



# Controlling Noise from Air-Cooled Chillers

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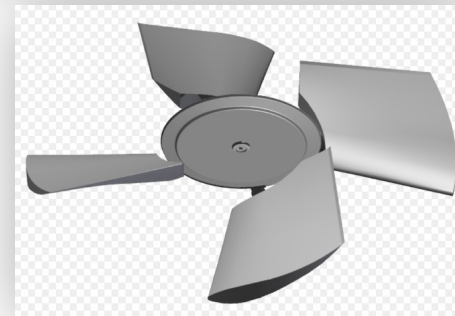
# THE PROBLEM – ENJOY THE SOLUTION!



# CHILLER NOISE | Control “Attempt”

## Initial Attempt:

- Many people assume wrapping the compressors with mass loaded vinyl jackets is all that is needed to control their noise issues.
- In fact, that very seldom solves the problem.
- Low noise propeller fans
  - Not quiet enough
- Why? ----- It's a system noise issue.



# CHILLER NOISE | NOISE SOURCES

The noise generated by air-cooled chillers is a combination of:

- mid to high frequency noise generated by the **screw compressors** (bottom of the unit).
- low to mid frequency noise being generated by the **up-blast fans** (top of unit).



# CHILLER NOISE | Control “Site Considerations”

## Site Considerations:

- Noise Ordinance (does one exist?, If so, how stringent?)
- Location of Chiller with respect to critical areas
  - On roof, On grade, in valley, up on hill, etc.
- Structural Issues (wind loading, seismic, concrete footings, tie-ins, drainage)
  - On grade
  - Rooftop (height of rooftop above grade)
- Materials of construction
- Local codes (electric, IBC, etc.)

# CHILLER NOISE | Control “Chiller Information”

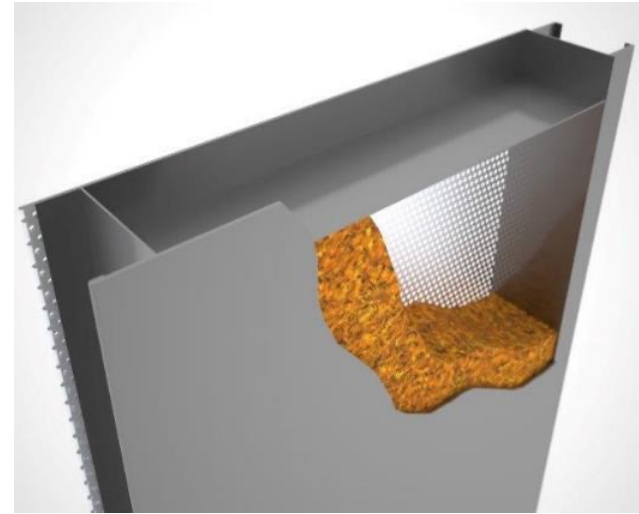
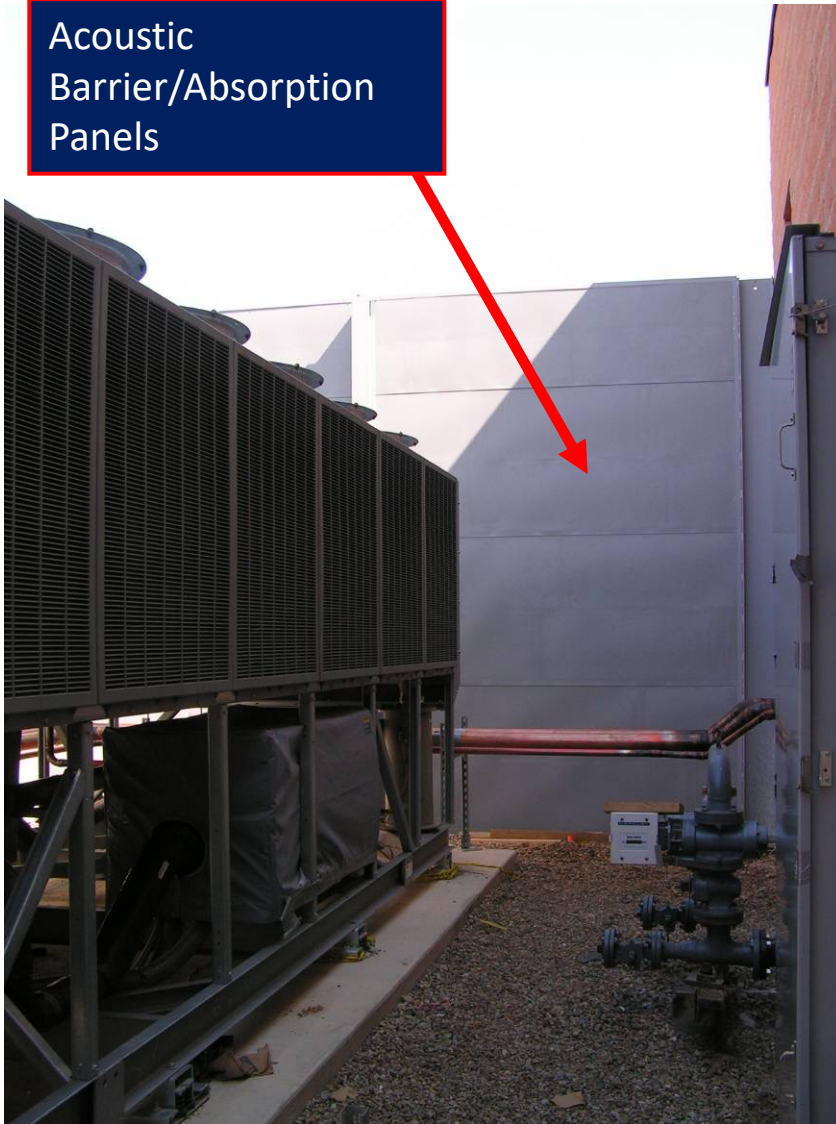
## Required Chiller Information:

- Schematic, GA Drawing
  - Installation Guidelines – service and operating clearances
  - Chiller Dimensions – L x W x H (is it sitting on dunnage or concrete pad?)
- Airflow (ft.<sup>3</sup> / min.)
  - Required equipment ventilation
- Sound Power Levels (Lw or PWL)
  - 63 Hz / 125 Hz / 250 Hz / 500 Hz / 1K Hz / 2K Hz / 4K Hz / 8K Hz
  - Operation loading conditions (25%, 50%, 100%)



# ACOUSTIC BARRIER/ABSORPTION PANEL

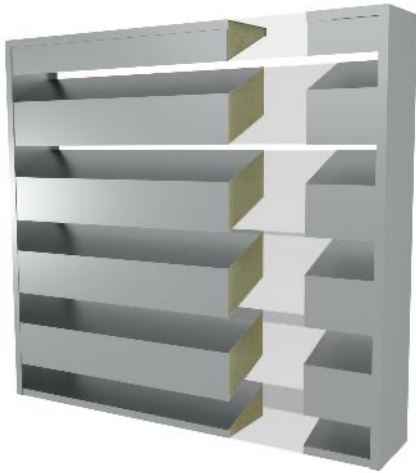
Acoustic  
Barrier/Absorption  
Panels



## Construction:

- Solid Outer Shell
- Acoustic Media Fill
- Perforated Inner Shell
- 4-inch Thick
- Minimum 4 lbs./ft.<sup>2</sup>

# ACOUSTIC LOUVERS – Fixed Blade



## Construction:

- Solid Outer Shell
- Acoustic Media Fill
- Perforated under blades
- Various Thicknesses, PD, TL (NR)



# ACOUSTIC WALL SYSTEM – “Simplistic”





# ACOUSTIC WALL SYSTEM – “Maximum Attenuation”

## Site Overview

- Air-Cooled Chiller  
New Installation
- Exceeded desired  
noise levels at school  
entrance.



