



Heat Sealing

PTFE-Coated (or Laminated) Substrates/Composites

Introduction

The following procedure for heat sealing PTFE-coated substrates is intended as a general guideline. It will provide the basic steps to heat sealing.

Each time a seal is attempted, you should prepare test samples prior to undertaking the primary seal. Variables such as ambient temperature may result in modification of the procedure each time you attempt a seal.

There are two common methods used to seal. They are described on the following pages. Select the proper method based on your needs and equipment availability.

Sealing Methods

Method No. 1

Using TEFLON PFA film as a bonding agent between the surfaces to be sealed.

Comments:

PFA has an upper continuous service temperature rating of 260°C. Use this method when the composite to be sealed has been lightly coated and does not have a sufficient amount of PTFE surface interface to effect a proper seal.

Method No. 2

Using only the PTFE coating on each surface to be sealed; relying only on the composite coating; thus eliminating the use of a sealing agent (PFA) between surfaces.

Comments:

This seal will tolerate continuous operating temperatures equal to the rating of the PTFE substrate, normally 260°C. Use only when the surfaces to be sealed contain sufficient PTFE to affect the seal. Make up a test piece prior to starting a production seal (See test method for evaluating seam).

Tools Required

- Heat sealing press capable of reaching temperature of 345°C to 400°C.
- Teflon PFA film 0.05mm to 0.125mm thick. The thicker film is recommended for thicker, high weight fabrics with very textured surfaces.
- Silicone release cloth 0.13mm thick (SRC-5) or 0.195mm thick (SRC-10) both of which are available from Saint-Gobain Performance Plastics.
- Insulation Board (e.g. marinite).

NB: Refer to DuPont Manual “Teflon®, Safety in Handling and Use”

Preparing to Seal

1. Energise the heat sealer so that it will heat to temperature while sealing preparations are underway. Check the temperature setting prior to energizing; 370-380°C.
2. Measure and cut the primary material to be sealed.
3. Cut test strips in preparation for evaluating the sealing technique.
4. All surfaces (not just those to be sealed) should be free of contamination at the area to be sealed and for 75mm on all sides. A solvent soaked cloth may be used to wipe the surface provided the area cleaned is allowed to thoroughly dry.
5. Cut the PFA film (if required) and silicone release cloth.
6. Refer to specific instruction on heat sealing with or without PFA film.
7. Check the sealing equipment temperature with a thermocouple if available. If not, the test seal will uncover any temperature problems which may exist.
8. Prepare and seal the test samples.

Evaluating the Seal

1. Make up a test sample of 2 pieces of the PTFE-coated fabric to be sealed of approximately 25mm by 300mm.
2. Seal 25mm x 275mm of the test pieces together one on top of the other, leaving the remaining 25mm open
3. Allow the seal to cool to room temperature.
4. Grasp each layer of sealed composite at the 25mm end which was left open. Slowly pull apart the seal taking care not to tear the fabric.
5. Examine the previously sealed surfaced to ensure that the PTFE has been completely removed from one surface, exposing bare fabric on the other piece. If bare fabric has been exposed, you have achieved a proper seal. If not, repeat the sealing procedure increasing time and/or temperature and retest.

Sealing with PFA Film (Method No.1)

