OSD Series with Desiccant Dehumidification Wheel

Desiccant Dehumidification Wheel

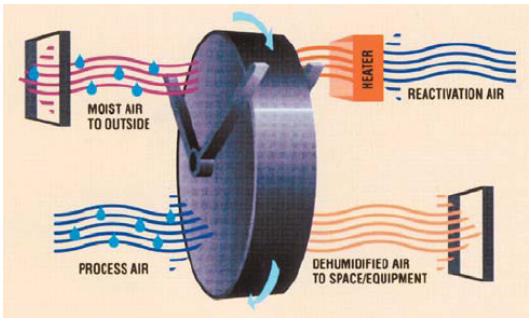
Desiccant Dehumidification

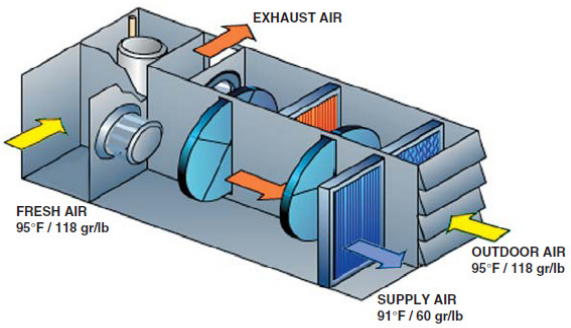
The Desiccant Dehumidification Wheel is designed to provide maximum moisture removal with a minimum pressure drop for those applications where humidity control is required. A desiccant dehumidification wheel provides the HVAC system designer another tool to control humidity effectively and efficiently particularly in the low humidity ranges.
The desiccant wheels are used extensively in the well-known industrial markets for corrosion protection and humidity control for many industrial processes. Commercial applications include refrigerated warehouses, ice rinks, schools, supermarkets and hospitals. A residential and light commercial market is developing where small gas fired or hot water regenerated desiccant equipment is used for centralized humidity control. The ability to control home humidity in the 50%RH range improves comfort, saves energy with higher set point temperatures, and prevents the formation of mold and mildew-a potential problem that is of increasing importance to the homeowner.

- *Improved indoor air quality*
- *Precise humidity control*
- *Both silica gel (WSG) and molecular sieve (LT3) desiccant wheels available*
- *Utilizes all types of regeneration energy*
- *Very low dewpoints achievable*

Desiccant Cooling

The available of waste heat from distributed generation projects along with the increased ventilation standards for improved IAQ, is revitalizing the desiccant cooling industry. With waste heat, desiccant cooling systems become extremely efficient while providing the additional benefit of independent temperature and humidity control.
The ASHRAE Standard 62-1989 (Ventilation for Acceptable Indoor Air Quality), describes a recommended target ratio of makeup air to return air for a variety of applications and building types. Building codes in the world are becoming increasingly more comprehensive in addressing ventilation requirements. The actively regenerated desiccant wheels combined with evaporative cooling provide the design engineer with many options to deal with the high latent loads associated with increased ventilation requirements.





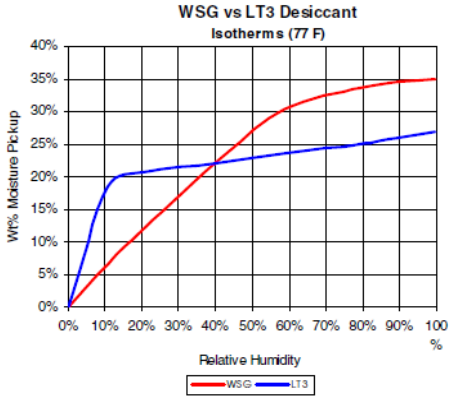
A typical twin wheel system: a desiccant wheel for dehumidification, and a sensible wheel for heat exchange.

Desiccant Types

There are both a high performance Silica Gel (WSG) desiccant and specialty Molecular Sieve (LT3) desiccant to meet the dehumidification needs of most applications. The differences in the desiccant properties are more clearly defined by their respective static adsorption isotherm curves, a measure of the desiccant's ability to adsorb moisture under constant static conditions.

The isotherm curve for the WSG desiccant is more linear and rises to a high capacity at higher relative humidity. Conversely, the LT3 curve exhibits high desiccant capacities at low relative humidity and flattens out as %RH increases. Therefore, the WSG desiccant wheels are recommended when the inlet %RH is high (>60%) and the primary goal is the removal of the largest quantity of moisture with the most efficient use of the heat input. If the inlet %RH is low (<50%) and the lowest possible outlet dewpoint is desired, then the LT3 desiccant wheels are preferred. Experience has shown that in many cases, the WSG desiccant wheels adequately meet the requirements of the application.

- *WSG wheels used with high inlet %RH (>60%) and when efficient removal of moisture is required.*
- *LT3 wheels preferred with low inlet %RH (<50%) and/or when low dewpoints are required.*



Features and Benefits

The desiccant wheels are constructed from a unique corrugated high temperature fibre-based media impregnated with a non-migrating water selective desiccant. Unlike other media, the desiccant is uniformly and permanently dispersed throughout the matrix structure in contrast to being coated, bonded, or synthesized onto the matrix, and therefore, is not susceptible to delamination or erosion of the desiccant material.

- *Homogenous media-desiccant is permanently bound to the media.*
- *The desiccant wheels will not dust.*
- *Desiccant loading of > 75%.*
- *Tough, non-brittle media-resists damage.*
- *Wheel is completely water washable.*
- *High temperature resistant media for use with regeneration temperatures up to 350ºF.*
- *Used with direct or indirect fired gas, electric heat, steam, and hot water regeneration.*

Cassettes

- Heavy duty galvanized steel construction with removable side panels.
- Wheels are center supported, using a fixed shaft and internal maintenance-free bearings on smaller cassettes. Larger cassettes use a rotating shaft with external pillow block or flanged bearings.
- Unique adjustable, full contact silicon bulb seal design prevents air leakage for differential pressures of up to 8" wc.
- Drive system includes a heavy duty gear motor with chain drive and tensioner that eliminates wheel slippage.
- Cassette orientation available in a 75/25 or a 50/50 split.

Design Consideration and Control Strategies

Control of moisture levels in spaces or process air streams is generally accomplished by either regulating reactivation heat or bypassing a portion of the air around the dehumidification wheel. The response time, energy efficiency, and dewpoint bandwidth determine what level of control is required. The degree of control varies from the simplest form of on/off control to maintain a space condition, to the most comprehensive which would include wheel bypass dampers (and perhaps face dampers) plus reactivation heat modulated to control an exit exhaust air temperature.

Humidity sensors vary in type, principle of operation, accuracy, and precision , and need to be chosen to suit the control requirement. Placement of sensors in well-mixed air streams is critical to performance monitoring.

Reactivation heaters should be equipped with suitable safety devices and interlocks to prevent overheating the wheel. The maximum operating temperature is 350ºF. Separate high temperature cutouts should be provided if this temperature could be exceeded during operation. Reactivation airflow should be maintained and proven anytime reactivation heat is energized.

Software Selection Program

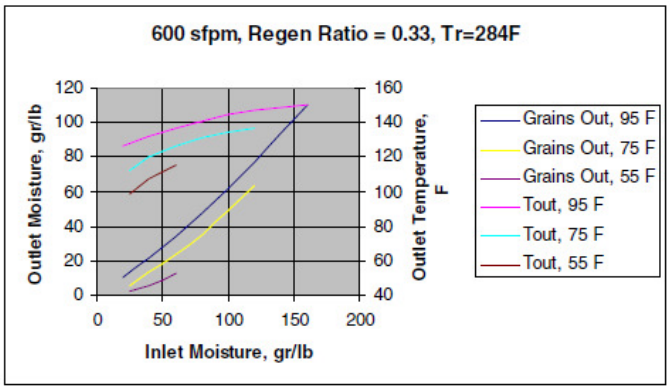
For a more comprehensive analysis of performance, please consult the factory with the model selection software program. The program models the performance of a wide array of input parameters to ensure the proper selection of desiccant wheel size and type.

Wheel Performance

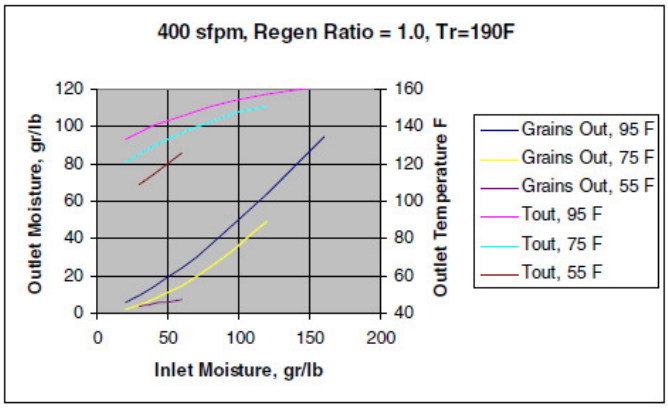
The desiccant wheels are designed to operate with either a 25% area for reactivation and 75% area for process (25/75 split), or with 50% area for reactivation and 50% for process (50/50 split). Generally, the 25/75 split is used for industrial dehumidification, low dewpoint and compact desiccant cooling applications. The 50/50 split is more often used for commercial cooling applications, or application where low temperature waste heat is available for reactivation.

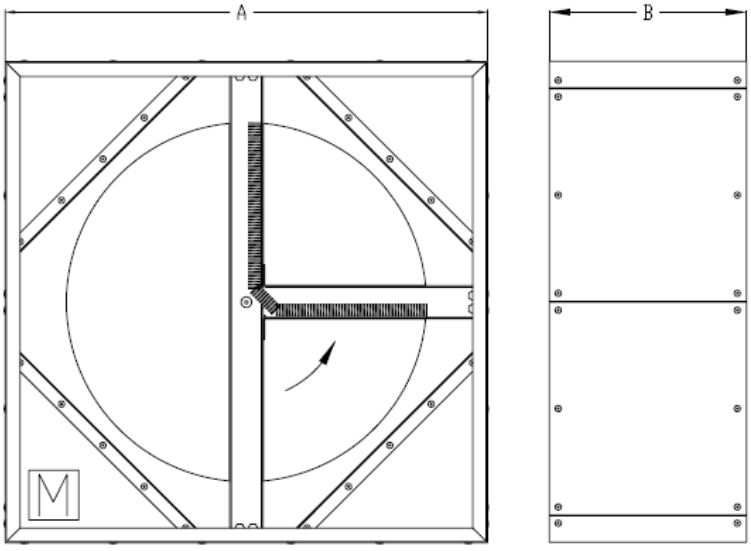
In addition to the regeneration temperature and cassette zoning, several other factors influence the performance of the desiccant wheel. Process and regeneration inlet humidity and temperature, regeneration to process flow ratio, face velocity, and wheel rotation speed all has an impact on performance. The following curves show the relationship between some of these parameters on performance for the WSG desiccant wheel.

