

CRATE SPECIFICATIONS



Smithsonian Institution
Traveling Exhibition Service

12/2002;
updated 2/2005;
updated 6/2024



SITES

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Smithsonian Institution Traveling Exhibition Service

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CRATE SPECIFICATIONS

Introduction and General Notes:

Designing and fabricating crates for traveling exhibitions requires planning, care, skill, and great attention to detail. A SITES crate is designed to protect its contents in many different situations and make efficient use of space and material. These specifications are for use in traveling exhibitions; crates use for one-way or short local trips will be much less elaborate.

Over the life of a traveling exhibit, crates will be shoved, lifted, dropped, flipped, turned, hit, bumped, and stacked. They may be subject to shock and abuse and will probably be packed, moved, and unpacked thirty or forty times. Sometimes crates will move on pallet jacks or dollies, more often they will be pushed or dragged across floors, trucks, or pavement. At times they will be lifted with forklifts, or just shoved with the ends of the forks. Loaded onto trucks, planes or ships, crates will often be exposed to extremes of weather conditions on loading docks, airport tarmacs, and non-climate-controlled trucks.

The overriding concern in crating and packing of this type is for the safety and protection of the objects. Consideration must be given to the safest method to handle the object during the packing and unpacking process. Because traveling exhibit crates have to withstand external forces over a period of years, and still protect its contents, special considerations, materials and techniques are required for their design and construction. Objects are to be packed in a manner suitable for multiple packing and unpacking. Crates containing objects should be designed to travel through doorways on the horizontal axis, without being angled except with advance permission from SITES. Before making any alteration or substitutions to the procedures or materials specified for crate and packing construction, or if there are any questions concerning the correct packing configuration of objects, contact SITES.

There are several factors to consider when planning the size of a crate. The simplest factor is the truck door. Any crate must be able to fit through a standard tractor trailer door 104" H x 87" W. If there is any possibility the exhibition will travel by sea or air freight, those dimensions change – sea containers have doors of 89" H x 84" W. Maximum crate size for a passenger plane is 63" H x 10' L and for a freighter plane 97-116" H x 20' L. If the exhibition is going to travel in a panel truck, then the door sizes change again. Forklifts, pallet jacks, and/or dollies add height to a crate.

The type of shipment is important in determining crate sizes. SITES defines shipping its exhibitions in two ways: outgoing and pro-rated. **Outgoing** refers to shipments arranged by each venue. SITES generally designates its smaller, less complex exhibitions for outgoing shipping, and venues taking such exhibitions generally have fewer amenities and staff. It is important that the crating for these exhibitions be as light as practical and that, if possible, the crates are manageable for two handlers to lift during truck loading situations when a raised loading dock may not be available. We have found through experience this size to be no larger than 30" H x 33" W x 40" D, with a weight of no greater than 250-300 lb. Crates this size and weight can also be stacked during transport, making for a more efficient load.



Pro-rated shipments are contracted with a specific carrier for an entire tour. These exhibitions tend to be larger, more complicated, with more exhibition furniture and with higher security restrictions. Most pro-rated exhibitions ship in exclusive use trucks to major facilities with appropriate equipment for larger and heavier crates. However, a few pro-rated exhibitions are for space reservations on a truck, which means the crates have the same size and weight needs for easy handling as those in the Outgoing shipping exhibitions. The SITES Registrar will provide guidance about the exhibition type and its shipment method.

Crates also need to move into and through museums. The infrastructure of museums varies widely. Many are in historic or old buildings and do not have modern loading docks or roll up doors. Exhibition areas are often accessed only by standard double doors, with an average opening of 80" H and 64" W. Crates may travel in smaller passenger elevators rather than larger freight elevators and the elevator doors can be narrower than its interior. Museums may have staff who are not experienced with handling large and heavy crates, with potential for mishandling and damage to the crate and its contents. By consulting with the SITES Registrar as to the anticipated type of venue, the crate sizes can be adjusted as appropriate for the venues. Usually more and smaller crates are more protective of the contents.

Another factor is the stability of the crate. Tall, heavy crates are difficult to move as one cannot see over the top. They can also become unstable. The plywood sides and lids of very large crates warp and shift out of their original position, making the fasteners no longer line up and the crate difficult to open and close.

Also consider how the crate is to be unpacked. Contents should be arranged so no special equipment is needed for unpacking and so the installation crew can reach the contents and remove them. Do not put heavy items at the top of a tall crate – few people have enough upper body strength to raise heavy objects over their heads safely. Do not make the crates too deep and avoid vertical slot packing – it is difficult to pull out an item when bending at the waist as you cannot use your legs for leverage. When packing heavy exhibition elements, consider using sliding plywood trays in the interior of side load crates. This way the object is pulled out by the tray and then lifted. Another strategy to avoid reaching in or lifting heavy items is to have two removable lids or have the crate shell lift off a bottom pallet.

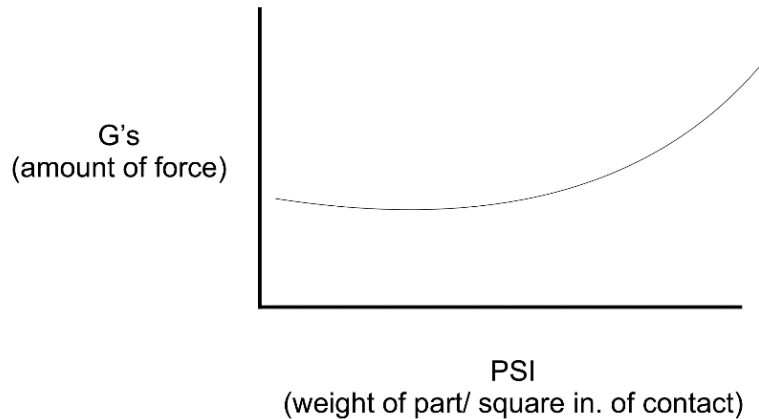
Multiple items are usually packed into each crate. Lender, exhibit installation sequence, object classification, size, weight, and material can affect how items are grouped within the exhibition crates. SITES Registrar will designate their priority. Each object within a crate must be identified, located, and secured in a specified space. An itemized crating list will specify every object in the exhibit, the crate in which it is packed, and its specified box or tray. A list of all objects packed in a crate, with their tray/box noted, must be secured inside each crate. Written instructions within each crate for handling, unpacking, and repacking must be clear and neat.

When packing any piece of a traveling exhibition, whether it be the museum object, a framed text panel, a Plexiglas vitrine, a base, or a mount, always pay close attention to its structure and particular characteristics. Surface protection and the proper points of support and contact of any piece should be considered carefully. Damage, especially surface damage, can occur from too much packing material as well as too little. The materials used need to withstand repeated unpacking and repacking of the contents. To determine the appropriate amount of material used



to support objects consider the effect shock, vibration, and atmospheric conditions have on the objects and incorporate the dynamic cushioning curve:

The horizontal axis is the PSI (Pounds per Square Inch) of the foam supporting the part. PSI is calculated by taking the weight (in pounds) of the part and dividing the surface area of foam supporting the part (in square inches). For example, a 10-pound part supported by 10 square inches of foam will have a PSI of 1.



For further information check PACCIN's (Preparation, Art handling, and Collections Care Information Network) website: <https://www.paccin.org/>.

These crate specifications are generalized to accommodate the widest possible range of objects. There will be occasions and circumstances that warrant additional or more specific packing and crating guidelines. Confirm with SITES Registrar beforehand about the type of crates to be used and the contents of each crate. For assistance with or additional questions concerning crating or packing, contact SITES Registrar.

SITES follows the International Standards for Phytosanitary Measures No. 15 (ISPM 15) standards for all wood products used in our crates. ISPM 15 is an International Phytosanitary Measure developed by the International Plant Protection Convention (IPPC) that directly addresses the need to treat wood materials of a thickness greater than 6mm, used to ship products between countries. Its main purpose is to prevent the international transport and spread of disease and insects that could negatively affect plants or ecosystems. ISPM 15 affects all wood packaging material (pallets, crates, dunnage, etc.) requiring that they be debarked and then heat treated or fumigated with methyl bromide and stamped or branded, with a mark of compliance. This mark of compliance is colloquially known as the "wheat stamp". Products exempt from the ISPM 15 are made from alternative material, like paper, plastic, or wood panel products (i.e., oriented strand board (OSB), hardboard, and plywood).



Basic Crate Shell Construction

Crate shell materials:

- ½" exterior grade AC fir plywood
- 1 x 4" heat treated, solid pine or poplar battens
- 4 x 4" pine or fir (skids)
- wood glue: aliphatic-resin (yellow carpenter's glue) or polyvinyl-acetate (PVA white glue)
- 1 ½" x .086 common round wire nails
- 3" x .120 screw shank nails
- #6 bugle head drywall screws, various lengths
- #8 washer head Robertson (square) drive screws, various lengths
- spun-bonded polyethylene olefin fibers (Tyvek®)
- aluminized polyethylene and nylon barrier film (Marvelseal®)

The basic crate shell can be configured to either open from the top or from the side.

As detailed in the **Introduction**, when planning the crates, consider final crate size and weight. Loading docks, gallery access, interior doors, corridor sizes, trucks, sea containers, and airline cargo restrictions will affect the size, movement, and mode of transit of the finished crates. Certain restrictions and regulations may apply to crates being shipped overseas, check applicable sources before beginning construction. Contact SITES for information concerning these limitations.

Panel construction:

The basic crate panel is constructed using ½" exterior grade AC fir plywood reinforced with 1 x 4" solid wooden battens. (For heavier objects, ¾" plywood with battens can be substituted for the crate floor panel.) Battens and joints are glued with polyvinyl-acetate or aliphatic-resin adhesive. Reinforce glued joints and seams with nails. Attach battens to plywood panels by driving 1 ½" common round wire nails with diamond points through the batten and plywood. Then crimp the exposed points back into the panel. This is best accomplished with a pneumatic nail gun on a steel faced worktable. Crimped nail system is stronger than pneumatic driven 15- or 16-gauge wire. Finishing nails are not acceptable. When larger panels are required, use diagonal battens for reinforcement. Cover flat butt joint seams in the plywood with a 1 x 4" solid wood batten, glued and nailed to surface. See page 9 for schematic drawing.

To attach crate wall panels together, use 3" screw shank nails after gluing joint. Reinforce joint with # 8-3 ½" washer head Robertson (square drive) screws. After joints secured, add corner edge battens using wood glue and nails. The lid end of these corner edge battens serves as a locator when attaching the lid, i.e., the battens extend to the exterior of the secured lid.

At the two narrow ends of a crate, attach a routed 1 x 4" pine or poplar batten to create handles for the crate. Place 24" H and span the width of the crate. If crate is square, place at opposing sides. Schematic drawing page 9.

Gasket:

- 2" wide x 1/8" adhesive-backed polyvinyl chloride (PVC) 12 lb. density



Gasket is attached to the underside edge of the crate lid before drilling bolt holes. Apply a bead of hot melt glue around the interior edge of the gasket. Remove gasket face tape before final packing. See page 10 for schematic drawing.

Bolt plates and bolts:

Use case hardened, zinc plated, cold rolled steel bolt plates with the following specifications to secure lid to crate. See schematic drawings on pages 11-13.

Top plate on crate lid:

- 1/8" thick x 2 3/4" long x 2" wide with four smooth sided holes
- three holes are 15/64" and countersunk to accept #6 bugle head, drywall screws, attaching top plate to crate lid
- fourth hole is 11/32", not countersunk, for 5/16"-18 course thread bolt

Threaded plate on interior crate wall:

- 3/16" thick x 3 1/2" long x 3/4" wide
- two holes smooth sided, 15/64" countersunk for #6 bugle head, drywall screws
- center hole threaded for 5/16"-18 course thread bolt

Bolt:

- 2" long, 5/16"-18 course thread, Grade 5 (case hardened) 1/2" hex head

Screws:

- three 1" long #6 bugle head drywall screws-course threaded per plate set
- two 1 5/8" long #6 bugle head drywall screws-course threaded per plate set

Each threaded plate is set in a routed mortise 3/16" deep x 4" long x 3/4" wide, centered within the crate wall placing the center bolt holes 7" from each corner and equidistance from each other. Generally, do not exceed 24" from bolt to bolt. Threaded plate is secured with two 1 5/8" #6 bugle head drywall screws. Provide a 15/32" clearance hole that passes through the crate lid down into the center of the mortise for the lid bolt. Threaded bolt plates must withstand numerous openings and closings of the crate. Cam locks, draw latches, hinges, and hasps are unacceptable as lid attachment devices.

Provide extra bolts and plates for replacement throughout the tour. Order bolt plates from Balint Tool and Stamping Company, 48 Eagle Street, Brooklyn, NY 11222, 718.392.4040. Currently, the direct contact is Maurice at 201.868.4445, extension 102.

For water protection, cover the exposed edge of the crate wall containing the threaded bolt plates with a 3" wide, water activated, non-asphaltic, kraft paper tape, see schematic drawing page 10.

Crate Lining

There may be instances where the crate interior may need to be lined with a barrier material, such as Tyvek® or Marvelseal®. Marvelseal® or similar aluminum/polyethylene laminate minimizes off-gassing of acidic components from wood crate materials. Contact SITES Registrar with questions of crate lining.



Skids:

- Fir or pine 4 x 4 x 12" lumber beveled at ends on bottom

To attach first glue skid to bottom of crate, then nail and screw from inside of crate with 3" screw shank nails and #8 3" washer head Robertson drive screws. Stacked 2 x 4" blocks or plywood are not acceptable as skids. Orient skids parallel to length of crate unless overall crate size does not permit pallet jack entry. Narrow width crates can have full width skids running front to rear. Consider size of standard pallet jack widths when planning placement of skids. Crate skids should allow for 3 ½" clearance from the floor for lowered forks on pallet jacks.

Skid-Mates® (heavy duty plastic cushioning) are acceptable substitutes when solid wood skids cannot be used. Confirm use with SITES Registrar.

Exterior coating:

Seal crate exteriors with two coats of clear, semi-gloss, water-based polyurethane or acrylic. Coating should cover all sides, including the bottom of the crate. Apply with either roller or sprayer. Allow to dry before stenciling crate.

Stencils:

Use black and red stencil ink meeting Federal Specifications Commercial Item Description (CID) A-A-208 Type 4 for porous and nonporous surfaces. Stencil in a pattern consistent with schematic drawings on page 14. Stencil lettering is 2" high block type. Stencil imprints should be clear and crisp.

A red, triangular, inked stencil marks the upper right-hand corner of the lid. This red marking extends 2" around the corner and onto the top of the crate.

Stencil the following symbols onto the crates: a broken wine glass for fragile and an umbrella for keep dry. The size of these stencils may vary but generally keep within the scale of the crate. See drawings for more detail.

The crate containing the condition report book(s) is designated with a 5" high green five-pointed star on each side and the top. The green-stenciled star can be an acrylic spray paint. Confirm with SITES Registrar which crate this will be.

The crate number should be stenciled/written on each side and top of each crate.

Include on two sides and top of each crate (including crate lid):

- stenciled SITES exhibit number (see below for more detail)
- crate's dimensions, rounded up to next inch, in order of H x W x D"
- crate's weight in pounds

SITES Exhibition number:

The word "SITES" with the SITES exhibition number is stenciled within a bright yellow painted acrylic 9 x 11" rectangle on two sides and top of the crate (including crate lid) as shown in schematic drawings on page 14. The lettering should be 2" high block type.

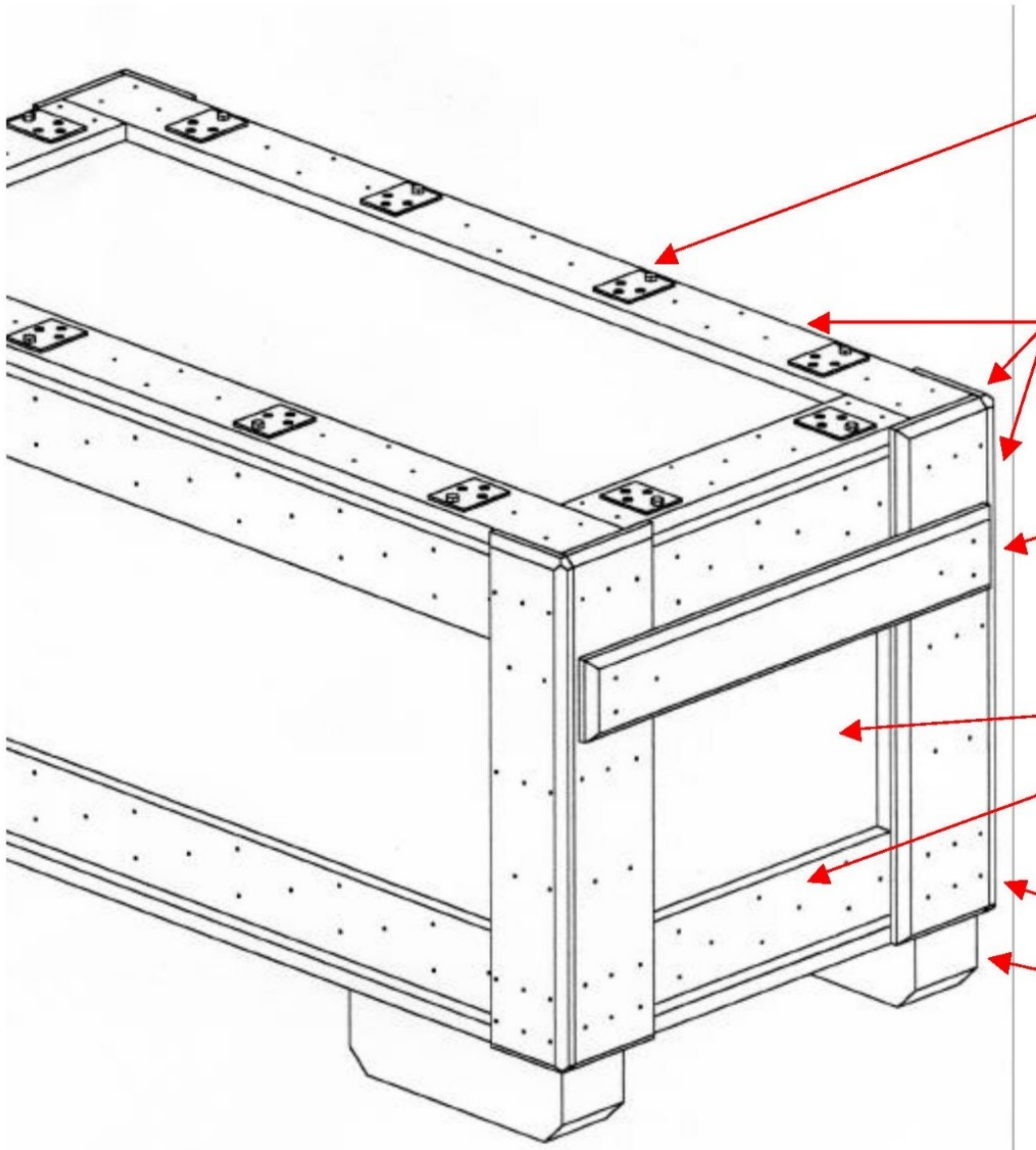
Each SITES exhibition is assigned a specific exhibition number; contact SITES Registrar for the number to be stenciled on the crates.



