Reliability of Information

All recommendations and technical information contained herein are based on experieces and tests, which the manufacturer believes to be reliable; however, their accuracy and completeness are not warranted.
The user is requested to conduct their own test/tests to determine the fitness of this product for the intended application.

Warranty

Nikkalite™ Products are warranted to be free from defects in materials and workmanship at the time of their sale. except herein expressly warranted. NCI's (Nippon Carbide Industries Co., Inc.) liability is limited to replace the defective materials solely as stated herein. NCI shall not be liable for any loss, damage or injury, direct or indirect or incidental, arising from the use or inability to use said products, and the warranties of merchantability or fitness for a particular purpose as well.

Warning

Failure to comply with the explicit instructions in this bulletin will result in voiding all warranties express or implied for use of this product. If retroreflective sheeting is to be applied to a surface other than conventional sign blank materials, prospective users should contact technical representatives of Nippon Carbide Industries Co., Inc. for advice before such application.

Safety and Health Information

Read carefully in advance the labels, instruction manuals, material safety data sheets (MSDS), and first aid measures of the retroreflective sheetings supplied by Nippon Carbide Industries Co., Inc. (hereinafter referred to as "NCI"), the auxiliary materials such as inks and solvents used for NCI's products, and proprietarily used chemicals such as substrate cleansers.

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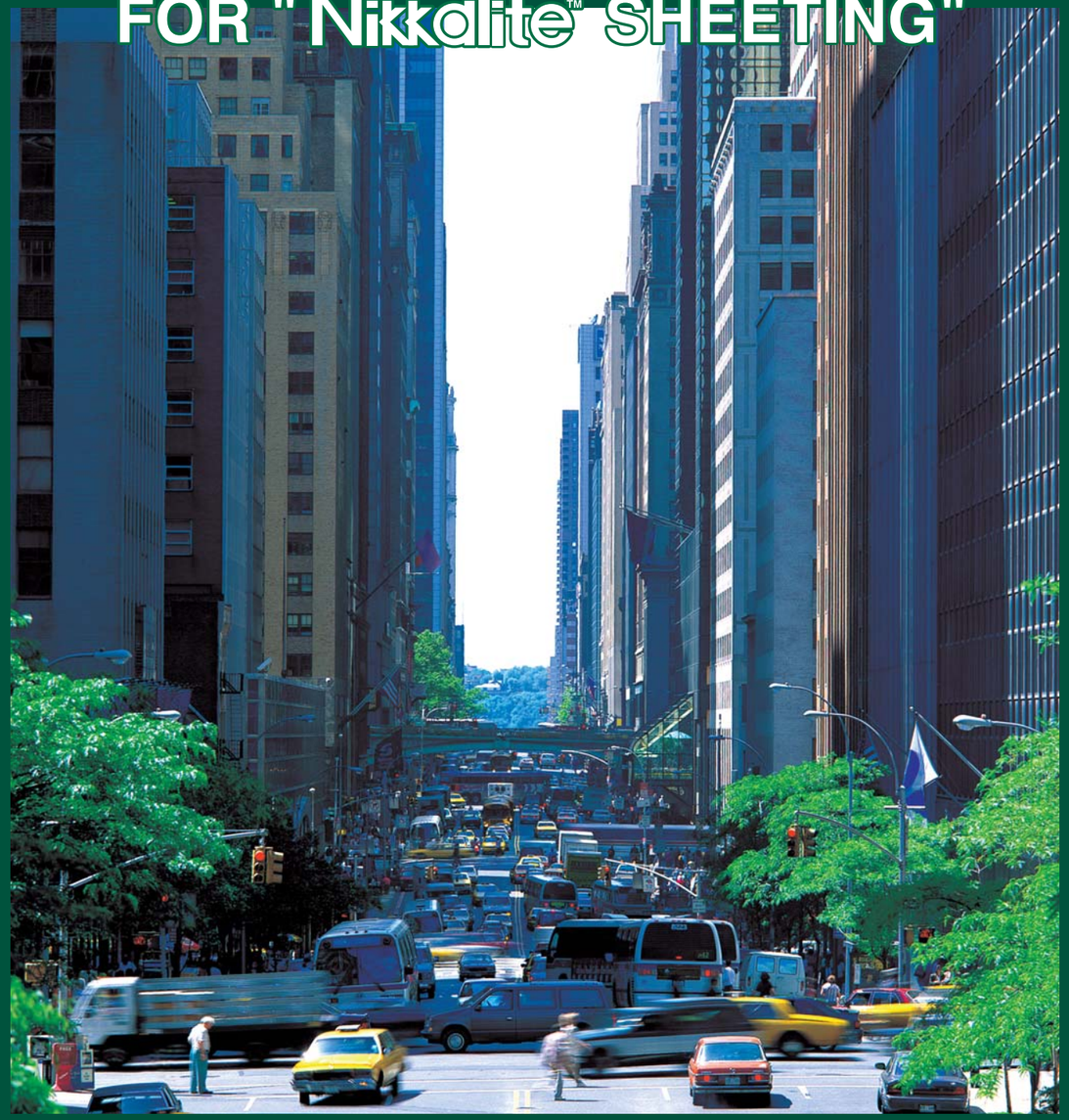
Nikkalite™

Information for Sign Shop

TECHNICAL INFORMATION FOR "Nikkalite™ SHEETING"



NIPPON CARBIDE INDUSTRIES CO.,INC.

Table of Contents

NO.1
Storage and application conditions for Nikkalite sheeting

The following conditions for the storage and application of Nikkalite sheeting must be strictly observed;

1. Nikkalite sheeting must be stored at a temperature of 20-26℃ (68-79˚F) for at least 24 hours prior to application.

2. The application and fabrication areas should be substantially free of dust particles and debris.

3. The optimum application and fabrication conditions are;

Atmospheric temperature:20-26℃ (68-79˚F)
Relative humidity:30-60%

4. If 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.

5. Nikkalite sheeting sheeting should not be stretched or folded.

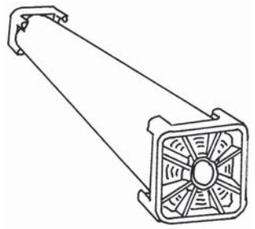
6. When short lengths of Nikkalite sheeting (eg 3 meters, 10 meters) must be stored, It must be wound tightly on 106mm or larger diameter roll core.

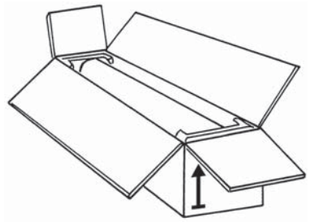
7. Partially used rolls of Nikkalite sheeting should be rewound tightly on their original roll cores with a strong adhesive tape securing the entire width of the roll to prevent unwinding and loosening of the roll.

