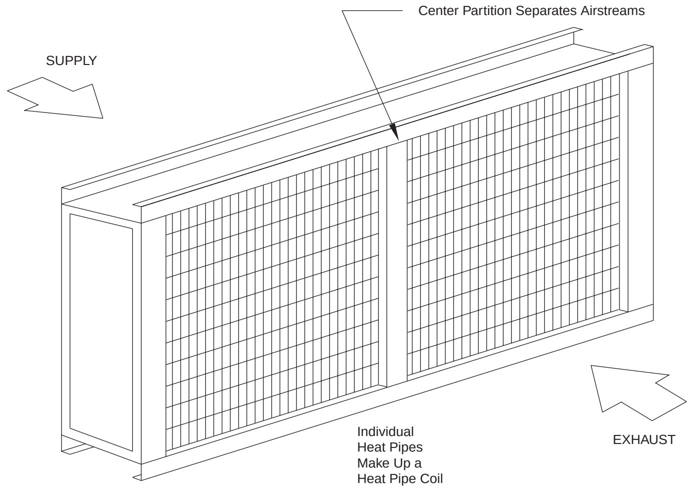
AH Series Air Handling Units with Heat Pipe, Heating Water Coil, Cooling Water Coil or Packaged Cooling, Supply & Exhaust Air

HPC SERIES
HEAT PIPE COILS



HPC Series heat pipe coils are air-to-air heat exchangers that transfer heat from one air stream to another. Their basic uses include heat recovery, frost and temperature control, IAQ, enhanced dehumidification, and indirect evaporative cooling applications for the commercial and light industrial markets.

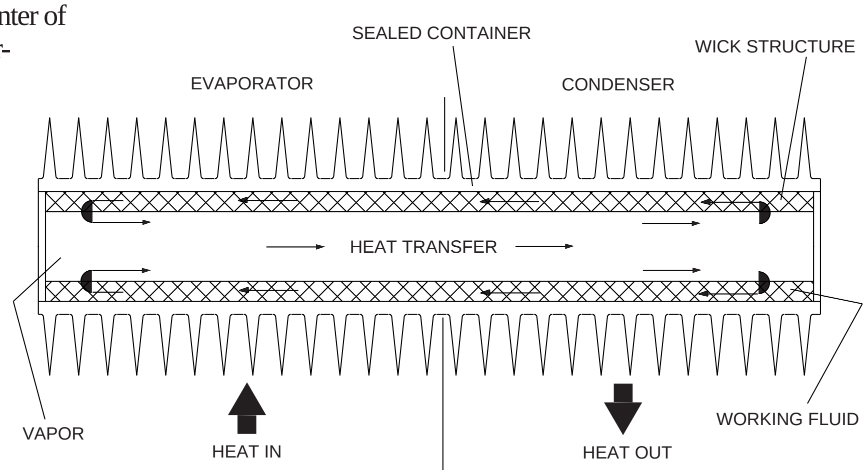
HPC heat pipe coils consist of a bundle of individual heat pipes made of 1” inside diameter aluminum tubes with an internal capillary wick formed into the inside wall and with integral extruded fins on the outside of the tube. The standard construction allows for heat pipe coils up to 8 rows deep, 28 tubes high, and 20 feet in length.

HOW IT WORKS

An individual heat pipe is made up of three basic components: a sealed tube (pipe), a capillary wick structure, and a working fluid. It starts with a 1” inside diameter aluminum tube with an integral capillary wick formed into the inside wall. The tubes have integral fins (with .015” average mean thickness and 11 fins per inch) that are extruded from the tube wall to insure maximum heat transfer.

Internally the heat pipes are partially filled with a suitable working fluid (HPC Series' standard is R134a) and hermetically sealed. Because the heat pipe is sealed under a vacuum, the refrigerant is in equilibrium with its own vapor. The capillary wick distributes the refrigerant over the inside of the pipe.

An external partition, usually located in the center of the heat pipe coil, separates two typically counter-flow air streams. Warmer air flowing over one end of the heat pipe evaporates the refrigerant inside the tube. The vapor migrates through the tube to the cooler end where it is condensed, giving off its heat to the other air stream. The condensed liquid returns to the warmer end through the wick, completing the cycle.



This heat pipe system is being driven entirely by the temperature difference between the two air streams. There are no moving parts, no maintenance, no external power required – just long life and problem free operation.

The HPC Series heat pipe coil has taken this innovative technology and applied it to the task of saving energy for buildings and industry ... energy from conditioned air in buildings ... from wasted heat in HVAC systems or industrial processes ... in fact savings from almost any waste heat or cooling application that you can imagine. In short, wherever the heat pipe coils have been applied, the basic plant or process heat balance equation has been improved and the cost of the equipment is amortized in a very brief time.

HEAT PIPE COIL NOMENCLATURE

HPC - 23 TF - 144 L - 11 FPI - 6 R - B

- **HPC**: Heat Pipe Coil
- **23 TF**: Number of tubes in the face of the coil. 6-28
- **144 L**: Fin Length in inches 24-240
- **11 FPI**: Fins per inch 11 is Standard
- **6 R**: Rows Deep 1-8
- **B**:

B	=	Basic Heat Pipe Coil
U	=	In-Line, Wrap Around
T	=	Tilt
FB	=	Face and Bypass
IDEC	=	Indirect Evaporative Cooling

HPC HEAT PIPE COIL FEATURES

Integral Fin Design – Each heat pipe is made from one piece of material, with no discontinuities between fin and tube. This yields the maximum heat transfer possible with minimum pressure drop. It also eliminates the possibility of corrosion at the tube and fin interface.

Individual Heat Pipe – Each individual heat pipe is independent, ensuring the utmost in reliability and performance. Quality control includes individual testing and assembly of each heat pipe.

Complete Load Capability – HPC heat pipe coils are designed to handle virtually any heating/cooling load without the need for gravity assist. The 1” internal diameter means that the HPC heat pipe coil can be installed level for both summer and winter operation. No seasonal change-over is required.

Integral Capillary Wick – HPC heat pipe coils have a capillary wick formed into their inside wall. The integral wick keeps the heat pipe performing under all load conditions, with no dry-out of the evaporator.

Extended Life – Units have no moving parts. Each HPC heat pipe coil is permanently sealed to provide operation indefinitely within the prescribed temperature range.

No Cross-contamination – A sealed partition separates the supply from the exhaust airstreams preventing contamination of one airstream by the other.

Passive Energy Recovery – HPC heat pipe coils require no external power for operation.

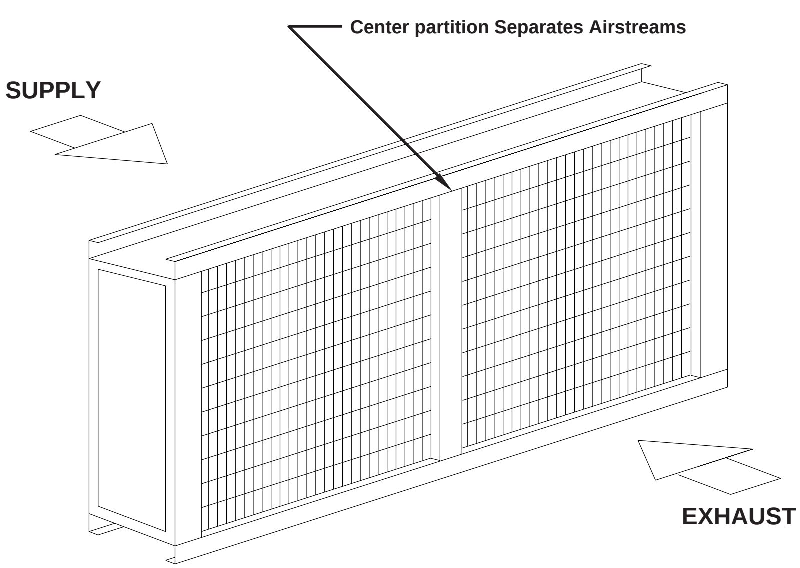
Minimum Maintenance – Since there are no moving parts, repairs are not needed. External cleaning only may be required, and with most systems cleaning is infrequent.

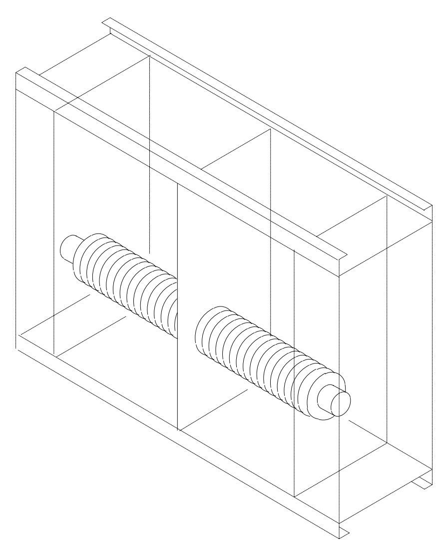
Compactness – The deepest standardly constructed HPC heat pipe coil is only 17 inches in the direction of airflow. The compact design allows more space for other equipment.

System Size Flexibility – Many sizes are available to accommodate the capacity of most any system.

System Performance Flexibility – A large selection of row depths, face areas and fin densities is available to meet the required energy recovery performance.

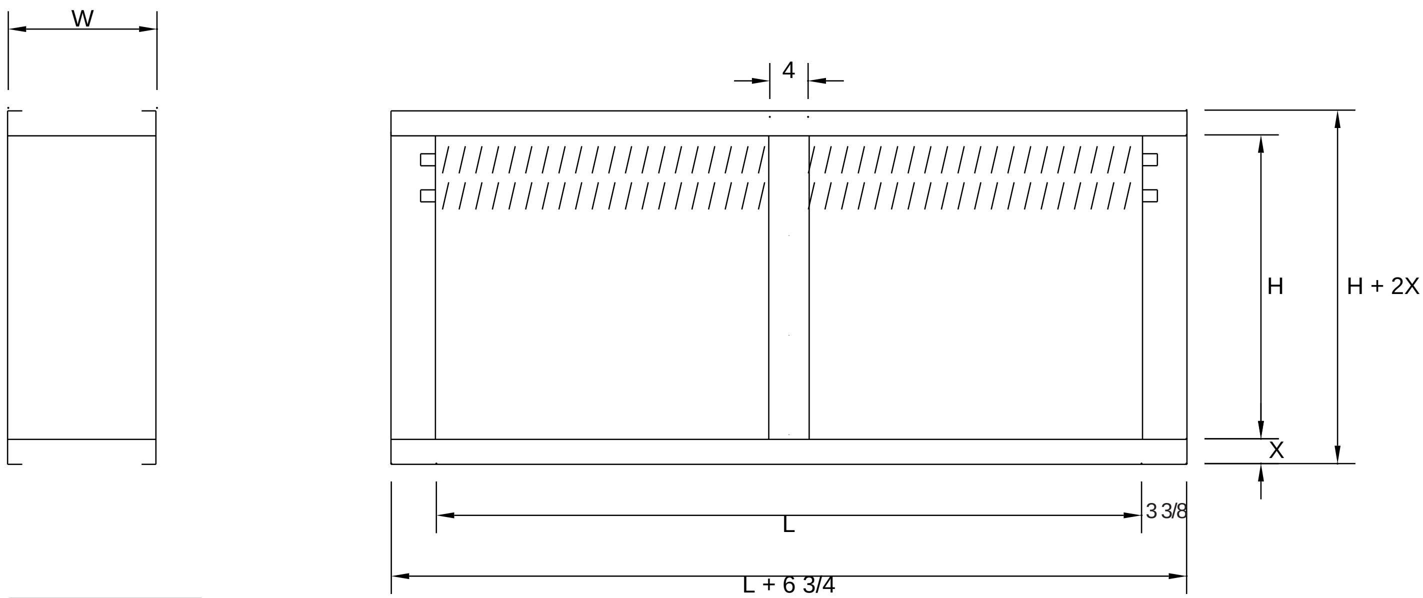
Bidirectional Heat Transfer – HPC heat pipe coils can be used for both heating and cooling.





HPC HEAT PIPE COIL DIMENSIONS

Heat pipe dimensions, designations and construction



ROWS	W
4	9 5/8
5	11 1/2
6	13 3/8
7	15 1/4
8	17 1/8

TUBES IN FACE	7	10	13	16	19	22	25	28
HEIGHT (H)	14 7/8	21 1/4	27 5/8	34	40 3/4	46 3/4	53 1/8	59 1/2

LENGTH (L)	< = 144	> 144
VALUE OF "X"	2	3

(for row depths of 4 or less, "X" = 1 1/2)

Heat pipe model designation	19 TF	144L	11FPI	6R
(EXAMPLE)	# TUBES IN FACE OF COIL	FIN LENGTH IN INCHES	FINS PER INCH	ROWS DEEP

Heat Pipe Construction			
Fin Density	11 fins per inch	Partition Thickness	16 gauge minimum
Row Depths	2 through 8	Partition Material	galvanized steel
Heat Pipe I.D.	1 inch	Frame Thickness	16 gauge minimum
Wall Thickness	.049" to .058"	Frame Material	galvanized steel
Tube Material	aluminum	End Cover Thickness	16 gauge minimum
Fin Thickness	.017 mean thickness	End Cover Material	galvanized steel
Fin Material	aluminum	Face Areas	2.5 through 99.2

HPC HEAT PIPE COIL FACE AREA AND WEIGHTS

The following charts show HPC Series's standard size configurations. the factory will build to any length or tubes in face within these charts to meet your heat pipe coil requirements.

Heat Pipe Coil Face Area

(Sq. Ft.)

FIN HEIGHT INCHES	TUBES IN FACE	FIN LENGTH IN INCHES 24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228	240
14 7/8	7	2.5	3.7	4.9	6.2	7.4	8.7	9.9	11.2	12.4	13.6	14.9	16.1	17.4	18.6	19.8	21.1	22.3	23.6	24.8
21 1/4	10	3.5	5.3	7.1	8.9	10.6	12.4	14.2	15.9	17.7	19.5	21.3	23.0	24.8	26.6	28.3	30.1	31.9	33.6	35.4
27 5/8	13	4.6	6.9	9.2	11.5	13.8	16.1	18.4	20.7	23.0	25.3	27.6	29.9	32.2	34.5	36.8	39.1	41.4	43.7	46.0
34	16	5.7	8.5	11.3	14.2	17.0	19.8	22.7	25.5	28.3	31.2	34.0	36.8	39.7	42.5	45.3	48.2	51.0	53.8	56.7
40 3/8	19	6.7	10.1	13.5	16.8	20.2	23.6	26.9	30.3	33.6	37.0	40.4	43.7	47.1	50.5	53.8	57.2	60.6	63.9	67.3
46 3/4	22	7.8	11.7	15.6	19.5	23.4	27.3	31.2	35.1	39.0	42.9	46.8	50.6	54.5	58.4	62.3	66.2	70.1	74.0	77.9
53 1/8	25	8.9	13.3	17.7	22.1	26.6	31.0	35.4	39.8	44.3	48.7	53.1	57.6	62.0	66.4	70.8	75.3	79.7	84.1	88.5
59 1/2	28	9.9	14.9	19.8	24.8	29.8	34.7	39.6	44.6	49.6	54.5	59.5	64.5	69.4	74.4	79.3	84.3	98.3	94.2	99.2

Heat Pipe Coil Weights

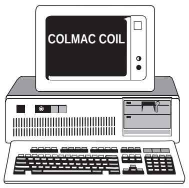
(BASE UNIT)

FIN HEIGHT INCHES	TUBES IN FACE	FIN LENGTH IN INCHES 24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228	240
14 7/8	7	116	153	189	226	272	309	345	382	419	465	502	565	603	642	690	729	767	806	844
21 1/4	10	157	207	256	306	369	419	469	519	568	632	681	757	809	861	926	978	1029	1081	1133
27 5/8	13	198	261	324	387	466	529	592	655	718	798	851	950	1015	1080	1162	1227	1291	1356	1421
34	16	259	315	391	467	565	640	716	792	868	964	1040	1143	1221	1299	1397	1475	1554	1632	1710
40 3/8	19	280	369	459	548	660	750	839	929	1018	1131	1220	1336	1427	1518	1633	1724	1816	1907	1998
46 3/4	22	321	423	526	628	758	860	963	1065	1168	1297	1400	1528	1633	1738	1869	1973	2078	2182	2287
53 1/8	25	362	477	593	709	855	970	1086	1202	1318	1463	1579	1721	1839	1957	2104	2222	2340	2458	2575
59 1/2	28	403	531	660	789	932	1081	1210	1339	1468	1630	1759	1914	2045	2176	2340	2471	2602	2733	2864

WEIGHT CORRECTION FACTORS

ROWS DEEP	4	5	6	7	8
MULTIPLIER	.82	1.0	1.21	1.39	1.58

SIZING SOFTWARE



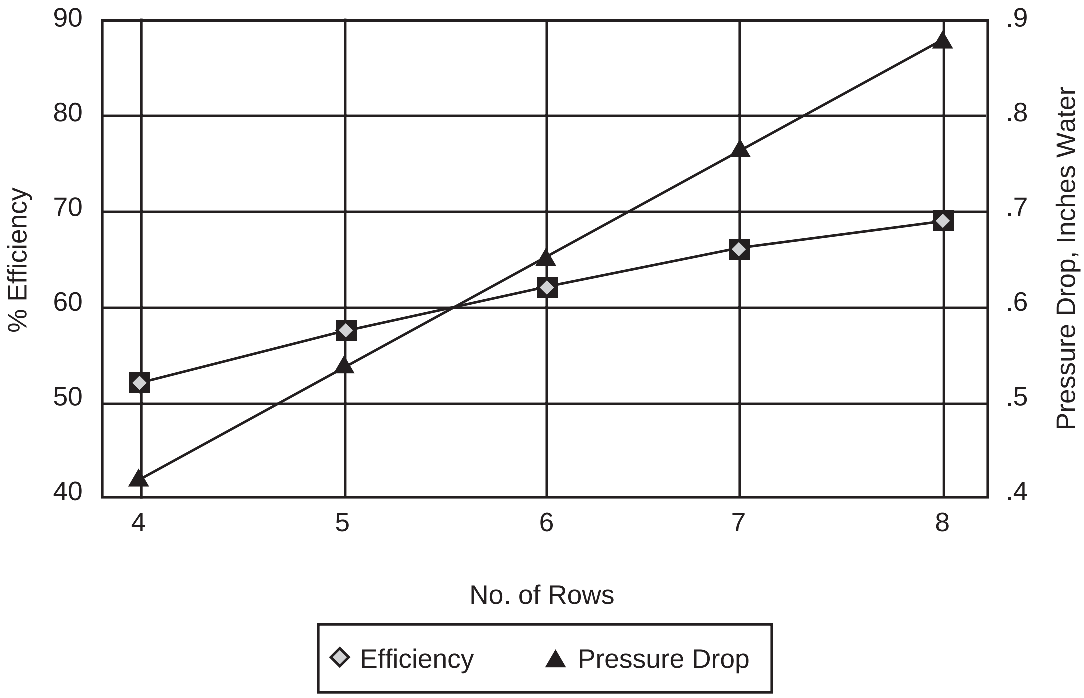
The factory offers Heat Pipe Pro sizing software that allows you to size your own heat pipe coils for ratings, capacities and conditions desired.

"Heat Pipe Pro" is a Windows based heat pipe coil selection, sizing, and pricing software. It will pick an appropriate heat pipe coil model, given flow and temperature input, or will give the exact performance of the heat pipe for a selected model. The program performs precise psychrometric calculations and determines exactly how much control is required to prevent frost build up. It calculates indirect evaporative cooling and dehumidification applications as well. Heat pipe drawings, specifications, and pricing for the model selected are also included in the software.

HPC HEAT PIPE COIL SELECTION

HPC heat pipe coils are normally sized in a manner similar to other heating/cooling coils, using a face velocity of 500 feet per minute. At this velocity, pressure drops across the heat exchanger are modest when compared with other types of heat exchangers. If higher pressure drops can be tolerated, face velocities higher than 500 feet per minute can be used under proper conditions.