PANEL CONSTRUCTION

TOP-LOADING CRATE

Reference on Pages 6-8



top bolt plates

corners and edges routed

1x4 wood handles—routed, glued, nailed, and screwed at 24" height

1/2" plywood—AC exterior

1x4 wood battens—glued and nailed

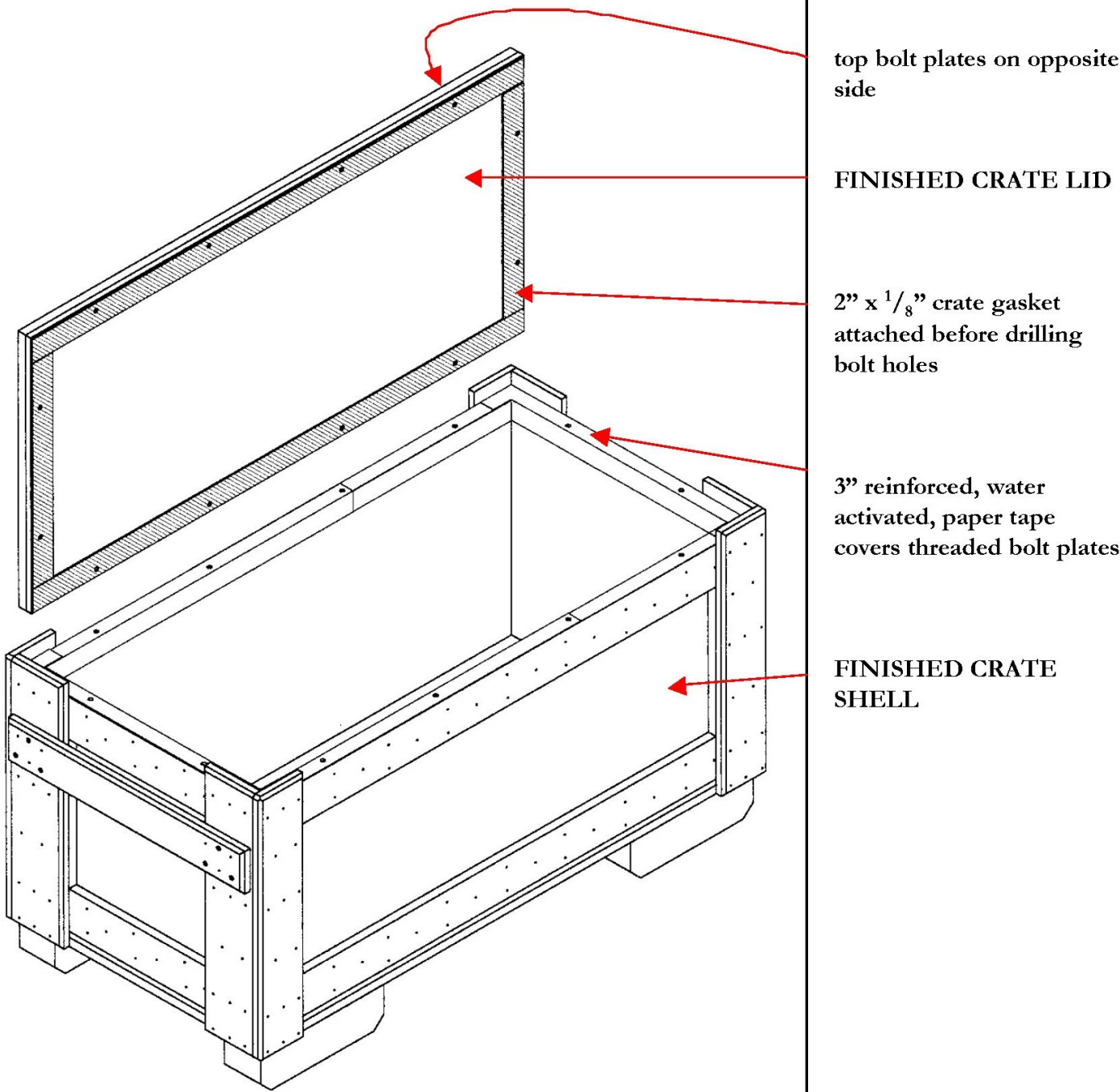
wood corner battens—glued and nailed

4x4 skids—edges chamfered, glued, and nailed



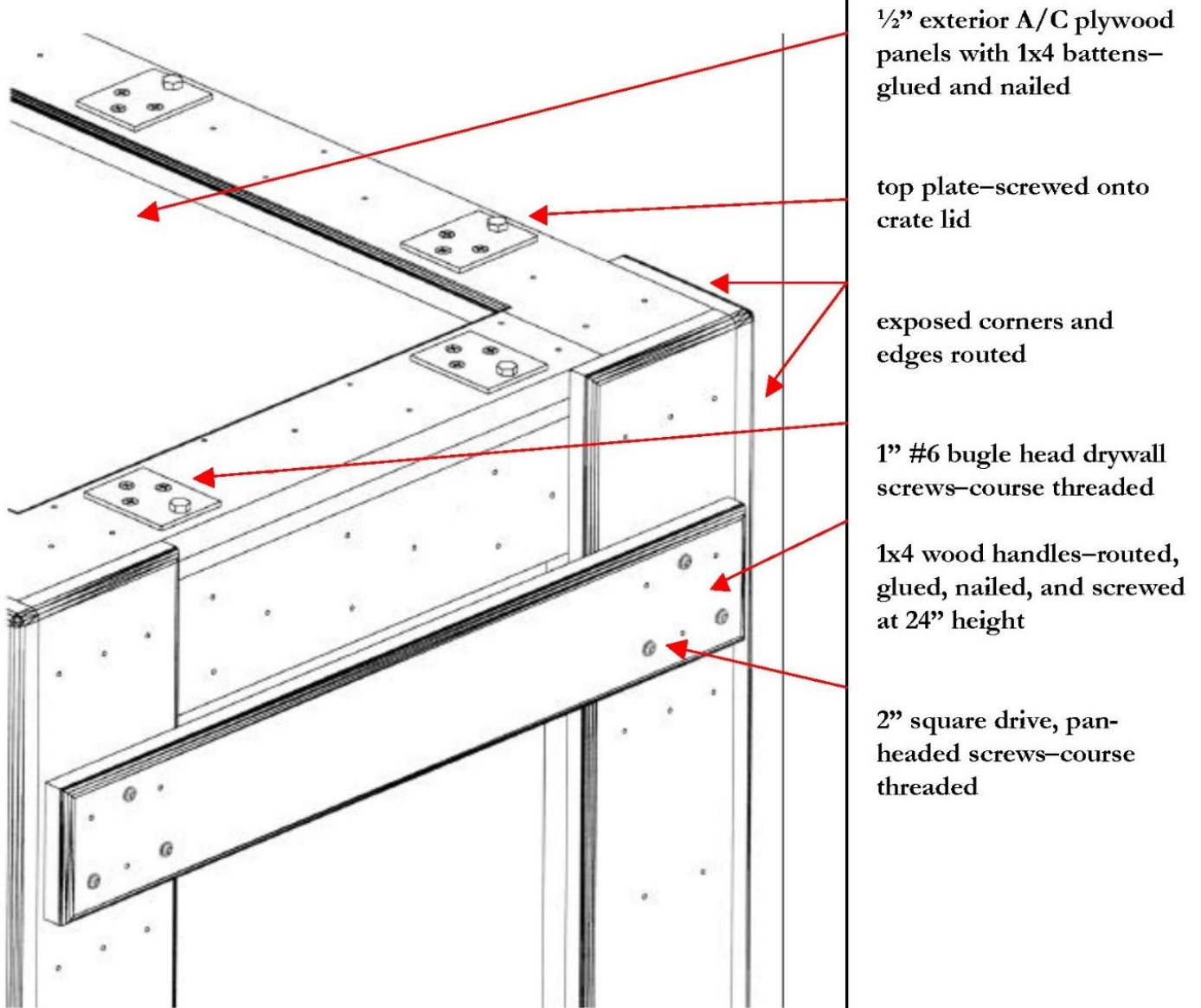
GASKET INSTALLATION

Reference on Page 7



BOLT CRATE CORNER DETAIL

Reference on Pages 6-8



BOLT PLATE DIMENSIONS

Reference on Page 7

BOLT

2" long, 5/16"-18 coarse thread,
Grade 5 (case hardened)
1/2" hex head

TOP BOLT PLATE

1/8" thick, 2 3/4" long x 2" wide case
hardened, cold rolled zinc plated
steel with four smooth sided holes

three 15/16" countersunk holes for
1" #6 bugle head, drywall screws-
course threaded

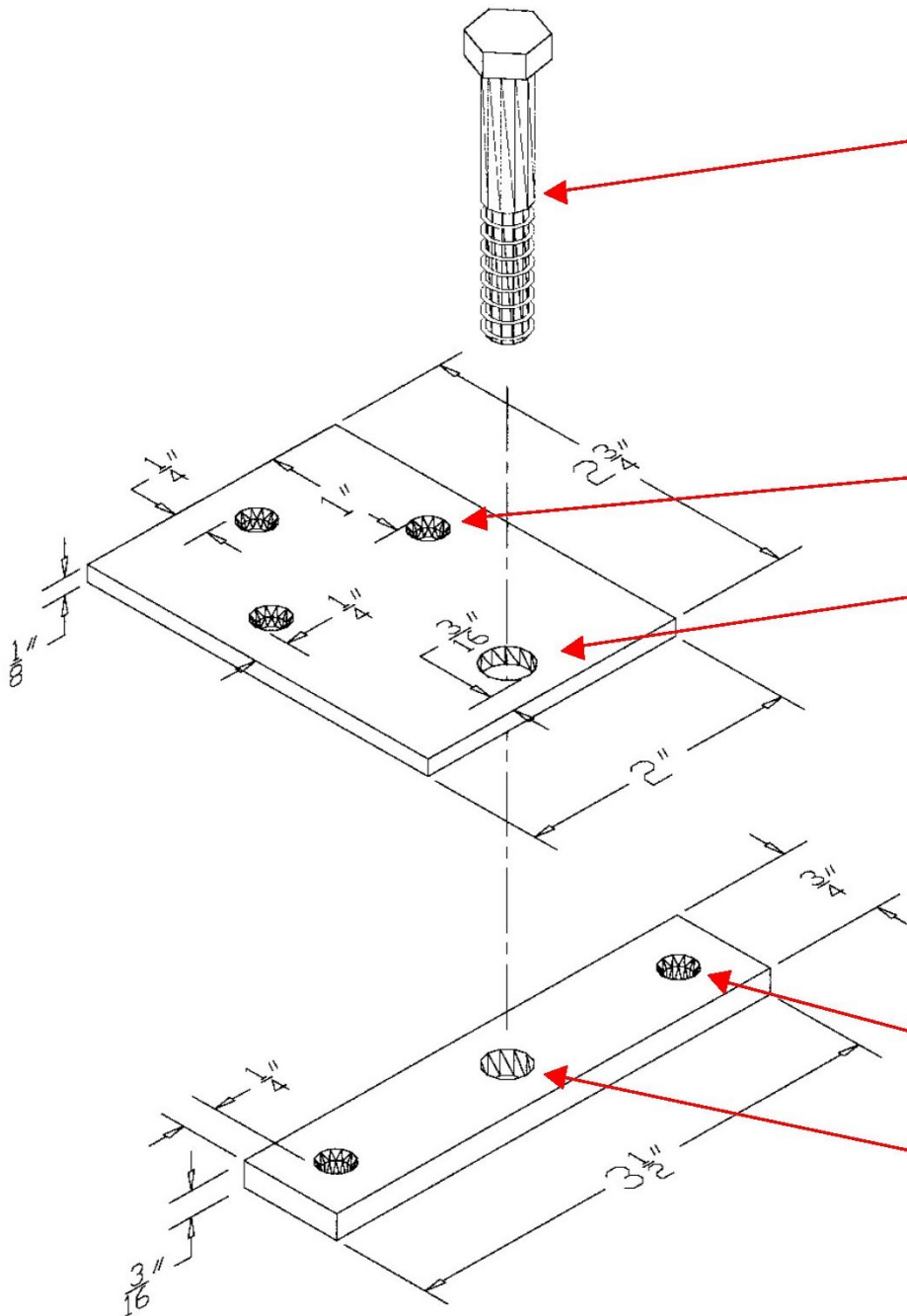
fourth hole is 11/32", not
countersunk or threaded, for bolt
that connects lid to crate

BOTTOM BOLT PLATE (threaded)

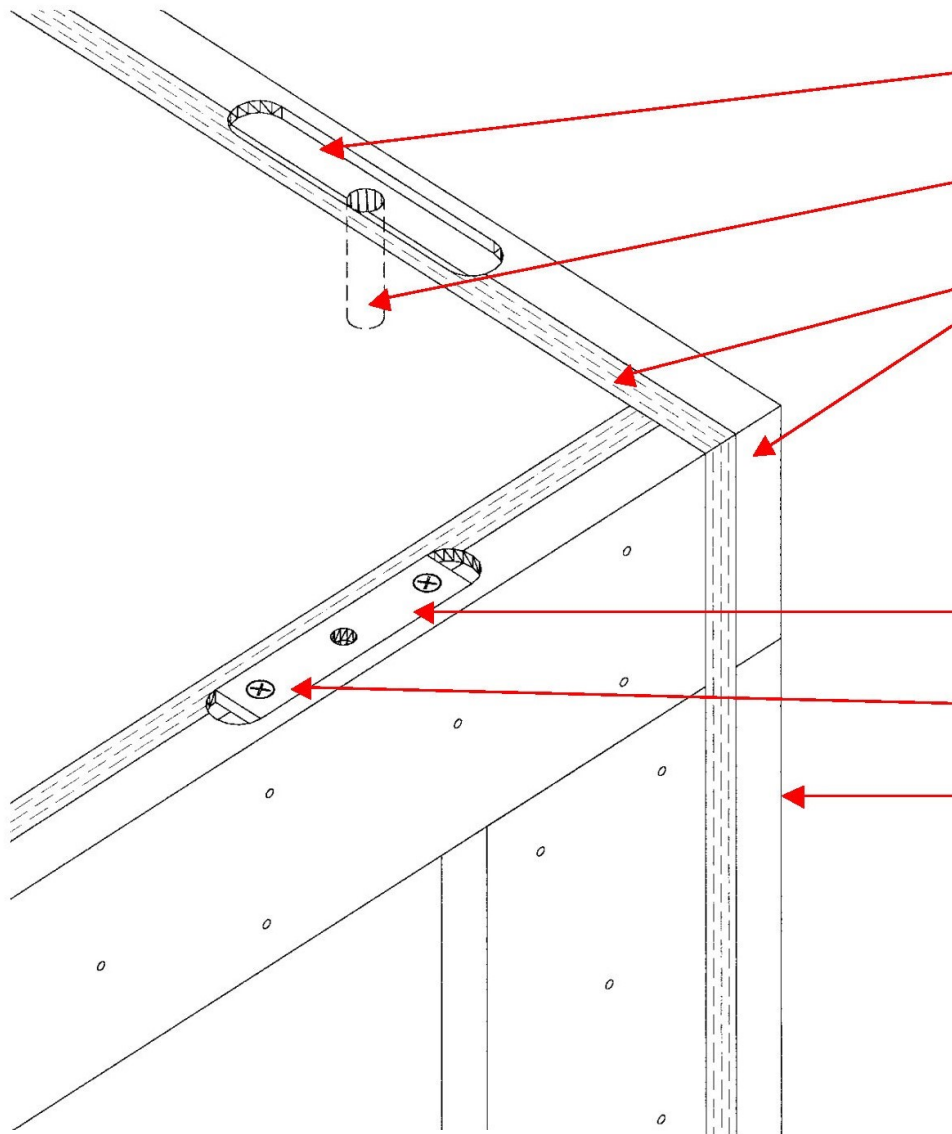
3/16" thick, 3 1/2" long x 3/4" wide case
hardened, cold rolled zinc plated
steel

two 15/16" countersunk holes for 1
5/8" #6 bugle head, drywall screws-
course threaded

center hole threaded for 5/16"-18
coarse thread, grade 5 (case
hardened) 1/2" hex head bolt, 2"
long



THREADED BOLT PLATE INSTALLATION



Reference on Page 7

Routed Mortise
centered in crate wall

3/16" deep x 3/4" wide x 4" long
routed mortise for threaded
bolt plate

15/32" bolt clearance hole

1/2" plywood panel with
1x4 battens—glued and
nailed

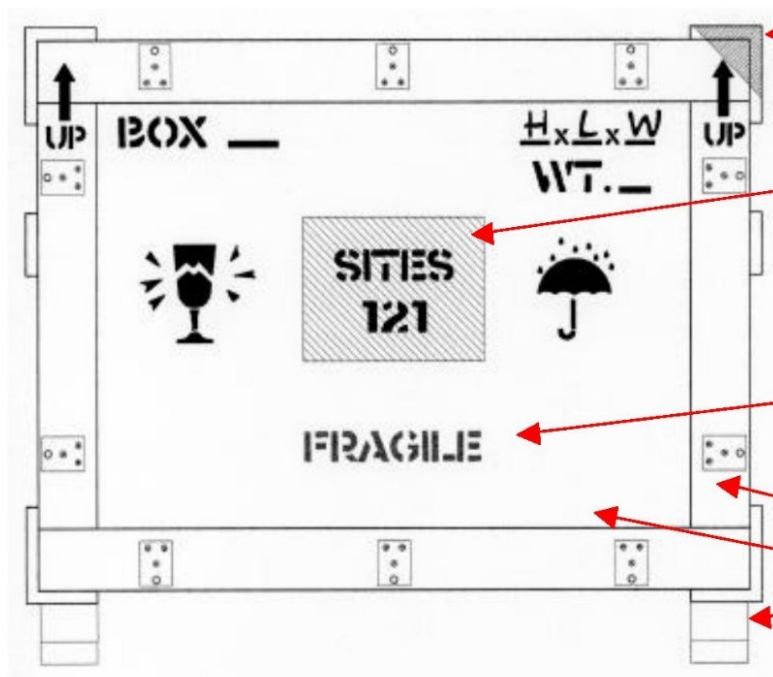
**THREADED BOLT
PLATE**

1 5/8" #6 bugle head drywall
screws—course threaded

panels nailed and glued
together



CRATE STENCILING



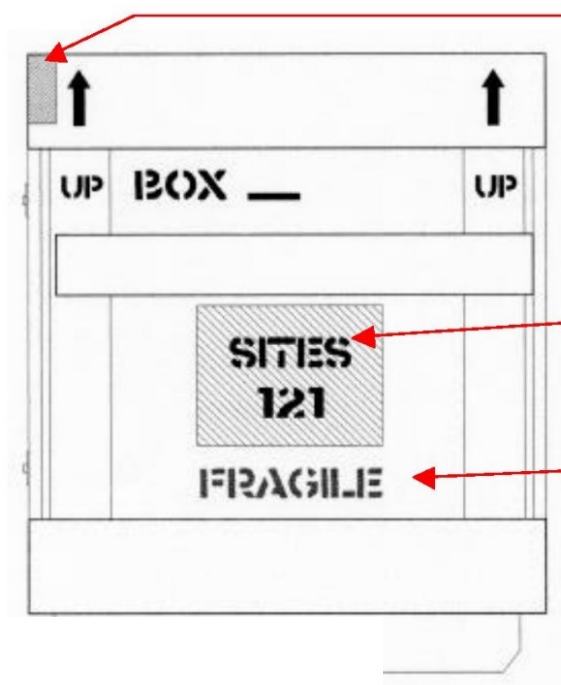
Reference on Page 8

lid locator marking—red

SITES project number—
black on bright yellow
rectangle 9" x 11"

"FRAGILE"—red

1x4 battens
1/2" plywood panels
4x4 skids



lid locator marking—red

SITES project number—
black on bright yellow
rectangle 9" x 11"

"FRAGILE"—red



Labels and Markings of Crate Interiors

Rationale for Clear Labels and Markings

SITES exhibitions are often installed and de-installed without a SITES staff member present. Our exhibitions go to a variety of non-traditional locations, including museums, libraries, schools, community centers and shopping malls. We have seen over the years that crate reports and checklists often do not make their way into the hands of those unpacking and repacking the crates. It is therefore very important that interior labels and markings are obvious, clear, and easy to understand.

