Tesla 47700 Kato Road and 1055 Page Avenue Improvements Project

Attachment 1.13: Noise

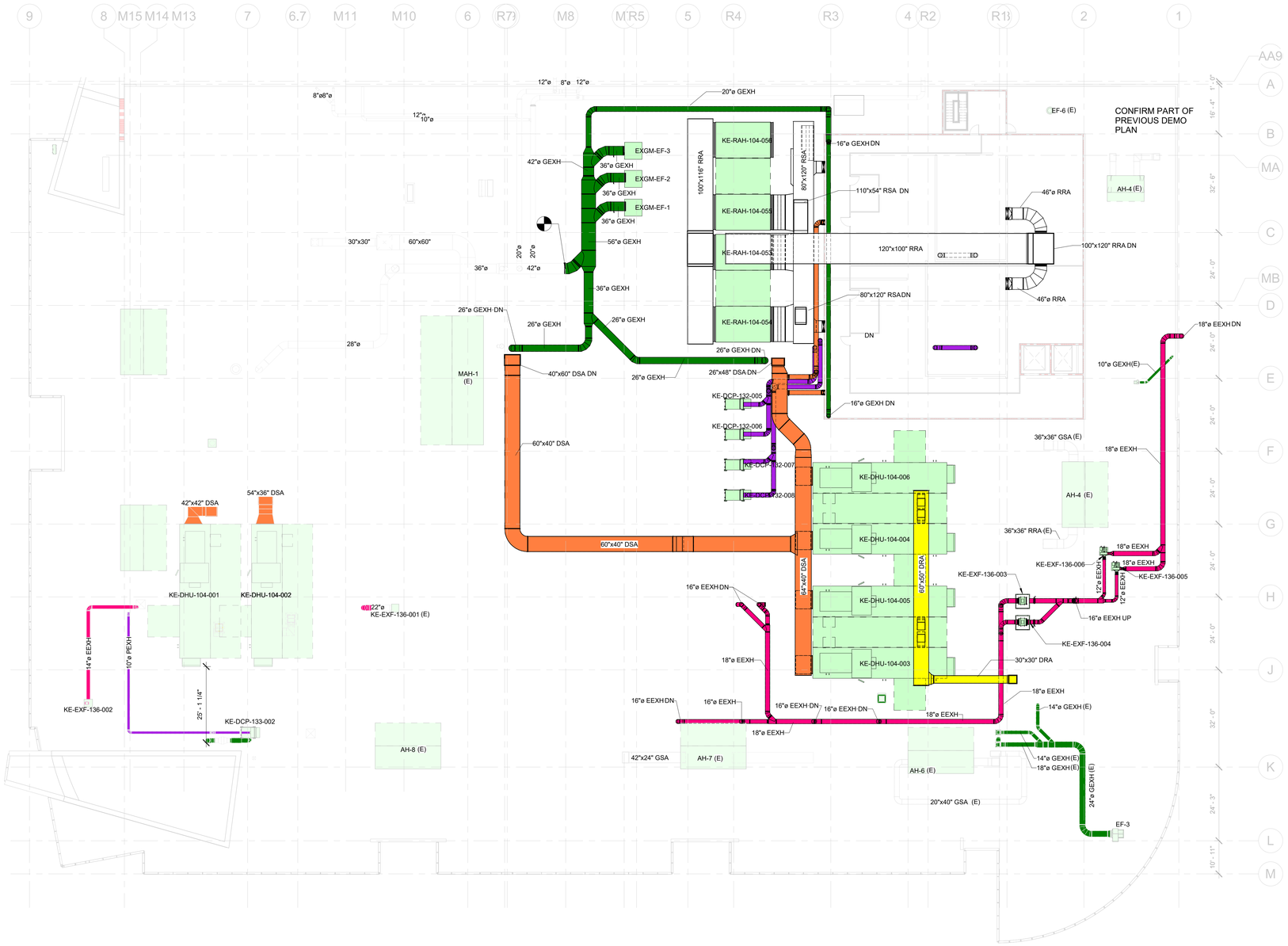
A. Kato Rooftop Equipment Diagram

B. Kato Rooftop Equipment Noise Calculation

C. Page Rooftop Equipment Diagram

D. page Rooftop Equipment Noise Calculation

E. Rooftop Equipment Cut-Sheets



1 3F OVERALL HVAC PLAN VIEW_J

SJC-EK-103-COLOR REF: SCALE: 1/16" = 1'-0"

TESLA

PROJECT NAME
KATO IMPROVEMENTS

PROJECT NUMBER
EK19-0003B

PROJECT ADDRESS
47700 KATO RD
FREMONT, CA 94538

CONFIDENTIAL

NO.	ISSUED FOR	DATE

Drawn By: J Checked By: JS

SEAL

NOT FOR CONSTRUCTION

SHEET TITLE
RR-OVERALL ROOF PLAN (COLOR)

SHEET NUMBER
SJC-EK-103-COLOR

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Table 2A: Kato - Rooftop Mechanical Noise Calculation (dBA)

HVAC Units:

$L_{at\ PL} = L_w + 10*LOG\ (1/(2*pi*d^2)) - d(a_m+a_n)/1000 + k$

Where:

$L_{at\ PL}$ = dBA at property line
L_w = sound power at source
d = distance from source to property line
a_m = molecular absorbtion coefficient (standard day at 59 degrees, 70% relative humidity)
a_n = anomalous effect coefficient
k = constant factor of 10

Fans and other non-directional Point Sources:

$L_{at\ PL} = L_w = 10*LOG(Q/(4*pi*d^2)) + k$

Where:

Q = directivity factor = 1

Air Handling Units:

KE-RAH-104-56

				pi	d	d^2	$2*pi*d^2$	
			2	3.14159	83	6889	43284.82702	
							2.31028E-05	$1/2*pi*d^2$
							-46.3633569	10 Log
Type:	63	125	250	500	1000	2000	4000	8000
Radiated:	85	81	74	75	74	64	48	51
Lp (dB):	49	45	38	38	37	27	10	13
Correction Factor for dBA:	-26	-16	-9	-3	0	1	1	-1
reference dBA at property line:	23	29	29	35	37	28	11	12
dBA at property line:	40.3	(using dB calculator)						