HPC HEAT PIPE COIL PERFORMANCE



Assumptions: 500 FPM face velocity
balanced flows, no condensation, sea level

The graph above gives an approximate method for determining the efficiency of a HPC heat pipe coil. The graph is valid for equal supply and exhaust air flows with a 500 feet per minute face velocity, at sea level with no condensation occurring. Sizing the heat pipe coil can be done with the help of the Heat Exchanger Face Area Table. Please note that heat exchanger sizing is done with standard cubic feet per minute (SCFM), which is the actual volume of air flow corrected to sea level and 70 degrees by the following formula:

SCFM = ACFM (530/(T + 460))

Where: T = temperature of air (deg F)

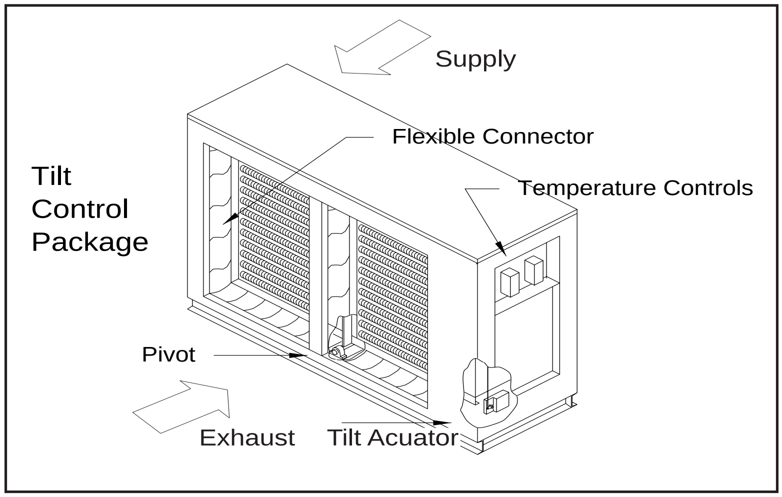
Additional correction will be needed if the application is not at sea level

FROST AND TEMPERATURE CONTROL

It is sometimes desirable to control the performance of a heat pipe coil in order to prevent frost build-up on the exhaust side of the heat exchanger in the winter, or to prevent inadvertent heating of the supply air when cool make-up air is desired in the spring or fall. HPC heat pipe coils have two very effective methods of temperature control:

TILT CONTROL

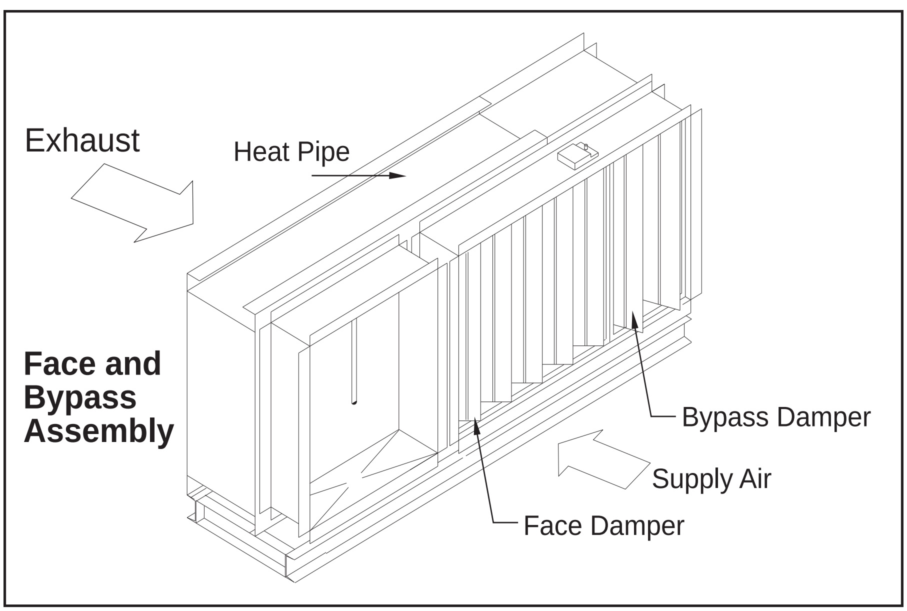
Because HPC heat pipe coils depend on an internal evaporation/condensate cycle, their performance can be altered by using gravity to limit the effectiveness of the cycle. If the heat pipe is tilted such that the cool air end is lowered below the warm air end, the effectiveness of the heat pipe coil is diminished. The tilt can be adjusted to accomplish just the right amount of temperature control. The heat pipe coil is mounted on a central pivot; its tilt from the level is controlled by a mechanical actuator responding from the input from two proportional temperature controllers. The heat pipe coil is connected to ducts by short flexible duct connectors.



There is a common misconception that tilting a heat pipe coil increases its efficiency. It does not. Gravity can assist a small diameter heat pipe that “chokes” due to insufficient flow area. Because of its larger internal diameter, HPC heat pipe coils have no such problem, and can handle any thermal load, summer or winter, without resorting to tilt. For temperature and frost control tilt is actually used to <u>derate</u> the performance of the heat pipe exchanger to achieve its desired effect.

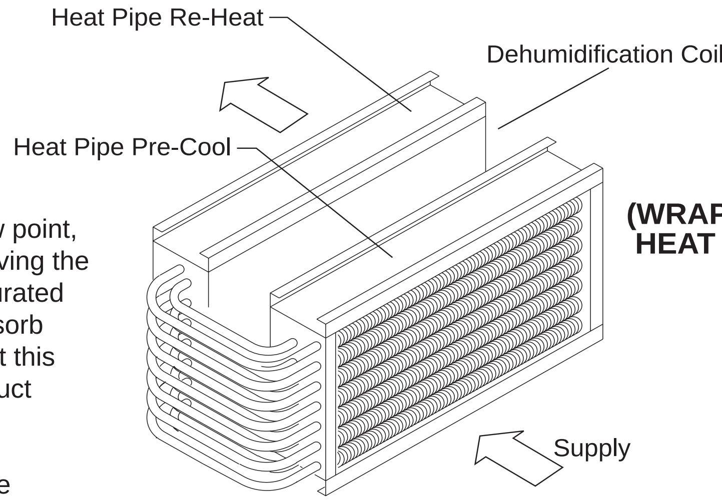
FACE AND BYPASS DAMPERS

Face and bypass dampers are used throughout the industry, and can be used effectively with HPC heat pipe coils to control frost and temperature. In the winter when supply air temperatures are cold enough to create frost on the exhaust air side, face dampers begin to close and allow cold supply air to bypass the coil. Face dampers also close to prevent heating of supply air in spring and fall when an economizer cycle is desired. While several frost control strategies are available, the most common is to adjust the tilt or the damper position on the temperature of the air leaving the exhaust side of the exchanger.



Both tilt control and face and bypass control have similar results. As the entire volume of cold supply air passes through the heat pipe coil, the overall temperature of the heat pipe is decreased. Somewhat more control needs to be exercised with face & bypass dampers, which results in slightly lower thermal performance in frosting conditions. However, because of its inherent design, tilt control offers slightly better economizer temperature control.

ENHANCED DEHUMIDIFICATION



(WRAP-AROUND) HEAT PIPE COIL

An example of how the HPC heat pipe coils can be used to solve air-to-air heat recovery problems is its use in conjunction with dehumidification coils.

Dehumidification coils cool air below its dew point, extracting water in the process. The air leaving the coil has less absolute humidity, but it is saturated with water vapor and has no capacity to absorb more water. It is common practice to reheat this cold, clammy air to avoid condensation in duct work and to make the air more comfortable.

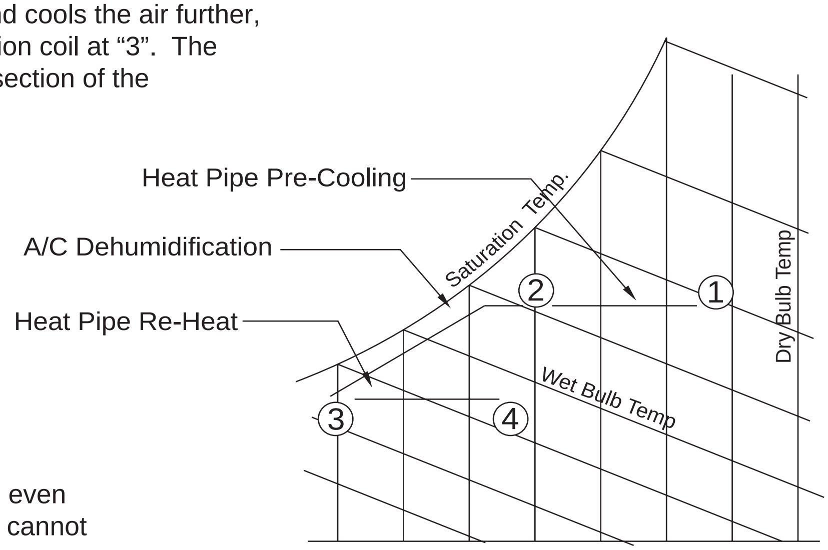
This additional expenditure of energy can be avoided by the use of HPC heat pipe coils. In its in-line (wrap-around) configuration, the heat pipe actually wraps around the DX or chilled water dehumidification coil, with one section of the heat pipe coil upstream and one section downstream. Typically, a two row heat pipe coil is used.

Hot, humid air enters through the first heat pipe coil section. The heat pipe pre-cools this air prior to entering the dehumidification coil. This allows the coil to have a higher chilled water temperature for a given amount of cooling, or in the case of a DX coil, a lower compressor load. This cooling savings is in addition to the saving from the free reheat.

As the cool, dehumidified air emerges from the cooling coil, it passes through the second section of the heat pipe coil, where it is reheated to a temperature with a more comfortable relative humidity.

All of this is done without any expenditure of energy. The HPC heat pipe coil simply exchanges precooling energy in the first section for reheat energy in the second section. The heat pipe coil modifies the “sensible heat ratio” of the air, transforming cool, muggy air into slightly warmer air with a much lower relative humidity.

The psychrometric chart below shows the effect of the HPC heat pipe coil. Air entering at “1” is precooled by the heat pipe coil to the condition at “2”. From here, the dehumidification coil brings the air to saturation and cools the air further, extracting water. The air leaves the dehumidification coil at “3”. The muggy air at “3” then passes through the second section of the heat pipe coil, where it is reheated to a more comfortable condition at “4”.



The HPC “enhanced dehumidification” heat pipe coil is designed to be a sturdy, reliable unit. Individual “U” tubes are welded to each section of the heat pipe coil to ensure sound construction. Moreover, the individual tubes ensure that there is even distribution of working fluid in all heat pipes, which cannot be guaranteed in a manifolded construction. Connections between the heat pipe sections are compact and are located opposite to the dehumidification coil connections. The heat pipe coil can be sized either to closely wrap around the coil or to allow space between it and the cooling coil.

INDIRECT EVAPORATIVE COOLING

One of the most powerful applications of the HPC heat pipe coil is indirect evaporative cooling (IDEC). IDEC is a way of capturing most of the cooling energy lost when conditioned air is exhausted from a building and is a way of cooling building make-up air without adding humidity. In either case, building make-up air is cooled by using the psychrometric potential of air exhausted from the building or outside air. Water is sprayed on this airstream, lowering its temperature towards its wet bulb temperature. The HPC heat pipe coil carries this coolness and transfers it to the supply air stream, without the addition of humidity. IDEC is distinguished from evaporative (or swamp) cooling, which merely exchanges a drop in temperature for a rise in humidity.

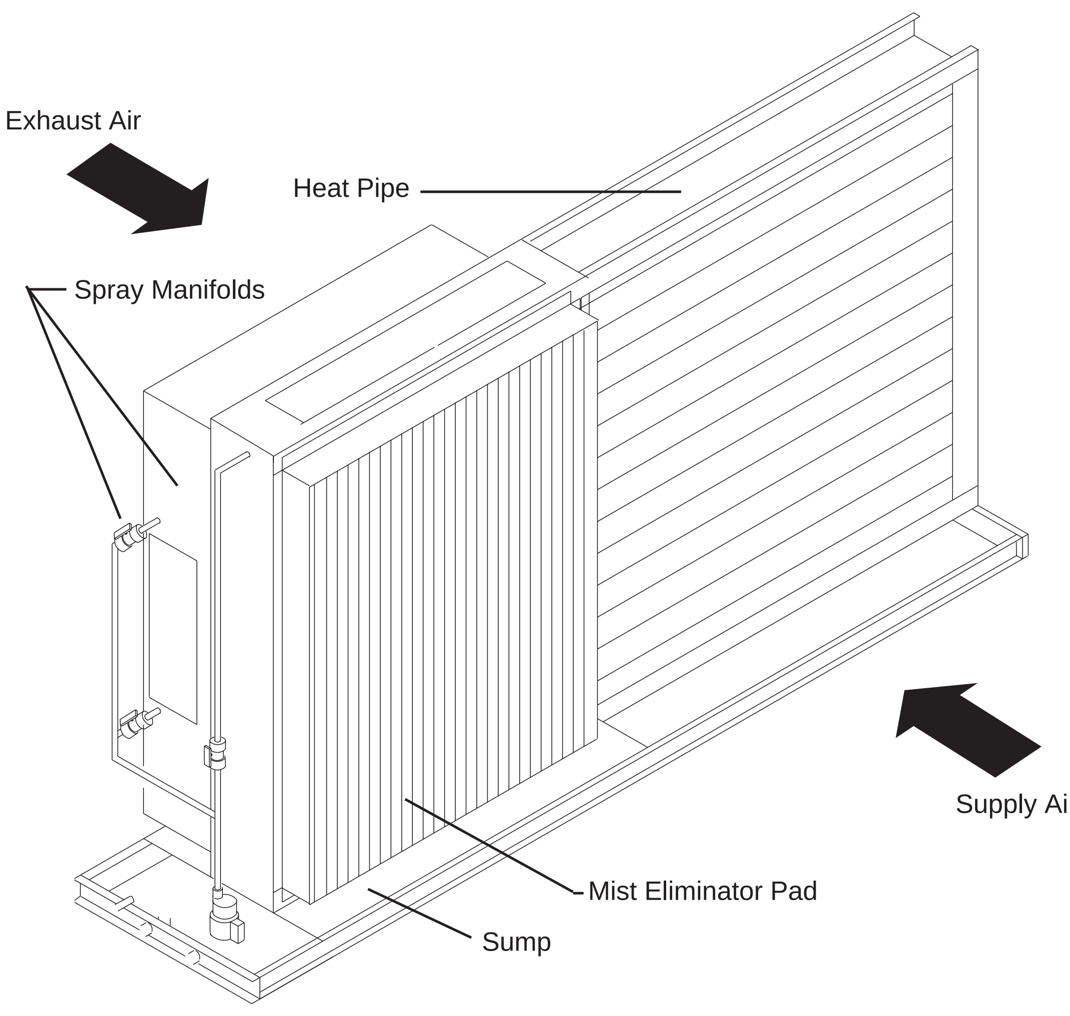
The HPC indirect evaporative cooling systems are highly efficient, and take full advantage of the temperature potential of the exhausted airstream. Unlike other systems that use a “media” to saturate the air upstream of the heat exchanger, the HPC indirect evaporative cooling system keeps the air saturated through the coil as the dry coolness is being supplied to the make-up air. This means that in a typical application, several more degrees of cooling can be supplied to the building make-up air.

An IDEC system can reduce the size, or sometimes eliminate the need for mechanical air conditioning equipment. In either case IDEC systems significantly reduce electric power consumption.

For instance, a conventional air-cooled mechanical system utilizing a compressor consumes approximately 1.5 kilowatts per ton of cooling capacity. A HPC IDEC system, however, typically consumes only 0.25 to 0.90 kilowatts per ton.

Under the most adverse conditions, the HPC IDEC system can cut power consumption by 20%. When wet bulb temperatures are favorable, power costs can be significantly reduced even further. Additional savings can often be achieved during colder periods through the recovery of the heat in the exhaust air. Actual power cost reductions will vary with local weather conditions, power prices and power demand charges, but payback periods can be as low as one year.

HPC SERIES HEAT PIPE COIL SYSTEM

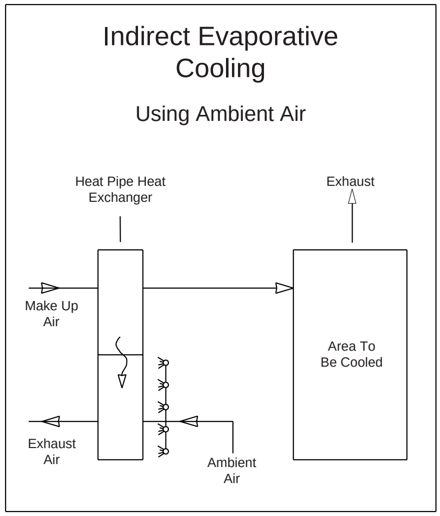


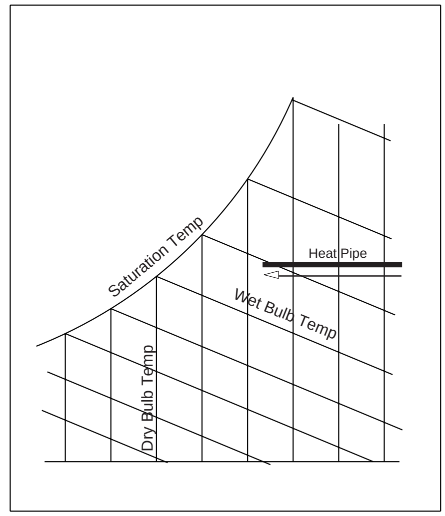
UTILIZING THE HPC SERIES IDEC HEAT PIPE COIL

There are three ways a HPC Series IDEC heat pipe coil system can be utilized.

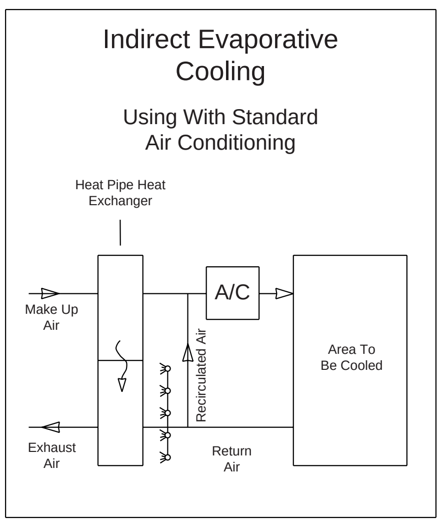
The first type of application is in an area that needs to be cooled 10 to 15 degrees without increasing the humidity, such as a manufacturing plant. In this situation, an IDEC system is connected to the area's ventilation ducts to lower the temperature of the incoming supply air. The same system can be used in the heating season to recover heat from exhaust air. The compactness and simplicity of the IDEC heat pipe coil system allows it to be installed easily, keeping first costs low.

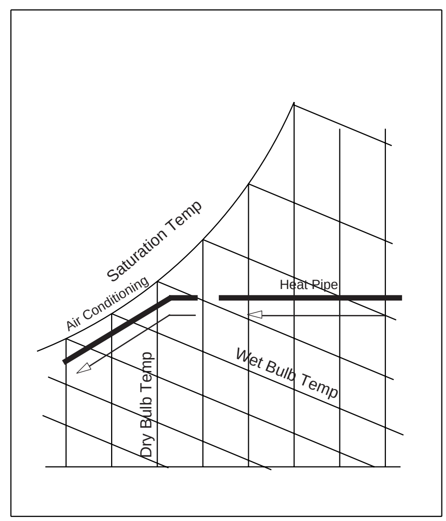
Operating costs are also low since a water supply and a small pump are all that is required. Pump motors are generally less than 1 hp and less than 1 gmp of water is evaporated.



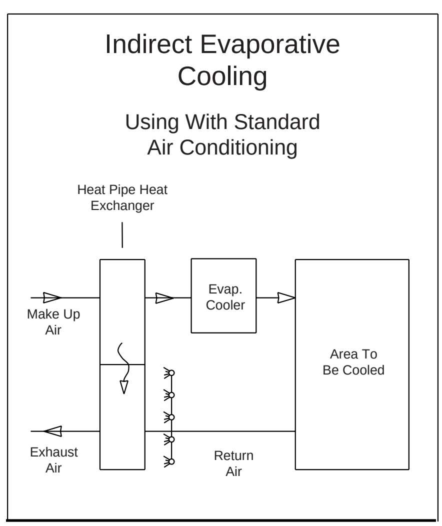


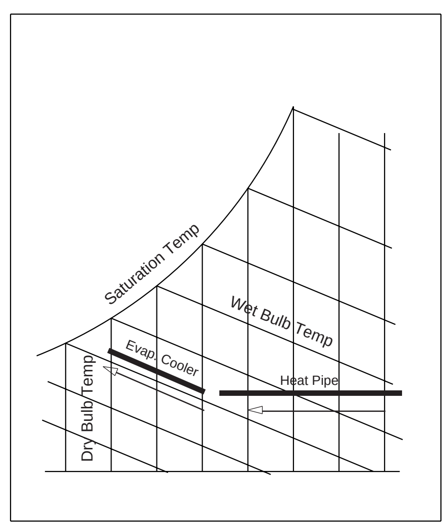
A second application combines a IDEC heat pipe coil system with conventional air conditioning. Conditioned building exhaust air is typically at 75 degrees with a relative humidity of 50%. The lower relative humidity of this air greatly increases its cooling potential. In this arrangement, most or all of the coolness of the exhaust air can be recaptured and supplied to the make-up air with a IDEC heat pipe coil system.





A third IDEC arrangement is commonly used in drier climates. This arrangement incorporates a IDEC heat pipe coil system with a direct evaporative cooler to cool the space as well as add moisture. Outside air first goes through the IDEC heat pipe coil system where it is cooled, and then is passed through the cooler where it is humidified and further cooled.





HPC SERIES HEAT PIPE COIL INSTALLATION

Installation Considerations

Flow configuration: The exchanger is of counterflow design. That is, the exhaust and supply airstreams flow in opposite directions through each respective side of the exchanger.

Leveling the exchanger: Energy recovery units shall be installed with:
(a) 1/4 inch per ft. exhaust end down when used for heating and ventilating only.
(b) 1/8 inch level end-to-end when used for heating, ventilating and cooling.

Supporting structure: The exchangers must be secured rigidly to not allow more than 1/8 inch bow end to end.

Duct design: The exchanger is manufactured with a center partition and frame such that standard duct flanges can be screwed to the frame. Sheet metal screws 3/8 inches long should be used. The duct design should be in accordance with good practice in establishing a uniform air flow across the entire coil surface. In addition, blades on face dampers should be perpendicular to the tubes.