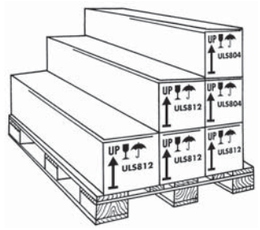
8. Partially used rolls of Nikkalite sheeting should be stored horizontally suspended in the original carton box utilizing the plastic roll suspensions, or iron bar should be inserted inside the roll core and sheeting roll should be hanged in mid-air by suspending both ends of iron bar horizontally.

9. When the carton boxes of retroreflective sheeting are piled up, the utmost number of the carton will be four. Refrain from piling up the different size of carton boxes and also refrain from piling up it in parallel crosses.

10. Nikkalite sheeting should be stored indoors, avoiding contact with direct sunlight at a temperature of 20-26℃ (68-79˚F) and in an atmosphere with a relative humidity of 30-60%. The shelf life of the retroreflective sheeting is one year after purchase.







NO.2
Instructions for cutting Nikkalite sheeting

1. Nikkalite sheeting rolls should be stored at an optimum temperature of 20-30℃ (68-86 ˚F) for at least 24 hours prior to their usage.

2. During the handling, unwinding and cutting of Nikkalite sheeting, static electricity will be crated causing dirt and dust particles adhere to the sheeting surface. The best results are obtained by thoroughly cleaning the work area before processing sheeting.

3. Cutting knife blades should be kept clean, sharp, and free from contamination such as adhesive, dirt, grease, etc.

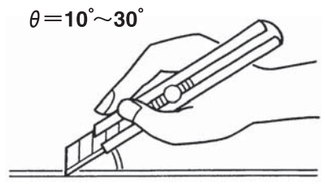
4. Cutting of Nikkalite sheeting at temperature below 20℃ (68˚F) is not recommended.

5. Cutting knife blade should always be inserted from the top surface of Nikkalite sheeting and cut it on a cutting mat, a thick glass plate or a nylon plastic plate.

6. When cutting Nikkalite sheeting by hand, the knife blade should be held at an angle of 10-30 degrees from the sheeting surface.

7. When cutting Nikkalite sheeting by hand or die cutting processes, only one panel should be cut at a time.

8. When cutting Nikkalite sheeting by guillotine shears, a maximum of 50 sheets should be processed at any one time.



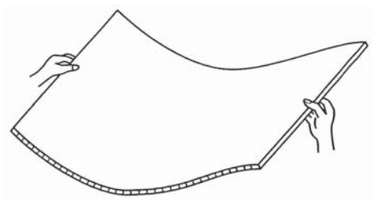
9. Cutting Nikkalite sheeting with either band or radial saw blades is not recommended.

10. When handling Nikkalite sheeting for screen printing, avoid manual contact with the surfaces which are to be screen printed.

11. Hand cut Nikkalite sheeting panels of equal size should be stack with the sheet surfaces placed "face to face", up to 100pcs.

12. When Nikkalite sheeting panels are cut by semi automatic sheeting machines, a maximum of 100 sheets should be stacked together.

13. Cut Nikkalite sheeting panels should be stacked on a smooth, flat, and rigid surface. Nikkalite sheeting should never be stacked on soft foam materials such as polyurethane, polyethylene or polystyrene. Two or three pieces of plywood or similar material, approximately 1cm thick, should be placed upon the stacked Nikkalite sheeting panels. It is recommended that they are slightly oversize.



NO.3
Instructions for preparation of Nikkalite process colors

1. The ink should be carried to the work shop at least one day prior to use. After shaking the ink container well for one minute, keep it in a warm room preferably under the temperature of 20-26℃ (68-79°F).

2. When the atmospheric temperature is less than 15℃ (approx. 59°F), printing may become difficult due to increased ink viscosity. In such a case, we recommend to warm up the ink slowly near a heater in the room to a temperature of 20-24℃ (68-75 °F).

3. The work shop should be thorougly cleaned and 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. Decant sufficient ink needed for one batch of screening work, pour it into a clean container and stir it thoroughly with a putty knife or a mixer. One liter ink will cover approximately 20-26m^2 (215-258 sq.ft.) 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 viscosity. When necessary,however, add up to 10 parts of thinner by the weight.

7. Mixer recommended: Driven by an air motor with 3 blades of a diameter 5cm (2 ins.), and mixing speed of 1000-2000 RPM.

8. When a mixer is used, the rotating blades should be inserted deep into the ink to avoid trapping air bubbles in the ink.

9. N3600 and N3800 Series inks mixing ratio and time (Two-component) : Hardener is required for these inks. Mix the ink and hardener at the ratio shown below.

Series	Hardener	Mixing ratio (Ink : Hardener)	Pre-screening	Post-screening
N3600	N3631	100 : 8	OK	NG
N3800	N3830	100 : 14	OK	OK

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

10. Special use of N3600 and N3800 series inks without hardener as one-component ink :

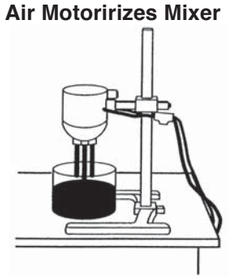
Can shaker.....10 min.
Putty knife..... 3 min.
Motorized mixer..... 1 min.

11. Use N3600 and N3800 series inks (Two-component) within 5 hours after mixing. Mix sufficient ink for a half-day use in the morning and prepare another new lot for the afternoon work.

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

13. Store unmixed ink and hardener out of direct sunlight at room temperatures of 20-26℃(68-79°F), and the relative humidity of 30-60%. Shelf life of the ink is one year after purchase.

Air Motoririzes Mixer



⚠
Solvent resistance: a little bit weaker than the usage of with hardener

14. If ink or hardener gets into eyes, immediately wash them off with fresh water and go to an eye physician. If it contact to your skin, wipe it off with cloth or paper towel and then with a cloth soaked with thinner and finally wash it off with a mild detergent. If inflammation or irritation persists, seek proper medical attention immediately.

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

NO.4
Instructions for pre-screening Nikkalite sheeting on cut-sheets

1. Nikkalite sheeting cut sheets and inks should be stored in the printing room, preferably at 20-26℃ (68-79°F), at least 24 hours prior to printing.

2. The printing room should be clean with temperature of 20-26℃ (68-79 °F), relative humidity of 30-60%.

3. The recommended screen mesh is 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 preparation. Solvent type masking media are not recommended.

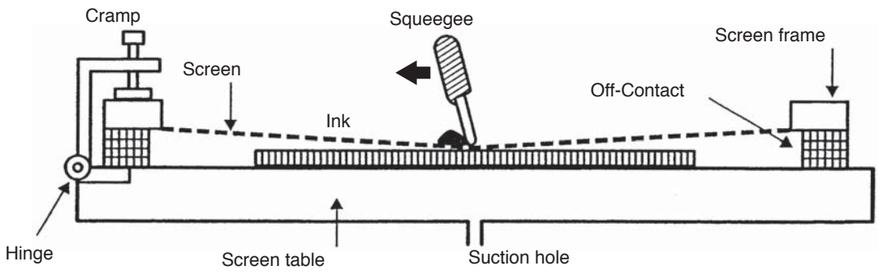
5. The printing machine should be equipped with a printing table on which cut sheets are held by vacuum. This applies for both manual and semi-automatic machines.

