NIPPON CARBIDE INDUSTRIES CO.,INC.

Rennicks U.K.
CLEARLY BETTER

Sign shop processing instructions for Nikkalite® retroreflective & Hi-S Cal® non-retroreflective sheetings

Section; A Sheeting storage & processing instructions
B Screen printing with Nikkalite inks

Section A; Sheeting storage & processing instructions

1) Storage conditions

Boxed rolls should be stored horizontally preferably at a temperature of 15°C to 25°C for a minimum of 24 hours before use. Full rolls should be stored no more than 5 boxes high and not directly on a concrete floor. The boxes should be arranged so that each box size is stacked correctly to prevent collapsing in the centre of boxes and damage to the contents. Stocks should be rotated within 12 months and stored out of direct sunlight.

Nikkalite® boxed inks should be stored at a temperature of 15°C to 25°C in a metal cabinet preferably in the print shop 24 hours before use to acclimatise.

2) Sign shop environment

Application should be undertaken in a clean dust free environment having an ambient temperature of between 15°C to 26°C, and relative humidity 30 to 60%, where both the sign face sheeting and substrate have conditioned to this temperature.
If the relative humidity drops below 30%, then one of the following methods should be utilized to increase relative humidity above 30%.

a) Usage of a humidifier
b) Spraying a moderate amount of water on the floor.

Open rolls

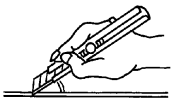
Open rolls should be supported through the core on a rack or returned to the original box and supported at each end with the plastic supports. End of the roll should be firmly taped to avoid unwinding. Rolls should not be stored vertical on their end at any time due to possible damage to the roll edge. Open rolls should not be laid horizontally on a flat surface for extended periods.

Sheeting off cut storage

Off cuts may be stored flat or wound tightly around a core of appropriate diameter to the sheeting type.

3) Handling and cutting sheetings

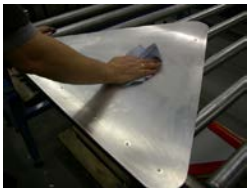
Avoid touching surfaces of sheeting's during handling particularly prior to printing. Sheeting should be cut from the upper surface using sharp blades. When using semi-automatic cutting equipment a maximum of 100 sheets should be stacked and the equipment settings tested to avoid clamping damage to sheeting and reflective properties.



Sheeting should be stacked flat on a firm rigid surface and handled carefully avoiding flexing or folding of the sheeting.

4) Substrate preparation

Metallic substrates



To obtain optimum adhesion and long durability, it is absolutely necessary to eliminate any contaminants from approved substrate surfaces by degreasing surfaces with mineralised methylated spirits or citrus cleaners.
Surfaces should be degreased and then dried with a separate clean cloth.
Painted metal surfaces should be prepared by abrading and cleaning the area to provide a suitable surface for correct adhesion.
Nikkalite® & Hi-S Cal® sheetings have been satisfactorily tested on degreased aluminum sheet, aluminum traffic composites and HP 200 steel substrates.

Non-metallic substrates

Plastic substrates should be tested for quality and suitability before use as plastic substrates can emit plasticizer from the surface, which could have a detrimental effect on the adhesion of self-adhesive materials.
Customer accepts responsibility for testing conformity to EN 12899.

5) Cutting and application of sheetings

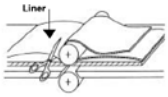
Select the appropriate roll size to eliminate joins in sign face sheetings. Where it is unavoidable in non-retroreflective, RA1 Engineering grade or RA2 Ultralite sheetings these should be overlapped with the upper edge overlapping the lower piece by approximately 6mm to allow water runoff.
When applying protective overlays EF40801 or DT142-S to the base sheeting these should not be applied across overlapped joints.

Microprismatic sheetings must not be overlapped a butt joint is the correct method.

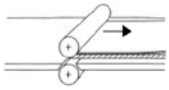
Coloured overlays forming the sign face detail should be applied in the same way as above and after application and removal of the plastic application tape the sign panel should be passed back through the lamination roller to ensure correct adhesion.