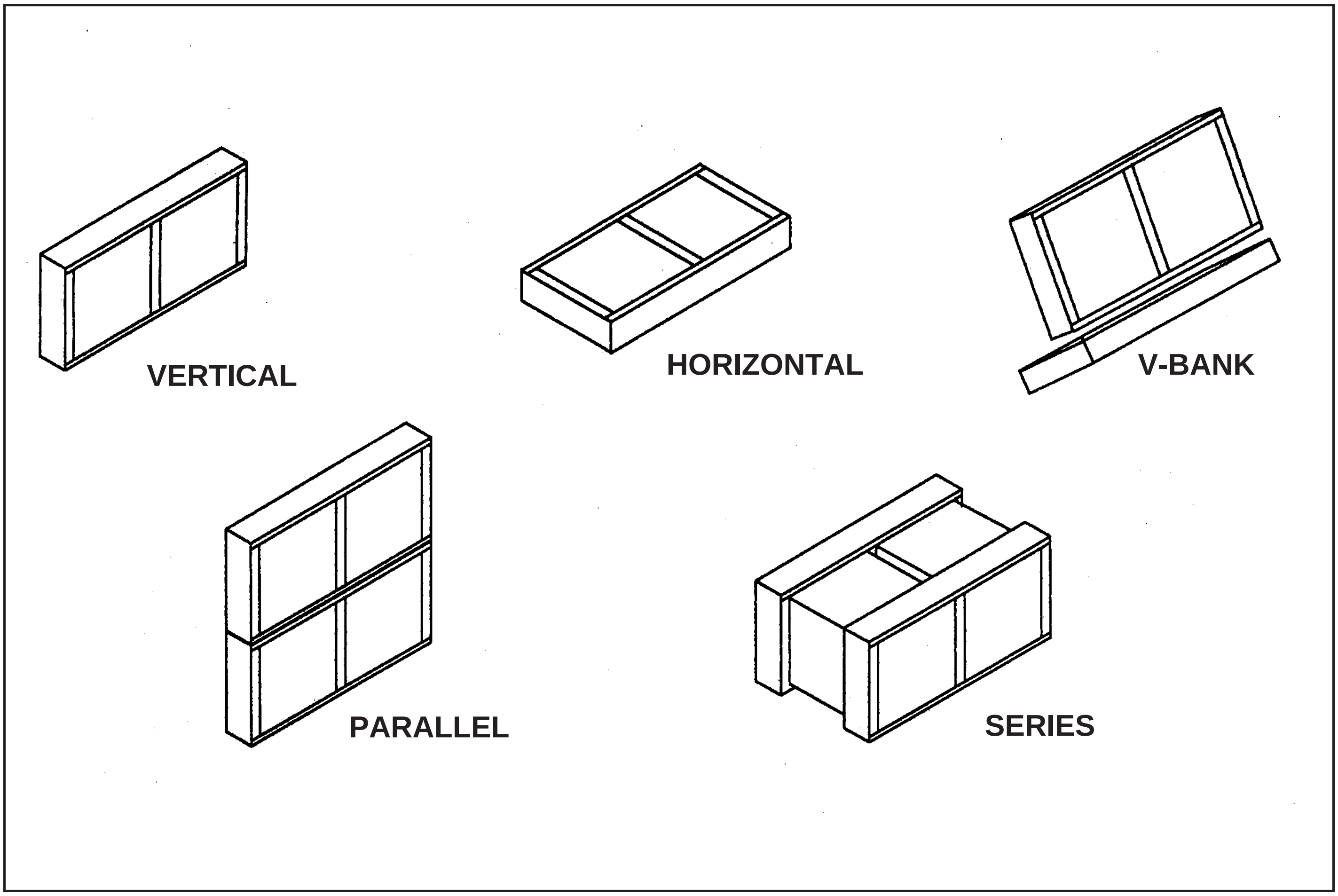
Filtration requirements: Performance specifications are based on clean air and a clean surface. Adequate filtration should be used in both exchanger airstreams to ensure optimum performance and minimum maintenance.

Access doors: Access to allow periodic inspection of the exchanger and to facilitate cleaning should be provided.

Drain pans: Drain pans are recommended under the entire exchanger both as a condensate collection system and for cleaning purposes.

Code requirements: The installation of the exchanger should conform to all codes, laws and regulations applying at jobsite.

HPC HEAT PIPE COIL ARRANGEMENTS



HPC HEAT PIPE COIL SPECIFICATIONS

1. General specifications

1.1 Furnish and install heat pipe coils for air-to-air heat exchanger types shown on the schedule.

1.2 Heat pipe coils shall transfer heat between air streams flowing in a counter-flow arrangement.

1.3 Heat pipe coils shall be installed with 1/4-inch per foot tilt angle, hot end down, when used for heating and ventilating applications only or within 1/8-inch level end to end when used for heating, ventilating and cooling applications.

1.4 The heat pipe coil shall have no moving parts.

2. Construction

2.1 Heat pipes shall be constructed of 1-inch I.D. seamless, integrally finned aluminum tubing.

2.2 Heat pipes shall be arranged in the heat pipe coil with a maximum of 2-1/8 inches on center on the face and 1-7/8 inches on center row to row.

2.3 Heat pipe fin surface shall be integral to the heat pipe container wall and shall have a minimum of 0.017 inch mean fin thickness. Fins shall be tapered root to fin tip. Fin surface from the root to the fin tip shall have a minimum of 0.437 inches mean fin height.

2.4 Heat pipes shall have a capillary wick structure integral to the heat pipe container wall.

2.5 Heat pipes shall be of one piece construction. Two component heat pipes such as expanded tube to fin shall not be allowed.

2.6 Heat pipe working fluids shall be R-134a or be selected on the basis of heat pipe operating temperature and compatibility with heat pipe container material.

2.7 Heat pipes shall be individually processed, charged, hermetically sealed and factory tested.

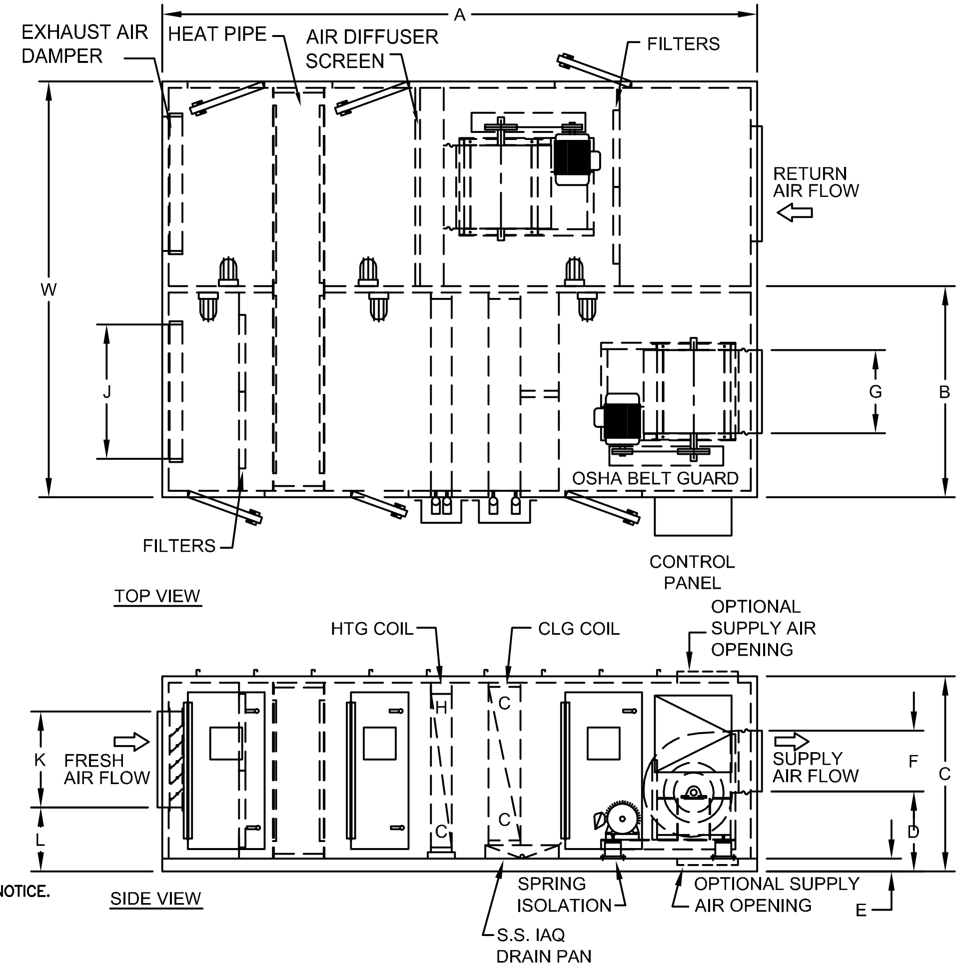
2.8 Heat pipe coil structural frame shall be fabricated from a minimum of 16 gauge galvanized steel. The heat pipe coil shall be supplied with a minimum of 2-inch wide flanges on all four sides both front and back. Intermediate supports shall be furnished as required.

2.9 Heat pipe coils shall be provided with a partition to isolate the airstreams and prevent cross contamination. The partition shall be at the center unless otherwise specified. The partition shall be fabricated from a minimum of 16 gauge galvanized steel and shall extend beyond the finned surface with 4-inch flanges. Both front and back are to be flush with the frame.

2.10 End covers shall be provided to protect the heat pipe ends. End covers shall be fabricated from a minimum of 16 gauge galvanized steel.

2.11 Heat pipe working fluids shall be classed as Group 1 in the American National Standard Code for Mechanical Refrigeration.

2.12 Additional specifications for other configurations available upon request.



NOTES:
1. 1 1/2 INLET AND DISCHARGE DUCT FLANGES.
2. SERVICE ACCESS PANELS MUST NOT BE OBSTRUCTED RECOMMENDED CLEARANCE 24 INCHES.
3. DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES. FOR REFERENCE USE ONLY, SUBJECT TO CHANGE WITHOUT NOTICE.

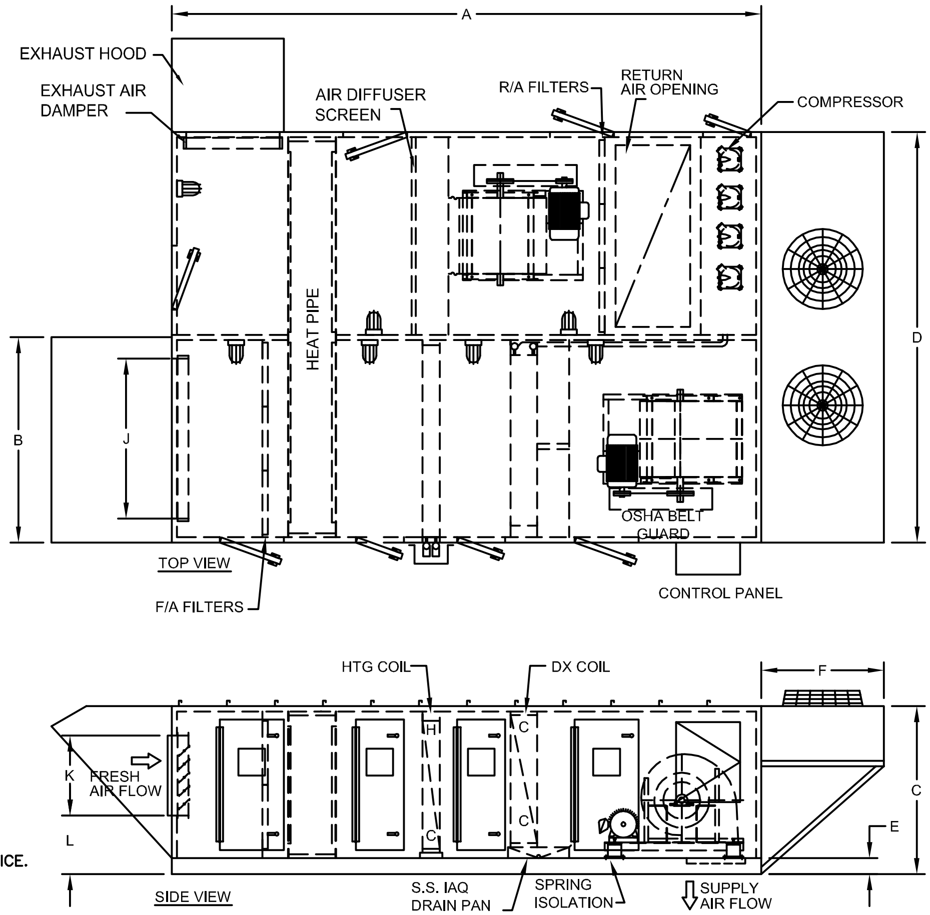
MODEL	CFM	A	B	C	D	E	F	G	J	K	L	W	HTG COIL QTY/SIZE	CLG COIL QTY/SIZE	S/A & E/A MOTOR (HP)	S/A & E/A FAN (inch)	F/A FILTER QTY/SIZEX2"	R/A FILTER QTY/SIZEX2"	CONTROL PANEL SIZE
AH-20-HP	2000	174	38	38	19.5	4	14	18	24	20	11	74	1-25x32	1-25x32	2	12	2-16x25	2-16x25	24x12
AH-60-HP	6000	180	54	49	22	4	16	22	40	25	14	106	1-40x48	1-36x48	5	15	2-24x24, 2-24x12	2-24x24, 2-24x12	24x24
AH-80-HP	8000	186	66	61	25	4	19	26	42	30	20	130	1-48x60	1-48x60	10	18	4-24x24	4-24x24	24x24
AH-120-HP	12000	186	78	61	26	4	22	28.5	60	30	20	154	1-48x72	1-48x72	15	20	6-24x24	6-24x24	24x30
AH-150-HP	15000	190	78	79	28	4	24	32	60	30	20	154	1-60x72	2-30x72	20	22	6-24x24,3-24x12	6-24x24,3-24x12	24x30
AH-180-HP	18000	204	78	90	32	4	29	38.5	60	40	36	154	1-72x72	2-35.5x72	20	27	9-24x24	9-24x24	24x30
AH-210-HP	21000	206	90	90	35	4	32	43	72	40	36	178	1-72x84	2-35.5x84	30	30	9-24x24,3-24x12	9-24x24,3-24x12	24x30

Rev	By	Revision Description	Date

ICE WESTERN SALES

TITLE
CONVERTIBLE WET AIR HANDLING UNIT
w/ HEAT PIPE, HEATING/COOLING WATER COILS
BI DWDI FAN c/w MOTOR (SUPPLY & EXHAUST)
MODEL: AH-HP

DRAWN BY	ISSUED BY	SCALE	DRW. NO.
		1/5"=1'	
CHK. BY	DATE	JOB NO.	PAGE F-13



NOTES:
1. 1 1/2 INLET AND DISCHARGE DUCT FLANGES.
2. SERVICE ACCESS PANELS MUST NOT BE OBSTRUCTED RECOMMENDED CLEARANCE 24 INCHES.
3. DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES. FOR REFERENCE USE ONLY, SUBJECT TO CHANGE WITHOUT NOTICE.

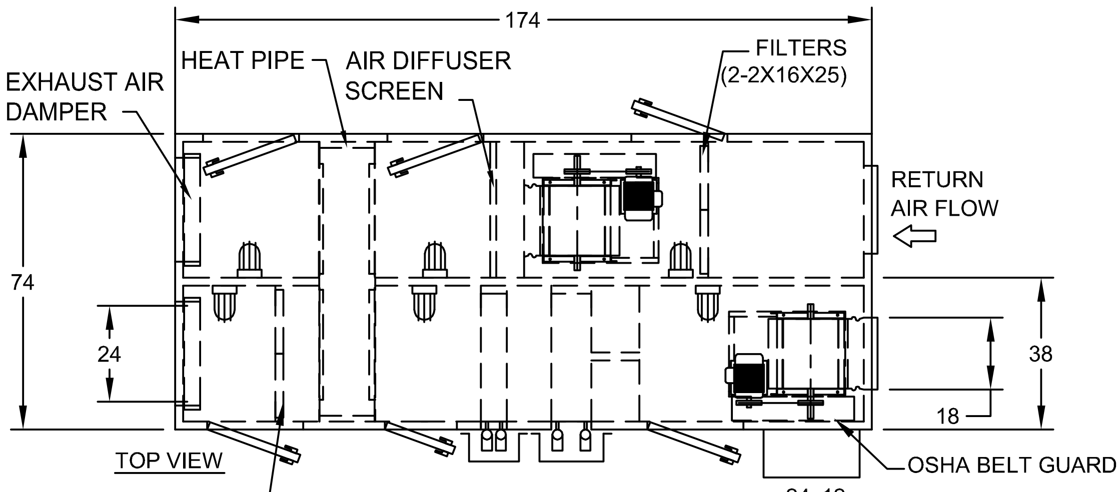
MODEL	CFM	A	B	C	D	E	F	J	K	L	HTG COIL QTY/SIZE	CLG COIL QTY/SIZE	S/A & E/A MOTOR (HP)	S/A & E/A FAN (inch)	F/A FILTER QTY/SIZEX2"	R/A FILTER QTY/SIZEX2"	CONTROL PANEL SIZE
AH-20-HP-DX05	2000	190	37	38	74	4	45-7/8	24	20	11	1-25x32	1-25x25	2	12	2-16x25	2-16x25	24x12
AH-60-HP-DX10	6000	195	53	51	106	6	45-7/8	40	25	16	1-40x48	1-36x40	5	15	2-24x24, 2-24x12	2-24x24, 2-24x12	24x24
AH-80-HP-DX20	8000	211	65	63	130	6	45-7/8	42	30	22	1-48x60	1-48x52	10	18	4-24x24	4-24x24	24x24
AH-120-HP-DX30	12000	231	77	63	154	6	45-7/8	60	30	22	1-48x72	1-48x64	15	20	6-24x24	6-24x24	24x30
AH-150-HP-DX40	15000	235	77	81	154	6	45-7/8	60	30	22	1-60x72	2-30x64	20	22	6-24x24,3-24x12	6-24x24,3-24x12	24x30
AH-180-HP-DX45	18000	256	77	92	154	6	45-7/8	60	40	38	1-72x72	2-35.5x64	20	27	9-24x24	9-24x24	24x30
AH-210-HP-DX50	21000	271	89	92	178	6	45-7/8	72	40	38	1-72x84	2-35.5x75	30	30	9-24x24,3-24x12	9-24x24,3-24x12	24x30

Rev	By	Revision Description	Date

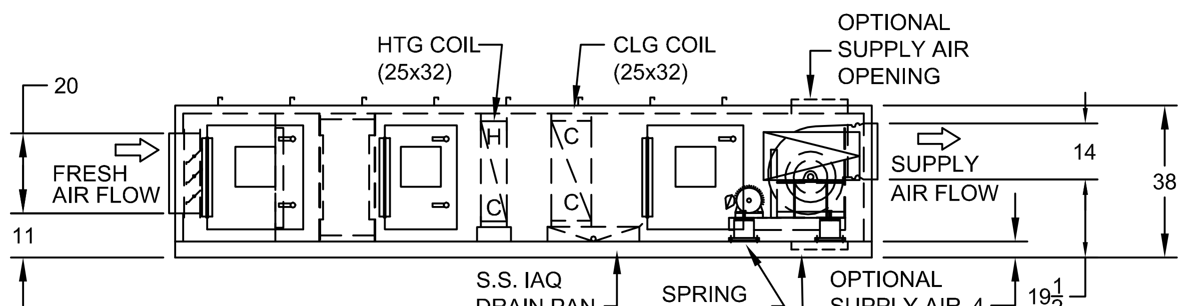
ICG WESTERN SALES

TITLE
OUTDOOR AIR HANDLING UNIT
w/ HEAT PIPE, HEATING WATER COIL & PACKAGED COOLING
BI DWDI FAN c/w MOTOR (SUPPLY & EXHAUST)
MODEL: AH-HP-DX

DRAWN BY	ISSUED BY	SCALE 1/6"=1'	DRW. NO.	
CHK. BY	DATE		JOB NO.	PAGE F-14



TOP VIEW



SIDE VIEW

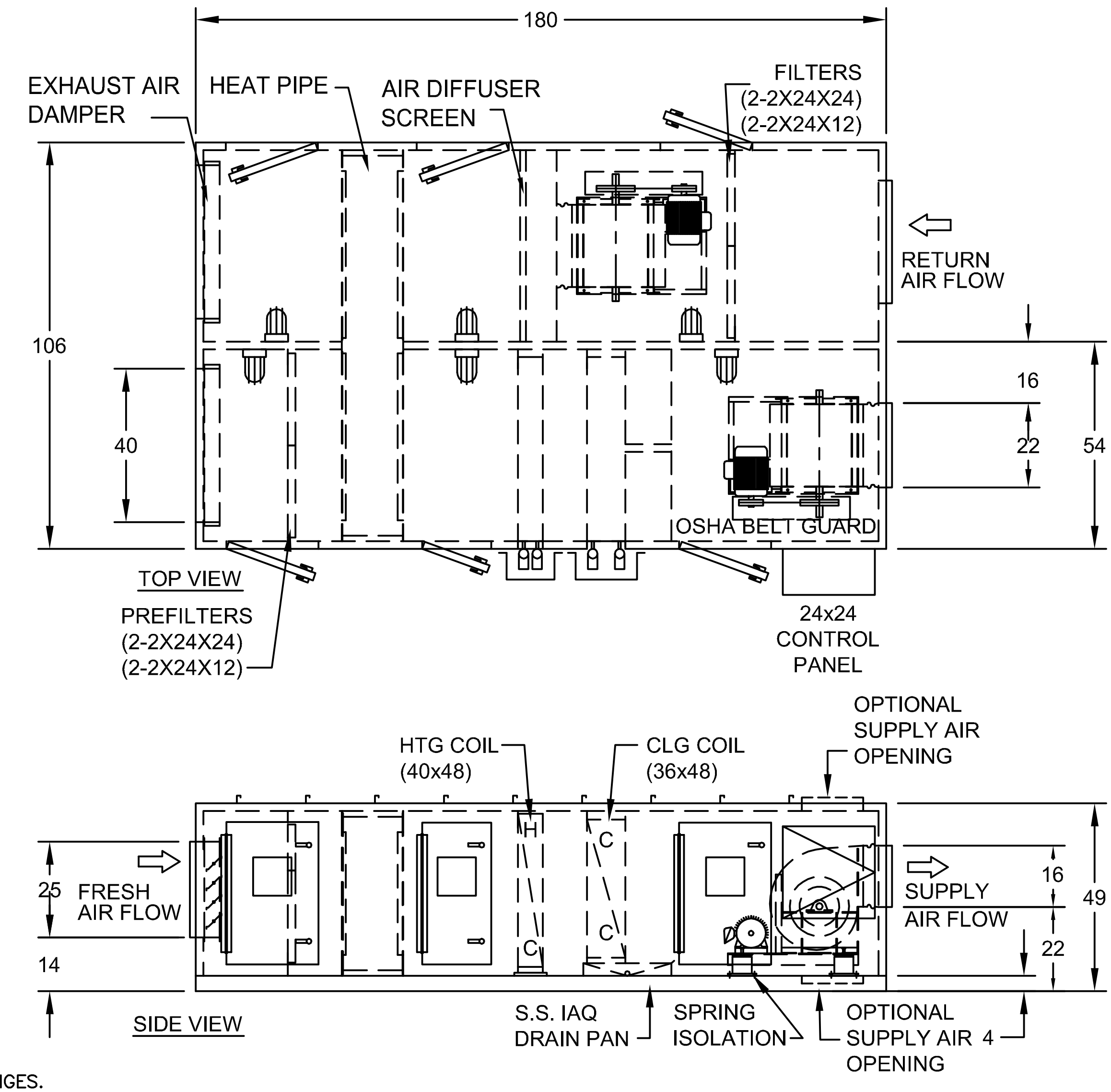
NOTES:

1. 1 1/2 INLET AND DISCHARGE DUCT FLANGES.
2. SERVICE ACCESS PANELS MUST NOT BE OBSTRUCTED RECOMMENDED CLEARANCE 24 INCHES.
3. DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES. FOR REFERENCE USE ONLY, SUBJECT TO CHANGE WITHOUT NOTICE.