Crate Markings

Any disjoint internal crating structure which separates from the exhibition crate must be marked with the crate number and the instructions “SAVE FOR REPACKING,” or “REPLACE IN CRATE FOR REPACKING.” Include the checklist number if appropriate.

Any layers, either boxes or trays, which need to be placed in a specific order must be identified by a number, with the lowest number at the bottom of the crate, and with an orientation mark, such as a black corner, so that the layer is always placed in the correct position.

Orientation marks for disjoint internal crate structures are necessary. Colored corners or stripes, cards, etc. are acceptable; the important thing is that they be permanent, visible, and consistent throughout the packing. Do not use numbers or letters as they may be confused with checklist or tray/box identifications.

If orientation marks do not clearly explain the method of repacking the structure, attach instructions to the interior of the crate. For example, instructions for repacking a three-sided structure, one side of which is acrylic, should say “PACK WITH ACRYLIC FACE DOWN ON THE VOLARA.” Trays for framed pieces should be labeled “PHOTOGRAPHS FACE UP.” When possible, use images for clarity.

Consider the best way to pack and unpack the crate when writing instructions. As needed, state if it works better to pack one element first.

Crate Content Lists, Checklist Labels, and Object Packing Markings

A list of all crate contents should be visible when the crate is opened. Whenever possible, this information should be posted inside on a crate wall and not on the crate lid or other disjoint part.

Always use the SITES checklist number to indicate the packing location of each element, both object and structure. Every element with a distinct checklist number must have a corresponding crate location marked with that number. Same items are not always exactly the same size and thus their specific packing location must be indicated. SITES may provide a digital version of the exhibition checklist with case information and images, especially of objects. When possible, incorporate this information and images into the interior crate markings.

The checklist marking for individual elements should be immediately visible when the crate is opened so each piece can be quickly identified.



Markings to assist in repacking the item in its proper orientation are important. Consider clues such as “PACK BRACKET FACING OUT,” “PACK LABEL TO LABEL”, or “FRONT THIS SIDE.”

Labels and markings need to be permanent and indestructible. Instructions printed with a label maker on adhesive paper which is then covered with clear tape that adheres properly to plywood or ethafoam are preferred. We found that self-adhesive paper, and mailing labels are not sufficient for a long tour. Detailed instructions may be printed out on paper and secured in a heavy plastic document protector taped to the crate interior.

Font

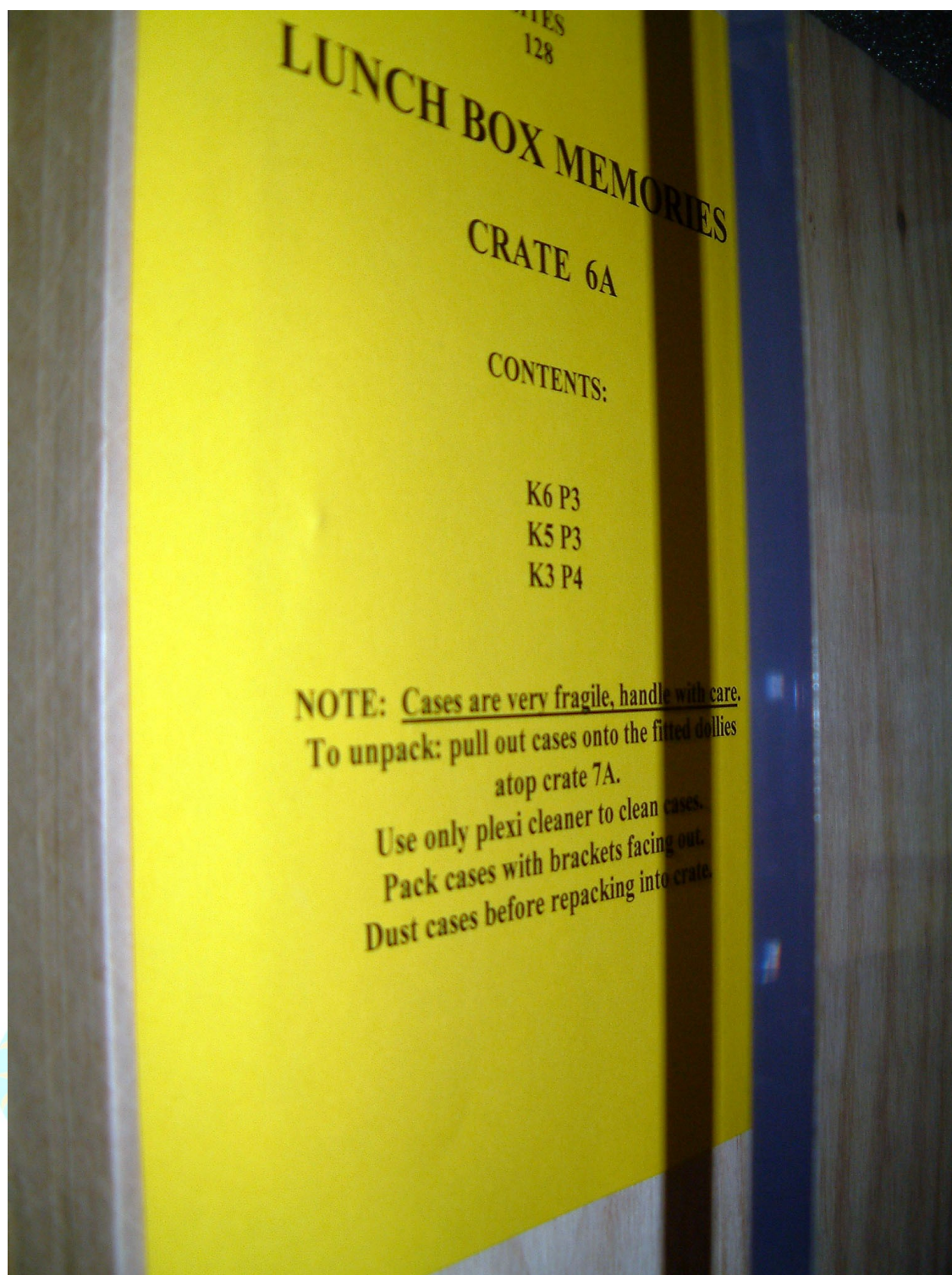
Use the largest font possible, larger than 12 point (currently used in this document); **boldface**; **san serif**, such as Arial.

See the following images for examples of preferred labeling and interior marking.

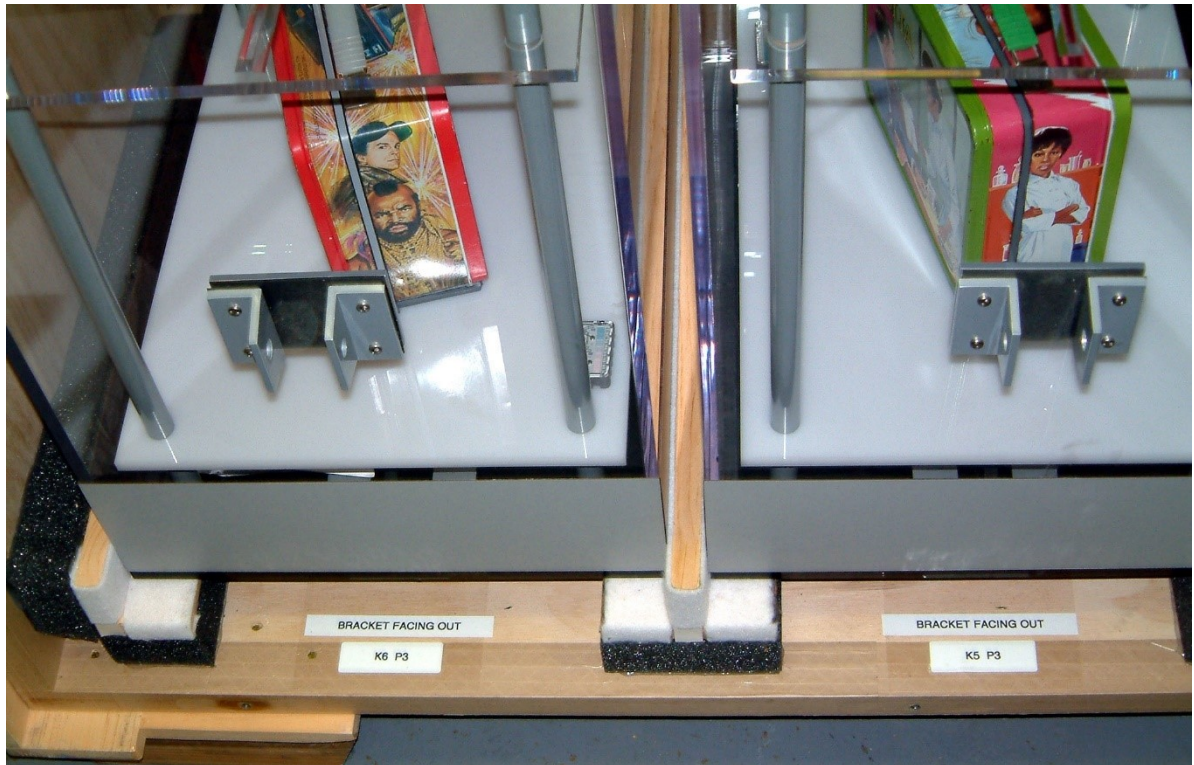
Crate showing markings of disjoint parts, clear view of labels while items are in crate, use of object photographs, unpacking directions, label type:



Directions and checklist secured in a plastic document protector and properly adhered to the plywood:



Checklist numbers and orientation instructions are immediately visible upon opening the crate:



Put checklist numbers outside the cavity for each element (NOT underneath the element).

Checklist number visible
when object is packed

Finger/hand access
holes in foam



Single Painting Crate

Materials:

- refer to basic crate construction for exterior shell, pages 6-18
- expanded polyethylene closed cell foam, white, 2.2 lb density (Ethafoam ®)
- hot melt adhesive (ethylene acetate copolymer) that meets FDA requirements 175.105
- irradiated, cross linked, closed cell polyolefin foam (Volara®)
- spun-bonded polyethylene olefin fibers (Tyvek)
- aluminized polyethylene and nylon barrier film (Marvelseal)®

Application: for large paintings, paintings that cannot travel in a tray

Attach 2 x 2" strips (crate bumpers) of expanded polyethylene foam (Ethafoam ®) with hot melt adhesive to the walls and lid of the crate at spaced intervals. Chamfer exterior edges of bumpers prior to gluing. The crate bumpers support and cushion the frame without causing abrasion during transit. The actual number of strips will vary, depending on the weight of the framed object. Foam loading should conform to dynamic cushioning curves (definition on page 5) for the weight of the object and the density of the foam.

For gilt frames, line the strips with a cross linked irradiated foam (Volara®). This is attached using heat fusing or hot melts glue. Do not use contact cement to attach foam bumpers. For ornate or very heavy frames contact SITES Registrar for alternative packing methods. See schematic drawing on page 20 for typical placement.

Generally, paintings are not wrapped for traveling exhibitions. There may be instances where the crate interior may need to be lined with a barrier material, such as Tyvek® or Marvelseal®. Contact SITES Registrar if there are questions concerning wrapping paintings or crate lining.

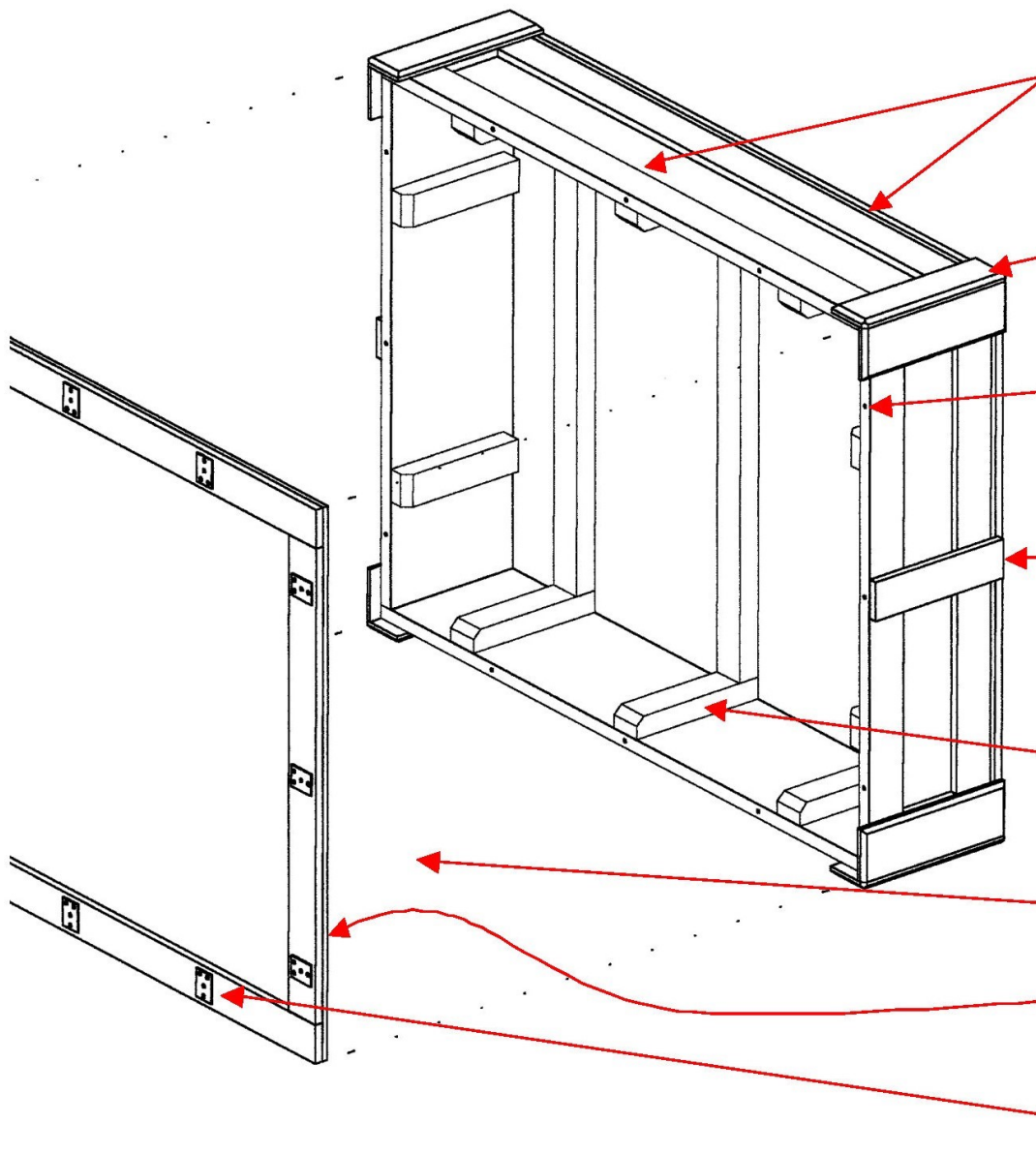
Generally, single painting crates that ride vertically do not have 4 x 4" skids attached for reasons of stability. Instead, 2 x 4" skids are acceptable in those cases.

Crates for large paintings that ride vertically may need to be lowered flat before packing and unpacking.



SINGLE PAINTING CRATE

Reference on Page 19



Exterior

1/2" exterior A/C plywood panels with 1x4 battens—nailed and glued

wood corners—nailed, glued, and routed

threaded bolt plate—routed, screwed, and paper taped

1x4 wood handle at 24" height—glued, nailed, and routed

Interior

2" polyethylene foam bumpers—hot-melt glued, chamfered outside edge

2" polyethylene foam bumpers on inside of lid or on top tray

2" wide x 1/8" thick gasket on inside of lid

top plates



Travel Frame General Specs

Materials:

- corrugated plastic sheet (Coroplast®)
- Oz Clips®: two with loop, two without, size depends on artwork
- 9/16" wafer-head screws
- #8 self-tapping Phillips screws, length will vary
- four bolts, each with a fitting wing nut, lock washer, 4-prong Tee nut, washer
- four 10" long 1 x 4" heat treated, solid pine or poplar battens
- wood glue: aliphatic-resin (yellow carpenter's glue) or polyvinyl-acetate (PVA white glue)
- 1/4" roundover router bit
- metal flip down handles
- 3/4" thick wide pine
- hot melt adhesive (ethylene vinyl acetate copolymer)
- irradiated, cross linked, closed cell polyolefin foam (Volara®)
- nylon film (Su®)

Application: for paintings that need to travel vertically and cannot travel in a tray

Select 3/4" pine for travel frame (t-frame) with few knots to reduce the risk of sap. Router all edges with 1/4" roundover bit. Create a four-sided box to fit around the perimeter of the artwork. Along the plane of the t-frame, secure two boards spanning the length (Y) of each side. Fit cross braces (Z) between the Y boards at either end and in the center of the plane, or at regular intervals, to provide rigidity. See Cut Diagram on page 22 for reference. Glue and screw all joints.

For width and length of t-frame, plan for at least 5" beyond painting frame perimeter (unless otherwise discussed due to weight/height issues) to allow room for Oz Clips. Make sure Oz Clips will reach blocks attached to Y and Z boards when holding arm is extended.

