SELECTION OF ARCHITECTURAL SCREENING

Presenters

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LEARNING OBJECTIVES

- Learning Objective #1: Participants will understand architectural screening codes and standards complying with progressive city requirements.
- Learning Objective #2: Participants will be familiarized with different types of architectural screening and materials to choose which will be best for their project.
- Learning Objective #3: Participants will understand the curb appeal, property value, and security that is added when an architectural screen is used.
- Learning Objective #4: Participants will recognize the necessity for quality architectural screening that is engineered to meet IBC and ASCE7-16 codes for wind loads on structures.

LEARNING OBJECTIVE #1

Participants will understand equipment screening codes and standards complying with progressive city requirements.

THE EVOLUTION OF ARCHITECTURAL SCREENING

- Today's commercial and industrial landscape is changing with the community in mind.
- The challenge is getting developers and owners on board with these changes which are resulting in greater costs with no immediate return on investment.
- To achieve this initiative, community planners and designers are implementing more rigid appearance standards.
- The most forward-thinking change in these standards is in regards to the building envelope.

SAN FRANCISCO, CA SCREENING REQUIREMENTS

- The following shall be completely screened from view from the street and view from other buildings:
  - Outdoor storage
  - Mechanical Equipment
  - Solar Panels
  - Industrial fans
  - Loading areas

THE EVOLUTION OF ARCHITECTURAL SCREENING

- A great deal has been changed over the years regarding building design but little consideration has been given the surrounding amenities, equipment, and structures.
- Today's community planners and designers, like Kansas City, are carrying the building design outward to screen-off mechanical equipment, dumpsters, transformers, RTU, rooftop units, docks, and outside storage.
- This screening is being referred to as architectural screening.

KANSAS CITY, MO SCREENING REQUIREMENTS

The following must be entirely screened from public view with architectural materials compatible with the building design and character of the surrounding area:

- Ground mounted mechanical equipment.
- Building mounted mechanical equipment.
- Dumpsters or refuse collection.
- Loading docks.

THE EVOLUTION OF ARCHITECTURAL SCREENING

- Appearance standards have been in place for years in many progressive communities.
- However, these standards were very loose in their interpretation of the application and the use of materials.
- Screening was limited to outside storage, rooftop units, and dumpsters.
- Screening was achieved by the use of solid or semi-private fencing. Chain link fencing with privacy slats and wood privacy fencing was the most popular.
- Today's designers, such as Boulder, Colorado, find the use of fencing as a low-end solution drawing attention to what is being screened.
- They want a solution that carries the building design outward and blends-in as being more intentional.

BOULDER, CO SCREENING REQUIREMENTS

- Mechanical equipment shall be totally screened from all viewable angles.
- The form, material, and color of the screening shall meet the following criteria:
  - Screening is consistent with the building design, colors, and materials
  - The height of any screen is the minimum appropriate to adequately screen the mechanical equipment
  - Screening does not increase the apparent height of the walls of the building.

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THE EVOLUTION OF ARCHITECTURAL SCREENING

- Another change in today's building community is mixed-use subdivisions and developments.
- Retail and professional have been mixing for years.
- Recently, we have seen a wider blend of industrial, commercial, and even retail mixed-use facilities.
- Small distribution facilities aligned next to retail and service based industries with storefronts are becoming more common.

SUCCESSFUL MIXED USED DEVELOPMENTS

- "Mixed-use develops offer low vacancy rates and high quality tenants" – Fortune Builders
- Successful mixed-used development examples: (via fortune builders)
  - Wilshire Grand Center (Los Angeles, CA): Thomas Properties Group had to get one of the largest building permits in the history of the city for this mixed-use development. However, the most impressive part about this property is that when completed it will host a 73 floor earthquake-proof tower.
  - Port Covington (Baltimore, MD): Construction has not yet begun for this Maryland property, but the completed project is expected to house over 250 residential units, 180,00 square feet of office space, and industrial space.

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THE EVOLUTION OF ARCHITECTURAL SCREENING

- Industrial subdivisions with full-scale landscaping, customer parking, and sidewalks speckled with restaurants and shopping are not unusual.
- In these subdivisions and developments, industrial and commercial users are being held to the highest standards, providing full architectural screening throughout the property to provide an inviting feeling.
- Designers want these facilities to feel like retail space while these perform like industrial.

SUCCESSFUL MIXED USED DEVELOPMENTS

- Successful mixed used development examples: (via fortune builders)
- Brickell City Center (Miami, FL): Swire Properties built this 5.4 million square foot development only a few short years ago. The towers are home to luxury condos, restaurants and industrial space
- Lincoln Yards (Chicago, IL): While this project is still in development, it's expected to cover 53 acres once completed. The space will include new residences, hotels, industrial space, retail and office space, and even a soccer stadium.
- "Mixed use developments provide greater exposure to customers, better property management, existing amenities, less risk, walkability and transportation" – Fortune Builders

THE EVOLUTION OF ARCHITECTURAL SCREENING

- How to get developers and owners onboard with this application?
- Architects and designers have a responsibility to communicate to their end-user the benefits of improving the curb appeal of their investment.
- By applying architectural screening throughout the property to blend and hide their equipment, high-end industrial, commercial, retail, and even professional users will be enticed to locate within these developments.
- When this happens in cities like Austin, Texas it increases the stakes for all those located within the division. Property values will soar, increasing equity and values.

AUSTIN, TX SCREENING REQUIREMENTS

- A person constructing a building shall completely screen from public view each area on a property that is used for the following activities:
  - Off-street parking.
  - Mechanical equipment.
  - Outside storage.
  - Refuse collection.
  - Loading and unloading materials.
  - Manufacturing yards.

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THE EVOLUTION OF ARCHITECTURAL SCREENING

- This new trend in architectural screening is spreading.
- More and more communities are removing fencing from their current standards and incorporating specifications that require architectural and mechanical equipment screening to be of the same type and appearance of materials used in the construction of the building.
- Other communities are broadening the requirements for items to be screened, such as Scottsdale, Arizona
- In the past, all of these items were excluded from requiring screening or covered under stored materials to be screened.

