A Superior Foam Board for Interior & Exterior Use

SMART-X®

FABRICATION GUIDE

3A Composites USA

3ACOMPOSITESUSA.COM/DISPLAY / 800.626.3365

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INTRODUCTION

Thank you for choosing a 3A Composites product for your graphic display applications.

This Fabrication Guide was created in order to incorporate the most common fabrication methods that are used with 3A Composites' line of graphics display products.

Important Notes:

- The information contained in this publication is based on our current level of knowledge and is, in our opinion, reliable. However, we cannot guarantee the correctness of this information for every application and for the results arising from their use.
- The user or converter is always responsible for ensuring that the materials and processes are appropriate, cost-effective and suitable for the intended purpose and location, and that they comply with the local laws and regulations.
- Technical knowledge and skills as customary in trade and industry, a normally developed capacity to make judgements as well as knowledge and observance of the applicable regulations appertaining to work safety are assumed.
- Be aware of the manufacturing/extrusion direction: SMART-X sheets have different characteristics (mechanical behaviour and optical appearance) depending on the manufacturing direction (parallel or across the direction of the sheets initial production).
- To ensure up-to-date relevance and impartiality of this publication, 3A Composites has decided to neither recommend any particular ancillary product and material nor their manufacturers, but always provide generic terms instead. This way, the purchasers remain free to obtain these products from suppliers of their choice.

The date of the last revision is shown on the bottom right hand corner of each page. Please make sure you have the most current version by going to 3acompositesUSA.com and selecting the fabrication manual from the downloads section.

If you have any further questions about our product or about how to use this manual, please feel free to contact us at 1-800-626-3365.

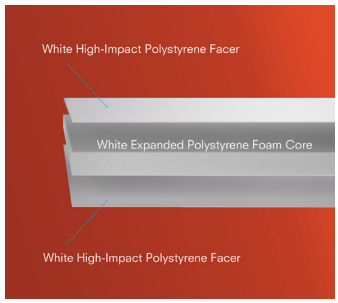
PLEASE NOTE:
TRIALING IS RECOMMENDED TO ENSURE SUITABILITY FOR THE PROPOSED APPLICATION AND FABRICATION BEFORE FULL-SCALE COMMERCIALIZATION.

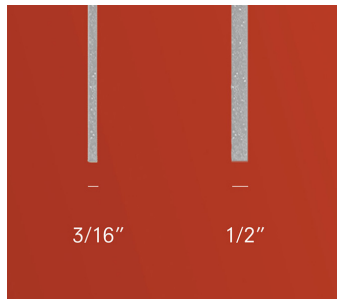
INTRODUCTION TO SMART-X

WHY CHOOSE SMART-X?

SMART-X is distinctive lightweight foam board for demanding visual communication applications. This extremely light weight, 100% polystyrene foam board offers weather and UV-resistant high-impact polystyrene facers and a moisure-resistant expanded polystyrene foam core. These properties mean that it is a lightweight material that can be used in outdoor applications for a period of up to two years without significant color change.

It has a very high strength to weight ratio and provides a super rigid & flat yet lightweight board, making it ideal for all types of signage as well as self-supporting, free-standing structures. And because there is no adhesive used in the manufacturing process it can be fully recycled at the end of life.





Features & Benefits

- Polystyrene facers deliver excellent direct digital printing results
- 100% pure polystyrene for easy recyclability - no adhesive used
- Strong, rigid and dimensionally stable - signs stay flat
- Very good resistance to weathering and warping
- High UV stability and moisture resistance
- Extremely lightweight for easy handling & hanging
- Excellent for digital & screen printing applications
- Good for CNC cutting as well as die cutting
- Vinyl graphics are repositionable

Applications

SMART-X is the perfect solution for medium to long term signage, POP displays, and dimensional lettering for interior or exterior use.

- Outdoor signage
- POP / POS Displays
- Signage & Lettering
- Wayfinding & Directional Signage
- Window Displays
- Shop Design
- Exhibition Design
- Promotional Campaigns
- In-Store Partitions

