Crating Designs

Travelling exhibitions and long term storage

Overview

WHAT IS A MUSEUM CRATE?
Various specifications

EXTERIOR
Materials and design
Joint construction
Variants: End loaders and A-frames

INTERIORS
Materials and design
Variants: travel frames , skeleton crates
Case studies- Calder and Hess
What works and what doesn't
Long term storage in crates

Open forum for questions and answers

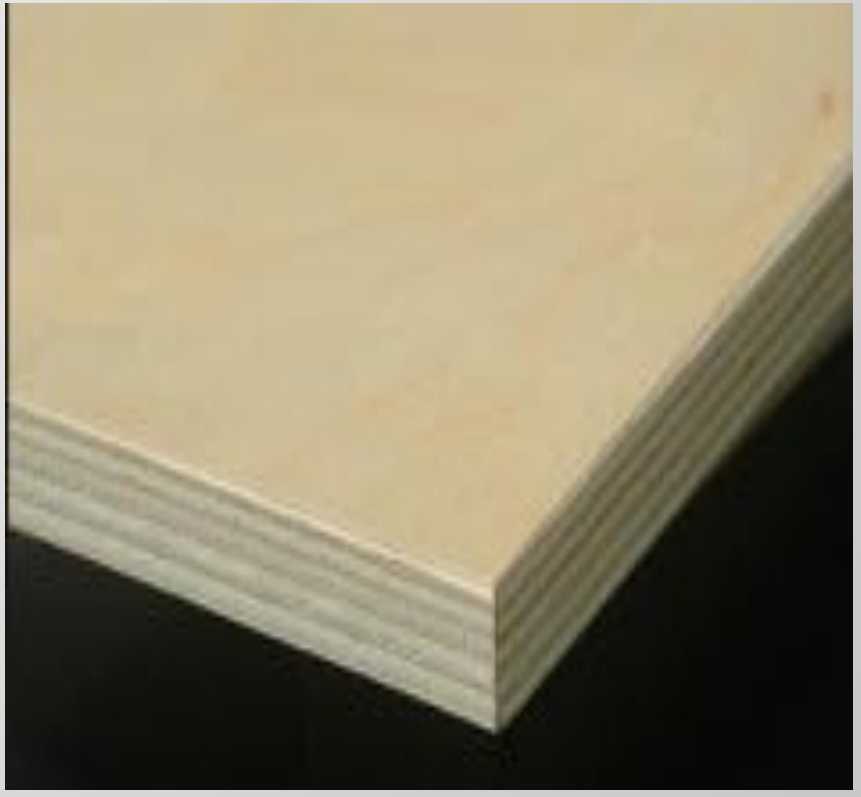
Types of Materials Used in Museum Crates: Exterior

ACX Exterior Grade Plywood:

- Layered softwoods using phenol-formaldehyde adhesive
- Has acidic off gassing from the soft wood as well as some off gassing from the Formaldehyde.
- Lining the crate will greatly reduce the off gassing effect.
- It is a good building material, but not as good as MDO.

Birch Plywood

Mostly made in china, renewable forest production. It has similar properties to ACX plywood. Prettier but has thinner veneer. Usually a Birch face with Poplar core



MDO Plywood

MDO: (*medium density overlay)*

- The exterior glue is a thermosetting phenolic resin system comprised of cellulose fiber based overlay. Phenolic resins are the most stable of all plywood adhesives. It has excellent off gassing properties and is almost water impermeable. By far, the best and most expensive crate construction material.
- Is heavier than other plywoods.
- Cuts very clean due to face material.

Battens

Batten Material:

- Pine battens. Battens go on the exterior and reinforce the joints of the crate as well as provide inset for lids.
- Must be “KDHT” for international travel. Plywood can also be used but crates become very heavy and routed edges are never clean.

What is a museum crate?

- Commercial perspective
- Museum perspective
- Communication

What is a museum crate ? ICEFAT

Minimum requirements for ICEFAT members:

#1 Crate should be built of ½ inch to ¾ inch plywood material if plywood is used it should be painted or varnished with waterborne polyurethane or Acrylic paint

#2 Crate should have battens on all surrounding edges for strength

#3 crate should have some moisture barrier

#4 crate should have some reusable closing system for multiple use

#5 crate should have a gasket to prevent water leakage made of Polyethylene Neoprene or silicone material

#6 Crate should have handles apx 22-24 inches high from floor

#7 crate top should be designed flat so to prevent water seeping in

#8 crate should have skids so it can be moved with a fork and pallet jack

#9 Crate should have thermal insulation foam as well as shock absorption foam

What is a Museum Crate? SHIP/ART

- Case walls to be made of ½" plywood; double sided MDO preferred
- 1" X 6" or 1"x 4" battens glued & nailed around all sides
- Corners have alternate overlapping butt joints of 1" x 6" or 1 x 4"
- All exposed edges should be beveled or routed.
- All wood must be high quality and sanded (if necessary) to prevent splinters
- All seams should be joined with waterproof, wood glue and sealed with silicone
- Skids are provided on all crates for access by forklift or pallet jack
- The crates must have securely attached wooden "bar" or metal handles for lifting
- Minimum 1" r tech poly faced polystyrene insulation; ester or EPS on request
- Lids must be sealed with neoprene or EPDM gaskets
- Reusable closure such as bolt and plate or cam lock closures
- Mark exterior with standard markings (broken goblet, umbrella, etc.) and arrows to indicate correct travel position of crate
- Mark crates with dimensions and packed weight
- When possible cases to be constructed of a size allowing handling by two people with dollies
- All cases are made ISPM 15 compliant and are marked with internationally recognized stamp
- Exteriors to be coated with water-based paint or clear coat
- Interiors to be constructed with archival materials and create microclimates

Museum of Contemporary Art Chicago

General Packing/Crating Specifications Revised 9/24/2014

Exterior (all crates):

- Lacquer: water-based, clear urethane
- Stencil arrows, "fragile" and keep dry symbol on all sides
- Write dimensions and weight on lid (no other permanent markings should be on the crate)
- Attach reinforced handles (wood or metal) on at least two sides. Should be at least 22”-24” high
- Flat on top - no battens
- Use 1/2” bolts and plates.

Construction:

- 1/2” or 3/8" MDO plywood. EU approved wood, stamped on each side.
- 1 x 4 (minimum) pine battens glued & nailed around all sides (not on top unless top load).
- Round and sand all edges.
- Glue seams before nailing.
- Inset lid with gasketing (all removable sides should be gasketed.)
- Use 2 x 4 or 2 x 6 skids on bottom to accommodate pallet jack or 4 x 4 skids for larger and heavier crates.
-

Museum of Contemporary Art Chicago

Interior:

- Line with 2" of gray esterfoam or EPS*, as appropriate, on all sides and glue it down.
- Additional 2" of esterfoam or ethafoam, as appropriate, on bottom/riding edge
-
- **Paintings:**
- Do not wrap paintings
- Side (end) load with travel frame for smaller, mid-size paintings as appropriate
- Masonite slide for travel frame (see travel frame specs below)
- For front loaders, consider 2-part crate lid for extremely large 2D works

MCA Specs Continued

Travel frames:

- Build for OZ Clips with standard wooden blocks and bolts
- Coroplast lid with stenciled upright arrows and “fragile”.
- Coroplast secured with 9/16” wafer-head screws from the outside of the t-frame (no tape or screws on the inside of the t-frame
- Attach folding metal handles to each side of travel frame (no straps)
- Dimension around painting should be at least 5” (unless otherwise discussed due to weight/height issues)
- Use locking bolts to secure Oz-clips – no wing nuts.
- Generally, we do not wrap Works.

