronic modulating gas valve with Discharge Air Sensor in the leaving air stream maintains a constant discharge air temperature. Standard discharge temperature range is 55 deg. to 90 deg. F. adjustable.

With the "Summer-Off-Winter" season switch in the "Summer" position, gas furnace(s) is deenergized and blower operates to provide summer ventilation.

"MA" – HEATING & VENTILATING



The "MA" **Heating and Ventilating** unit combines the control of both make-up air and space temperature. This sequence is equally effective for up to 100% of either outside or return air heating and ventilating applications, or 100% outside air only.

The "On" position of the "On-Off-Auto" blower switch provides continuous blower operation. The "Auto" position allows blower operation whenever the room thermostat calls for heat. The "Winter" position of the "Summer-off-Winter" season switch energizes the gas furnace(s). On call for heat in the space, the room thermostat opens the electronic modulating gas valve to provide full gas input. If room thermostat is satisfied, the electronic modulating gas valve maintains a constant discharge air temperature. Standard discharge temperature range is 55 deg. to 90 deg. adjustable.

With the "Summer-Off-Winter" season switch in the "Summer" position, gas furnace(s) is deenergized and blower operates to provide summer ventilation.

All Models

Standard Equipment & Optional Items

Description	Model		
	RA	OA	MA
Blower section with variable drive (thru 10 H.P.) Motor and starter (priced separately) Insulation of blower section.	Std. Std. Std.	Std. Std. Std.	Std. Std. Std.
Natural (6" to 14") or propane (11" to 14") gas duct furnace(s) with "DSI" direct spark ignition 24 volt control circuit. Power venter and type 409 stainless steel tubular exchanger. Electronic modulating valve. (Discharge air control only.) Electronic modulating valve and two position room override control.	Std. (see note) NA NA	Std. (see note) Std. Opt.	Std. (see note) NA Std.
Factory Assembly and wiring.	Std.	Std.	Std.
Blower "on-off-auto" switch.	Std.	NA	Std.
Thermostat (on-off).	Opt.	NA	NA
Remote control station with operating switches and indicating lights.	Opt.	Opt.	Opt.
Filters – 2" cleanable or extended surface.	Opt.	Opt.	Opt.
Fresh air intake hood with birdscreen. (Note 4)	NA	Opt.	Opt.
Fresh air shut-off damper with 2 position motor, linkage and end switch.	NA	Opt.	NA
Mixing dampers with either two position motor or modulating motor & temperature controller.	NA	NA	Opt.
Vibration isolators (spring type). (Note 1)	Opt.	Opt.	Opt.
Internal (spring) vibration isolation for fan motor and fan.	Opt.	Opt.	Opt.
Two stage gas valve(s).	Opt.	NA	NA
Selectra MS-1 electronic modulation make-up air package with remote discharge temperature selector dial. (Standard Temperature Range of Dial / 55° - 90° F)	NA	Std.	Opt.
Selectra MS-2 electronic modulation space heating package added to basic system. Modulating thermostat replaces on-off thermostat. (Room Temperature)	Opt.	NA	NA
Selectra MS-3 electronic package. Make-up air portion same as MS-1; space heat is two position override. (Temperature Discharge Range of Dial / 55° - 90° F)	NA	Opt.	Std.
Low outlet temperature shut-off.	NA	Opt.	Opt.
Day-Night operation.	Opt.	Opt.	Opt.
Blocked intake switch and signal light.	Opt.	Opt.	Opt.
Step down transformer.	Std.	Std.	Std.

All Models

Standard Equipment & Optional Items

Description	Model		
	RA	OA	MA
Fused disconnect switch. – Shipped unmounted.	Opt.	Opt.	Opt.
Two speed motor – 1800/1200 or 1800/900 RPM. (Note 2) (Note 5)	Opt.	Opt.	Opt.
Two pipe system for indoor model only. Combustion air and venting.	Opt.	Opt.	Opt.
High gas pressure regulator – 1/2 PSIG & over.	Opt.	Opt.	Opt.
Roof curbs and plenums – insulated. (Note 4)	Opt.	Opt.	Opt.
Direct Evaporative cooling section. (Note 3)	Opt.	Opt.	Opt.
Premium energy efficient motor.	Std.	Std.	Std.
BACnet MSTP thru RS485 cable.	Opt.	Opt.	Opt.