WSG Wheel Performance
600 sfpm
R/P ratio .33
Tr= 284°F



WSG Wheel Performance
400 sfpm
R/P ratio 1.0
Tr= 190°F

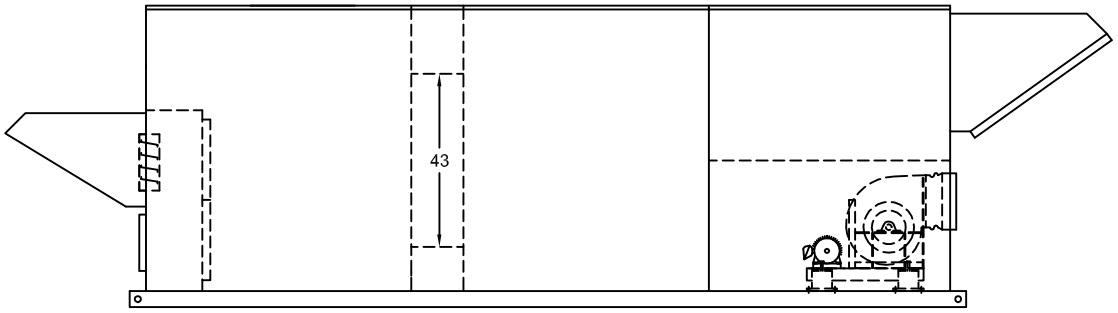




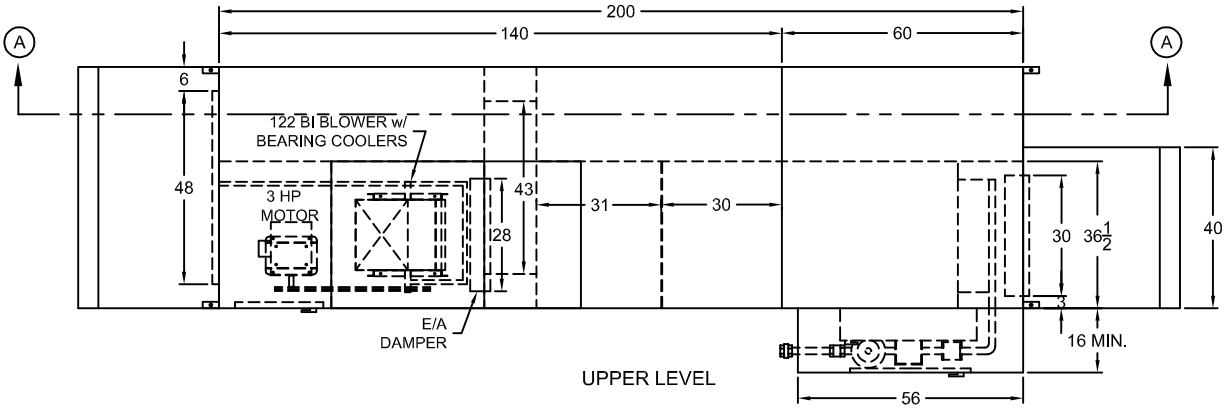
ENGINEERING DETAIL

REGENERATION SIDE					WHEEL SIZE					
	CAPACITIES		INPUT		WHEEL	FLOW RATE	WHEEL DIAMETER (mm)	WHEEL DEPTH (mm)	CASSETTE HEIGHT/ WIDTH A (inches)	CASSETTE DEPTH B (inches)
MODELS	CFM MIN	CFM MAX	MBH MIN	MBH MAX	MODEL	(scfm) 75/25				
OSD 109	1600	2500	114	500	250	200	250	200	21	11.5
					370	500	370	200	24	12
					440	700	440	200	26	12
					550	1000	550	200	29	12
					770	2000	770	200	36	12
					965	3500	965	200	43	13
					1070	4500	1070	200	48	13
					1220	6000	1220	200	54	13
OSD 112	2500	4000	178	750	1525	8500	1525	200	69	14
					1730	11000	1730	200	77	15.5
OSD 115	3000	7000	214	1250	1940	14000	1940	200	85	15.5
					2190	18000	2190	200	96	17
OSD 118	4500	10000	321	2000	2438	22500	2438	200	106	17
					2743	28000	2743	200	122	18.25
OSD 120	10000	14000	380	2500	3050	35000	3050	200	134	18.25

Note: The desiccant wheels are offered in a standard depth of 200mm. optional 50mm, 150mm and 400mm depths are available in some sizes. Please consult the factory for depth options and dimensional tolerances.



SECTION A-A



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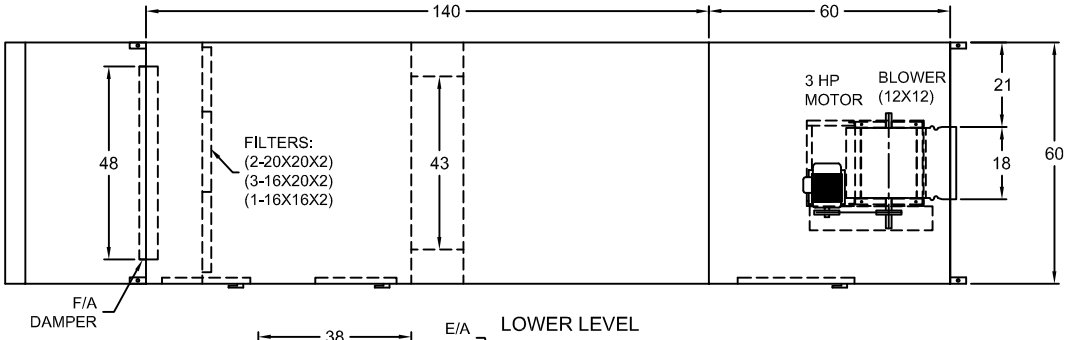

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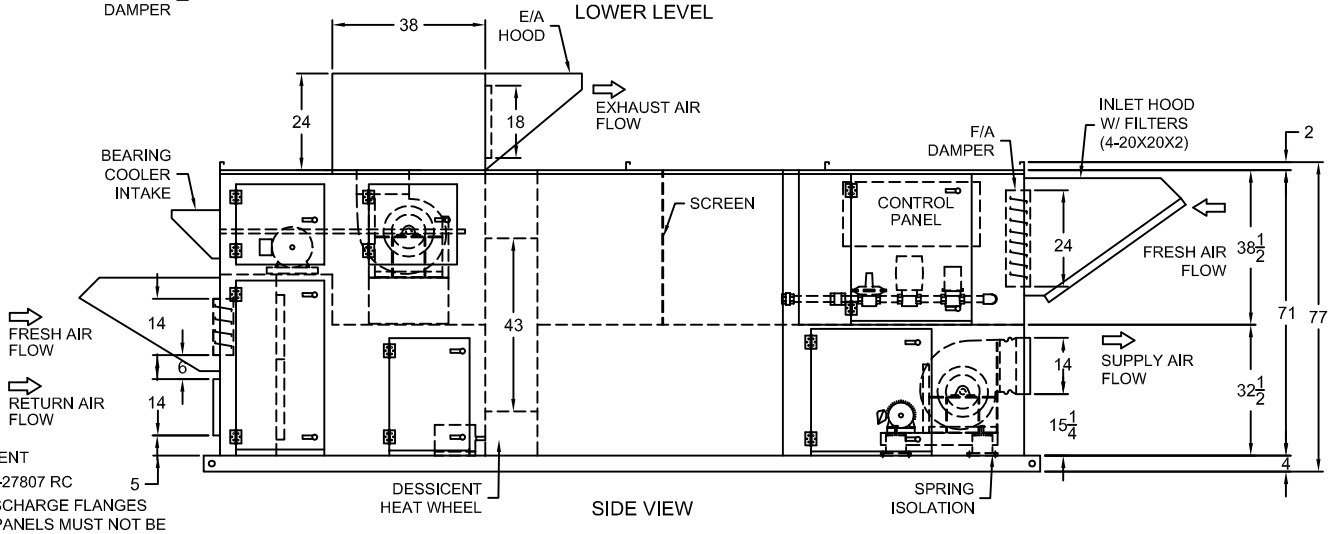

SIDE VIEW

NOTES:

(S) SPLIT FOR SHIPMENT
SEE CURB DWG. #60-27807 RC

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

OSD SERIES

TITLE
OSD 109
HORIZONTAL CONFIG. OUTDOOR
UNIT w/ MIX BOX, FLAT FILTER, HEAT WHEEL (WSG 965x200)
AND INLET HOOD

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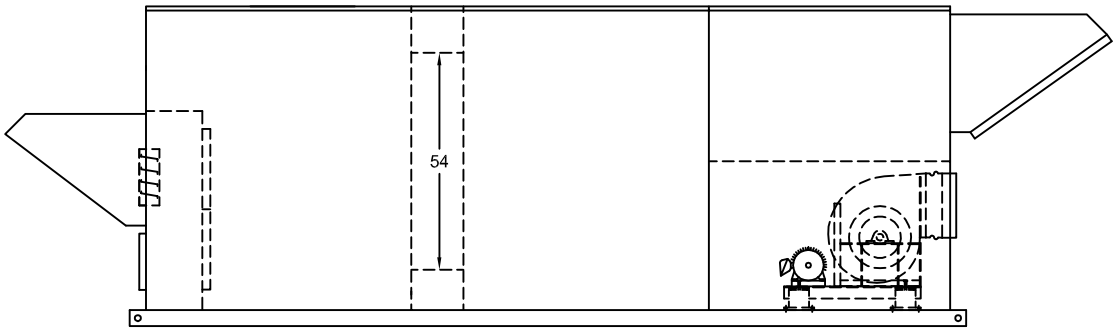
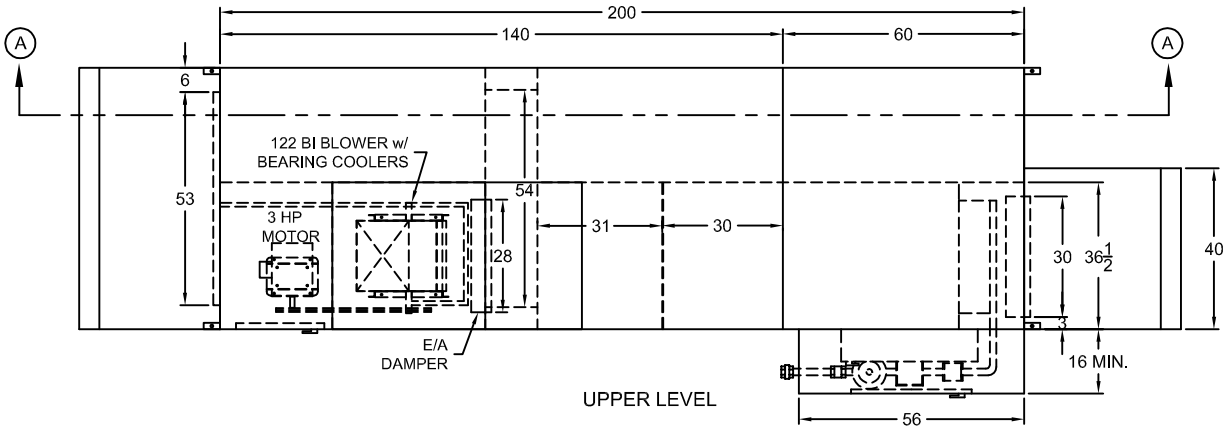


SECTION A-A



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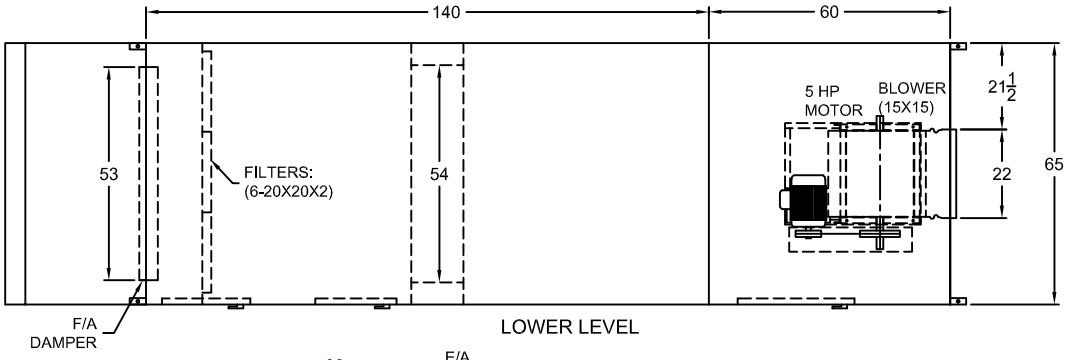