# ACOUSTIC WALL SYSTEM – “Maximum Attenuation”





# ACOUSTIC WALL SYSTEM – “Maximum Attenuation”





# ACOUSTIC WALL SYSTEM – “Maximum Attenuation”

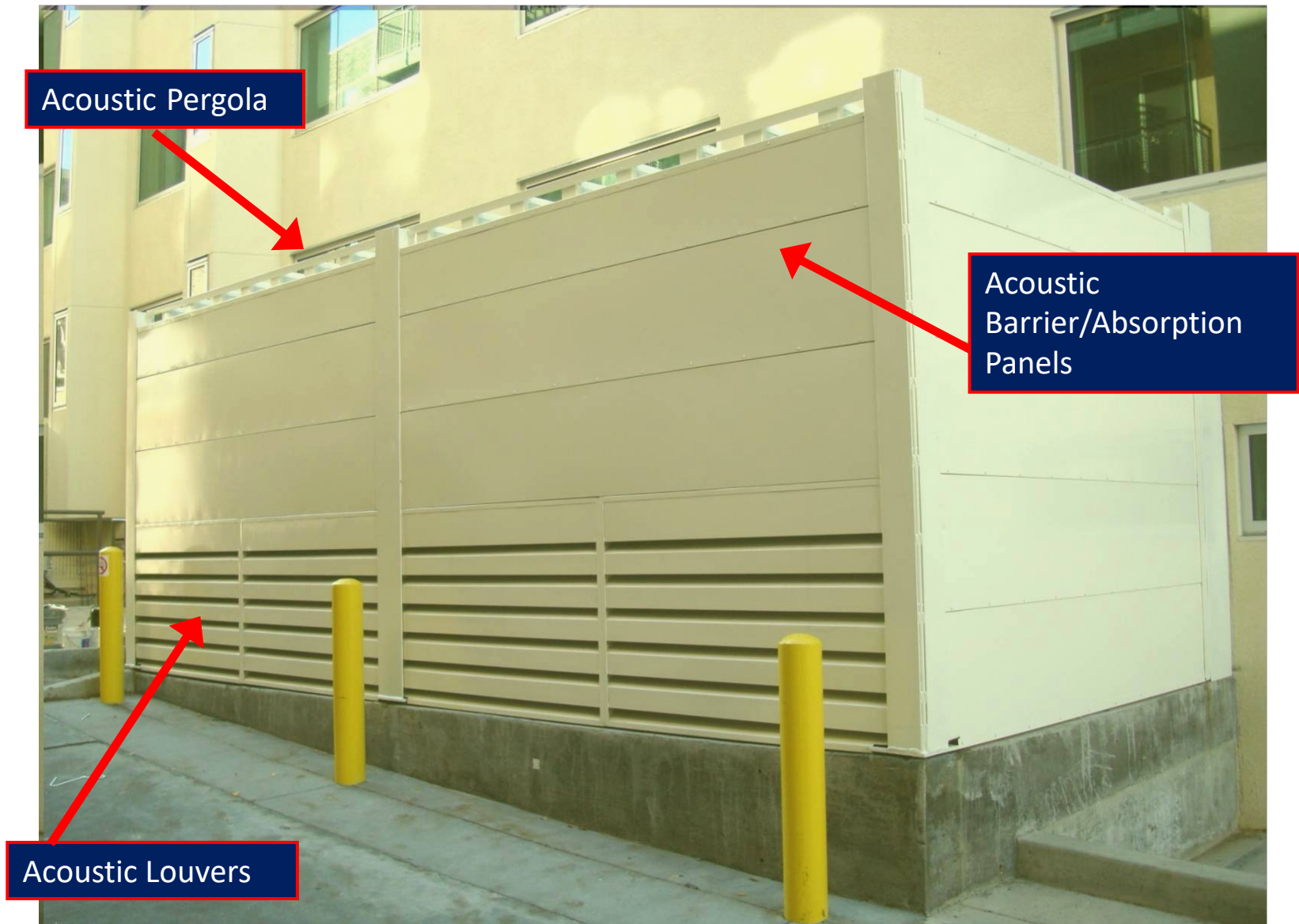
Acoustic  
Barrier/Absorption  
Panels

Acoustic Pergola

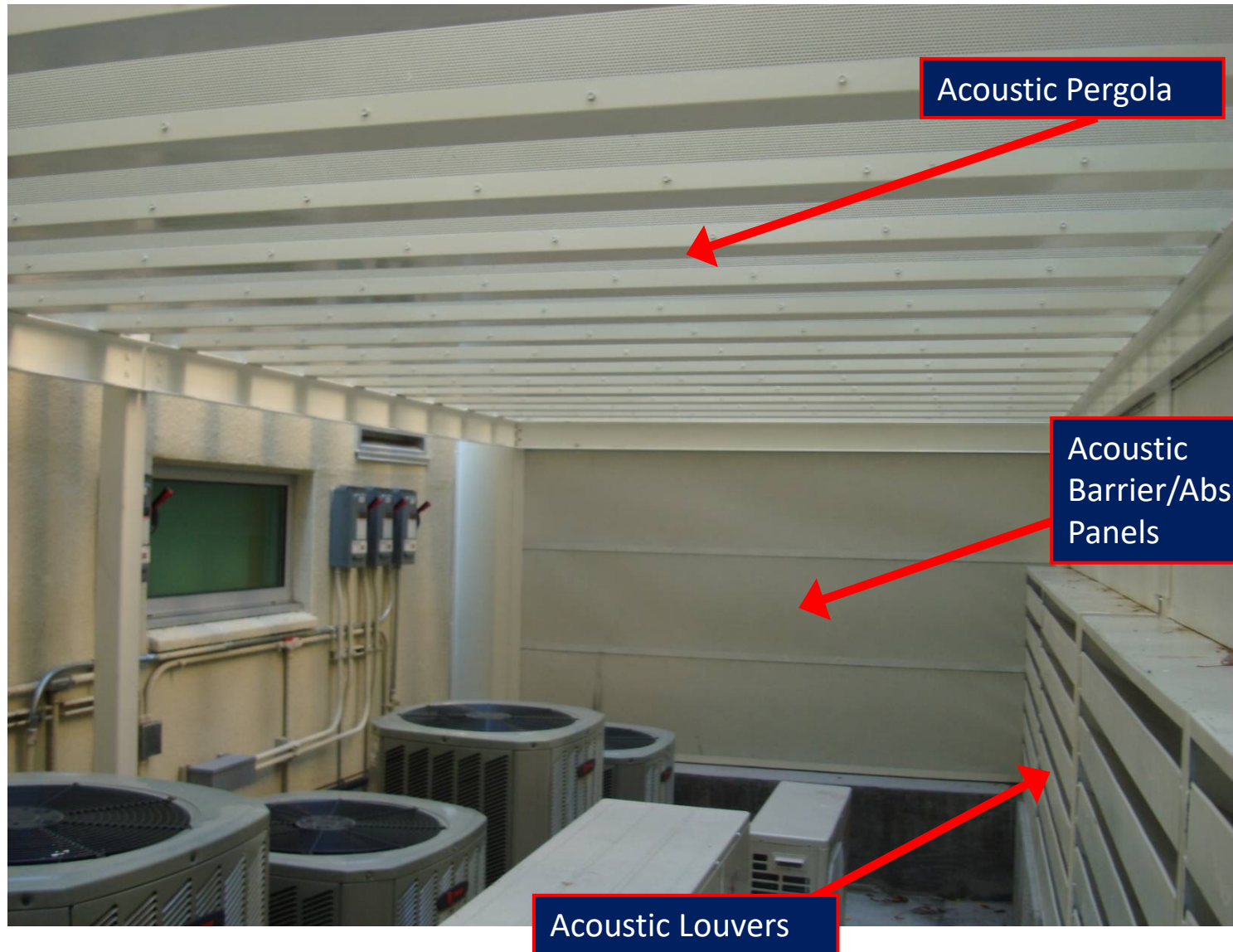
Acoustic Louvers



# ACOUSTIC WALL SYSTEM – “Hospital Application”



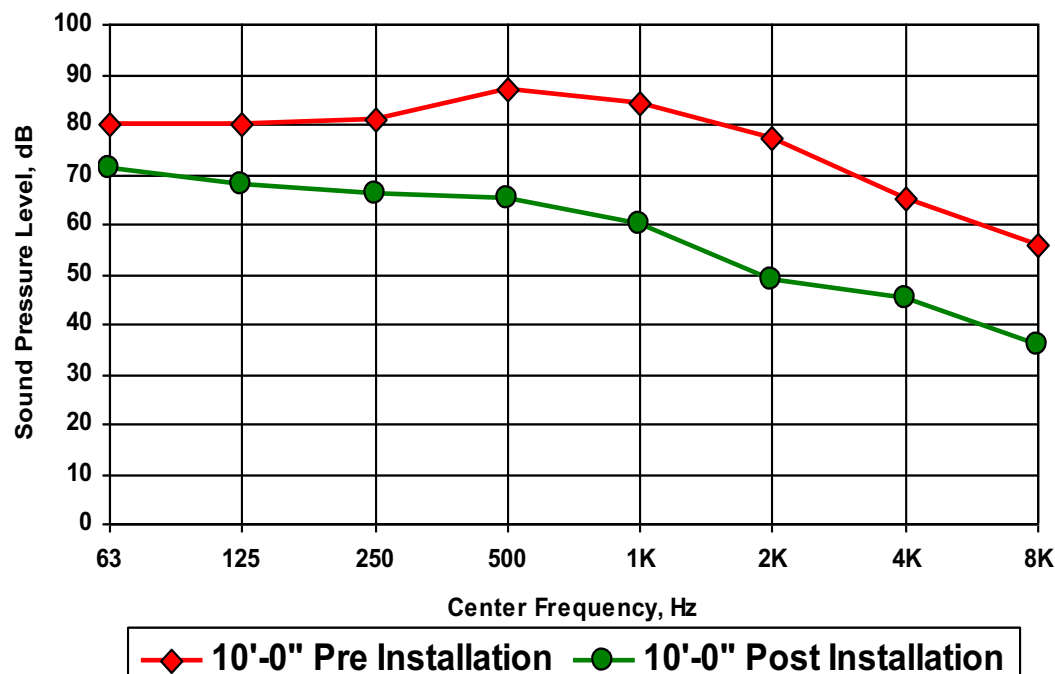
# ACOUSTIC WALL SYSTEM – “Hospital Application”





# FIELD VERIFIED ACOUSTIC