KE-RAH-104-55

			2	3.14159	100	10000	62831.8	
							1.59155E-05	
							-47.981795	
Type:	63	125	250	500	1000	2000	4000	8000
Radiated:	85	81	74	75	74	64	48	51
Lp (dB):	47	43	36	37	36	25	9	11
Correction Factor for dBA:	-26	-16	-9	-3	0	1	1	-1
reference dBA at property line:	21	27	27	34	36	26	10	10
dBA at property line:	39.0							

KE-RAH-104-53

			2	3.14159	116	13456	84546.47008	
							1.18278E-05	
							-49.2709548	
Type:	63	125	250	500	1000	2000	4000	8000
Radiated:	85	81	74	75	74	64	48	51
Lp (dB):	46	42	35	36	34	24	8	10
Correction Factor for dBA:	-26	-16	-9	-3	0	1	1	-1
reference dBA at property line:	20	26	26	33	34	25	9	9
dBA at property line:	37.5							

KE-RAH-104-54

			2	3.14159	135	18225	114510.9555	
							8.73279E-06	
							-50.5884704	
Type:	63	125	250	500	1000	2000	4000	8000
Radiated:	85	81	74	75	74	64	48	51
Lp (dB):	44	40	33	34	33	23	6	8
Correction Factor for dBA:	-26	-16	-9	-3	0	1	1	-1
reference dBA at property line:	18	24	24	31	33	24	7	7
dBA at property line:	36.1							

DeHumidifiers

KE-DHU-104-6

			2	3.14159	164	26896	168992.4093	
							5.91743E-06	
							-52.278672	
Type:	63	125	250	500	1000	2000	4000	8000
L Design	102	104	101	98	94	90	87	84
Lp (dB):	60	62	59	56	51	47	44	40
Correction Factor for dBA:	-26	-16	-9	-3	0	1	1	-1
reference dBA at property line:	34	46	50	53	51	48	45	39
dBA at property line:	59.0							

			2	3.14159	184	33856	212723.3421	
							4.70094E-06	
KE-DHU-104-4							-53.2781515	
Type:	63	125	250	500	1000	2000	4000	8000
L Design	102	104	101	98	94	90	87	84
Lp (dB):	59	61	58	55	50	46	43	39
Correction Factor for dBA:	-26	-16	-9	-3	0	1	1	-1
reference dBA at property line:	33	45	49	52	50	47	44	38
dBA at property line:	55.4							

			2	3.14159	204	41616	261480.8189	
							3.82437E-06	
KE-DHU-104-5							-54.1743984	
Type:	63	125	250	500	1000	2000	4000	8000
L Design	102	104	101	98	94	90	87	84
Lp (dB):	58	60	57	54	50	45	42	38
Correction Factor for dBA:	-26	-16	-9	-3	0	1	1	-1
reference dBA at property line:	32	44	48	51	50	46	43	37
dBA at property line:	56.4							

			2	3.14159	224	50176	315264.8397	
							3.17194E-06	
KE-DHU-104-3							-54.9867554	
Type:	63	125	250	500	1000	2000	4000	8000
L Design	102	104	101	98	94	90	87	84
Lp (dB):	57	59	56	53	49	44	41	37
Correction Factor for dBA:	-26	-16	-9	-3	0	1	1	-1
reference dBA at property line:	31	43	47	50	49	45	42	36
dBA at property line:	54.8							

			2	3.14159	319	101761	639382.68	
							1.56401E-06	
KE-DHU-104-1							-58.0576087	
Type:	63	125	250	500	1000	2000	4000	8000
L Design	102	104	101	98	94	90	87	84
Lp (dB):	54	56	53	50	46	42	39	36
Correction Factor for dBA:	-26	-16	-9	-3	0	1	1	-1
reference dBA at property line:	28	40	44	47	46	43	40	35
dBA at property line:	52.0							

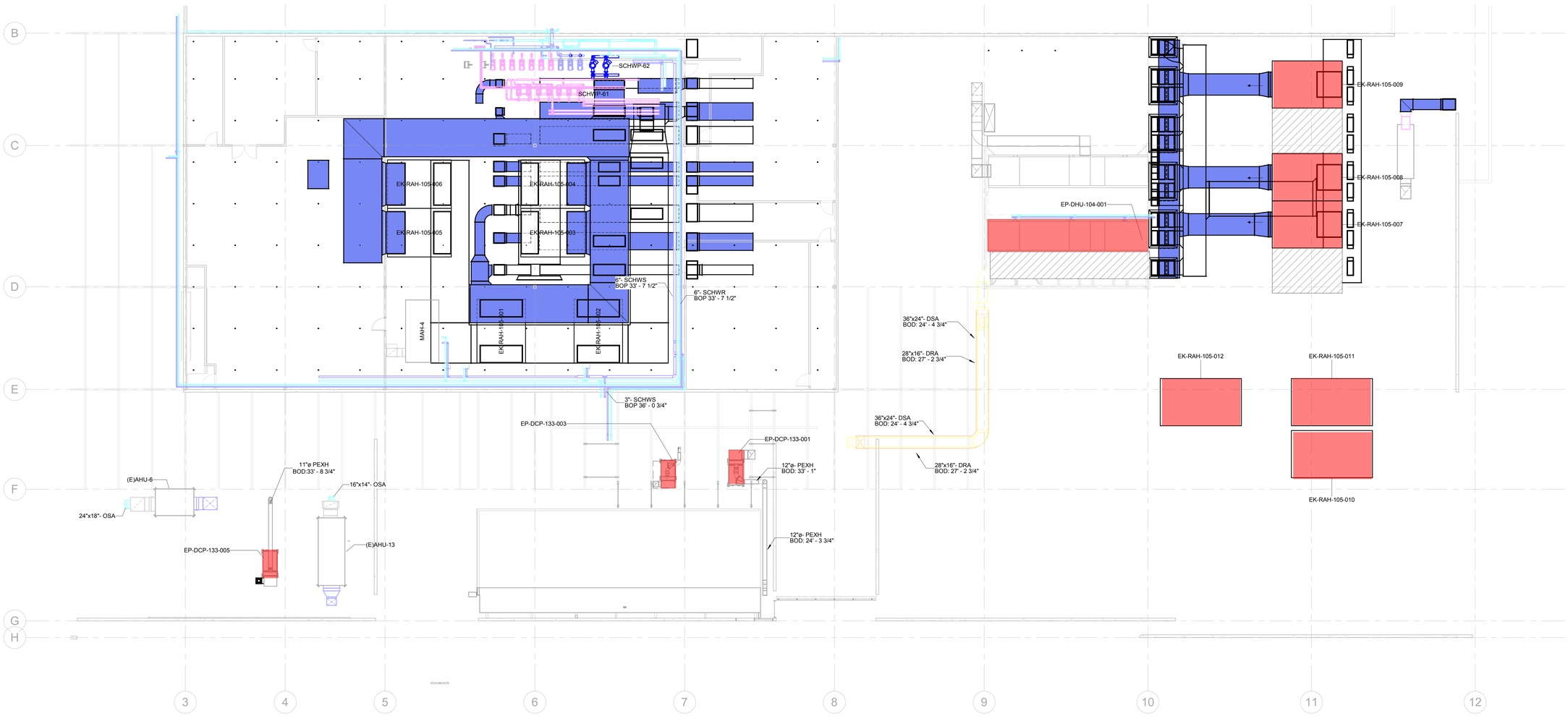
			2	3.14159	301	90601	569262.3912	
							1.75666E-06	
KE-DHU-104-2							-57.5531249	
Type:	63	125	250	500	1000	2000	4000	8000
L Design	102	104	101	98	94	90	87	84
Lp (dB):	54	56	53	50	46	42	39	36
Correction Factor for dBA:	-26	-16	-9	-3	0	1	1	-1
reference dBA at property line:	28	40	44	47	46	43	40	35
dBA at property line:	52.0							