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

⚠
Ink on the screen dries fast if the printing room temperature becomes higher than 26℃ (79F).

⚠
When used solvent type masking media, the adhesive melts into the ink, which can become a cause of "White spots".

7. We recommend the 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 sheeting.



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

9. The screening speed (squeegee speed) for Nikkalite sheeting must be lower than 20m/min. (22 yards./min.). For screening big signs with 60cm diameter or more, the speed should be lowered down 15-18m/min. (16-20 yards./min.). Faster speeds will cause unsatisfactory wetting of ink or bad off-contact resulting in an uneven printing.

10. Do not pour too much ink onto the screen at one time. During printing, frequent supplies of small amounts of ink each time is recommended. By doing so, the ink viscosity will remain constant and therefore, a constant color thickness will be obtained from beginning to end.

11. Before printing, blow the dust using the ionic air with air gun, or wipe the Nikkalite sheeting cut sheet surface with a dust free soft cloth. If a tacky cloth for dusting is used, wipe the surface lightly leaving no tacky material on it.

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 a 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 clogs on the screen mesh.

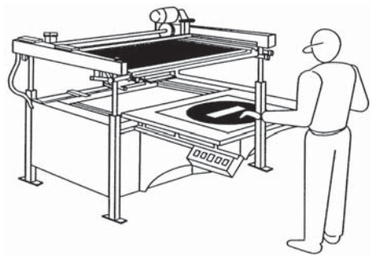
13. The ink cannot be wiped off the Nikkalite sheeting surface with solvent when the printing has failed.

14. When printing with a manual machine for which the screen will move by the hinges, the squeegee should be moved toward the hinges during the impression passing.

15. When printing is finished, clean the screen and the squeegee immediately with the solvents listed below. We recommended utilizing an explosion-proof ventilation equipped automatic screen cleaning machine. When manually cleaned, we recommend to ware complete protections such as goggles, anti poison mask, rubber gloves, rubber aprons and do it in a well-ventilated place.

Solvents : Nikkalite N3511 or N3611, lacquer thinner, xylene, T-900 or T-910 (NAZDAR products), Solvesso 100 or 150 (Esso standard products), Supersol 100 (Mitsubishi Oil products), or equivalent one.

If ink dries on the screen, clean it with a 50%-50% mixture one of the above solvents mixed with cyclohexanone.



NO.5
Instructions for post-screening Nikkalite sheeting on applied cut-sheets

1. The applied Nikkalite sheeting sheets should be kept indoors, preferably at 20-26℃ (68-79˚F), at least two day before printing.

⚠ Immediate printing after application may cause cracks on the sheet surface.

2. The applied Nikkalite sheeting and inks should be stored at the work shop, preferably at 20-26℃(68-79˚F), at least 24 hours before printing.

3. The work shop should be clean with a temperature of 20-26℃ (68-79˚F), relative humidity of 30-60%.

⚠ Ink on the screen dries fast if the printing room temperature becomes higher than 26℃ (79˚F).

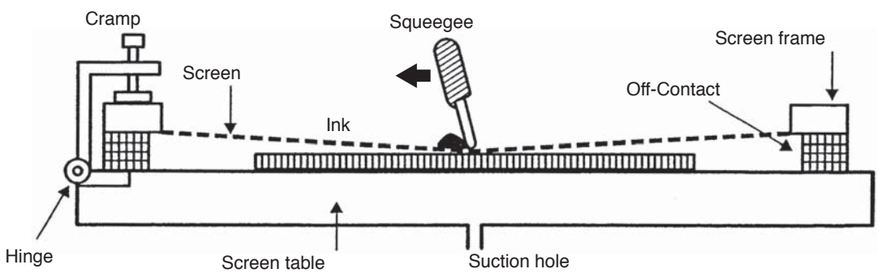
4. A polyester mono-filament, plainly woven screen with mesh size from 62-87/cm (157-220/in.) is recommended. For traffic signs we recommend mesh size of 62-71/cm (157-180/in.), and for multi-colored or fine markings, 71-87/cm (180-220/in.). The coarser mesh is recommended when high weather resistance is required.

5. Water-soluble masking media should be used for screen preparation. Solvent type masking media are not recommended.

⚠ When used solvent type masking media, the adhesive melts into the ink, which can become a cause of "White spots".

6. 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".

7. The off-contact system should be applied for printing. The off-contact height should be determined by repeated test screening on white blank sheets since it is affected by the screen size and its tension.



8. Further adjustment such as the printing positions, pressure, balance on both ends of the squeegee, the squeegee angle, speed, etc. should be made.

9. The screening speed (squeegee speed) for all Nikkalite retroreflective sheetings including Nikkalite sheeting must be lower than 20m/min. (22yds./min.). For screening big signs with 60cm diameter or more, the speed should be lowered to 16-18m/min. (17-20yds./min.). Faster speeds will cause unsatisfactory wetting of ink or bad off-contact, resulting in an uneven printing.

10. Do not feed too much ink on the screen at one time. During printing, frequent supplied of small amount of ink each time is recommended. By doing so, the ink viscosity will remain constant and therefore, a constant color thickness will be obtained from begiing to end.

11. Before printing, blow the dust using the ionic air with air gun, or wipe the Nikkalite sheeting cut sheet surface with a dust free soft cloth. If a tack cloth for dusting is used, wipe the surface lightly leaving no tacky material from tack cloth on it.

12. Ink fill-passing procedure is a must. When manually printed, an impression pass comes first, and immediately after that, the fill pass, then exchange the screened sheet with an unscreened sheet. For automatic or semi-automatic printing, the machine should be set to stop when the fill-pass is completed so that the panel can be replaced with a new one after the fill-passing. Such procedures will prevent clogs on the screen mesh.

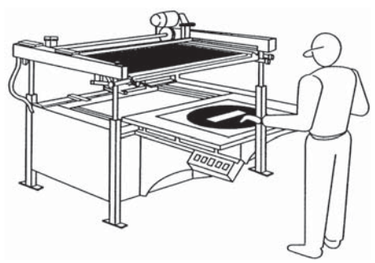
13. Ink cannot be wiped off the Nikkalite sheeting surface with solvents when the printing has failed.

14. When printing with a manual machine for which the screen will move by the hinges, the squeegee should be moved toward the hinges during the impression passing.

15. When printing is finished, clean the screen and the squeegee immediately with the solvents listed below. We recommended utilizing an explosion-proof ventilation equipped automatic screen cleaning machine. When manually cleaned, we recommend to ware complete protections such as goggles, anti poison mask, rubber gloves, rubber aprons and do it in a well-ventilated place.