Rev	By	Revision Description	Date

ICG WESTERN SALES

TITLE 2,000CFM CONVERTIBLE WET AIR HANDLING UNIT W/ HEAT PIPE, HEATING/COOLING WATER COILS 12" BI DWDI FAN c/w 2HP MOTOR (SUPPLY & EXHAUST) MODEL: AH-20-HP				
DRAWN BY	ISSUED BY	SCALE 1/4"=1'	DRW. NO.	
CHK. BY	DATE		JOB NO.	PAGE F-15



NOTES:

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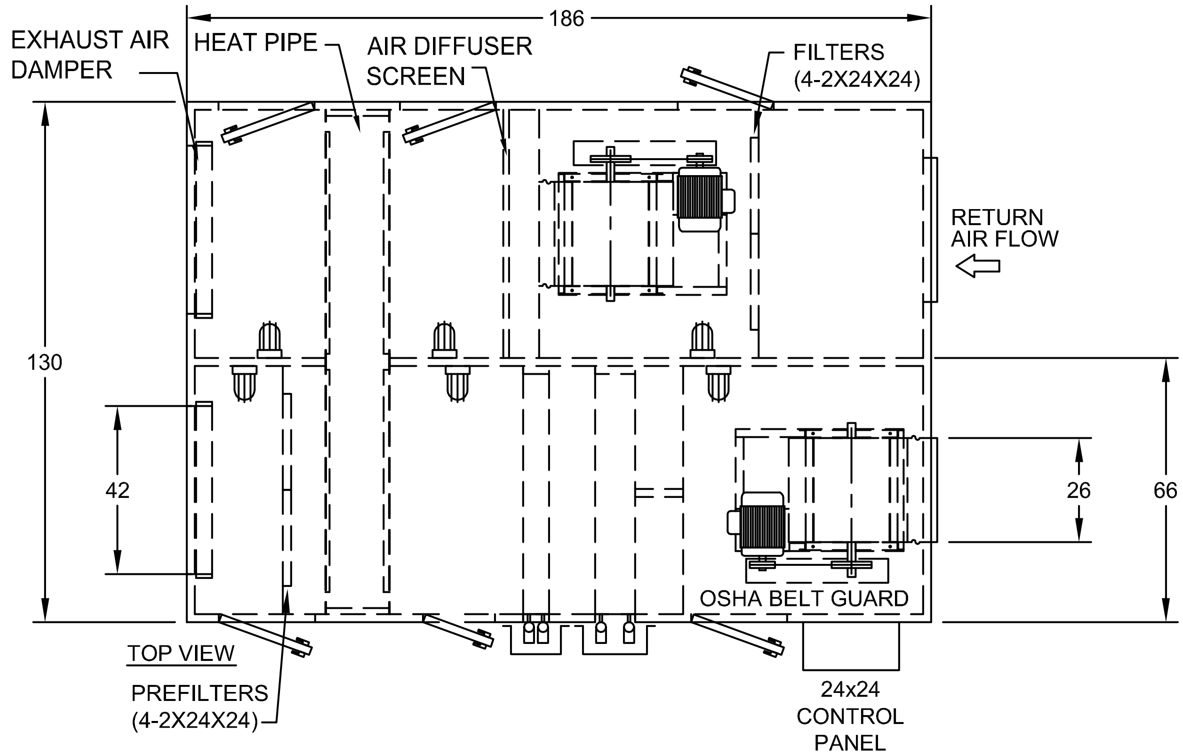
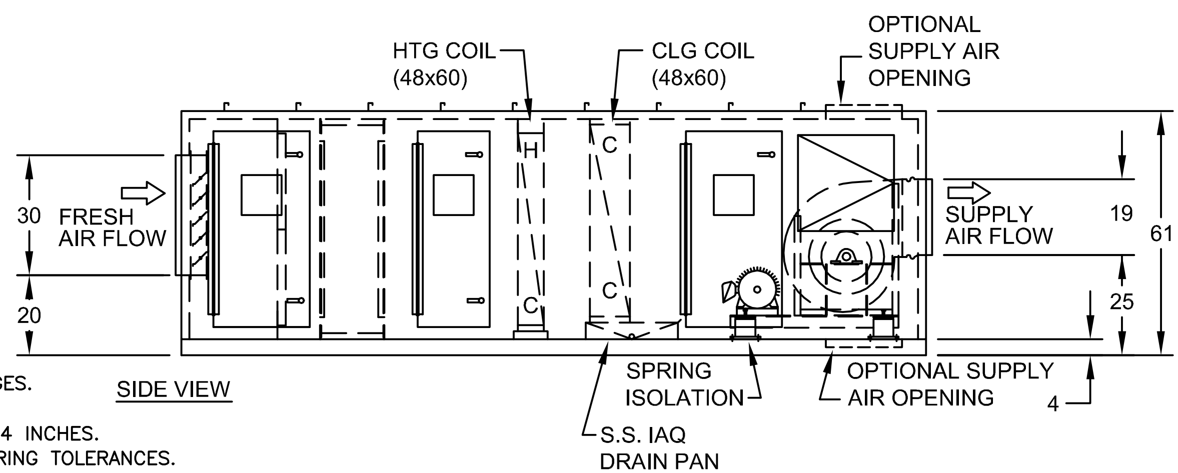
Rev	By	Revision Description	Date

ICG WESTERN SALES

TITLE 6,000CFM CONVERTIBLE WET AIR HANDLING UNIT w/ HEAT PIPE, HEATING/COOLING WATER COILS 15" BI DWDI FAN c/w 5HP MOTOR (SUPPLY & EXHAUST) MODEL: AH-60-HP			
DRAWN BY	ISSUED BY	SCALE 1/4"=1'	DRW. NO.
CHK. BY	DATE	JOB NO.	PAGE F-16



TOP VIEW



SIDE VIEW

NOTES:

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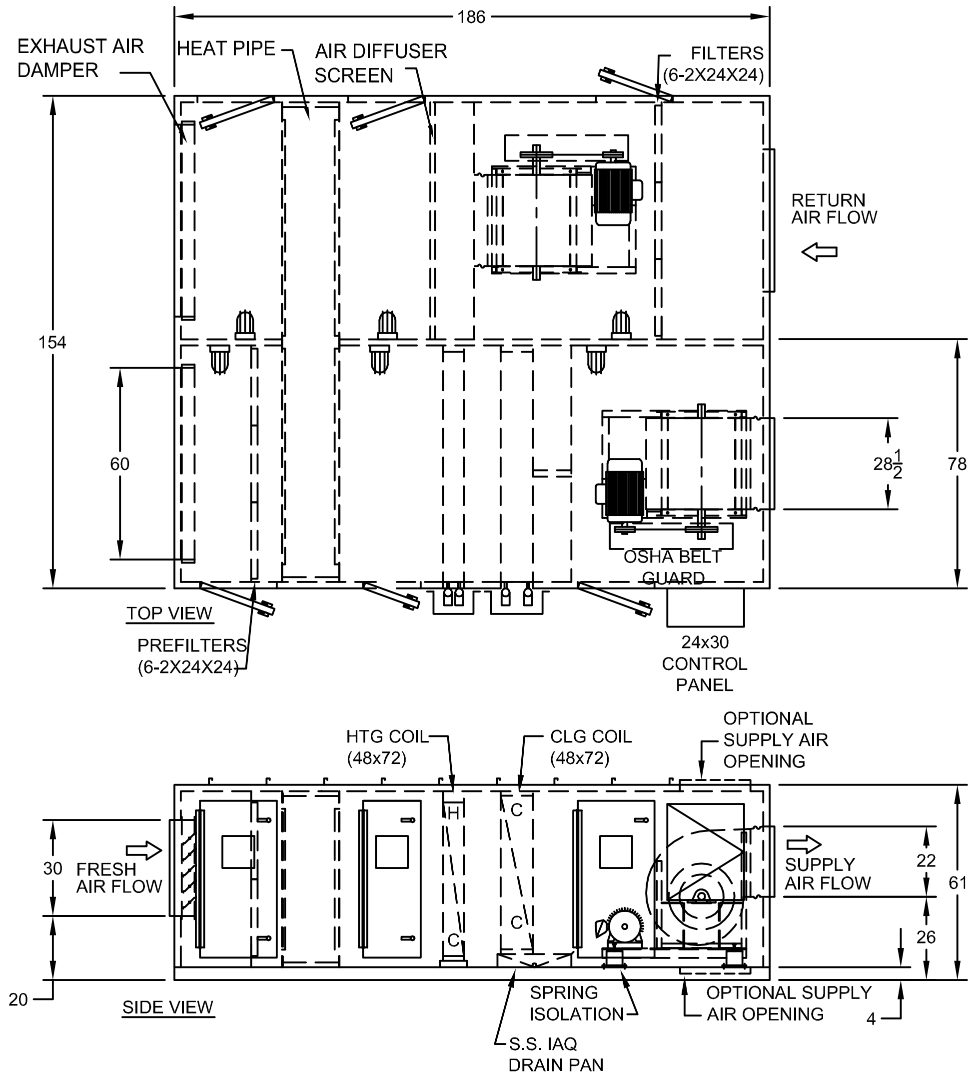
Rev	By	Revision Description	Date

ICG WESTERN SALES

TITLE 8,000CFM CONVERTIBLE WET AIR HANDLING UNIT w/ HEAT PIPE, HEATING/COOLING WATER COILS 18" BI DWDI FAN c/w 10HP MOTOR (SUPPLY & EXHAUST) MODEL: AH-80-HP				
DRAWN BY	ISSUED BY	SCALE 1/4"=1'	DRW. NO.	
CHK. BY	DATE		JOB NO.	PAGE F-17



NOTES:
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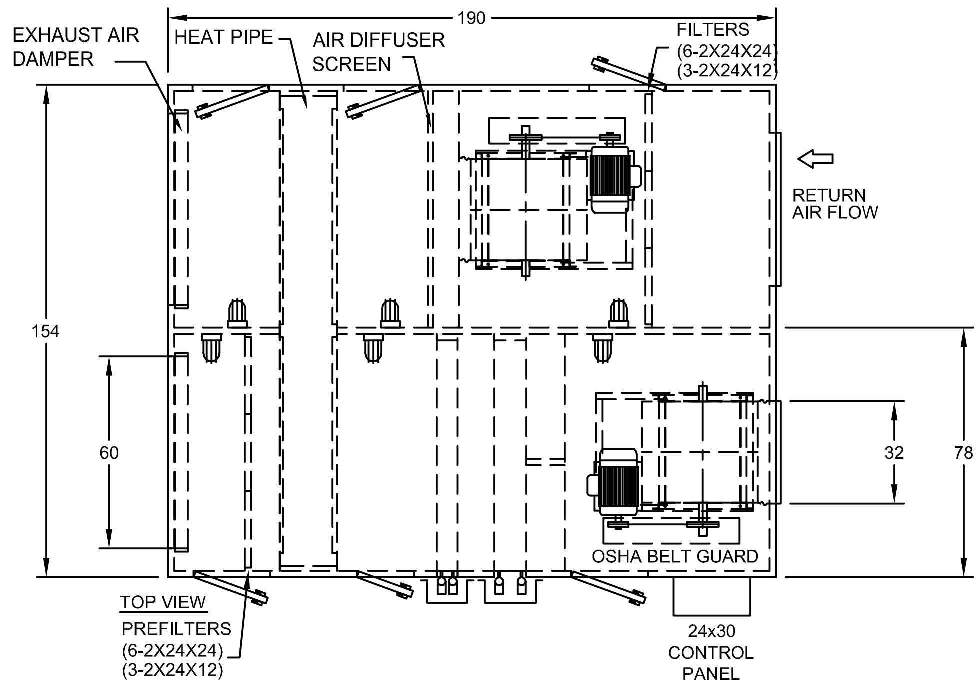
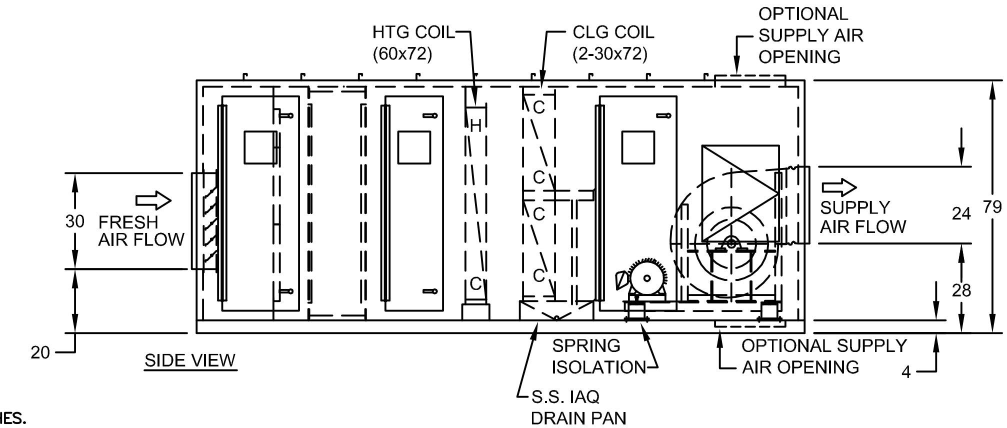
Rev	By	Revision Description	Date

ICG WESTERN SALES

TITLE 12,000CFM CONVERTIBLE WET AIR HANDLING UNIT w/ HEAT PIPE, HEATING/COOLING WATER COILS 20" BI DWDI FAN c/w 15HP MOTOR (SUPPLY & EXHAUST) MODEL: AH-120-HP				
DRAWN BY	ISSUED BY	SCALE 1/5"=1'	DRW. NO.	
CHK. BY	DATE		JOB NO.	PAGE F-18



TOP VIEW



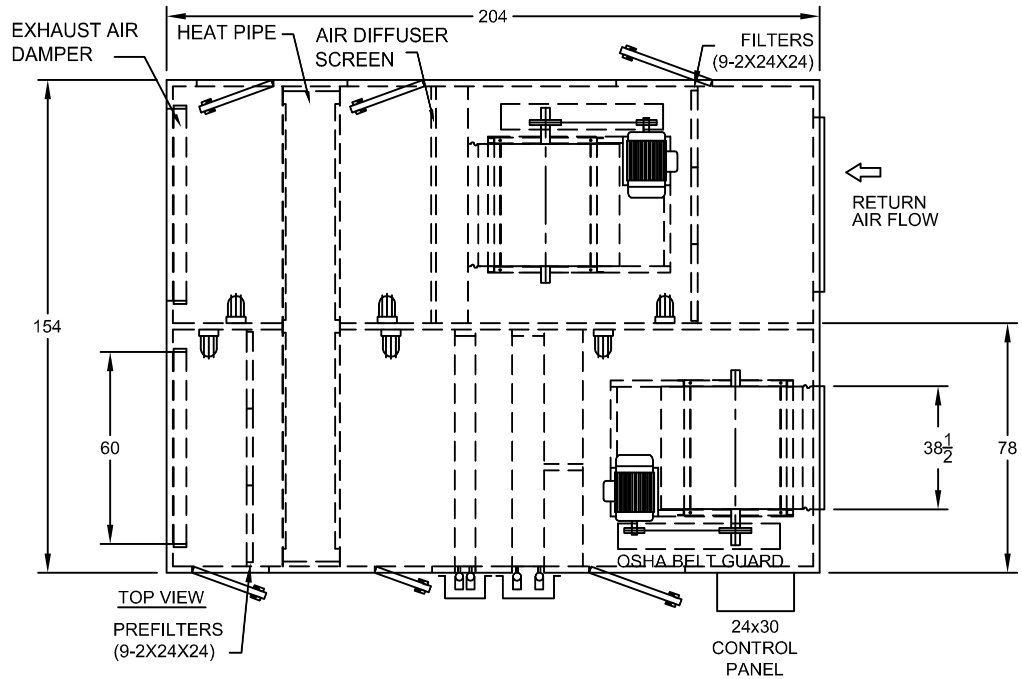
SIDE VIEW

NOTES:
1. 1 1/2 INLET AND DISCHARGE DUCT FLANGES.
2. SERVICE ACCESS PANELS MUST NOT BE OBSTRUCTED RECOMMENDED CLEARANCE 24 INCHES.
3. DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES. FOR REFERENCE USE ONLY, SUBJECT TO CHANGE WITHOUT NOTICE.

