

Avery Dennison® Instructional Bulletin 2.2

Converting Procedure for Vacuum Forming

This bulletin gives specific instructions for vacuum thermoforming of translucent series films when applied to rigid plastic sheet substrates.

CAUTION: Due to normal variations in forming equipment, it is recommended that test faces be produced to confirm that Avery Dennison translucent films are suitable for use with specific forming equipment and that the formed faces are acceptable for the intended use prior to beginning any project.

Safety Precautions

Ventilation

Proper ventilation in and around the forming area must be provided to remove fumes, which may be produced during the heating stage of the forming process.

Safety

To ensure employee safety, it is recommended to consult with an Industrial Hygienist or specialist in the field of work environment safety to ensure appropriate airflow and air recovery requirements for your specific operation.

NOTE: Airflow directed to the heated sheeting will lower the forming temperature, which in turn may affect forming performance.

Process Precautions

Temperature

Forming process temperature should not exceed 190°C.

Time

Forming period should not exceed 10 minutes.

CAUTION: Overheating the translucent film may result in over exposure to harmful fumes, and may result in film degradation including film colour change and may cause premature failure during outdoor exposure of the sign.

- In order to prevent film overexposure to heat during the forming process, heat sensitive thermo labels can be used to make temperature measurements on the surface of the film and plastic sheet, during the heating phase of the forming operation.
- For polycarbonate substrate sheeting, the use of double-sided heaters to heat both sides of the plastic sheet will result in the plastic sheet reaching proper forming temperature faster, and reduce the chance of overheating the pressure sensitive film.

Minimise Strain

To minimise translucent film strain, it is recommended that the mould forms utilise a draft angle of 30° or less.

Minimise Stretch

To minimise translucent film stretch, the depth of draw should be kept to a minimum, but not to exceed 7.5cm

CAUTION: Exceeding the depth of draw will produce film thinning, colour change of the film and may induce premature film failure in the field.

Substrate (Rigid Sheeting) Preparation

- If using the wet method to apply the Avery Dennison translucent films to the rigid sheeting, re-drying must be performed after each layer of film has been applied.
- Severe bubbling under the applied film may occur during the heating stage of the forming process if the substrate drying process is not properly performed.
- Rigid plastic sheeting to which Avery Dennison translucent films are to be applied must be properly prepared and dried as recommended by the sheeting manufacturer prior to the application.
- Drying procedures will vary based on rigid sheet thickness used, please refer to rigid sheet manufacturer instructions.
- Refer to Instructional Bulletin 1.05 for preparation of polycarbonate sheeting

Temperature

- It is recommended the film be applied when air and application surface temperature is in the range of 14° to 32° C.
- All surfaces must be considered contaminated and must be cleaned prior to application of film. Refer to Instructional Bulletin 1.01 for substrate cleaning and preparation procedures.

Cleaning

- Wash surface with a mild detergent in water, and then rinse with clean water.
- Wipe dry with lint free cloth prior to self-drying.

Final Surface Cleaning and Preparation

- After following the cleaning instructions above, the substrate should be thoroughly cleaned with Avery Surface Cleaner.
- Spray onto the surface that is to be prepared and allow to dwell, remove using a clean, soft, lint-free cloth, remembering to rotate the cloth for each new area you clean.

or alternatively

- IPA (isopropyl alcohol) can be used, by wiping the surface with a cloth soaked in IPA.
- After thoroughly wiping with IPA, dry wipe the surface completely using a clean, soft, lint-free cloth before solvent evaporates.

Translucent Film Application Notes

- Application of the Avery Dennison translucent films can be performed by either the wet method or by a dry roll laminator.
- If using the wet method application, refer to the sheeting manufacturer's drying instructions.
- If the film was applied dry using a power laminator, allow the plastic with applied film to dwell for 4 hours (based on typical room temperature and humidity conditions) to permit the adhesive to achieve a functional bond, before forming.

Forming Moulds

Mould Style

- Either male or female moulds can be used to form faces using film.
- For first surface decorations, the plastic sheet with applied film must be formed using male moulds, for second surface applications, female moulds must be used. Depth of draw should be limited to 7.5cm on returns and 2.0cm on embossed or debossed copy. Copy should be cut to minimize the amount of film that is thinned during the formed process.

Mould Handling

- The film should never be trapped between the surface of the mould and the plastic sheet, which will result in severe disruption and distortion of the applied film.

Forming of Film Applied to Polycarbonate Sheet

Heaters

- The use of film on polycarbonate sheet for forming is restricted to double-sided heaters, where the heat input to the film side of the face can be controlled to minimise the heat exposure of the film.
- For polycarbonate substrate sheeting, the use of double-sided heaters to heat both sides of the plastic sheet will result in the plastic sheet reaching proper forming temperature faster, and reduce the chance of overheating the film.
- The sheet must be heated on both sides in double-sided ovens. The use of this type of heating permits rapid, uniform, controlled heating of both sides of the plastic sheet. By properly adjusting the heaters, it is possible to reach proper forming sag without exceeding the 190° C temperature limitation (use temperature tapes to ensure proper heating).
- Periodic testing to determine temperature level reached during the heating cycle is recommended to make sure film is not being overheated.
- Failure to adhere to these restrictions may result in overexposure to harmful fumes and poor film performance.

Sheet Thickness

- Forming of film applied to polycarbonate sheet is restricted to sheet thickness of 2.5mm or less. Greater thickness sheeting may require higher forming temperatures, which is not recommended.

Forming of Film Applied to Acrylic Sheet

- Forming of film applied to acrylic sheet can be done with most existing vacuum forming equipment.

NOTE: Testing of the forming capabilities of your equipment prior to forming any faces is recommended to assure that the results are satisfactory to you and the end-user.

Cutting and Weeding

- The surface gloss of the rigid plastic sheet can be altered in the areas where translucent film has been exposed to the heat.
- Cutting and weeding should be completed as soon as possible after forming.
- Avoid the use of carbon paper and marking pens, which may leave permanent marks on the film.
- Once faces have cooled to permit handling, graphics may be cut and weeded from the applied film.
- Film cutting may be done with conventional 'graphic' knives, using sharp blades. Use minimum pressure to avoid cutting or scoring the plastic sheet substrate.
- Patterns may be placed directly onto flat areas of panned faces, by pouncing, using chalk or carbon dust.
- For cutting around debossed or embossed copy, the film can be cut at any location, i.e. on the flat area of the letter, the beginning of the return, halfway into the return, etc., as required.
- Avoid over cutting at corners of letters and graphics to eliminate or reduce light bleed during illumination. Any 'over cuts' may continue to lengthen or expand, creating light bleed in these areas during illumination. Use rounded corners whenever possible.

- Weeding may best be done by carefully holding a corner of the 'weed' and removing it by pulling with sharp, short jerks between 110° and 160 ° angles (the angle at which the film is removed should be varied to minimize adhesive transfer).
- Whenever possible, pull the weed away from, rather than toward, the portion of film that is to remain on the surface. If adhesive transfers to the surface during removal, warming the surface slightly during removal will reduce the amount of transfer. Cutting the film to remove that portion of the film thinned during forming is recommended.

For further information, contact your local Avery Dennison representative.