Dust Collector Fans			4	3.14159	161	25921	325732.6176
KE-DCP-132-5	85						3.07E-06
	40						-55.1286125
			4	3.14159	172	29584	371763.1942
KE-DCP-132-6	85						2.68988E-06
	39						-55.7026639
			4	3.14159	181	32761	411686.52
KE-DCP-132-7	85						2.42903E-06
	39						-56.1456665
			4	3.14159	190	36100	453645.596
KE-DCP-132-8	85						2.20436E-06
	38						-56.567167
			4	3.14159	194	37636	472947.525
KE-DCP-133-2	85						2.1144E-06
	38						-56.7481296

Exhaust Fans for ELEX		4	3.14159	205	42025	528101.279
KE-EXF-136-6	73					1.89358E-06
	26					-57.2271722
		4	3.14159	211	44521	559466.9136
KE-EXF-136-5	73					1.78742E-06
	26					-57.4777441
		4	3.14159	216	46656	586296.0922
KE-EXF-136-3	73					1.70562E-06
	25					-57.68117
		4	3.14159	222	49284	619320.4862
KE-EXF-136-4	73					1.61467E-06
	25					-57.9191545
		4	3.14159	280	78400	985202.624
KE-EXF-136-1	73					1.01502E-06
	23					-59.9352556
		4	3.14159	371	137641	1729646.357
KE-EXF-136-2	73					5.78153E-07
	21					-62.3795732
Exhaust Fans (using GEHX fans)		4	3.14159	117	13689	172020.902
EXGM-EF-3	78					5.81325E-06
	36					-52.3558122
		4	3.14159	123	15129	190116.4604
EXGM-EF-2	78					5.25993E-06
	35					-52.7901972
		4	3.14159	130	16900	212371.484
EXGM-EF-1	78					4.70873E-06
	35					-53.270962

63.6 dBA: Total new rooftop mechnaical equipment noise at nearest property line

70.0 dBA Ldn at property line



1 ROOF PENTHOUSE ENLARGED PLAN

SJC-EP-M-102-RF REF: SCALE: 3/32" = 1'-0"

TESLA

PROJECT NAME

PAGE IMPROVEMENTS

PROJECT NUMBER

EP19-0003

PROJECT ADDRESS

1055 PAGE AVE, FREMONT
CA 94538

CONFIDENTIAL

NO.	ISSUED FOR	DATE

Drawn By: JY Checked By: JS

SEAL

SHEET TITLE

RR-ROOF PENTHOUSE ENLARGED PLAN

SHEET NUMBER

SJC-EP-M-102-RF

3/2/2020 10:25:07 AM

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Table 2B: Page - Rooftop Mechanical Noise Calculation (dBA)

HVAC Units:

$L_{at\ PL} = L_w + 10*LOG\ (1/(2*pi*d^2)) - d(a_m+a_n)/1000 + k$

Where:

$L_{at\ PL}$ = dBA at property line
L_w = sound power at source
d = distance from source to property line
a_m = molecular absorbtion coefficient (standard day at 59 degrees, 70% relative humidity)
a_n = anomalous effect coefficient
k = constant factor of 10

Fans and other non-directional Point Sources:

$L_{at\ PL} = L_w = 10*LOG(Q/(4*pi*d^2)) + k$

Where:

Q = directivity factor = 1

				pi	d	d^2	$2*pi*d^2$	
			2	3.14159	152	23104	145166.5907	
Air Handling Units:							6.88864E-06	$1/2*pi*d^2$
KE-RAH-104-1							-51.6186668	10 Log
Type:	63	125	250	500	1000	2000	4000	8000
Radiated:	82	78	81	70	68	60	46	51
Lp (dB):	40	36	39	28	26	18	3	7
Correction Factor for dBA:	-26	-16	-9	-3	0	1	1	-1
reference dBA at property line:	14	20	30	25	26	19	4	6
dBA at property line:	32.9	(using dB calculator)						

			2	3.14159	138	19044	119656.8799	
Air Handling Units:							8.35723E-06	$1/2*pi*d^2$
KE-RAH-104-2							-50.7793767	10 Log
Type:	63	125	250	500	1000	2000	4000	8000
Radiated:	82	78	81	70	68	60	46	51
Lp (dB):	41	37	40	29	27	19	4	8
Correction Factor for dBA:	-26	-16	-9	-3	0	1	1	-1
reference dBA at property line:	15	21	31	26	27	20	5	7
dBA at property line:	34.1	(using dB calculator)						