MCA Continued

3-D Objects and furniture:

- All bracing and pads should be esterfoam or ethafoam, as appropriate, and covered in soft Tyvek/ Volara/Dartek as specified
- In cases where braces must be secured inside of the crate, 1/2" bolts and plates should be used
- If specified, braces may be screwed into place from the outside.
- Heavy furniture should rest on Masonite or Tivar for sliding purposes.
- For the heaviest objects, break-away crates will be specified

Cavity-pack:

- Cut cavity out of esterfoam (for heavier objects) or ethafoam to fit the contour of the object
- Line cavity walls with soft Tyvek, Volara, or Dartek as appropriate or specified
- Generally, objects are not wrapped.

Whitney Museum of American Art

General Specs.

- All crates should have clear, concise and detailed packing instructions (with images if possible) inside the crate, positioned so that they are easily available for reference.
- Upright /Ride Flat/End load / Break-Away
- Constructed of ½ in MDO Plywood
- "1 x 4" pine battens glued and stapled
- All pine stamped "Heat Treated"
- Gasketing (1/4) stapled all around lid or lids.
- Skids secured to bottom of crate with glue and screws.
- Skids can be 2 x 4's for lighter smaller crates. 4 x 4's should be used for larger heavier crates that will require the use of a pallet jack. The bottom of skids should not be painted. (See below)
- Wood Handles should be set at 22-24 inches in height. Handles should be glued and screwed.
- Battens and Skids should be placed so that the crate is stable when being transported on one or more dollies. Skids should be placed in such away as to allow a J-bar or hand truck to be used. This means either skids are inset or there is space between them.
- Removable panels should be secured with bolt plate closure.
- Non-removable joints should be glued and screwed.
- Note: the bottoms of the skids should not be painted.

Whitney Museum of American Art

Exterior Specs:

- Upright / Ride Flat / End load / Breakaway
- The crates are to be painted "Whitney Green" (Sherwin Williams #6920 semi gloss)
- Stencil arrows indicating which way up and "Fragile" and "Keep Dry" on 2 sides.
- Attach well placed handles at a height of 22-24 inches wood (glued and screwed)
- Use ½ inch bolt plates to secure the lid unless there is a compelling reason to use screws
- Top of crate should be flat with no battens
- The dimensions and weight are to be written neatly on at least two sides.
- Large ride flat crates should be marked to indicate which side tips up.

Whitney Museum of American Art

General Interior Specs:

- Upright / Ride Flat / End load / Breakaway
- Insulation:
- Line crates with 2in Grey Ester Foam on sides, 4 in on riding edge.
- Note: Ester Foam can be covered with Marvel Seal for works that appear sensitive to off gassing.
- Or
- 2in of EPS* all around with 2 in. bumpers of Ethafoam
- NOTE: if the crate is going to serve as a storage container for the pc after it has returned from a loan, then the insulation material should be EPS*.

Crate Specific Interior Specs:

- Tray Pack / Flat Pack
- Please Note: It is inadvisable to mix small works and oversized works together in the same crate in trays.
- Works to be wrapped in Glassine or other appropriate material like Photo-Tex, Silicone Release Paper or Dartek. The package is then wrapped in plastic with all seams sealed.

Whitney Museum of American Art

Travel Frame General Specs:

- WMAA places foam below the work as a preventative measure to guard against OZ-Clip failure (more on this below)

- The actual frame of the travel frame should be ¾ inch pine joined to create a four sided L shaped channel (not slatted) around the perimeter of the artwork with cross braces joined in the center or at regular intervals to provide rigidity. Furthermore Corrulite should be affixed to the negative space between the wood on the front and back.

- Allow for inside dimensions of 3 inches beyond frame edges (painting edges if unframed) for OZ-Clips.

- Use wing nuts and lock washers to fasten OZ-Clips to travel frames. WMAA does not recommend the use of T-nuts with travel frames.

- Allow approximately 2-4 inches above face of artwork if the work is flat. If work is not flat allow above the highest point in the works face while lying flat.
- Note: Built up artworks or extremely large works could require more depth.

- Attach metal flip down handles to outside of travel frame.

- For oversized travel frames, handles should be attached at approximately 22 inches from the bottom.

- Lids are to be constructed for travel frames unless there is a compelling reason not to.

- Place a block or series of blocks 2in x depth of riding edge side of travel frame usually covered in Volara and when necessary, covered in Dartek. The pads should be placed 1/8 inch below the bottom edge of the artwork. This is the above mentioned preventative measure against OZ-Clip failure. This method also makes unpacking large works on a lean safer and easier.
- Important: Seal outside of travel frame in plastic completely with sealed cut outs for Handles.

Whitney Skeleton

Skeleton Crate General Specs.

- The cage is to be constructed of 1 x 4 pine
- Cage is usually enclosed with Corrulite unless there is specific reason not to be.
- Artwork to be held in place with braces, guillotine braces or tie downs.
- Note: Can be very useful for local transport in which weight and size are an issue.
- Also suitable for storage of stable objects.
- Skeleton Crates can work as an inner box when weight is a factor.
- Inner Crates
- There are times when an object warrants the extra security of an inner crate. An inner crate is almost always constructed of 1/2 inch MDO that is glued and stapled and screwed together. Inner crates have on occasion been constructed of 3/4 inch MDO.

Exteriors

Rigid Structure RH Retention and Long Term Use

- Proper construction effects long term use.
- Side effects of improper construction:

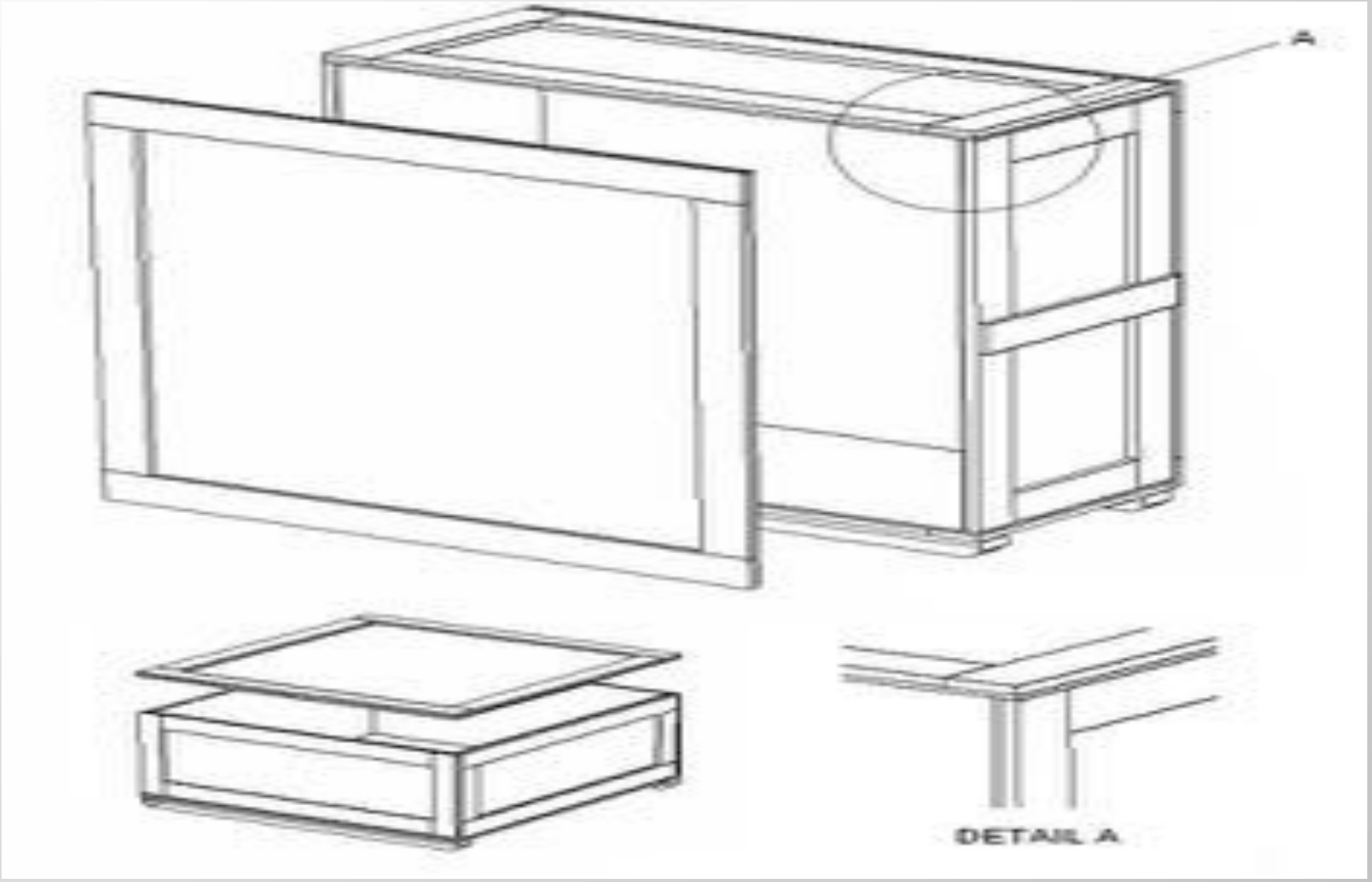
  -Racking of crates causing poor fitting lids. Stripping of bolt plates