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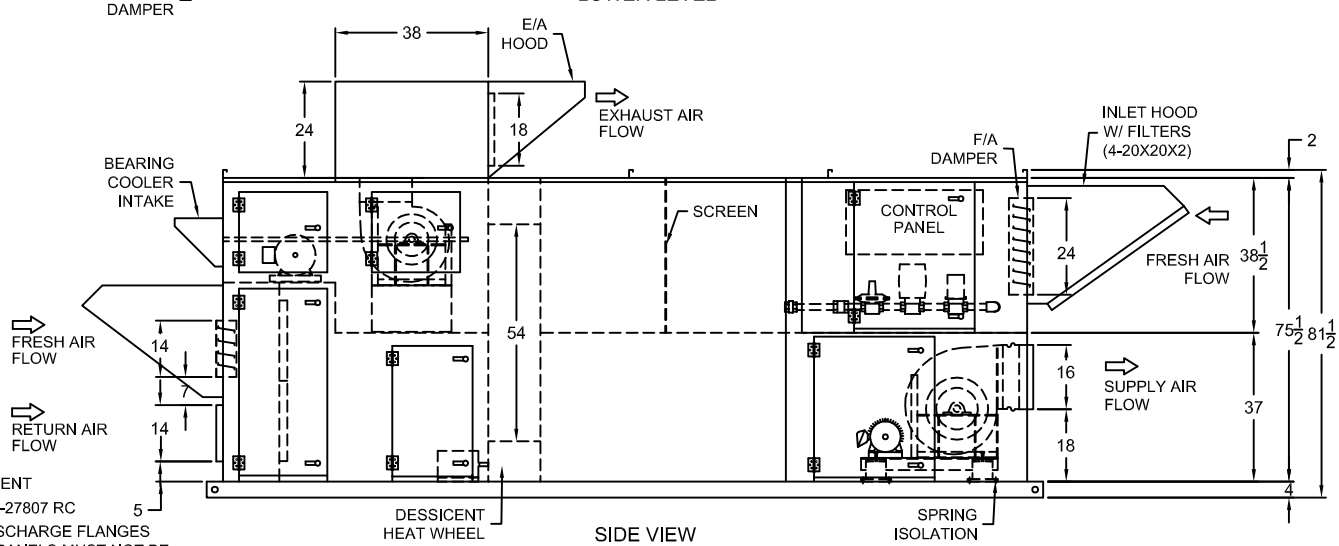

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OSD SERIES

TITLE
OSD 109
HORIZONTAL CONFIG. OUTDOOR (6000CFM)
UNIT w/ MIX BOX, FLAT FILTER, HEAT WHEEL
(WSG 1220x200 or 1070x200) AND INLET HOOD

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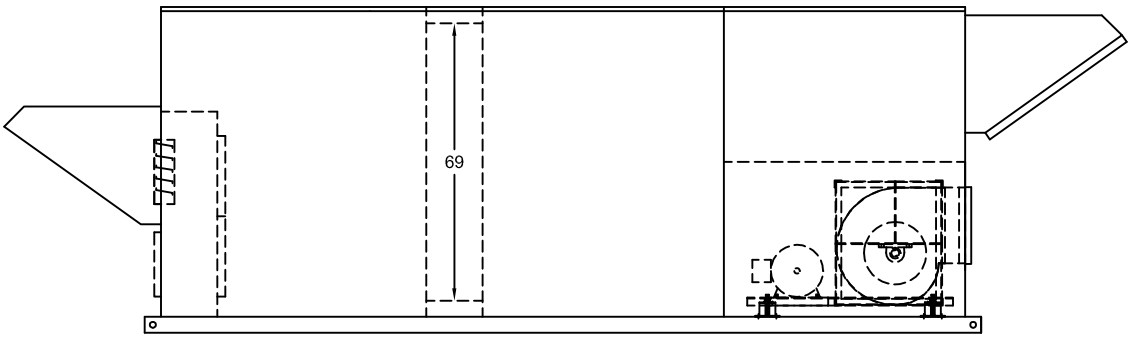
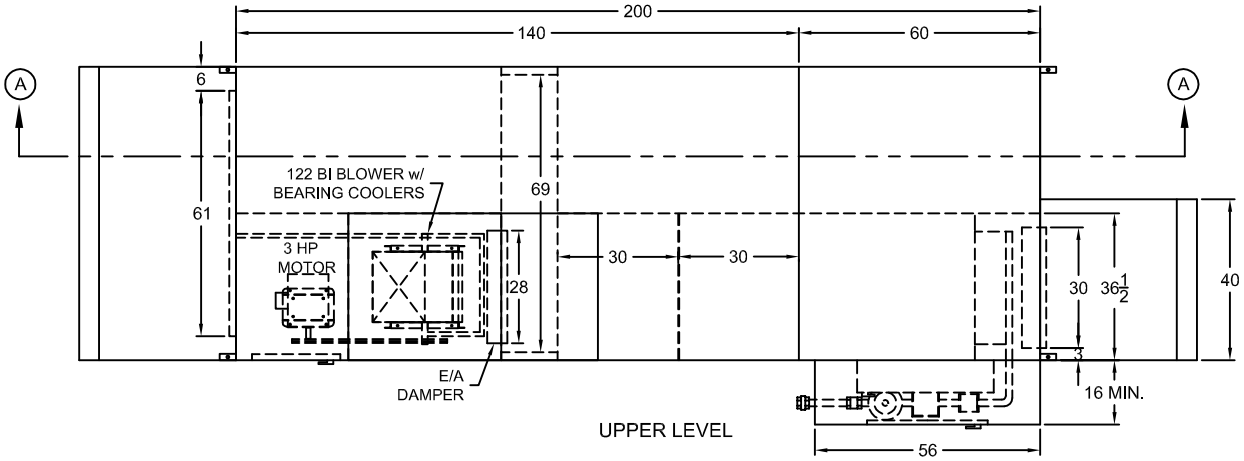


SECTION A-A



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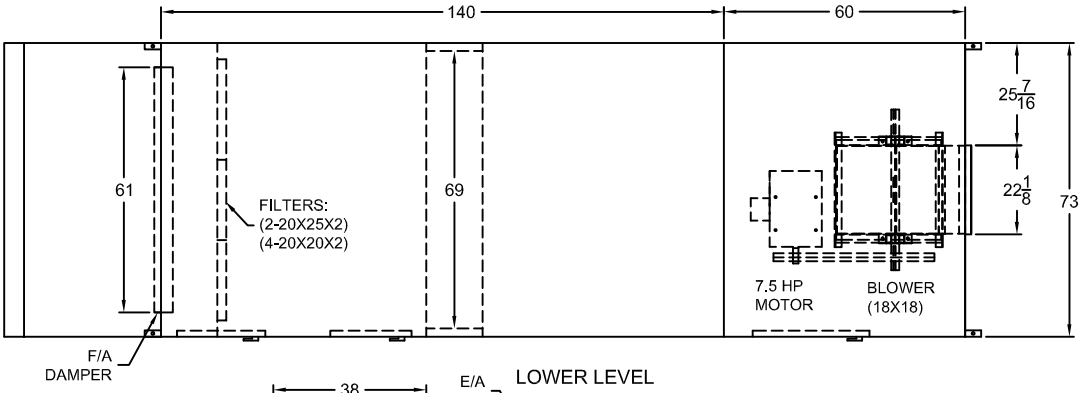

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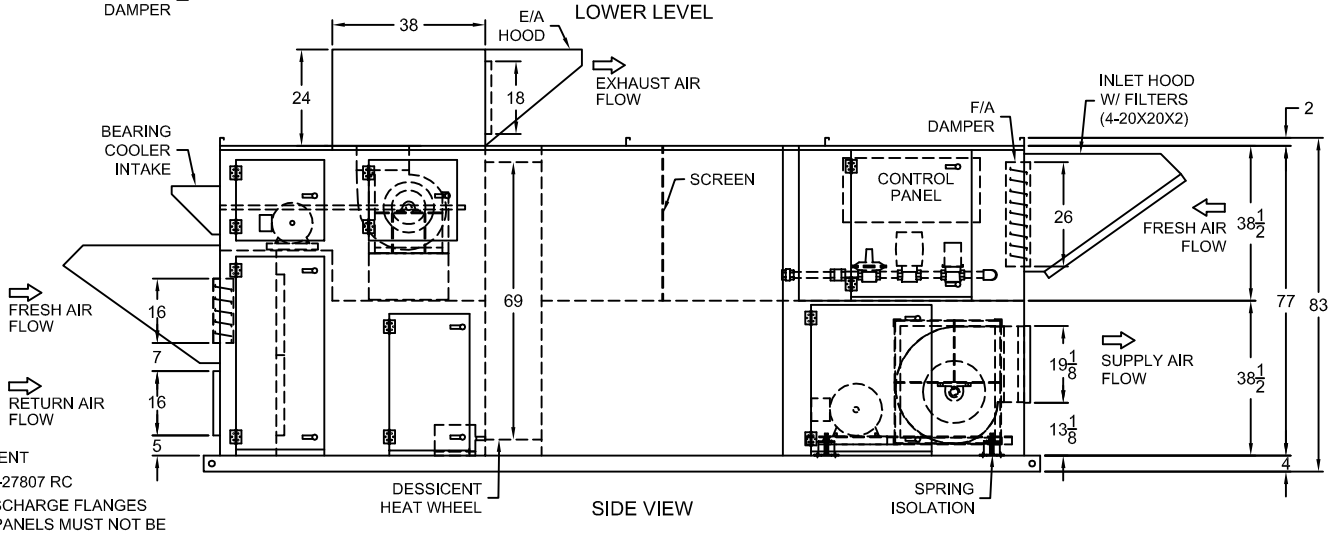

SIDE VIEW

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ICG

OSD SERIES

TITLE
OSD 112
HORIZONTAL CONFIG. OUTDOOR
UNIT w/ MIX BOX, FLAT FILTER, HEAT WHEEL (WSG 1525x200)
AND INLET HOOD

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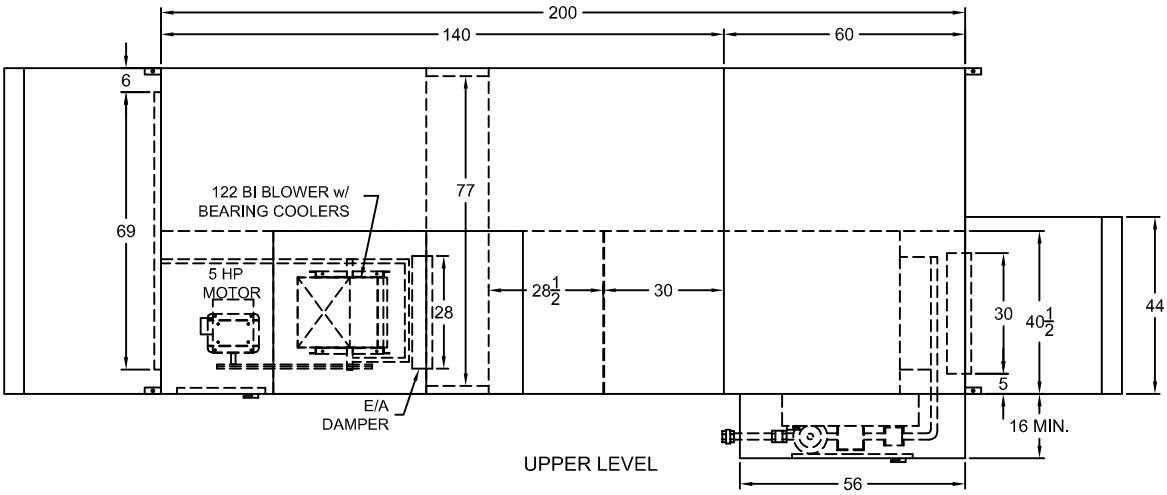