For depth of frame, plan 2-4" above highest point of artwork. Built up artworks or extremely large works could require more depth.

Coroplast should be affixed to the negative space between Y and Z boards, secured with 9/16" wafer-head screws from the outside of the t-frame (no tape or screws on the inside).

A lid to the t-frame should be made with additional Y and Z boards and with Coroplast covering the negative space, mirroring the back plane of the t-frame. Stencil with upright arrows and "fragile" along with other SITES stencil specifications referenced on page 8.

Attach metal flip down handles to each side of t-frame (no straps). For oversized travel frames handles should be attached at approximately 22" from the bottom.

Build for Oz Clips with blocking and hardware in detail on page 23. Hardware to attach Oz Clips specific to artwork and Oz Clip.

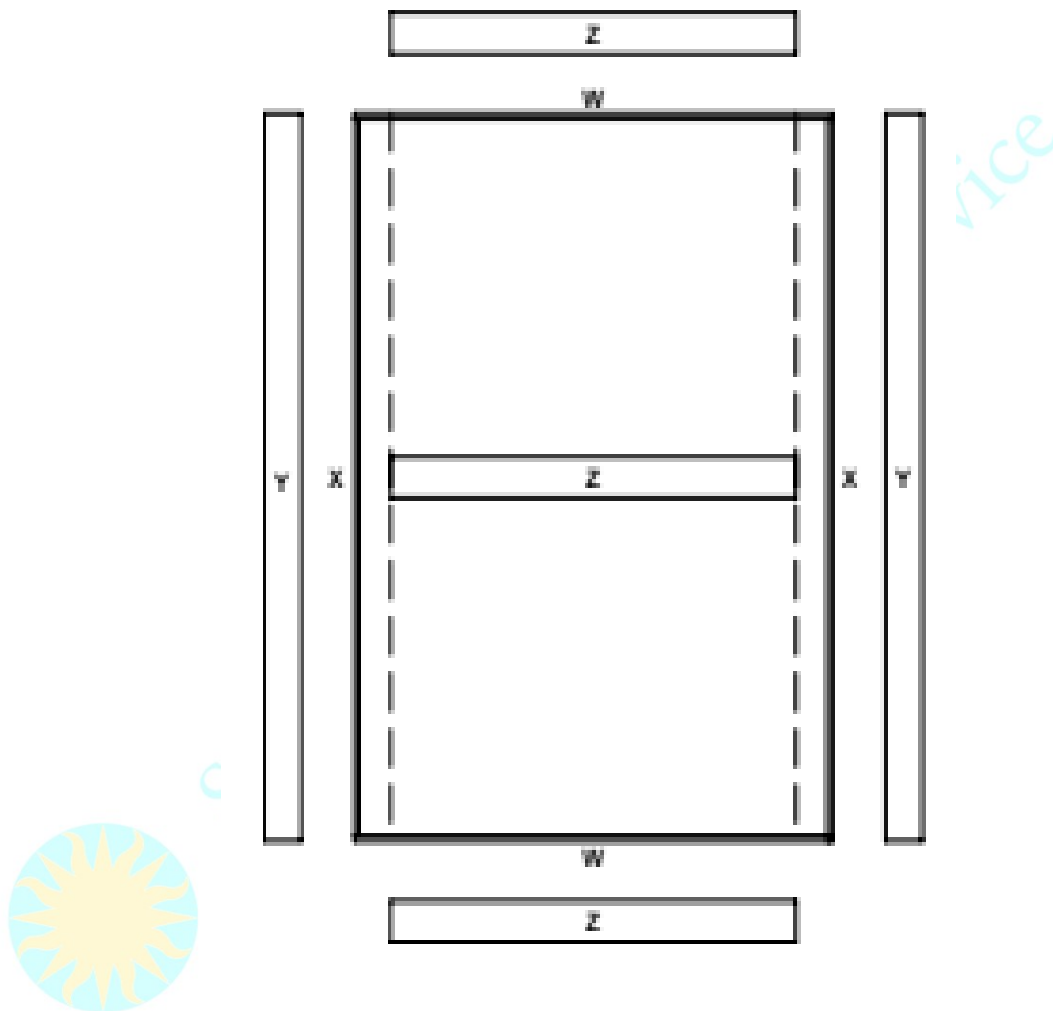


Place a block or series of blocks 2" x depth of riding edge side of travel frame. Cover blocks in Volara and when necessary, cover in Dartek. The pads should be placed 1/8" below the bottom edge of the artwork. This is a protective measure in case of Oz Clip failure. This method also makes unpacking large works on a lean safer and easier.

Generally, do not wrap work.

Seal outside of travel frame in plastic completely with sealed cut outs for handles.

Travel Frame Fabrication Cut Diagram



if planning for a 5" perimeter:

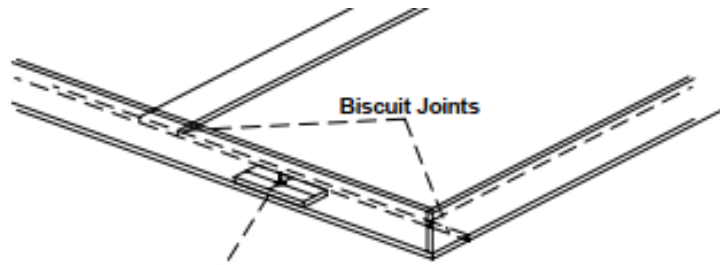
$W = \text{shortest side of painting plus } 10'' \text{ (twice)}$

$X = \text{longest side of the painting plus } 10'' \text{ twice}$

$Y = X + 1 \frac{1}{2}'' \text{ twice}$

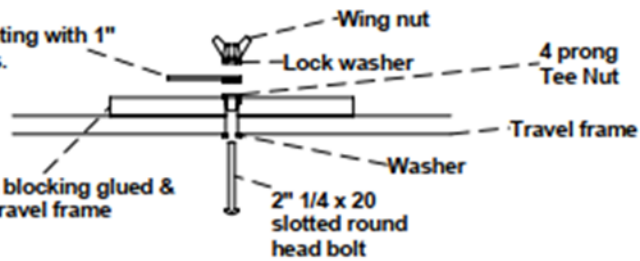
$Z = W - 11''$ (2 x 5 1/2", width of pine) three times or more to suit length of travel frame



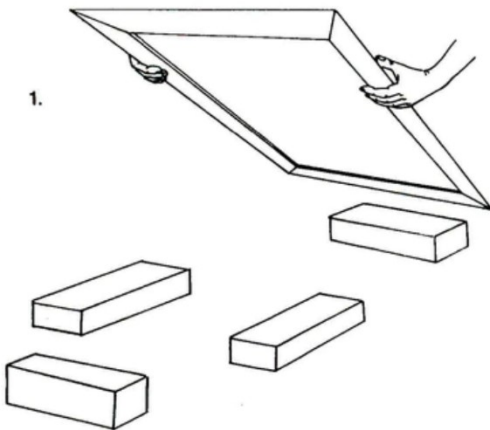


OZ clip Detail

OZ clip attach to painting with 1" #8 zinc plated screws.

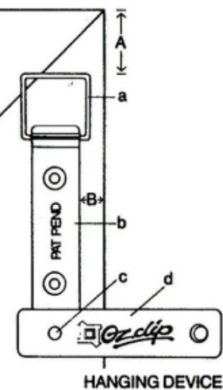


1.

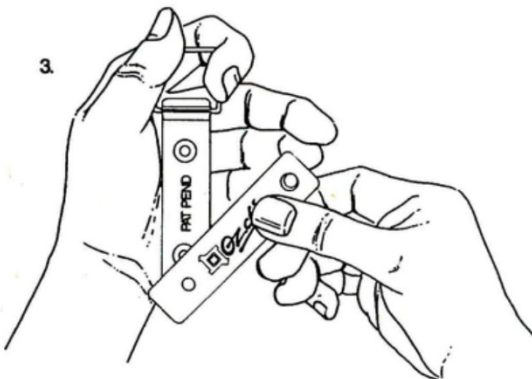


2. BACK OF FRAME

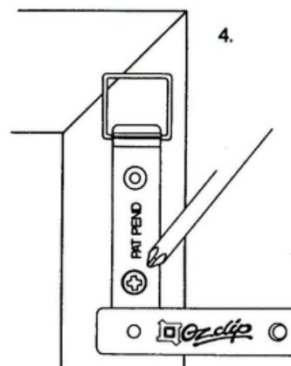
- a. Stainless steel loop
- b. Base bar
- c. Pivot pin
- d. Holding arm
- A. Distance between top of frame and top of hanging loop
- B. Distance between edge of frame and edge of OZCLIP



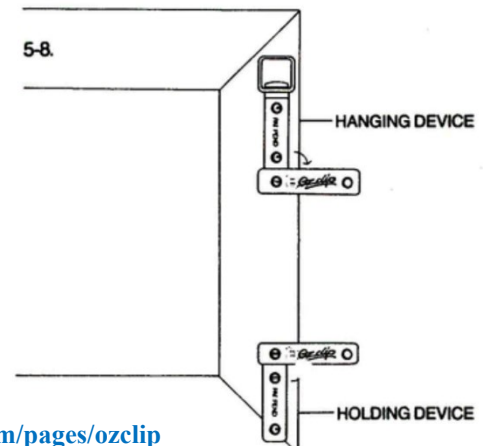
3.



4.



5-8.



<https://masterpak-usa.com/pages/ozclip>



Tray Packing

Materials:

- basic crate construction for exterior shell, pages 6-18
- ½" white, clay coated paper liners laminated to an extruded polystyrene center (Fome-Cor®)
- ½" white, clay coated paper over a honeycomb kraft paper interior (Airlyte ® Graphic Arts Board)
- 6 mil, 1" wide, white paper hinge tape for edging trays
- strips of expanded polyethylene closed cell, 2.2 lb density (Ethafoam®)
- hot melt adhesive (ethylene vinyl acetate copolymer)
- irradiated, crosslinked, closed cell, polyolefin foam (Volara®)

Application: for packing multiple framed/two-dimensional objects or panels of differing sizes into the same crate

The crate is lined with 2" strips of expanded polyethylene foam (crate bumpers, see **Single Painting Crate**, pages 19-20) attached to the sides, lid, and bottom at intervals to support and cushion the trays. The stacked trays are made of ½" Fome-Cor® or Airlyte ® (with edges taped with white paper hinge tape) that are cut to fit within the crate bumpers. The crate can ride vertically or flat, its orientation depending on the specific needs of the framed objects. Confirm orientation with SITES Registrar. Cardboard trays are not acceptable.

Each object is fitted and sized onto its tray by using strips of polyethylene foam around the frame's perimeter. The height of the strips is determined by the frame's depth. The strip must be ¼" higher than the object (including its frame) to prevent the next tray layer from resting on the object. Hanging hardware or security plates may necessitate additional depth or space on the tray. On the inside edges of the tray foam strips, cut finger/hand access holes for lifting objects out of the tray. The foam strips support and cushion the objects. Additional strips of foam can be used if necessary to support the outer edges of the tray.

Multiple objects can be packed on a single tray with their own foam perimeter. Confirm with SITES Registrar. On a multi-object tray, the height of foam should be consistent throughout the tray and based on the highest frame.

Gilt frames may require lining the foam strips with a softer material such as Volara®. Do not line them with polyester felt. Ornately carved or heavy frames require special packing techniques. In such cases, contact SITES Registrar for technical assistance.

Attach a list of the crate contents and write any special instructions on the top tray. Do not pack objects on the top tray.

Number trays placing Tray One at the bottom of the crate and continue sequentially to the top layer. To confirm that each tray is always placed in its correct orientation, identify each one with:

- crate number
- tray number
- an orientation mark, such as a black corner, that is consistent within crate



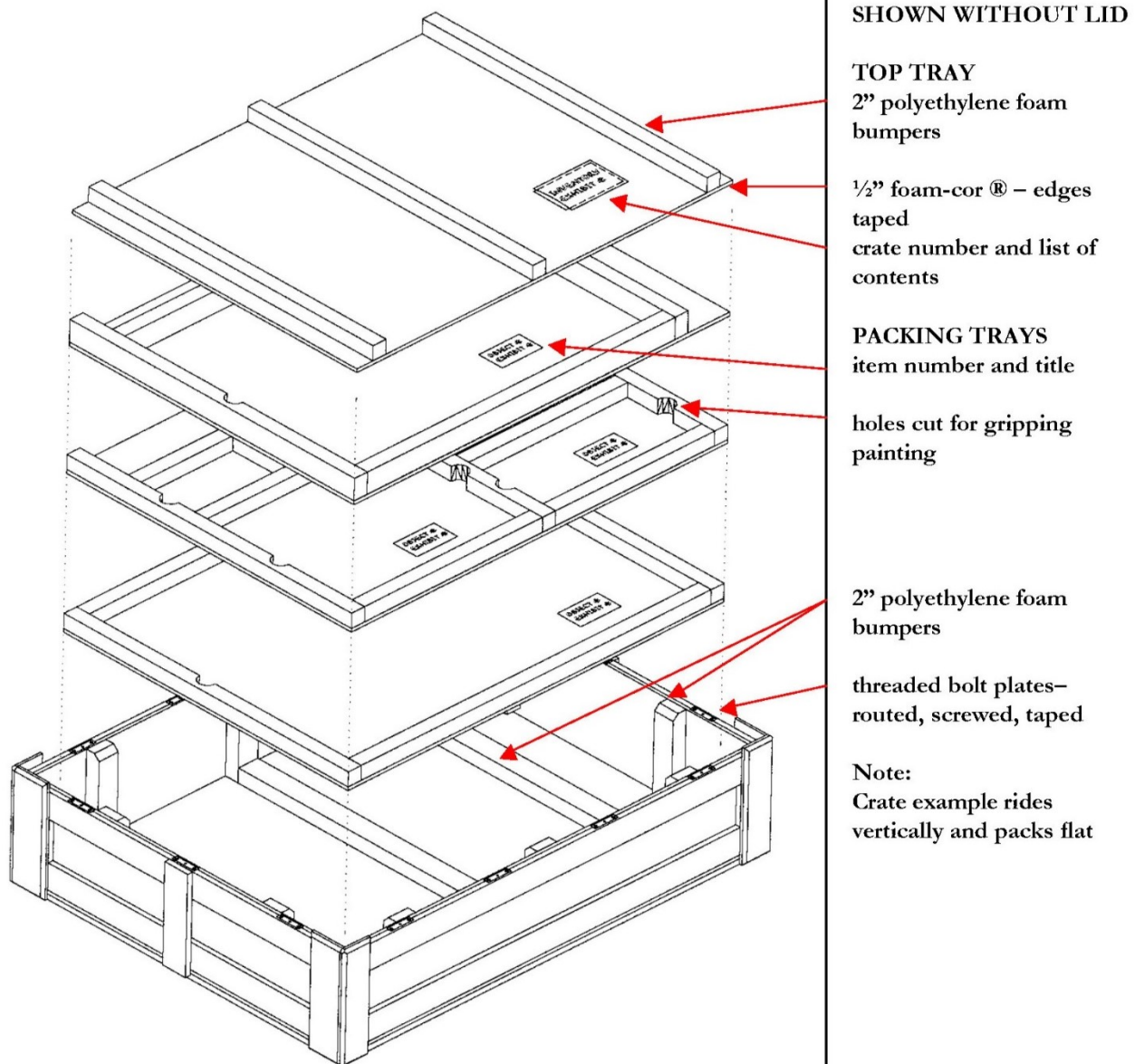
An identifying label or tag is applied to the back of each frame/panel. Place a corresponding label to identify the specific tray/space in tray for each object. When possible, this label should be visible when the object is packed onto the tray.

When packing and unpacking the crate, each object should be moved on and off the trays before the trays themselves are moved. Instructions should reflect this on the top foam layer of the crate.

Most SITES exhibits will have a set of Condition Report Notebooks. These should be packed near the top layer of the crate for easy access. The crate containing these books is noted with a green star stenciled to the crate exterior (see Stencils, page 8). Discuss with SITES Registrar the best crate for these to be packed.

Wooden tray packing for larger objects is discussed further below on page 28-32.

TRAY PACKING



Cavity Packing

Materials:

- refer to basic crate construction for exterior shell, pages 6-18
- polyester urethane foam, 2 lb. density (dark gray Esterfoam)
- DuPont spunlaced aramid fiber sheeting (Nomex®)
- DuPont spunbonded olefin sheet product (Tyvek®)
- hot melt glue (ethylene vinyl acetate copolymer)
- cotton muslin (unbleached and unsized)
- aluminized polyethylene and nylon barrier film (Marvelseal®)

Application: generally used for packing fragile, three-dimensional objects

Cavity (or contour) packing is stacked layers of polyester urethane foam in a top loading crate with negative spaces (cavities) cut and contoured to fit the objects. The safety of the objects is of primary concern. If there are any questions as to how to pack objects using this method, contact SITES Registrar.

For ease of loading and unloading the foam layers, the crate interior can be lined with Tyvek®. Heavier and/or larger objects are packed in the lower layers of the crate. Lighter and more fragile objects are placed higher in the crate. Generally, the foam is 2" and 4" thick layers. Allow for foam on all sides, top and bottom, surrounding the objects to adequately cushion and protect the objects while in transit. Be aware of contact points on the object. Take into consideration proper dynamic cushioning curves (page 5) when cutting cavities.