(Note) Heat exchanger warranty of first bank applies to all furnaces. Refer to heat exchanger warranty bulletin G-4A.

(Note 1) Not available for units with discharge plenum and roof curbs.

(Note 2) Depending on temperature rise. Not available on all units.

(Note 3) Transition from EC units runs to both openings at rear of IST blowers when for 100% outside air. When mixed outside and return air is required a V-Bank mixing box with dampers is required.

(Note 4) Rooftop models only.

(Note 5) 90° T.R. is maximum on either speed as an “A” arrangement.

Blower Table – RA, OA, MA Models with Single Bank Furnaces

Model No. & MBH Input	Btuh Output	Ship Wt. Lbs.	Duct Furnace Used	Air Temperature Rise								
				40°			50°			60°		
				CFM	Total S.P.	HP	CFM	Total S.P.	HP	CFM	Total S.P.	HP
100	80,000	561	ISTD-100	1850	.5"	1/2	1480	.5"	1/3	1234	.5"	1/3
					2"	1		2"	1-1/2		2"	1
150	120,000	584	ISTD-150	2777	.5"	1/2	2221	.5"	1/2	1850	.5"	1/2
					2"	1-1/2		2"	1-1/2		2"	1
200	160,000	599	ISTD-200	3702	.5"	1-1/2	2961	.5"	3/4	2468	.5"	1/2
					2"	3		2"	2		2"	1-1/2
250	200,000	1390	ISTD-250	4628	.5"	1	3702	.5"	3/4	3085	.5"	1/2
					2"	3		2"	2		2"	2
300	240,000	1407	ISTD-300	5553	.5"	1	4443	.5"	1	3702	.5"	3/4
					2"	3		2"	3		2"	2
350	280,000	1407	ISTD-350	6479	.5"	1-1/2	5183	.5"	1	4319	.5"	3/4
					2"	5		2"	3		2"	3
400	320,000	1426	ISTD-400	7404	.5"	1-1/2	5923	.5"	1	4936	.5"	1
					2"	5		2"	3		2"	3

Model No. & MBH Input	Btuh Output	Ship Wt. Lbs.	Duct Furnace Used	Air Temperature Rise								
				70°			80°			90°		
				CFM	Total S.P.	HP	CFM	Total S.P.	HP	CFM	Total S.P.	HP
100	80,000	561	ISTD-100	1057	.5"	1/3	925	.5"	1/3	822	.5"	1/3
					2"	3/4		2"	1/2		2"	1/2
150	120,000	584	ISTD-150	1586	.5"	1/3	1388	.5"	1/3	1234	.5"	1/3
					2"	1-1/2		2"	1		2"	1
200	160,000	599	ISTD-200	2115	.5"	1/2	1850	.5"	1/2	1645	.5"	1/3
					2"	1-1/2		2"	1		2"	1
250	200,000	1390	ISTD-250	2644	.5"	1/2	2313	.5"	1/2	2057	.5"	1/3
					2"	1-1/2		2"	1-1/2		2"	1-1/2
300	240,000	1407	ISTD-300	3173	.5"	1/2	2777	.5"	1/2	2468	.5"	1/2
					2"	2		2"	1-1/2		2"	1-1/2
350	280,000	1407	ISTD-350	3702	.5"	3/4	3239	.5"	1/2	2879	.5"	1/2
					2"	2		2"	2		2"	2
400	320,000	1426	ISTD-400	4230	.5"	3/4	3702	.5"	3/4	3291	.5"	1/2
					2"	3		2"	2		2"	2

NOTE: Use Total Static Pressure column that will overcome total system resistance. Approximate pressure drop for components and accessory items: filter (dirty) 1/4", intake hood 1/8", birdscreen 1/8". Damper resistance may be ignored.