- Nikkalite coloured overlay sheetings should not be joined or overlapped.
- Nikkalite Dewtect sheeting DT 142-S should not be joined or overlapped.
- Nikkalite Anti-graffiti EF40801 must not be overlapped. The surface properties allow the easy removal of graffiti and adhesives. Therefore an overlapped joint will not adhere satisfactorily when applied to itself.

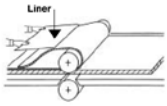
Application should be undertaken in an area having an ambient temperature of between 15°C to 26°C, where both the sign face sheeting and substrate have conditioned to this temperature.

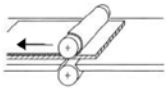


Setting up for application using manually operated pneumatic roller

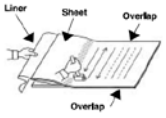


Large areas of sheeting should be applied onto the pre cleaned substrate through a wide width roller with a rubber shore hardness of approximately 60-70, operating at a pneumatic pressure of 40 to 60 PSI*. Run test panels to confirm application is correct and all air is expelled.
Use the half and half technique for long panels. Application rollers must be suitably constructed to provide constant uniform pressure across the full width of the rollers without any flexing of the upper or lower roller.
*Based on 100mm internal diameter pneumatic cylinders.

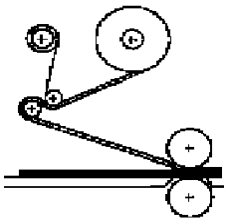




A hand roller may be used for small areas and for text providing firm overlapping strokes are used to expel the air.
Following application to test for remaining air, apply firm pressure using a small hand roller.



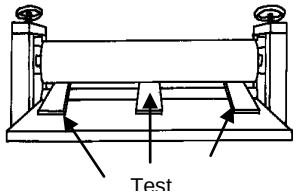
Setting up for roll application



A. Setting the roller:

1. The feedstock roll and release film rewinding roll together with the guides should all be checked to ensure that they are parallel to each other.

2. Prepare 3 test plates, approximately 5 × 15cm in size on which Nikkalite sheeting was manually applied.

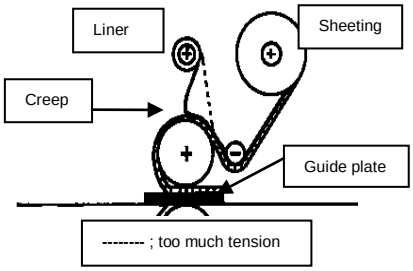


3. Position plates in nip of roller as shown.

4. Lower the top roller onto the plates slowly and adjust the clearance between the roller and the substrates surface so that the top roller touches the surface of the test plates simultaneously.

5. Slightly increase setting of the top roller so that the test plates cannot be removed by hand.

6. Apply a little more pressure on the test plates by tightening the adjusting knob a quarter or a half turn.



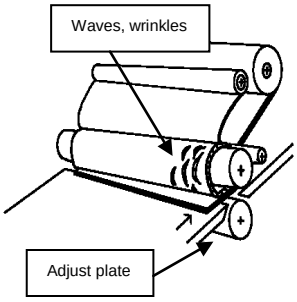
7. If the powered squeeze roller applicator is equipped with pneumatic air cylinders and an upper roll with 60-70 shore hardness, set the pressure at 40 to 60 PSI to provide a pressure of approximately 2Kg/cm2 (30 lbs/in.2) at the nip point.

B. Application process:

1. Prepare guide plates as required using a narrow section of substrate which is the same overall width as the Nikkalite sheeting to be applied.

2. Set up the feedstock roll in accordance with the equipment manufacturer's instructions.

3. Peel 10cm of the release liner away from the end of the sheeting and adhere it evenly to the guide plate avoiding any wrinkles or stretches.

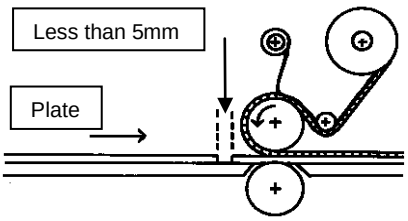


4. Feed the guide plate between the nip rollers without closing the gap. Adjust the feeding angle of the guide plate to eliminate any uneven tension in the sheeting.