SCOTTSDALE, AZ SCREENING REQUIREMENTS

- The following areas are required to be completely screened from any vantage point with architectural materials consistent with the existing buildings and landscape:
  - Exterior storage.
  - Refuse areas.
  - Roof, wall, or ground mounted equipment.
  - Solar energy collection
  - Loading docks and service areas.

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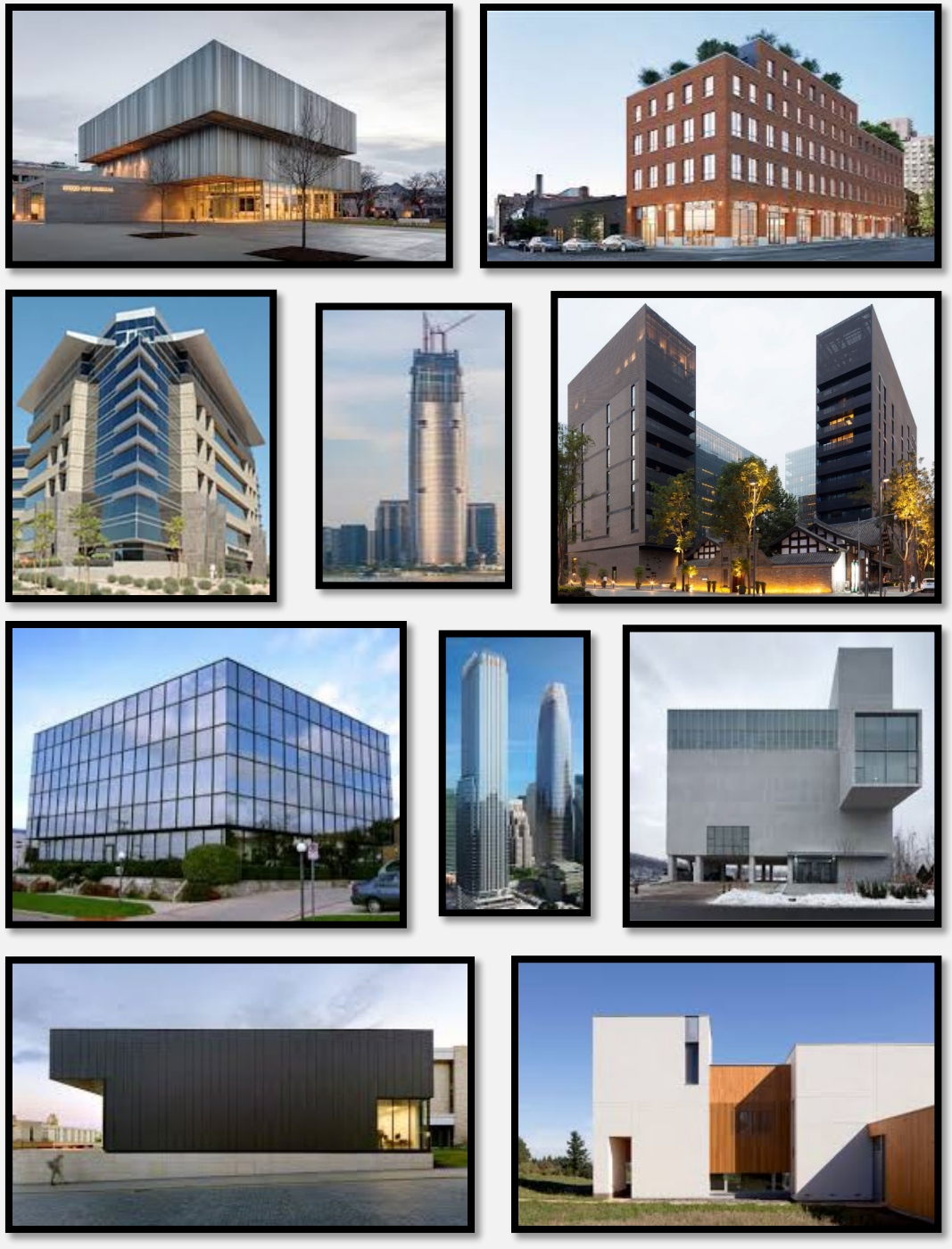
LEARNING OBJECTIVE #2

Participants will be able to delineate between different types of architectural screening and materials used in order to choose which will be best for their project.

SELECTING ARCHITECTURAL SCREENING

- The challenge with the new trend in architectural screening matching the material type and design of the building is that the materials used in the construction of the building are not a good economical, structural or sustainable solution.
- Many of today's commercial and industrial buildings are incorporating masonry, precast concrete panels, EIFs, stucco, and glass into the exterior finish of the building.
- None of these materials have an immediate platform or support structure for serving as affordable and sustainable screening.
- Most of these materials require significant footings, bond beams, and framing.



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SELECTING ARCHITECTURAL SCREENING

- This challenge has been overcome with the use of metals, composites, and vinyl high-grade materials, and designs by manufacturers specializing in the engineering, design, and fabrication of architectural screening, mechanical equipment screening, and rooftop screening.
- These materials and designs complement today's popular building exteriors with a wide range of design elements, colors, and textures.
- More importantly, these materials are incorporated into engineered frameworks that are both economical, application easy to apply, and designed to meet the same building code wind load requirements.