Solvents : Nikkalite N3511 or N3611, lacquer thinner, xylene, T-900 or T-910 (NAZDAR products), Solvesso 100 or 150 (Esso standard products), Supersol 100 (Mitsubishi Oil products), or equivalent one.

If ink dries on the screen, clean it with a 50%-50% mixture one of the above solvents mixed with cyclohexanone.



NO.6 Instructions for drying screened Nikkalite sheeting

A. Drying Environment and Equipment

1. Prepare a large enough area for drying.

2. The drying space or room should always be kept clean and free from dust.

3. The net size of the drying racks for storing the pre-screened Nikkalite sheeting should be smaller than 12cm×12cm (5ins.×5ins.). If it is bigger, we suggest covering the racks with flat vinyl net a mesh size of 3-8cm (1-3ins.), or with thin cardboard, so that the printed Nikkalite sheeting will stay flat on the rack. The screened sheets under drying should be kept flat or small cracks will appear on the surface.

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

5. Specification of the electric fans.

Wing diameter----------30-40cm (12-16 ins.)
Max. wind velocity---------180-220m/min.
Max. wind volume----------55-65m^3/min.

6. Set the fans at 1.5 to 2 meters apart from the drying racks and let it blow slightly downward towards all the surfaces of the screened signs. There is a possibility that insufficient blow or air volume will cause fine cracks.

7. We recommend an oven dryer with controls for temperature,oven dryer wind velocity and volume.

8. We recommend a jet dryer having four separate drying zones in each 3 to 4 meters in length with controls for wind velocity/volume/temperature. (PRE-SCREENED SIGN FACES DO NOT REQUIRE A JET DRYER)
Note: Decide which to use: an oven dryer or a jet dryer, depending on the amount you print signs.

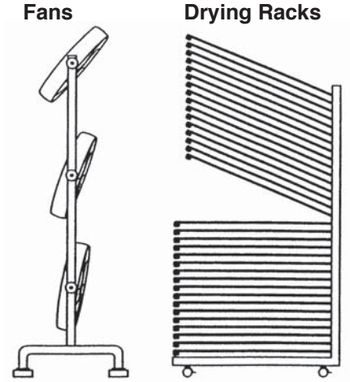
B. Drying of Pre-screened Sign faces

1. Before printing, set the drying racks and the fans at a convenient place for fans to be turned to "high". Blow air across the screened surface.

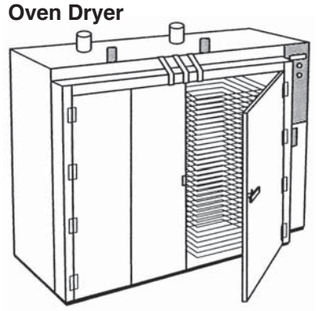
⚠

There is a possibility that insufficient blow or air volume will cause cracks on the Nikkalite sheeting. If cracks appear on it, we cannot guarantee durability.

Fans **Drying Racks**



Oven Dryer



2. Immediately after screening each sign face, place it on the rack.

3. Move the screened sign face from the printing table to the drying racks holding it flat and firm at both edges. Cracks will appear if it is strongly warped. A large size sign face should be held by two persons.

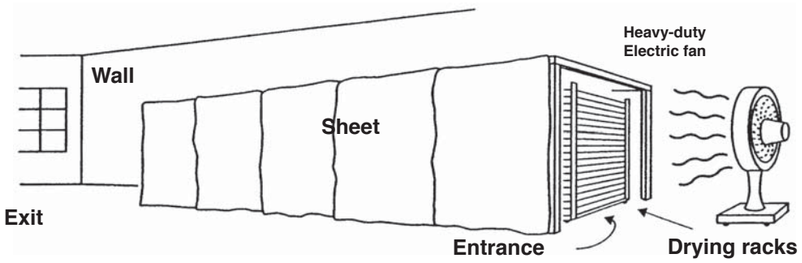
4. The open area between the shelves should be at least 10cm (4 ins.) so that adequate air can pass through. If they are narrower, then use every other shelf.

5. After the racks have become full with screened signs, continue blow air for an additional 30min. at high speed.

6. When a jet dryer is used like the clause A 8, turn off the heater of all the zones and give the maximum air volume, then pass through the screened sign faces and store them likewise the clause 4 and 5.

7. After these processes, keep the electric fans going,turning the speed to "middle" for 24 hours.

8. For 24 hours drying, it needs one electric fan to every drying rack. To reduce cost, we recommend to use the drying method referred to the drawing below. A long tunnel covered by thick sheet like PVC or tar-paulin sheet which can accommodate one row of drying racks in it can be installed along the wall. Set a heavy-duty electric fan at one opening of the tunnel and blow air towards the exit.



9. 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. Peel them off close to your ear and if you hear any peeling sound, the drying is unsatisfactory. Continue airflow until completely dry.

10. Satisfactorily dried sign faces can be stacked up to 50 pieces high for storage.

11. Special caution: PRE-SCREENED SIGN FACES WITH PET RELEASE LINER SHOULD NOT BE HEAT DRIED AT 50°C OR MORE.
ALL THE OTHER SHEETING SHOULD NOT BE HEAT-DRIED AT 70°C OR MORE.

C. Drying of Post-screened Sign Faces

The drying procedures and method of pre-screened sign faces as B. above will apply to post-screened sign faces as well.

D. Heat-oven Drying of POST-SCREENED Sign faces

1. Before starting the printing, bring the drying racks and the electric fans to a place easily accessible and start the fans blowing at "high" speed.

2. Each printed sign should be placed on the drying rack right after printing.

3. Allow a space of at least 10cm (4 ins.) above the screened surface to allow sufficient air flow across them. If extra rack space is available, then place the screened signs on every other rack.

4. Blow air at a high speed on to the racks for an additional 30 minutes even though they have become full.

5. When a jet dryer is used like clause A.8, turn off the heater of the first and the fourth drying zones and give the maximum air volume at the second and the third drying zones setting the temperature at 40°C±3°C. Put the printed sign through all the drying zones for at least four minutes each. Place the jet-dried signs following the above, and precede the next step.

6. The drying racks filled with screened sign should further be dried in an oven under the conditions mentioned below.

Temperature ---------- 40 ℃±3 ℃(104°F±5°F)
Air volume ---------- To the full capacity of the machine
Exhausting volume -------- 50% of total air volume (another 50% for circulation)
Drying period ---------- 2 hours

7. Drying racks dried in an oven should be allowed to cool down at room temperature for at least 30 minutes.

8. By scratching the printed surface with fingernail to test thorough drying, confirms that ink is hard enough, and bonded to the sheet.

9. In case of post screen printed materials, keep in the shelves where you can put them vertically keeping moderate distance to avoid direct contact each other. Refrain from piling up horizontally.