Blower Table – RA, OA, MA Models with Double Bank Furnaces

Model No. & MBH Input	Btuh Output	Ship Wt. Lbs.	Duct Furnace Used	Air Temperature Rise								
				70°			80°			90°		
				CFM	Total S.P.	HP	CFM	Total S.P.	HP	CFM	Total S.P.	HP
200	160,000	851	(2) ISTD-100	2115	.5"	1/2	1850	.5"	1/2	1645	.5"	1/3
					2"	1-1/2		2"	1		2"	1
300	240,000	897	(2) ISTD-150	3173	.5"	3/4	2777	.5"	3/4	2468	.5"	1/2
					2"	2		2"	1-1/2		2"	1-1/2
400	320,000	927	(2) ISTD-200	4230	.5"	1-1/2	3702	.5"	1-1/2	3291	.5"	1
					2"	3		2"	3		2"	2
500	400,000	1768	(2) ISTD-250	5288	.5"	1	4626	.5"	1	4114	.5"	3/4
					2"	3		2"	3		2"	3
600	480,000	1806	(2) ISTD-300	6346	.5"	1-1/2	5554	.5"	1-1/2	4936	.5"	13
					2"	5		2"	3		2"	3
700	560,000	1806	(2) ISTD-350	7404	.5"	1-1/2	6478	.5"	1-1/2	5758	.5"	1-1/2
					2"	5		2"	5		2"	3
800	640,000	1846	(2) ISTD-400	8460	.5"	2	7404	.5"	1-1/2	6582	.5"	1-1/2
					2"	7-1/2		2"	5		2"	5

Model No. & MBH Input	Btuh Output	Ship Wt. Lbs.	Duct Furnace Used	Air Temperature Rise								
				100°			110°			120°		
				CFM	Total S.P.	HP	CFM	Total S.P.	HP	CFM	Total S.P.	HP
200	160,000	851	(2) ISTD-100	1480	.5"	1/3	1346	.5"	1/3	1234	.5"	1/3
					2"	1-1/2		2"	1		2"	1
300	240,000	897	(2) ISTD-150	2221	.5"	1/2	2016	.5"	1/3	1851	.5"	1/2
					2"	1-1/2		2"	1-1/2		2"	1
400	320,000	927	(2) ISTD-200	2962	.5"	3/4	2692	.5"	3/4	2468	.5"	1/2
					2"	2		2"	1-1/2		2"	1-1/2
500	400,000	1768	(2) ISTD-250	3702	.5"	3/4	3366	.5"	1/2	3085	.5"	1/2
					2"	2		2"	2		2"	2
600	480,000	1806	(2) ISTD-300	4443	.5"	3/4	4039	.5"	1-1/2	3702	.5"	3/4
					2"	3		2"	3		2"	2
700	560,000	1806	(2) ISTD-350	5183	.5"	1	4712	.5"	3/4	4319	.5"	3/4
					2"	3		2"	3		2"	3
800	640,000	1846	(2) ISTD-400	5923	.5"	1	5385	.5"	1	4936	.5"	1
					2"	3		2"	3		2"	3

NOTE: Use Total Static Pressure column that will overcome total system resistance. Approximate pressure drop for components and accessory items: filter (dirty) 1/4", intake hood 1/8", birdscreen 1/8". Damper resistance may be ignored.

Blower Table – RA, OA, MA Models with Triple Bank Furnaces

Model No. & MBH Input	Btuh Output	Ship Wt. Lbs.	Duct Furnace Used	Air Temperature Rise								
				90°			110°			130°		
				CFM	Total S.P.	HP	CFM	Total S.P.	HP	CFM	Total S.P.	HP
1200	960,000	2267	3) ISTD-400	9872	.5"	3	8077	.5"	3	6835	.5"	2
					2"	7-1/2		2"	5		2"	5

NOTE: Use Total Static Pressure column that will overcome total system resistance. Approximate pressure drop for components and accessory items: filter (dirty) 1/4", intake hood 1/8", birdscreen 1/8". Damper resistance may be ignored.

Equipment Selection

“RA” – SPACE HEATING

1. Select model size according to Btuh requirements
2. Specify desired air delivery or temperature rise. For normal applications, an air delivery resulting in a 70° F temperature rise is recommended.
3. Specify motor size to deliver the selected SCFM against required TSP (total static pressure).