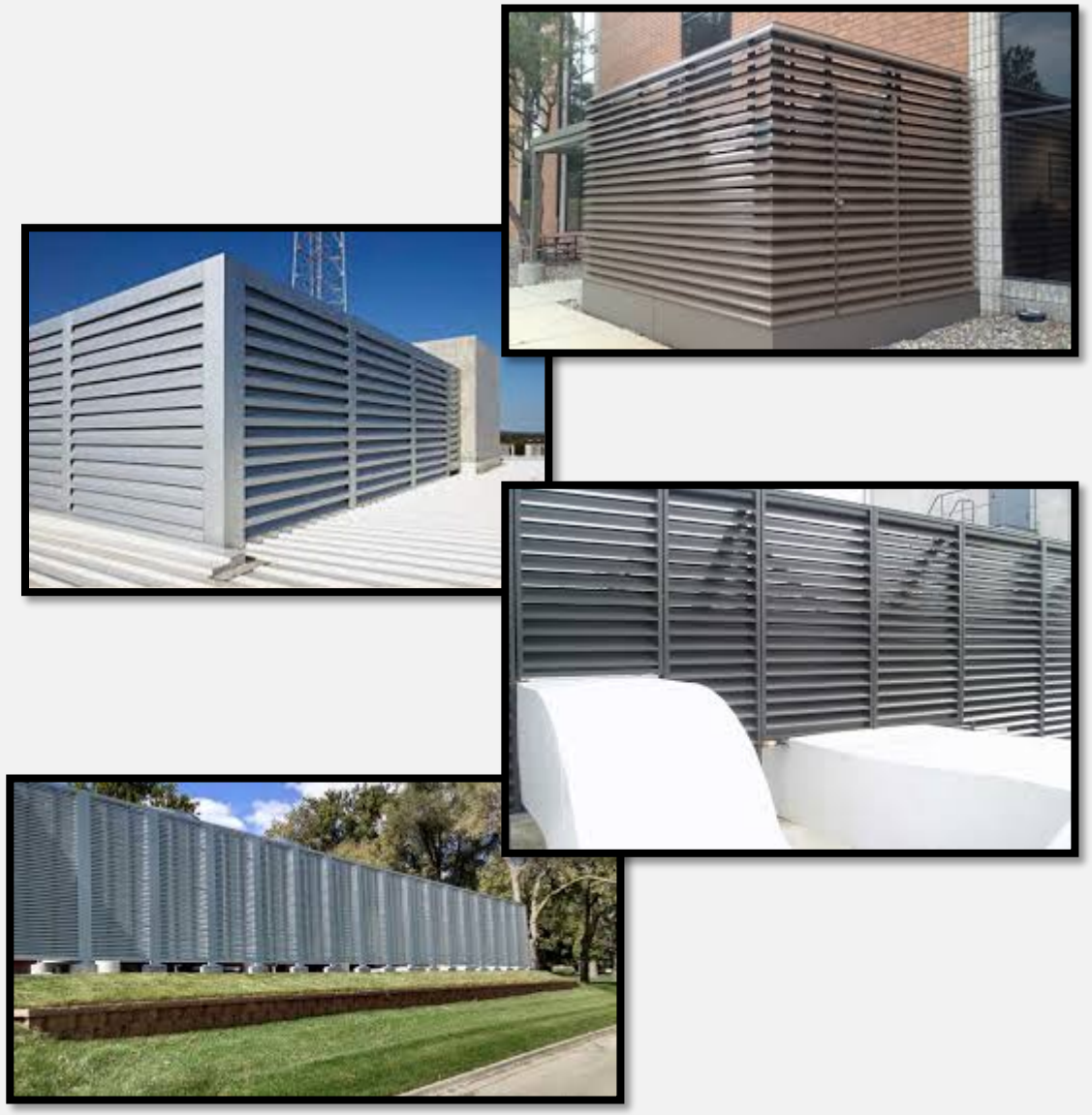




TYPES OF ARCHITECTURAL SCREENING

LOUVERS

- The most popular architectural screening design
- Very aesthetically pleasing solution to compliment any building exterior
- Provides necessary venting of the enclosed area to keep mechanical equipment from overheating and trash areas from growing too pungent



LOUVERS

Popular Applications

- Rooftop Enclosures
- Trash Enclosures
- Mechanical Equipment
- Equipment Enclosures
- Patios
- HVAC Screens
- Generators
- Transformers
- Courtyards
- Loading Docks

LOUVERS

PROS

- Provides ventilation while obscuring view
- Meets mechanical equipment percentage openness specifications
- Modern architectural look
- Provides sun shade

CONS

- Never 100% blockage
- More easily accessed through force
- More costly than solid screening.
- Limited options in materials
- Allows foreign debris

PERFORATED METALS

- Endless applications such as enclosures, partitions, sign panels, guards, screens, and more.
- Wide variety of hole sizes
- Variety of open area percentages
- High strength-to-weight ratio
- Aesthetically pleasing

PERFORATED METALS

Popular Applications

- Dumpsters
- Courtyards
- Gardens
- Patios
- Partitions
- HVAC Screens
- Walkways
- Generators
- Transformers

PERFORATED METALS

PROS

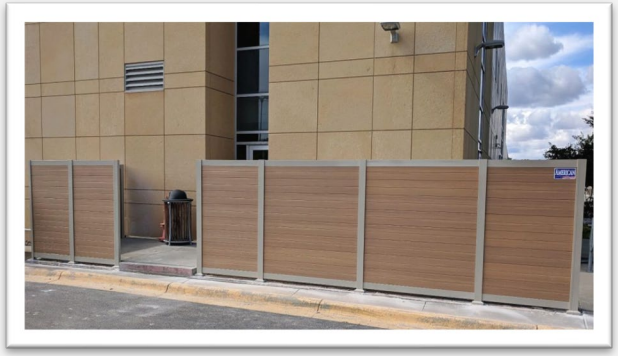
- Wide variety of hole sizes, spacing & shapes
- Available CAD imagery and patterns
- Customize light and visibility
- Wide range of openness percentages
- Very aesthetically pleasing
- Wide range of base material types

CONS

- Lots of edges creates opportunities for corrosion.
- Difficult to apply long lasting coatings with thin materials
- Single flat profile leads to high visibility with greater openness
- No depth like other louver options

SOLID SURFACE SCREENING

- Vertical and horizontal plank options
- Wide variety of material selections including vinyl, aluminum and composite
- Typically includes tubular top and bottom rail
- Wide variety of color options and contrasting between infill and framework



SOLID SURFACE SCREENING

Popular Applications

- Dumpsters
- Patios
- Generators
- HVAC Screens
- Loading Docks
- Courtyards
- Gardens
- Walkways
- Transformers
- Equipment Enclosures

SOLID SURFACE SCREENING

PROS

- 100 % blocked visibility
- A wide variety of material selection types and colors
- A wide variety of material profile and designs
- Generally less expensive compared to louvered designs

CONS

- No ventilation for mechanical equipment.
- Requires considerable structural support system due to heavy wind loading.
- May make small patio areas appear boxed-in