  -Improper fitment of interior braces

  -Loss of waterproofing at joints and lids

  -Loss of stabilization of RH

Joint Construction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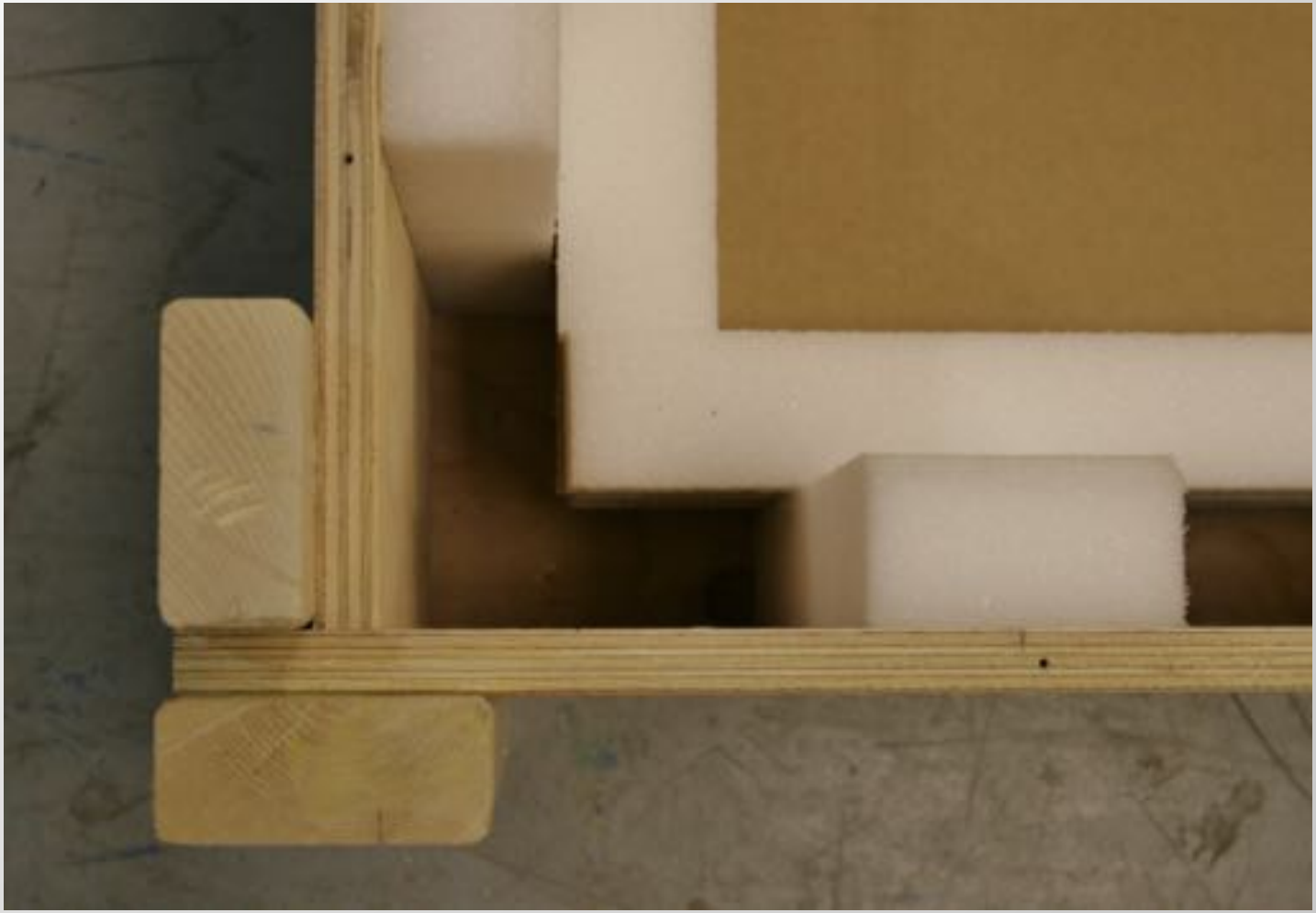
DETAIL A

One Way Joint



Moisture Barrier Questions

- Best joint sealer?
- Best way to adhere marvel seal? Staples and tape? Iron? Spray adhesive?
- Best gasket material?
- Double gaskets and inset lids?
- Drip lip on a rain cap?

Gaskets

- Neoprene vs. Rubber
- Application methods
- Staple vs. adhesive
- Location of gasket Lid vs. top of crate wall
- Neoprene is a polymer chloroprene and is available in many varieties including nonsulfur "W" type. We find this type of gasket has the best spring back and and is easy to work with and is far better than naturals rubbers and polyurethane gaskets
- You should avoid using natural rubber and latex rubber. Both contain sulfur.
- Avoid polyurethane materials which are unstable and have acidic byproducts.

Closures

CAM LOCK:

EASE OF USE NO TOOLS REQUIRED

CAN BE DAMAGED IN TRANSIT

NUT AND BOLT:

STANDARD THROUGHOUT WORLD

TOOL REQUIRED AIDS IN SECURITY

Skids

- Proper installation techniques
- What works long term?
- Pallet jack height or not and why?
- Extra supports for forklifts

Plan for the journey and the tools that will be used

- domestic vs. international
- art handler vs. freight carrier
- forklifts
- dollies
- j bars
- pallet jacks


BOX
FRAGILE


ARTEX


ARTEX

Interiors

Materials
Interiors

- TYVEK
- NOMEX
- DARTEK- Dartek is a transparent, highly refined plastic wrap that is thin slick and strong. Dartek is a nylon film has no surface coatings and is softer than Mylar or Glassine and can absorb up to 10% of it's weight in moisture.
- EPS EXTRUDED POLYSTYRENE*- EPS is a hard-surfaced commercial foam. It is chemically stable, inexpensive, and suitable for storage. It is used as an insulation / liner for crates. It's disadvantage is that it can crumble with heavy use.
- *Confirm definition- most specs in art world show EPS as Extruded but EPS is actually Expanded

Coroplast

Archival Coroplast:

Coroplast® is an inert extruded twin-wall polypropylene. Available in a neutral translucent color, product is virgin polypropylene, manufactured specifically for archival applications. Unlike the conventional Coroplast® products, this material has not been corona treated, and the anti-static and ultra-violet inhibitor additives have been omitted. At regular temperatures, Coroplast® is resistant to oils, solvents, and water. Coroplast® can be easily fabricated and lends itself to die cutting, sewing, sawing, scoring, folding, drilling, stapling, nailing, and spot or heat welding.