5. Tighten the nip rollers and manually peel off the release film and wind it around the release film rewinding roll with an even tension.

6. Start the roller applicator slowly and check that the sheeting is completely free of waves and wrinkles.

7. If the first guide plate shows any wrinkles or uneven tension, insert a second guide plate and release the pressure of the nip rollers in order to take out waves and wrinkles. Repeat the processes described in 4-6 above to completely eliminate uneven tension in the sheeting.



8. Then, feed the substrate plates one by one and continue the application process.

9. The gap between each plate must not be more than 5mm.

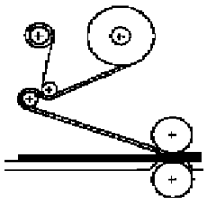
10. Tension in the sheeting can be reduced by allowing the sheeting to creep up along the feed roll before it is fed into the nip rollers.

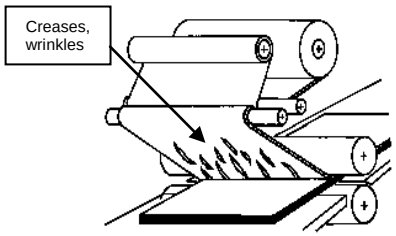
11. The application speed should not be greater than 4 m/min.

12. Each piece of substrate coated with sheeting coming out of the machine should be separated from the next one by cutting the sheeting with a sharp knife and trimmed at once.

13. During the above processes, inspect panels after application, and firmly press the sheeting surface with a hand roller. If any air remains between the sheeting and the substrate this will be visible on the surface of the sheeting. Recheck to determine that the pressure of the nip rollers is correct and also check if both rollers are parallel to each other.

14. The diagram below shows applicator roll positions which are not correct and may cause creases and wrinkles. To avoid this use roll positions in diagram at 7 above.





Trimming

The sheeting should be trimmed back sufficiently using a sharp knife to avoid damage during handling and transportation.

Packaging, transportation and site storage

Signs should be suitably packed using bubble wrap or similar to withstand handling and transportation.
Sign faces should be stacked face to face on wooden or rubber mats and off a concrete floor.

The sign face should not be walked on. Abrasion from sand, soil or road grit must be prevented. Contact with standing water and sharp objects must be avoided. Care must be taken to avoid undue flexing or stress on the sign face during unloading. Protect edges and faces of sign when using slings.

On receipt by customer, sign faces should be carefully inspected. If any part of the packaging is or becomes wet, it should be removed immediately for the sign face to dry naturally.
Signs must not be stored wet or outside with the packaging in place. Remove packaging and maintain an air gap between the sign faces to allow free air circulation.

Section B; Screen printing with Nikkalite® inks

Nikkalite® N3600 series screen print processing information to EN 12899

Introduction

Nikkalite® N3600 series pre-screening inks are durable, highly transparent, quick drying screen printing inks, manufactured by Nippon Carbide Industries (NCI), that bond strongly and permanently to Nikkalite retroreflective sheetings.

N3600 colour	Code
Black	N3603
Yellow	N3604
Blue	N3616
Red	N3625
Thinner	N3611
Toner	N3612
Hardener	N3631

The following processing instructions should be strictly adhered to for compliance to EN 12899.

NCI cascaded ITT is available for RA1, RA2 and R3B sheetings to support and reduce customers own screen printing ITT.

Nikkalite Sheeting types RA1 8100 and RA2 800 series & Hi-S Cal 4178

N3600 inks may be used without N3631 hardener on 8100 series EG & 800 ULS series sheetings.
If required the hardener can be added to provide a solvent resistance surface.

Nikkalite Sheeting type R3B 92800 Crystal grade

N3600 inks should always be mixed with N3631 hardener when printing onto 92800 Crystal grade R3B series.

Sheeting type	N3631 hardener
4178 Non- reflective	Optional
8100 RA1 Engineering grade (EG),	Optional
800 RA2 Ultralite Special grade (ULS)	Optional
92800 R3B Crystal grade (CRG)	Necessary

Screen mesh

Polyester monofilament plain weave mesh 62T to 77T/cm is recommended (except for N3625 red onto 8112 sheeting – see below) for compliance to EN 12899-1.
For non-traffic multi coloured or fine detail work such as crests a 71T to 87T/cm mesh may be used and clear coating using a toner to achieve increased durability.