SEMI-PRIVATE SCREENING

- Offers both semi-privacy and ventilation
- Planks may be placed vertically and horizontally
- As screening allows visibility consideration must be given to what is behind the screen.
- Gap spacing is adjustable
- Wide array of material infill available

SEMI-PRIVATE SCREENING

Popular Applications

- Dumpsters
- Courtyards
- Generators
- Patios
- Partitions
- HVAC Screens
- Walkways
- Gardens
- Transformers
- Equipment Enclosures

SEMI-PRIVATE SCREENING

PROS

- Allows some air flow
- May complement contents behind screening
- Modern look
- More cost effective than louvers

CONS

- Not as secure as solid surface or louvered
- Contents behind screen are exposed
- May be prone to climbing
- More likely to be damaged with single planks

MASONRY

- Strong traditional appearance
- Stone, brick or block screening
- Requires extensive foundation work
- May include columns in the corners and ends

MASONRY

Popular Applications

- Dumpsters
- Courtyards
- Patios
- Partitions
- Pools
- Walkways
- Gardens
- Ornamental Areas

MASONRY

PROS

- A great choice in matching building exterior masonry
- A very high end solution for screening
- Sustainable materials

CONS

- Expensive foundation work required
- Expensive material choice
- Repair costs may be extensive
- Future expansion costly

LANDSCAPING

- Green living plants
- Shrubs, flowers, trees and bushes
- Always growing
- Always changing

LANDSCAPING

Popular Applications

- Courtyards
- Patios
- Partitions
- Pools
- Walkways
- Gardens
- Ornamental Areas

LANDSCAPING

PROS

- A softer solution to screening
- Blends well with adjoining landscaping
- Eco-friendly solution
- Natural

CONS

- Inconsistent with change of seasons
- Inconsistent as plants grow
- Requires annual maintenance
- Provides minimal security

ARCHITECTURAL SCREENING MATERIAL OPTIONS

- Material type and finish is a critical design priority for architects and designers.
- Since many building exteriors utilize precast concrete panels and masonry, designers must select architectural screening material finishes that compliment brick, stone, block and concrete.
- There are many suitable materials and finishes that compliment these building materials such as composite woods, solid vinyl and aluminum planks.
- If selecting a metal finish that is to be powder coated, anodized or polished, the selections are endless and sustainable.

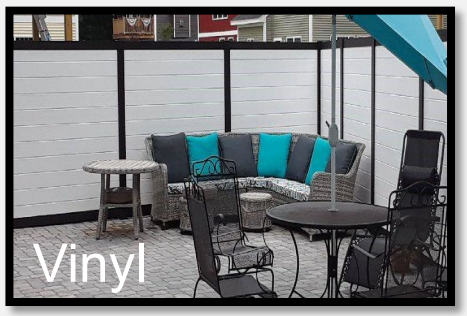









MATERIAL OPTIONS



GALVANIZED STEEL

PROS

- Protects product from red rust
- Strengthens the integrity of the steel
- Structures have a higher resistance to scratches
- Highly durable and long lasting
- Will not get contaminated by the affect of other chemicals and harmful substances
- Sustainable

CONS

- High cost associated with galvanization, especially in large-scale projects
- Can develop white rust over time if exposed to moisture
- May have irregular or bumpy finish
- Material may “oil can” during galvanizing process
- Painting or powder coating over material is not always a good combination

ALUMINUM

PROS

- Affordable
- Rust Free
- Light weight
- Can be molded and shaped with relative ease
- Anti-Corrosive
- Versatile
- Aluminum is through and through

CONS

- Surface has annealing, requiring media blasting before coating
- May have dissimilar metal reaction with other metals
- May dull over time
- High thermo-expansion

STAINLESS STEEL

PROS

- Corrosion resistant
- Durable
- Temperature Tolerant
- Sustainable and recyclable
- Long life-span
- Lots of finish options such as brushed, swirl, polished, matte, and mirror

CONS

- Higher cost
- May be brittle under temperature variations
- Paint or powder coating does not apply well
- Dissimilar metals reaction with other metals
- Can be stained by foreign substances

COMPOSITE

PROS

- Can match to building finish
- Color Variety
- Looks more natural
- Lightweight
- Anti – corrosive
- Sturdy
- Weather resistant
- Low maintenance

CONS

- Higher cost
- May fade over time
- May bow toward the sun
- Heavy material requiring structural support
- May stain from foreign materials

WOOD

PROS

- Easy to paint and stain
- Easy to shape
- Beautiful, natural look
- Inexpensive

CONS

- Not fire resistant
- Not water resistant
- Continued maintenance required
- Can warp and twist
- May need to be replaced
- Will age over time

VINYL

PROS

- Low maintenance
- Several color options
- Most have 20 year plus warranty
- Holds color well

CONS

- Not a structural component
- Soft material; prone to dings
- May react to the sun
- It can look “plastic”

BRICK OR STONE

PROS

- Can match building exterior
- Long lasting
- Low-maintenance
- Weather and fire resistant
- Eco-friendly

CONS

- Higher Cost
- Higher repair costs
- Color limitations
- High cost of footings compared to other options
- Gates can be difficult to attach

EXTERIOR INSULATION FINISHING SYSTEM (EIFS)

PROS

- Can match building exterior
- Durable
- Long lasting
- Low-maintenance
- Structurally sound

CONS

- Higher cost
- Higher repair costs

LEARNING OBJECTIVE #3

Participants will understand the added curb appeal, property value, and security that is added when a architectural screen is used.

APPEARANCE STANDARDS

- The following slides will show examples inadequate or unappealing screening of equipment, dumpsters, loading docks and other unsightly areas.
- Then, those examples will be edited to demonstrate how quality architectural screening can improve a buildings overall aesthetics and curb appeal.