SMART-X

APPLICATION 'QUICK' GUIDE

		POP Displays	Exhibits & Fixtures	Framing	Interior Signage	Exterior Signage	Structural Signage	Interior Design	Packaging	Poster Glazing	Mechanical Assembly	Furniture Construction	MDF Replacement	Load-Bearing Platforms
$	**FOME-COR FOUNDATION** (Acid-Free)	○	○	■[0]	○									
	FOME-COR	○	○	■	○									
	FOME-COR w/ ENCORE Technology	○	○	■	○									
	FOME-COR SINGLESTEP (Heat-Activated)	○	○	■	○									
	FOME-COR CANVAS	○	○	■	●			●						
	FOME-COR JETMOUNT	○	○	■	○									
	FOME-COR QUICKSTIK (Self-Adhesive)	○	○	■	○									
	DISPA	○	○	■	○			○	○					
	POLAR	●	●	●	●		●	●				●		
	SINTRA CONSTRUCT		●	■			●				■			■
$$	**SINTRA VERS**	●	●	■	●	●								
	SINTRA	●	●	■	●	●		●						
	SINTRA ECLIPSE	●	●	■	●	●		●						
	SINTRA XT	■	■	■	■	■	■				■			■
	GATORBLANKS	●	●		●	●								
	GP APEX	●	●	■	●	●								
	GATORFOAM	●	●	■	●	●[1]								●
	GATORFOAM SELF-ADHESIVE	●	●	■	●									
	SMART-X	●	●	■	●	●		●						●
	LUMEX G	●	●	■	●				●	●				
	SWEDBOARD FIBRE	■	■		■	■	■				■	■	■	■
$$$	**DIBOND**	■	■	■	■	■	■[2]	■			■	■		■

Trialing is recommended to ensure suitability for the proposed application before full-scale commercialization.

- ○ Short term application
- ● Medium term application
- ■ Long term application
- 0 Archival mounting applications
- 1 Black GATORFOAM is not recommended for outdoor usage
- 2 Applications such as workzone signage, canopies, pylons, and column covers

SMART-X

FABRICATION 'QUICK' GUIDE

		Mounting	Repositioning Vinyl	Digital Printing	Screen Printing	Painting	Knife Cutting	Saw Cutting	Routing	Die Cutting/ Punching	Embossing	Forming	Creasing
$	**FOME-COR FOUNDATION** (Acid-Free)	◊0					◊			◊	◊		
	FOME-COR	◊		◊	◊	◊3	◊			◊	◊		◊
	FOME-COR w/ ENCORE Technology	◊		◊	◊	◊3	◊			◊			
	FOME-COR SINGLESTEP (Heat-Activated)	◊					◊			◊	◊		◊
	FOME-COR CANVAS			◊	◊	◊	◊			◊	◊		
	FOME-COR JETMOUNT	◊		◊	◊	◊3	◊	◊	◊	◊	◊		
	FOME-COR QUICKSTIK (Self-Adhesive)	◊					◊			◊	◊		◊
	DISPA	◊		◊	◊	◊	◊		◊	◊		◊7	◊
	POLAR	◊		◊	◊	◊	◊					◊7	
	SINTRA CONSTRUCT	◊1	◊			◊		◊	◊	◊5		◊	
$$	**SINTRA VERS**	◊1	◊	◊	◊	◊	◊4	◊	◊	◊5		◊	
	SINTRA	◊1	◊	◊	◊	◊	◊4	◊	◊	◊5		◊	
	SINTRA ECLIPSE	◊1	◊	◊	◊	◊	◊4	◊	◊	◊5		◊	
	SINTRA XT	◊1	◊	◊	◊	◊		◊	◊	◊		◊	
	GATORBLANKS	◊				◊	◊	◊	◊				
	GP APEX	◊	◊	◊	◊	◊3	◊	◊	◊	◊5		◊7	
	GATORFOAM	◊		◊	◊2	◊3		◊	◊				
	GATORFOAM SELF-ADHESIVE	◊	◊					◊	◊				
	SMART-X	◊	◊	◊	◊	◊3	◊	◊	◊	◊5			
	LUMEX G	◊	◊	◊	◊	◊		◊	◊	◊		◊	
	SWEDBOARD FIBRE	◊		◊	◊	◊	◊					◊7	
$$$	**DIBOND**	◊1	◊	◊	◊	◊		◊	◊	◊6		◊	

Trialing is recommended to ensure suitability for the proposed fabrication before full-scale commercialization.

0 Archival conservation mounting
1 Cold mounting techniques only
2 Face priming will provide better results
3 Do not expose polystyrene foam to solvent-based paints
4 1-3mm may be cut with a knife or blade
5 May be die cut in gauges up to 5mm or 3/16"
6 Punch press die set is required
7 Can be V-cut and folded to form shapes

Transport, Storage & Handling

To receive an optimal final product, please note the following:

- Unprocessed sheets must be stored dry, flat and away from heat and dust. Surplus sheets are best kept in their original wrapping which should be carefully resealed for storage. Never store SMART-X outdoors.

- Polystyrene is rather brittle compared to other plastics. Particularly the corners of already printed SMART-X sheets should be well padded for transport to prevent them from chipping and to avoid injuries from sharp corners.

- The structure of SMART-X sheets is oriented in the direction of production (arrow on the protective film, long side of an original sheet). SMART-X panels are therefore much more brittle along the manufacturing direction than across. For this reason, large sized 5 mm SMART-X sheets must not be bent along the manufacturing direction and should be lifted around and handled by two persons during unpacking and processing.