Cut cavities with care using a sharp razor knife. Surfaces of the cavities are lined with a barrier material such as Nomex®, Tyvek® or cotton muslin. Choice of the lining material depends on the surface of the object being packed. Line bottom side of foam layer directly above object with same barrier material. To secure the barrier material, create an approximately 1" deep slit in the foam, following the entire exterior perimeter of the cavity/contour. Using back of knife, insert barrier material into said slit. **No adhesive should be used to secure material (can leak/drip onto object).**

Attach a list of the crate contents and write any special instructions on the top layer. Do not pack objects on the top layer. Number foam layers placing Layer One at the bottom of the crate and continue sequentially to the top layer. To confirm that each layer is always placed in its correct orientation, identify each one with:

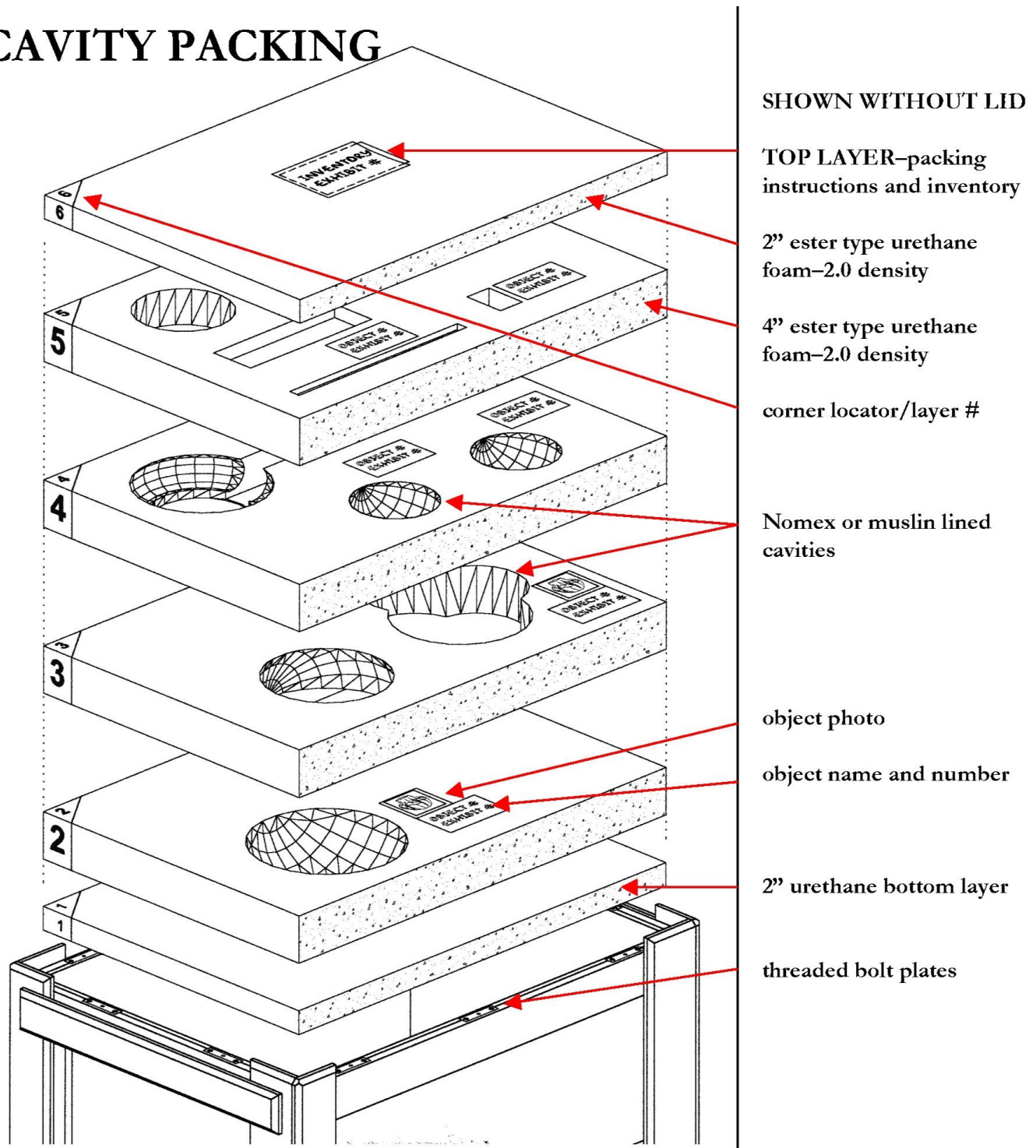
- crate number
- tray number
- an orientation mark, such as a black corner, that is consistent within crate

Identify each cavity with the object it holds. A photo of the packed object in the cavity along with the name or title, checklist number, and any special handling instructions should be attached to the foam beside the cavity. See drawing on next page for details.



Packed objects are removed from cavities before each foam layer is removed from the crate. When packing, the foam layer should be placed in the crate before objects are packed into cavities.

CAVITY PACKING



Sliding Wooden Tray, Brace Packing, and Fome-Cor Boxes

Materials:

- refer to basic crate construction for exterior shell, pages 6-18
- 1 ¼" 5/16-18 coarse thread, grade 5, hex head bolts
- wafer head screws
- ½" or ¾" exterior AC plywood panel
- 1" x 4" heat treated pine or poplar battens
- 1/8" tempered hardboard (Masonite®)
- expanded polyethylene foam (Ethafoam®)
- crosslinked polyethylene foam (Volara®)
- polyester urethane foam (Esterfoam®)
- DuPont spunlaced aramid fiber sheeting (Nomex®)
- DuPont spunbonded olefin sheet product (Tyvek®)
- cotton or nylon straps

Application: a sliding wooden tray allows the safe removal of the object or exhibition component from its crate with a minimal amount of handling

The object and the tray are secured into the crate during transit by several methods. Safety of the object is the primary concern. If there is any question about how to safely secure an object onto a tray, contact SITES.

The wooden tray is ½" or ¾" exterior AC plywood with the A side to the top. 1 x 4" solid wood battens are attached to the C side with glue and nails. Any protruding nail points are crimped back into the plywood. Two strips of tempered Masonite are glued and screwed to the bottom outer edges of the crate interior. These strips facilitate the movement of the tray in and out of the crate. Securing the tray from above are two wood battens attached to the crate wall with glue and drywall screws. Allow 1/16" spacing between the surface of the tray and the wall battens. Loops of cotton or nylon webbing attached to the tray using wafer head screws act as handles for the tray. The crate lid secures the tray from movement during transit. See schematic drawings on pages 29-30.

Objects can be secured onto the tray and into the crate by using a fitted brace. A brace is attached to the crate wall by means of a permanently mounted bolt fixture. See Brace Assembly drawing on page 31. The bolt plates are the same as used on the crate lid (pages 7, 12-13). Please note, the brace bolts are shorter than the 2" lid bolts. Instead, use 1¼" 5/16–18 coarse thread, grade 5, hex head bolts for the braces. The brace is made of solid pine or poplar. A T-beam configuration is stronger and more rigid, but depending on the object, a single batten could be used. The T-beam is two lengthwise wooden battens glued and screwed perpendicular along the center of one. Leave space at each end for a top bolt plate. Padding of appropriate foam and barrier material is attached to the underside of the brace. Contour the foam to fit the contact points on the object.

The bolt fixture that attaches to the crate wall is made of two blocks of ¾" wood with a threaded bolt plate attached to the inner facing block. The two blocks are glued and stapled together. There is a clearance hole below the bolt plate. Two edge locator pieces are also glued and stapled

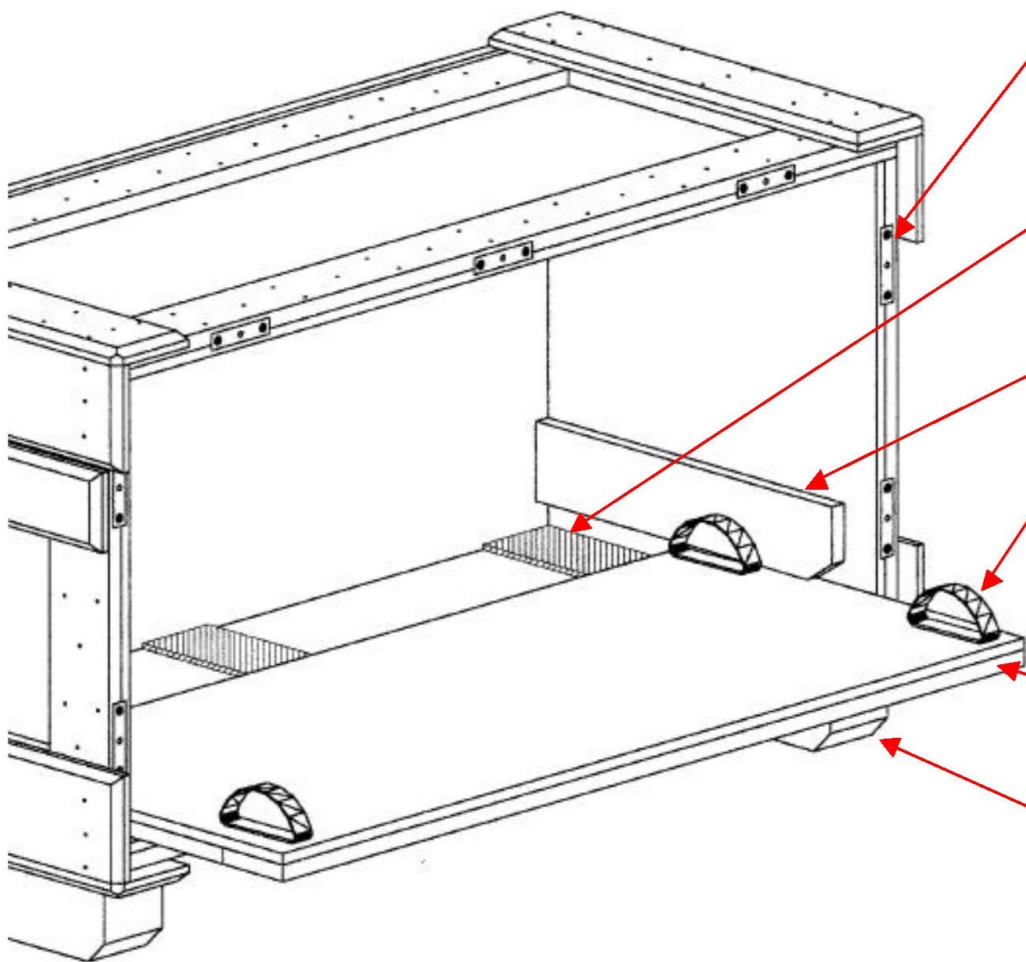


to the block. The fixture is glued and screwed to the crate wall from the outside at the appropriate position that secures and cushions the object.

On the interior side wall of the crate are packing and handling instructions, an inventory of the contents of the crate, and photos of the packing configuration of the objects. See “Labels and Markings for Crate Interiors,” pages 15-18 for more details.

SIDE-LOADING CRATE WITH SLIDING TRAY

SHOWN WITHOUT LID



threaded bolt plates—
routed, screwed, and
paper taped

1/4" tempered masonite
strips—attached with
countersunk screws

wall batten secures tray—
screwed from outside

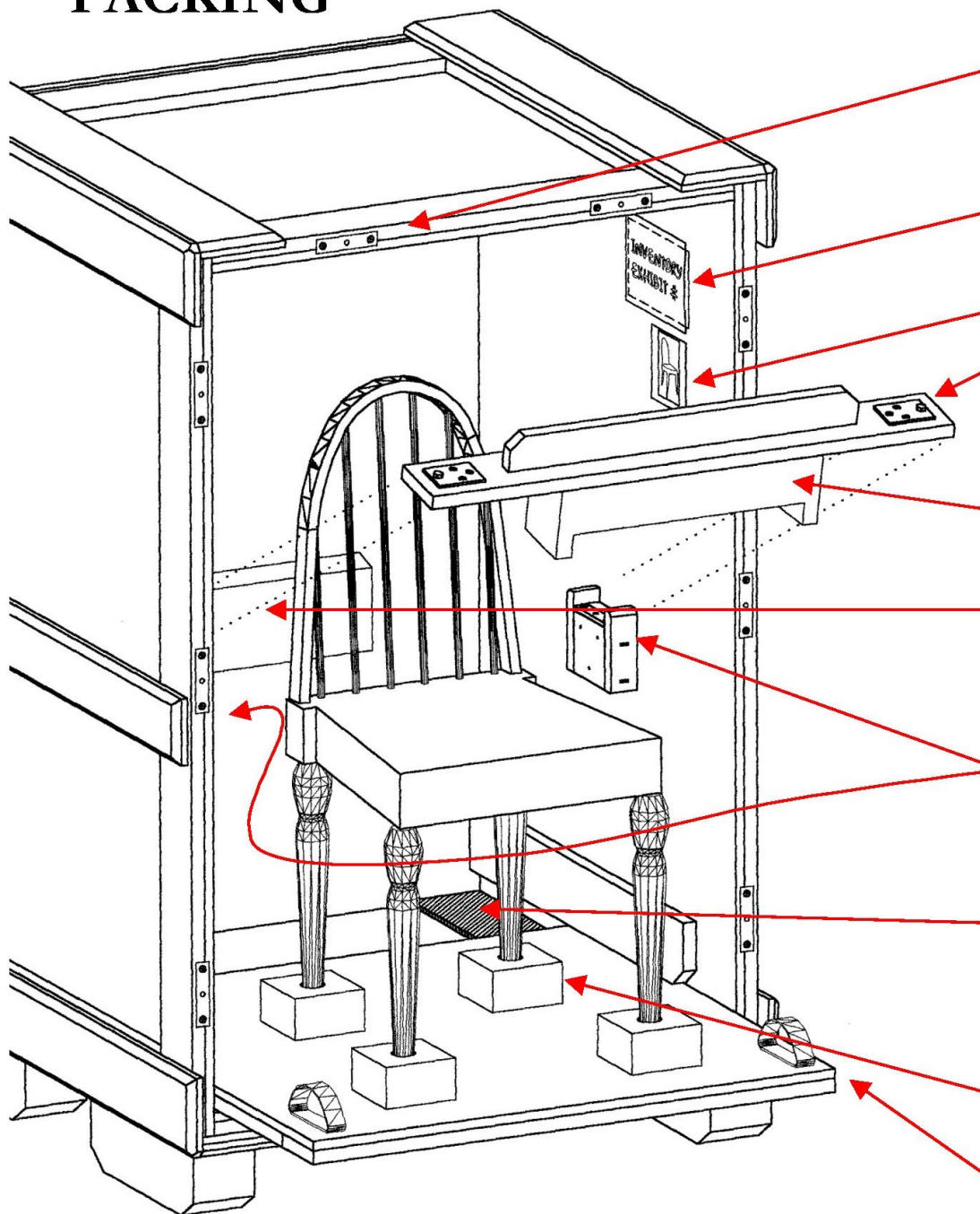
cotton web strap handles—
hot-melt glued and
screwed to tray

1/2" or 3/4" plywood and
batten panel—battens on
underside of tray

4x4 skids



SLIDING TRAY AND BRACE PACKING



SHOWN WITHOUT LID

threaded bolt plates—
routed, screwed, taped

packing and handling
instructions
inventory and crate no.

item photo

BRACE
1x4 wood brace, bolt plate
attached

foam—padded and covered
with Tyvek or Volara

ester type urethane foam—
Tyvek or Volara covered ,
hot-melt glued to crate
wall

bolt fixtures (2 per brace)—
screwed to crate wall from
outside of crate

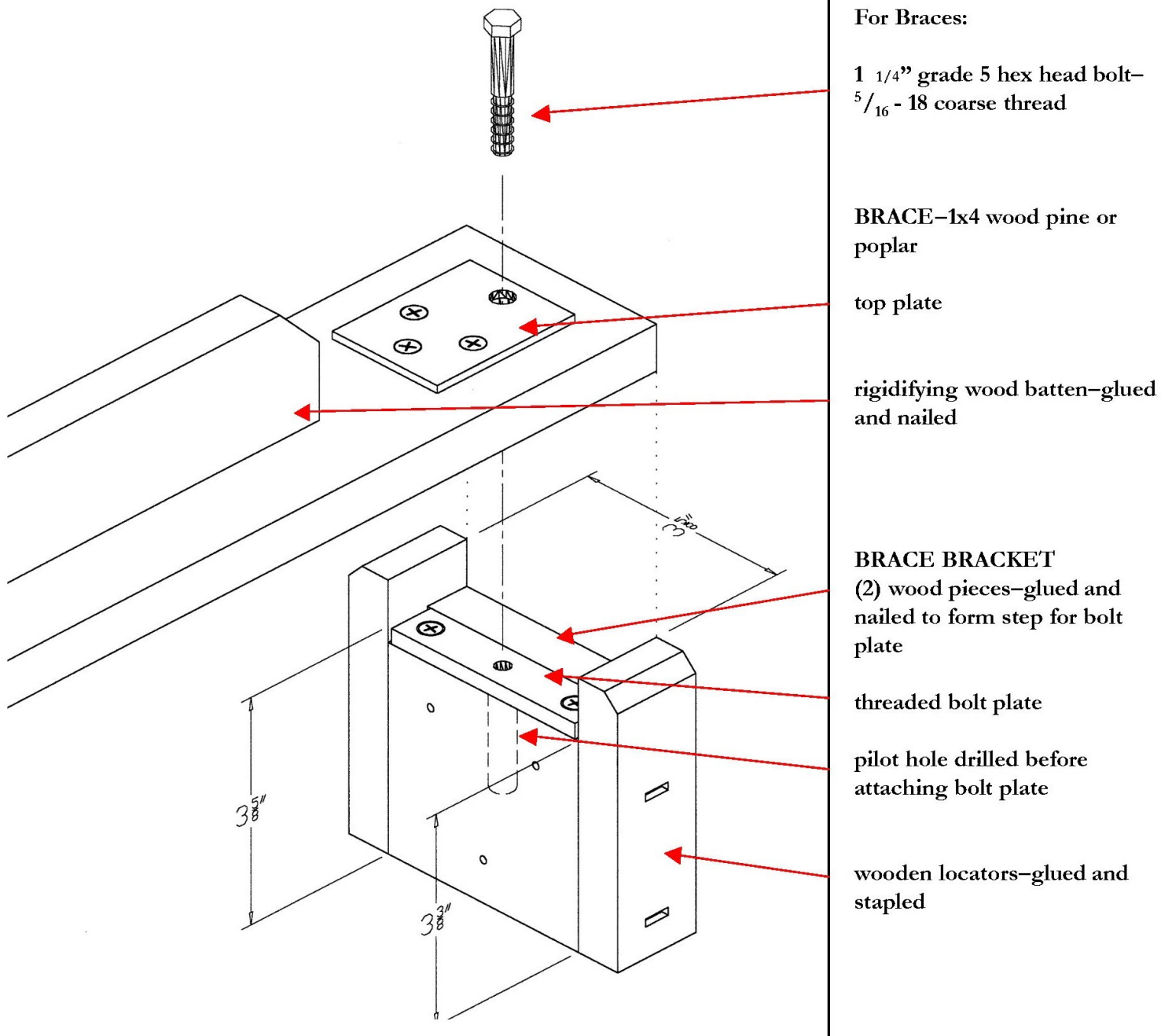
tempered masonite
runners—attached with
countersunk screws and
glue

polyethylene foam—volara
faced

sliding tray



BRACE ASSEMBLY



Wooden trays can be used for packing exhibition components, vitrines, interactives, and more. Several wooden trays can be implemented within one crate using the same building principles as described above, pages 28-31. Below are photographs of wooden trays with either padded wooden blocks or Ethafoam strips and Volara-padded web straps with buckles to secure components onto trays. Use either strap loops or wood blocks to slide trays in/out of crate.



Fome-Cor boxes can be used for packing objects and as needed, exhibition components, vitrines, and more. Either one or several Fome-Cor boxes with taped edges can be packed in one crate using the same building principles as described on pages 24-25. They can be stacked in a crate or on trays (either Fome-Cor or wooden) and either lifted or slid out.

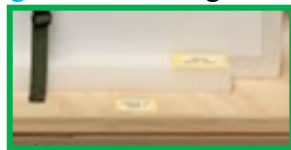
Velcro is the preferred fastener of a lid to the front of a box as tape pulls out of place over time. Top lid, front side, or both can open. Object is secured in box with Ethafoam lined with either Volara or Tyvek as braces. Object can slide out of its box either on an Ethafoam or wooden tray.