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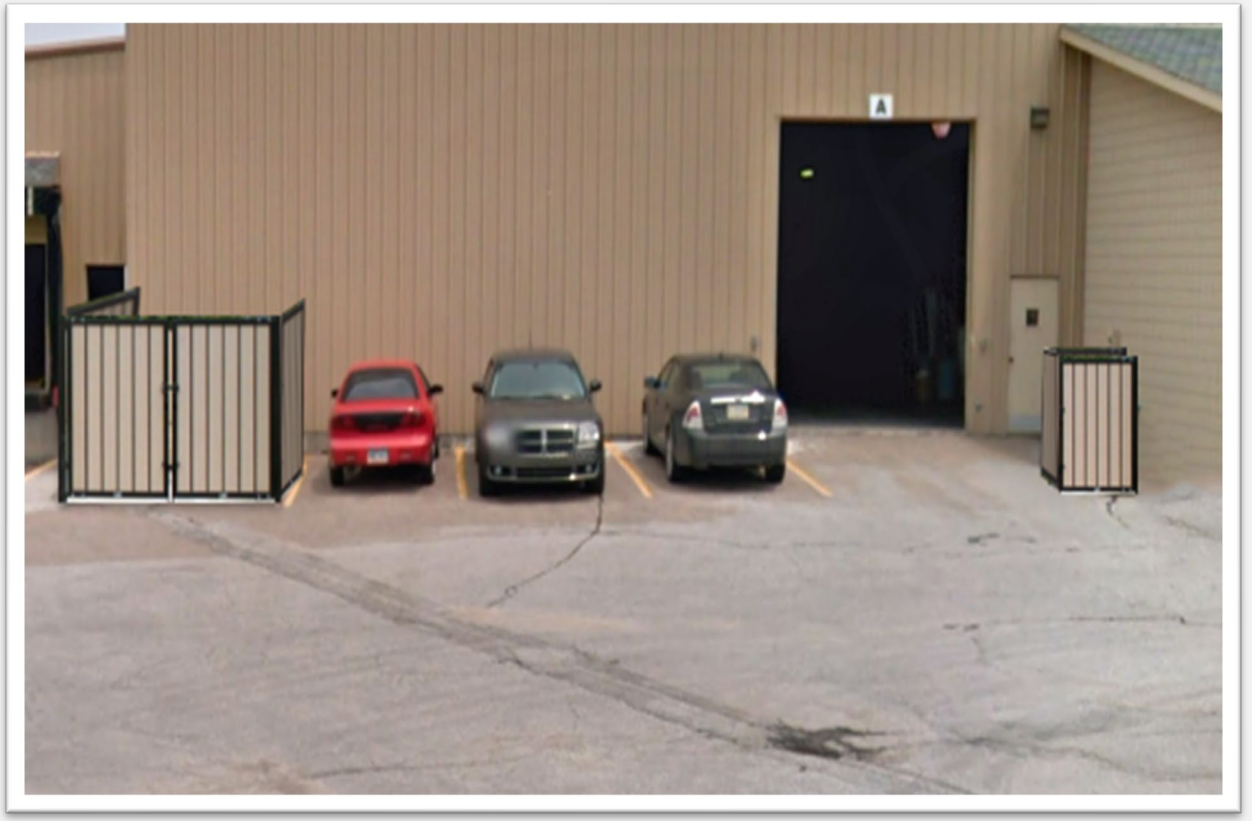

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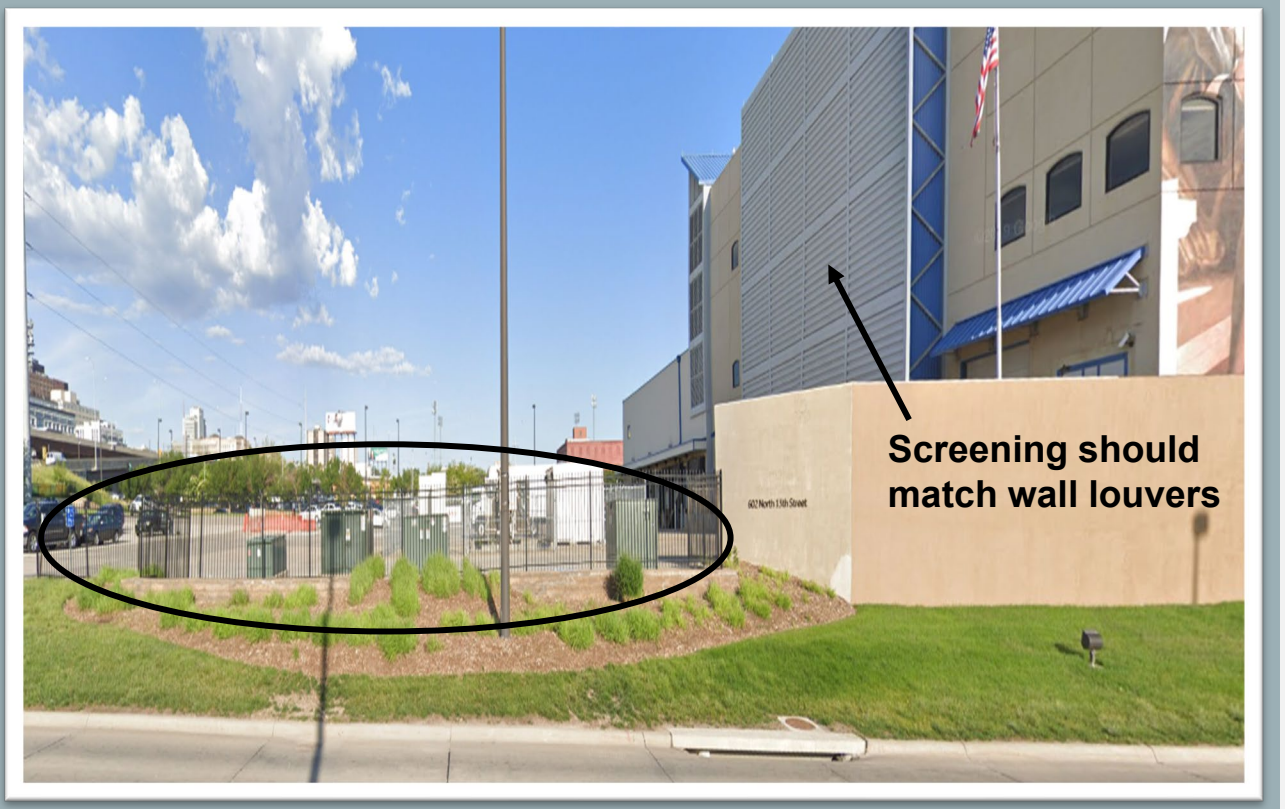