Direct Digital Printing

SMART-X is incredibly well-suited for digital printing due to the consistent plastic surfaces which allow for good ink adhesion and bright, vibrant colors. To achieve an optimal print result, please note the following:

- SMART-X sheets can be printed with excellent results using UV-curing inks on flatbed printers. A low lamp power setting (half the UV lamps) is sufficient to cure the UV inks and obtain good ink adhesion (cross hatch test Gt 0 according to EN ISO 2409).

- Rule of thumb: the higher the power setting of the lamps, the lower the dot gain and the more obvious any surface imperfection becomes.

- Attention: High lamp power generates a lot of heat and may also cause warping of small formats due to the high thermal insulation power of SMART-X.

- Wear cotton gloves when handling unprinted sheets. Never spray liquid cleaning agents directly onto the sheets, only on a rag. Use ionized air to blow loose debris off SMART-X sheets prior to printing.

- 45% relative humidity of air has proven very successful in fighting static charges. To this end, the climate in the print shop must be checked regularly, especially in cool weather seasons.

- Remove the protection film slowly but steadily to prevent the generation of additional static charges, and blow ionized air over them one last time just before starting to print.

- NOT due to 'defective' sheets are the following problems:
    > Bowing/warping of sheets during or after printing
    > Arched streak and banding
    > Static charge and the resulting poor print quality
    > Unsatisfactory ink adhesion

CUTTING METHODS

Saw Cutting - General Information

• SMART-X sheets can be cut to size on normal horizontal or vertical panel saws. Recommended are machines with chip and dust extraction, as commonly used in the woodworking and plastics industries.

• In view of the high rotating speed of cutting tools, it is very important for all protective devices on the machinery to be used and in good working order. It is mandatory that the prescribed personal safety equipment - at the very least a pair of safety goggles - be worn at all times during chip generating cutting operations.

• Any existing hold-down devices and sheet feeder brackets must be set to minimum pressure so that they don't leave marks and indentations on the surfaces of the sheets.

• Sturdy vertical sheet material cutters provide a viable alternative means for trimming SMART-X sheets up to 10mm thickness. The absence of dust particles is an important advantage of this technology.

Circular Saw Blades

• Attention: the circular saw blade must be very sharp! Worn or blunt circular saw blades would result in poor quality cuts (crumbling of the foam core on the edges, excessive burring and chipping on the lower surface).

• Best suited for SMART-X sheets are circular saw blades with a carbide-tipped (often marked HM) alternate flat tooth / trapezoid tooth design. A hollow (concave) face grind of the teeth would be ideal.

• Circular saw blades made of high-speed steel (often marked HSS) are NOT suitable because they will dull quickly.

• Equally unsuitable are circular saw blades with alternate top bevel teeth because those will cause chipping on the lower surface.

Sawing Technique

• Very important for good quality cuts is the position of the circular saw blade. For cutting SMART-X sheets, the circular saw blade should project about 20mm over the sheets.

> The higher the circular saw blade projects over the surface, the better the quality of cut of the top face of the sheet.

> The lower the circular saw blade projects over the surface, the better the quality of cut of the bottom face of the sheet.

• Other conditions which may improve the quality of the cut are slow feed, cutting in production/extrusion direction, and as little as possible vibrations.

• Since it is unlikely that all optimal conditions can be met in any given situation, the best possible combination needs to be determined locally by a series of practical tests. This is epecially true for the tooth design: the difference between flat face grind and hollow face grind for example isn't decisive for a successful sawing job but would be noticeable if someone is looking for the best possible quality of the cut.

• Consider the extrusion direction of the foam & facers when cutting sheets to smaller formats.

CUTTING METHODS

Milling / Routing

• SMART-X sheets are best machined on modern CNC portal milling machines. These should allow for high tool speeds up to 50’000 rev / min. and rapid feed rates up to 500 mm / sec. in order to achieve a top quality edge finish.

• Single edge end mills (dia. 4 to 6 mm) are recommended, because these permit the removal of large quantities of chips without overheating.

• An alternative machining option would be routers which can be equipped with copy milling cutters with a ball bearing guiding roller. In this case, SINTRA would be the ideal material for the guide plates.

Laser Cutting

• As opposed to expanded rigid PVC sheet material, SMART-X sheets can be laser cut without damaging the laser machine. However, a very good knowledge of the laser technology is essential in order to achieve high grade machining results.

• Cutting can indeed be faster with higher laser power. However, the increase of the laser power in relation to the feed rate can easily lead to black discoloration on the cut edges. The following settings and advise have proven good starting points:

> Laser power: at least 70 W for 5 mm sheest / at least 250 W for 10 mm sheets
> Slow feed (start with 300 cm/min. for 10 mm sheets)
> High compressed air pressure (4 bar)
> High fume extraction volume above and beneath
> Nozzle with truncated cone shape (recommendation)

ADHESIVES

Adhesive Bonding

• Pieces of SMART-X can be bonded to each other using commercially available hot-melt glue. The heat of the adhesive won't damage the cell structure of the SMART-X sheets.

