

COMMON PACKING MATERIALS FOR ARTWORKS

The following list of packing materials was prepared by Yuri Yanchyshyn, Senior Conservator at Period Furniture Conservation LLC to facilitate the emergency safeguarding of Ukraine's artworks, during Ukraine's war with Russia, begun in February 2022. The working assumption is that these common packing materials for artworks are available in Eastern Europe. This may or may not be the case. This condensed list is based on a much larger list found at <https://www.paccin.org/content.php?s=a7bb83682c673a3b9b1a12f7bb2bf5f9>

It should be understood that the improper use of these materials can harm works of art, depending on environmental and other conditions. It is recommended that trained conservators oversee the packing process. Yuri Yanchyshyn, March, 2022

Acid-Free Tissue - Unbuffered

Batting

Blueboard

Brown Paper (Kraft Paper)

Bubble Wrap®

Cardboard

Dartek®

Ethafoam™ Polyethylene Foam

Loose Fill (Extruded Polystyrene Chips, Peanuts, or Pelspan®)

Muslin (Cotton fabric)

Poly Sheeting - High Density Polyethylene (HDPE)

Poly Sheeting - Low Density Polyethylene (LDPE)

Volara® Crosslinked Polyethylene Foam

Acid-Free Tissue - Unbuffered

Acid free tissues do not contain lignin and are made from high quality pulp. Un-buffered tissue is used with protein-based materials (wool, silk, leather, fur) and other materials sensitive to alkali (silver, color photos). Buffered tissues have a component added to push the pH to neutral or alkaline range, which can help scavenge acidic pollutants. Choose un-buffered when content is mixed or unknown, or its somewhat softer qualities are preferred. Its hygroscopic qualities can help stabilize relative humidity within a closed envelope.

Forms/Sizes

Machine-made rolls 30-60" wide; pre-cut sheets up to 30" x 40". Weights range from 9 to 18 lb.

Batting (Pellon)

An extremely soft non-woven padding material; non-museum use is for quilted blankets, clothing and quilts. Normally made from cotton or polyester. Cotton as an organic is hygroscopic and can therefore provide some rH buffering, but is more attractive to insects. Polyester is more durable and has more of a cushioning "memory" where cotton will tend to flatten out over time.

Forms/Sizes

Roll lengths vary - widths typically 40" or 45" up to 90". Thickness (referred to as "loft") ranges from .007" to 1". Can easily be stacked to achieve more substantial thicknesses.

Applications

The most common type used for packing and many storage applications is polyester. Often used as additional cushioning in foam cavities, as loose fill inside Fomecor® or corrugated plastic boxes, or incorporated into padded textile hangers or stockinette tubes. Batting fibers can easily snag on small object parts - tyvek or other barriers serve to prevent this. Versions that allow you to separate layers allow for greater flexibility in use. Polyfil is a non-layered form of polyester batting that can help conform to more extreme surfaces. If used in storage applications be sure that it has been tested for long term stability.

Blueboard

Common term for acid free, lignin-free, buffered corrugated cardboard, typically light blue, grey in color but may also white or light tan. Available in single and double wall thicknesses and some variation of fluting sizes and patterns. Has good hygroscopic and buffering properties. pH ranges from 7.5 as high as 9.5. Check manufacturer's specs. Very expensive.

Forms/Sizes

Available pre-cut as small as 8" x 10" up to 55" x 120" sheets. 40" x 60" and up requires trucking, which adds considerably to expense. Thicknesses: single-wall E-flute 1/16", single-wall B-flute 1/8", double-wall BB-flute 1/4".

Applications

Used for some shipping and many storage purposes. Blueboard is a versatile boxmaking material, and is also used to craft inserts, dividers, backings and supports, and to line drawers and shelves. Like all corrugated products, it is stronger in one direction, which can be mitigated by cross-laminating sheets, or taken into consideration of forming boxes or inserts.