NO.7
Substrate preparation for Nikkalite sheeting application

Nikkalite sheeting will adhere strongly to smooth and clean surface of various metal plates, plastic plates, and painted plates. For a long-term usage such as traffic signs, however, we recommend the surface of substrates be cleaned by the instructions given below. Oxidized substances created by atmospheric moisture and gases, or dirt and oil are usally present on the surface of metal plates.

There are many kinds of plastics available on the market and some of them will yield plasticizer, which will give unfavorable effect on adhesion of retroreflective sheeting. To obtain an optimum adhesion and a long durability, it is absolutely necessary to eliminate such contaminants. This can be done by abrading the surface, by cleaning with solvents.

On the market, we see many new and improved substrates. On using such new materials, you should pre-check the quality and suitability before using.

A. Treatment Method

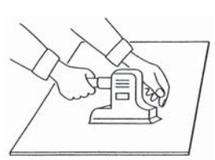
a. Cleaning with Solvent

1. Prepare clean, soft cloth (as clean as possible).
2. 1st Step: Soak the cloth into any of the solvents described in the article 7 and wipe all the surface.
3. 2nd Step: Soak another piece of cloth into the solvent and wipethe surface once again.
4. 3rd Step: Wipe the surface with dry clean cloth.
5. The cloth should be always kept clean by washing after use because dirty cloth will only spread contamination all over the surface.
6. Confirm that there is no residues of dirt or solvent on the surface.
7. Solvents usable: Mineral spirits, Lacquer thinner.
8. For plastic plates please refer to b. below and use the minimum volume of solvent for soaking cloth and wipe the surface swiftly.

b. Abrasion Method

1. Rub the surface of an aluminum with sandpaper, No.150-200, evenly. For surfaces of plastics or painted steel, use No.400 or finer sandpaper.
2. Debris should be taken away with a vacuum cleaner.
3. Wipe the surface as instructed in 2.-8. a. above.
4. An abrasion method will take off the oxidized surface film or contamination and will give fresh surface.
5. The abraded rough surface will also give grip to the adhesive.However, too much abrasion will effect adversely poor adhesion.
6. The abrasion work should be done in an isolated room from other work shops.

Sanding



Sanding

B. Substrate material, Treatment method, and Recommendable Nikkalite sheeting

Substrate	Treatment Method	Remarks
Aluminum	a	Aluminum pretreated at the manufacturer.
Aluminum	b	Not treated.
Iron & Steel	b	Epoxy powder or melamine thermos etting painted plates are recommended.
Stainless Steel		Do not recommend stainless steel for substrate.
Galvanized Iron	b	Adhesion is normally poor.
Painted Iron	b	Epoxy powder or melamine thermos etting painted plates are recommended.
Glass plate	a	Methanol will work.
Concrete		Do not recommend concrete for substrate.
Plastics	Refer to the 1) Wipe with methanol. or 2) Wipe with methanol → Sanding → Take out the debris → Wipe again with methanol.	

⚠ You should pre-check the adhesion before using.

NO.8
Instructions for removing Nikkalite sheeting release film

1. Optimal working conditions are:
Atmospheric temperature: 20-26°C(68-79 °F)
Relative humidity: 30-60%

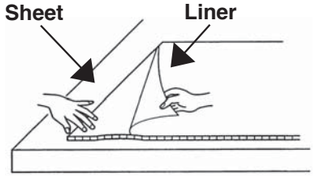
2. Place Nikkalite sheeting cut sheeting on a flat table with the release film (liner) facing upwards.

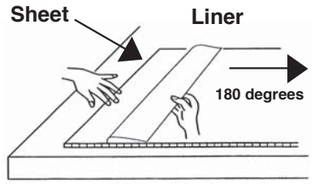
3. Begin by removing the release film one corner of the sheeting.

4. Then, slowly remove the release film along the entire width of the sheet and carefully pull it away 180 degrees.

5. Never remove the release film by pulling the Nikkalite sheeting itself from the release film.

"Correct"





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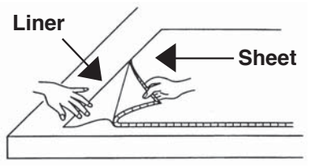


NO.9
Instructions for manual application on small panels

1. Optimal working conditions are:
Atmospheric temperature: 20-26°C(68-79 °F)
Relative humidity: 30-60%

2. Cut or printed Nikkalite sheeting panels should be applied to their substrates as soon as possible after cutting or printing.

3. Prior to application, Nikkalite sheeting panels should be inspected carefully for any defects.

4. Use an appropriate shape of a jig tool/fixture in accordance with the shape of a ribbed substrate. A manual squeeze roller applicator is not suitable for the curved substrate.

5. Remove approximately 5cm (2 ins.) of the release film from one edge.

6. Either cut off or fold the 5cm (2 ins.) portion of the release film.

7. Carefully locate Nikkalite sheeting on the substrate while preventing the adhesive side from adhering to it.

8. Using light pressure, apply the 5cm (2 ins.) portion (with the exposed adhesive) to the substrate.Extreme care must be taken to avoid wrinkles and distortions. Then, apply firm pressure to this portion of the sheeting using a hand roller having a width of 5cm (2 ins.).

9. While holding the remainder of the sheeting and taking care not to fold or crease, laminate it in sections of 5-10 cm (2-4 ins.) by following the recommendations in 7. and 8. above.

10. Continue to repeat the process described in 9. Until the entire panel of sheeting is applied.

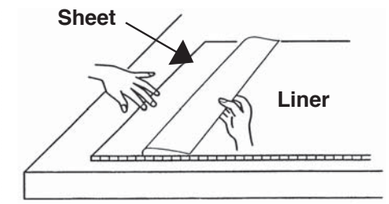
11. Carefully move the hand roller in smooth round curves continuously across the sheet.

12. When applying the sheeting with a hand roller, take care not to leave any air pockets between the sheeting and the substrate. The hand roller should be moved in narrow sweeps in such a manner that half of the roller is used to press new sections of sheeting, while the other half is used to press the previously rolled section of sheeting.

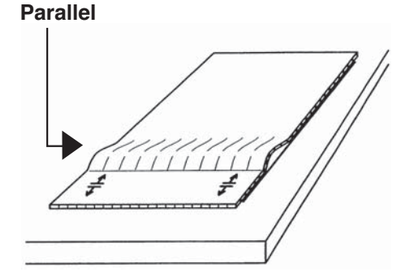
13. Now, when the sign has already received one complete application of the hand roller, rotate it through 90 degrees and apply firm pressure once again following the steps outlined in 11. above.

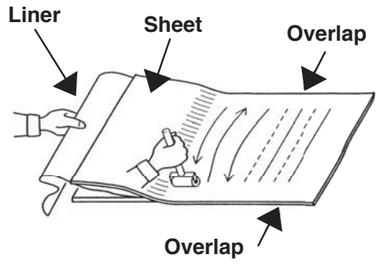
14. When more than two sheetings are to be applied on one substrate, they should be spliced horizontally with the upper sheet overlapping on the lower sheet by 10-15mm (13/32-19/32 ins.).