PERFORMANCE

## Chiller Noise Control System Performance



### Walls

(Reduction):

- 18-23 dBA

### Pergola Top

(Reduction):

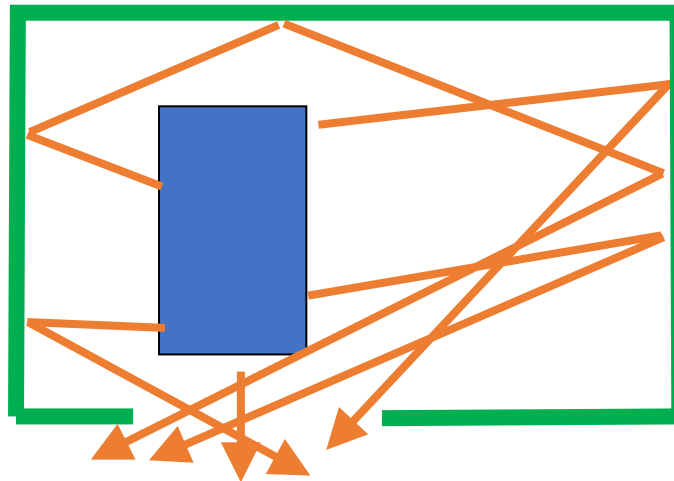
- 8-10 dBA

$\Delta P = 0.10''$  W.G.  
SYSTEM

# CHILLER NOISE | EQUIPMENT YARDS

Chillers are often placed in equipment yards constructed of “**hard**” **cinder block walls**.

These hard surfaces create a reverberant sound field which **magnifies and redirects noise** to the surrounding community.