Brown Paper (Kraft Paper)

Alternate names: butcher paper

Characteristics

Very inexpensive; high acid content; tears easily; slightly abrasive; absorbs moisture; can be easily recycled.

Bubble Wrap®

Polyethylene, polyvinylidene chloride, or polyvinyl chloride films sandwiched to create compartments of various sizes into which air is injected. Inexpensive and tear resistant, but bubbles will deflate and plastic may degrade in a fairly short time. Some versions - Aircap®, Polycap® have an additional layer of nylon designed to prolong the life of the bubble. Available in versions that stick to themselves, and where flat film layers sandwich compartments on both sides.

Forms/Sizes

Rolls up to 72" wide. Bubble sizes 1/4" to 2" diameter; typically 3/16", 5/16" and 1/2". Perforations optional (e.g. every 12").



Applications

A traditional soft packing material, often used to pack paintings or in conjunction with tissue to pack 3-D objects. Gauge bubble size to object weight and size. Objects

wrapped with bubbles faced in can be left with distinctive surface marks echoing the bubble pattern, especially if no interim layer is used. Bubbles faced out are more prone to breakage. Used appropriately it is a valuable short-term material. Used inappropriately it can create the illusion of protection. Bubbles have a tendency to break exactly where protection is required (corners/projections). This can be mitigated by using two layers face to face. Use better grades to extend life.

Cardboard

Comes in many forms: corrugated, flat, rolled, single wall, double wall, triple wall, and boxes. Most cardboard is corrugated layers with a paper lining on at least one side. Wall refers to the number of layers of corrugation. Test refers to the amount of pressure per square inch the material will withstand without puncturing. (The most common is 200 or 275 test.) It is a paper product and does have a high acid content. It is excellent for using as a protective barrier for objects. It can be cut or scored with a knife to create almost any shape; it absorbs moisture and can be coated to minimize absorption. It is very strong and fairly inexpensive and can be bought in ready-made cartons that are excellent for packing objects when filled with a cushioning material. Some cardboard is not corrugated such as mat board.

Dartek®

A Dupont product cast nylon film with 'saran-wrap'-like feel and clarity. Softer and more pliable than Mylar or glassine, and tear-resistant, with good release properties. Maintains characteristics across a wide temperature range. Capable of absorbing up to 10% or its weight in moisture. C-917 type has no plasticizers, additives or surface coatings. More expensive than glassine, which it typically replaces in packing applications.

Forms/Sizes

Rolls 10" to 88" wide. Available in gauges from .0075" (.19 mil) to .075" (1.9 mil).

Application

Dartek® is a replacement for glassine when wrapping paintings that are susceptible to tackiness and abrasion. Works best as an object wrap in situations where moisture and heat can be avoided as it can stick to objects under certain conditions. Adheres with hot melt or double sided tape to other surfaces, or to itself or other plastics using a heated spatula or tacking iron. It is water clear instead of slightly milky like LDPE. It can make a good storage dust cover where light sensitivity is not an issue.

Ethafoam™ Polyethylene Foam

Ethafoam is the brand name of polyethylene foam plank manufactured by Sealed Air Corporation (formally by Dow Chemical Company). It is a durable, flexible, closed-cell foam with excellent memory when used in an appropriate coverage and density for the load. It is watertight and impervious to most chemicals. It performs consistently through a wide range of temperatures. It is easily cut with knives, hot knives, band saws, powered foam rubber cutters, and table saws. Ethafoam adheres to itself and other polyethylene-based materials with heat-welding, or to most other surfaces with industrial-grade hot glue. The natural color of polyethylene foam is brilliant, sparkling white with a slight translucence in thin areas, but black and blue are also available in a limited range of sizes. Ethafoam is not cross-linked, so it is easily recyclable.