			2	3.14159	135	18225	114510.9555	
Air Handling Units:							8.73279E-06	$1/2*pi*d^2$
KE-RAH-104-3							-50.5884704	10 Log
Type:	63	125	250	500	1000	2000	4000	8000
Radiated:	82	78	81	70	68	60	46	51
Lp (dB):	41	37	40	29	27	19	4	8
Correction Factor for dBA:	-26	-16	-9	-3	0	1	1	-1
reference dBA at property line:	15	21	31	26	27	20	5	7
dBA at property line:	33.9	(using dB calculator)						

			2	3.14159	125	15625	98174.6875	
Air Handling Units:							1.01859E-05	$1/2*pi*d^2$
KE-RAH-104-4							-49.9199953	10 Log
Type:	63	125	250	500	1000	2000	4000	8000
Radiated:	82	78	81	70	68	60	46	51
Lp (dB):	42	38	41	30	28	20	5	9
Correction Factor for dBA:	-26	-16	-9	-3	0	1	1	-1
reference dBA at property line:	16	22	32	27	28	21	6	8
dBA at property line:	34.9	(using dB calculator)						

			2	3.14159	141	19881	124915.9016	
Air Handling Units:							8.00539E-06	$1/2*pi*d^2$
KE-RAH-104-5							-50.9661773	10 Log
Type:	63	125	250	500	1000	2000	4000	8000
Radiated:	82	78	81	70	68	60	46	51
Lp (dB):	41	37	40	29	27	18	4	8
Correction Factor for dBA:	-26	-16	-9	-3	0	1	1	-1
reference dBA at property line:	15	21	31	26	27	19	5	7
dBA at property line:	33.8	(using dB calculator)						

			2	3.14159	147	21609	135773.2366	
Air Handling Units:							7.36522E-06	$1/2*pi*d^2$
KE-RAH-104-6							-51.3281417	10 Log
Type:	63	125	250	500	1000	2000	4000	8000
Radiated:	82	78	81	70	68	60	46	51
Lp (dB):	41	37	40	28	26	18	4	8
Correction Factor for dBA:	-26	-16	-9	-3	0	1	1	-1
reference dBA at property line:	15	21	31	25	26	19	5	7
dBA at property line:	33.5	(using dB calculator)						

			2	3.14159	144	20736	130288.0205	
Air Handling Units:							7.6753E-06	$1/2*pi*d^2$
KE-RAH-104-7							-51.1490449	10 Log
Type:	63	125	250	500	1000	2000	4000	8000
Radiated:	86	81	86	78	78	75	59	51
Lp (dB):	45	40	45	37	37	33	17	8
Correction Factor for dBA:	-26	-16	-9	-3	0	1	1	-1
reference dBA at property line:	19	24	36	34	37	34	18	7
dBA at property line:	41.5	(using dB calculator)						

			2	3.14159	137	18769	117929.0054	
Air Handling Units:							8.47968E-06	$1/2*pi*d^2$
KE-RAH-104-8							-50.7162064	10 Log
Type:	63	125	250	500	1000	2000	4000	8000
Radiated:	86	81	86	78	78	75	59	51
Lp (dB):	45	40	45	37	37	34	17	8
Correction Factor for dBA:	-26	-16	-9	-3	0	1	1	-1
reference dBA at property line:	19	24	36	34	37	35	18	7
dBA at property line:	41.7	(using dB calculator)						

			2	3.14159	124	15376	96610.17568	
Air Handling Units:							1.03509E-05	$1/2*pi*d^2$
KE-RAH-104-9							-49.8502287	10 Log
Type:	63	125	250	500	1000	2000	4000	8000
Radiated:	86	81	86	78	78	75	59	51
Lp (dB):	46	41	46	38	38	35	18	9
Correction Factor for dBA:	-26	-16	-9	-3	0	1	1	-1
reference dBA at property line:	20	25	37	35	38	36	19	8
dBA at property line:	42.7	(using dB calculator)						

			2	3.14159	184	33856	212723.3421	
Air Handling Units:							4.70094E-06	$1/2*pi*d^2$
KE-RAH-104-10							-53.2781515	10 Log
Type:	63	125	250	500	1000	2000	4000	8000
Radiated:	83	79	83	74	75	68	51	51
Lp (dB):	40	36	40	31	31	24	7	6
Correction Factor for dBA:	-26	-16	-9	-3	0	1	1	-1
reference dBA at property line:	14	20	31	28	31	25	8	5
dBA at property line:	35.1	(using dB calculator)						

			2	3.14159	175	30625	192422.3875	
Air Handling Units:							5.1969E-06	$1/2*pi*d^2$
KE-RAH-104-11							-52.842556	10 Log
Type:	63	125	250	500	1000	2000	4000	8000
Radiated:	83	79	83	74	75	68	51	51
Lp (dB):	40	36	40	31	32	25	7	6
Correction Factor for dBA:	-26	-16	-9	-3	0	1	1	-1
reference dBA at property line:	14	20	31	28	32	26	8	5
dBA at property line:	36	(using dB calculator)						

			2	3.14159	158	24964	156853.3055	
Air Handling Units:							6.37538E-06	$1/2*pi*d^2$
KE-RAH-104-12							-51.9549368	10 Log
Type:	63	125	250	500	1000	2000	4000	8000
Radiated:	83	79	83	74	75	68	51	51
Lp (dB):	41	37	41	32	33	25	8	7
Correction Factor for dBA:	-26	-16	-9	-3	0	1	1	-1
reference dBA at property line:	15	21	32	29	33	26	9	6
dBA at property line:	36.9	(using dB calculator)						

Dehumidifier			2	3.14159	118	13924	87486.99832	
							1.14303E-05	
KE-DHU-104-1							-49.4194352	
Type:	63	125	250	500	1000	2000	4000	8000
L Design	102	104	101	98	94	90	87	84
Lp (dB):	63	64	61	58	54	50	46	43
Correction Factor for dBA:	-26	-16	-9	-3	0	1	1	-1
reference dBA at property line:	37	48	52	55	54	51	47	42
dBA at property line:	59.9							