# AIR COOLED CHILLER YARD – High School



- Air-Cooled Chillers – NEW
- Generated 69 dBA at nearest resident, (X)
- Exceeded Local Noise Ordinance (60 dBA daytime, 55 dBA night)

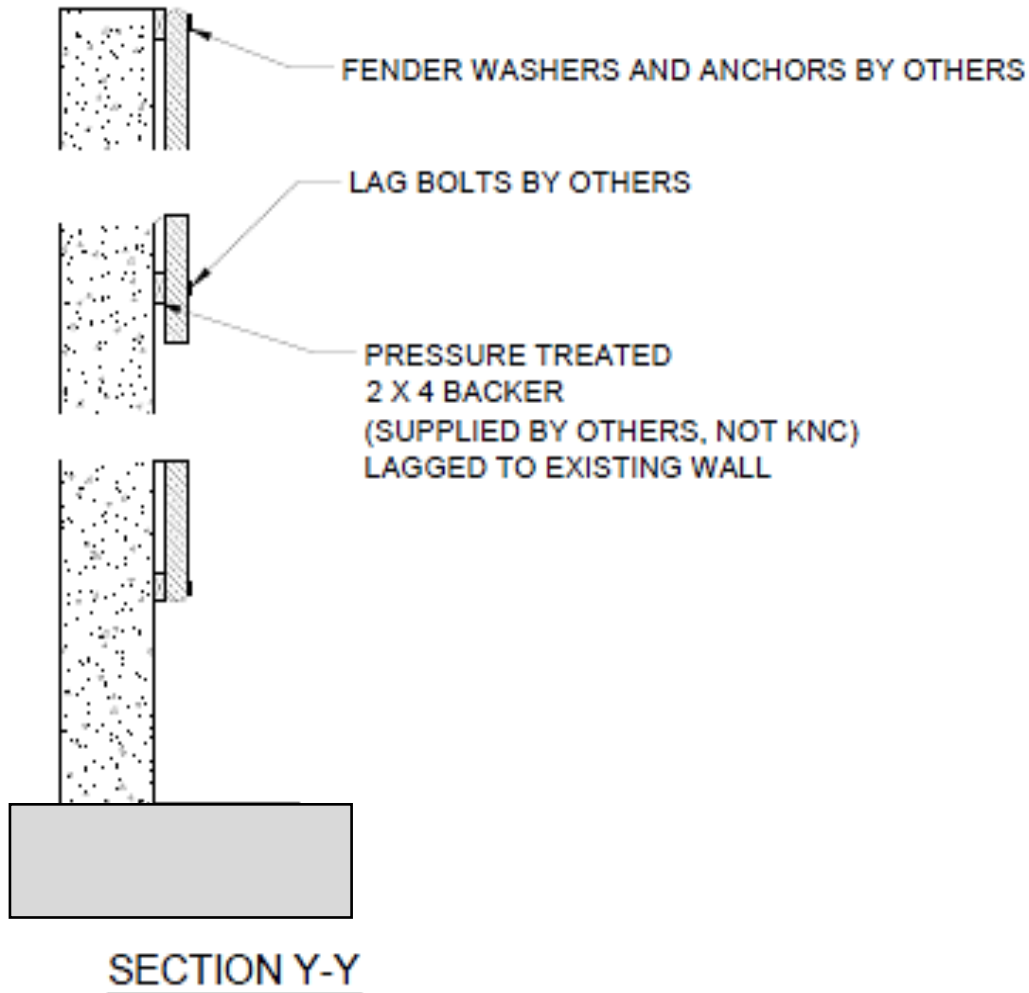


# AIR COOLED CHILLER YARD – High School



# OUTDOOR SOUND ABSORPTION QUILT

## Installation detail



# AIR COOLED CHILLER YARD | INSTALLED





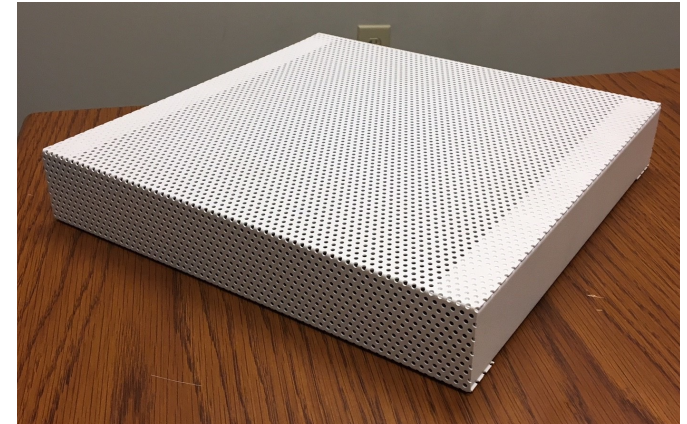
# AIR COOLED CHILLER YARD | INSTALLED



# AIR COOLED CHILLER YARD | ALTERNATE

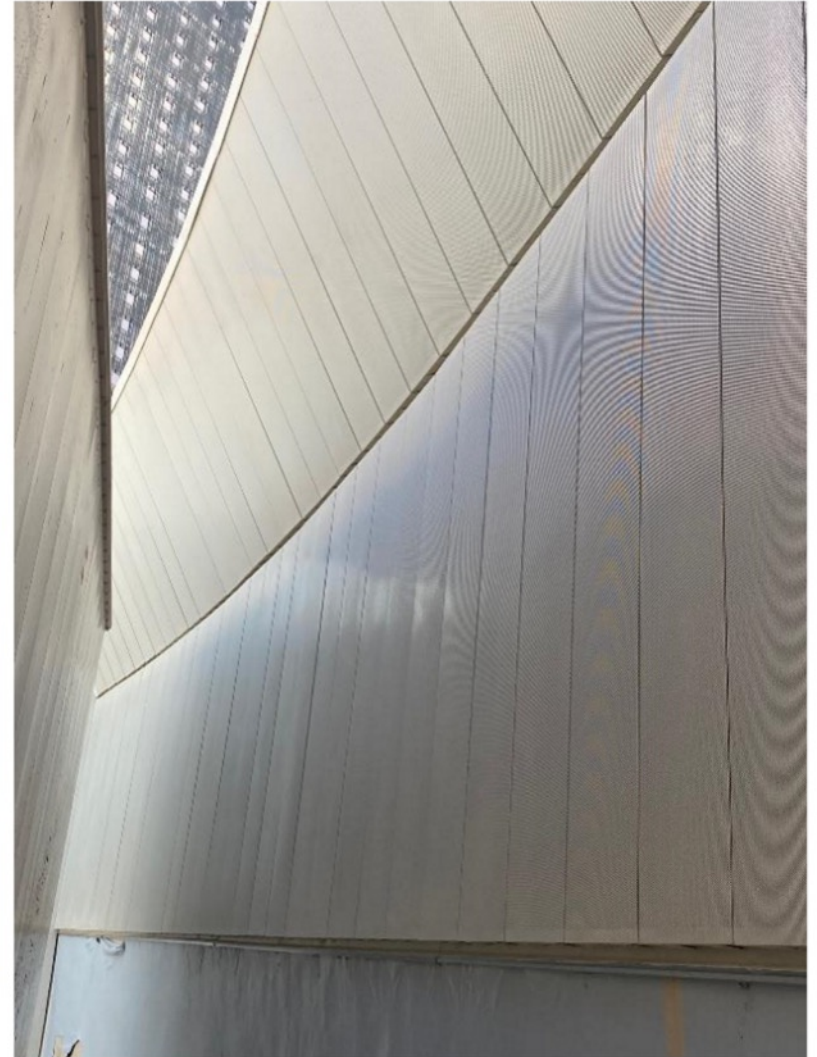
## Rigid Perforated Absorptive Panels

- Aluminum, Galvanized, Galvanneal
- Continuous top & bottom Mounting
- Flush Mount
- Bagged Media
- Powder-Coat Finish