Sheets and planks have a skin on each of the large faces. The skin is an unbroken surface, but has a bubbly texture with approximately 1mm relief, and despite the absence of additives the foam feels waxy to the touch. The edges of the planks expose open cells where they have been broken. Individual cells range between 1-2mm diameter at medium density. Plank edges and other cut surfaces create a rougher texture than that of the closed skin. Both surfaces are generally considered too abrasive for making direct contact with sensitive surfaces, and require the mediation of a smoother material between the Ethafoam and the object, such as Tyvek Softwrap, Volara, or poly-sheeting for a few examples. This mediation can be achieved either by lining the foam or wrapping the object.



Ethafoam 220 appears very similar to PolyPlank EXT220 and PolyPlank LAM220, another brand name of polyethylene foam, but the two PE foams are manufactured with slightly different methods and chemical compositions. PolyPlank has a larger cell structure on average, and the broken cell walls of cut surfaces feel rougher. It offers less resistance to compression and puncturing than Ethafoam of the same weight. PolyPlank LAM offers two more light-density options than Ethafoam; 0.9 pcf and 1.2 pcf.

2" material is relatively expensive per square foot, but less so than 2" polyurethane ester foam. The latter is also typically applied in greater quantity per container, thus magnifying the price difference.

Loose Fill (Extruded Polystyrene Chips, Peanuts, or Pelspan®)

Extruded polystyrene chips or “peanuts” or “Pelspan®” are available in different shapes some of which are designed to mesh together enhance their stability. More commonly they are used loosely in a container and packed around an object. When used this way they need to be packed tightly around the object, and the container should be shaken to get the fill to mesh correctly as objects tend to shift to the bottom of the container.

A more accepted method in the museum community is to place peanuts very loosely in thin polyethylene bags to allow the bags to conform to the shape of the object and prevent objects from settling through to the bottom of the container (HDPE especially works well for this application).

While they give overall support, there is a limitation to how much weight they can support. They are very unsound environmentally and are not biodegradable. This negative aspect can be minimized through re-use but when used loose their tendency to scatter – and in doing so, attract dirt make a less than optimal packing material, especially when during repacking you may be faced with the temptation to sweep them up dirt and all.

Vegetable starch peanuts with names like “ECO-Fill” are a biodegradable answer to polystyrene peanuts. They are made of vegetable starches and water and can actually be eaten. They are water soluble and work the same as the peanuts for filling voids, giving overall support. This is a material has been discussed as a replacement for normal polystyrene.

Considerations to weigh in the decision making process include the issue that in storage situations the fact that they are basically a food can attract insects. Others have expressed concerns that when used in contact with objects, the packing material if exposed to water can become a form of goo that can damage objects more that the water itself. For short term use, when bagged or when re-use is unlikely there can be a good argument for their use.

Muslin (Cotton fabric)

Soft cotton cloth often used in storage applications, especially with textiles. Usually used in un-bleached form. It is recommended that it be washed to remove any sizing applied during manufacturing.

Poly Sheeting - High Density Polyethylene (HDPE)

Polyethylene sheeting with a denser structure than the type commonly used to wrap paintings. The same material used to make Tyvek®, its greater density allows for superior protection with a much thinner film .23mil - .35 mil is typical depending on form purchased. The manufacturing process tends to reduce the need for plasticizers and slip agents. More heat-resistant than LDPE. Thinner versions behave like a very supple non abrasive form of tissue only without hygroscopic properties.

Forms/Sizes

Easy to purchase as "food grade" bags as thin as .23 mil in smaller sized sizes from a plastics distributor, or in rolls up to 12" x 400' in .31 mil thickness as 'painters plastic' at home improvement centers and painting supply stores. The Husky brand product has been the most widely used version which has consistently passed oddy tests.



Applications

Can be used in much the same way as LDPE. Being thinner, smoother and less rigid than tissue, it is perfect as a protective barrier for delicate objects. Will conform readily to complex shapes without build up of bulky folds. Also a superior, inexpensive and lightweight dust cover. Lack of additives means it can be handled for long periods of time without leaving a residue or film on hands or objects. Because it is so thin it can be used to supplement pre-existing packing solutions. When used in two layers it provides a "slip sheet" effect where one layer stays with the object and the other with cushioning material that virtually eliminates risks of abrasion to fragile surfaces. Like most synthetic materials though there can be a risk of static charge with movement so it may not be appropriate for use with some friable materials.