Dust Collector Fans				4	3.14159	160	25600	321698.816
KE-DCP-133-1	85							3.1085E-06
	40							-55.0744946
				4	3.14159	166	27556	346278.6162
KE-DCP-133-3	85							2.88785E-06
	40							-55.3942567
				4	3.14159	233	54289	682215.118
KE-DCP-133-5	85							1.46581E-06
	37							-58.3392134
				4	3.14159	190	36100	453645.596

60.3 dBA: Total new rooftop mechnaical equipment noise at nearest property line

66.7 dBA Ldn at property line

Technical Data Sheet for KEH-RAH-104-053,054,055,056

Supply Fan Array	Component: 5	Length: 50 in	Shipping Section: 3

Fan Performance

Air Volume*	Static Pressure External	Static Pressure Total	Static Pressure Cabinet	Brake Horsepower*	Speed Operating	Speed Maximum	Fan Circuit MOP	Fan Circuit MCA
12500 cfm	4.00 inWc	6.41 inWc	0.03 inWc	18.12 BHP	1782 rpm	1981 rpm	125.0 A	102.2 A

Fan Data

Fan Type	Blade Type / Class	Quantity of Fans	Wheel Diameter	Number of Blades	Discharge	Motor Location
SWSI / 2x2	Airfoil / 2	4	27.00 in	12	Axial	Behind Fan

Motor Data

Power	Electrical Supply	Speed	Efficiency	Enclosure	Frame Size	Supplier	Number of Poles	Lock Rotor Current*	Full Load Current*
20.0 HP	460/60/3 V/Hz/Phase	1750 rpm	Premium	ODP	256 T frame	Generic	4	145.00 A	24.00 A

Fan Options

Isolation Backdraft Dampers:	Provided	Block Off Plate:	None
Shaft Grounding Kit:	Provided	Isolator Type:	Spring

VFD/Starter/Disconnect Data

Selection Type:	1 VFD per row	Vendor:	Daikin Applied
Auxiliary Control:	Disconnect	Voltage:	460 V
Disconnect Type:	Fused	Height x Width x Depth:	47.20 in x 41.40 in x 15.70 in
Mounting:	Door Side	Enclosure:	NEMA 3R with Window Kit (fan array)
VFD Quantity:	2		

Panel

Location	Width	Opening
Removable panels	- in	Outward

Notes

** after a unit label denotes the data for an individual fan.*

Plenum Section	Component: 6	Length: 58 in	Shipping Section: 4

Opening Location	Opening Size	Air Pressure Drop
End upper	54.00" x 138.00"	0.12 inWc

Door

Location	Width	Opening
Drive side	30 in	Outward

Special Options

Tread Plate Floor Liner

Tread plate installed

Unit Sound Power (dB)

Type	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Radiated:	85	81	74	75	74	64	48	51
Unit Discharge:	90	86	86	90	90	86	80	78
Unit Return:	86	83	85	88	78	73	61	51

KE-DHU-104-3,4,5,6

CHICAGO BLOWER CORPORATION • 1675 Glen Ellyn Road • Glendale Heights, IL • 60139

an ISO 9001 Company

Description

October 7, 2019

Job Description:	**21955971-01**
Reference:	**Process Fan**
Fan Type:	**Square Fans**
Fan Model:	**Design 36A SQAD SW Airfoil Direct Drive**
Fan Size:	**33**
Fan Width:	**80%**

Performance

Values are in accordance with AMCA Standard 210

	58.3 Hz Design	**60 Hz Ref**
Volume Flow Rate (ACFM)	19773	19773
Static Pressure (IN. WG)	10.7	11.9
Density (LB/FT³)	0.076	0.076
Temperature (°F)	62.1	62.1
Altitude (FT)	0	0
Speed (RPM)	1721	1770
Power Required (BHP)	40.2	43.8
Static Efficiency (%)	81.9	83.2
Outlet Velocity (FT/MIN)	3302	3302
Damper Opening (%)	N/A	N/A
Control Type	RPM Change	
Outlet Area (FT²)	5.99	

Sound

Values are in accordance with AMCA Standard 300

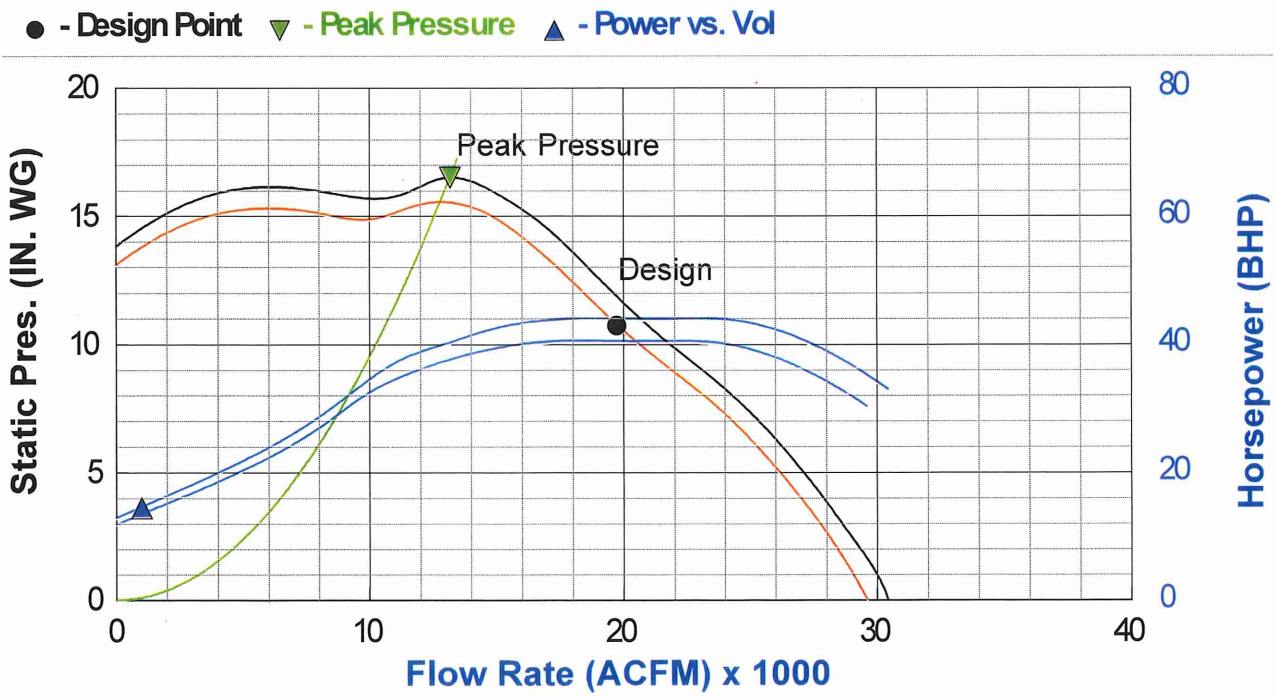
External Sound Power Levels (dB):