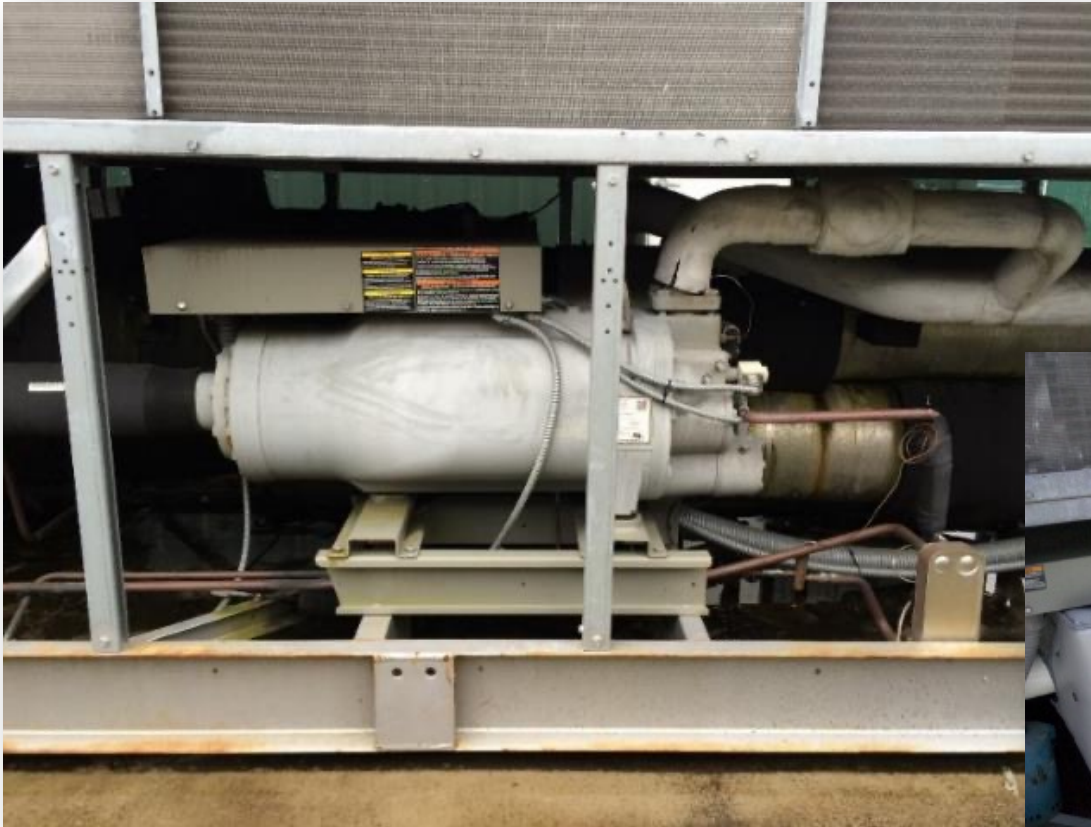


# AIR COOLED CHILLER YARD | ALTERNATE



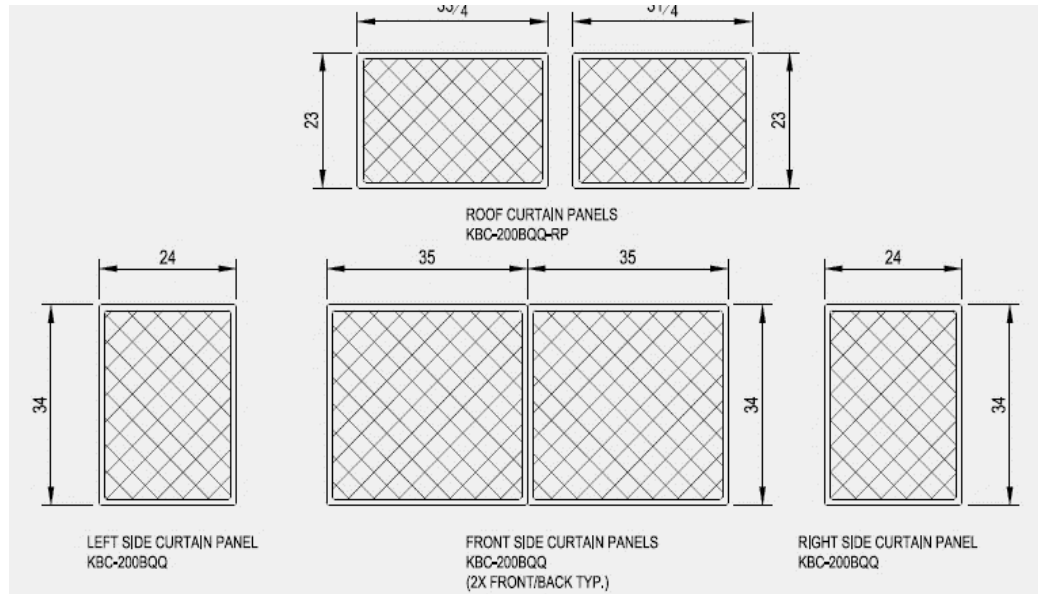


# AIR COOLED CHILLER | COMPRESSORS



- Custom-fit, noise jackets are expensive
- Often are NOT reinstalled after routine maintenance

# COMPRESSOR NOISE CONTROL



## Features:

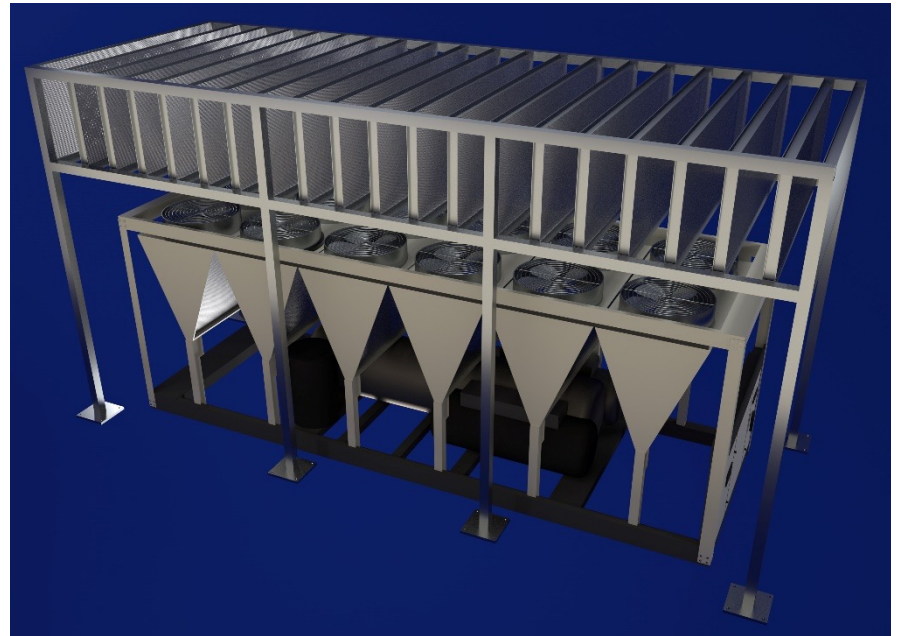
- Easy maintenance access, removal and re-installation
- Offers high level of noise control
- Factory cut-to-size system
- Bolt together framing