Volara

- (polyethylene, closed cell structure):
- This material is used in crating to cover foam blocks. It is an excellent material for very delicate surfaces. It is soft, smooth, easy to use, and non-abrasive. Volara is an irradiation, cross-linked, closed-cell polyolefin foam. This is from a family of cross-linked polyethylene foams, and is very related to Ethafoam. Cross-linking gives a more stable structure with smaller cells providing a smoother surface can be applied to ethofoam with a heat gun for non abrasive bracing

Soft Tyvek

Note:

After careful inspection of the material Tyvek, it was suggested by a representative of Talas that the re-introduction of plasticizers and anti-staticides that had been incorporated into the formula for soft – tyvek, can react with certain materials (like metals) which can cause an unwanted reaction. For this reason WMAA tends to discourage the use of Tyvek. Certain exceptions may apply but warily.

Finishes and Moisture Barriers

- MDO with silicon sealant in seams of the crate offers the best moisture barrier available.
- Water based varnish, water borne polyurethane, or acrylic paint have been found to reduce emissions by 50-15% for aldehydes and 56% for acids. These products also work well as a moisture barrier.
- Marvelseal- Marvelseal is an aluminized nylon and polyethelene barrier film that will resist the passage of vapors together with other atmospheric gases and pollutants. It can be used to line travel crates when objects are going to be stored in them for long periods of time. It can be used in any number of applications when a protective barrier needs to be established.

M I T S

Material Information Translation Site

ICEFAT

Two Image Styling

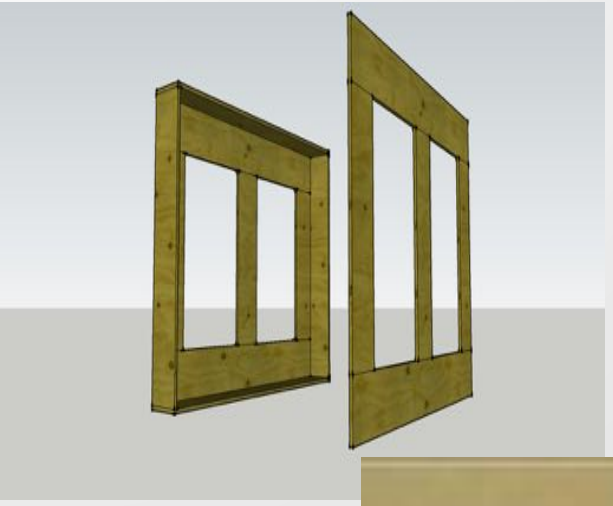
- When products vary between countries, an image of each will be shown under the relative language translation.

Insulation Questions: Esterfoam vs. EPS?

- Line crates with 2” Grey Ester Foam on sides, 4” on riding edge.
- Note: Ester Foam can be covered with Marvel Seal for works that appear sensitive to off gassing.
- 2” of EPS* all around with 2” bumpers of Ethafoam
- NOTE: if the crate is going to serve as a storage container for the pc after it has returned from a loan, then the insulation material should be EPS*

Travel Frames

Museum Travel Frame

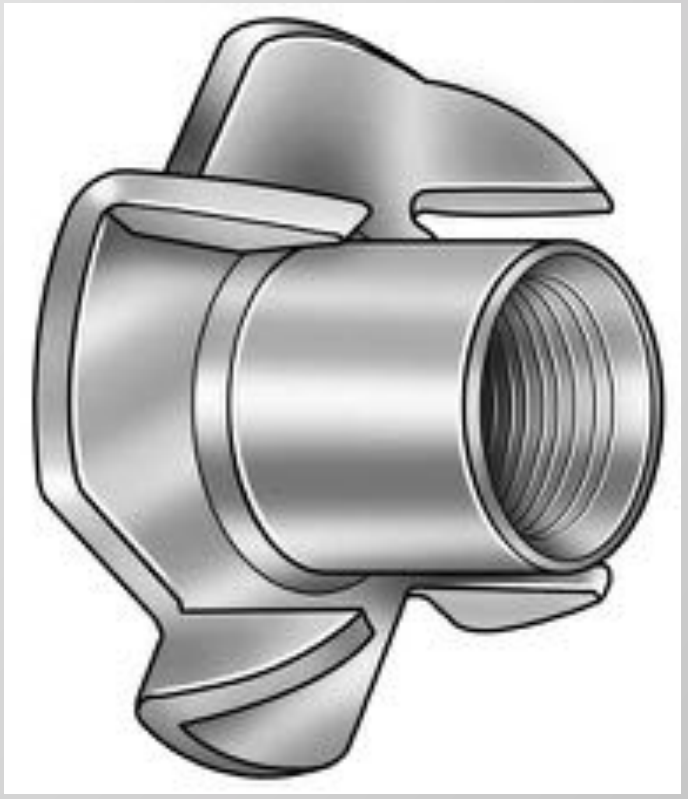


- Basic construction
- Twill tape
- Enclosed travel frames
- Coroplast vs Corulite
- No adhesive or screws on the inside
- Wrapping or not wrapping
- New poly each time?
- Screw closures on lids?

Travel Frame Hardware

WINGNUTS AND WASHERS

T -NUTS



Travel Frame hardware

OZ CLIPS

OZ CLIP KIT

Wingnuts with Nylock

One Method

Travel Frame Questions

- WMAA places foam below the work as a preventative measure to guard against OZ-Clip failure. What about all round as a guide? Rest artwork on foam or float?
- Use wing nuts and lock washers to fasten OZ-Clips to travel frames. Doesn't the lock washer shave off parts of brass from Oz clip? What about using a nut? What about a nut with Nylock? Some people are using nut and bolt setup. Which is better and why?
- WMAA does not recommend the use of T-nuts with travel frames. Why? Need an image of an agreed good setup. Mention seeing travel frames without backing washers and splitting.
- If an existing travel frame does not have a lid place a grid of twill tape across face of the travel frame and secure with 9/16 wafer head screws. Attach twill to sides or back of the travel frame as appropriate. Try to avoid screwing into the riding edge.
- Important : Seal outside of travel frame in plastic completely with sealed cut outs for Handles. Even when inside a sealed case?

End Loaders

Why End loaders?