1. Place the insulation board on a flat, stable surface.
2. Place the first silicone release cloth down on top of the insulation board. Since this cloth is coated on both sides, either side may be used.
3. Place the first layer of material to be sealed on the silicone release cloth, with the side to be sealed facing up. Preferably this should be a test piece to qualify the procedure.
4. Place a section of PFA film on the area to be sealed. Under normal conditions 0.05mm thick film will suffice. If, however the surface to be sealed is pronounced, such as with a woven fabric with a prominent weave pattern, use 0.125mm PFA film, or three layers of 0.05mm film. Using masking tape, secure the PFA film in position on each end. Keep masking tape away from belt.
5. Place the second layer to be sealed with the side to be sealed facing down against the PFA film.
6. Using hand pressure, apply the heat tacking unit to small sections 25 x 25 mm of the area to be sealed, for 15-20 seconds. These sections should be selected so that they serve to temporarily hold the composite to be sealed together while it is being manoeuvred during the remaining procedures. This is referred to as tacking, and as the name implies, is meant only to hold the material to be sealed in temporary register/position. Remove the masking tape used to hold the PFA in position. This tacking procedure can be eliminated if stapling is an acceptable alternative. The staples may be removed after the seal is completed.
7. Place the second silicone release cloth over the area to be sealed. You should now have the following sandwich of material positioned on the insulation board (see figures on pages 6 and 7):
 - First silicone release sheet
 - First layer of material to be sealed
 - Layer of 0.05mm or 0.125mm PFA film
 - Second layer of material to be sealed
 - Second silicone release sheet
8. Tack overlay film tape on both sides of splice to cover the open end splice.
9. You are now ready to seal. (**Reminder: Test sample first**). If you are using a fixed heat sealer, place the entire sandwich between the platens of the heat sealer. If not, place the portable heat sealer in position over the area to be sealed.
10. Using air pressure or weight, apply from 5 to 10 psi (0.35 to 0.7 kg/cm²) to the area to be sealed
11. Apply approximately 370-380°C for 30 seconds to four minutes. This will vary with conditions such as ambient temperature, type of heat sealer, thickness of material being sealed, etc.

12. You should have begun by sealing a small test piece. The next step is to evaluate the test seal you have just completed using the steps outlined earlier. If an improper seal was made, repeat the procedure increasing the time and/or temperature until a satisfactory level is achieved. You may then complete the primary seal.
13. The primary seal is most effectively executed starting at the centre of the seal and alternating back and forth toward the belt edges. See the matrix below:

ETC.	FIFTH SEAL	THIRD SEAL	FIRST SEAL	SECOND SEAL	FOURTH SEAL	ETC.
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14. After sealing/heating materials should be cooled down to minimize material shrinking around sealing area (can be done by wiping by clean cooled cloth, cooling iron etc.)

Sealing without PFA Film (Method No.2)

1. Refer to Method No. 1 and perform step Nos. 1, 2 and 3. Ignore Step No. 4.
2. Place the second layer of material to be sealed, with the side to be sealed facing down, on top of the first layer of material.
3. Refer to Method No. 1 and perform step Nos. 6 and 7. You should now have the following sandwich of material positioned on the insulation board:

First silicone release sheet
 First layer of material to be sealed
 Second layer of material to be sealed
 Second silicone release sheet

4. Refer to Method No. 1 and perform step Nos. 9 and 10.
5. Apply approximately 370-380°C for one to four minutes. This will vary with conditions, such as ambient temperature, type of heat sealer, thickness of material being sealed, etc.
6. You should have begun by sealing a small test piece. The next step is to evaluate the test seal you have just completed using the steps outlined earlier. If an improper seal was made, repeat the procedure increasing the time and/or temperature until a satisfactory level is achieved. Then you may complete the primary seal.
7. The primary seal is most effectively executed starting at the centre of the seal and alternating back and forth toward the belt edges. See the matrix below:

ETC.	FIFTH SEAL	THIRD SEAL	FIRST SEAL	SECOND SEAL	FOURTH SEAL	ETC.
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8. After sealing/heating materials should be cooled down to minimize material shrinking around sealing area (can be done by wiping by clean cooled cloth, cooling iron etc.)

GENERAL COMMENTS

When applying heat to most composites which consist of material with different thermal coefficients of expansion, puckering or creasing may occur. Here are two suggestions for minimizing this occurrence:

- Affix a flat surfaced material, such as sheet steel or aluminium, on the top of the composite to be sealed, flush to the area to be sealed. Place sufficient weight on this flat surface to hold the area surrounding the heat sealed area flat until the procedure is complete and the material has cooled to ambient temperature.
- Grasp the edges of the composite with "C" clamps or vise grip pliers, taking care to protect the composite by lining the jaws of the clamping device with something non-abrasive such as wood. Attach rope to the clamping devices. Exert constant tension to the ropes, pulling away from the composite holding it in a tensioned state. Maintain the composite under tension during and after the heat sealing operation, allowing it to cool to ambient temperature before removing the tension. Bear in mind that care should be exercised not to disturb the area to be sealed. The tacking procedure will not withstand the tension required to minimize puckering. You should secure the entire area to be sealed in a fixed position so that it cannot shift during the sealing procedure.