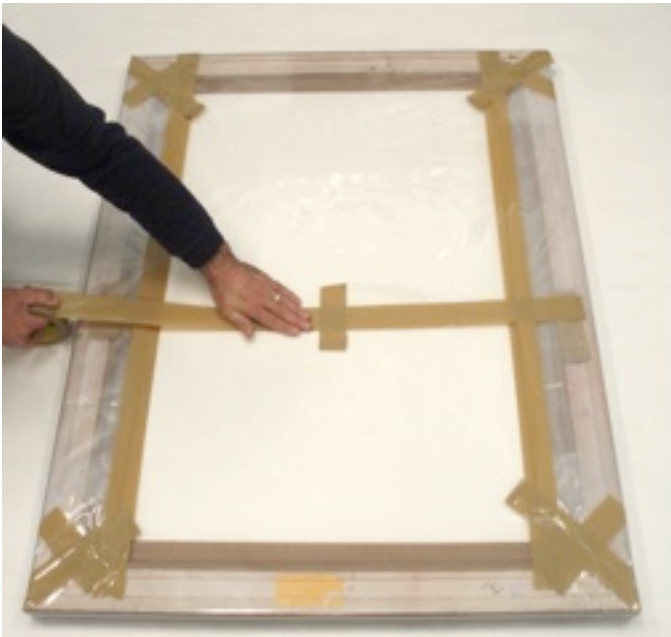
Poly Sheeting - Low Density Polyethylene (LDPE)

Characteristics

Chemically inert, pH neutral, and water repellent, especially if seams are sealed. It is non-abrasive if clean. Some manufacturers use talc or other release agents which create a residue or oily film. Especially true of material with recycled content. "Virgin" grade is non-recycled, "UDSA" grade has been determined safe for storing food. Less expensive than Marvelseal® but less effective as a barrier to gaseous pollutants.

Forms/Sizes

Rolls in a wide variety of widths and lengths; 3 or 4 mil thickness typically used, up to 6 mil for heavy objects or those exposed to more stress. Also available in various widths of tubing.



Applications

Commonly used to wrap paintings for softpacking and to wrap inner boxes and travel frames to create a sub-environment within crates. Virgin grade preferable especially when an additional barrier layer (glassine, Dartek® etc.) is not used. Also used as a moisture barrier lining for crates, and as protective sheeting in storage.

Volara® Crosslinked Polyethylene Foam

Material Name

Crosslinked Polyolefin-Based Polyethylene Foam

Description

Volara is the brand name of a polyolefin-based polyethylene foam from Sekisui Voltec LLC. It is irradiation crosslinked, producing a closed-cell foam with virtually microscopic cells. It has an extremely soft texture throughout, including that of cut surfaces where the tiny cells are presumably broken. Its other desirable qualities include chemical stability, consistent thickness/texture/density, high tensile strength, low water absorption and vapor transmission, workability, and aesthetic appeal, all serving to make it a highly versatile material.

The surface tension of 2 pcf Volara when pressed with a finger is not unlike that of larger-celled foams with lower densities, such as 0.9 pcf polyethylene. It is very easily cut with a knife - but the blade must be quite sharp to avoid thin bits of "flashing" along the exit edges of the cut. A single slice with the blade will produce a smoother cut than a sawing motion, which can produce a somewhat shredded or faceted appearance. The natural color is a creamy, antique white, or ivory. One or both faces of 1/8" Volara in particular can sometimes have a subtle sheen which will wrinkle softly on the inside of a tight curve, and also display a random network of faint lines, increasing its passing resemblance to human skin. Being crosslinked, Volara is not recyclable.