Use 70T to 77T/cm mesh type for N3625 Red onto 8112 White sheeting and thoroughly mix toner in a ratio of 100 parts N3625 Red ink to 25 parts N3612 Toner by weight.
Toner should not be added for any other colours or sheeting types.

Thinner

Nikkalite inks do not normally require dilution due to their pre-adjusted viscosity, however, if necessary only use with Nikkalite® N3611 thinner in mixing ratio of 100 parts ink and up to 10 parts thinner as necessary.

N3631 Hardener ratios

Where required N3631 Hardener should be thoroughly mixed in a ratio of 8 parts by weight of hardener to 100 parts of ink by hand mixing for 100 revolutions, or with an electric mixer with an explosion proof motor for one minute.

Processing instructions

Screen printing should be undertaken in a clean separated area with good air extraction and ventilation.

- Set up oscillating fans before printing commences inclined slightly downwards directed on the drying racks over the surface of the printed sheeting to remove solvent and speed up the drying process.
- Set fans too “high” for approximately 30 minutes.
- Provide an air gap between the drying rack shelves of at least 10cm for adequate airflow and to reduce the drying time. Insufficient air circulation and flow may cause fine cracks in the sheeting surface.
- When tunnel drying do not exceed 70°C and place in drying rack afterwards.
- To confirm sign faces are dry for storage, press two screened surfaces together firmly for 5 seconds. Hold close to ear and pull apart. If peeling sound is heard, continue the drying process.

Processing guidance for N3600 series two component inks.

- Calculate amount of ink needed for print run.
- Using postage type scales for weighing accuracy, mix 8 parts hardener to 100 parts of N3600 ink.
- After mixing with hardener inks have a maximum 8 hour pot life - shorter in hot temperatures.
- Prints must be racked for 5-6 hours before stacking and storage (ideally racking should be overnight).
- Ink will not dry completely through a tunnel drier.
- Drying conditions for racked prints; warm and ventilated with good airflow from oscillating fans.
- Screen needs to be cleaned thoroughly immediately after printing. If any residue is left in the mesh it will cure and block the mesh (if this happens then the only solution is a new mesh).

Instructions for preparation of "Nikkalite" process colors

1. The ink should be stored in the print shop preferably between 20–30°C, in a metal cabinet for at least one day prior to use. Shake the ink container well for one minute.

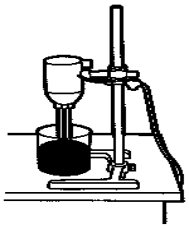
2. When the ambient temperature is less than 20°C, printing may become difficult due to increased ink viscosity. In such a case, we recommend to warm up the ink slowly near a heater to the temperature of 20–24°C.

3. The work shop should be free from dirt or dust. Any foreign matter in the ink will cause non-wetting or uneven printing.

4. Ink containers, putty knives and the mixer should be always kept clean. If any ink or resin previously used is mixed into the new ink, it will cause non-wetting, uneven printing, color change or insufficient ink adhesion.

5. Measure the necessary amount of ink needed for one batch of screening work, pour it in a clean container and stir it thoroughly with a putty knife or a mixer. One litre ink will cover approximately 22–24 ㎡ area with a screen mesh of 62–71/cm (157–180/inch) and mono-filament.

6. Normally, "Nikkalite" ink does not require dilution with thinner since it's viscosity is pre-adjusted. However, when necessary, add up to 10 parts of thinner by the weight.

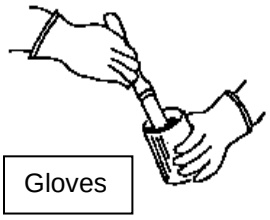


7. Recommended mixer: Air driven motor with 3 blades of a diameter 5cm (2 ins.), at 1000–2000 RPM. Electric motor should not be used due to danger of sparks.

