

SIMPLE COMPARISON VERY LARGE SILENCER MOUNTING METHODS

Applicability: Installations of Large Stationary Engines (over 3000bhp) require emissions and acoustic treatments usually provided by “combination silencers” that may be 72-108” in diameter, be 30-60 feet in length and weigh over 15,000#. Other regulations may require exit stack outlets 80 feet or more above grade. This is a discussion of different mounting options. Most factors favor selection of a vertically mounted combination unit. Additional factors provide economic, maintenance and safety justifications for a unit with catalysts mounted near grade level yet locating entry flanges 15-25 feet above grade. No comparisons are made of smaller unit mountings (smaller engines) or separate catalyst/silencer arrangements.

Comparisons Made:

- ✍ Horizontal Ground Mount
 - ✍ Horizontal Rooftop Mount
 - ✍ Type 3, Trunnion and Rack Vertical Mount
 - ✍ Type 3 Base Ring and Skirt, Type 3, Vertical Mount (no trunnions)
 - ✍ Type 4 Base Mounted or “Ladderless” Vertical Mount (High Side Inlet)
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Horizontal Ground Mount

1. This method uses up a lot of real estate.
2. The exhaust piping is more complex since the engine exhaust starts well above grade and has to be piped down to the silencer inlet.
3. The exhaust tailpipe may have to be bent to tie into a separate vertical stack.
4. The exit stack will have to be a lot longer than if it were an extension of a vertical unit to meet the same emissions requirement. (More steel, more cost)
5. The concrete pad(s) for the silencer and stack are more complicated than for a single vertical unit. (several instead of one)
6. Laying on the ground likely means it will have to be insulated or otherwise guarded against accidental personnel contact over its whole length.
7. An alternate would be to raise the unit up on legs to simplify exhaust piping... more cost yet.
8. If the silencer is thinly built, there will be another issue of "breakout" noise from the walls of the silencer that may exceed the noise exiting the stack. In general, we do not require insulation of the silencer to insure catalyst operation.... The volume of exhaust gas per minute is many times the volume of the chamber prior to the catalysts so heat loss has not proven to be a problem. Some advocate insulation for catalyst's benefit when the real reason may be to control breakout noise.
9. There seems to be a lot of extra cost that is not in the silencer itself.

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Horizontal Rooftop Mount

1. Requires no extra real estate if the silencer / stack are within the building perimeter.
2. There seem to be a lot of "hidden" costs not tied to silencer price.
3. The building structure will have to support the unit. These silencers weigh in the 12,000-16,000 pound range unless thinly built.
4. The building structure will have to support the additional wind and seismic loads.
5. Though the building looks like it is supporting the silencer, it often is not. The silencer is standing on legs passing through the roof and to the isolated engine mount below. Are the budgets for the building capital and equipment capital in two separate funds so no one notices the impact to the total project cost of a 'simple' roof mount? Someone should take note of total installed cost.
6. The exit stack, if vertical, will also have to be mounted on something and supported. To avoid complex building reinforcement, it will likely stand on a ground pad and be much longer than if it were an extension to a vertically mounted unit.
7. If the exit stack is horizontal, it will "point" the noise in some direction, not upwards.
8. Mounting and catalyst access may require cradles and/or extra platforms on the roof top plus roof access hatches, internal ladders, stairways or man lifts or....
9. My previous comments about breakout noise from the walls of a thinly built or single wall silencer apply.
10. The only plus for this design is that the exhaust pipe can rise vertically out of the engine, go thru the roof and into the side of the silencer. This eliminates one 90-degree bend and saves about 1-2" w.c. allowing a less efficient silencer design to succeed.

Type 3, Trunnion and Rack Vertical Mount

1. This has been a common approach since it uses existing "type 3" side inlet design silencers held up on a separate structure to line up the inlet and duct.
2. It involves more engineering.
 - a. The lug positions and base design need to be coordinated, often among two different engineering and fabrication shops to insure alignment.
 - b. The responsibility of wind and seismic strength has to be properly assigned and taken into account for both designs. Responsibility, should an incident occur, may be difficult to determine or assign.
3. The mounting for such a base may be a bit more complex, with four or more pads to be properly designed, located and poured. The center of gravity may be higher and the tipping moments of the final assembly may be higher than with a base mounted design
4. The drain will have to be piped down in the field.