“OA” – MAKE-UP AIR

1. Check the exhaust specification or equipment to determine the total SCFM of fresh air required.
2. Increase the total SCFM by approximately 10% if building needs to be slightly pressurized.
3. Determine air temperature rise, usually 70° F. minus winter outside design temperature.
4. Select model and motor size to deliver desired air temperature rise and SCFM against required TSP.

“MA” – HEATING & VENTILATING

1. Calculate the total SCFM of outside air needed to satisfy exhaust air requirements and meet ventilation specifications.
2. Find the Btuh output needed to heat the total SCFM of outside air by multiplying SCFM x TD (room temperature minus winter outside design temperature) x 1.08.
3. Find total Btuh output by adding the space heat loss to the Btuh ventilation requirement from step 2.
4. Select model and motor size to deliver total Btuh output and SCFM against required TSP. The SCFM chosen must equal or exceed the volume required for ventilation.

NOTE: Total static pressure as found in the blower tables must overcome total system resistance. Duct furnace pressure losses are found in the “Furnace Pressure Drop Table” below. Accessory equipment air pressure losses are found on page 5 and 6 of this bulletin. Total system resistance is the total of these pressure drops added to the pressure loss of all system duct work and registers.

MODEL		CONFIGURATION	
IST- (X) - MBH Input	(X) - I - Indoor IS - Indoor/Two Pipe System Separate Tube O - Outdoor	(X) - RA - Space Heating OA - Make-up Air MA - Heating & Ventilating	(X) - A- Single Bank B- Double Bank C- Triple Bank

GAS CONNECTION SIZE (*)

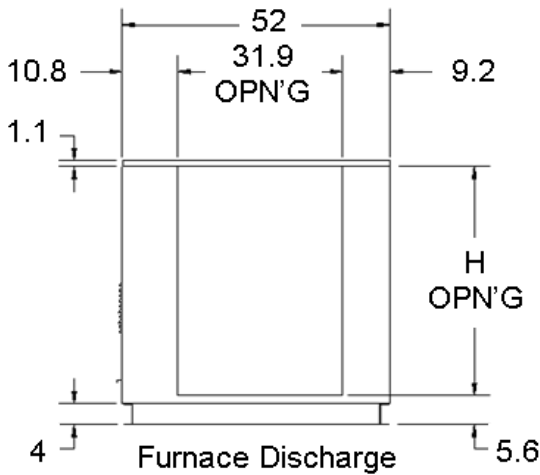
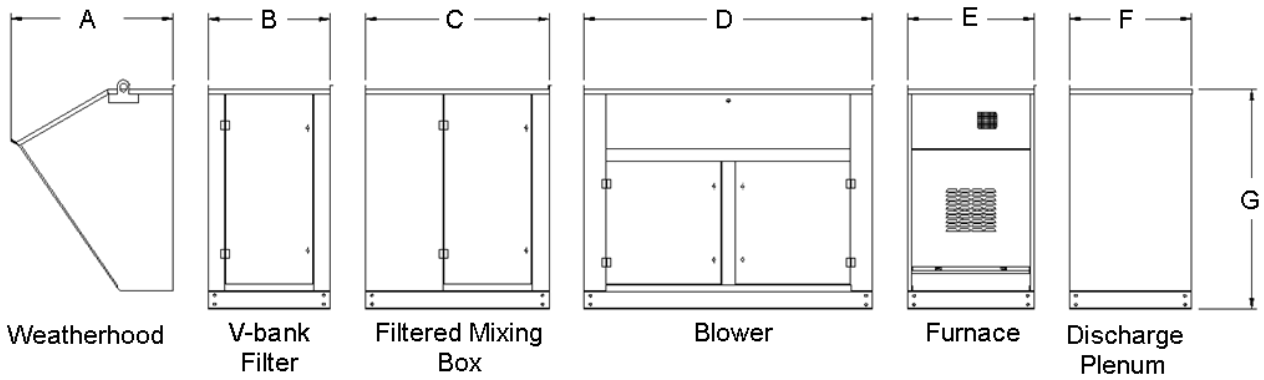
MBH Input	100	150	200	250	300	350	400
Size	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"

(*) Table based on natural gas at 6" pressure at full flow rate.