8. When a mixer is used, insert the rotating blades deep into the ink to avoid trapping air bubbles.

9. N3600 Series Ink mixing ratio and time (One-component without hardener):
   Usage: Pre-Screening for Nikkalite sheetings
   Pre- and Post-screening for Nikkalite enclosed lens type sheeting except F4300 MPG

   Putty knife ……3 min.
   Motorized mixer …… 1 min.
   Do not try to mix inks by shaking can method.



10. N3600 Series Ink mixing ratio and time (Two-component with hardener):
    Hardener is required for this ink. Mix the ink and hardener at the ratio shown below.
    Usage: Pre-Screening for Nikkalite sheetings
    Pre- and Post-screening for Nikkalite enclosed lens type sheeting except F4300 MPG

    Ink …… 100 parts by weight
    Hardener …… 7–8 parts by weight

    Putty knife ……3 min.
    Motorized mixer …… 1 min.
    Do not try to mix inks by shaking can method.

11. Use N3600 (Two-component) inks within 5 hours after mixed. Mix a small amount of ink enough for 4 to 5 hours use in the morning and prepare another new lot for the afternoon work. Make efficient use of your ink by mixing only that amount of ink necessary to complete your job.

12. Reseal open containers of any unmixed ink and/or hardener. Failure to properly store unmixed ink and/or hardener will render them unusable.

13. Store unmixed ink and hardener out of direct sunlight at room temperatures of 20–30℃, and relative humidity of 30–80%. Shelf life of the ink is one year after purchase.

14. If ink or hardener gets into the eyes, wash with copious amounts of clean water and seek medical attention. If in contact with skin, wipe away with cloth or paper towel, and then with a cloth soaked with thinner and finally wash off with a mild detergent. If inflammation or irritation persists, seek medical attention immediately.

15. Keep inks, thinners, solvents and hardeners away from children.

Instructions for pre-screening Nikkalite sheeting

1. Nikkalite cut sheets and inks should be stored in the printing room, preferably at 20-24℃, at least 24 hours prior to printing. Preferably keep them at room temperature

2. The printing room should be clean with temperature of 20-24℃ , relative humidity of 30-50%.

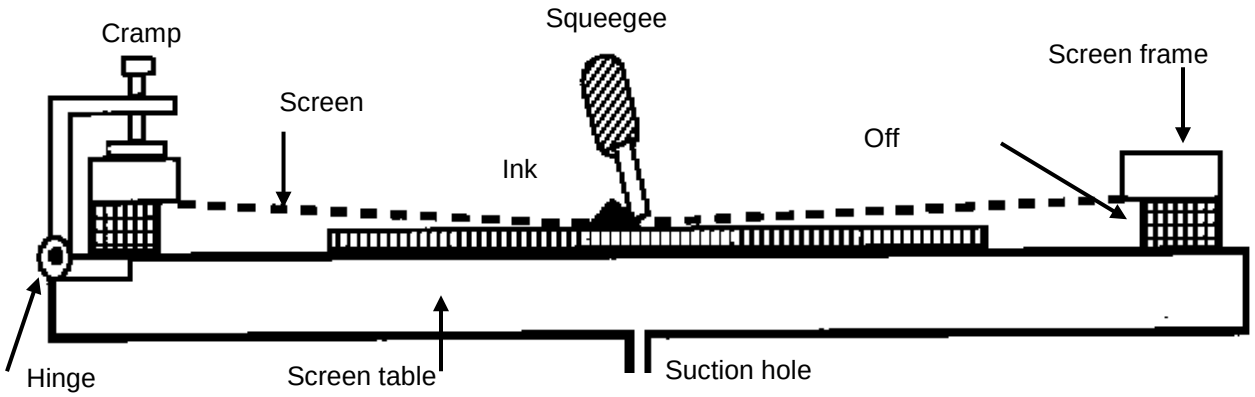
3. The recommended screen is a polyester mono-filament, plain weave with mesh size of 62-87/cm (157-220/in.). For traffic signs, we recommend 62-77/cm (157-196/in.) mesh, and for multi-colored or fine markings, 71-87/cm (180-220/in.). The coarser mesh is recommended when high weather resistance is required.

4. Water-soluble masking media should be used for screen. Solvent type masking's are not recommended.

5. Cut sheets should be held firmly in place on the print table by vacuum regardless of automatic or manual printing process.