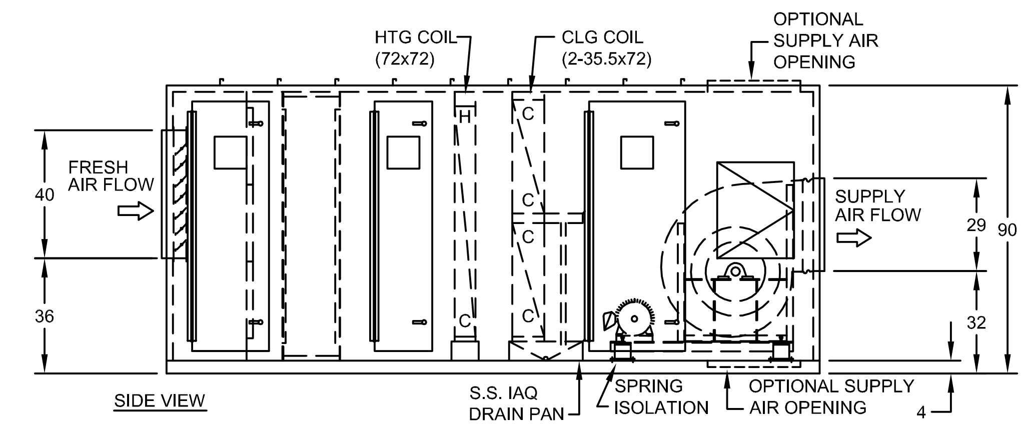
Rev	By	Revision Description	Date

ICE WESTERN SALES

TITLE 15,000CFM CONVERTIBLE WET AIR HANDLING UNIT w/ HEAT PIPE, HEATING/COOLING WATER COILS 22" BI DWDI FAN c/w 20HP MOTOR (SUPPLY & EXHAUST) MODEL: AH-150-HP				
DRAWN BY	ISSUED BY	SCALE 1/5"=1'	DRW. NO.	
CHK. BY	DATE		JOB NO.	PAGE F-19



TOP VIEW



SIDE VIEW

NOTES:

1. 1 1/2 INLET AND DISCHARGE DUCT FLANGES.
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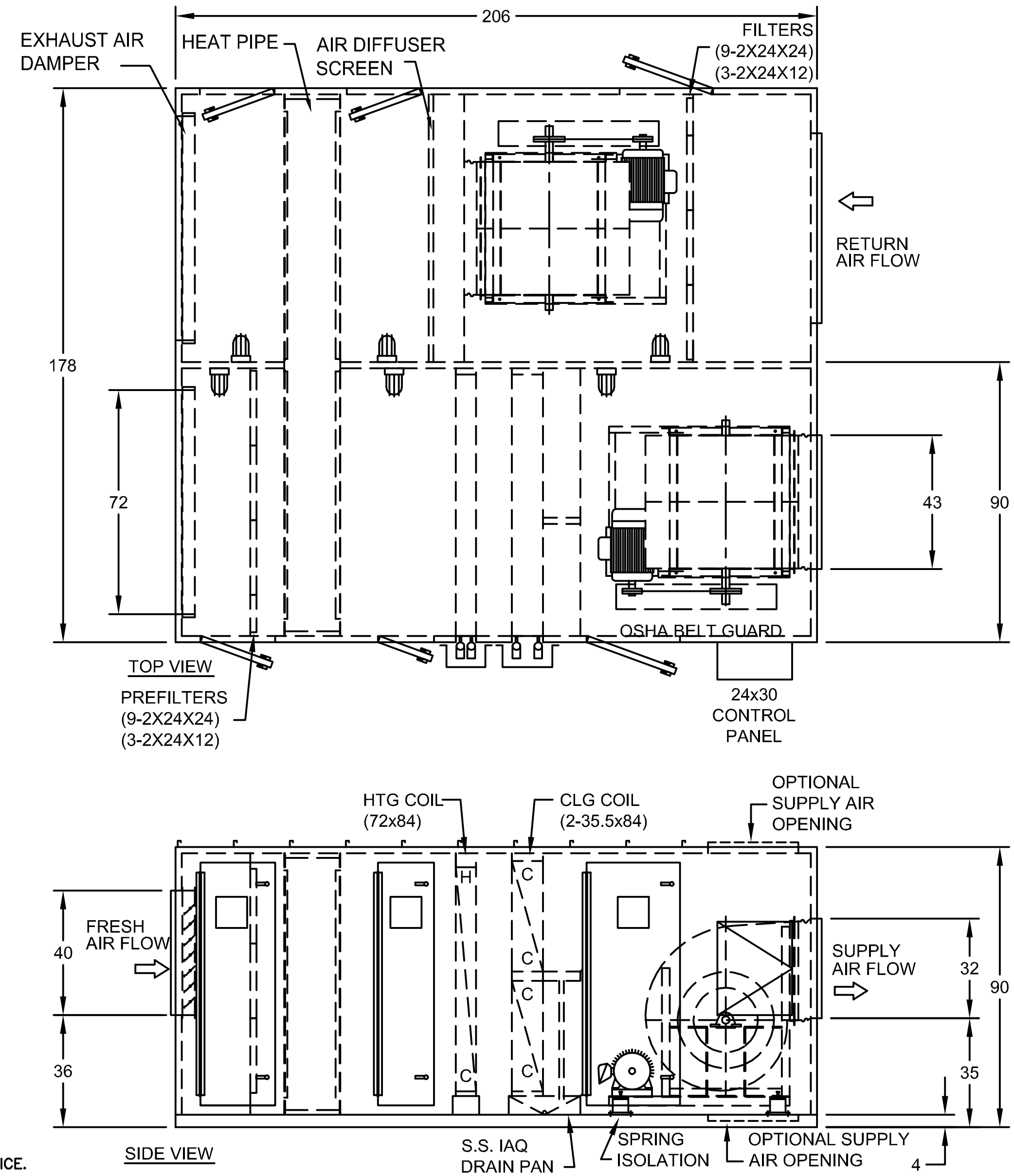
Rev	By	Revision Description	Date

ICG WESTERN SALES

TITLE 18,000CFM CONVERTIBLE WET AIR HANDLING UNIT w/ HEAT PIPE, HEATING/COOLING WATER COILS 27" BI DWDI FAN c/w 20HP MOTOR (SUPPLY & EXHAUST) MODEL: AH-180-HP				
DRAWN BY	ISSUED BY	SCALE 1/5"=1'	DRW. NO.	
CHK. BY	DATE		JOB NO.	PAGE F-20



NOTES:
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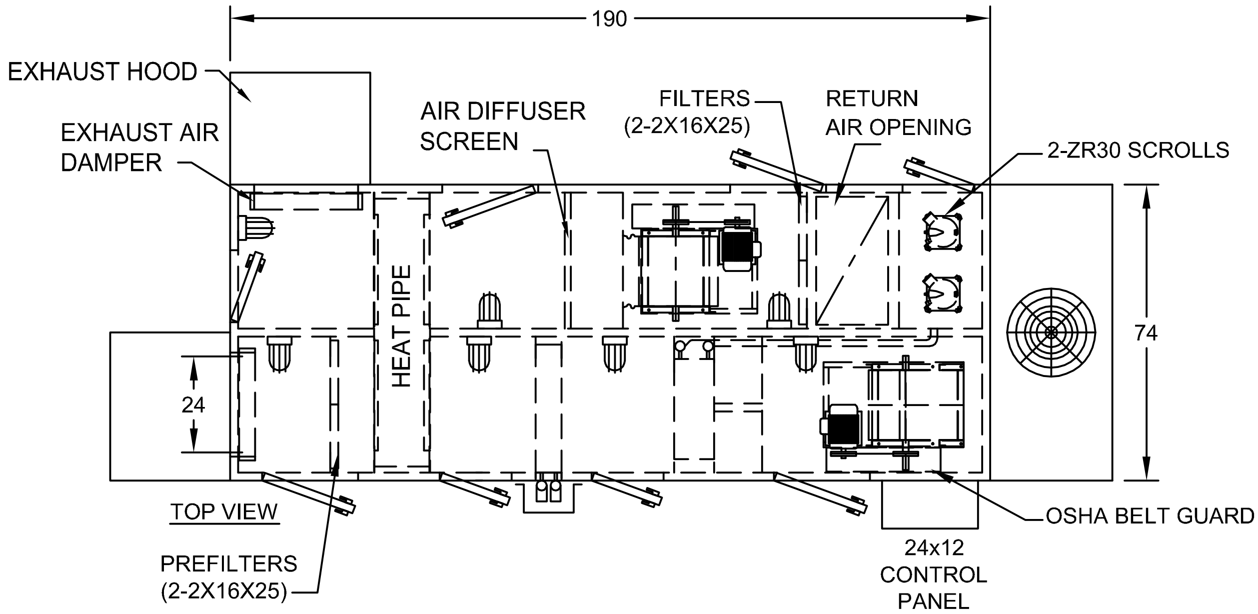
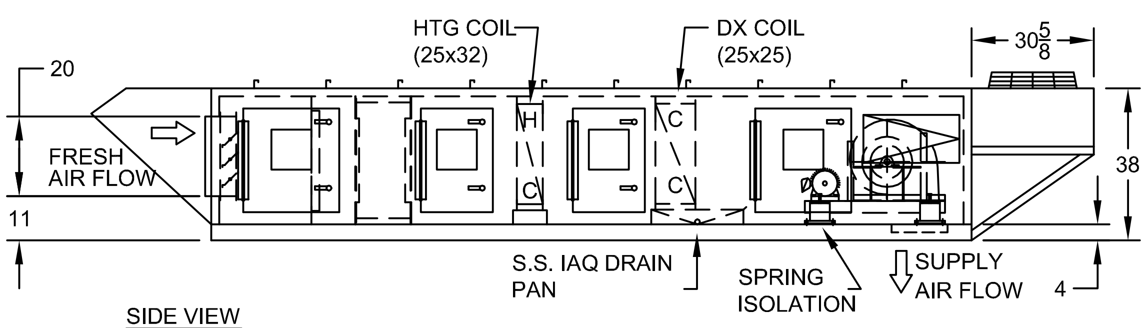
Rev	By	Revision Description	Date

ICG WESTERN SALES

TITLE
21,000CFM CONVERTIBLE WET AIR HANDLING UNIT
w/ HEAT PIPE, HEATING/COOLING WATER COILS
30" BI DWDI FAN c/w 30HP MOTOR (SUPPLY & EXHAUST)
MODEL: AH-210-HP

DRAWN BY	ISSUED BY	SCALE 1/5"=1'	DRW. NO.	
CHK. BY	DATE		JOB NO.	PAGE F-21





NOTES:

1. 1 1/2 INLET AND DISCHARGE DUCT FLANGES.
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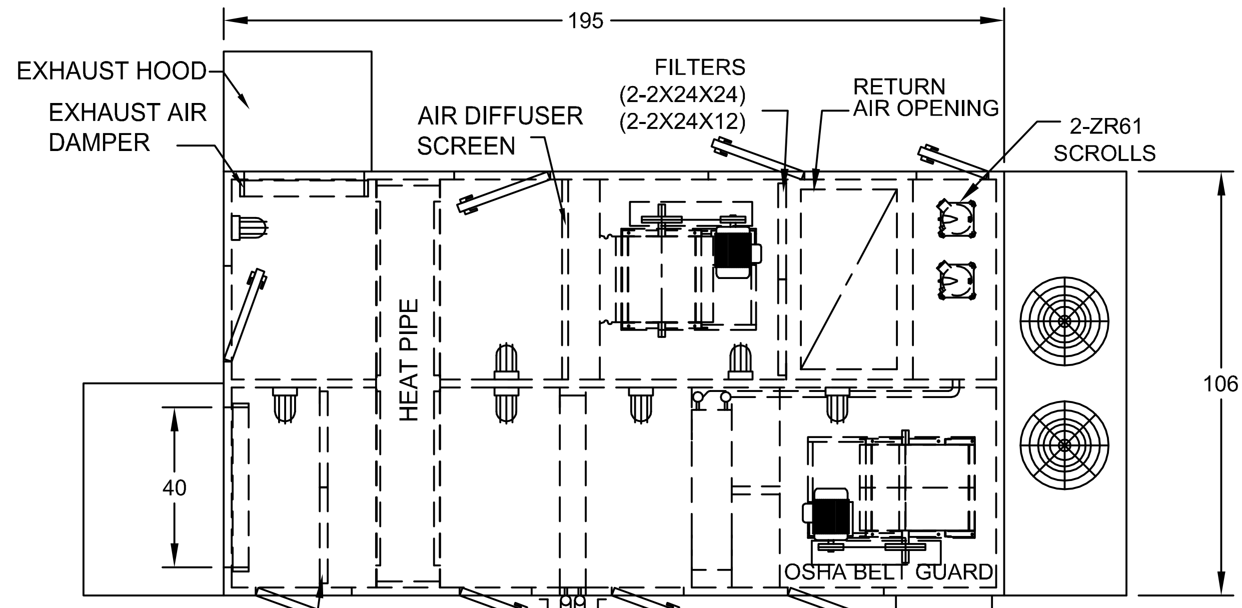
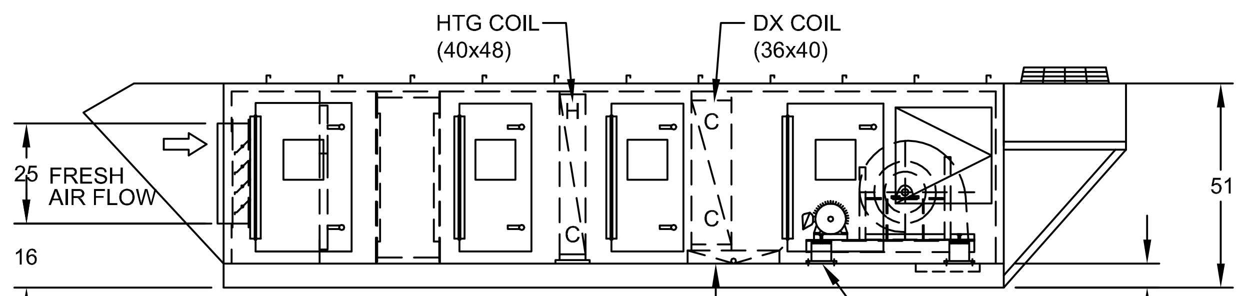
Rev	By	Revision Description	Date

ICE WESTERN SALES

TITLE 2,000CFM ROOFTOP AIR HANDLING UNIT w/HEAT PIPE, HEATING WATER COIL & PACKAGED COOLING 12" BI DWDI FAN c/w 2HP MOTOR (SUPPLY & EXHAUST) MODEL: AH-20-HP-DX05				
DRAWN BY	ISSUED BY	SCALE 1/4"=1'	DRW. NO.	
CHK. BY	DATE		JOB NO.	PAGE F-22



TOP VIEW



SIDE VIEW

NOTES:

1. 1 1/2 INLET AND DISCHARGE DUCT FLANGES.
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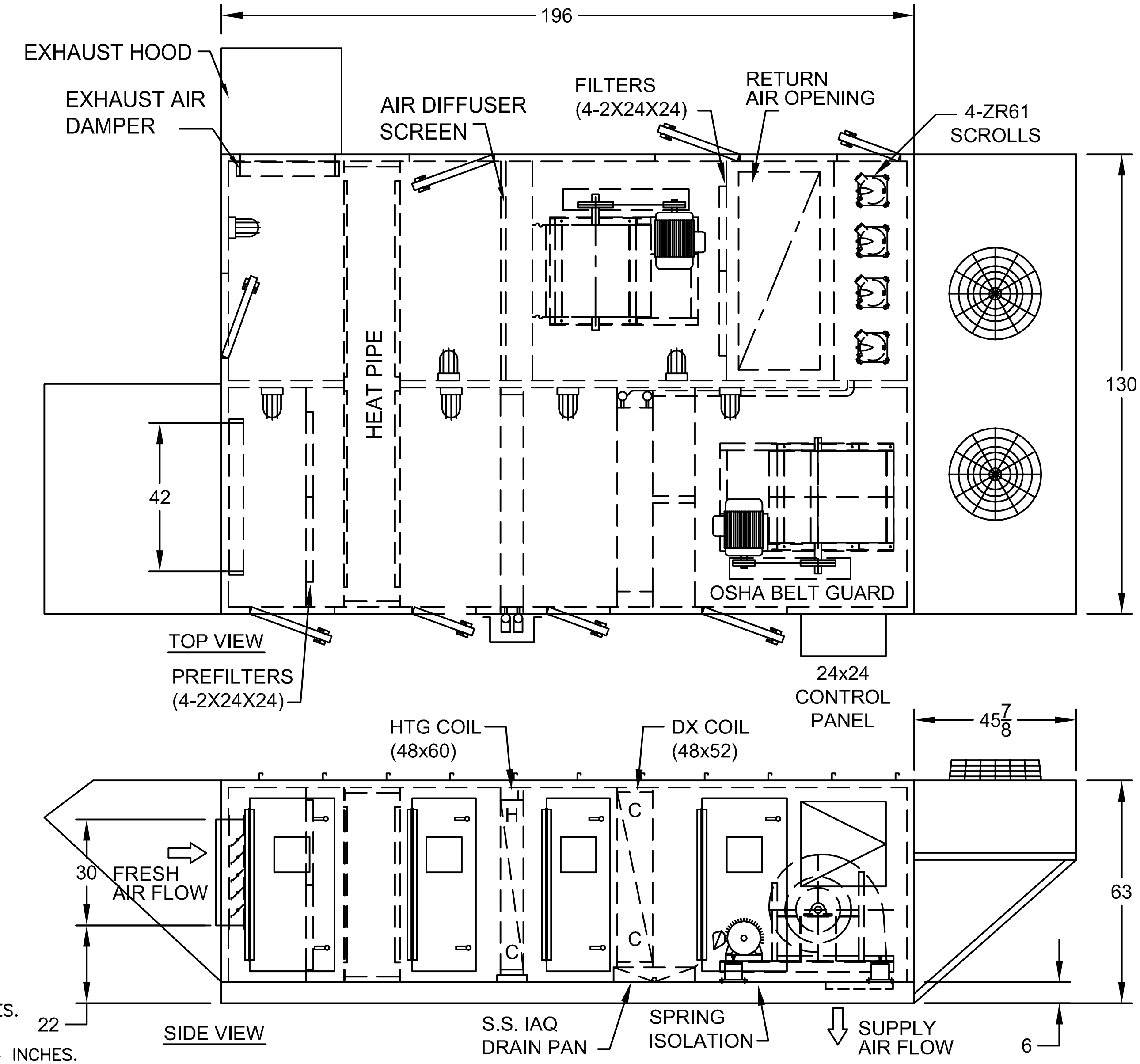
Rev	By	Revision Description	Date

ICE WESTERN SALES

TITLE 6,000CFM ROOFTOP AIR HANDLING UNIT w/ HEAT PIPE, HEATING WATER COIL & PACKAGED COOLING 15" BI DWDI FAN c/w 5HP MOTOR (SUPPLY & EXHAUST) MODEL: AH-60-HP-DX10				
DRAWN BY	ISSUED BY	SCALE 1/4"=1'	DRW. NO.	
CHK. BY	DATE		JOB NO.	PAGE F-23



NOTES:
1. 1 1/2 INLET AND DISCHARGE DUCT FLANGES.
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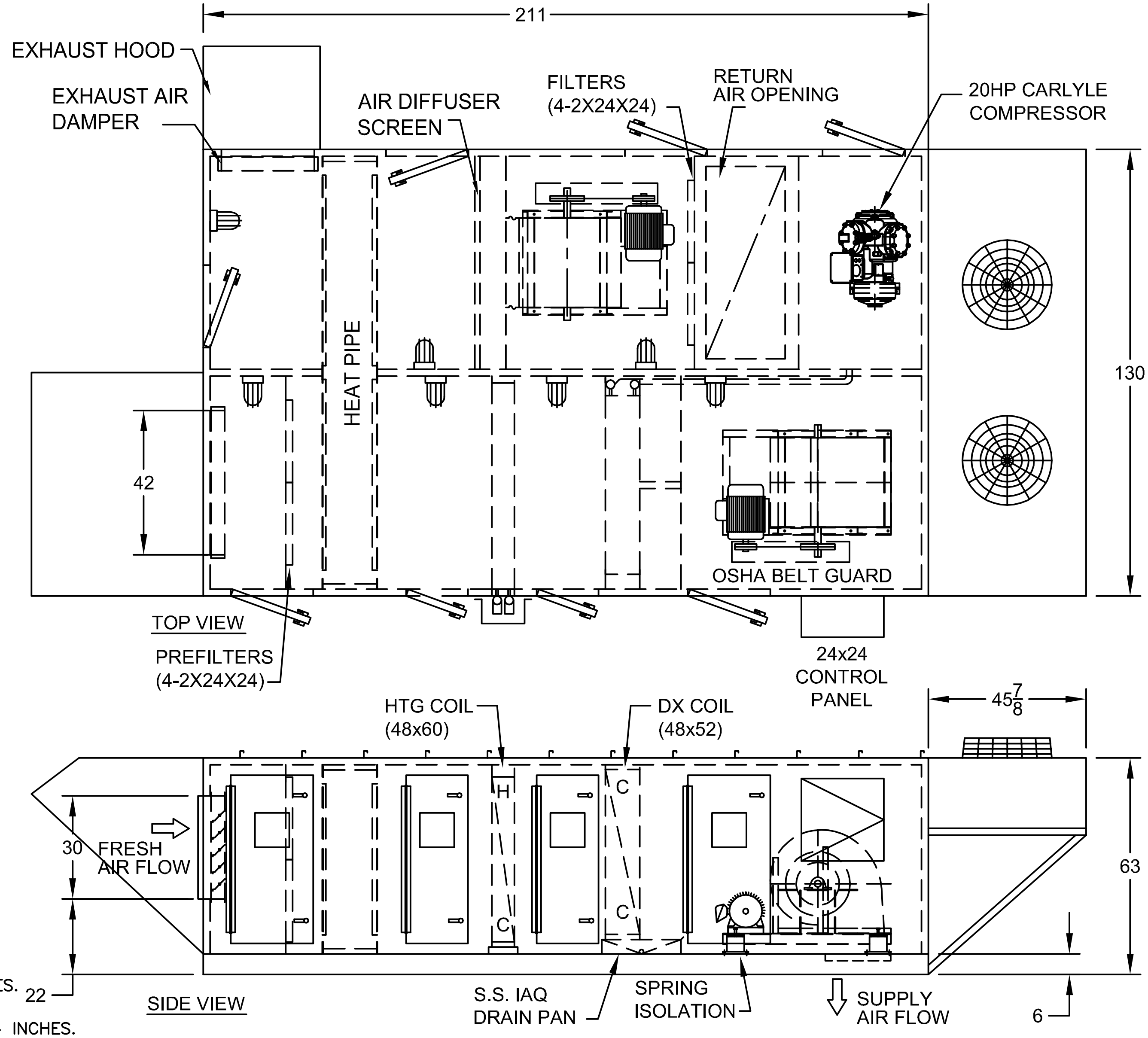
Rev	By	Revision Description	Date

ICG WESTERN SALES

TITLE 8,000CFM ROOFTOP AIR HANDLING UNIT w/ HEAT PIPE, HEATING WATER COIL & PACKAGED COOLING 18" BI DWDI FAN c/w 10HP MOTOR (SUPPLY & EXHAUST) MODEL: AH-80-HP-DX20				
DRAWN BY	ISSUED BY	SCALE 1/4"=1'	DRW. NO.	
CHK. BY	DATE		JOB NO.	PAGE F-24



NOTES:
1. 1 1/2 INLET AND DISCHARGE DUCT FLANGES.
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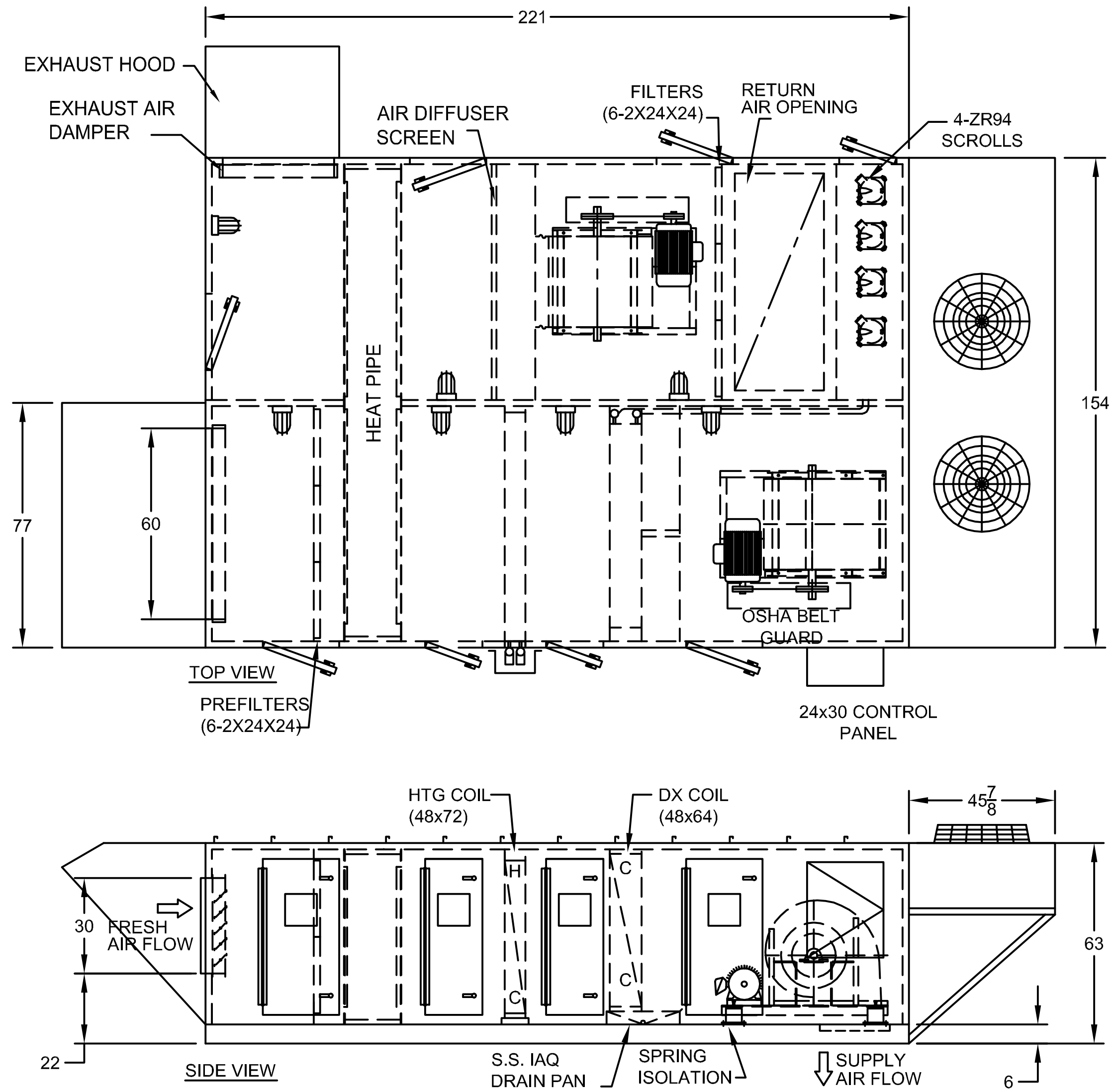
3. DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES. FOR REFERENCE USE ONLY, SUBJECT TO CHANGE WITHOUT NOTICE.