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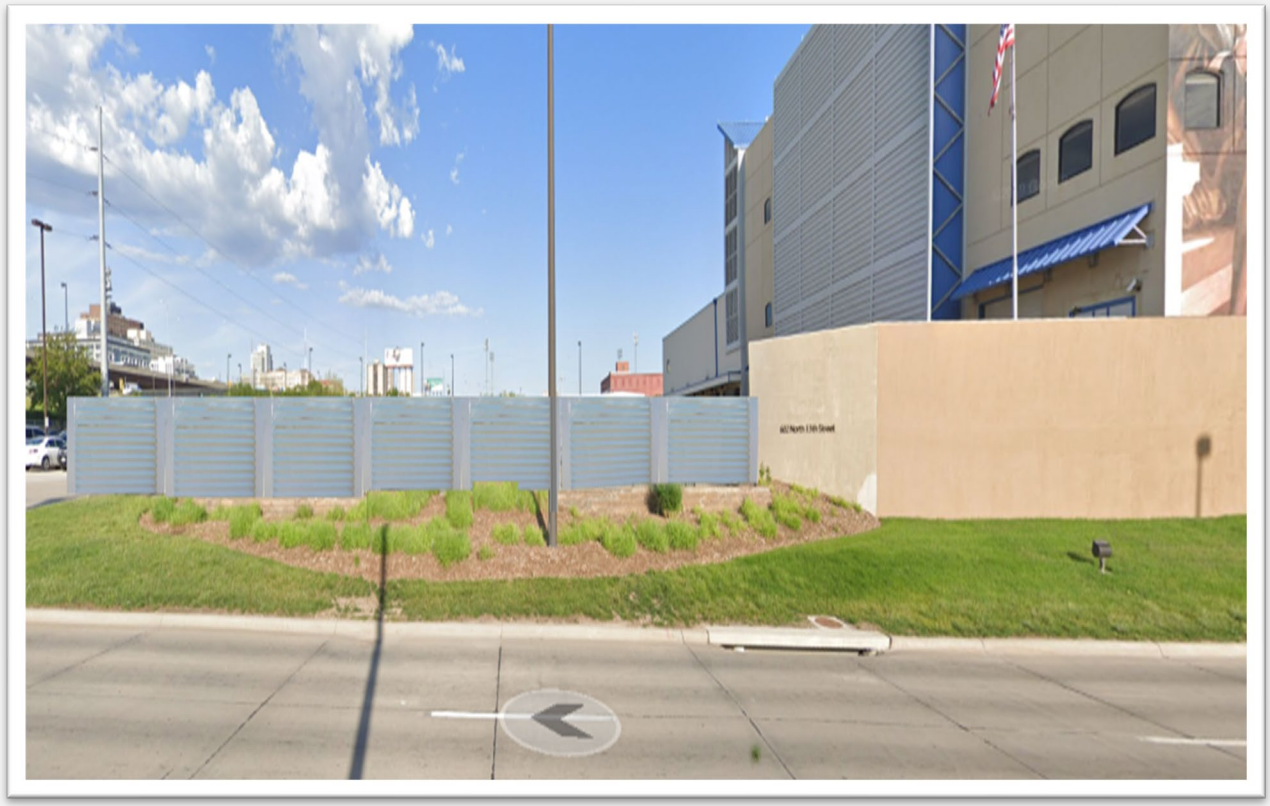

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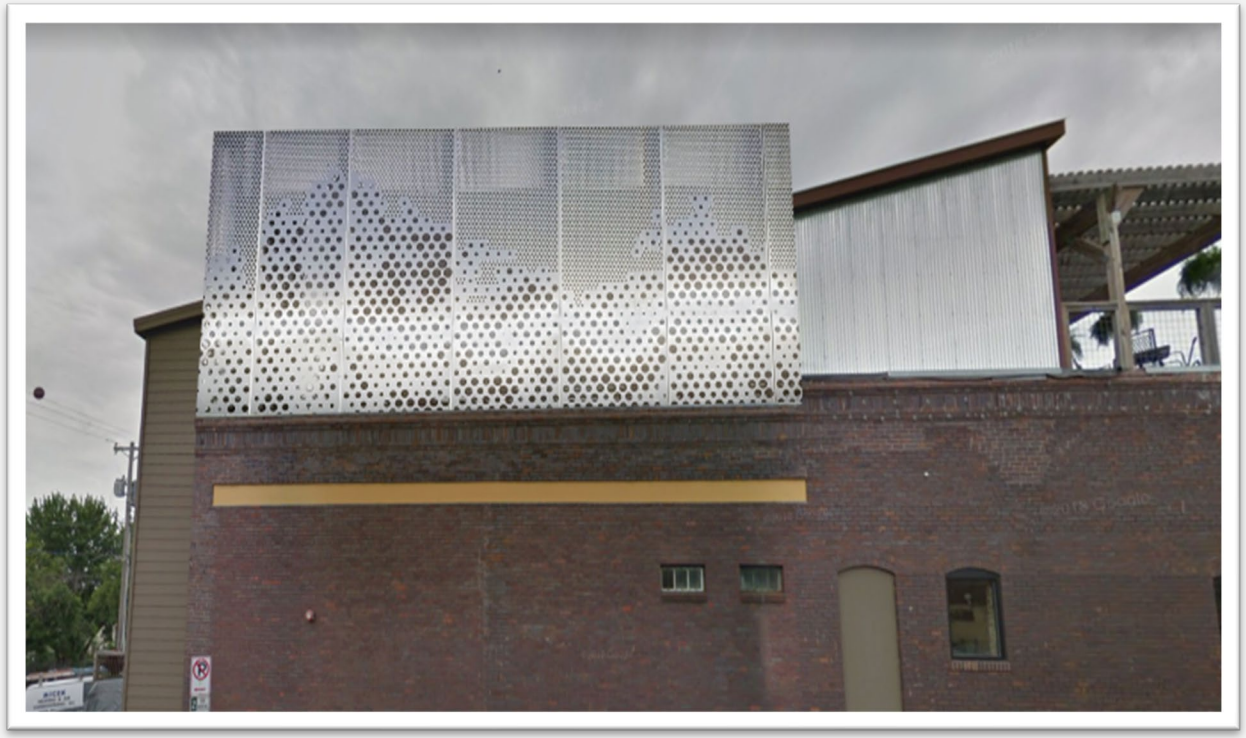

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LEARNING OBJECTIVE #4

Participants will recognize the necessity for quality architectural screening that is engineered to meet IBC and ASCE7-16 codes for wind loads on structures.