• Small parts can be glued with UHU Plast special glue for Polystyrene.

• High performance double-sided adhesive tapes (VHB™-products) are well suited for securely bonding SMART-X sheets to entirely different materials. These tapes are also available as self-adhesive picture hangers for mounting prints.

Working with Adhesive Films

Compared to traditional sheet materials, the surfaces of SMART-X sheets are slightly rougher. A laminating test with the intended graphics film prior to undertaking a commercial operation with SMART-X for the first time is highly recommended in order to verify that the adhesive strength of the film is really adequate for the application.

• It is good practice to ensure that there is no humidity, no large temperature differences between the SMART-X substrate and the film, there is no over-drawing of the film during its application, and that the ink of a printed film is completely dry.

• If the face which is covered with the light blue protection film is used for lamination, cleaning of the surface underneath won't be necessary. Heavy stains on SMART-X can be removed with IPA.

• Thin gauge adhesive films and cast types adapt easier to the surface structure of SMART-X than thick decorative films and especially much better than multi-layer film composites whose high inherent stiffness limits the contact area of the adhesive layer to the higher points of the surface roughness of the SMART-X sheets. It is therefore recommended to apply first the adhesive film separately to the SMART-X sheet in order to achieve a good adhesive base for the multi-layer composite right from the beginning.

• If contrary to all expectations, an adhesive film has delaminated from a SMART-X sheet, it is worth the trouble to inspect the back face of the film, i.e. its adhesive side: The more brilliant (untouched) the layer of adhesive, the less it was in contact with the surface of SMART-X and the lower in turn must have been the adhesive strength of the film.

• It is good practice to fight the dreaded 'label effect' by rolling over the edges of a laminated film once more firmly with a hand roller in order to press the adhesive as deeply as possible down into the surface structure of the SMART-X sheet.

• Large format laminates should be moved as little as possible during the first 24 hours after lamination and on no account must they be bent during the transport.

FASTENING, FINISHING, & PAINTING

Mechanical Fastening

• SMART-X sheets can be quickly assembled into free-standing information posts and totems using universal sheet connectors or clamping bases.

• Plasterboard plugs inserted (screwed) into the edges of 19 mm SMART-X sheets can in turn accommodate standard eye bolts. A plasterboard plug can hold a tensile load of up to 22 lbs.

• SMART-X sheets can be mounted to rigid support structures with screws and large diameter washers or to a chain link fence with cable ties. Due to thermal expansion, unforced assembly with unrestricted movement of the SMART-X component is essential. Clearance holes should be drilled at least 30 mm from the edge.

• The linear thermal expansion of SMART-X sheets is 0.08 mm/mK

Edge Finishing

• The edges of SMART-X sheets can be lined or made look nice with commercially available 10 mm plastic extrusions, usually made of PVC. The double-U extrusions (called W-profile) which are available from 3A Composites are especially useful for corner joints. Attention: PVC extrusions must be bonded to the SMART-X sheets with any PVC glue.

• The white edge liners made of Melamine resin intended for furniture industry have proved an interesting alternative to PVC extrusions. They are available in hardware stores as well as at the carpenter around the corner in small quantities and have a coat of hot melt glue on their backside. This adhesive, molten with an ordinary pressing iron or a special machine will bond the liners to the edges of SMART-X sheets without melting them. A bit of experimenting will be necessary to set the correct bonding speed.

Painting

• SMART-X sheets can be painted in a choice of colours using acrylic paint from spray cans. The edges won't be etched.

• On the other hand, aggressive solvent based paints (e.g. screen printing inks!) may attack the surfaces of SMART-X sheets rather seriously.

WASTE DISPOSAL

SMART-X is made up of 100% pure polystyrene, making it a mono-material and 100% recyclable. SMART-X can easily be disposed of in the plastic waste stream.

CONCLUSION

This Fabrication Manual has been developed to assist fabricators to work with the substrate in the most efficient and effective manner. The tips and suggestions contained in this manual are the result of many years of combined experience by fabricators in the U.S., Canada, South America, Asia and Europe.

These fabrication suggestions and product specifications are based on information which is, in our opinion, reliable. However, since skill, judgment, and quality of equipment and tools are involved, and since conditions and methods of using the substrate are beyond our control, the suggestions contained in this manual are provided without guarantee. We recommend that prospective users determine the suitability of both the material and suggestions before adopting them on a commercial scale.

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Also, normal safety and health precautions practiced in any fabricating environment should be used when fabricating the substrate.

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