Rev	By	Revision Description	Date

WESTERN SALES

TITLE
8,000CFM ROOFTOP AIR HANDLING UNIT
w/ HEAT PIPE, HEATING WATER COIL & PACKAGED COOLING
18" BI DWDI FAN c/w 10HP MOTOR (SUPPLY & EXHAUST)
MODEL: AH-80-HP-DX20

DRAWN BY	ISSUED BY	SCALE	DRW. NO.	
		1/4"=1'		
CHK. BY	DATE		JOB NO.	PAGE F-25



NOTES:
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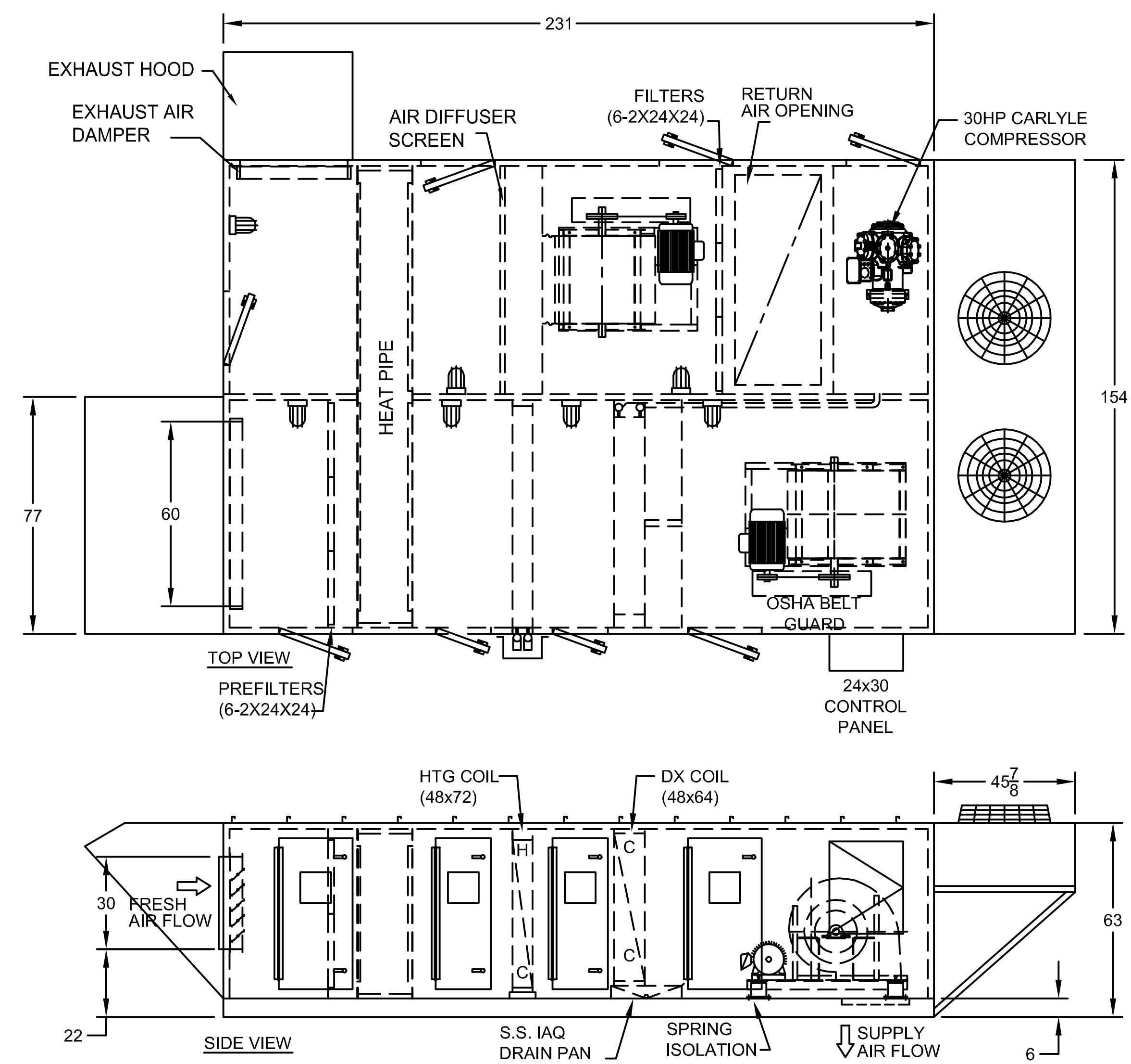
3. DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES. FOR REFERENCE USE ONLY, SUBJECT TO CHANGE WITHOUT NOTICE.

Rev	By	Revision Description	Date

ICE WESTERN SALES

TITLE
12,000CFM OUTDOOR AIR HANDLING UNIT
w/ HEAT PIPE, HEATING WATER COIL & PACKAGED COOLING
20" BI DWDI FAN c/w 15HP MOTOR (SUPPLY & EXHAUST)
MODEL: AH-120-HP-DX30

DRAWN BY	ISSUED BY	SCALE 1/5"=1'	DRW. NO.	
CHK. BY	DATE		JOB NO.	PAGE F-26



NOTES:
1. 1 1/2 INLET AND DISCHARGE DUCT FLANGES.
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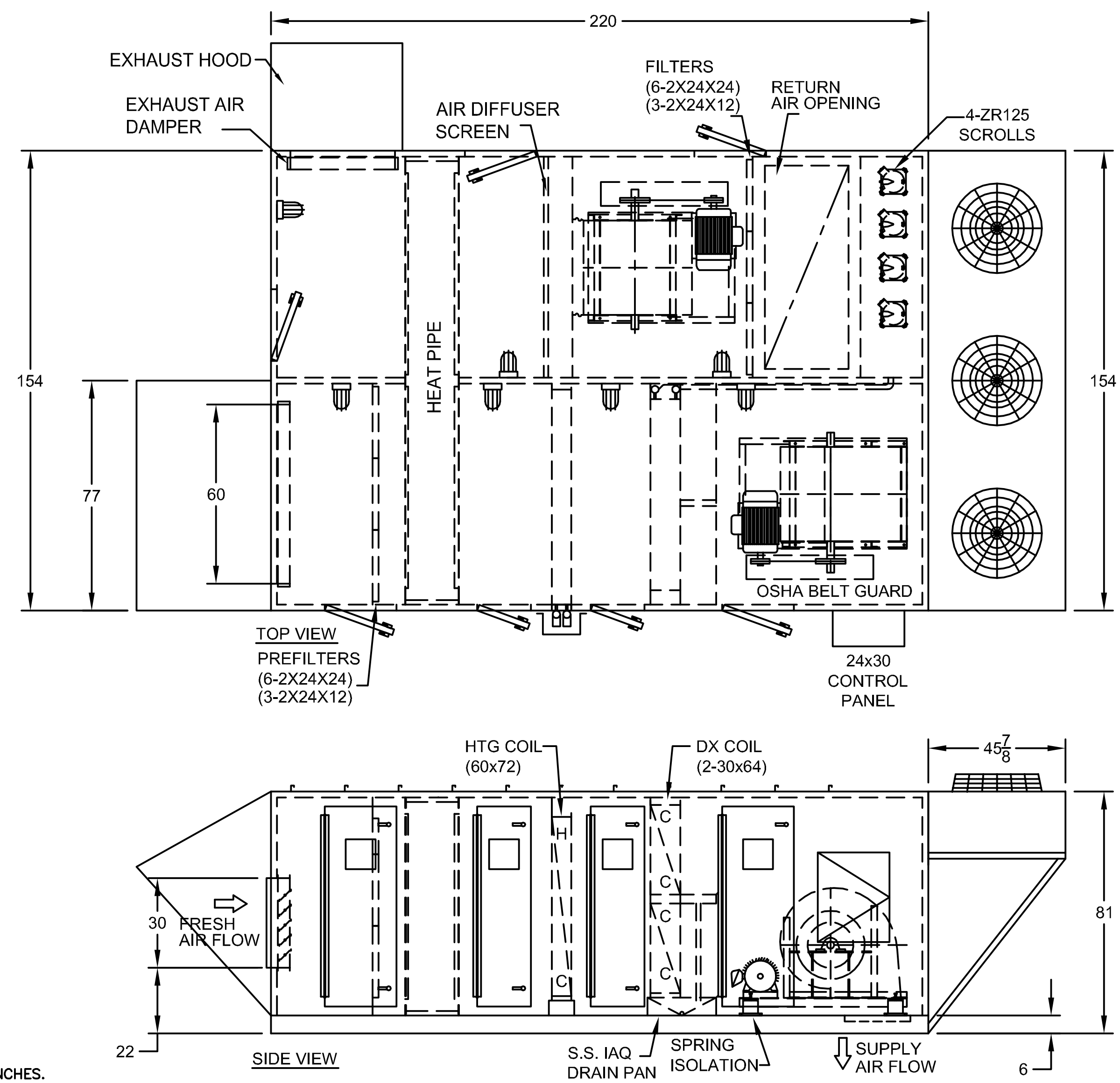
Rev	By	Revision Description	Date

ICE WESTERN SALES

TITLE
12,000CFM OUTDOOR AIR HANDLING UNIT
w/ HEAT PIPE, HEATING WATER COIL & PACKAGED COOLING
20" BI DWDI FAN c/w 15HP MOTOR (SUPPLY & EXHAUST)
MODEL: AH-120-HP-DX30

DRAWN BY	ISSUED BY	SCALE	DRW. NO.	
		1/5"=1'		
CHK. BY	DATE		JOB NO.	PAGE F-27



NOTES:
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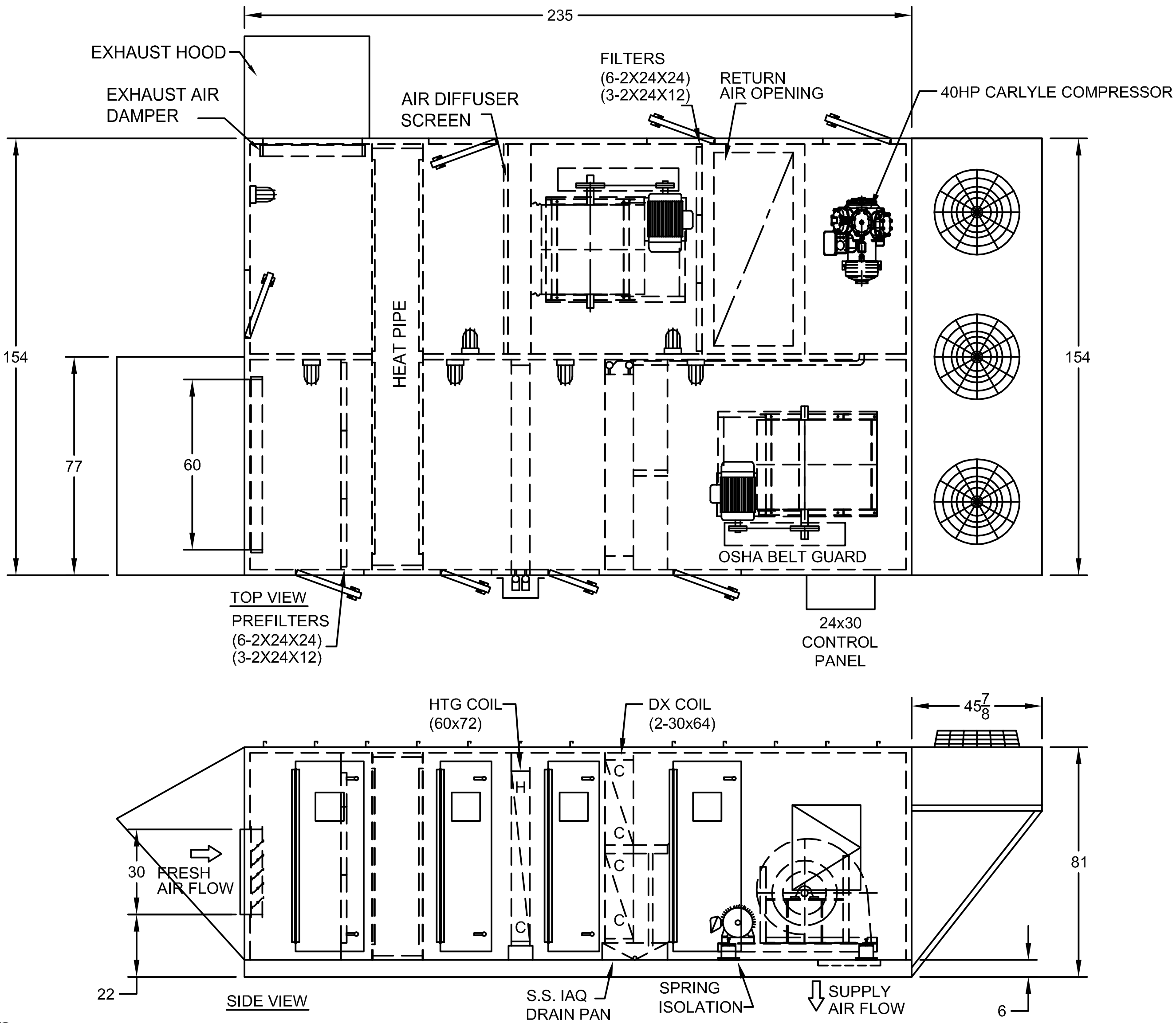
Rev	By	Revision Description	Date

ICG WESTERN SALES

TITLE
15,000CFM OUTDOOR AIR HANDLING UNIT
w/ HEAT PIPE, HEATING COIL & PACKAGED COOLING
22" BI DWDI FAN c/w 20HP MOTOR (SUPPLY & EXHAUST)
MODEL: AH-150-HP-DX40

DRAWN BY	ISSUED BY	SCALE 1/5"=1'	DRW. NO.	
CHK. BY	DATE		JOB NO.	PAGE F-28



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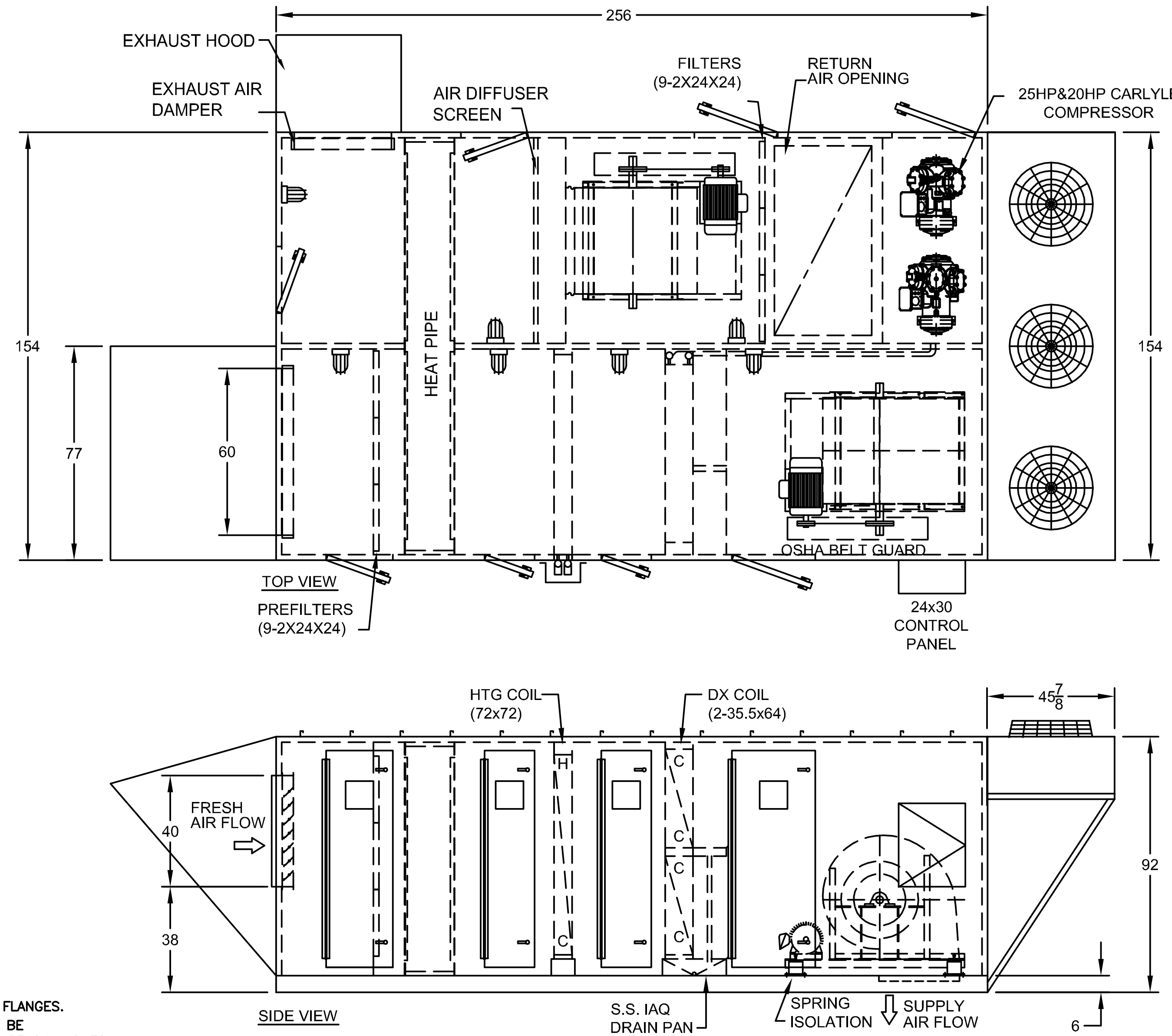
Rev	By	Revision Description	Date

ICG WESTERN SALES

TITLE
15,000CFM OUTDOOR AIR HANDLING UNIT
w/ HEAT PIPE, HEATING COIL & PACKAGED COOLING
22" BI DWDI FAN c/w 20HP MOTOR (SUPPLY & EXHAUST)
MODEL: AH-150-HP-DX40

DRAWN BY	ISSUED BY	SCALE 1/5"=1'	DRW. NO.	
CHK. BY	DATE		JOB NO.	PAGE F-29



NOTES:
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Rev	By	Revision Description	Date

ICE WESTERN SALES

TITLE
18,000CFM OUTDOOR AIR HANDLING UNIT
w/ HEAT PIPE, HEATING WATER COIL & PACKAGED COOLING
27" BI DWDI FAN c/w 20HP MOTOR (SUPPLY & EXHAUST)
MODEL: AH-180-HP-DX45