Applications

Volara is perhaps most commonly used as a surface material added to thicker foam cushions. Its silky/rubbery texture, pliability and softness at 2 pcf makes it a useful primary contact material for many unwrapped objects, whether the cushion is a flat surface or a contoured shape. It is also a handy material for shimming inexact foam contours for a better fit. Volara can be used alone when rigid support, such as wood or foam-board bracing, is desired close to the object. Then the main shock-absorption material can surround the exterior of the rigid securing structure. Likewise, Volara can sometimes be used as a vibration-dampening gasket between two hard surfaces, such as a cabinet and its hinged door, or a large object and the structural load spreader beneath it. Finally, Volara is often used as an effective liner for storage shelving and drawers. (Note: It has been known to compress and even stick slightly to the bottoms of glass objects left in place over a long period of time.)

Volara bonds well with itself and with non-crosslinked PE foams, like Ethafoam and PolyPlank, by heat-welding. With practice, large flat surfaces can be heat-welded without overheating the larger-cell PE foam, which can melt under the heat gun and produce dips in the plane. The thinner forms of Volara are pliable enough to heat-weld onto convoluted surfaces, including custom cavities carved into other PE foams. Volara bonds well with hot glue, but it takes care to ensure that beads of glue do not show through the thin material. Volara also bonds very well with 0.003" double-sided PVC film tape. This tape is useful for attaching Volara to hard, flat materials like foam boards or MDO, where beads of hot glue are more likely to partially dry before lamination and show ridges.

On the downside, Volara is easily soiled with dust and dirt, and once smudged it is pretty much impossible to clean. When removing the material from a shop to use on site, it is recommended to wrap it in poly or transport it in a plastic bag.

Common Fabrication Tools

Knives (deli knife, extendable box cutter, specialty foam knife)

Band Saw - Lamination of thin Volara to a thicker foam is recommended prior to use.

For best results, also use a scalloped or straight blade.

Foam Rubber Cutter (powered) - Lamination of thin Volara to a thicker foam is recommended prior to use.

Heat Gun

Hot Glue

Double-Stick Tape

Thermal & RH Properties

Volara claims excellent thermal insulation, though it is not typically used in art handling with a thickness and coverage comparable to polyurethane or non-crosslinked polyethylene insulates. Click this link for the [Volara Technical Data Sheet](#).

Stability

Volara is chemically stable, and widely considered an archival material suitable for preventative conservation. It is appropriate for use in long-term storage containers, but care must still be taken to ensure that nothing touches any object surfaces that may become unstable in the storage environment. Volara will not prevent damage to an inherently unstable object in an unregulated environment, should the object's glaze or other surface treatment become re-activated in excessive heat or moisture.

Safety

Volara is non-toxic, and it contains no CFC, HCFC, or hydrocarbon blowing agents. Click this link to view the [Volara Material Safety Data Sheet](#).

Forms

In the art handling field Volara is most commonly stocked in one or two forms; 1/4" sheeting in a 60" x 300' roll, and 1/8" sheeting in a 60" x 600' roll. The lightest density available - 2 pcf - is the most useful for securing art objects, whether as a smooth laminate on 2.2 pcf PE foams, or as a buffer between harder surfaces. The natural color is white (ivory).

Other specs are available from the manufacturer however. The density range of the standard formulation is 2 pcf - 20 pcf. Thickness for rolled sheet can be 0.01" - 0.42", and thickness for laminated forms can be 0.5" to 2". Width of rolls can be up to 88". It is also available in 40 colors.

The standard formulation of Volara used in art handling is called Type A. Other formulations created for special purposes include:

AF = with fire-retardent properties

AS = with deep-draw vacuum forming capabilities

EO = with increased flexibility/resiliency/adhesive anchorage

G = with further increase in EO qualities

LM = with superior heat stability

M = with compression-molding capabilities and increased stiffness

TS = for industrial tapes and gaskets

RSH = for low pressure molding applications.

Note that only A, AF, AS, and M are made from polyethylene. The other specialized Volaras are made from alternate polymers.

Primary Use & Background

In addition to specialized packaging, Volara is primarily used as carpet padding, gaskets and insulation for vehicles and machinery.