Center Hz	63	125	250	500	1000	2000	4000	8000
L_{wi} Design	102	104	101	98	94	90	87	84
ERC	6	3	1					

Sound Pressure 3.0 FT from Fan (dBA) 93

Sound Pressure, Radiated, 3.0 FT from 0.105 housing 76 dBA.

L_{wi} (L_{wo}) is sound power at the fan inlet (outlet)/airstream, less ERC.



CAUTION:FAN MUST NOT OPERATE LEFT OF PEAK PRESSURE CURVE, EXCEPT FOR START-UP

Search mail

KE-DCP-132- 5,6,7,8

Compose

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CEQA Input Needed - Dust Collector Noise

Inbox ×

Andrew Clakeley
Jianyu, Can you send over cut sheets (with noise levels) for the dust collector exhaust fans that are to be mounted on the roof of Kato (not Page)? Needed to cc

Jianyu Yan <jiayan@tesla.com>
to Sarah, Andrew, me, Rebecca, Logan

Andrew,

Please refer to the attached cutsheet for the dust collector on the roof.

Also attached the schedule in our permit set indicate with the silencer the noise shall not be above 85 DBA.

I also add our dust collector vendor Sarah to this email loop, based on the discussion with her, with the silencer it shall be around 79DBA.

She can also help us request formal documentation of this, please let me know if this is required

Thank you

Jianyu

SWIFT - DUST COLLECTOR SCHEDULE

EQUIPMENT ID NUMBER	FLOW CAPACITY	EQUIPMENT LOCATION	TEMP RATING(F)	MANUFACTURER	MODEL	Kst (bar-m/sec)	Pmax (Pa)	DUST LOADING (g/m3)
KE-DCP-133-002	2000 CFM	ROOF	55°F-80°F	DONALDSON	DFE 2-4	299	10	0.0147

NOTES:

1. FAN EXTERNAL STATIC PRESSURE ASSUMES DUCT LOSSES FROM PROCESS EXHAUST INLET TO DUST COLLECTOR INLET. SILENCER/STACK EX
2. FAN SHALL BE SPARK RESISTANT, AMCA TYPE B.
3. PROVIDE FAN OUTLET SILENCER. SOUND POWER LEVEL SHALL NOT EXCEED 85dBA AT 3 FEET FROM THE FAN SILENCER OUTLET.
4. PROVIDE WITH MERV 15 FILTER CARTRIDGES AND ULPA AFTER FILTER.
5. PROVIDE BAG IN/OUT SYSTEM FOR FILTER AND DUST COLLECTION DRUM.
6. EQUIPMENT IS OWNER FURNISHED AND INSTALLED BY THE CONTRACTOR.
7. PROVIDE ULPA AFTER FILTER. MAX CLEAN/DIRTY APD IS 1 IN-WG / 2 IN-WG.
8. PROVIDE CHEMICAL SUPPRESSION SYSTEM COMPLETE WITH SYSTEM MONITOR, BATTERY BACK-UP, TRIPLEX EXPLOSION SENSOR, AND CHEMI MANUFACTURER'S INSTALLATION REQUIREMENTS.
9. CONTRACTOR SHALL INSTALL BONDING CONDUCTORS ACROSS EACH SECTION OF CONDUCTIVE DUCT WHERE JOINTS BETWEEN DUCTS IS NO GROUNDED. REFER TO ELECTRICAL SPECIFICATION 26 05 26 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS FOR REQUIREMENTS OF IN
8. PROVIDE EMERGENCY POWER, REFER TO ELECTRICAL DESIGN.

KE - EXF - 134 - 3,4, 1,2, 5,6

Job Name: USF-313-BI Cut Sheet
Tag: MK-1
Quantity: 1
Printed Date: October 24, 2019

Model: USF-313-BI

Backward Inclined Single Width Blower

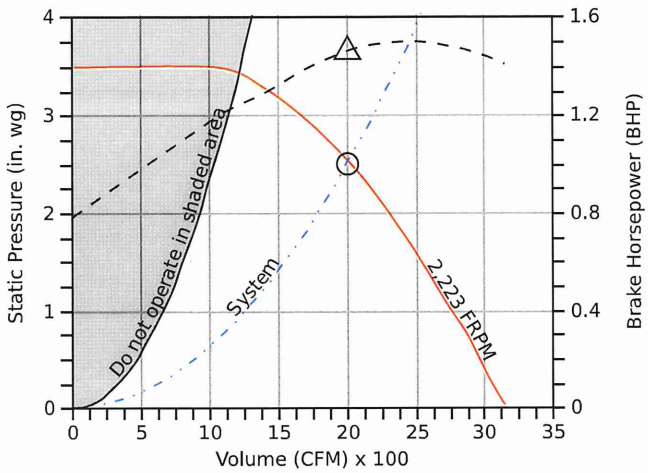
Standard Construction Features: Galvanized Steel scroll (optional painted), PermaLock seam (optional welded seam). Centrifugal backward inclined steel wheel. Steel inlet cone. Belt driven motor mounted out of the air stream.