DRAWN BY	ISSUED BY	SCALE 1/5"=1'	DRW. NO.	
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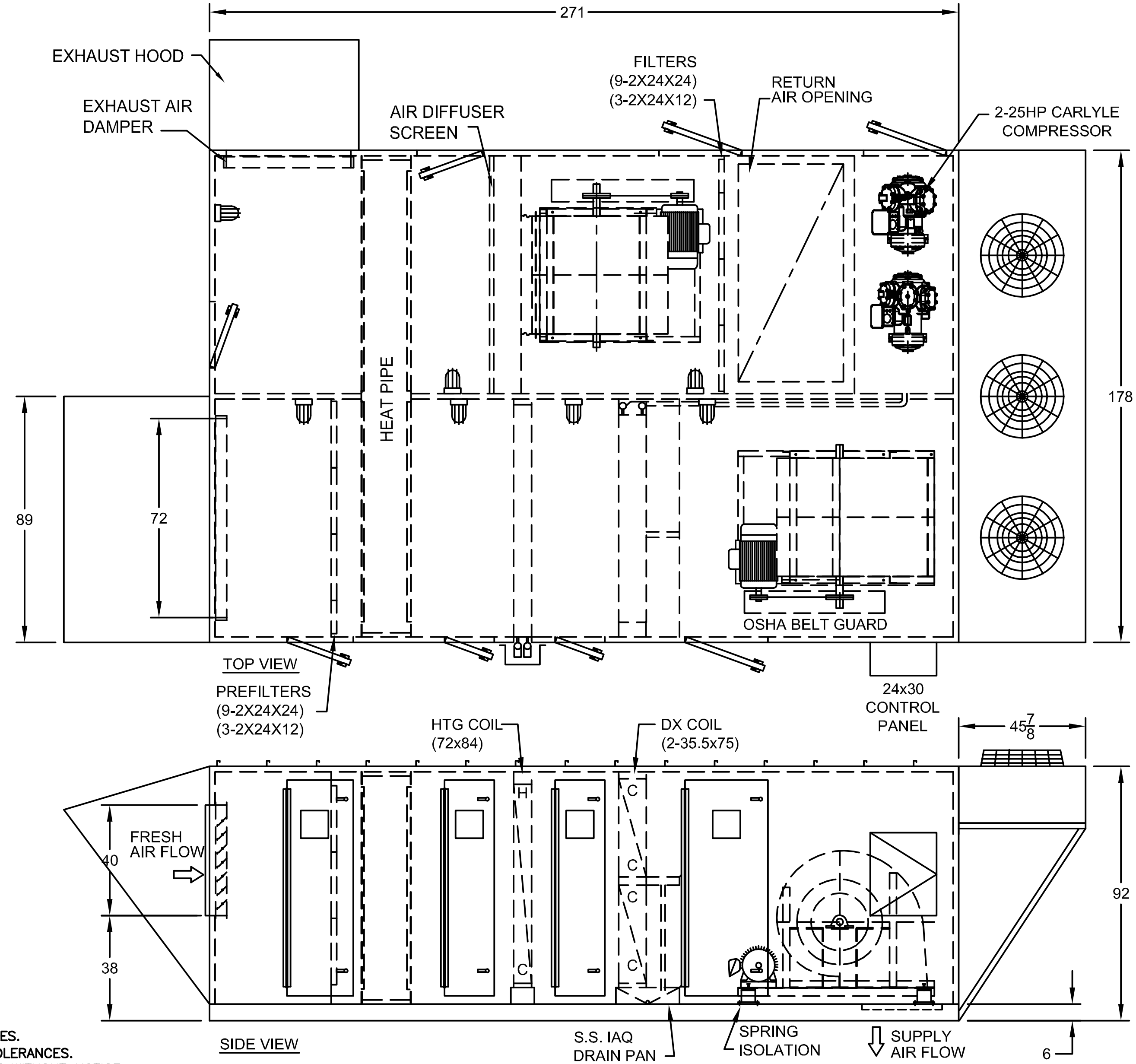


NOTES:
1. 1 1/2 INLET AND DISCHARGE DUCT FLANGES.
2. SERVICE ACCESS PANELS MUST NOT BE OBSTRUCTED RECOMMENDED CLEARANCE 24 INCHES.
3. DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES. FOR REFERENCE USE ONLY, SUBJECT TO CHANGE WITHOUT NOTICE.

Rev	By	Revision Description	Date

ICG WESTERN SALES

TITLE
21,000CFM OUTDOOR AIR HANDLING UNIT
w/ HEAT PIPE, HEATING WATER COIL & PACKAGED COOLING
30" BI DWDI FAN c/w 30HP MOTOR (SUPPLY & EXHAUST)
MODEL: AH-210-HP-DX50

DRAWN BY	ISSUED BY	SCALE 1/5"=1'	DRW. NO.	
CHK. BY	DATE		JOB NO.	PAGE F-31

AIR HANDLING UNITS w/ HEAT PIPE, HEATING WATER COIL, COOLING WATER COIL OR PACKAGED COOLING, SUPPLY & EXHAUST AIR BLOWER TYPICAL SPECIFICATIONS

CASING

The unit exterior casing shall be heavy gauge G90 rated bonderized steel. Unit roof shall feature standing seam construction. The entire unit casing shall be insulated with 1-in. thick 1.5-lb. (2-in. thick 1.5-lb.) fiberglass insulation with hard neoprene backing in a sandwich wall fashion (22-gauge solid liner). The unit exterior shall be finished with industrial enamel (catalyzed epoxy) paint. An integral welded iron channel frame shall support the unit casing. The structural iron frame shall be sandblasted, primed and finished with industrial enamel (catalyzed epoxy) paint.

BLOWER/MOTOR SECTION

The fan section and motor assembly shall be constructed in accordance with the requirements of the Air Moving and Conditioning Association (AMCA). The assembly shall be designed to house the fan(s), bearings, motor, and v-belts, which shall be selected for at least 50% above the rated motor capacity. The fan(s) and motor shall be mounted on a welded unitary base made of angle iron frame. The frame shall be sandblasted, primed and finished with industrial enamel (catalyzed epoxy) paint. The unitary base shall be provided with seismic spring vibration isolation. The blower section shall have a hinged access door with Ventlock handles to allow easy maintenance of filters and belts. The NEMA T-Frame motor shall be mounted on an adjustable base located within the fan section. The blower wheel shall be statically and dynamically balanced, and mounted on a turned, ground and polished shaft with rigid bearing supports. The shaft shall be designed with a maximum operating speed not exceeding 75% of the first critical speed. The bearings shall be split taper lock ball bearing type L20 minimum life of 100,000 hours (L10 200 kHr).

Fan performance shall be based on tests conducted in accordance with AMCA Standard Test Code for Air moving Devices. (All fans shall have sharply rising pressure characteristic extending throughout the operating range and continuing to rise well beyond the efficiency peak to assure quiet and stable operation under all conditions. Horsepower characteristics shall be truly non-overloading and shall reach a peak in the normal selection area.) Fan manufacturer shall provide sound power ratings in the eight octave bands, which shall be based on AMCA Standard 300-67, test, setup number one. Sound power ratings shall be referenced 10-12 watts. A factory dynamic balance shall be made on all fans after their assembly. An IRD or PMC analyzer shall be used to measure velocity, and the final reading shall not exceed 0.1 inches per second. The exact level of vibration shall be recorded on the fan as proof of the final dynamic balance at the factory.

COOLING CONTROLS

Cooling control shall be achieved via a Honeywell T775 multi-stage sequencer. The sequencer shall be controlled with an analog signal provided by the discharge air thermostat. As the discharge air thermostat requires cooling the signal shall increase, thereby turning on the stages at specific set points. The set points shall be set with appropriate offset and differential to ensure accurate discharge temperature is maintained. The stages are to be sequenced without turning on and off of compressors to minimize unnecessary wear on the compressors. Upon sensing a call for cooling from the space, the compressors shall provide full cooling until the space sensor is satisfied, upon which time the cooling shall revert to discharge air control. A low discharge temperature set point with a large differential shall be set to prevent the compressor from cycling on and off. The compressor will remain on low setting until cooling is disabled manually or the ambient temperature falls below the minimum set point.

ELECTRICAL CONTROL EQUIPMENT

Electrical assembly and components shall be in strict accordance with the latest provisions and requirements of the National Electric Code. Control cabinet shall be designed and constructed to ETL specifications. A safety disconnect switch shall be mounted on the unit. The controls shall be located in a weatherproof cabinet. Provisions for service padlocking shall be provided. The following items shall be located within the cabinet: fuses, starters, control relays, timing and holding relays, resistors and numbered terminal strips. All components shall be labeled and cross-referenced to control and field wiring diagrams. The control circuit shall be 24V, single phase. Wiring shall be neatly run in "PANDUIT" wiring duct. Low and/or line voltage thermostats shall be furnished shipped loose for installation by others. Unit shall be equipped with automatic low limit freeze protection with bypass timer.

DAMPERS & FILTER SECTION

The dampers are to be galvanized steel (aluminum airfoil low leak) type (with seals). The dampers shall be equipped with 2-position (modulating) actuators. The filters shall be 2" pleated throwaway type with minimum of 85% arrestance and 30% efficiency. Filter access shall be through a latched and gasketed access doors located on both sides of the unit. (Final filters shall be 4 or 12 inch high efficiency cartridge filters.)

REMOTE CONTROL PANELS

Remote NEMA 1(12) locking control panel shall be equipped with summer/off/winter switch and blower on, burner on, flame failure and loaded filter lights. (A remote adjustment potentiometer shall control damper positioning.) (An LCD display shall provide system temperature and set points.)

FLUID COILS

Fluid coils are intended for use with water, glycol, or other appropriate heat transfer fluids. Coils are to be designed to maximize performance under specified conditions with minimal air-side pressure drop.
All water coils designed with 1/2" or 5/8" tubes are to be ARI performance certified and shall bear the ARI symbol.
Tubes and return bends shall be constructed from seamless UNS C12200 copper conforming to ASTM B224 and ASTM E527. Properties shall be O50 light annealed with a maximum grain size of 0.040 mm.
Tubes are to mechanically expanded into fins (secondary surface) for maximum heat transfer. Materials are to be 3/8" diameter x (0.014, 0.022) wall thickness, 1/2" diameter x (0.016, 0.025) wall thickness, or 5/8" diameter x (0.020, 0.025, 0.035, 0.049) wall thickness.
Secondary surface (fins) shall be of the plate-fin design using aluminum or copper, with die-formed collars. Fin design to be flat, waffle, or sine-wave in a staggered tube pattern to meet performance requirements.

Collars will hold fin spacing at specified density, and cover the entire tube surface. Aluminum properties are to be Alloy 1100 per ASTM B209, with O (soft) temper; copper is to be Alloy 11000 per ASTM B152-06 with soft (anneal) temper. Fins are to be free of oils and oxidation.
Headers are to be constructed of seamless UNS C12200, Type L (drawn) copper material sized to match specified connection size. Type K (drawn) copper headers and Schedule 40 steel headers shall be offered as optional materials.
Die-formed copper end caps are brazed on the inside of the headers, unless spun-closed (for sizes up to 1-3/8”). 1/4” vents and drains are to be provided for all fluid coils.
Connection material shall be copper, or Schedule 40 steel or red brass pipe. The type of connection is to be sweat type, MPT or FPT, grooved, or flanged as required.
Coil casing material shall be of G90 galvanized steel, 16 gauge minimum. Heavier material, stainless steel, copper, or aluminum casing are to be provided as required.
Intermediate tube supports are to be provided on all coils 48” and longer fin length. Coil casing on top and bottom of coils are to have double-flange construction, allowing for vertical stacking of coils.
All coils are to be brazed with minimum 5% silver content (BCup-3) filler material to insure joint integrity. Low-fuming, flux-coated bronze braze-weld material is to be used for ferrous to non-ferrous joints.
Coils shall be tested at 550 psig using dry nitrogen, submerged under water. Dual-operator verification shall determine that all coils are leak-free.
Fluid coils shall be designed to withstand 300ºF maximum operating fluid temperature, and 250 psig maximum operating pressure.

EVAPORATOR COILS

Evaporator coils are intended for use with a wide range of applications and refrigerant types. Coils are to be designed to maximize performance under specified conditions with minimal air-side pressure drop.
Coils shall be UL recognized as Refrigerant Containing Component. Coils to be used with refrigerant R-410A shall have undergone cycle testing, and shall be safety listed with 750 psig rating.
Tubes and return bends shall be constructed from seamless UNS C12200 copper conforming to ASTM B224 and ASTM E527. Properties shall be O50 light annealed with a maximum grain size of 0.040 mm.
Tubes are to mechanically expanded into fins (secondary surface) for maximum heat transfer. Materials are to be 3/8” diameter x (0.014, 0.022) wall thickness, 1/2” diameter x (0.016, 0.025) wall thickness, or 5/8” diameter x (0.020, 0.025, 0.035, 0.049) wall thickness.
Secondary surface (fins) shall be of the plate-fin design using aluminum or copper, with die-formed collars. Fin design to be flat, waffle, or sine-wave in a staggered tube pattern to meet performance requirements.
Collars will hold fin spacing at specified density, and cover the entire tube surface. Aluminum properties are to be Alloy 1100 per ASTM B209, with O (soft) temper; copper is to be Alloy 11000 per ASTM B152-06 with soft (anneal) temper. Fins are to be free of oils and oxidation.
Headers are to be constructed of seamless UNS C12200, Type L (drawn) copper material sized to match specified connection size. Type K (drawn) copper headers shall be offered as optional material.
Die-formed copper end caps are brazed on the inside of the headers, unless spun-closed (for sized up to 1-3/8”).
Evaporator coils shall be designed with brass liquid distributors (as required), and copper sweat suction connections. Distributors shall be capped using soft-solder for ease of cap removal; suction connections shall be capped.

Coil casing material shall be of G90 galvanized steel, 16 gauge minimum. Heavier material, stainless steel, copper, or aluminum casing are to be provided as required.
Intermediate tube supports are to be provided on all coils 48” and longer fin length. Coil casing on top and bottom of coils are to have double-flange construction, allowing for vertical stacking of coils.
All coils are to be brazed with minimum 5% silver content (BCup-3) filler material to insure joint integrity.
Coils shall be tested at 550 psig using dry nitrogen, submerged under water. Dual-operator verification shall determine that all coils are leak-free.
Coils shall be shipped with nitrogen charge to verify leak-free integrity, and to prevent moisture migration into coil.
Coils shall be certified to withstand 750 psig working pressure.

CONDENSER COILS

Condenser coils are intended for use with a wide range of applications and refrigerant types. Coils are to be designed to maximize performance under specified conditions with minimal air-side pressure drop.
Coils shall be UL recognized as Refrigerant Containing Component. Coils to be used with refrigerant R-410A shall have undergone cycle testing, and shall be safety listed with 750 psig rating.
Tubes and return bends shall be constructed from seamless UNS C12200 copper conforming to ASTM B224 and ASTM E527. Properties shall be O50 light annealed with a maximum grain size of 0.040 mm.
Tubes are to mechanically expanded into fins (secondary surface) for maximum heat transfer. Materials are to be 3/8” diameter x (0.014, 0.022) wall thickness, 1/2” diameter x (0.016, 0.025) wall thickness, or 5/8” diameter x (0.020, 0.025, 0.035, 0.049) wall thickness.
Internally enhanced rifled or cross-hatched tubes can be offered as an option.
Secondary surface (fins) shall be of the plate-fin design using aluminum or copper, with die-formed collars. Fin design to be flat, waffle, or sine-wave in a staggered tube pattern to meet performance requirements.
Collars will hold fin spacing at specified density, and cover the entire tube surface. Aluminum properties are to be Alloy 1100 per ASTM B209, with O (soft) temper; copper is to be Alloy 11000 per ASTM B152-06 with soft (anneal) temper. Fins are to be free of oils and oxidation.
Headers are to be constructed of seamless UNS C12200, Type L (drawn) copper material sized to match specified connection size. Type K (drawn) copper headers shall be offered as optional material.
Die-formed copper end caps are brazed on the inside of the headers, unless spun-closed (for sized up to 1-3/8”).
Condenser coils shall be designed with copper sweat connections, and shall be shipped with caps on connections.
Coil casing material shall be of G90 galvanized steel, 16 gauge minimum. Heavier material, stainless steel, copper, or aluminum casing are to be provided as required.
Coils designed for hot-gas applications shall have oversized tube sheet holes for hot gas feeds to allow for free expansion and contraction of tubes during operation.
Intermediate tube supports are to be provided on all coils 48” and longer fin length. Coil casing on top and bottom of coils are to have double-flange construction, allowing for vertical stacking of coils.
All coils are to be brazed with minimum 5% silver content (BCup-3) filler material to insure joint integrity.
Coils shall be tested at 550 psig using dry nitrogen, submerged under water. Dual-operator verification shall determine that all coils are leak-free.

Coils shall be shipped with nitrogen charge to verify leak-free integrity, and to prevent moisture migration into coil.
Coils shall be certified to withstand 750 psig working pressure.

REFRIGERATION COMPRESSORS

Compressors shall be either hermetic or semi-hermetic type.

A) Semi-Hermetic- Semi-hermetic reciprocating compressors shall be provided on systems with total cooling capacity of 25 Tons and larger. Up to 40 tons a single compressor will be used and multiple semi-hermetic compressors over 40 Tons. Compressors shall be completely factory assembled, piped, insulated, internally wired and tested. Units shall be shipped in one piece and come fully charged with refrigerant and filled with compressor oil. Units shall be rated in accordance with ARI standards. The refrigerant system shall be leak tested, evacuated and refrigerant charged at the factory. Compressors shall be suction gas cooled and come with integral spring vibration isolators, oil level sight glass, discharge mufflers, vibrasorbers, automatic reversible oil pump, oil filter screen. Oil charging valve, crankcase heater which de-energizes during compressor operation, liquid line service valves. Unit shall also have the following safety control features:
    - Low pressure cutout
    - High pressure cutout, manual reset
    - Adjustable low ambient lockout
    - Liquid line solenoids incorporating pump down system
    - Anticycling time device (to prevent excessive cycling and premature wear on compressor and contactors) and phase and brownout protection.
    - Oil failure control

Provide cylinder suction pressure unloaders for capacity control, with minimum steps required to provide coil frost protection, based on refrigerant circuit suction temperatures. Provide filter dryers, sight glasses and compressor service valves for each individual compressor. Provide hot gas bypass for each compressor. Compressor staging to be provided by a Honeywell T775 Series standalone controller mounted in the unit.

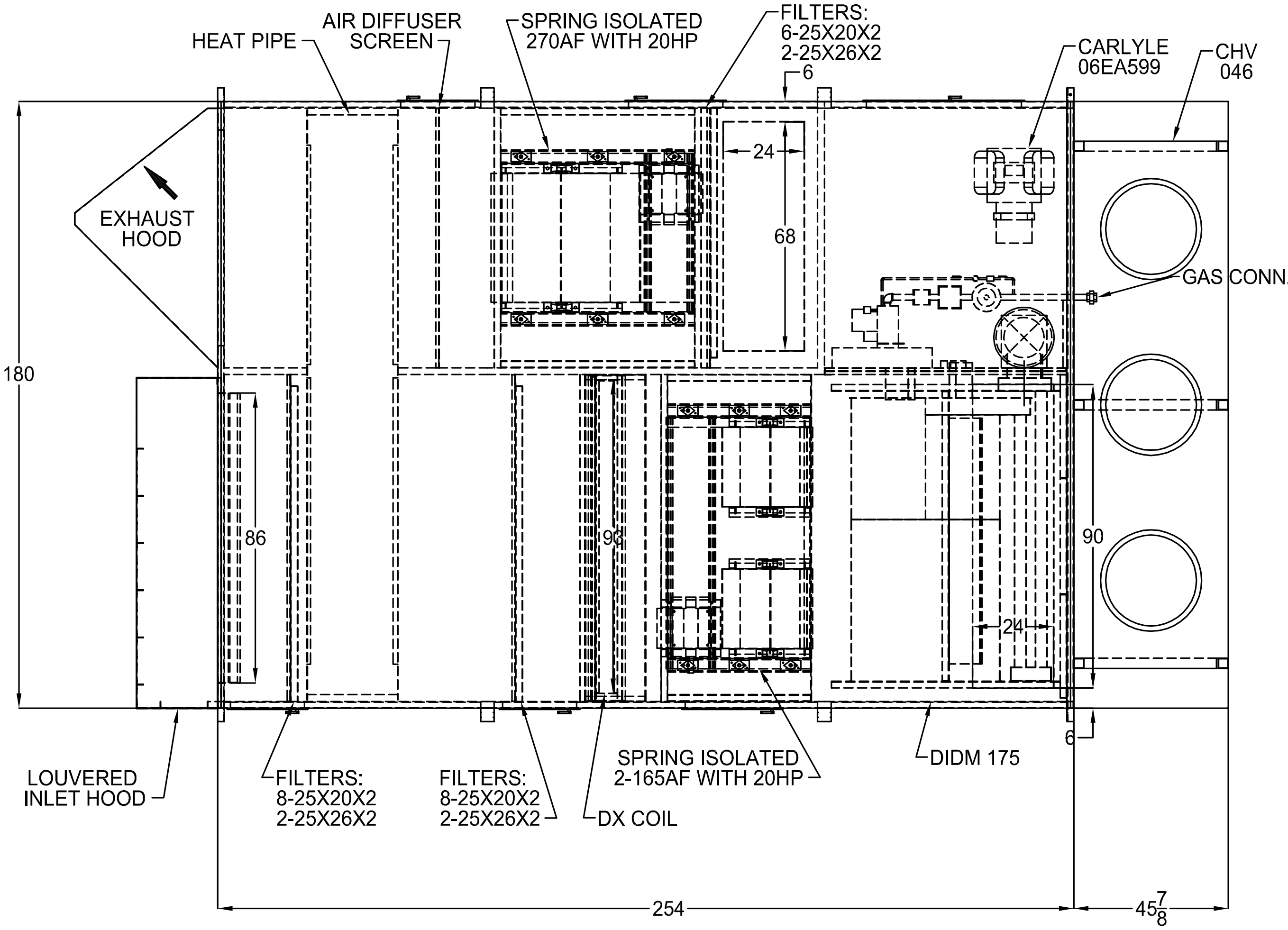
B) Hermetic compressors- Compressors shall be set on resilient neoprene mounts and complete with line voltage break internal overload protection, internal pressure relief valve and crankcase heater. Each unit shall have a minimum of two compressors. Whereby a unit utilizing two compressors the first stage compressor must be a digital scroll operating with a Emerson EC3 series stand-alone superheat controller with a built in synchronization control for the digital scroll. Unit will provide turndown on cooling. Multiple refrigeration circuits shall be separate from each other. Refrigeration circuits shall be complete with liquid line filter-driers, and service ports fitted with Schraeder fittings. Units shall incorporate load compensated thermal expansion valves with external equalizers (electronic expansion valves on digital systems) and combination sight glass moisture indicators. System charge will be designed for 10 degrees Fahrenheit. Each system shall be factory run and adjusted prior to shipment. Controls shall include:
    - Compressor motor contactors
    - Overload protection control