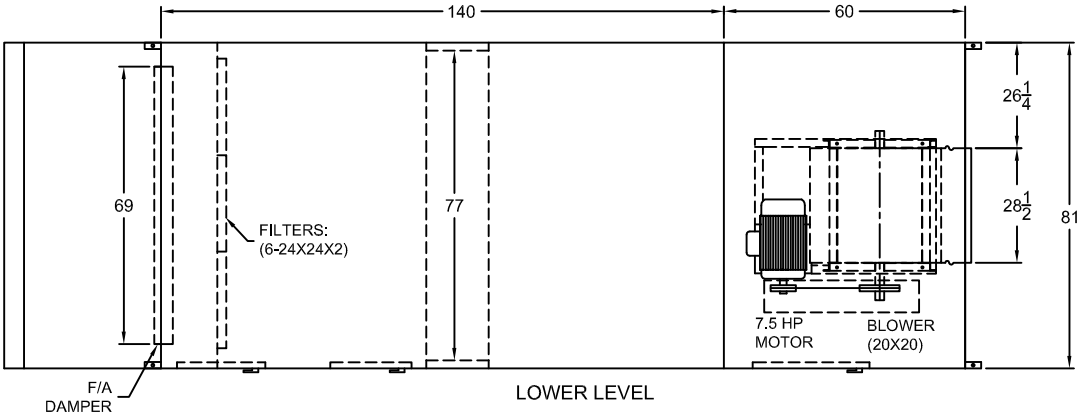

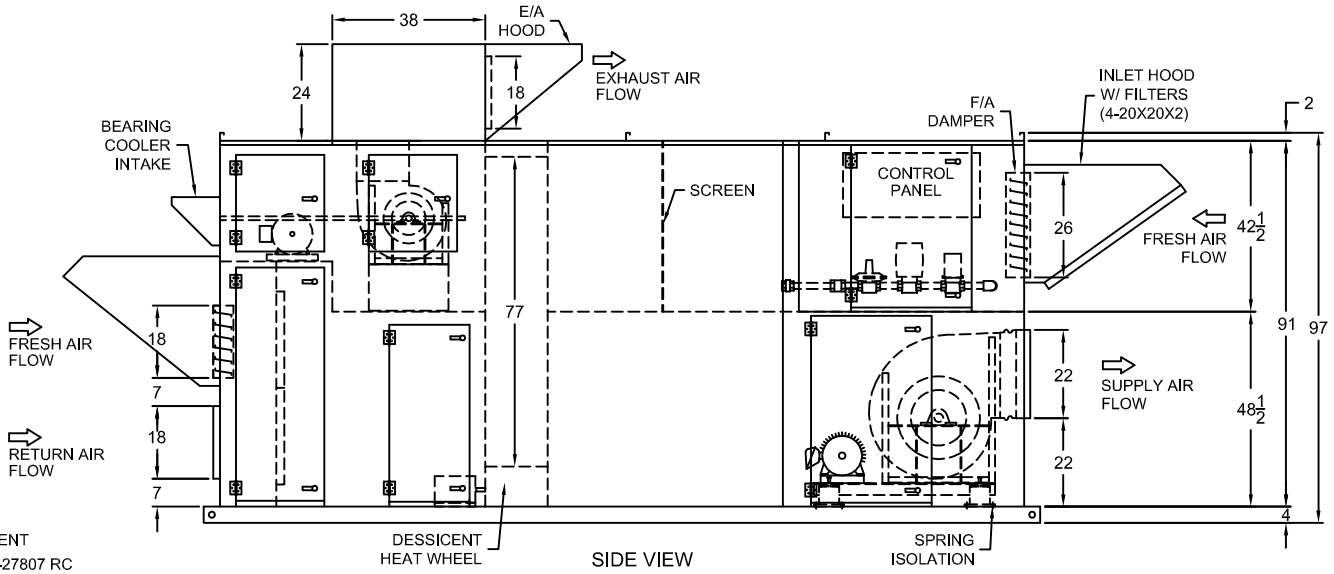

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OSD SERIES

TITLE
OSD 112
HORIZONTAL CONFIG. OUTDOOR
UNIT w/ MIX BOX, FLAT FILTER, HEAT WHEEL (WSG 1730x200)
AND INLET HOOD

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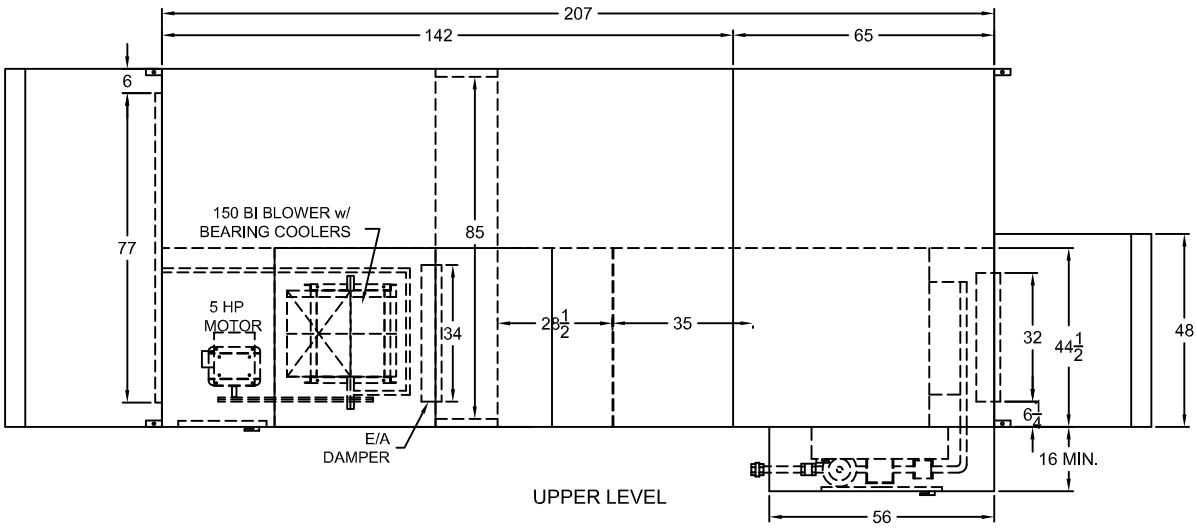

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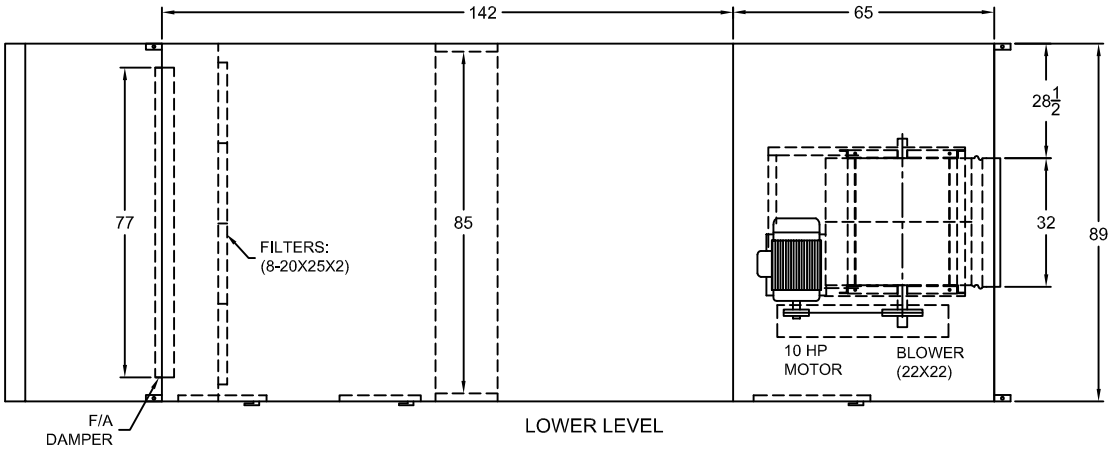

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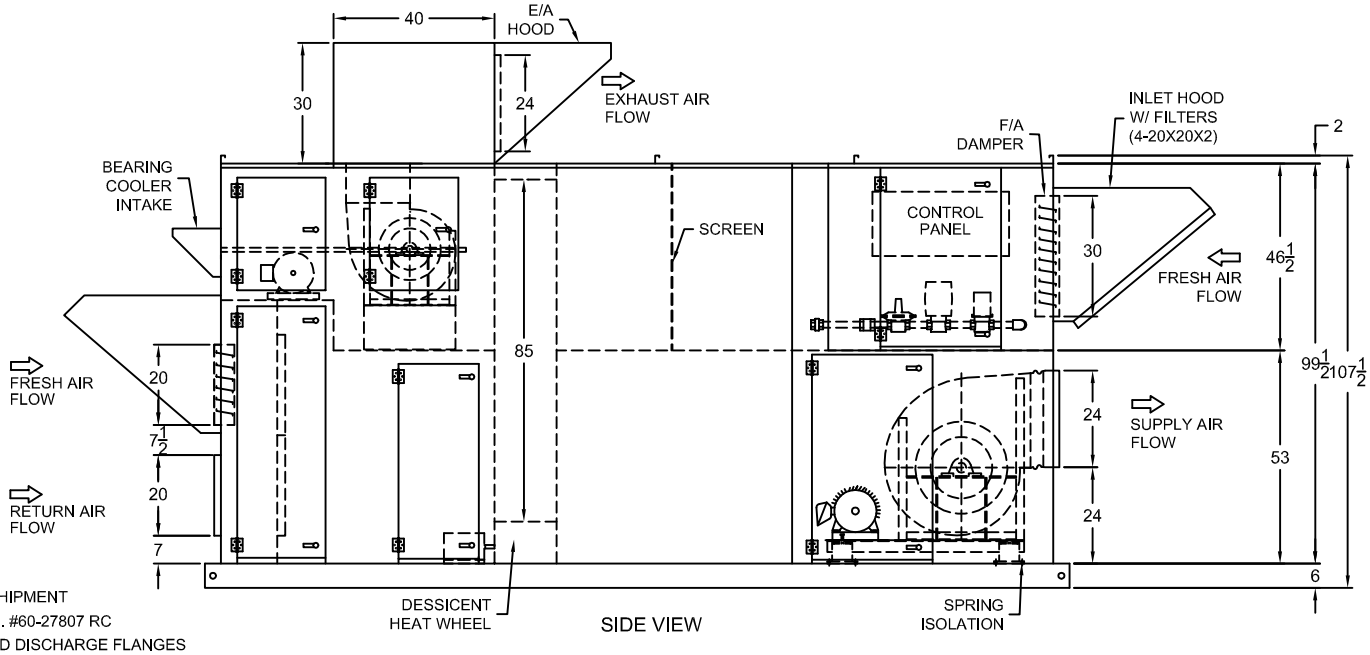