# COMPRESSOR NOISE CONTROL



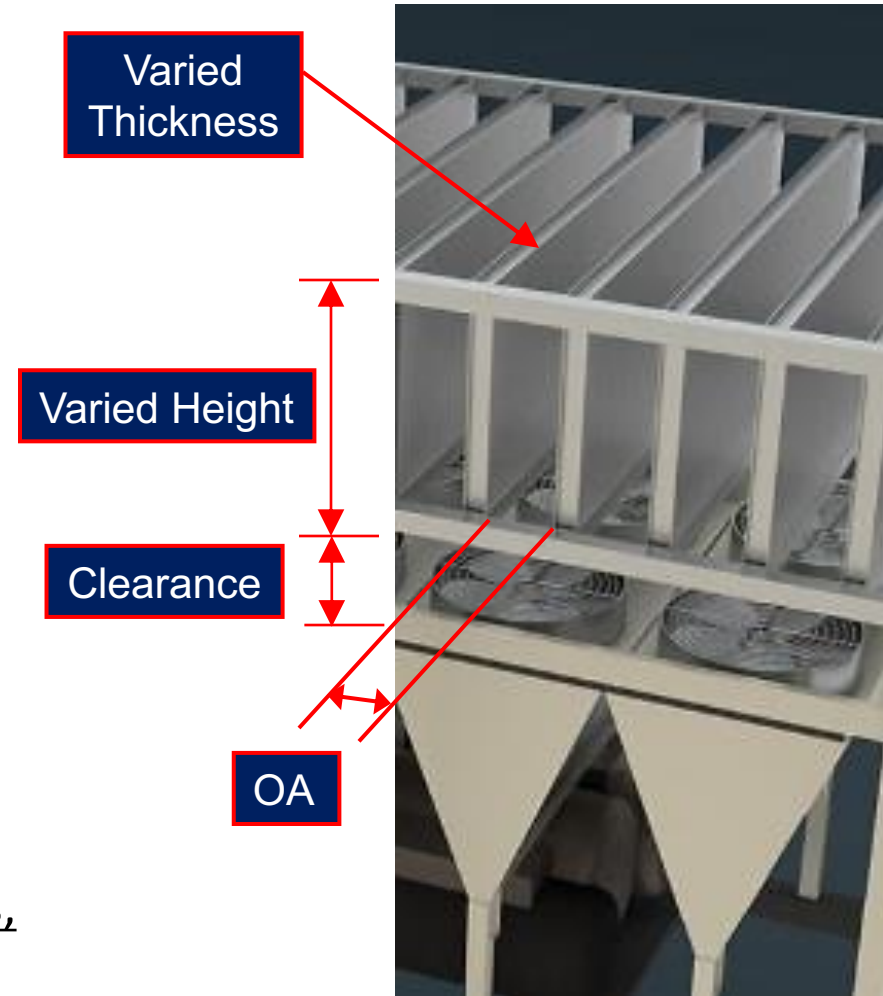


# UPBLAST FAN - NOISE CONTROL PERGOLA



# UPBLAST FAN - NOISE CONTROL PERGOLA

- Design balances total chiller airflow, pressure loss, required noise reduction
- Internal sound absorbing media suitable for wet/dry, freeze/thaw cycling
- Perforated skins both sides
- Galvanized, stainless steel, aluminum sheet construction
- Available in various baffle thicknesses, height and % open area