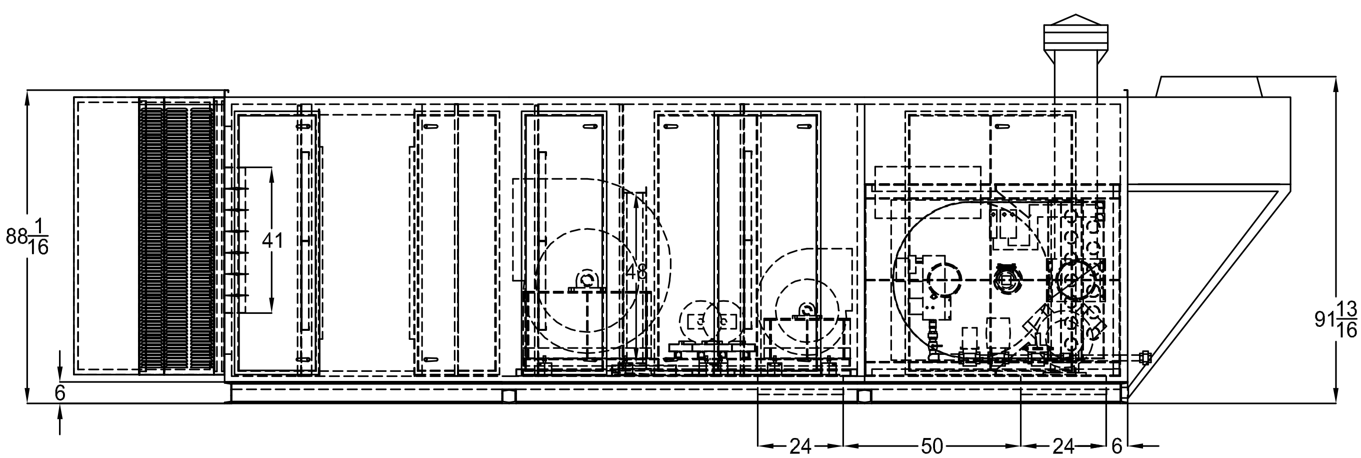
- Cooling relays
- Ambient compressor lockout
- Dual pressure controls
- Anti-cycle timers
- Hot gas bypass on lead compressor to maintain adequate suction pressure in the event of low loads
(only when digital scrolls are not being used)

Packaged units shall operate down to 50 degrees Fahrenheit as standard. Minus 40 refrigeration systems are available as an option. Compressors shall be located on the side of the unit in a service enclosure complete with hinged access doors.

HEAT PIPE COIL

Heat pipes shall be constructed of 1" I.D. seamless, integrally finned aluminum tubing. Heat pipes shall be arranged in the heat pipe coil with a maximum of 2-1/8" on center on the face and 1-7/8" on center row to row. Heat pipe fin surface shall be integral to the heat pipe container wall and shall have a minimum of 0.017" mean fin thickness. Fins shall be tapered root to fin tip. Fin surface from the root to the fin tip shall have a minimum of 0.437" mean fin height. Heat pipes shall have a capillary wick structure integral to the heat pipe container wall. Heat pipes shall be of one piece construction. Two component heat pipes such as expanded tube to fin shall not be allowed. Heat pipe working fluids shall be R-134a or be selected on the basis of heat pipe operating temperature and compatibility with heat pipe container material. Heat pipe shall be individually processed, charged, hermetically sealed and factory tested. Heat pipe coils structural frame shall be fabricated from a minimum of 16 gauge galvanized steel. The heat pipe coil shall be supplied with a minimum of 2-inch wide flanges on all four sides both front and back. Intermediate supports shall be furnished as required. Heat pipe coils shall be provided with a partition to isolate the airstreams and prevent cross contamination. The partition shall be at the centre unless otherwise specified. The partition shall be fabricated from a minimum of 16 gauge galvanized steel and shall extend beyond the finned surface with 4-inch flanges. Both front and back are to be flush with the frame. End covers shall be provided to protect the heat pipe ends. End covers shall be fabricated from a minimum of 16 gauge galvanized steel. Additional specifications for other configurations available upon request.





WESTERN
GIDM SERIES

REV	By	Revision Description	Date

TITLE GIDM175 WITH TILTING HEAT PIPE
INDIRECT FIRED PACKAGED COOLING

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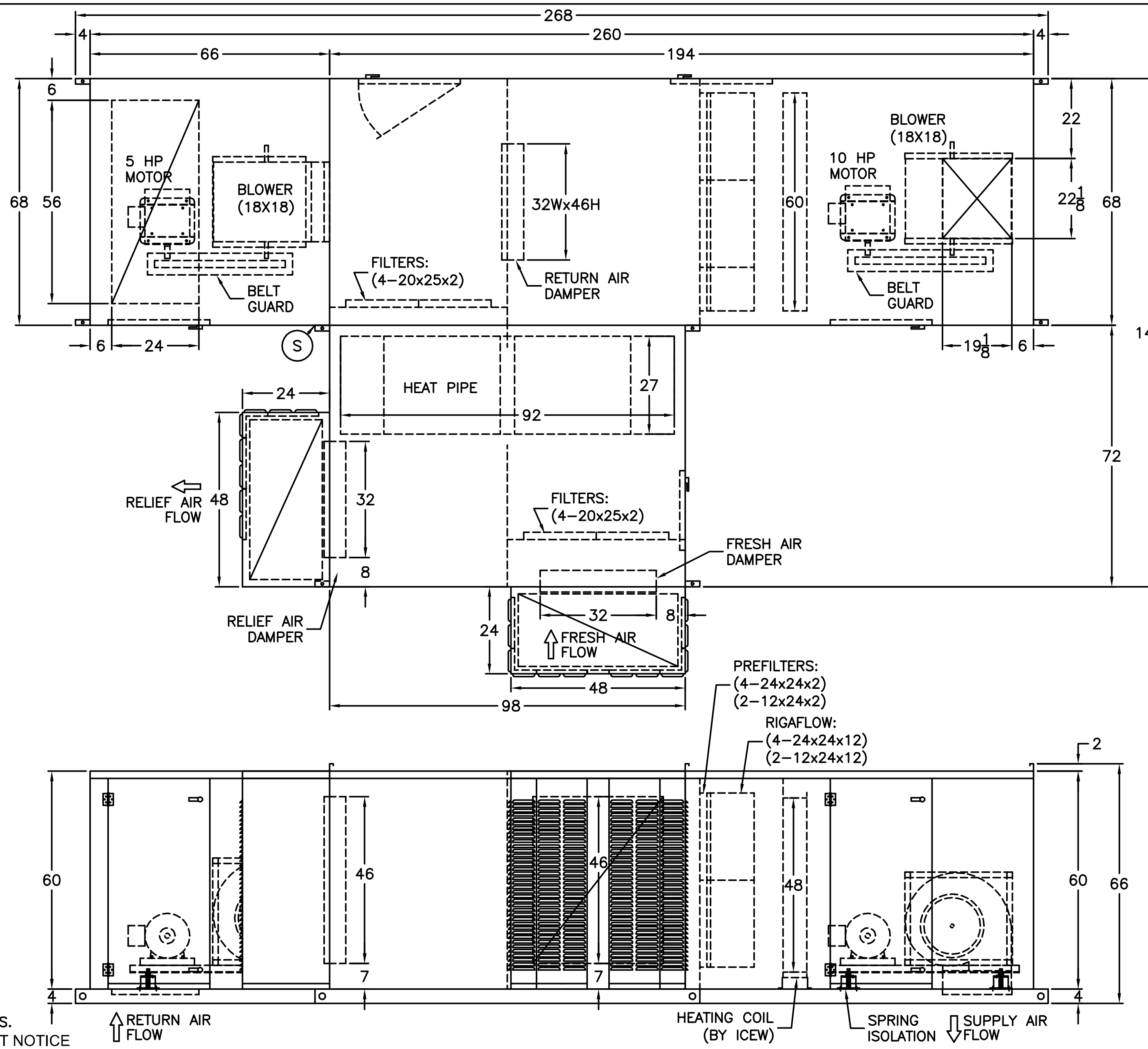
TOP VIEW

SIDE VIEW



NOTES:
SEE ROOF CURB DWG. # 60–27683 RC
Ⓢ SPLIT FOR SHIPMENT
1. 1 1/2 INLET AND DISCHARGE FLANGES
2. SERVICE ACCESS PANELS MUST NOT BE OBSTRUCTED RECOMMENDED CLEARANCE 24 INCHES.
3. DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES.
FOR REFERENCE USE ONLY, SUBJECT TO CHANGE WITHOUT NOTICE

Rev	By	Revision Description	Date

ICE WESTERN
GIDM SERIES

TITLE
GIDM 100 HORIZONAL CONFIG. OUTDOOR UNIT GRAVITY VENTED C/W FLAT FILTER, MIX BOX w/ RETURN BLOWER, AND LOUVERED INLET

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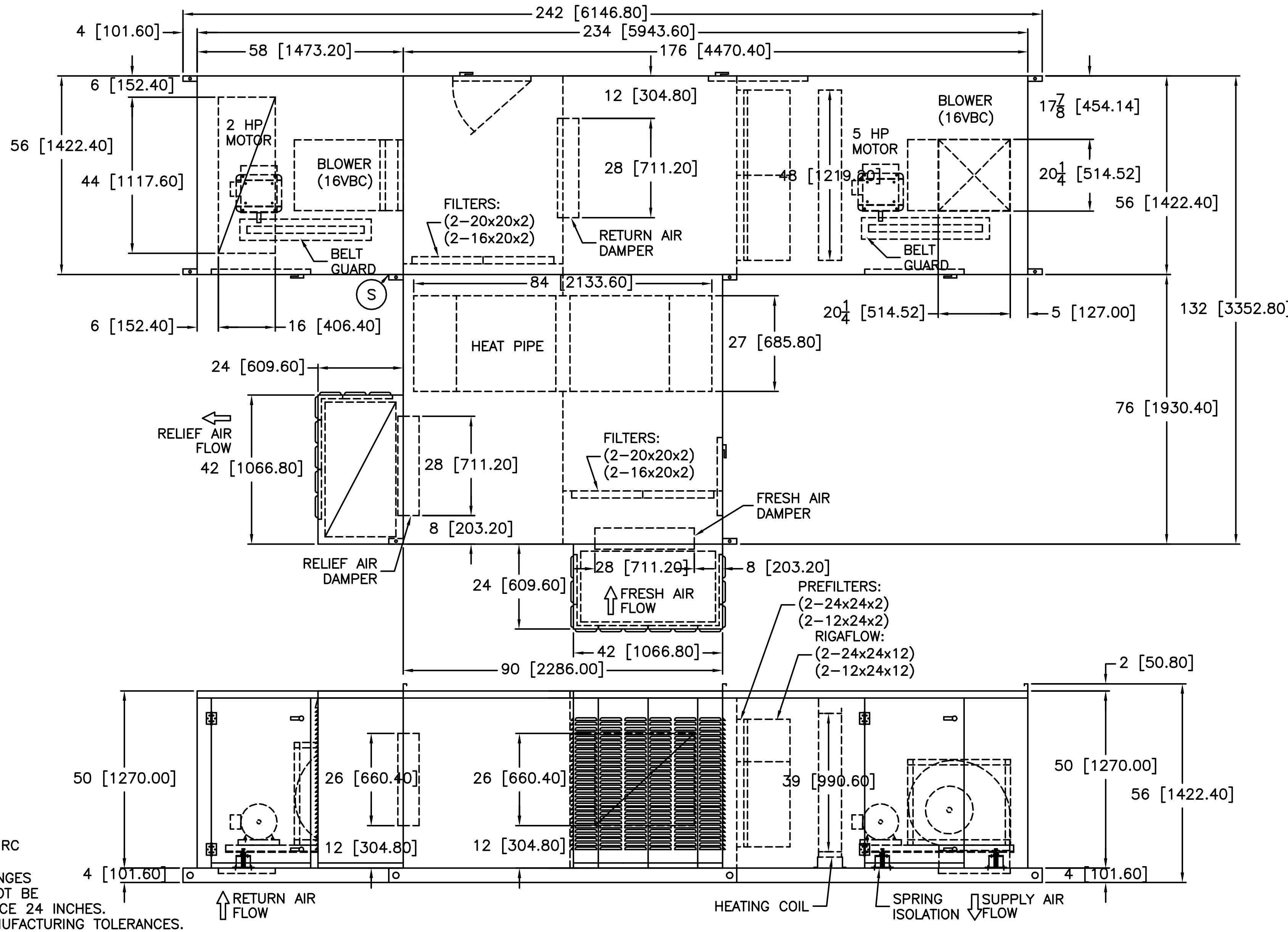
JR		1:40	60–27683	
CHK. BY	DATE		JOB NO.	PAGE F–39

TOP VIEW



SIDE VIEW

NOTES:
SEE ROOF CURB DWG. # 60–27684 RC
(S) SPLIT FOR SHIPMENT
1. 1 1/2 INLET AND DISCHARGE FLANGES
2. SERVICE ACCESS PANELS MUST NOT BE OBSTRUCTED RECOMMENDED CLEARANCE 24 INCHES.
3. DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES.
FOR REFERENCE USE ONLY, SUBJECT TO CHANGE WITHOUT NOTICE

Rev	By	Revision Description	Date

ICE WESTERN
AH SERIES

TITLE				
AH60HP HORIZONAL CONFIG. OUTDOOR UNIT C/W FLAT FILTER, MIX BOX w/ RETURN BLOWER, AND LOUVERED INLET				
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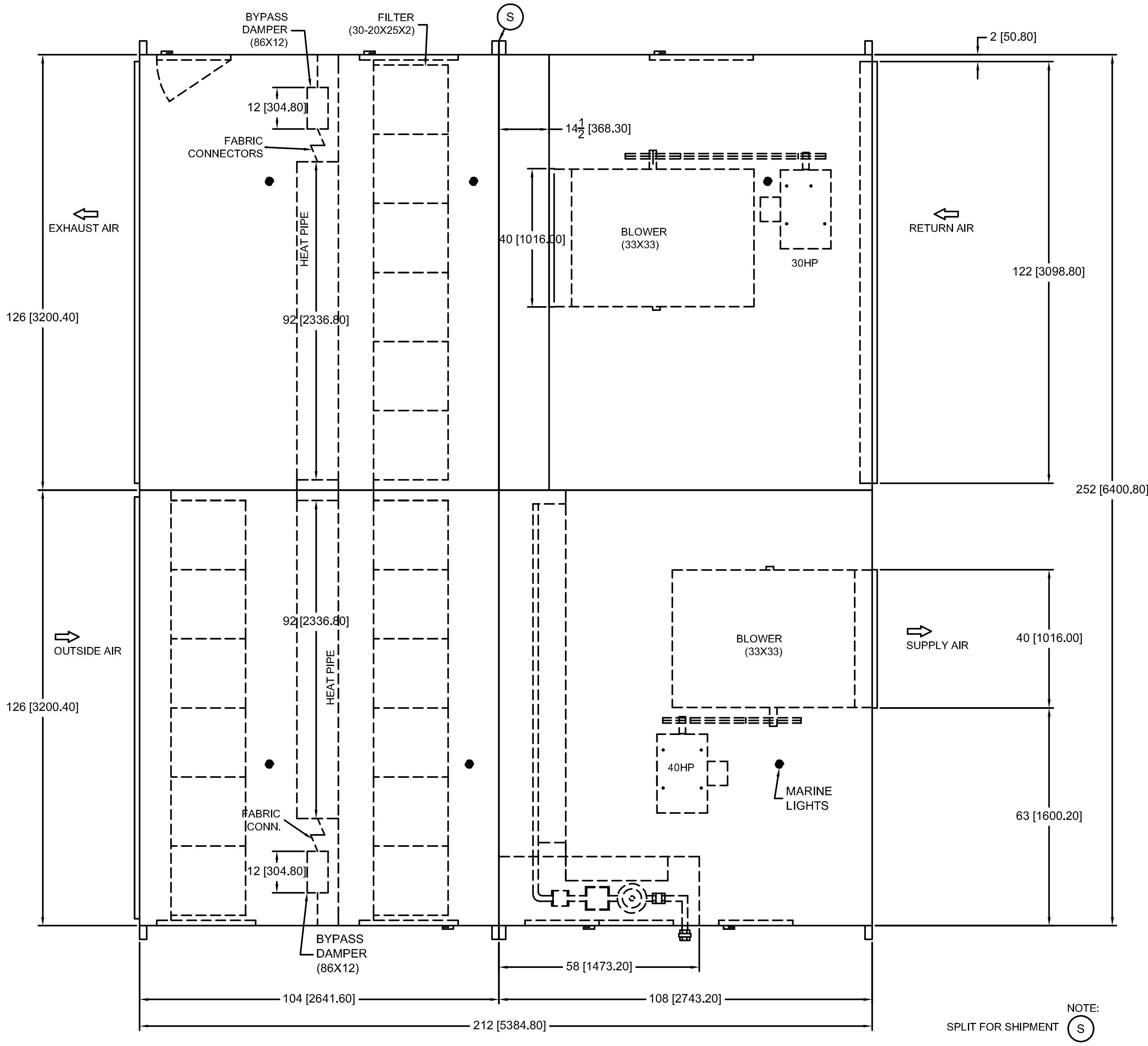
CHK. BY	DATE		JOB NO.	PAGE F–40

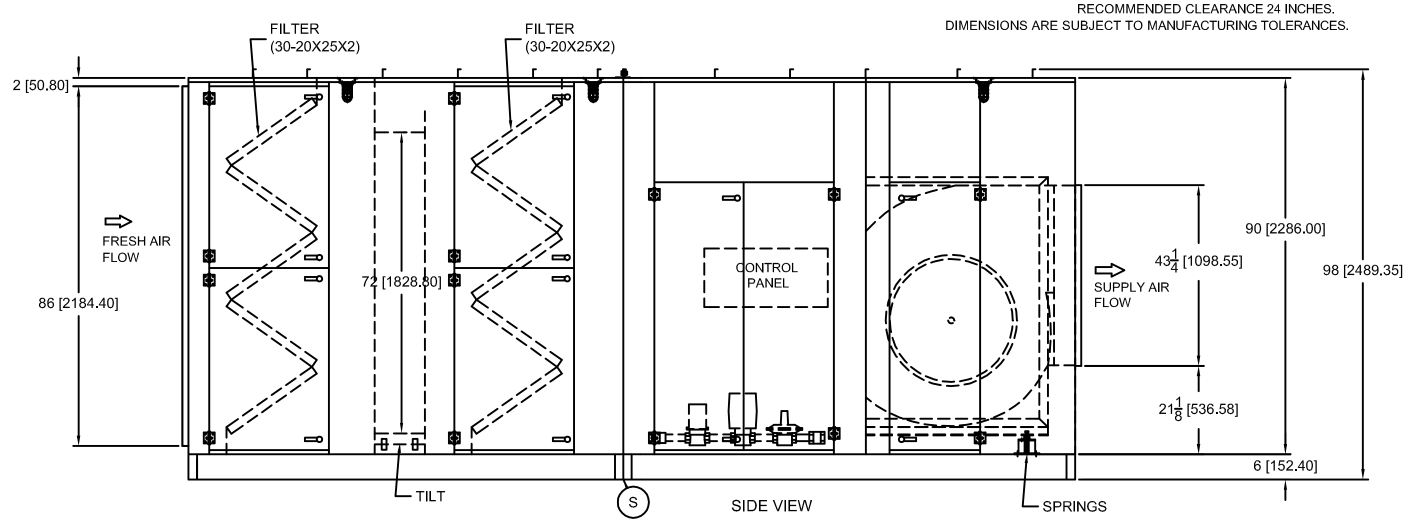


NOTE:

SPLIT FOR SHIPMENT (S)

TOP VIEW

1. 1 1/2" INLET AND DISCHARGE FLANGES
2. SERVICE ACCESS PANELS MUST NOT BE OBSTRUCTED.
RECOMMENDED CLEARANCE 24 INCHES.
DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES.



SIDE VIEW

ICE WESTERN
BMA SERIES

Rev	By	Revision Description	Date

TITLE
BMA 133 HP
HORIZONTAL CONFIGURATION SINGLE BLOWER
W/ HEAT RECOVERY

DRAWN BY	ISSUED BY	SCALE	DRW. NO.	
JR		1:34	60-26200	
CHK. BY	DATE		JOB NO.	PAGE F-41