6. Care should be taken not to damage the screen table surface. Very small dents or projections will cause uneven printing.

7. We recommend an off-contact printing method. The off-contact height will be determined by the size of the screen and its tension. Therefore, this height is to be fixed by repeating test runs blank paper before printing on Nikkalite sheets.



8. In addition to the off-contact height adjustment, further adjustment such as printing positions, pressure and the balance on both ends of the squeegee, the squeegee angle, speed, etc. should be made.

9. The screening speed (squeegee speed) for our all Nikkalite sheetings must be lower than 20m/min.
   For screening areas greater than 60cm diameter, the speed should be lowered down 16-18m/min.
   Higher speeds may cause unsatisfactory wetting of ink or bad off-contact resulting in an uneven printing.

10. Do not pour too much ink on the screen at one time. During printing, frequently add small amounts of ink as required. By doing so, the ink viscosity will remain constant and therefore, a constant colour thickness will be maintained throughout the production run.

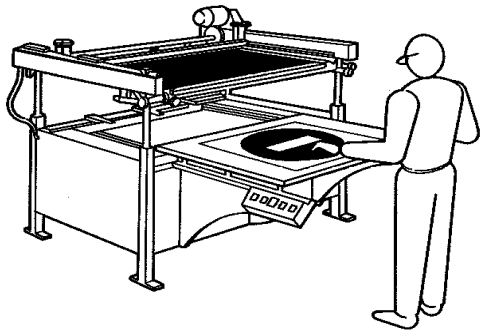
11. Before printing, use an ionic air gun, or wipe the Nikkalite surface with a dust free soft cloth. If a tack cloth is used to wipe the surface use it lightly so no tacky material remains.

12. Ink fill-passing is recommended. When manually printing, the impression pass comes first, and immediately after that the fill-pass, then the exchange of the screened sheet with an unscreened sheet to be printed next follows. For automatic or semiautomatic printing, the machine should be set to stop when fill-passing is completed so that the printed sheet can be replaced with a new one. Such procedures will prevent ink drying in the screen mesh.

13. Ink should not be wiped off the Nikkalite surface with solvent if the print has failed.

14. When printing is complete, clean the screen and the squeegee immediately with the solvents listed below. When manually cleaned in a well-ventilated area, protections such as goggles, face mask, rubber gloves, rubber apron should be used.

15. Solvents: Nikkalite 3611, lacquer thinner, xylene, solvesso 100 or 150 (Esso Standard products), or equivalent. If ink dries in the screen, clean it with a 50%-50% mixture of solvents and cyclohexanone.



Additional requirements for post-screening Nikkalite sheeting (applied to substrate)

The following should be read in conjunction with the previous section.

After application onto the substrate and before printing the ULS & CRG Nikkalite sheeting in particular should be stored at around 20-24℃ , for at least two day before printing to allow sheeting to stabilize. Immediate printing after application may cause hairline cracks on the Nikkalite surface.

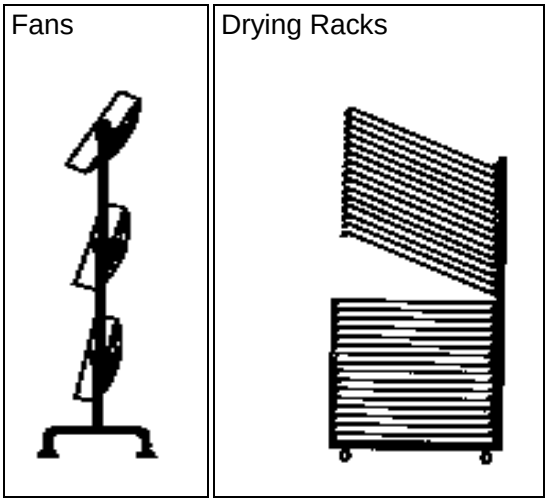
When set the “panel” with sheeting should be printed on the printing table, place two pieces of plates having the same thickness with the “panel” along with the upper and lower edges of the “panel” toward the screening direction, and fix them on printing table. The impression of the squeegee should be repeated on these plates or the screen will be torn on the edges of the “panel”.