- No huge lid to move around artworks
- Structurally stronger
- Ease of loading and unloading

End Load Crates

End Load Crates

Multiple travel frames

End Load Travel Frames

A-Frames

A- Frames

A-Frames

A-Frames

Difficult Places

LIMITED ACCESS

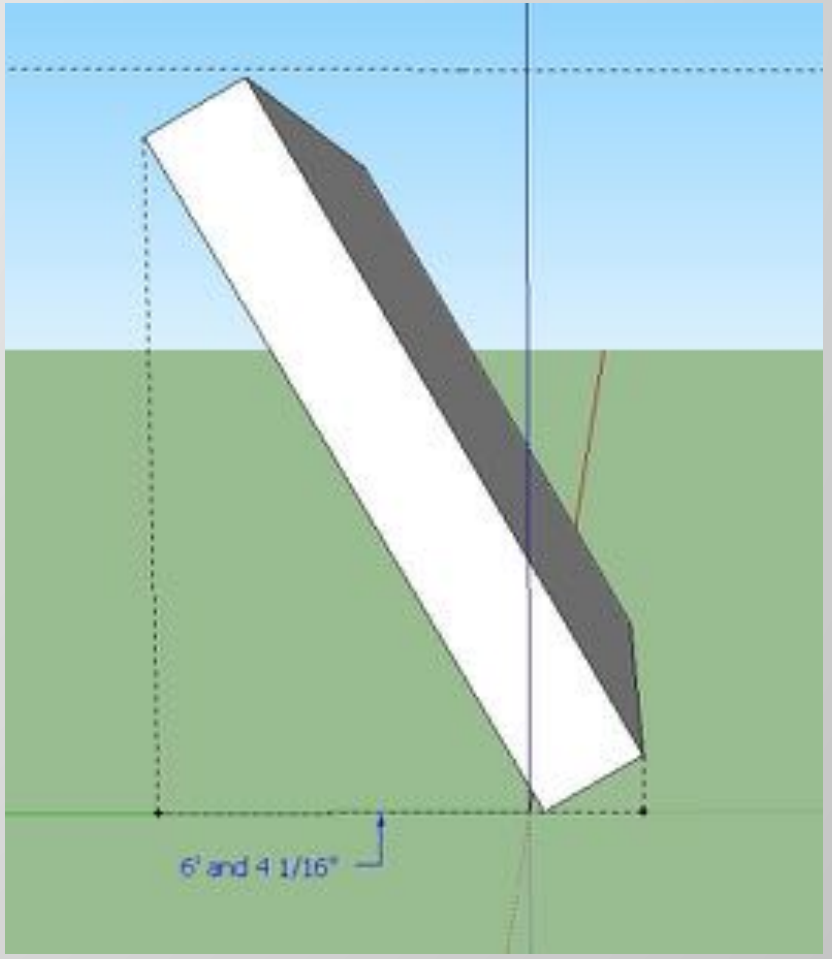
HEIGHT RESTRICTIONS

Hawaii A-Frame Design

- Hinged bottom
- Packs flat for less airfreight
- Easily converts to standard crate
- Easy to build

GOOGLE SketchUp

Really easy way to see how exactly how big your crate can be and what kind of angle



Pallet Bottom Crates

- When going on unsupervised journeys
- Stabilize on forklifts
- Prevents topple
- Removable