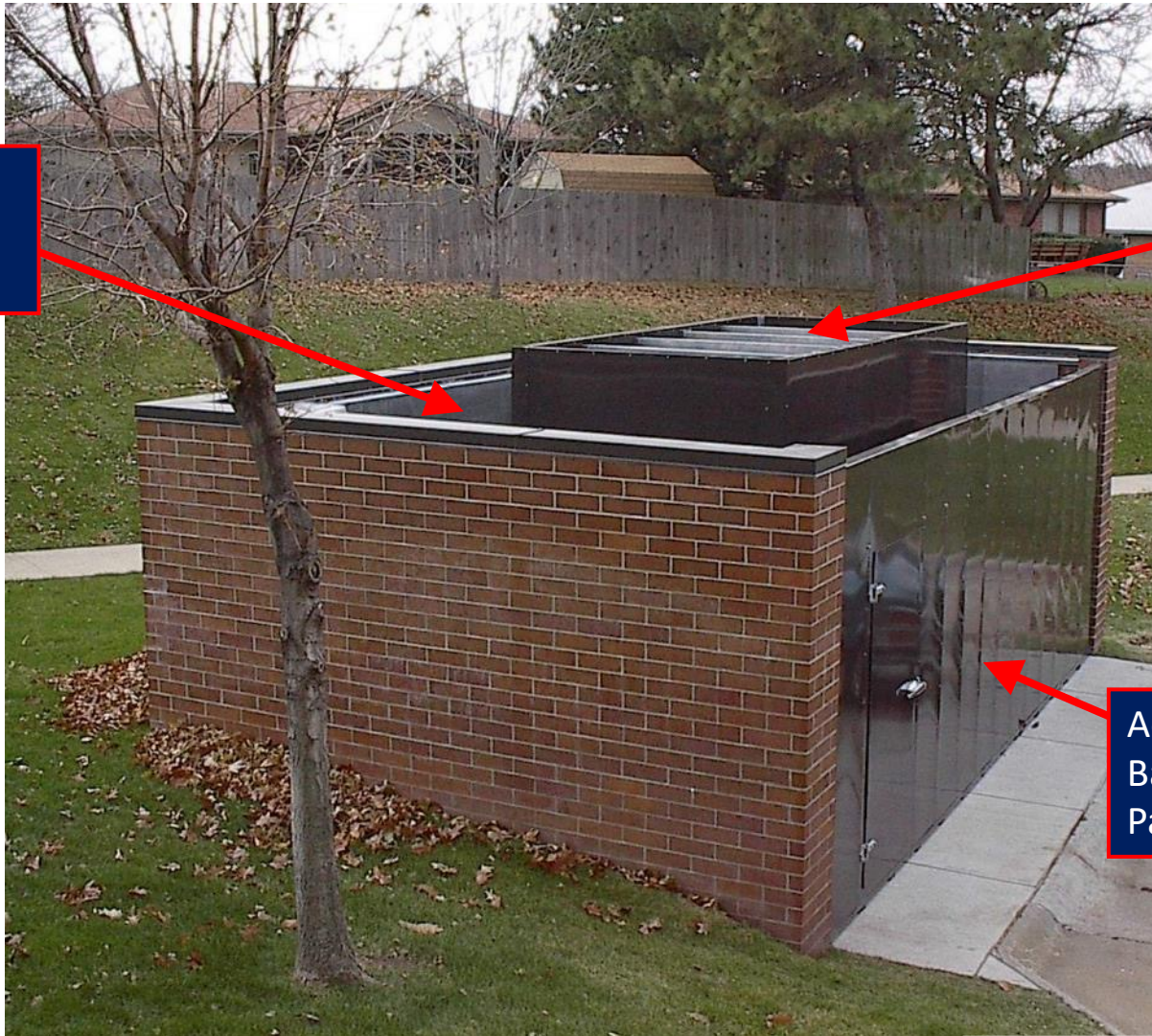


# COMPOSITE SOLUTION

Rigid  
Perforated  
Absorber

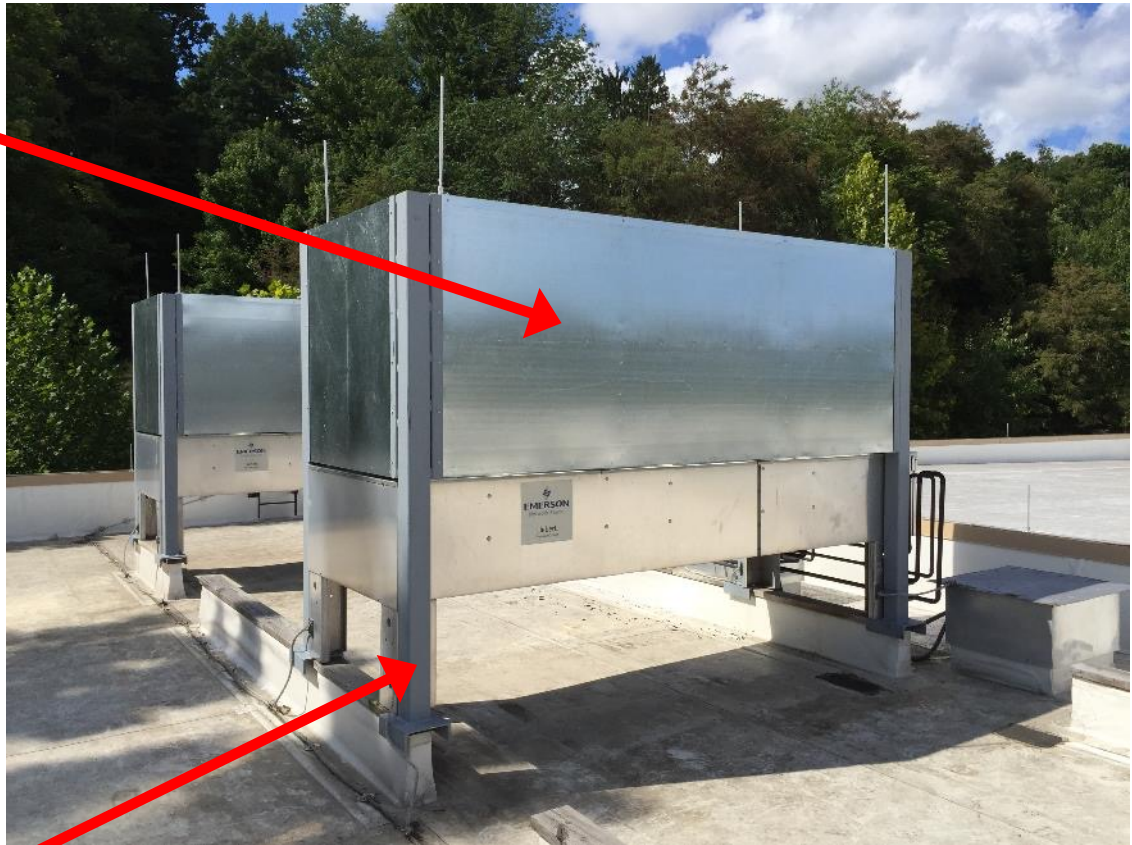
Chiller Stack

Acoustic  
Barrier/Absorption  
Panels



# ACOUSTIC CONDENSOR STACK – Side Noise Control

Acoustic  
Barrier/Absorption  
Panels

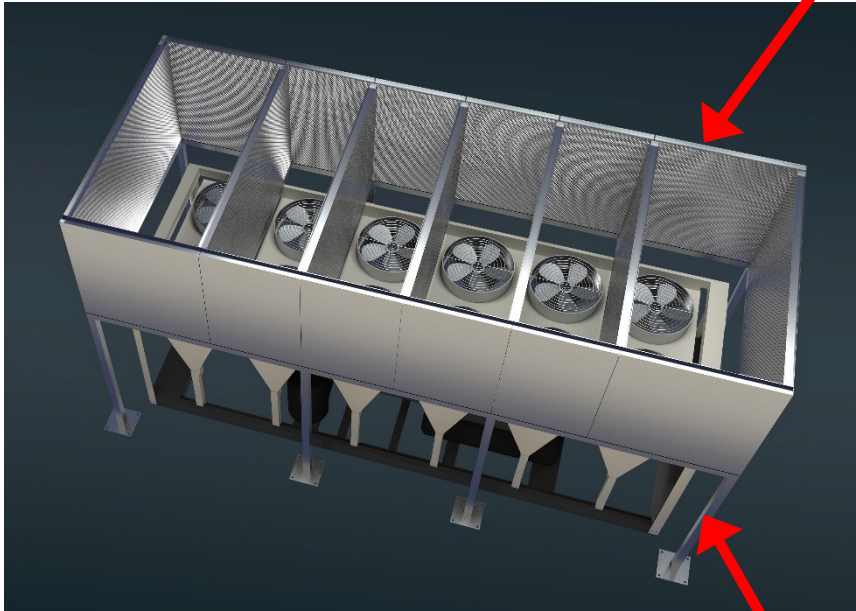


Independent Structural Frame

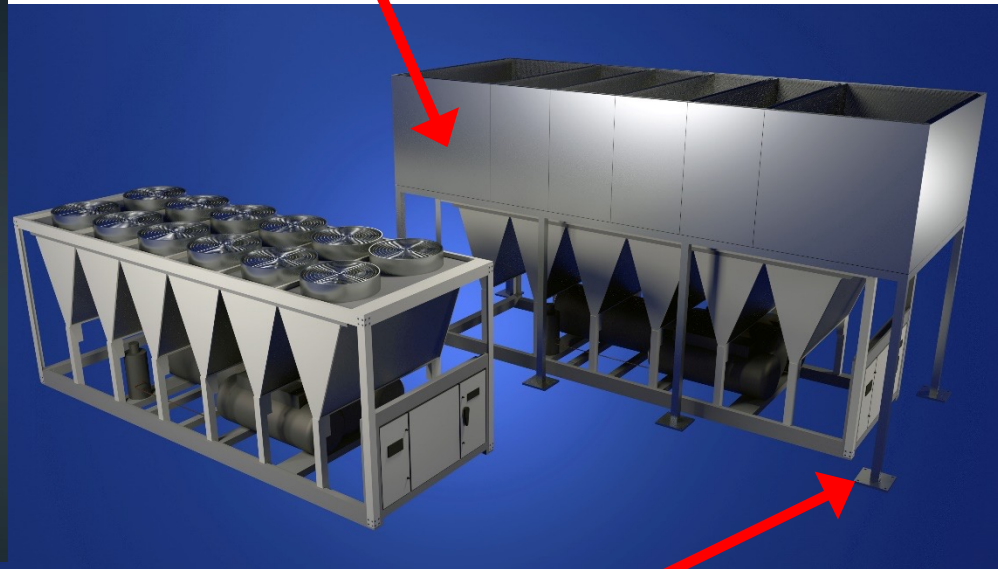


# ACOUSTIC CHILLER STACK

Acoustic Barrier/Absorption Panels



Optional access hatches available



Independent Structural Frame

# COMPOSITE ACOUSTIC CHILLER STACK

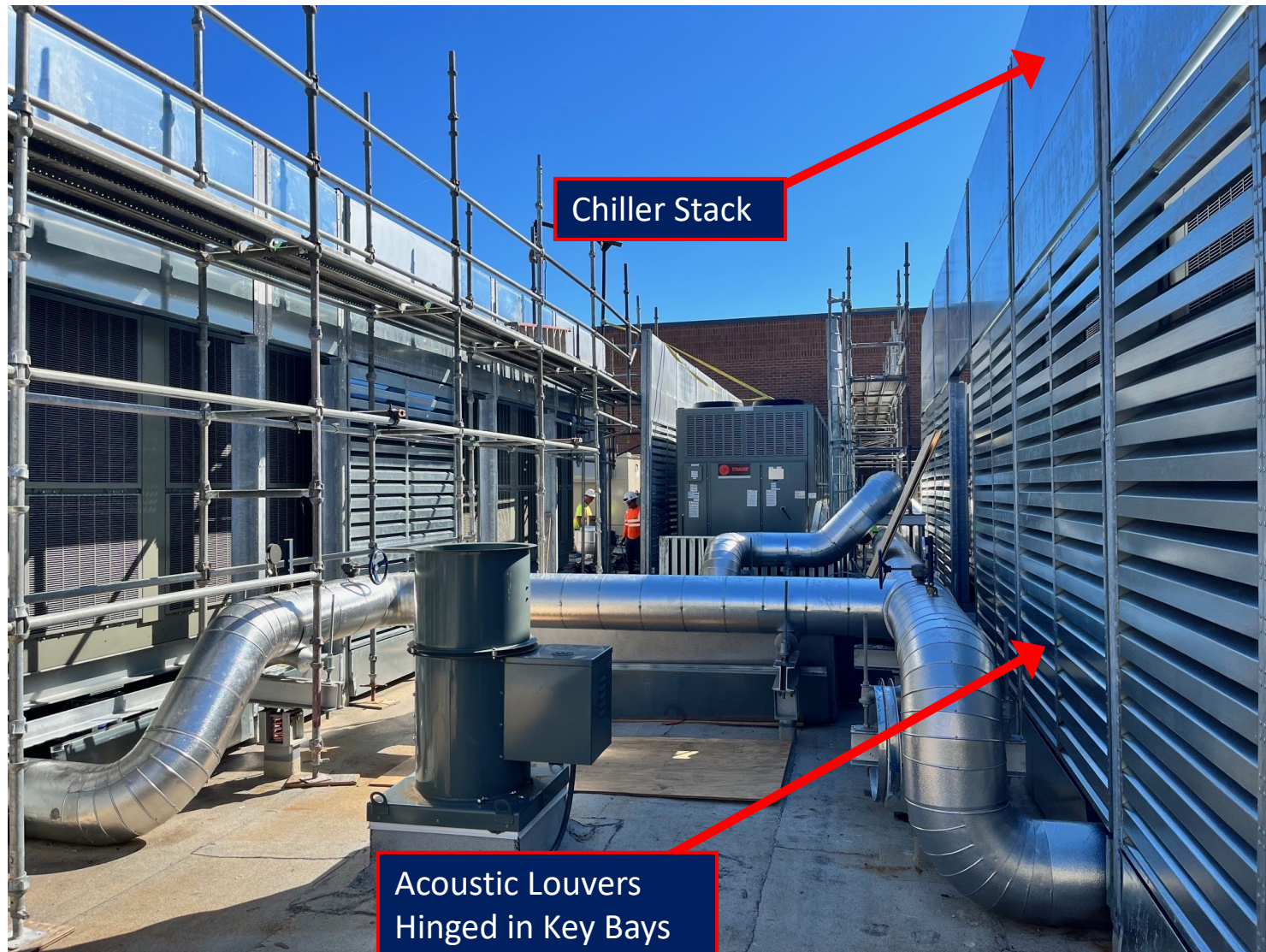