15. While the maximum size sign that can be manually applied will vary in accordance with the individual's skill level, generally it is difficult to manually apply Nikkalite sheeting whose dimensions are in excess of 60cm (24 ins.) square.



Parallel





NO.10
Instructions for applying Nikkalite sheeting in panel sizes of 60-90cm square using a manual squeeze roller applicator

A. Adjustment of the squeeze roller:

1. Check to ensure that the two nip rolls are parallel to the table face.

2. Prepare 3 pieces of test plates, with the same thickness as the substrate's approximately 5×15cm (2×6 ins.) in size on which Nikkalite sheeting was manually applied.

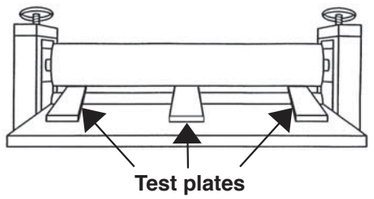
3. Place three plates on the right, center and left hand sides of the nip roller.

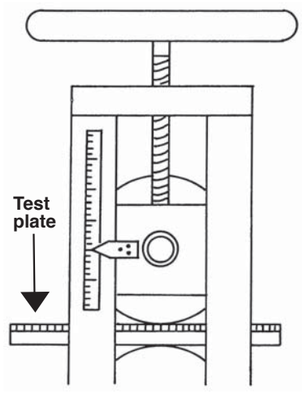
4. Lower the top roller onto the plates slowly and adjust the clearance between the roller and the substrates surface so that the top roller touches each surface of the three test plates simultaneously.

5. Adjust the 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 for an optional pressure.

7. The roller should be thoroughly cleaned before application of Nikkalite sheeting commences.





B. Application:

1. Optimal working conditions are:
Atmospheric temperature: 20-26°C(68-79 °F)
Relative humidity: 30-60%

2. Cut or printed Nikkalite sheeting should be applied to the substrate as soon as possible after processing.

3. Inspect the sheeting surface for any damage or defects.

4. Use an appropriate shape of a jig tool/fixture in accordance with the shape of a ribbed substrate. A manual squeeze roller applicator is not suitable for the curved substrate.

5. Peel the release film approximately 5cm (2 ins.) away from one edge and either fold it or cut it off.

6. The Nikkalite sheeting to be applied should be located on the substrates while preventing the adhesive side from adhering to it.

7. Avoid any action which causes wrinkling or stretches the Nikkalite sheeting and using light pressure, apply the exposed portion of the Nikkalite sheeting to the substrate using a hand roller having a width of approximately 5cm (2 ins.).

8. Feed the substrate in to the roller applicator making sure that the leading edge of the substrate is parallel to the rollers.

9. Fold the sheeting back over the upper roller and carefully peel away the remaining release film.

10. If necessary, adjust the folded sheeting to eliminate any waves or wrinkles.

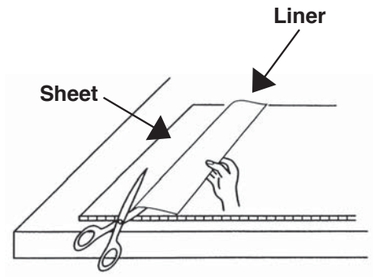
11. Turn the squeeze roller handle slowly but continuously until the entire panel has been applied.

12. Check the application by selecting one test specimen and press the sheeting surface firmly with hand roller. The pressed locus will be visible on the surface of the sheeting if any air remains between the sheeting and substrate. If the trace remains visible, recheck to determine that the pressure of the nip rollers is correct and also check if both rollers are parallel to each other.

13. Once you finish the application of the same type of substrate, tighten the adjusting knob a quarter and put all of them through the roller applicator successively once more.

14. Once the substrate of the same thickness finish is applied, we recommend to put all of them through the roller applicator with slightly stronger pressure once again immediately after the application.

15. When more than two sheetings are to be applied on one substrate, they should be spliced horizontally with the upper sheet overlapping on the lower sheet by 8-12mm (13/32-19/32 ins.).



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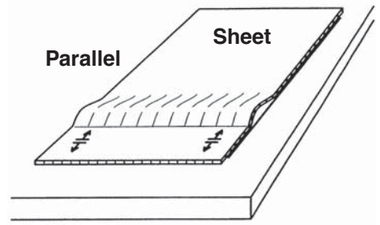

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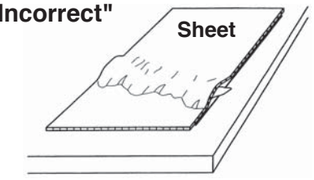
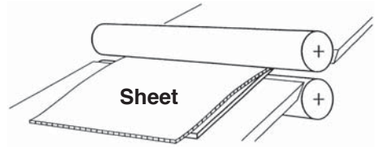
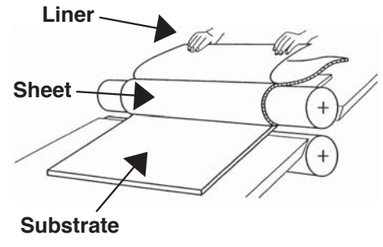






NO.11
Instructions for the application of Nikkalite sheeting panels larger than 90cm square by squeeze roller applicator

A. Adjustment of the squeeze roller:

1. Check to ensure that the two nip rolls are parallel to the table face.

2. Prepare 3 pieces of test plates, with the same thickness as thesubstrate's approximately 5×15cm (2×6 ins.) in size on which Nikkalite sheeting was manually applied.

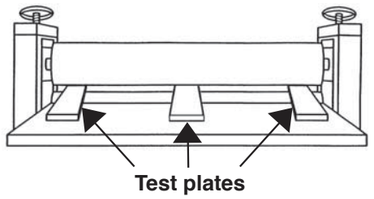
3. Place three plates on the right, center and left hand sides of the nip roller.

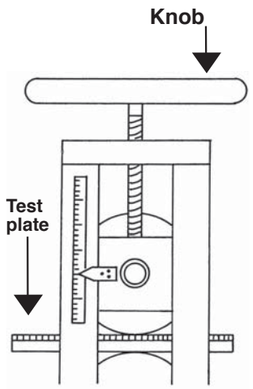
4. Lower the top roller onto the plates slowly and adjust the clearance between the roller and the substrates surface so that the top roller touches each surface of the three test plates sim-ultaneously.