Fome-Cor Box Materials

- ½" White, clay coated paper liners laminated to an extruded polystyrene center (Fome-Cor®)
- ½" White, clay coated paper over a honeycomb kraft paper interior (Airlyte® Graphic Arts Board)
- 6 mil, 1" wide, white paper hinge tape for edging trays
- strips of expanded polyethylene closed cell, 2.2 lb density (Ethafoam®)
- hot melt adhesive (ethylene vinyl acetate copolymer)
- irradiated, crosslinked, closed cell, polyolefin foam (Volara®)
- 2" wide hook & loop fasteners (Velcro®)

Note **strap handles** on sides of top and bottom trays, **clear labeling on bottom tray**, and using a **playing card or matching letters** to designate tray location and orientation.



Slotted Crate

Materials:

- refer to basic crate construction for exterior shell, pages 6-18
- solid wood strips either pine or poplar, various sizes
- 1/8" thick polyester felt strips with an adhesive backing, various sizes
- expanded polyethylene foam strips (Ethafoam®)
- 1/2" exterior AC plywood panels
- hot melt glue (ethylene vinyl acetate copolymer)
- wood glue (aliphatic-resin or polyvinyl-acetate)

Application: used to pack framed graphic or text panels or structural exhibit elements

Slotted crates can also be used for framed objects if the frame stock is uniform and smooth, and the objects are mounted securely in frames (placed in slot in correct orientation). If there is any doubt as to whether objects are suitable for this method of packing, contact SITES.

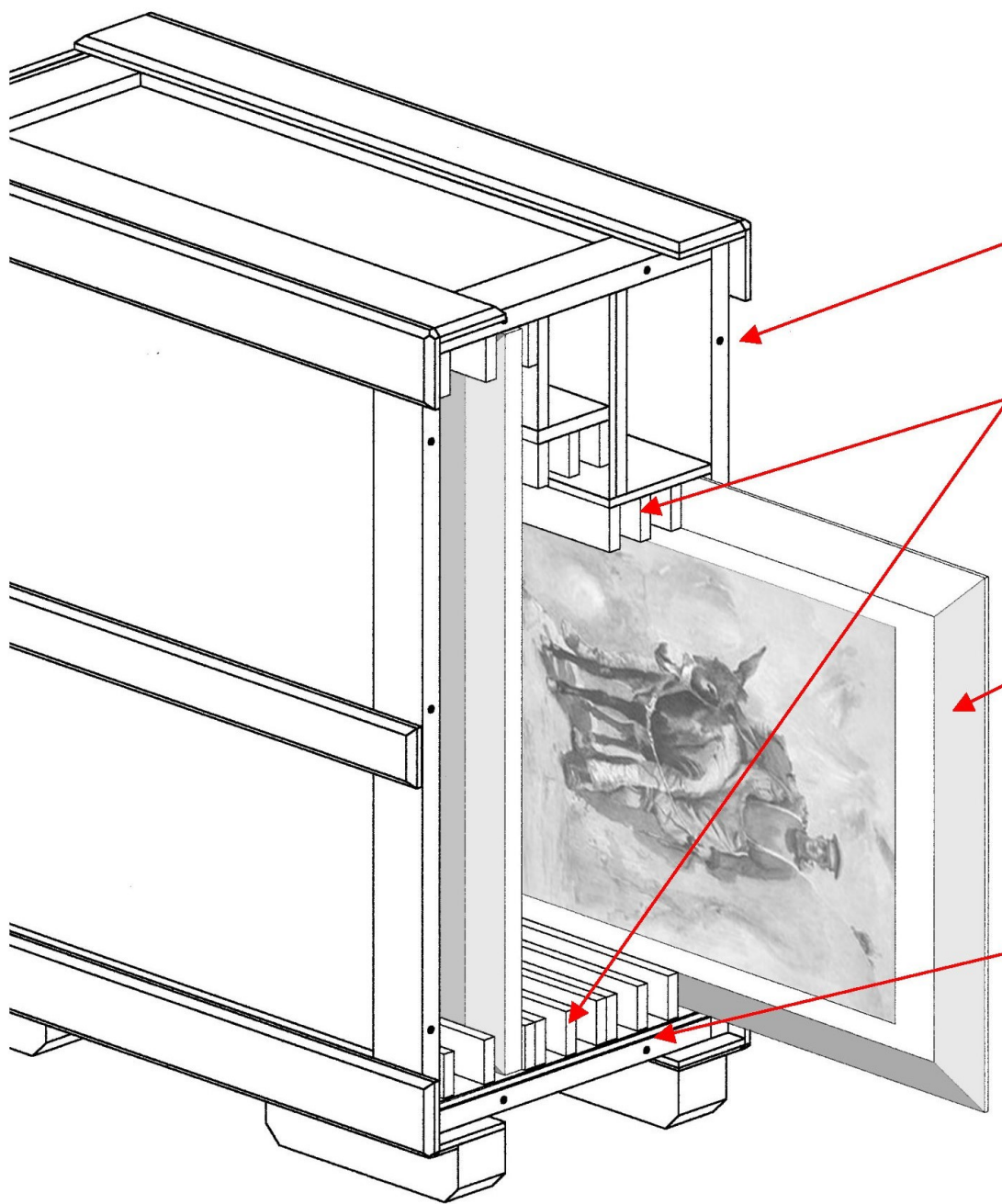
The slotted crate can be either top loading or end loading, depending on the material being packed. Wooden strips faced with polyester felt allow panels and frames to slide in and out of the crate with minimal force. These strips should extend the full length of the crate and be paired with matching strips at the top and bottom of crate or side to side. Expanded polyethylene (Ethafoam®) is not suitable material for slots; it is used for cushioning the frames at the bottom and lid of the top loading crate and the back and lid of the end-loading crate.

Wood strips are configured to limit the movement of the frames while in transit but allow easy packing and unpacking. Each slot is identified with the piece that it holds. Size variations are accommodated by buildups and plywood panels attached to the crate walls.

Surfaces in contact with frames or panels are covered with polyester felt. Felt should be securely attached to slots with hot melt glue and stapled at the ends. Be careful that any surface coming in contact with the packed object does not have protruding screw points, staples, glue residue, or anything that could damage the object.



END-LOADING SLOT CRATE



SHOWN WITHOUT LID

threaded bolt plates—
routed, screwed, taped

wood spacers—padded
with polyester felt and
screwed into place

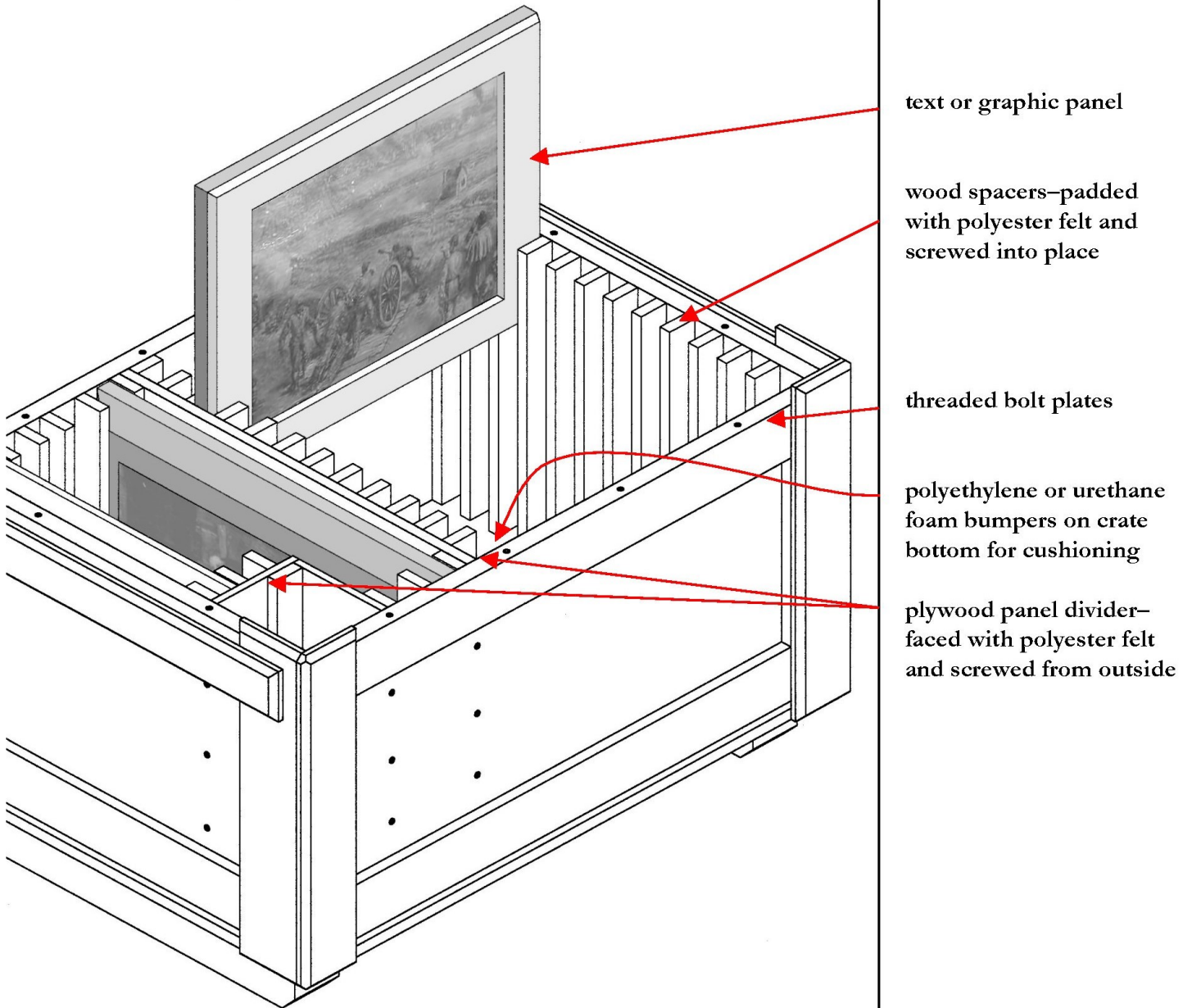
graphic or text panel

1/2" plywood floor—padded
with polyester felt



TOP-LOADING SLOT CRATE

SHOWN WITHOUT LID



Slat Crate

Materials:

- ½" or ¾" AC exterior plywood
- 1 x 4" heat treated pine or poplar battens
- 2 x 4" fir or pine
- 4 x 4" fir or pine (skids)
- wood glue (aliphatic-resin or polyvinyl-acetate)
- 1 ¼" x .086 common round wire nails
- 3" x .120 screw shank nails
- #6 bugle head drywall screws, various lengths
- #8 washer head Robertson drive screws, various lengths

Application: use for exhibit furniture, vitrines, wall or floor cases, or any object that does not require the protection of a solid wood paneled crate

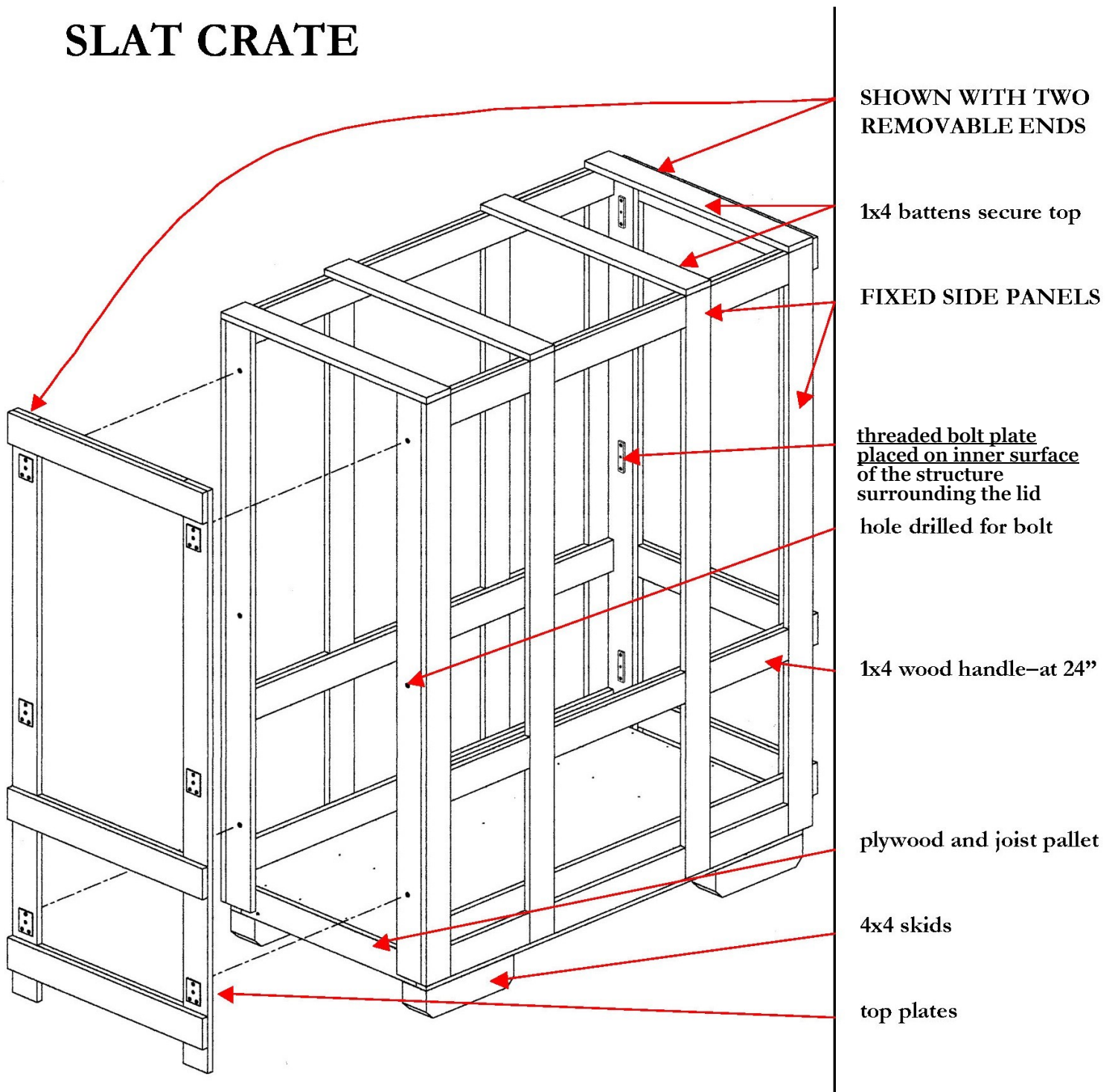
The slat crate can be a top loading or side loading crate, depending on the contents. The slat crate (or cage) is made primarily of 1 x 4" solid wood battens attached to a ½" or ¾" plywood deck supported by a floor joist configuration of 2 x 4" blocks.

4 x 4" skids are attached before the plywood deck is attached to the floor joist frame. The lid is attached using the same top and threaded bolt plates that are used in the construction of the solid sided crates, pages 7, 12-13. The difference is that after drilling holes for the bolts the threaded plates are placed on the inner surface of the structure surrounding the lid and screwed in place. Vertical L-beams are in the four corners with battens attached both horizontally and vertically forming a cage structure. The L-beams extend below edges of the plywood deck surface and attach to the 2 x 4" structure with nails and screws.

The interior of the slat crate can be configured as a slot crate or with bottom and side blocks that secure the object in place. Surfaces should be protected and the object identified in the packing as described and shown in **Sliding Wooden Tray, Brace Packing, and Fome-Cor Boxes**, pages 28-32. Padded web straps with buckles can be used as well as wood braces to secure objects in slat crates. If there are any questions concerning construction or packing using this method, contact SITES Registrar.



SLAT CRATE



Floor Joist Pallet

Pallet materials:

- ½" or ¾" exterior grade AC fir plywood
- 2 x 4" heat treated, fir or pine (floor joists)
- 4 x 4" pine or fir (skids)
- 1 x 4" heat treated, solid pine or poplar battens
- 1 ½" x .086 common round wire nails with diamond points
- 3" x .120 screw shank nails
- #8 washer head Robertson (square) drive screws, various lengths
- wood glue: aliphatic-resin (yellow carpenter's glue) or polyvinyl-acetate (PVA white glue)

Applications: as part of the crating for large exhibition components, especially exhibition cases with acrylic bonnets

Pallets may be used by themselves, with braces or other items, and with custom blankets.

Remember, in general crated/palletized items should not exceed 6 ½ feet in height or 5 feet in width. The goal is to move them through a standard 7 foot double door without mullions using a pallet jack. The floor joist can be up to 8 ¾" in height (and a wooden cap described on pages 45-48 adds pallet 1 ¾" in height) without the exhibition component being packed. If this is a problem, call SITES Registrar.

See drawings on the next four pages (39-42) of step-by-step construction of a floor joist pallet.

Pallet Deck:

The pallet is made of a ½" or ¾" AC exterior plywood, supported from below by a floor joist configuration of 2 x 4" fir or pine blocks. Joints are glued and reinforced with nails. Attach battens to plywood panels by driving 1 ½" common round wire nails with diamond points through the batten and plywood. Then crimp the exposed points back into the panel. This is best accomplished with a pneumatic nail gun on a steel faced worktable. Crimped nail system is stronger than pneumatic driven 15- or 16-gauge wire. Finishing nails are not acceptable. The pallet must extend beyond the base of the exhibition element it contains by at least 4" in all dimensions.

Skids:

- Fir or pine 4 x 4 x 12" blocks beveled at ends on bottom.

To attach first glue skid to bottom of crate, then nail and screw from inside of crate with 3" screw shank nails and #8 3" washer head Robertson drive screws. Stacked 2 x 4" blocks or plywood are not acceptable as skids. The skids must allow for 3 ½" clearances (from the floor) for lowered forks on pallet jacks.