SIDE VIEW

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OSD SERIES

TITLE
OSD 115
HORIZONTAL CONFIG. OUTDOOR
UNIT w/ MIX BOX, FLAT FILTER, HEAT WHEEL (WSG 1940x200)
AND INLET HOOD

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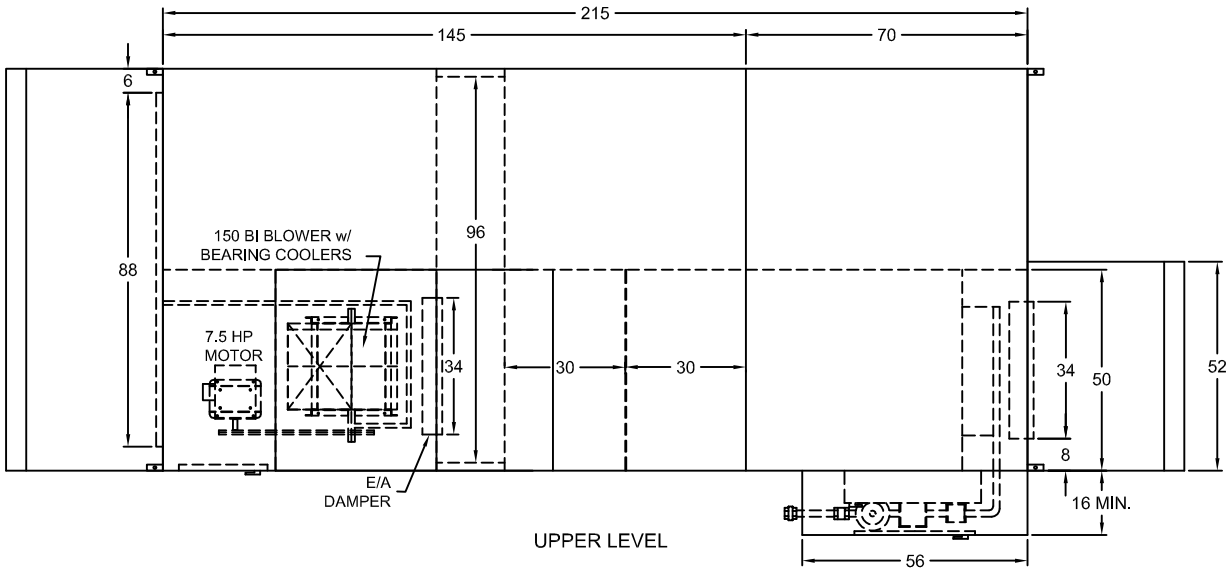

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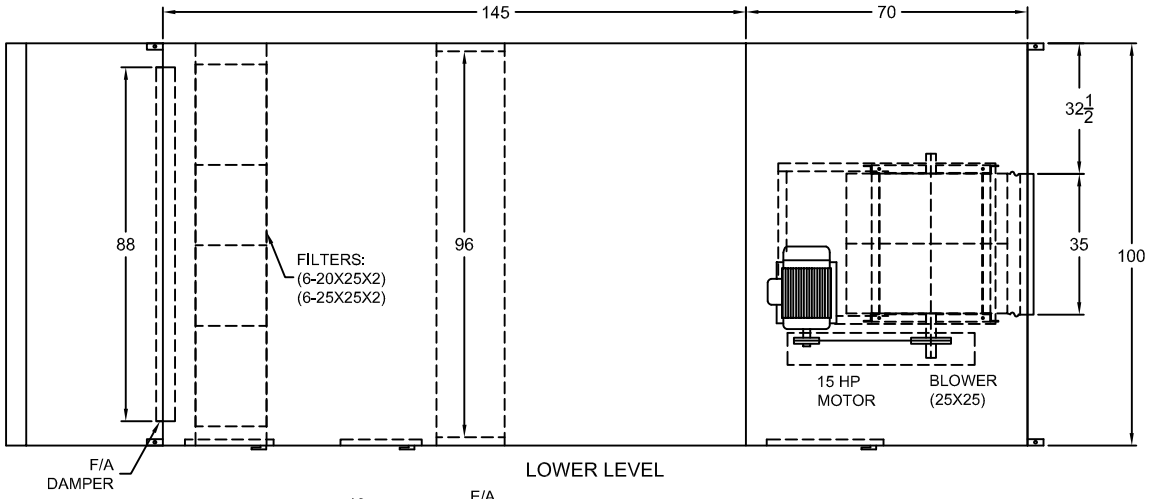

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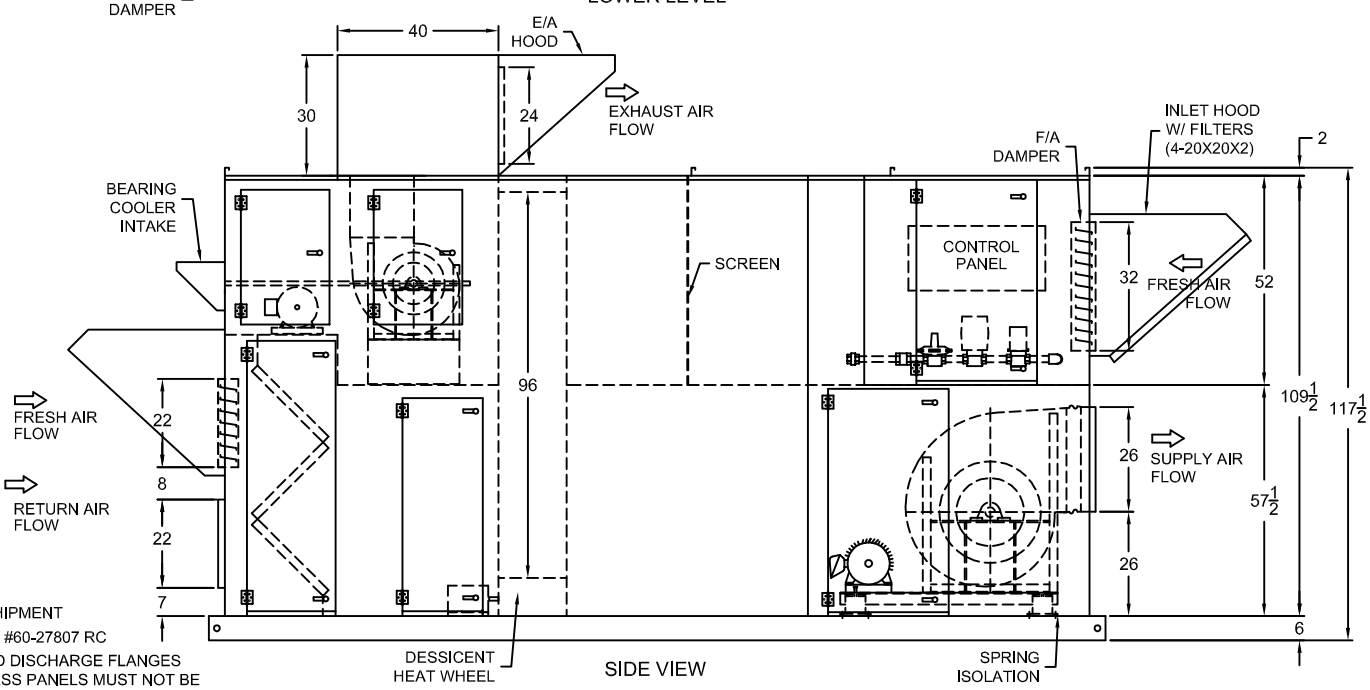

SIDE VIEW

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OSD SERIES

TITLE
OSD 115
HORIZONTAL CONFIG. OUTDOOR
UNIT w/ MIX BOX, FLAT FILTER, HEAT WHEEL (WSG 2190x200)
AND INLET HOOD

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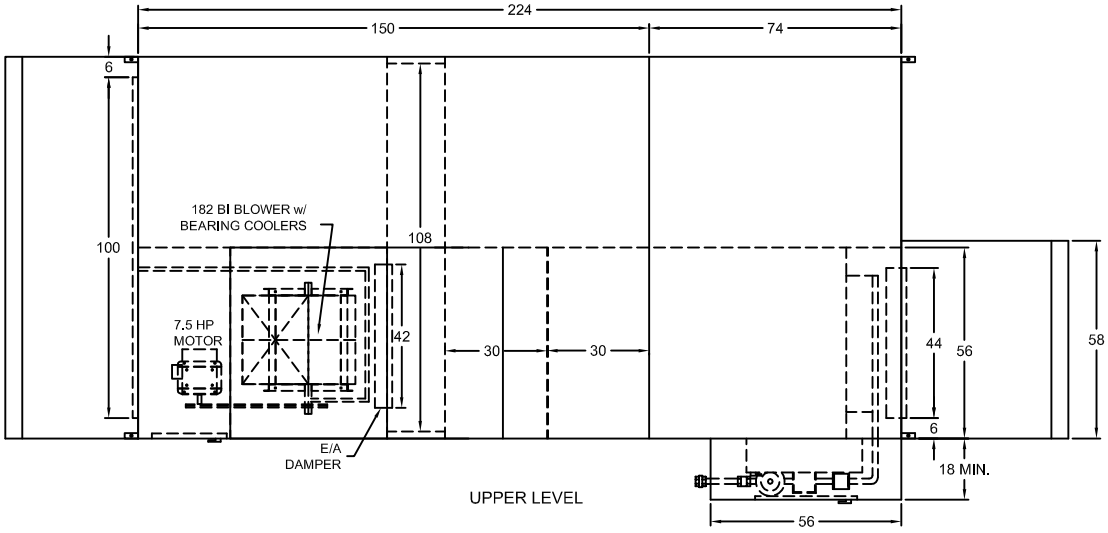