5. Adjust the 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 for an optional pressure.

7. The roller should be thoroughly cleaned before application of Nikkalite sheeting commences.





B. Application:

1. Optimal working conditions are:
Atmospheric temperature: 20-26°C(68-79 °F)
Relative humidity: 30-60%

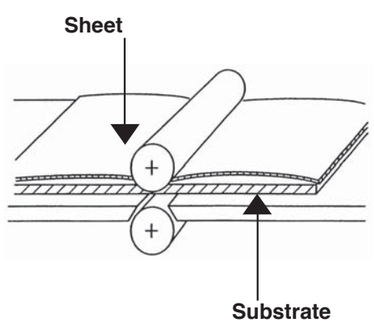
2. Cut or printed Nikkalite sheeting should be applied to the substrate as soon as possible after processing.

3. Inspect the sheeting surface for any damage or defects.

4. Use an appropriate shape of a jig tool/fixture in accordance with the shape of a ribbed substrate. A manual squeeze roller applicator is not suitable for the curved substrate.

5. Place the Nikkalite sheeting cut or printed sheet to be applied on the substrate and position it between the two nip rolls and locate the center of the substrate directly under the top roller.

6. Fold half of the Nikkalite sheeting over the top roller and peel off as much of the release film as is possible. Then, cut the release film away.



7. When the first half of the sheeting has been applied, reverse the roller to bring the substrate back to a point from which you can peel away the remaining release film.

8. Fold the remaining sheeting over the nip roll and peel away the remainder of the release film.

9. Then repeat process 7. above to apply the other half of the sheeting by turning the roller handle continuously but slowlyuntil the entire panel has been applied.

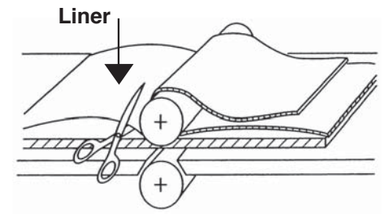
10. Check the application by selecting one test specimen and press the sheeting surface firmly with hand roller. The pressed locus will be visible on the surface of the sheeting if any air remains between the sheeting and the substrate. If the trace remains visible, recheck to determine that the pressure of the nip rollers is correct and also check if both rollers are parallel to each other.

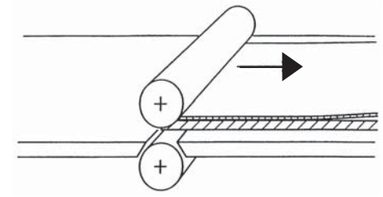
11. Once you finish the application of the same type of substrate, tighten the adjusting knob a quarter and put all of them through the roller applicator successively once more.

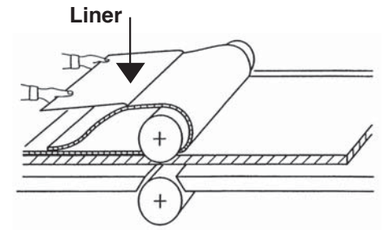
12. Once the substrate of the same thickness finish is applied, we recommend to put all of them through the roller applicator with slightly stronger pressure once again immediately after the application.

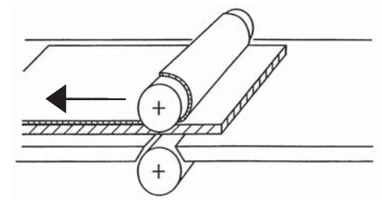
13. When more than two sheetings are to be applied on one substrate, they should be spliced horizontally with the upper sheet overlapping on the lower sheet by 8-12mm (13/32-19/32 ins.).

14. Check the application by selecting one test specimen and press the sheeting surface firmly with hand roller. The pressed locus will be visible on the surface of the sheeting if any air remains between the sheeting and the substrate. If the trace remains visible, recheck to determine that the pressure of the nip rollers is correct and also check if both rollers are parallel to each other.







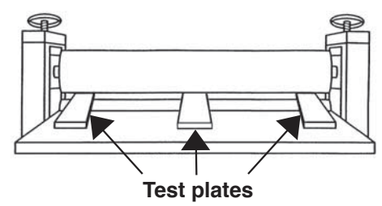


NO.12
Instructions for the application of Nikkalite sheeting using a powered squeeze roller applicator

A. Adjustment of the roller applicator:

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

2. Prepare 3 pieces of test plate, approximately 5×15cm (2×6ins.) in size on which Nikkalite sheeting was manually applied.



3. Place three plates on the right, center and left hand sides of the nip roller.

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 each surface of the three test plates simultaneously.

5. Adjust the 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 for an optional pressure.

7. If the powered squeeze roller applicator is equipped with pneumatic air cylinders and an upper roll with 65-75 shore hardness, set the pressure at 2Kg/cm^2 (30 lbs/in.^{2}).

B. Application process:

1. Optimal working conditions are:
Atmospheric temperature: 20-26°C(68-79 °F)
Relative humidity: 30-60%

2. Prepare guide plates as required using a marrow section of substrate which is the same overall width and the length of 25-35cm as the Nikkalite sheeting to be applied.

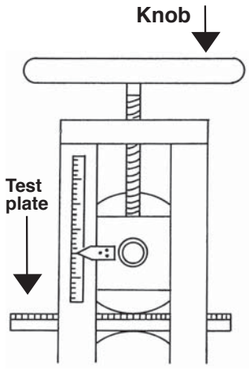
3. Set up the feedstock roll in accordance with the equipment manufacturers instructions.

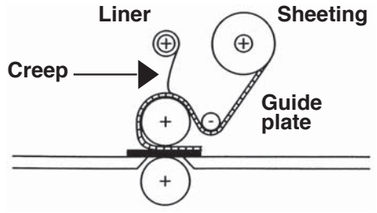
4. Peel 5cm (2 ins.) of the release film away from the end of the sheeting and adhere it evenly to the guide plate avoiding any wrinkles or stretches.

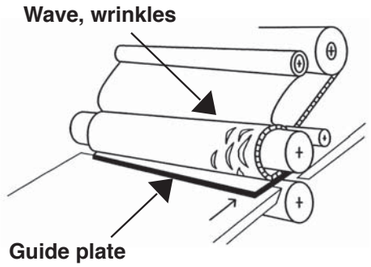
5. Feed the guide plate between the nip rollers without closing the gap. Adjust the feeding angle of the guide plate to eliminate any uneven tension in the sheeting.

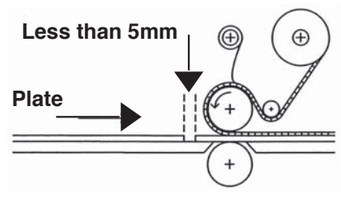
6. Tighten the nip rollers and manually peel off the release film and wind it around the release film rewinding roll with an even tension.

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









8. 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.-7. Above to eliminate uneven tension in the sheeting completely.

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

10. The application speed should not be greater than 4 m/min. (13 ft./min.).

11. Check the application by selecting one test specimen and press the sheeting surface firmly with hand roller. The pressed locus will be visible on the surface of the sheeting if any air remains between the sheeting and the substrate. If the trace remains visible, recheck to determine that the pressure of the nip rollers is correct and also check if both rollers are parallel to each other.