Certifications/special requirements: Spark Resistant B

Fan Configuration	
Arrangement	10
Discharge position	TH
Wheel rotation	CW
Fan material	Steel
Drive type	Belt

Performance	
Requested Volume (CFM)	2,000
Actual Volume (CFM)	2,000
Total External SP (in. wg)	2.5
Fan RPM	2,223
Drive Loss (%)	8
Operating Power (bhp)	1.46
Startup Power (bhp)	1.46
Air Stream Temp (F)	70
Start-up Temp (F)	70
Air Density (lbs/ft^3)	0.075
Elevation (ft)	56
Static Efficiency (%)	59
Outlet Velocity (ft/min)	1,905

Motor	
Enclosure	ODP
Size (hp)	1-1/2
V/C/P	460/60/3
NEC FLA (Amps)	3



Fan curve
Brake horsepower curve
Operating Point SP
Operating Bhp point
Max system curve
System curve

Sound

	Octave Bands (hz)								LwA	dBA	Sones
	62.5	125	250	500	1000	2000	4000	8000			
Inlet	84	84	79	82	80	75	73	68	84	73	21

Greenheck Fan Corporation certifies that the model shown herein is licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and AMCA Publication 311 and comply with the requirements of the AMCA Certified Ratings Program.Performance certified is for installation type B: Free inlet, Ducted outlet.Power rating (BHP/kW) includes transmission losses.Performance ratings do not include the effects of appurtenances (accessories).The sound power level ratings shown are in decibels, referred to 10^-12 watts calculated per AMCA Standard 301. The A-weighted sound ratings shown have been calculated per AMCA International Standard 301. Values shown are for inlet Lwi, LwiA, and outlet Lwo, LwoA sound power levels for installation type B: free inlet, ducted outlet. Outlet ratings include the effects of duct end correction. dBA levels are not licensed by AMCA International. The AMCA Certified Ratings Seal for Sound applies to inlet Lwi, LwiA and outlet Lwo, LwoA ratings only.

FLA - based on tables 150 or 148 of National Electric Code 2002. Actual motor FLA may vary, for sizing thermal overload, consult factory.

GREENHECK
Building Value in Air.

Printed Date: 12/19/2019
Job: RR EXH Fans
Mark: GEXH
Model: USF-336-BI

USE THIS?

Model: USF-336-BI

Centrifugal Utility Fan - Backward Inclined Wheel

Performance	
Quantity	2
Volume (CFM)	15,000
Total External SP (in. wg)	4
Operating Power (hp)	12.78
Required Power (hp)	12.78
Fan RPM	908
Max Fan RPM	1051
Oper. Frequency (Hz)	60
Elevation (ft)	49
Start-up Temp.(F)	70
Operating Temp.(F)	70

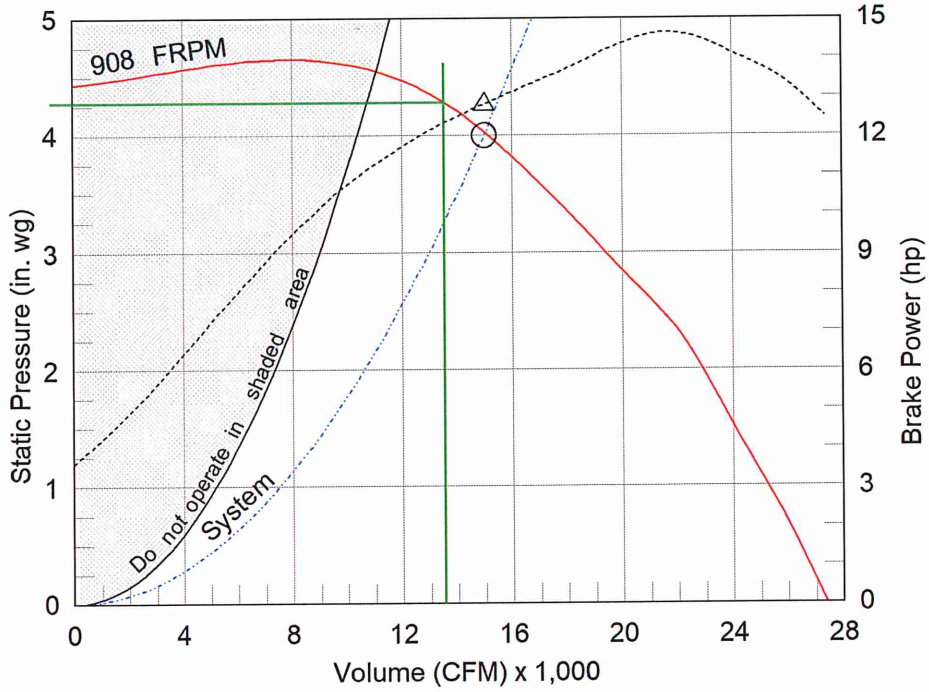
Fan Configuration	
Construction Type	PermaLock
Size	36
Arrangement	10
Rotation	CW
Discharge Position	UB
Spark Resistance	Spark B
Scroll Material	Steel
Wheel Material	Aluminum
Inlet Cone Material	Steel
Pedestal Material	Steel

Equipment Weights	
Fan (LMD)(lb)	1,007
Motor/Drive (lb)	279
Accessories (lb)	219

Misc Fan Data	
FEG	85
Outlet Velocity (ft/min)	1,958
Static Efficiency (%)	77
Tip Speed (ft/min)	8,680

Motor and Drives	
Motor	Included
Size (hp)	15
RPM	1725
Enclosure	ODP
V/C/P	460/60/3
Frame Size	254T
Max Frame Size	286
Location	Centered
Pulley Type	Constant
Drive Loss (%)	3.5
Drives	Multiple
Drive Service Factor	1.5
NEC FLA* (Amps)	21

Operating Performance



△ Operating Bhp point
○ Operating point at Total External SP
Fan curve
System curve
Brake horsepower curve

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Sound Power by Octave Band

Sound Data	62.5	125	250	500	1000	2000	4000	8000	LwA	dBA	Sones
Inlet	90	92	87	82	83	80	74	69	88	76	27
Outlet	97	97	88	86	85	81	76	70	90	78	33

*FLA - based on tables 150 or 148 of National Electrical Code 2002. Actual motor FLA may vary, for sizing thermal overload, consult factory.
LwA - A weighted sound power level, based on ANSI S1.4
dBA - A weighted sound pressure level, based on 11.5 dB attenuation per octave band at 5 ft- dBA levels are not licensed by AMCA International
Sones - calculated using AMCA 301 at 5 ft