Attach skids parallel to length of crate unless overall crate size does not permit pallet jack entry. Narrow width crates can have full width skids running front to rear. Consider size of standard pallet jack widths when planning placement of skids; the cross members of the joist construction



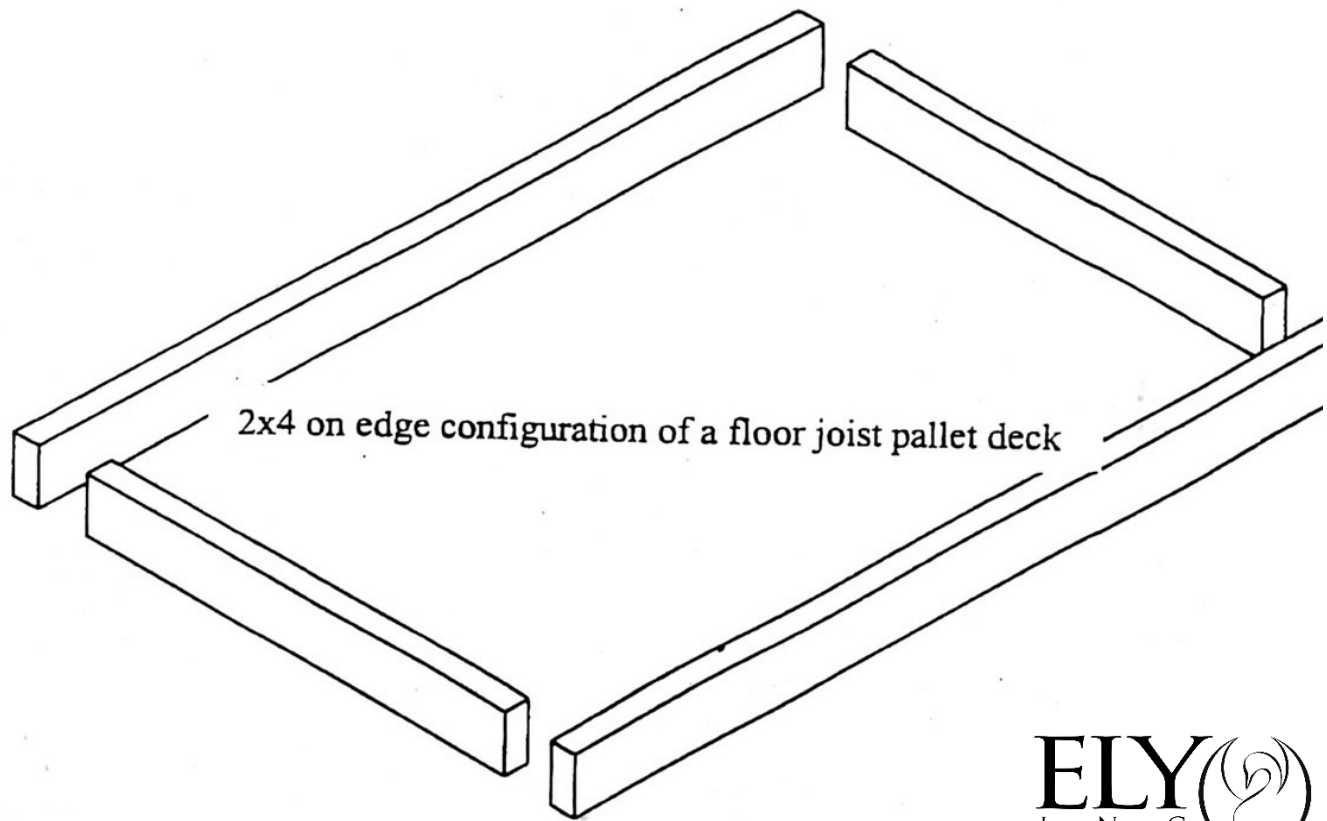
should not interfere with the use of a pallet jack. SkidMates® are acceptable substitutes when solid wood skids cannot be used. Confirm their use with SITES Registrar.

Exteriors and Stenciling:

Pallet exteriors are sealed with two coats of clear, semi-gloss, water-based polyurethane or acrylic. Coating should cover all sides except the underside. Apply with either roller or sprayer. Allow drying before stenciling crate.

Follow the stenciling specifications on page 8. SITES standard dimensions order is H x W x D". SITES also asks that crated/palletized components be weighed. Mark the exhibition number on each disjoint part of the crate/pallet (lid, blanket, shell, etc.) with a yellow background. SITES Registrar will provide exhibition number and item number for each pallet.

Floor Joist Pallet, Step 1

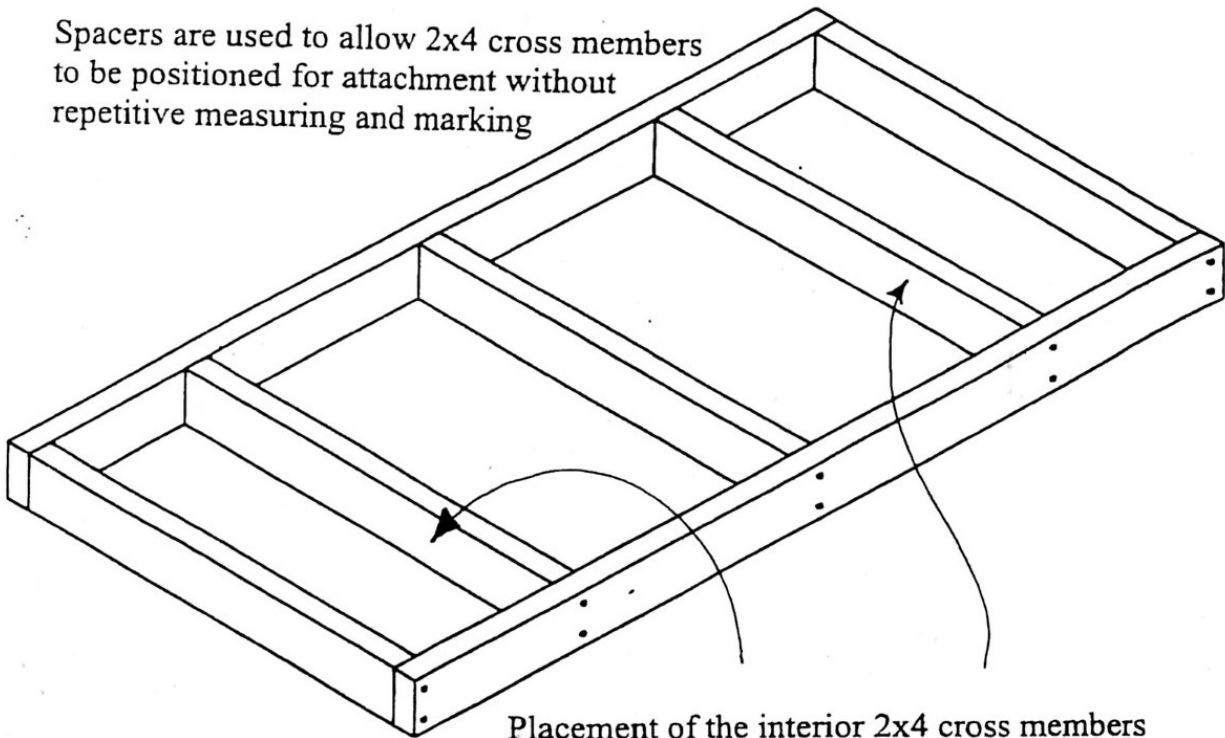


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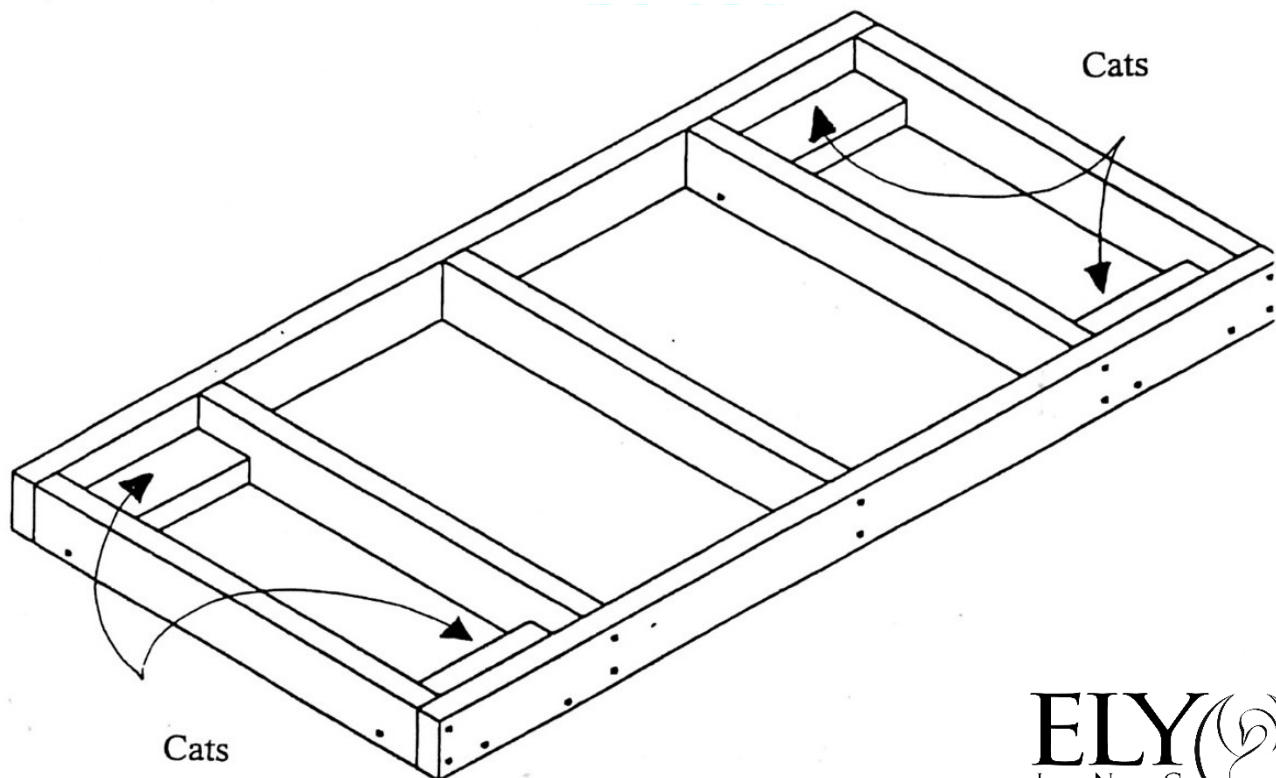


Floor Joist Pallet, Steps 2-3

Spacers are used to allow 2x4 cross members to be positioned for attachment without repetitive measuring and marking



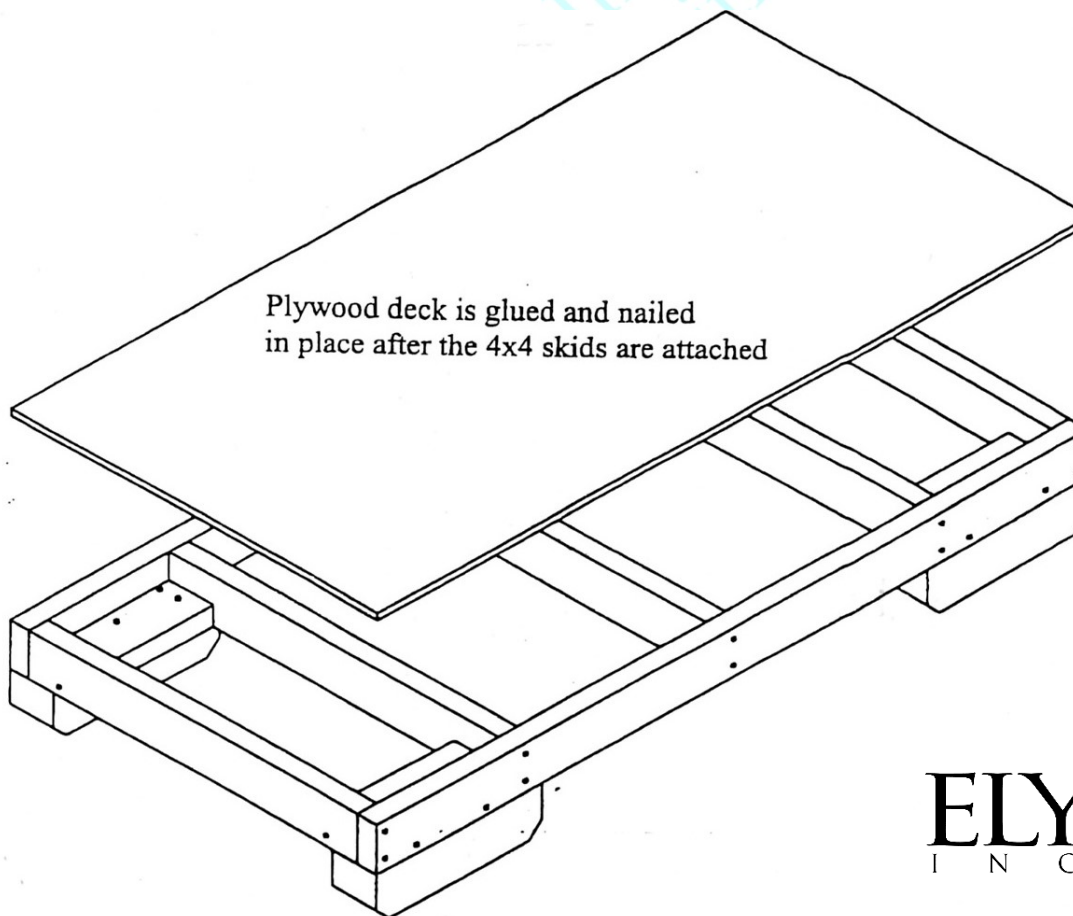
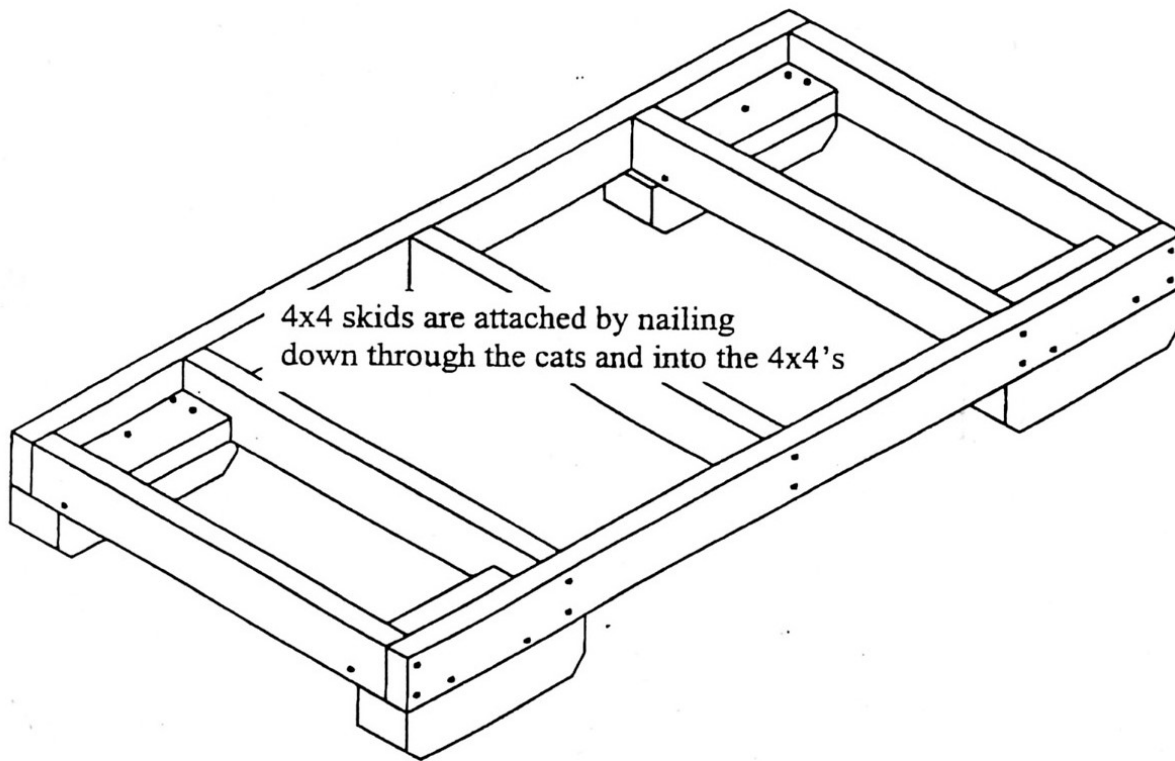
Placement of the interior 2x4 cross members has to accommodate the cats to which the 4x4 skids are attached.



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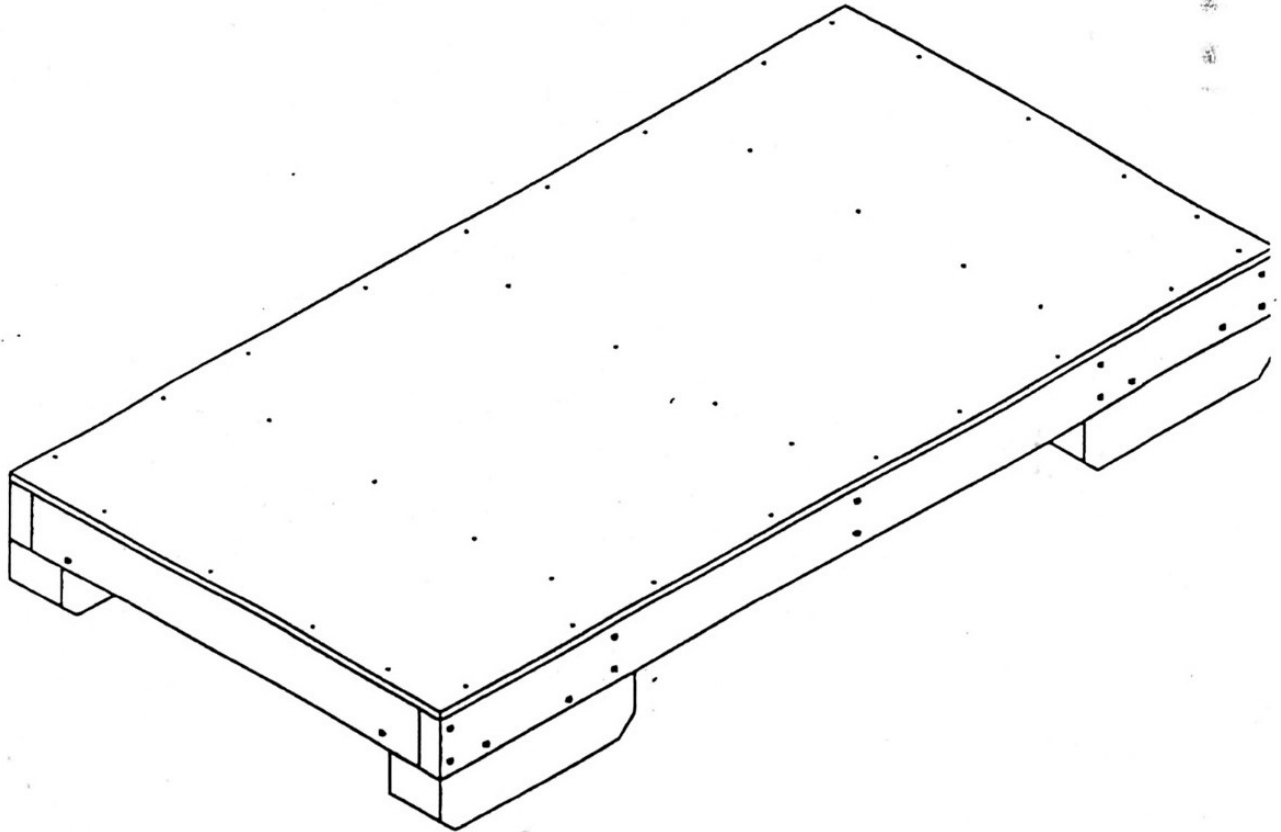
Floor Joist Pallet, Steps 4-5