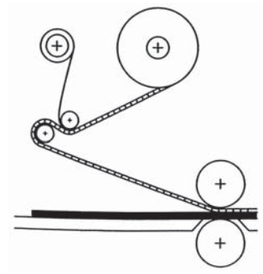
12. The gap between each plate must not be more than 5mm (13/64 ins.).

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

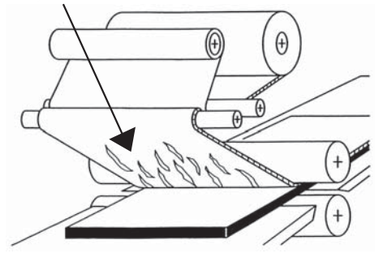
14. Each substrate coated with Nikkalite sheeting coming out of the machine should be separated from the next one by cutting the Nikkalite sheeting with a sharp knife and trimmed at once.

15. Once the substrate of the same thickness finish is applied, we recommend to put all of them through the roller applicator with slightly stronger pressure once again immediately after the application.

16. The applicator as in the following sketch will give waves and wrinkles to the sheeting easily. To avoid this defect, modify it as above sketch.



Wave, wrinkles

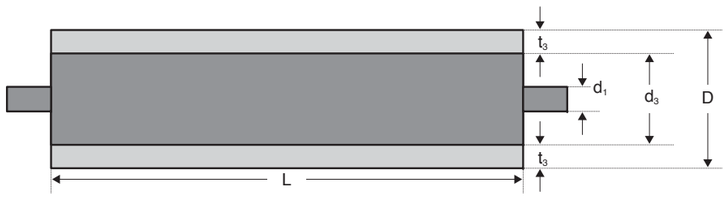


NO.13
Rubber rolls for a roller applicator

The nip roll as shown below is recommended for those who are newly buying a roller applicator, or modifying the conventional applicator, or using roll of a diameter less than 10cm (4 ins.), which is thin and easily bent. Too soft or too hard rubber rolls, thin journals or thin wall iron pipe nip rollers which are easily bent, should be avoided for use for retroreflective sheeting application since they will cause bubbles between the sheeting and substrate, or wrinkles and warps in the sheeting, which results in defective products.

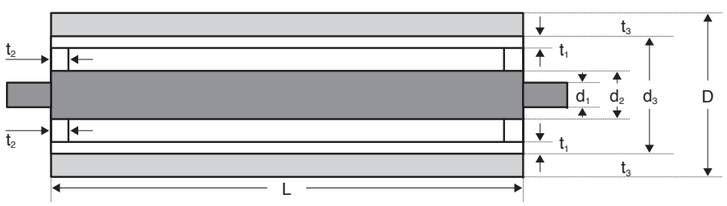
A. Nip rolls for which solid iron core is used;

L : Effective roll length·····1,000 - 1,500mm (40 - 60 ins.)
d1: Diameter of axle ·····25 - 30mm (1 - 1 3/16 ins.)
d3: Diameter of iron core ·····80 -100mm (3 5/32 - 4 ins.)
t3: Thickness of rubber·····10 -15mm (13/32 - 19/32 ins.)
D : Diameter of rubber roll ·····100 -130mm (4 - 5 1/8 ins.)
H : Rubber hardness (Shore hardness)·····65 - 75



B. Nip rolls for which iron pipe is used;

L : Effective roll length ·····1,000 - 1,500mm (40 - 60 ins.)
d1: Diameter of axle ·····25 - 30mm (1 - 1 3/16 ins.)
d2: Diameter of journal ····· 50 - 60mm (2 - 2 3/8 ins.)
d3: Diameter of iron core ·····120 -140mm (4 23/32 - 5 33/64 ins.)
t1: Thickness of iron pipe ·····5 -10mm (13/64 - 13/32 ins.)
t2: Thickness of plate ·····16 -20mm (5/8 - 51/64 ins.)
t3: Thickness of rubber·····10 -15mm (13/32 - 19/32 ins.)
D : Diameter of rubber roll·····140 -170mm (5 33/64 - 6 11/16 ins.)
H : Rubber hardness (Shore hardness)·····65 - 75



C. Grinding of the rubber roll;

The surface of the rubber roll should be ground at least once every two years since they become harder from aging. If the rubber thickness is reduced to less than 7mm (9/32 ins.), the rubber roll should be replaced.

NO.14
Instructions for cutting and preparation of "Nikkalite" 100 Series Overlay Films

Nikkalite PA100 Series Overlay Films can be cut by the following methods :
・Friction or sprocket fed rotary plotter cutters
・Friction fed flat bed plotter cutters
・Various sharp knives

1. Check the plotter blade to ensure that it is clean and sharp. Best results are achieved with a 30 degrees blade.
2. The cutting knife pressure must be adjusted to cut the film cleanly without cutting into the release liner. The pressure will vary depending on the equipment used and reference should always be made to the cutting equipment manufacturer's operating manual.
3. Plotting devices with tangential (mechanically) rotated knife blades are preferred than plotters with a drag-knife.
4. If using a drag-knife plotter, adjust the equipment to cut at low speed and increase the blade pressure so that a finger cutting edge can be achieved.
5. When handling Nikkalite 100 Series Overlay Films, avoid stretching or folding the film sharply otherwise the film may delaminate from the release liner.
6. Use tweezers or scalpel with a blunt edge to weed the film. When weeding is complete, lay the 100 Series Overlay Film flat or coil loosely and support vertically until application tape has been applied. The material may collapse under its own weight if laid horizontally on a bench top and coiled around a core.

NO.15
Instructions for the application of "Nikkalite" 100 Series Overlay Films

1. We recommend the use of medium tack transparent or translucent "plastic type" application tape as opposed to the "paper type" due to the better handling characteristics.

These tapes can be applied by :
・Hand roller
・Squeegee roller applicator

2. When applying the application tape with a hand roller, overlapping strokes should be follow straight through to the edge of the Overlay Film.
3. When applying application tape with either a squeegee roller, we recommend an upper roller with shore hardness of 65 to 75.
4. The leading edge of the application tape should be cut square correctly aligned with the leading edge of the sign plate. This is to prevent wrinkling of the Overlay Film.
5. When applying the Overlay Film through a squeegee roller, it is recommended that the operator uses the 50/50 or split liner method of application. This should ensure correct alignment and prevent wrinkling of the Overlay Film.
6. Following application, remove the tape slowly at an angle of 180 degrees to that of the substrate. It is important that a low angle is maintained during removal.
7. After removal of the application tape, submit the plate to a further pass through the laminator. In removing the application tape the Overlay Film is being pulled from the base material, therefore this secondary pass through the laminator is important.
8. For small signs, the same application results can be achieved using a hand roller with firm overlapping strokes. Following removal of the application tape re-roll the panel.

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When you use the other overlay films: EF40801 and DT142S, you must follow these application methods.