WIND LOADS AFFECT ON MECHANICAL EQUIPMENT

- Beyond providing security and improving the curb appeal of a building, architectural screening provides protection for equipment from damaging high winds.
- Below is an excerpt from FEMA's report on rooftop equipment in high-wind regions:
- "Observations after the 2017 hurricanes have once again shown that rooftop equipment is often damaged during high winds. Damaged equipment can impair the operation of the facility, and the equipment can detach and become damaging wind-borne debris. In addition, water can enter the facility where equipment was displaced or damaged."

DAMAGE TO UNENCLOSED ROOFTOP EQUIPMENT

During high winds this mechanical equipment was removed from its foundations and the roof itself. Even mechanical equipment on a low roof is susceptible to high winds without an enclosure.

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ARCHITECTURAL SCREENING'S AFFECT ON WIND LOADS

- In a recent study by the Insurance Institute for Business & Home Safety and the American Society of Heating, Refrigeration, and Air Conditioning Engineers it was found that "fully enclosed screen wall configurations do lower wind loads on the equipment it protects".
- An architectural screen engineered to meet the wind load codes set forth by the IBC and ASCE7-16 helps to protect expensive mechanical equipment and can save a business from unexpected expenses and difficulties associated with the loss of mechanical equipment.

DAMAGE TO INADEQUATE, NON-ENGINEERED SCREENING

This mechanical equipment and associated screening was detached from the top of a building as a result of high winds.

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THE EFFECT OF DAMAGED MECHANICAL EQUIPMENT

- The loss or damage of rooftop mechanical equipment results in high, unexpected costs for the building owner that goes beyond the cost of replacement and repair.
- According to the Insurance Information Institute, when a building is unusable for a business associated costs include:
  - Revenue lost due to the closure
  - Fixed expenses, such as rent and utility costs
  - Expenses of operating from a temporary location
  - Advertising to announce a new temporary location
  - Interruption in production

DAMAGE TO INADEQUATE, NON-ENGINEERED SCREENING

This mechanical equipment was screened, however, during high winds the screening was compromised and caused damage to the equipment.

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THE NEED FOR QUALITY ARCHITECTURAL SCREENING

- When designing a project an architect needs to be assured that the architectural screening used will be able to withstand a region's wind load.
- How does a designer select screening that is engineered to survive a region's wind load and protect a building's mechanical equipment?
- By identifying manufacturers that provide engineered architectural screening and have a demonstrated track record
- By avoiding the use of non-engineered systems such as the lattice fencing shown on the right.

DAMAGE TO INADEQUATE, NON-ENGINEERED SCREENING

Though these lattice panels provide up to 50% opening, they still failed under 60 MPH winds.

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DETERMINING MINIMUM WIND LOAD REQUIREMENTS

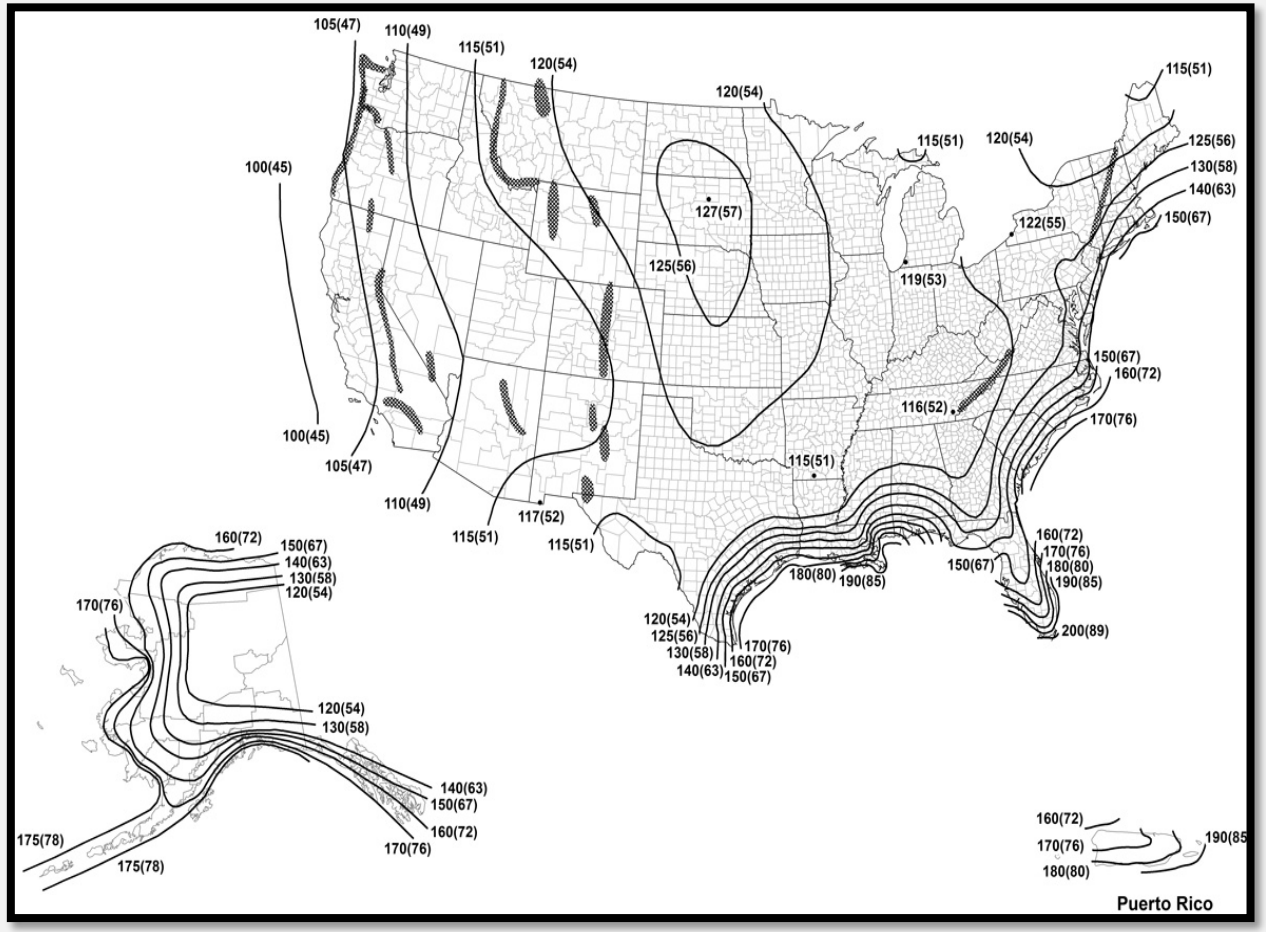
- Quality architectural screening should be designed for the wind load determined under section 29.5.1 of ASCE7-16. This is based on building risk category:

Risk Category	Nature of Occupancy
1	Buildings and other structures that represent a low hazard to human life in the event of failure.
2	Buildings and other structures except those listed in Risk Categories 1, 3 and 4.
3	Buildings and other structures that represent a substantial hazard to human life in the event of failure.
4	Buildings and other structures designated as essential facilities.

- As a minimum, your screening should apply to risk category 3 wind loads.

- On the right is a map detailing the minimum wind load a risk category 3 structure needs to be able to withstand per section 29.5.1 of ASCE7-16 and the IBC.

ASCE7-16 MAP OF REGIONAL WIND LOAD REQUIREMENTS



Shown above are three-second gust wind speeds at 33 feet above ground per region. These are the wind loads that category 3 structures should withstand.

THE NEED FOR A QUALITY ARCHITECTURAL SCREEN

- In summary, high winds can be detrimental to a facility's ability to operate effectively. It is vital to protect the equipment that keeps a facility in working order.
- Designers should utilize only reputable manufacturers that engineer architectural screening to withstand the wind loads laid out in ASCE7-16.
- Avoid using one-off, stick built, non-engineered systems that will fail under high winds.

DAMAGE TO UNENCLOSED ROOFTOP EQUIPMENT

High winds resulted in damage to this mechanical equipment. The equipment was screened by a non-engineered enclosure that was wood framed and corrugated steel application.

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THE NEED FOR ENGINEERING

- In addition to ASCE 7-16 wind load requirements, architectural screening shall also meet the following:
  - Risk category: III
  - Wind Speed: 120 MPH
  - Exposure: C
  - Importance Factor: Open Sign Structure, Case A
  - PW: 33 PSF

- It is important to note that architectural screening manufacturers will have readily available baseline engineering specifications for typical applications.
- However, site specific applications should include stamped drawings provided by a registered engineer in that jurisdiction. Risk category, exposure, and wind speeds will vary from site to site.
- Engineering is critical for protection of equipment and screened items. Also, since screening is often located on roof tops, engineering is critical for the protection of human life.

GROUND MOUNTING APPLICATIONS

- Ground mounted architectural screening is typically secured to the top of a concrete slab or footing.
- Concrete slab mounting shall be a minimum of 6 inch, 3000 psi.

- Earth footings would be approximately 16 inch by 42 inch in depth or as per your local frost depth code.
- Footings are assumed to be set in structural compacted soils.
- This would typically mean 94% compaction or per local code requirements.

CONCRETE ANCHORING OPTIONS

- Compression anchors:
  - These are anchors that apply great pressure against the adjoining concrete surface.
  - Great care must be given to assure these anchors are not placed too far together causing concrete sprawl or too close to the edge.
  - This same level of consideration should be given the length of the anchor relative to the distance of adjoining anchors as it creates a critical cone area for each anchor that should not overlap, possibly causing failure.

- Epoxy anchors:
  - These anchors create a chemical bond between the adjoining concrete and anchor.
  - No compressive strength is applied.
  - Installation is time consuming and tricky as the holes must be perfectly free of dust and debris.
  - These anchors will have to set for hours before applying any pressure.
  - The upside of epoxy anchors is the overall reliability and extraordinarily high pull-out strength

ROOFTOP MOUNTING CONSIDERATIONS

- Wind loads across rooftops are even greater than those on the ground due to the compressed nature of the wind as it travels over the top of the building.
- It is critical that the proper anchoring means be selected due to this increased wind load and exposure rating.

- Unfortunately, you cannot use traditional anchoring means due to the roofing materials and not violating the membranes.
- Most commercial roofing uses an EPDM or rubber membrane roofing.
- Any violation of this material creates an opportunity for water intrusion.

ALTERNATIVE ROOFTOP ANCHORING MEANS

- Attaching to existing mechanical equipment:
  - Some mechanical equipment will provide an exterior structural skeleton for a truss-like system to be anchored at key points to the equipment exterior.
  - Do not attempt to attach to the equipment unless there are intentional means.

- Concrete pavers:
  - Often screening providers will place a large, thick rubber mat under a series of concrete locking pavers.
  - These pavers are stacked to anchor the equipment to the rooftop without penetrating the rubber roof membrane.
  - Because these are not firmly attached and rely simply on the gross dead weight, it's outcome may be questionable.

- Large spanning dunnage:
  - These are large wooden or steel posts that span the distance from one side of the enclosure, to the other.
  - These are also placed on a large rubber mat.
  - Again, with no real means of attaching to the roof, the outcome is unreliable.

- Rooftop decking attachment:
  - This involves violating the rubber or steel roofing deck.
  - There is no guarantee that the attachment point will line-up with building trussing so bracing may be required to reinforce the attachment from truss to truss.
  - The key to this type of attachment is providing a proper raised boot around the point of violation.
  - It should include a binding glue and boot that would typically rise to snow load levels.

- With some roofs being only a steel deck or light weight concrete, it may be recommended to provide a 45 degree kicker on the backside of the screening that provides considerable alternative reinforcement.


Q & A

SOURCES

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