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5. The base, since it surrounds the silencer, requires a larger footprint than the silencer. The dynamic loading of each pad has to be taken into account since tipping moments and wind forces may be exerted through each leg separately in a non-uniform fashion depending on wind force directions.
6. The base is usually fabricated / assembled on site taking more time and running the risk of field errors. While not an issue for experienced crews, clearances have to be provided to allow the entry nozzle flange to pass into the framework.
7. The catalysts will be located somewhere above the side inlet, 25-40 feet above ground ---- therefore access platforms and ladders may be required or space to drive in a cherry picker has to be provided.
8. Handling catalysts high above ground requires extra safety measures and will take longer compared to a ladderless (base mounted) design.

Type 3 Base Ring and Skirt, Type 3, Vertical Mount (no trunnions)

1. Can use the same "type 3" design combination silencer as a trunnion mount.
2. Requires one mounting pad
3. Reduces site work since the unit should arrive as 1-2 pieces to be erected on site.
4. The catalysts will be located somewhere above the side inlet, 25-40 feet above ground ---- therefore access platforms and ladders may be required or space to drive in a cherry picker has to be provided.
5. Handling catalysts high above ground requires extra safety measures and will take longer compared to a ladderless (base mounted) design.

Type 4 Base Mounted or "Ladderless" Vertical Mount (High Side Inlet)

1. The silencer design requires better than average structural and fluid dynamics expertise to successfully locate the catalysts near grade level yet provide an entry flange 15-20 feet above grade AND manage backpressure.
2. The exhaust duct is a simple horizontal run from the engine into the silencer.
3. Only one pad need be engineered and poured to support the unit.
4. Little if any coordination with the building structure designers is required.
5. The tailpipe needed to meet height requirements will be shorter since it sits on top of the silencer itself.
6. The silencer may be of heavier construction to deal with wind loads and seismic action and to minimize the need for guy wires or supplemental bracing.
7. The heavier construction and double wall materials reduce breakout noise to almost zero.
Some may feel that the heavier construction will lead to longer life.
8. Catalyst access is at ground level with no additional ladders or platforms needed. Personnel guards are small and easily handled.
9. There are no building reinforcements or extra columns needed to support the dead weight, wind load and seismic load of the silencer and stack. The area around the equipment inside the building is less cluttered.

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10. No provisions for rooftop access to or around the unit are required.
11. Customer engineering and field erection times are minimized: Design/pour one concrete pad based on the load data we supply. Then... Bolt the exit stack in place, lift the complete unit onto the pad and bolt down. Connect the exhaust pipe as it exits the building.

SUMMARY COMPARISON								
Mounting Arrangement	Additional Real Estate	Field Assembly Before Erection	Erection Costs incl. access	Concrete Mounting Pad	Building Modification	Ladder Platform Cost for Catalyst Service	Engine Exhaust Piping to Silencer	Personnel Safety (Insulation) Req'd.
Horizontal On Ground	Most	Little	Low	3-4	None	None to small	Complex	Full Length
Horizontal Roof Mount	None or Stack pad	Little	Highest	None, possible stack	Med-High Engine Mount	Small to Medium	Simple	Some
Base Mount Ladderless	Slight	Little	Low	1	None	None	Simple	Some
Type 3 w/ Trunnions & Rack	More	Most	Med - High	1-6	None	High or use man-lift	Simple	Some
Type 3 w/ Base Ring and Skirt	Slight	Little	Medium	1	None	High or use man-lift	Simple	Some

Our base mounted / ladderless design is engineered by one group and manufactured by the same shop. It installs in one operation with the least amount of field work. The complete drain piping is installed at the factory. Exhaust piping requires a maximum of one 90 degree bend. The catalysts are at grade level and can be much more easily serviced. It requires no expensive ladders and platforms or access space for man lifts.

- ✍ We have over 40 years' experience in know-how, structural design and construction of large vessels and silencers.
- ✍ We control the manufacturing processes including AWS welder training and certification.
- ✍ We have the structural engineering expertise and modeling tools to successfully execute a sturdy vertical unit.
- ✍ We have the engineering resources to 'double check' that local building codes will be satisfied.
- ✍ We have the flow and fluid dynamics expertise and computer modeling tools to put the catalysts at ground level and provide low backpressure.
- ✍ We have the in-house acoustic labs to validate results and provide the knowledge to enhance engineering skills.

We developed this design. We are the most experienced. Choose us as your source.

Please direct all comments and questions and RFQ's to:
Dennis Kostrzewski 815-356-7499 or dennisk@pcaincorporated.com

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PCA, Inc., 3791 N Tamarack, Crystal Lake IL 60012