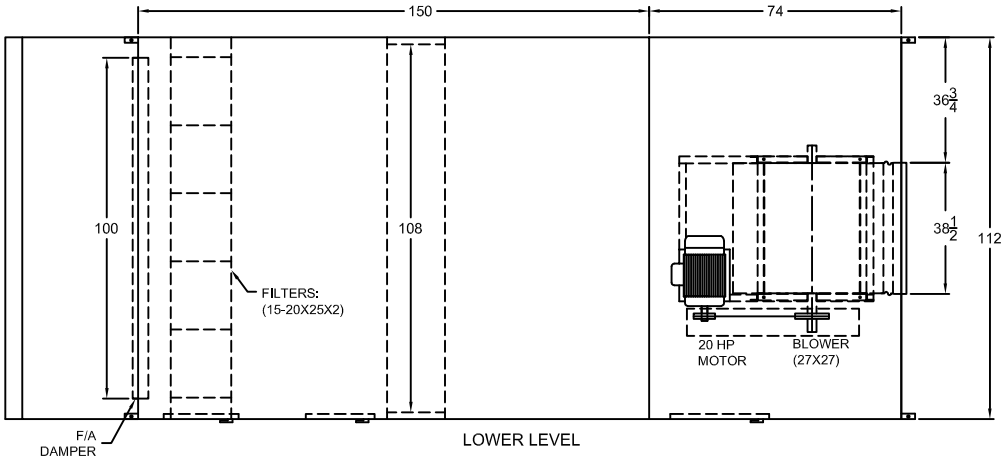

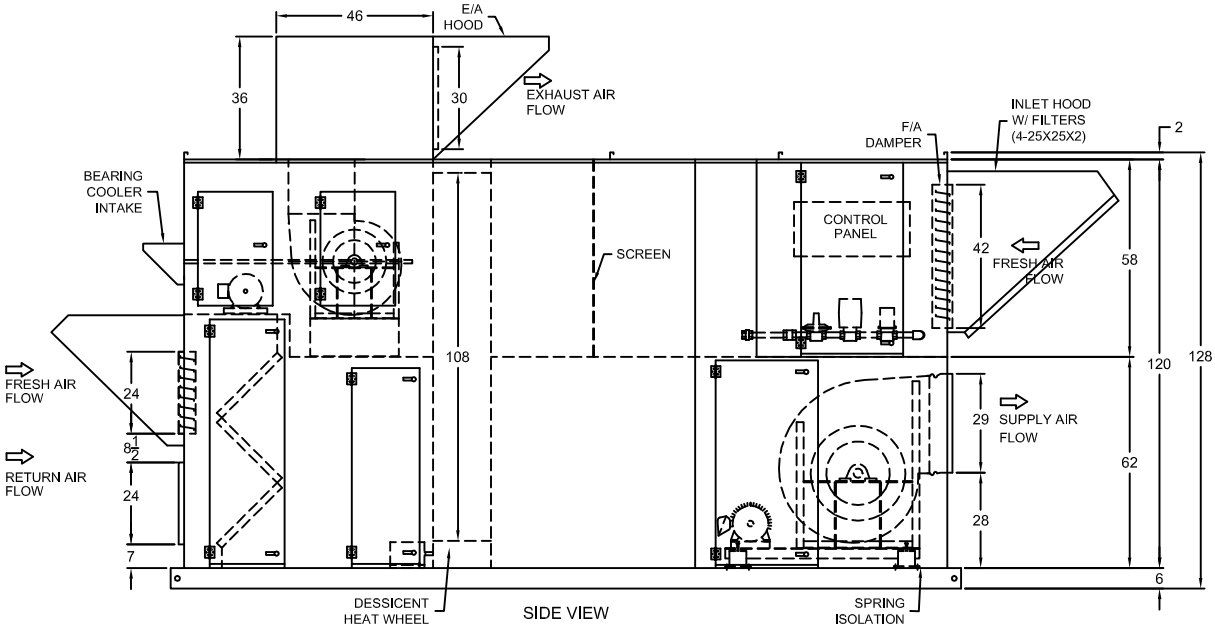

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OSD SERIES

TITLE
OSD 118
HORIZONTAL CONFIG. OUTDOOR
UNIT w/ MIX BOX, FLAT FILTER, HEAT WHEEL (WSG 2438x200)
AND INLET HOOD

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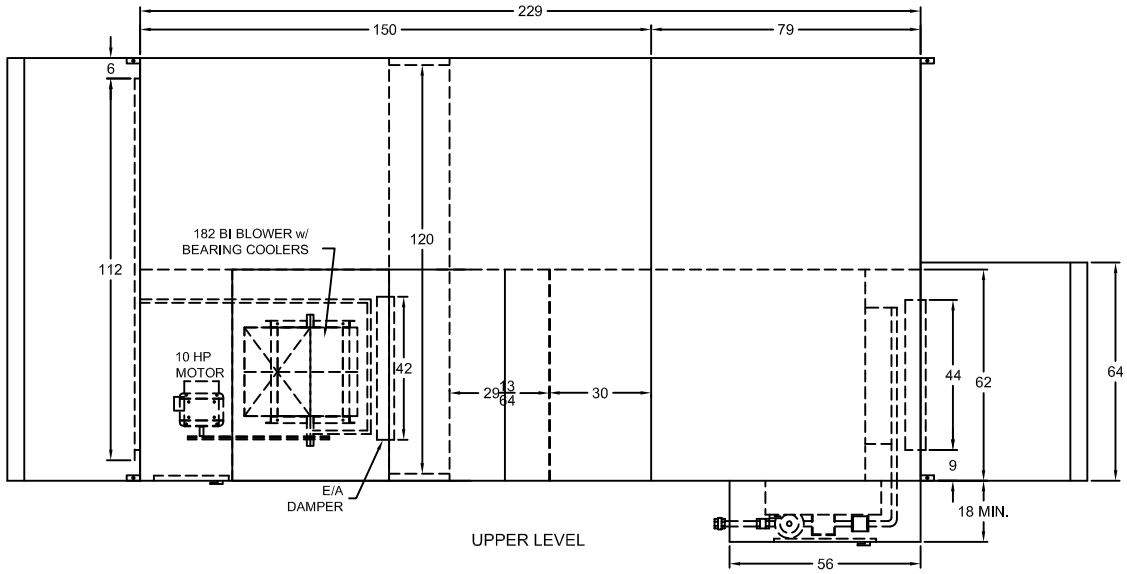

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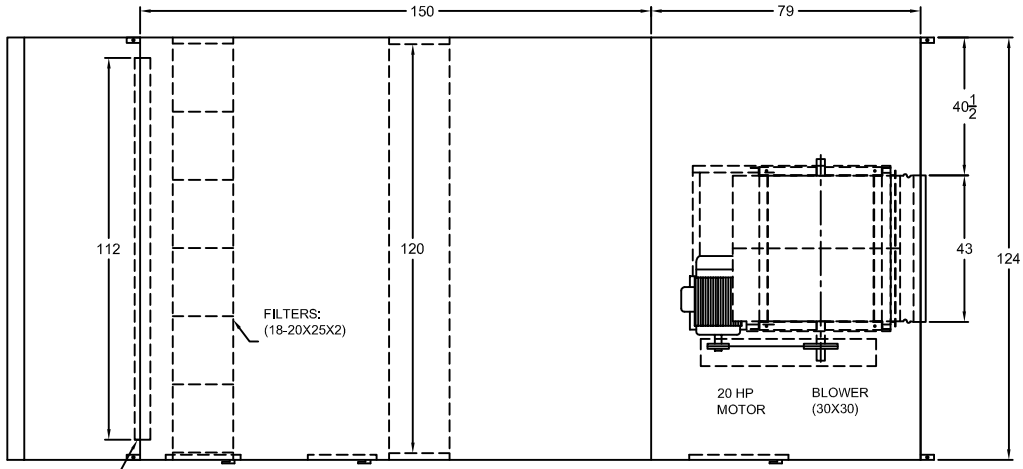
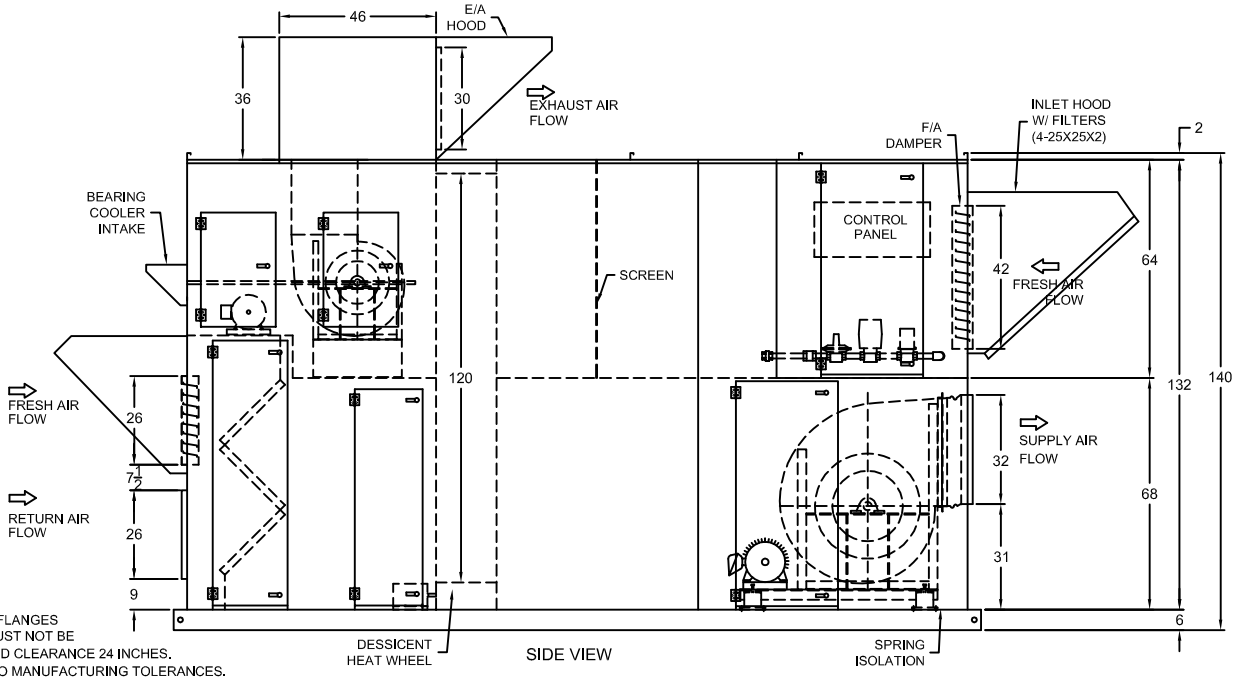


LOWER LEVEL



SIDE VIEW

NOTES:

(S) SPLIT FOR SHIPMENT
SEE CURB DWG. #60-27807 RC

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

ICC

OSD SERIES

TITLE
OSD 118
HORIZONTAL CONFIG. OUTDOOR
UNIT w/ MIX BOX, FLAT FILTER, HEAT WHEEL (WSG 2743x200)
AND INLET HOOD

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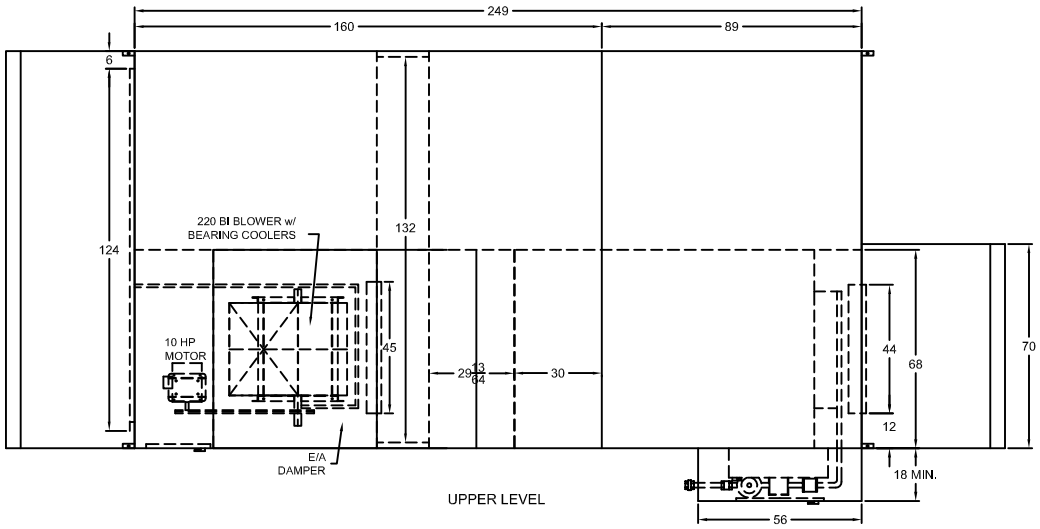
JR		1:60		
CHK. BY	DATE		JOB NO.	PAGE H-13



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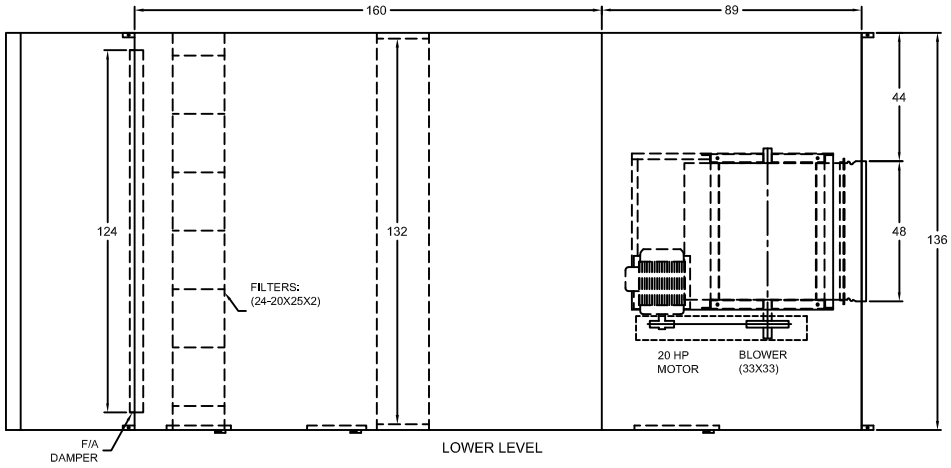