NOTE: Individual gas connections required on multiple furnace models.

Furnace Pressure Drop Table

CFM	Furnace Size						
	IST-100	IST-150	IST-200	IST-250	IST-300	IST-350	IST-400
1000	0.05	0.04	0.04				
2000	0.06	0.05	0.04	0.04	0.03	0.03	
3000	0.06	0.06	0.05	0.04	0.04	0.04	0.03
4000		0.08	0.07	0.06	0.05	0.05	0.04
5000			0.08	0.07	0.07	0.07	0.07
6000				0.08	0.08	0.08	0.07
7500					0.13	0.13	0.12
10000							0.25



Cabinet Size	Filter Quantity/Size
IST - 100 thru IST-200	(6) 20 x 25 x 2
IST - 250 Thru IST - 400	(8) 20 x 25 x 2

Section Dimensions

Cabinet Size	A	B	C	D	E	F	G	H
IST - 100 Thru IST - 200	37.1	28	42	52	29	28	40	34.4
IST - 250 Thru IST - 400	43.6	28	42	66	29	28	50	44.4

Dimensions are in inches.

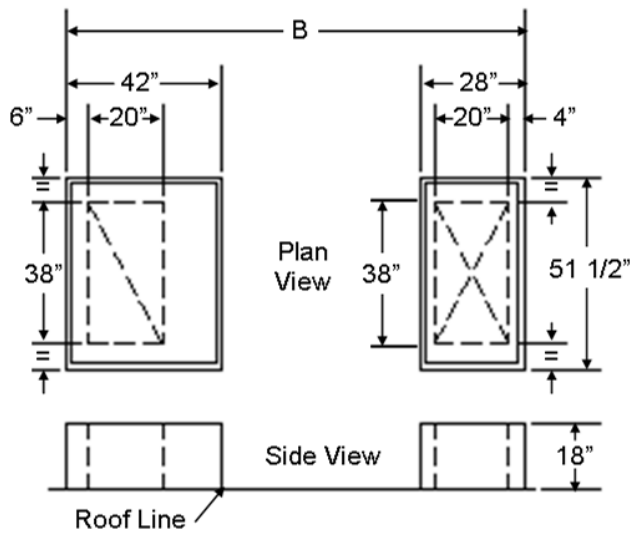
Approximate Section Weights

Cabinet Size	Weatherhood	V-Bank Filter	Filtered Mixing Box	Blower (less motor)	Furnace	Discharge Plenum	
IST - 100 Thru IST - 200	103	133	180	422	IST-100	290	125
					IST-150	313	
					IST-200	328	
IST - 250 Thru IST - 400	118	150	201	537	IST-250	384	151
					IST-300	401	
					IST-350	401	
					IST-400	420	

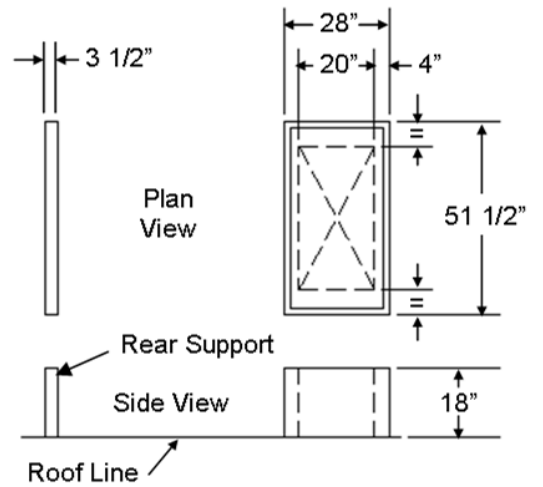
Weight is in pounds.