Outdoor  
Absorption Quilt

Acoustic  
Barrier/Absorption  
Panels



# COMPOSITE ACOUSTIC CHILLER STACK



# COMPOSITE ACOUSTIC CHILLER STACK



Acoustic  
Barrier/Absorption  
Panels

Acoustic Pergola

Composite Outdoor  
Quilted Curtains



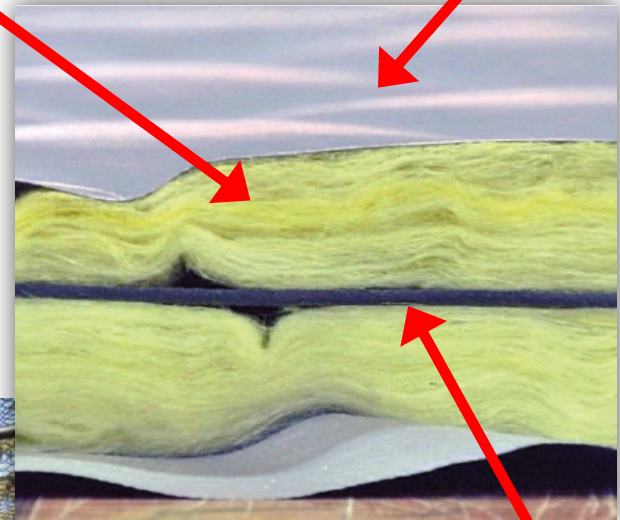


# OUTDOOR COMPOSITE CURTAINS



Quilted Fiberglass

Outdoor Facing



Mass Loaded Vinyl



# OUTDOOR COMPOSITE CURTAINS



Factory installed grommets fastened with nylon or wire zip ties.





# THANK YOU



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the post-course evaluation**