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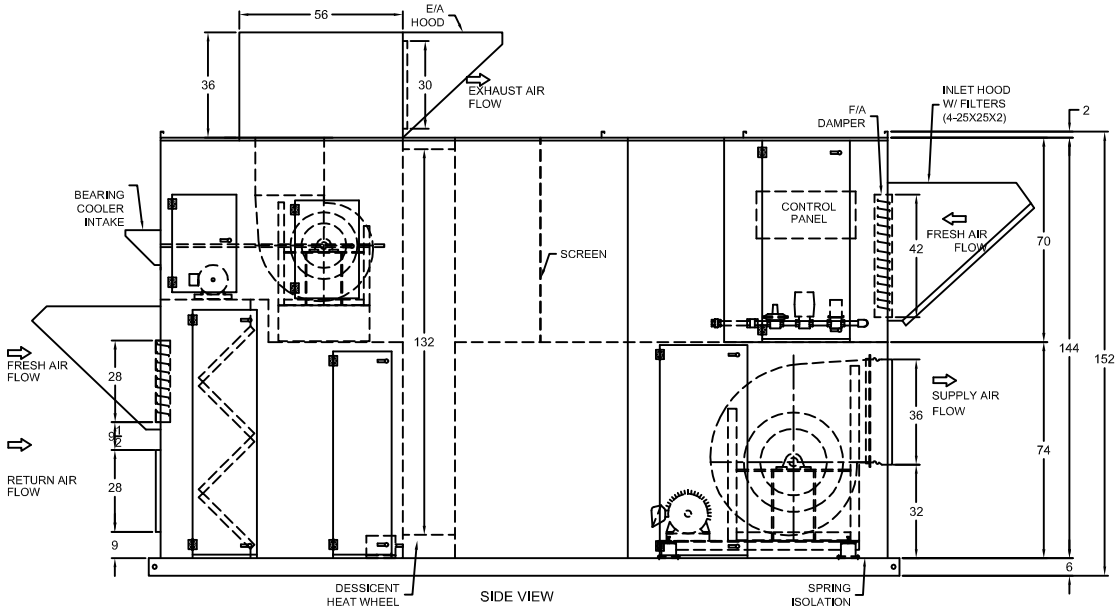

SIDE VIEW

NOTES:

(S) SPLIT FOR SHIPMENT
SEE CURB DWG. #60-27807 RC

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

OSD SERIES

TITLE
OSD 120
HORIZONTAL CONFIG. OUTDOOR
UNIT w/ MIX BOX, FLAT FILTER, HEAT WHEEL (WSG 3050x200)
AND INLET HOOD

DRAWN BY	ISSUED BY	SCALE	DRW. NO.
JR		1:70	
CHK. BY	DATE	JOB NO.	PAGE H-14

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

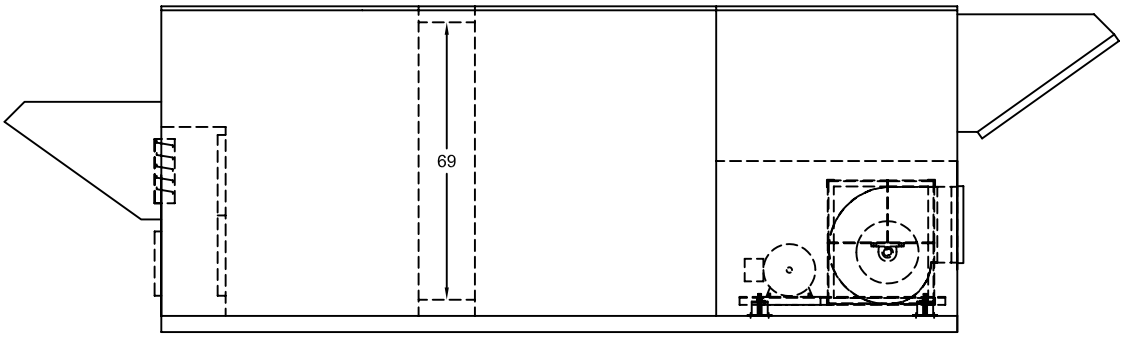
The dampers are to be galvanized steel (aluminum airfoil low leak) type (with seals). The dampers shall be equipped with 2-position (modulating) actuators. The filters shall be 2" pleated throwaway type with minimum of 85% arrestance and 30% efficiency. Filter access shall be through a latched and gasketed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

REMOTE CONTROL PANELS

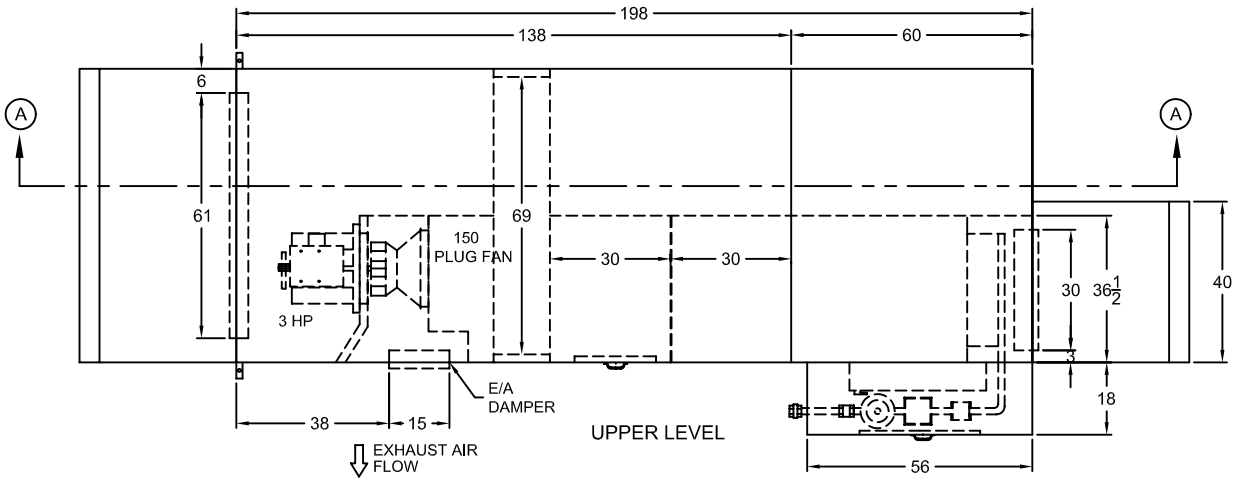
Remote NEMA 1(12) locking control panel shall be equipped with summer/off/winter switch and blower on, burner on, flame failure and loaded filter lights. (A remote adjustment potentiometer shall control damper positioning.) (An LCD display shall provide system temperature and set points.)

BMA TYPE BURNER SECTION

Each unit shall be equipped with a wide range fully modulating direct-fired burner capable of 30:1 turndown. The burner shall have stainless steel combustion baffles, non-clogging gas ports, spark-ignition intermittent pilot and flame safeguard system. Burner combustion must be clean and odourless. Combustion efficiency must limit the products of combustion to a maximum of 5 ppm carbon monoxide and 0.5 ppm nitrogen dioxide. The burner profile is to be equipped with adjustable profile plates. A heat-treated glass observation port shall provide a full view of the flame. Hinged access doors are to be provided to allow easy maintenance and inspection for burner, igniter and flame rod.



SECTION A-A



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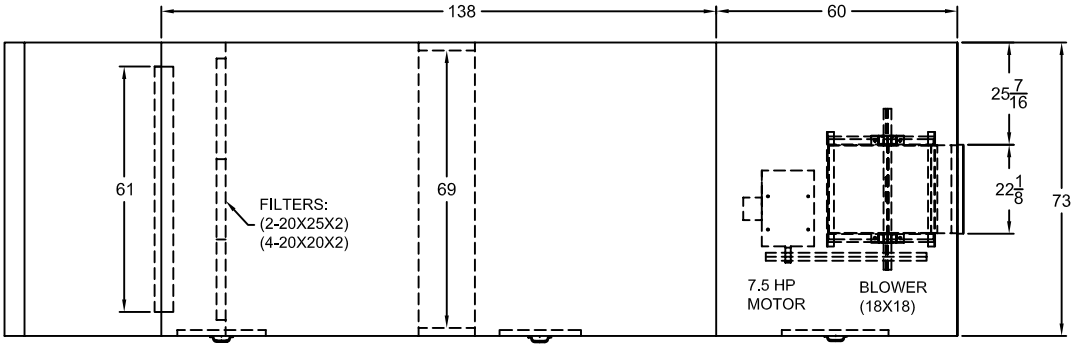
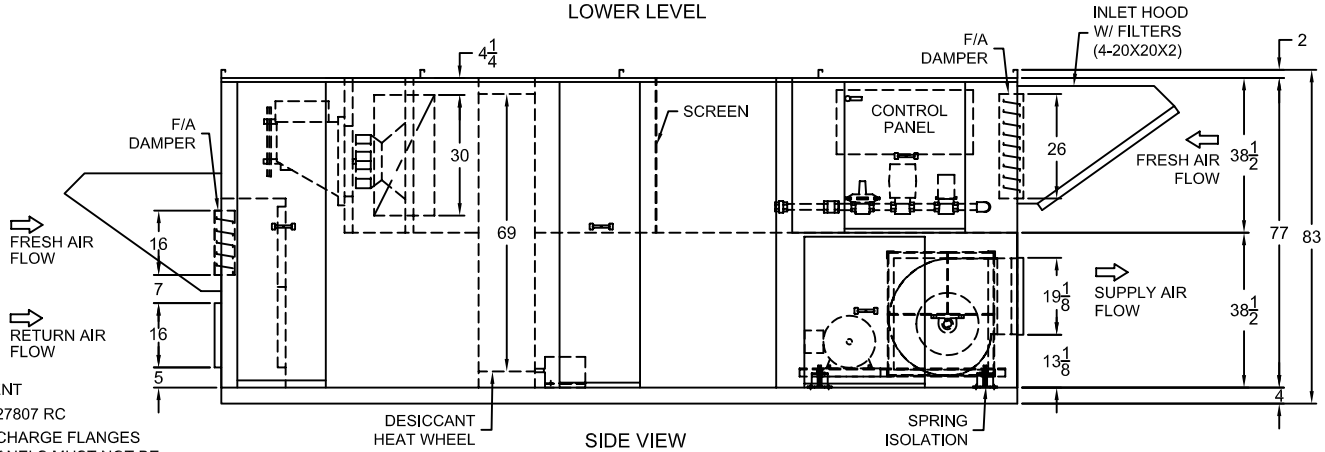


LOWER LEVEL



SIDE VIEW

NOTES:

(S) SPLIT FOR SHIPMENT
SEE CURB DWG. #60-27807 RC

1. 1 1/2 INLET AND DISCHARGE FLANGES
2. SERVICE ACCESS PANELS MUST NOT BE OBSTRUCTED RECOMMENDED CLEARANCE 24 INCHES.
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NOTE:
FIELD APPROVAL FOR PLUG FAN

Rev	By	Revision Description	Date

ICG

OSD SERIES

TITLE
OSD 109
150BI SWSI HRU HORIZONTAL CONFIG. OUTDOOR UNIT
c/w MIX BOX, FLAT FILTER, HEAT WHEEL
PLUG FAN AND INLET HOOD