Dimensions – Roof Curbs

Duct Curb - with Mixing Box and Discharge Plenum

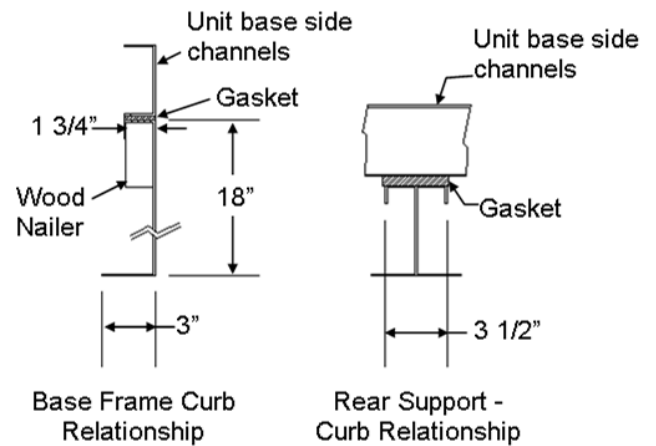


Duct Curb - Discharge Plenum



Blower Section	B		
	Single Bank	Double Bank	Triple Bank
ISTB-12	151	180	NA
ISTB-20	165	194	223

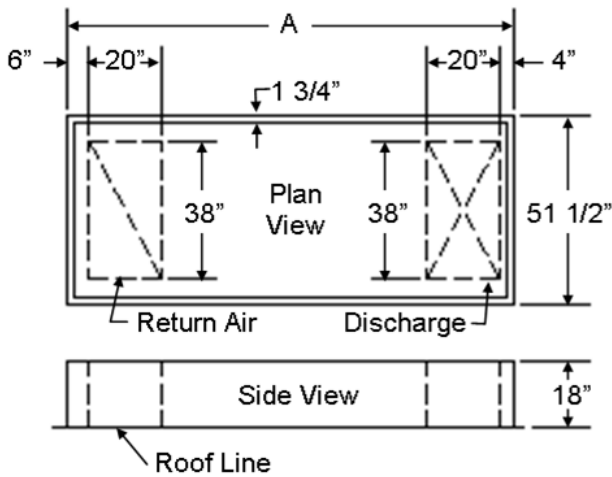
All dimensions in inches.



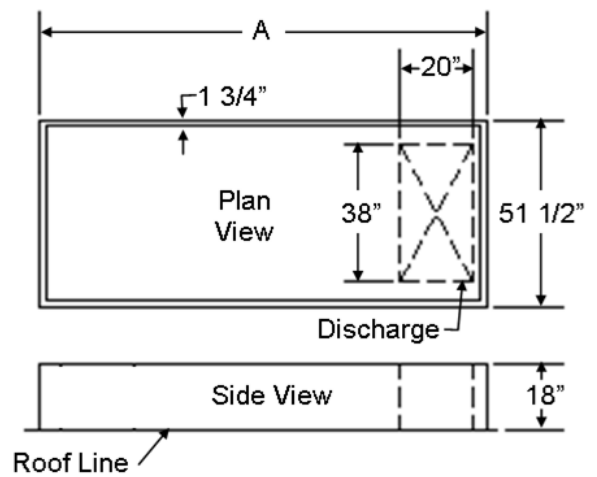
1. Standard flashing and mopping procedures are recommended for curb openings and gas and electrical roof penetrations.
2. Deck curb available to provide covered island under complete unit with openings for supply and return air

Dimensions – Roof Curbs for Discharge Plenums Only

Deck Curb - with Mixing Box and Discharge Plenum



Deck Curb - with Discharge Plenum



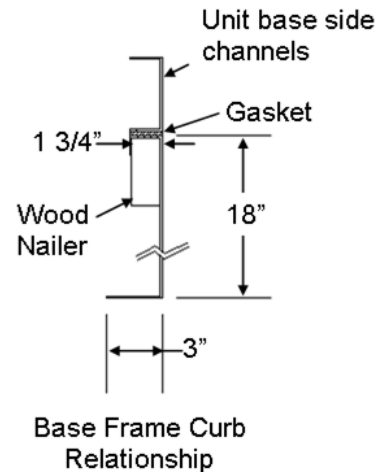
Blower Section	A						
	Furnace *			Filtered Inlet Plenum	Filtered Mixing Box	V-Bank Filter	Discharge Plenum
	Single Bank	Double Bank	Triple Bank				
ISTB-12	81	110	NA	+42	+42	+28	+28
ISTB-20	95	124	153				

All dimensions in inches.