Skeleton Crates

Hybrid Skeleton Crate

NEED ACCESS BUT WANT TO REDUCE PARTS

HIGH DENSITY OVERLAY

Hybrid Skeleton Crate

INNER SUPPPORTS

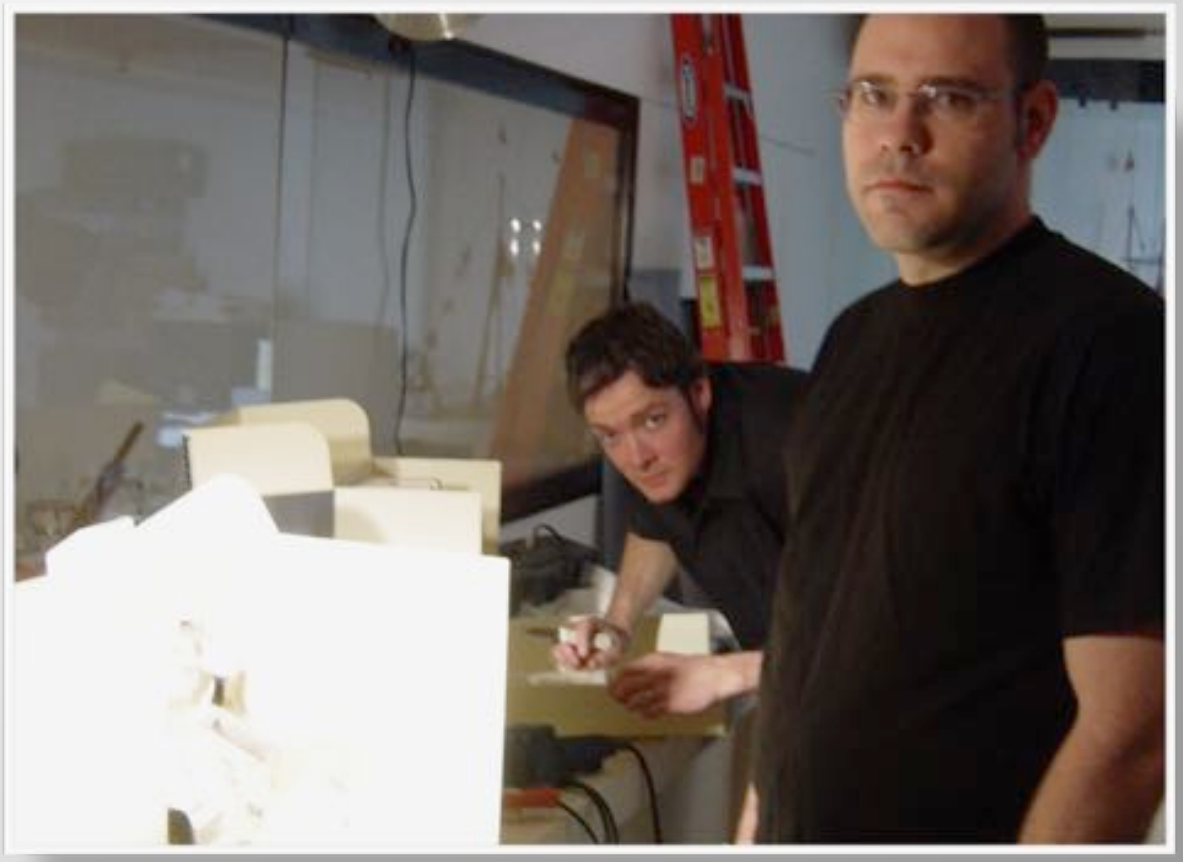
Skeleton Crate for Heavy Object

ACCESS FOR FORKLIFT
ON BOTTOM

REMOVABLE PADS AT TOP

Case Studies

Packing Calder's Circus



Circus

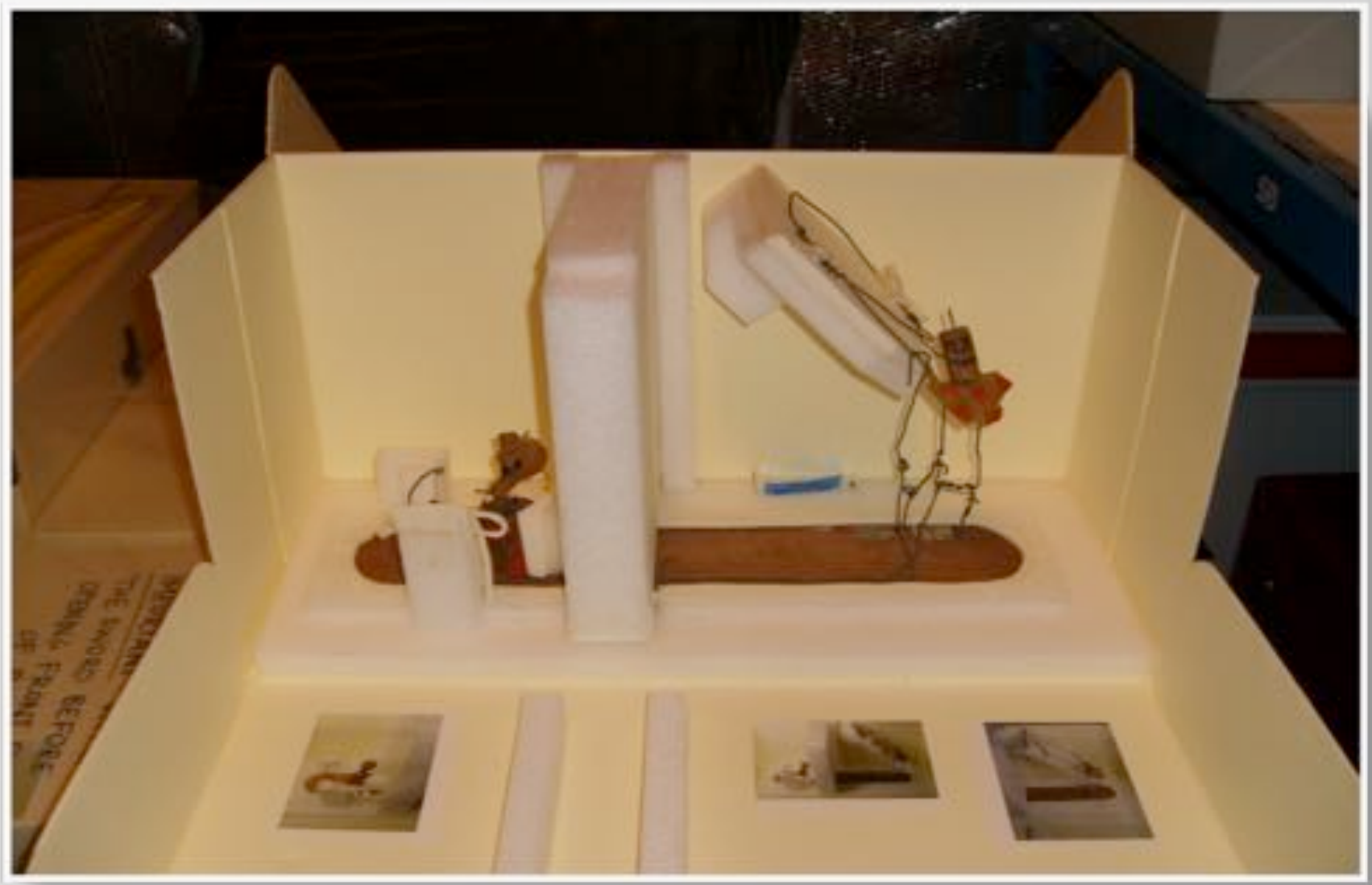
Boxes are made of Museum Board (archival quality).