Instructions for drying screened Nikkalite sheetings

Preparation before printing

The drying racks mesh size should be less than 12cm×12cm. If larger we suggest covering the racks with thin cardboard, so that the printed sheets lay flat and do not sag during drying as small cracks may appear on the surface.

Mount three fans on one pole. The fans should be movable up and down.



Specification of the fans.

Blade diameter----------30-40cm (12-16 ins.)
Max. wind velocity---------180-220m/min.
Max. wind volume----------55-65m3/min.

Set the fans 1.5 to 2 meters apart from the drying racks aimed slightly downward towards the printed surfaces and operate at a high setting. There is a possibility that insufficient air volume will cause fine cracks in sheeting surface.

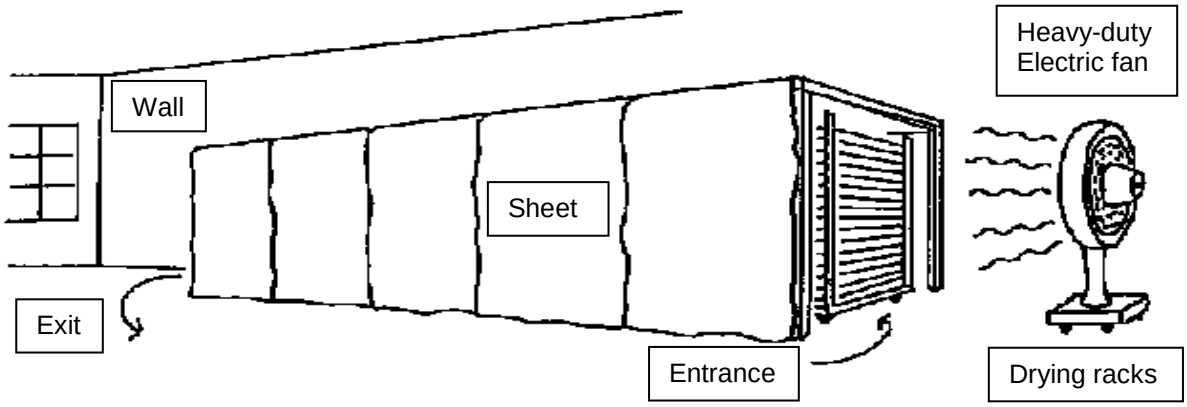
Drying of Pre-screened Sign faces

Immediately after screening, place each sign face on the rack holding the sheeting taught and flat. A large size sign face should be held by two persons.

The open area between the shelves should be at least 10cm for adequate airflow. If they are narrower, then use every other shelf.

After the racks have become full, continue air flow for an additional 30min at a high setting.

Air flow can be then reduced but maintained for 24 hours to ensure correct drying, one fan to each drying rack. We recommend the drying method referred to the drawing below. A long tunnel covered by PVC or tarpaulin sheet which can accommodate one row of drying racks. Set a heavy-duty fan at opening of the tunnel and blow air towards the rear.



After 24 hours of drying, check the screened surface for thorough drying. Put two pieces of screened signs together, face to face, firmly press them for 5 seconds. Hold close to ear and peel apart, if any peeling sound is heard, the drying is unsatisfactory. Continue airflow until completely dry and no sound is heard.

Correctly dried screen faces can be stacked up to 50 pieces for storing.

Drying of Post-screened Sign Faces
The drying procedures and method of pre-screened sign faces as above applies to post-screened sign faces.

Packing screened images
Screen printed Nikkalite® finished signs must be protected with slip sheet and foam padding. En sure that the shiny, waxy side is placed against the screened surface. Avoid banding tightly, or stacking which allows signs or faces to be under pressure.

Health and Safety
MSDS sheets are available on request.
If ink, hardener or thinner enters the eyes wash immediately with copious amounts of clean water and seek medical attention.
After contact with skin wipe away and wash with a mild detergent. Seek medical attention if inflammation occurs.

Reliability of information
All recommendations and technical information contained herein are based on experience and tests, which the manufacturer believes to be reliable, but their accuracy and completion are not warranted.
The user is cautioned to undertake tests to determine the suitability of a particular product for the intended application.