*dimension includes furnace(s) and blower section

Example:
 Calculate dimension A
 Blower Section: ISTB-20

 Furnace Size: Double Bank 124
 Filtered Mixing Box : +42 in.
 Discharge Plenum: +28 in.
 Dimension A = 124 in. + 42 in. + 28 in. = 194 in.



1. Standard flashing and mopping procedures are recommended for curb opening, rear support and gas and electrical roof penetrations.
2. Deck curb available to provide covered island under complete unit with opening for supply air.

Hastings “IST” Outdoor/Indoor Heating Systems

Engineers Specifications

Furnish and install the following Hastings (Natural) (Propane) gas fired equipment.

Configuration	Item No.	Model No.	Btuh Input	SCFM	Ext. S.P.	Motor HP	Motor Volts & Phase
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Blower Section:

- A. Single blower wheels shall be statically and dynamically balanced forward curved, double width, double inlet, class 2 rating with sizes ranging from 9” in diameter up to 20” in diameter.
- B. Single blower wheel shall be mounted on a solid turned ground shaft with key-way for driven sheave.
- C. Main fan bearings shall be ball bearing self-aligning greasable 200,000 hour average bearing life.
- D. Blower housing, bearings, and adjustable motor base shall be mounted and properly reinforced to insure rigidity and quiet operation.
- E. Cabinet shall be of 18 gauge aluminized steel with exterior cabinet primed and finished with an exterior enamel white finish coat.
- F. Base frame channels shall be constructed of 12 gauge aluminized steel for all models.
- G. Hinged design blower motor and filters access doors.
- H. Cabinet interior shall be insulated with 1” – 1 1/2 lb. density black composite insulation.
- I. The driver and driven sheaves shall be keyed hub type. The driven sheave shall be of a fixed pitch diameter and the driver shall be a variable pitch diameter sheave standard through 10 HP. V-belt drives shall be sized for 135% of motor horsepower.
- J. Blower motor shall be “T” frame, open dripproof, single speed, single phase or 3 phase, premium efficiency.

Furnace Section:

- A. Tubular Heat Exchanger tubes shall be –
 - 1. Standard type 409 (chrome) stainless steel. .049” tubular tubes and .078” header plate
 - 2. Tubular Heat Exchanger tubes and header plates are all swedged construction
- B. Inshot Burners shall be made of 18 gauge aluminized.
- C. Tubular Heat Exchanger shall be so constructed as to slide out from compartment for easy service and maintenance.
- D. Cabinet shall be of 18 gauge aluminized steel with exterior cabinet primed and finished with an exterior enamel white finish coat.

Dampers:

- A. Motorized two position dampers for 100% outside air applications with mixing dampers for outside air and return air applications available as an option with either a modulating damper motor or two position damper motor. 16 gauge aluminized steel construction.
- B. Damper shall be of 16 gauge aluminized steel and to be painted with an enamel white finish coat.

Stormproof Intake Hood and Screen:

- A. Intake hood and birdscreen. 18 gauge aluminized steel construction.
- B. Enamel white finish coat.

Controls, Panels, Gas Train:

- A. Gas and electrical components shall consist of not less than the following: Gas valve, high limit burner control, 24 volt control circuit and "DSI" direct spark ignition system.
- B. Weatherproof main control panel shall house U.L. approved electrical controls, motor starter, fuse block(s), timer terminal strip and shall be wired to meet or exceed N.E.C. requirements. Seal-tite conduit and conduit connectors to be provided.
- C. Electronic burner modulation allows turn down ability to within 50% (2:1) of full rate input which reduces heat exchanger stress and better temperature control at all times.

Efficiency:

- A. Unit shall be a minimum efficiency rating of 80% with power draft inducer insuring proper exhaust and post purge cycle at the end of each heating cycle.
- B. Unit shall bear an ETL label.