Generated by: roagarwal@tesla.com

Technical Data Sheet for EK RAH-105-001, 004, 005

Supply Fan	Component: 5	Length: 64 in	Shipping Section: 3

Fan Performance

Air Volume*	Static Pressure			Brake Horsepower*	Speed		Fan Circuit	
	External	Total	Cabinet		Operating	Maximum	MOP	MCA
12500 cfm	4.00 inWc	6.80 inWc	0.15 inWc	18.87 BHP	1833 rpm	1981 rpm	70.0 A	54.0 A

Fan Data

Fan Type	Blade Type / Class	Quantity of Fans	Wheel Diameter	Material Type	Number of Blades	Discharge	Motor Location
Centrifugal - Plenum	Airfoil / 2	2	27.00 in	Aluminum	9	Top, single opening	Behind Fan

Motor Data

Power	Electrical Supply	Speed	Efficiency	Enclosure	Frame Size	Supplier	Number of Poles	Lock Rotor Current*	Full Load Current*
20.0 HP	460/60/3 V/Hz/Phase	1750 rpm	Premium	ODP	256 T frame	Generic	4	145.00 A	24.00 A

Fan Options

Wheel Guard:	Provided	**Block Off Plate:**	Yes
Shaft Grounding Kit:	Provided	**Isolator Type:**	Spring

VFD/Starter/Disconnect Data

Selection Type:	VFD	**Vendor:**	ABB
Auxiliary Control:	Disconnect	**Voltage:**	460 V
Disconnect Type:	Fused	**Height x Width x Depth:**	36.86 in x 29.92 in x 16.00 in
Mounting:	Door Side	**Enclosure:**	NEMA 1
VFD Quantity:	1		

Door

Location	Width	Opening
Non-drive side	24 in	Outward

Special Options

Tread Plate Floor Liner

Tread plate installed

Notes

** after a unit label denotes the data for an individual fan.*

Unit Sound Power (dB)

Type	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Radiated:	82	78	81	70	68	60	46	51
Unit Discharge:	92	88	94	91	90	88	82	78
Unit Return:	82	78	85	72	68	64	52	51

Technical Data Sheet for EX-RAH-105-007-009

Supply Fan	Component: 4	Length: 66 in	Shipping Section: 3

Fan Performance

Air Volume*	Static Pressure			Brake Horsepower*	Speed		Fan Circuit	
	External	Total	Cabinet		Operating	Maximum	MOP	MCA
25000 cfm	4.00 inWc	5.09 inWc	0.00 inWc	31.75 BHP	1596 rpm	1620 rpm	150.0 A	114.8 A

Fan Data

Fan Type	Blade Type / Class	Quantity of Fans	Wheel Diameter	Material Type	Number of Blades	Discharge	Motor Location
Centrifugal - Plenum	Airfoil / 2	2	33.00 in	Aluminum	9	Axial	Behind Fan

Motor Data

Power	Electrical Supply	Speed	Efficiency	Enclosure	Frame Size	Supplier	Number of Poles	Lock Rotor Current*	Full Load Current*
40.0 HP	460/60/3 V/Hz/Phase	1160 rpm	Premium	ODP	364 T frame	Generic	6	290.00 A	51.00 A

Fan Options

Block Off Plate:	Yes	**Isolator Type:**	Spring

VFD/Starter/Disconnect Data

Selection Type:	VFD	**Vendor:**	ABB
Auxiliary Control:	Disconnect	**Voltage:**	460 V
Disconnect Type:	Fused	**Height x Width x Depth:**	48.67 in x 39.67 in x 16.00 in
Mounting:	Door Side	**Enclosure:**	NEMA 3R
VFD Quantity:	2		

Door

Location	Width	Opening
Non-drive side	24 in	Outward

Notes

** after a unit label denotes the data for an individual fan.*

Unit Sound Power (dB)

Type	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Radiated:	86	81	86	78	78	75	59	51
Unit Discharge:	96	91	99	99	100	103	97	85
Unit Return:	86	81	92	82	81	80	67	51

Technical Data Sheet for EX-RAH-105-010,011,012

Supply Fan	Component: 5	Length: 66 in	Shipping Section: 5

Fan Performance

Air Volume*	Static Pressure			Brake Horsepower*	Speed		Fan Circuit	
	External	Total	Cabinet		Operating	Maximum	MOP	MCA
20000 cfm	4.00 inWc	5.14 inWc	0.40 inWc	25.23 BHP	1452 rpm	1620 rpm	125.0 A	87.8 A

Fan Data

Fan Type	Blade Type / Class	Quantity of Fans	Wheel Diameter	Material Type	Number of Blades	Discharge	Motor Location
Centrifugal - Plenum	Airfoil / 2	2	33.00 in	Aluminum	9	End, single opening	Behind Fan

Motor Data

Power	Electrical Supply	Speed	Efficiency	Enclosure	Frame Size	Supplier	Number of Poles	Lock Rotor Current*	Full Load Current*
30.0 HP	460/60/3 V/Hz/Phase	1160 rpm	Premium	ODP	326 T frame	Generic	6	217.50 A	39.00 A

Fan Options

Wheel Guard:	Provided	**Seismic Restraint:**	With snubbers
Block Off Plate:	Yes	**Inlet Screen:**	Provided
Shaft Grounding Kit:	Provided	**Isolator Type:**	Spring

VFD/Starter/Disconnect Data

Selection Type:	VFD	**Vendor:**	ABB
Auxiliary Control:	Disconnect	**Voltage:**	460 V
Disconnect Type:	Fused	**Height x Width x Depth:**	43.43 in x 46.24 in x 16.00 in
Mounting:	Door Side	**Enclosure:**	NEMA 3R
VFD Quantity:	1		

Door

Location	Width	Opening
Non-drive side	24 in	Outward

Notes

** after a unit label denotes the data for an individual fan.*

Unit Sound Power (dB)

Type	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Radiated:	83	79	83	74	75	68	51	51
Unit Discharge:	93	89	97	95	97	96	89	80
Unit Return:	83	80	91	79	79	75	62	51