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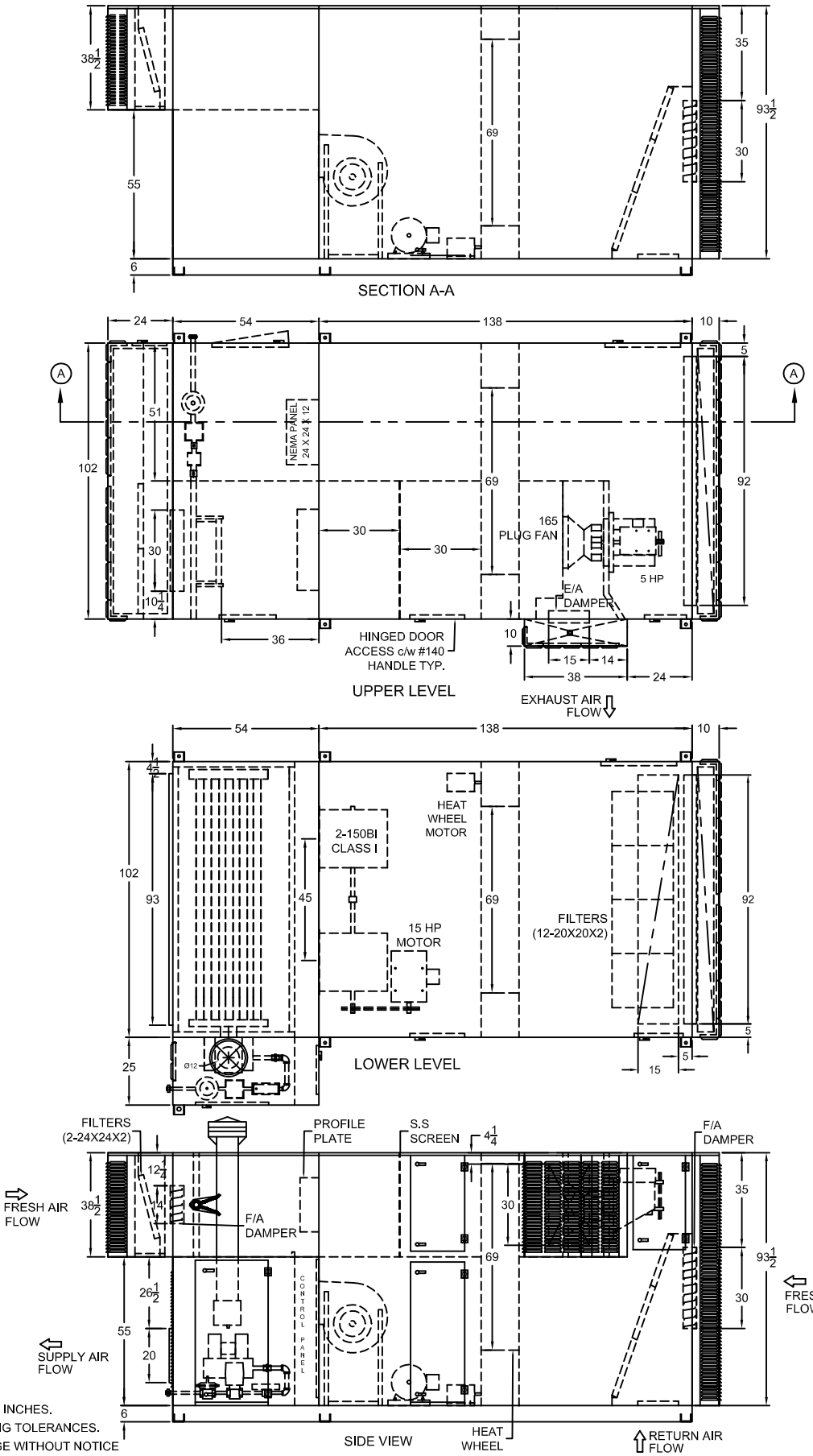
CHK. BY	DATE	JOB NO.	PAGE H-17



NOTES:

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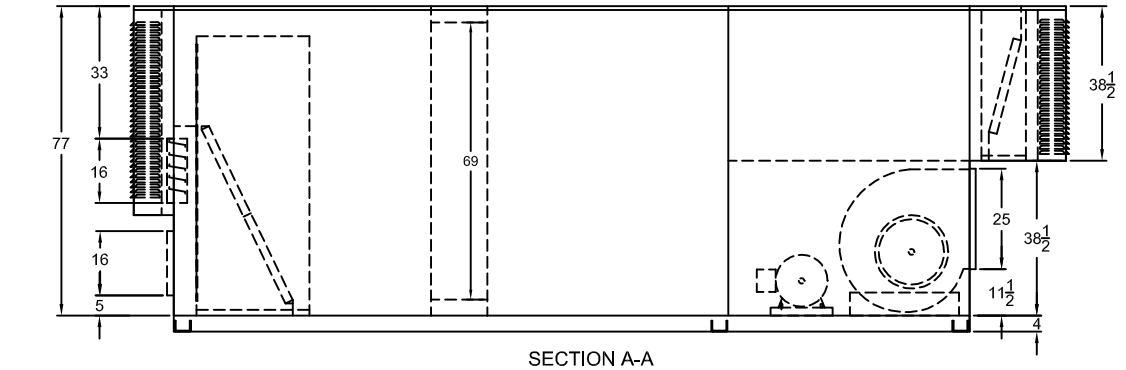
ICG WESTERN
OSD SERIES

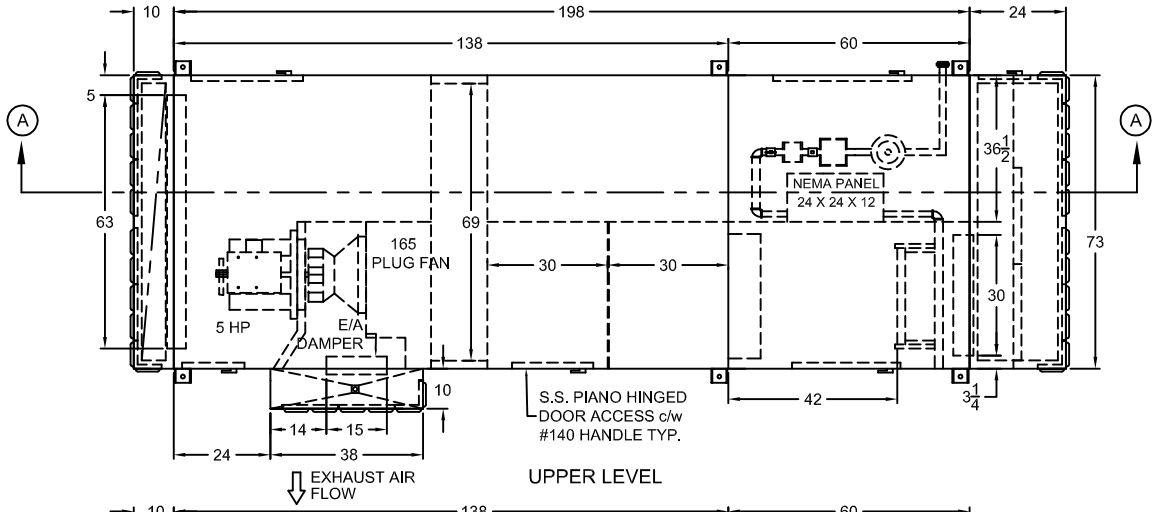
Rev	By	Revision Description	Date

TITLE
OSD 109
HORIZONTAL CONFIG. OUTDOOR UNIT
c/w MIX BOX, ANGULAR FILTER, HEAT WHEEL
PLUG FAN AND LOUVERED INLET

DRAWN BY	ISSUED BY	SCALE	DRW. NO.
JV		1:60	60-19676
CHK. BY	DATE	JOB NO.	PAGE H-18

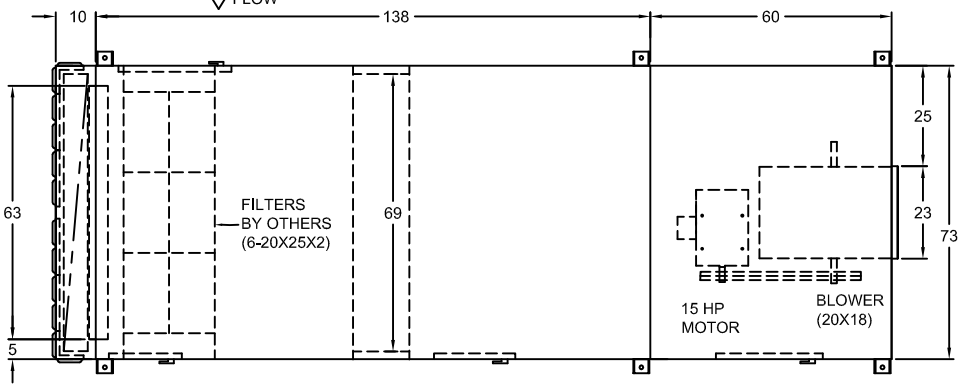


SECTION A-A

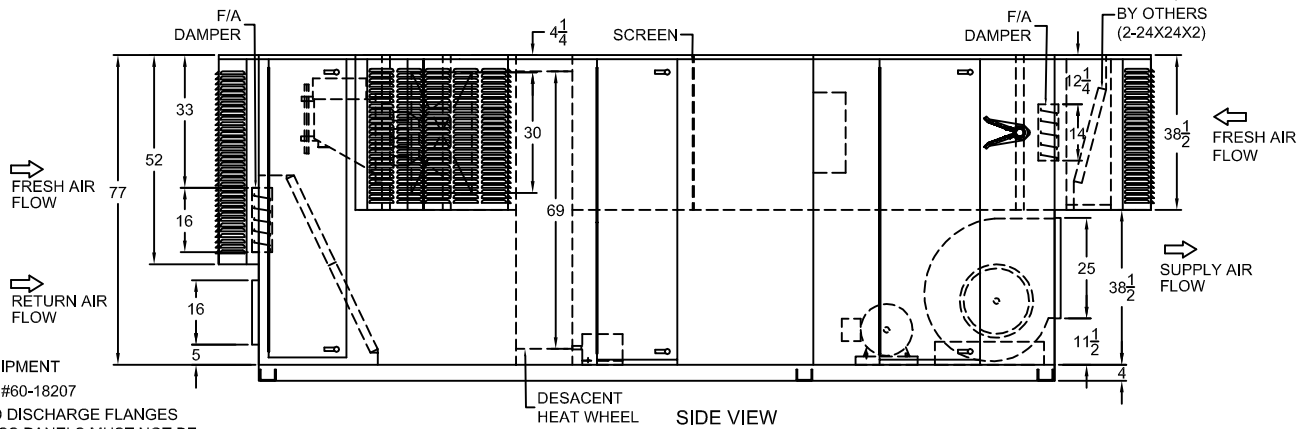


EXHAUST AIR FLOW

UPPER LEVEL



LOWER LEVEL



SIDE VIEW

NOTES:

(S) SPLIT FOR SHIPMENT
SEE CURB DWG. #60-18207

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ICC WESTERN
OSD SERIES

Rev	By	Revision Description	Date

TITLE
OSD 109
165BI SWSI HRU HORIZONTAL CONFIG. OUTDOOR UNIT
c/w MIX BOX, ANGULAR FILTER, HEAT WHEEL
PLUG FAN AND LOUVERED INLET

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CHK. BY	DATE	JOB NO.	PAGE
			H-19