Circus

Foam is ethafoam covered with volara at contact points

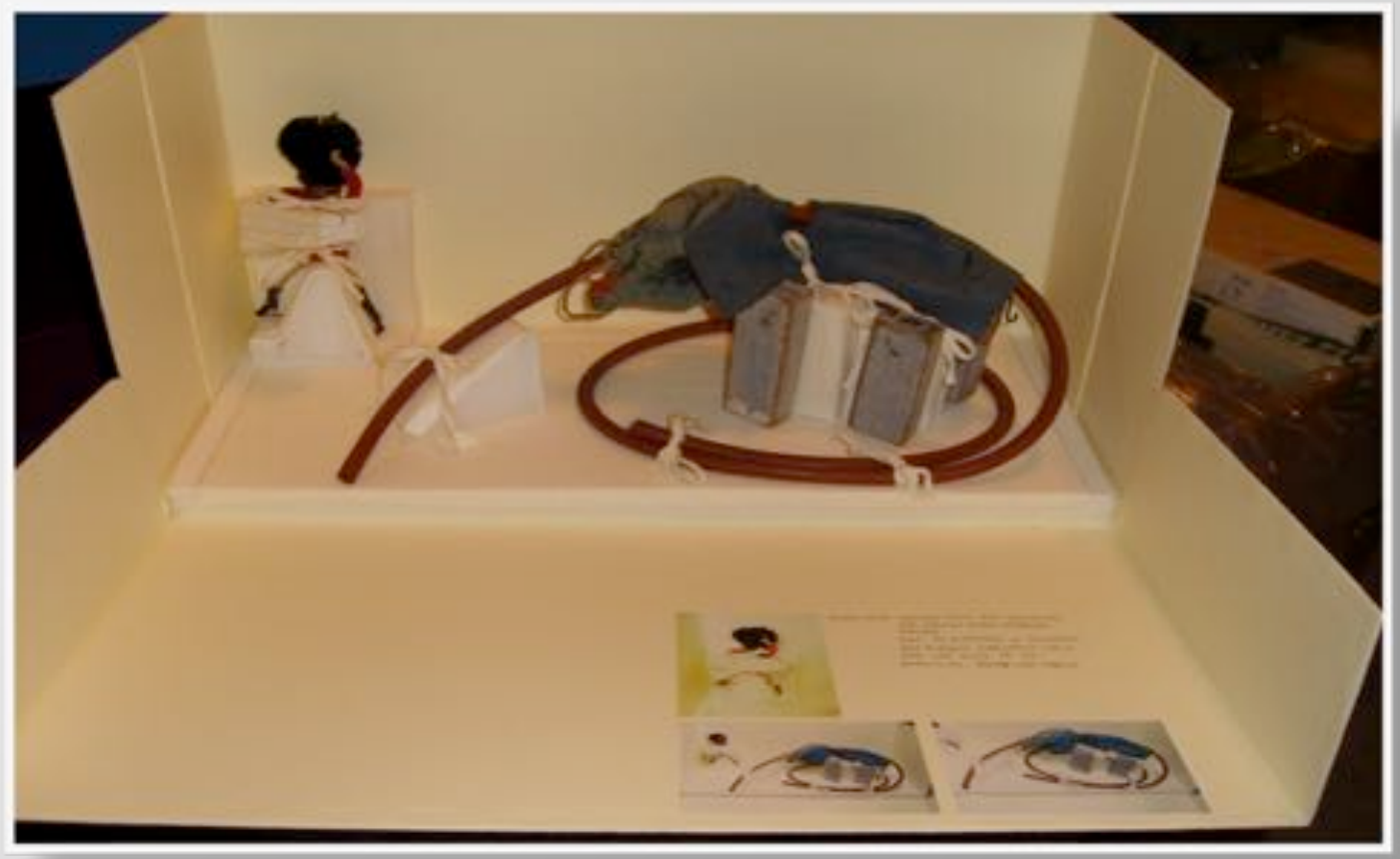
Circus

Detailed repacking pictures showing exact placement



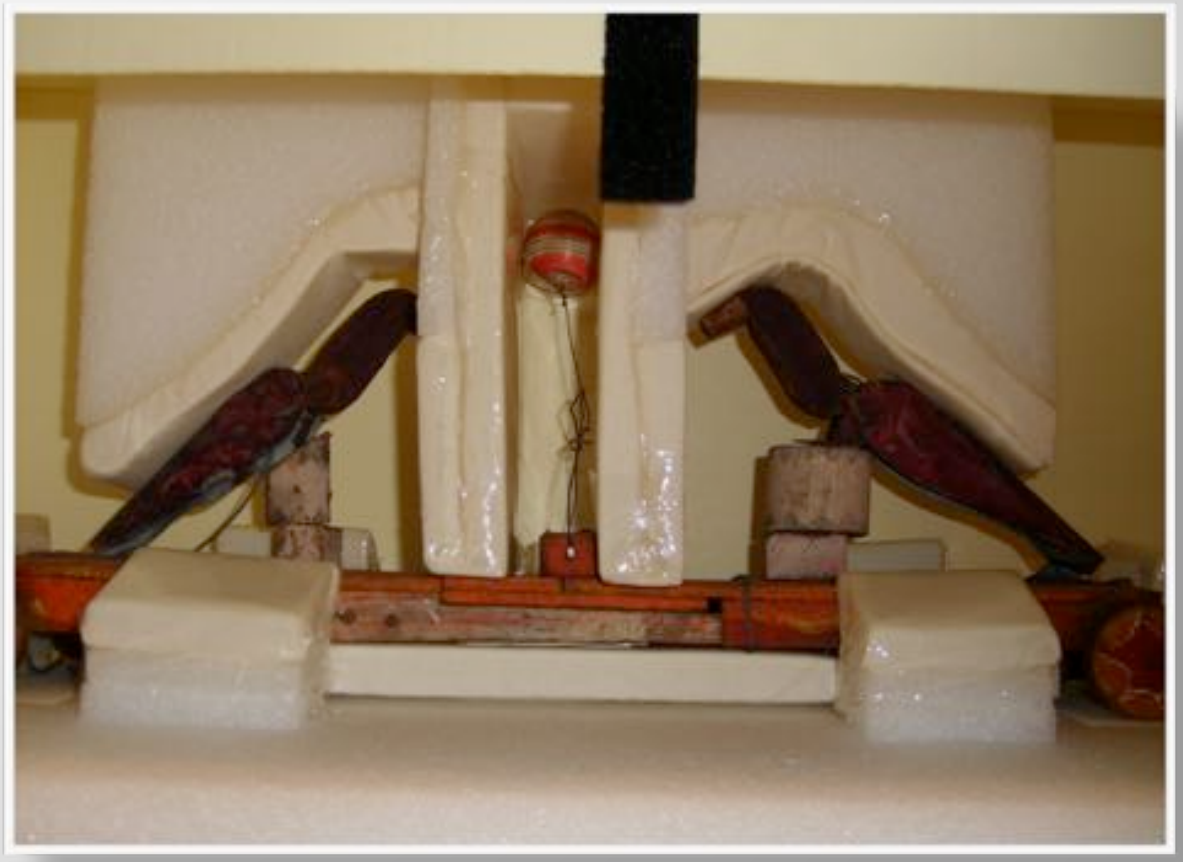
Circus

Note use of Muslin and tie-downs to secure art work



Circus

Circus



Circus

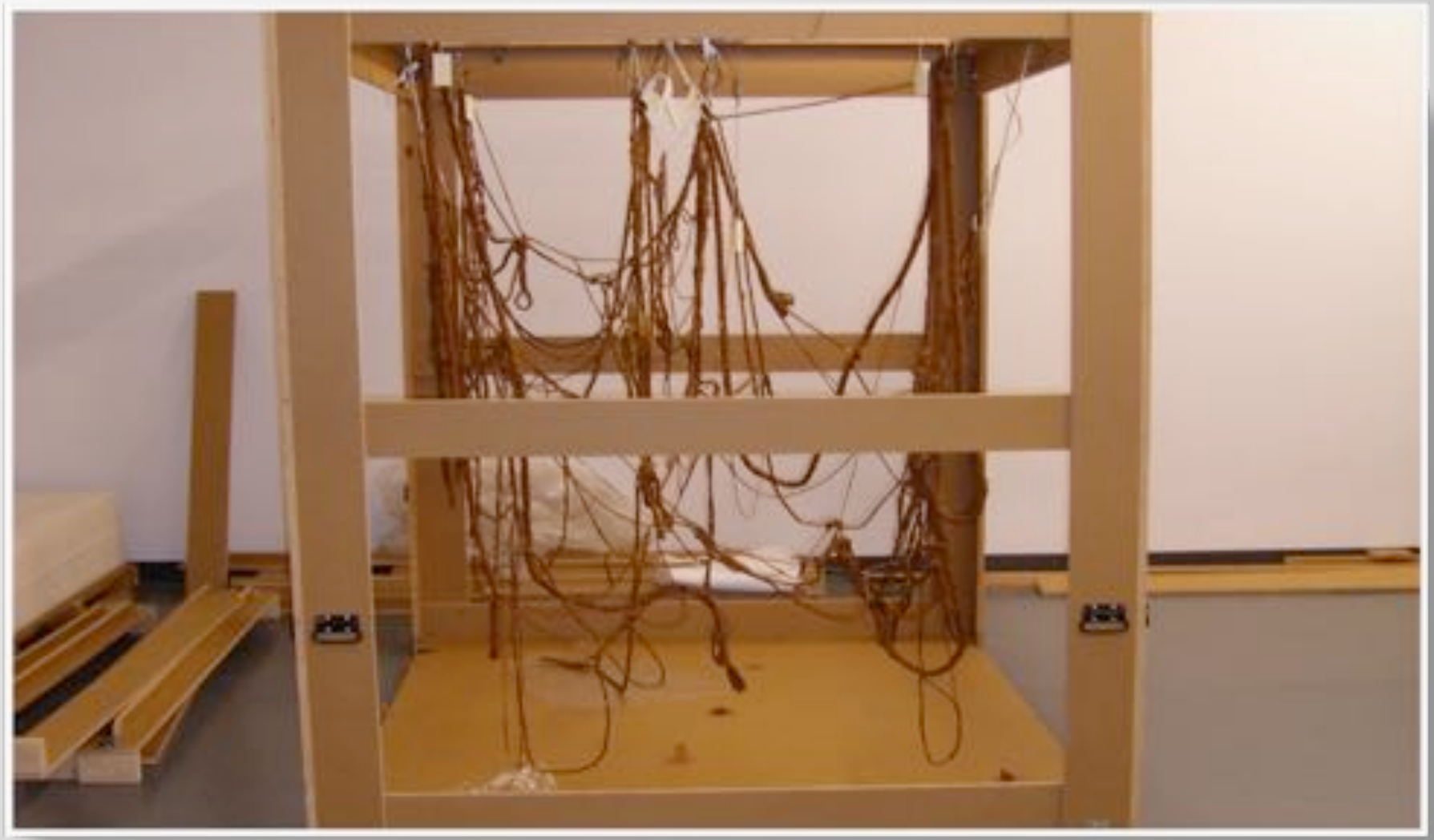
Final standardized box size

Circus

Circus

Hesse

Hesse



Hesse

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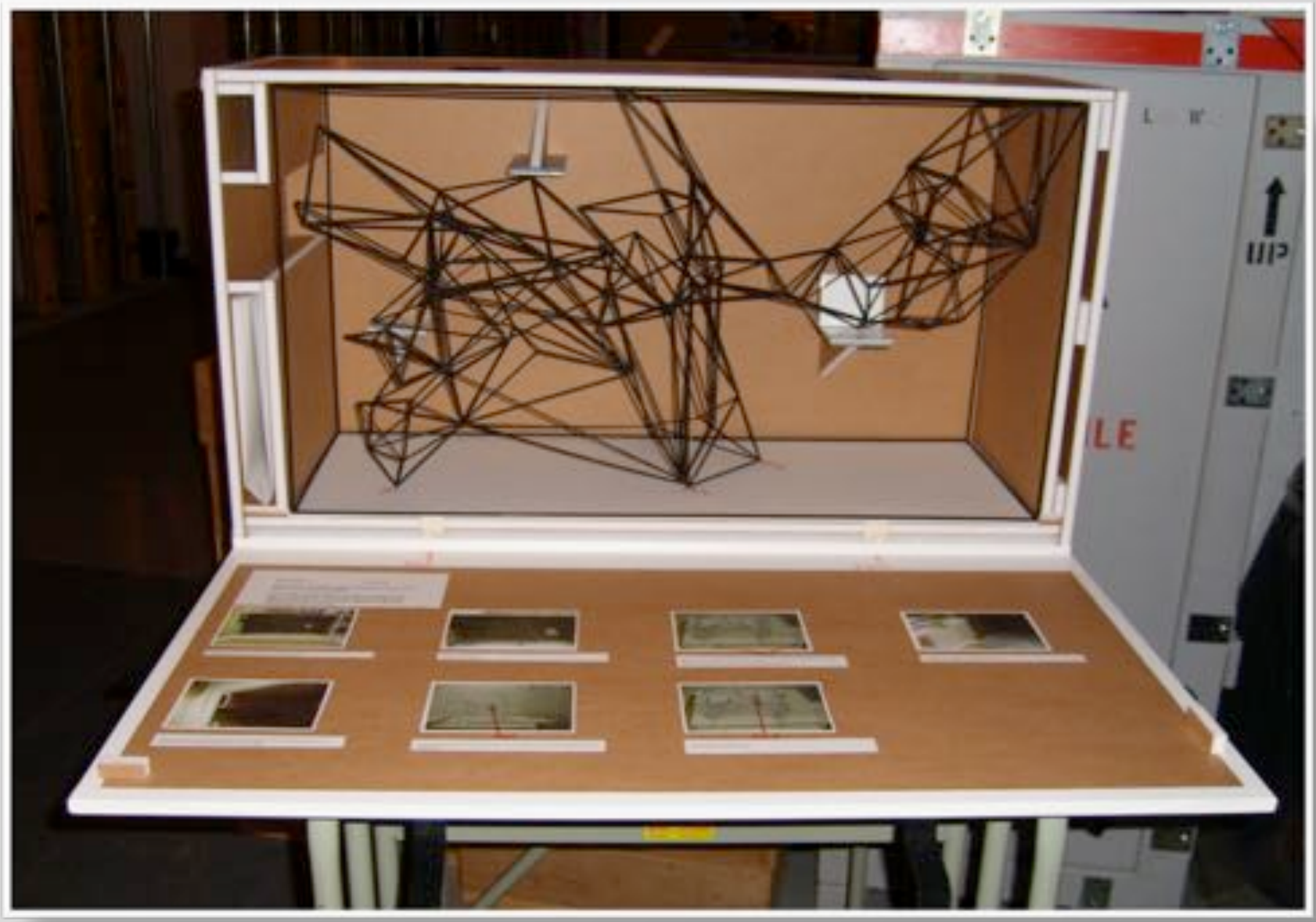

UP

Whitney

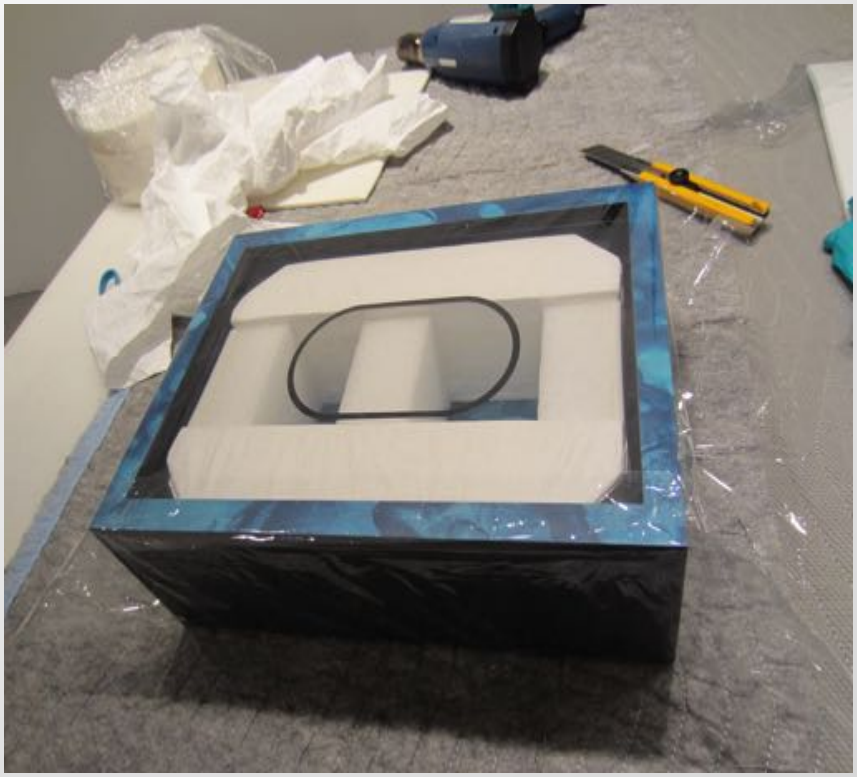
So far so Good!

Uh-oh!

New Inner Crate

Loading

Reworked Version




KEEP FLAT!


WMAA 94520-C


WMAA PACKED
RAM
39


FRAGILE
39

RICHARD ARTSCHWAGER: ***Exclamation Point (Chartreuse)*****, 2008. Plastic bristles on a mahogany core painted with latex; Gagosian Gallery, New York. E.2011.1031**

CRATE # RA 8

TOP PORTION OF OBJECT (Box in left side of crate)

PLEASE REVIEW BEFORE UNPACKING!

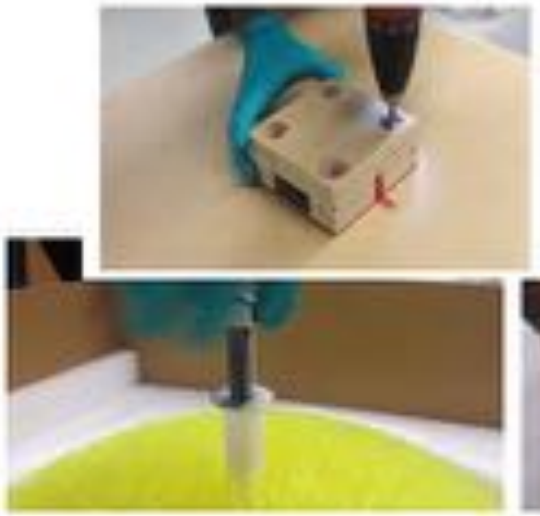
1. Box and object are very heavy. (Object approx. 150 lbs.)
2. Lay box flat to unpack
3. Remove screws and lift lid STRAIGHT UP and off
4. Remove long sides keeping ends (with caps) intact
5. Unbolt caps and undo threaded rod mounts
6. Unscrew box ends (triangles are attached) at this point piece is being held by bottom guillotines
7. Undo bolts at rod ends AND at contact points of piece
8. Remove travel rod and replace with exhibition rod, bolt at contact point at bottom of piece

RICHARD ARTSCHWAGER: ***Exclamation Point (Chartreuse)*****, 2008. Plastic bristles on a mahogany core painted with latex: Gagosian Gallery, New York. E.2011.1031**

CRATE # RA 8

BOTTOM PORTION OF OBJECT (Box in lower right side of crate)

PLEASE REVIEW BEFORE UNPACKING!



1. Remove lid front
2. Remove cap on top of box
3. Unscrew nut and washer – RETAIN FOR REPACK
4. Remove top lid of box
5. Remove nut and washer – RETAIN FOR REPACK
6. SLOWLY lift PVC shaft from top of object
7. Remove front guillotine
8. Gently slide tray out from box
9. Lift entire piece off of tray using rod
10. Use tyvek (in crate) to cling piece and tilt on side
11. Remove travel rod and place on exhibition base (in cardboard box, top of crate)
12. Turn object upright for display

Open Forum

Questions and Answers

Thank You!