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Floor Joist Pallet, Step 6



Trim edges of plywood deck flush with the 2x4 members
This will facilitate the attachment of structures added to the pallet



Smithsonian
Traveling

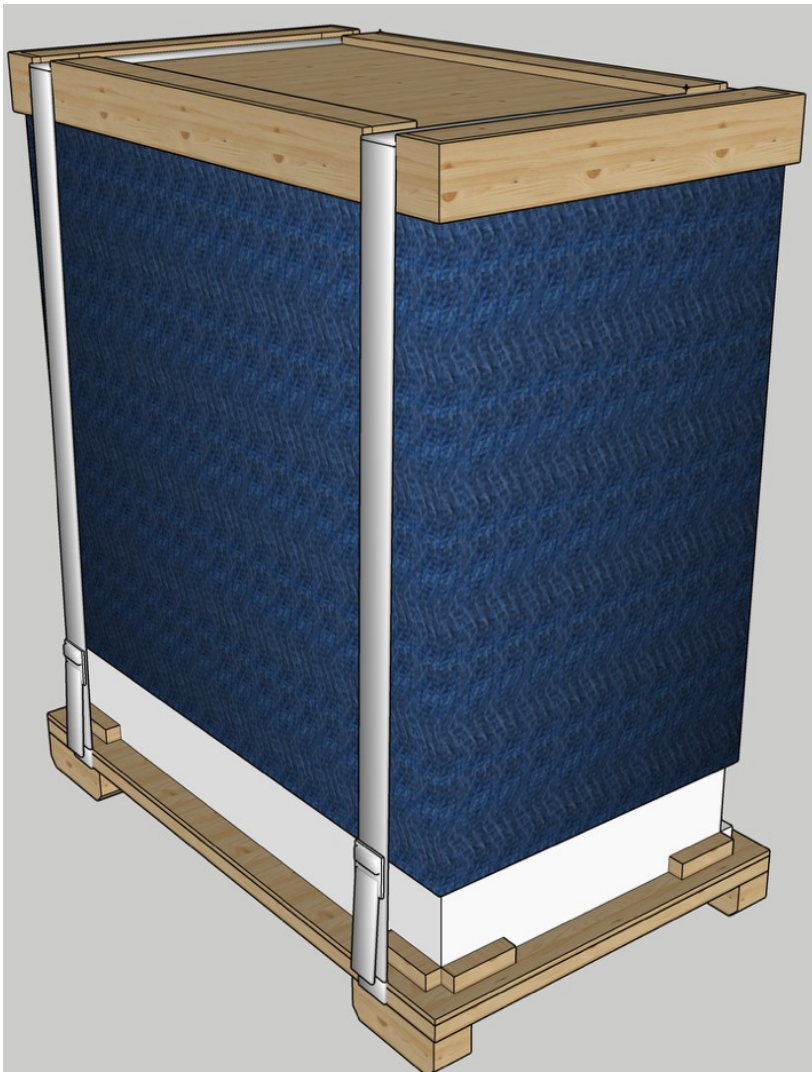


Custom 3-D Blanket

Application: blankets are used to protect exhibition elements on pallets and that are forklift or pallet jack accessible (such as large exhibition cases)

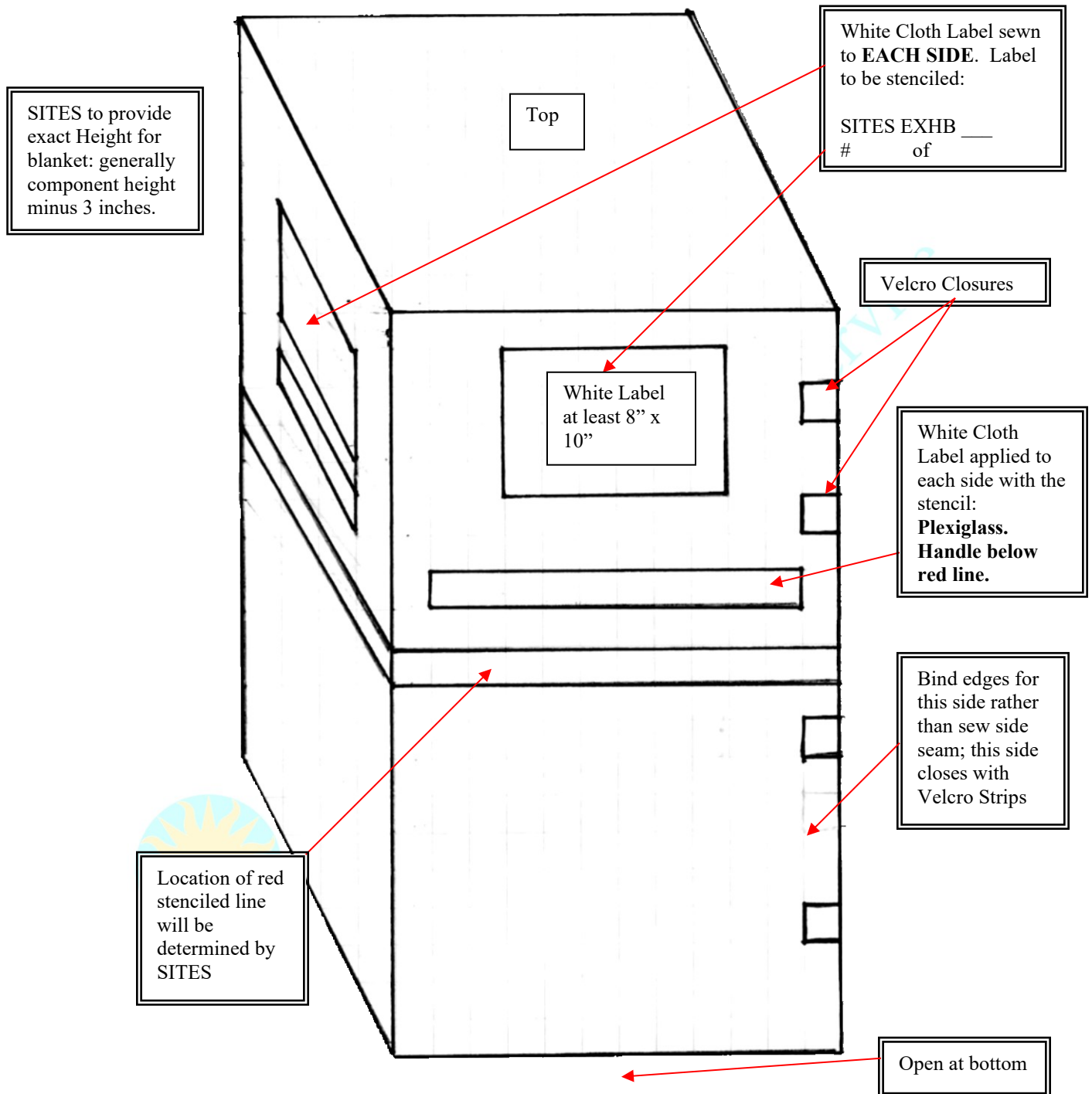
The blanket materials should be soft enough to resist damaging the surface of the element and tough enough not to tear during shipment. Typical materials include a canvas outer layer and a moleskin inner layer or both layers of DREADNAUGHT® material, with a padded middle layer which is zig-zag, lock-stitched into place. Each custom blanket should be open at the bottom. All blankets should have at least one side open (see pattern and description) to assist in covering the element with the blanket.

Custom blankets are generally made by specialty companies. Contact the SITES Registrar to confirm your source before placing an order.



Sample Custom 3-D Blanket

SITES will provide width and depth dimensions of the element. Vendor to calculate and to add appropriate allowances to those dimensions. The SITES Registrar may provide additional specifications for the label.



Pallet with Blanket and Cap for Exhibition Element

Materials:

- floor joist pallet
- custom 3-D blanket
- ½” or ¾” exterior grade AC fir plywood
- 1 x 4” heat treated, solid pine or poplar battens
- 2 x 2” poplar (blocks)
- 1/8” or ¼” thick polyester felt
- 1 ½” x .086 common round wire nails with diamond points
- 3” x .120 screw shank nails
- #8 washer head Robertson (square) drive screws, various lengths
- carpenter’s staples
- hot melt glue
- wood glue: aliphatic-resin (yellow carpenter’s glue) or polyvinyl-acetate (PVA white glue)

Applications: for exhibition cases, which ship assembled having the acrylic bonnet attached to the base.

As long as the cases are within the appropriate dimensions, they are palletized and covered by custom padded blankets (toaster covers) with a cap at the top. Blocks on the pallet stop the case from shifting on its horizontal axis. The entire construct is strapped down to prevent motion on the vertical axis. This crating protects the acrylic from excessive vibration and the pallet acts as a buffer between the case and other crates. Once uncrated, the blanket is sandwiched between the cap and the pallet with the strap encircling everything in order to have a neat package for storage.

Remember, in general, crated/palletized items should not exceed 6 ½ feet in height or 5 feet in width. The goal is to move them through a standard 7 foot double door without mullions using a pallet jack. The floor joist can be up to 8 ¾” in height and the cap adds pallet 1 ¾” in height, so that is 10 ½” in height without the exhibition component being packed. If this is a problem, call SITES Registrar.

Contact SITES to see if this type of crating is appropriate for a specific element.

Blocking:

Locator or register blocks for the case are made of 2 x 2” poplar. The blocks are attached to the pallet around the outside perimeter of the case by Robertson drive screws. The blocks should snug up to the kick plate of the case. They are covered with 1/8” or ¼” thick polyester felt over the facing edge of the block (the side next to the piece), part of the sides of the block and the complete top of the block. Secure with hot melt glue and staples.



Caps:

A cap for the palletized floor cases is made in the same manner as a crate panel, as described in the **Basic Crate Shell Construction** instructions on page 6. A cap is made of a ½” or ¾” AC exterior plywood with 1 x 4” battens on the top. The flat side of the cap rests on the top of the acrylic bonnet. Joints are glued and reinforced with nails. Attach battens to plywood panels by driving 1 ½” common round wire nails with diamond points through the batten and plywood. Then crimp the exposed points back into the panel. This is best accomplished with a pneumatic nail gun on a steel faced worktable. Crimped nail system is stronger than pneumatic driven 15- or 16-gauge wire. Finishing nails are not acceptable. The cap should be 2” larger in all dimensions than the acrylic bonnet but needs to be smaller than the pallet in length and width.

Place the battens to create notches to accommodate two webbing straps (webbing to be at least 1” in width) with saw tooth buckles. Since the entire cap extends past the acrylic bonnet, the straps will not rub against the acrylic.

Cap exteriors are sealed with two coats of clear, semi-gloss, water-based polyurethane or acrylic. Coating should cover all sides except the underside of the cap. Apply with either roller or sprayer. Allow drying before stenciling.

Straps:

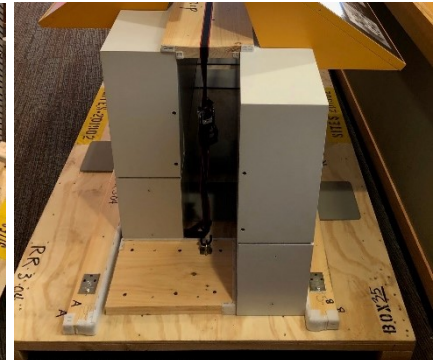
The straps are placed parallel to each other and run from the back of the pallet over the cap to the front of the pallet. The “tongue” of the strap is dipped in polyurethane or similar material to prevent fraying. The straps are hot glued and screwed to the sides of the pallet with washers and with Robertson screws with a shouldered head the appropriate length and size for the thickness of the belt and the pallet. Each strap is in two parts, one long and one short. The short piece has the buckle and is fastened to the pallet. The long piece with the “tongue” comes over the top.

Blankets:

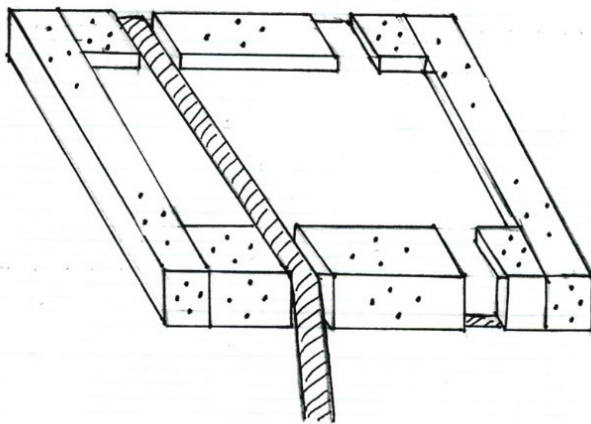
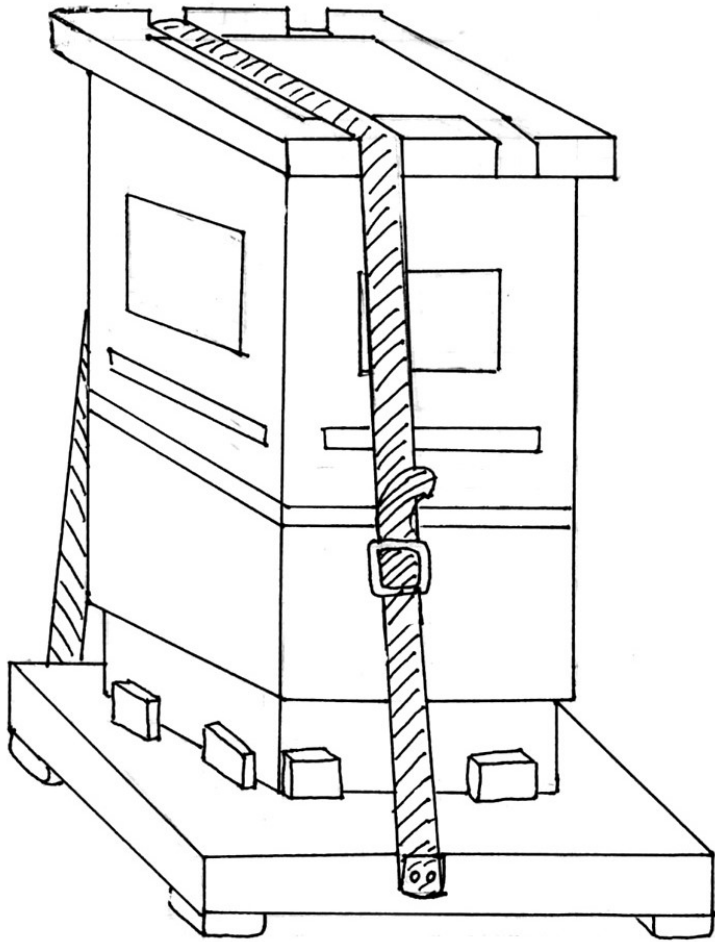
See description and schematic drawing of **Sample Custom 3-D Blanket**, pages 43-44.

Stenciling:

Follow the stenciling specifications on page 8. SITES standard order of dimensions is H x W x D”. SITES also asks that crated/palletized components be weighed. The exhibition number is to be marked on each disjoint part of the crate/pallet (lid, blanket, shell, etc.) with yellow background and will be provided by the SITES Registrar.



Pallet with Blanket for Exhibition Element



The battens on the cap face UP. If the battens face down, they can strike against the acrylic bonnet and damage it.



Details for Pallet with Blanket for Exhibition Element

Don't forget: the short piece has the buckle and the long piece has the "tongue".

Make sure that the buckle is attached so that the strap can be removed.



The strap attaches with glue, screws, and washers to the **SIDE** of the pallet.



Crating Odd Sized Items

Objects and exhibition furniture, especially cases and large panels, may be larger than a truck or museum door when packing in a traditional horizontal or vertical axis. Very narrow items crated separately, such as large paintings, may fit through the door, but do not have a large enough footprint to be stable. Be creative when planning the crates for these items – the use of diagonal braces or A-frames can allow these items to be handled with ease and be stable when shipped.

For example, this large and narrow framed object pictured below had dimensions of 95”H x 97”W x 3”D, which was too tall for many standard doors and also was not deep enough to rest safely. By attaching the entire crate to an A-frame on skids so the crate rested on the diagonal had a more stable depth of 48”, the item then was able to move through most doors and not require special strapping and bracing when shipped or stored.

Crate with A-frame attached



Close-up view of A-frame



Crating Odd Shaped Items

When crating an item, if adjustments cannot be made to the crate to accommodate truck and door sizes or if the object is of an unusual shape, consider creating or modifying additional equipment to allow safe movement and handling. A crate does not only serve as protection during shipment; it often serves as a container for objects and exhibition structure during movement through museums and during installation. For installation, SITES prefers to have exhibition structures go straight from the crate to the wall or floor and objects go straight from the crate to where it will be displayed.

For example, pictured below is a modified refrigerator truck used to transport tall and heavy display cases through a standard double door and a standard passenger elevator. By using the truck, staff can tip the case get through doorways and into smaller spaces.

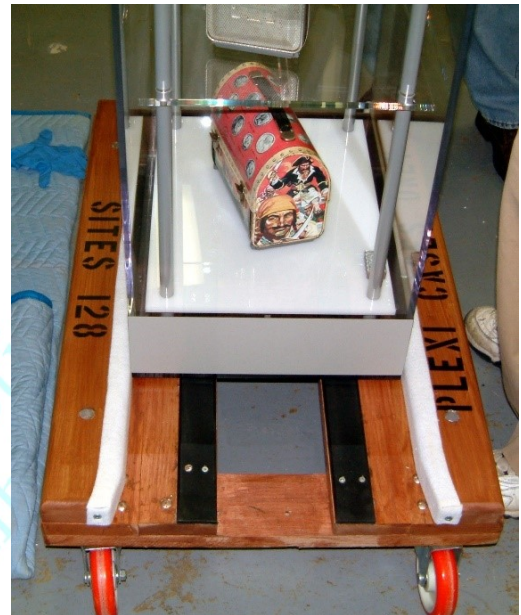


For another exhibition, the vitrines for object display separated from their bases for travel. However, because the method for connecting the vitrine to the base was a metal channel at the bottom of the vitrine, they could not be set flat on a surface. Since the objects traveled bracketed inside the vitrines, the vitrines had to remain upright at all times. The crate interior was specially fabricated for these channels. In addition, the crater constructed special dollies to support the vitrines during unpacking and movement in the exhibition area. The dollies and the crates were matched so that as the vitrine was removed, it could slide directly from the crate onto the dolly. The vitrine was then supported so it was stable on the dolly and the channel kept clear. Finally, the crater fabricated a special top for the crate so the dollies traveled safely and were immediately available for unpacking.

Packed Vitrines



Vitrine on Dolly



Packed Dollies



Additional Crate Interior Images