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STEP ONE: MAKE BUTT SEAM

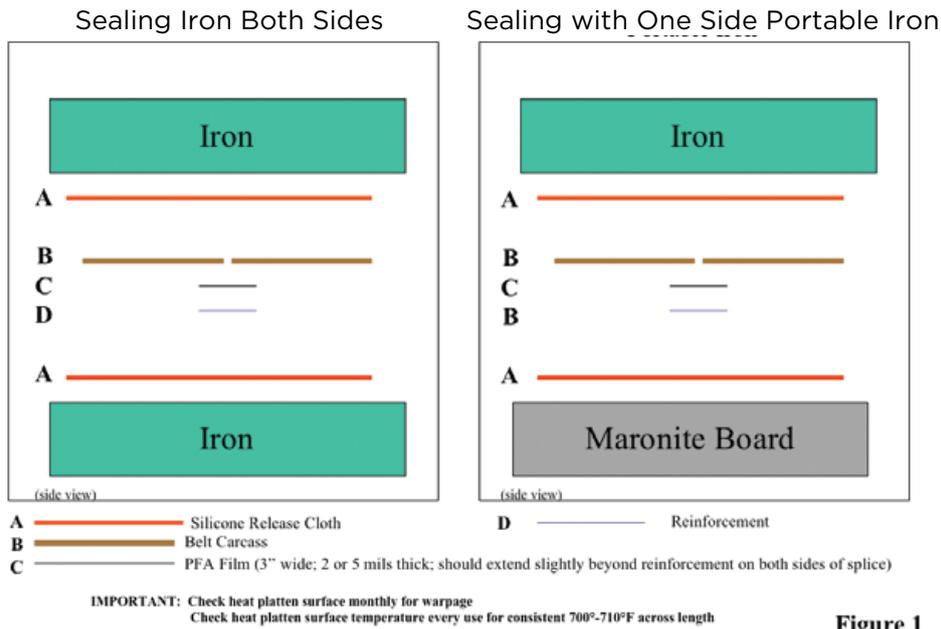


Figure 1

STEP ONE: ADD OVERTAPE TO SEAM

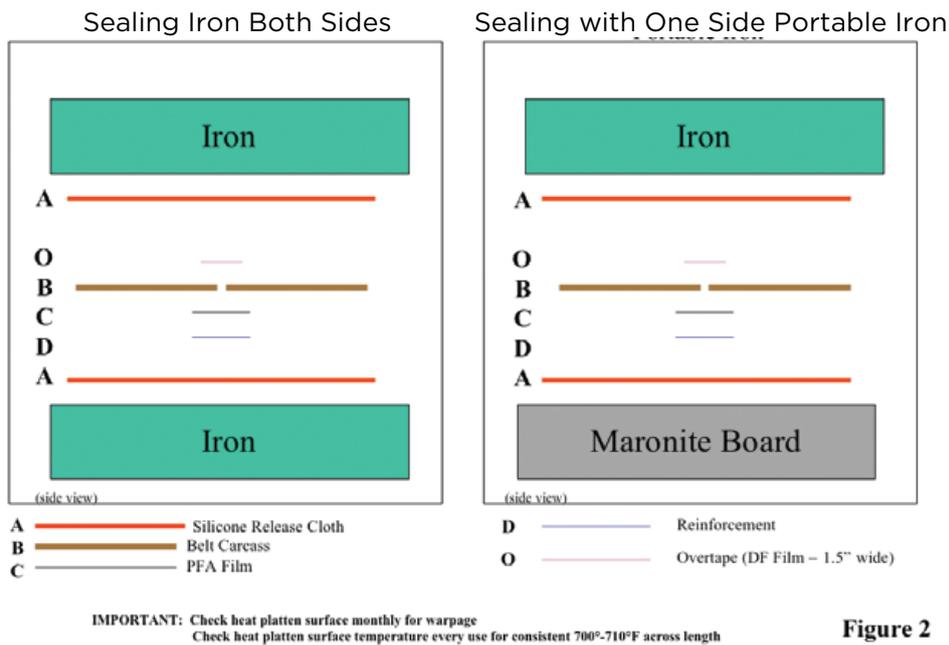
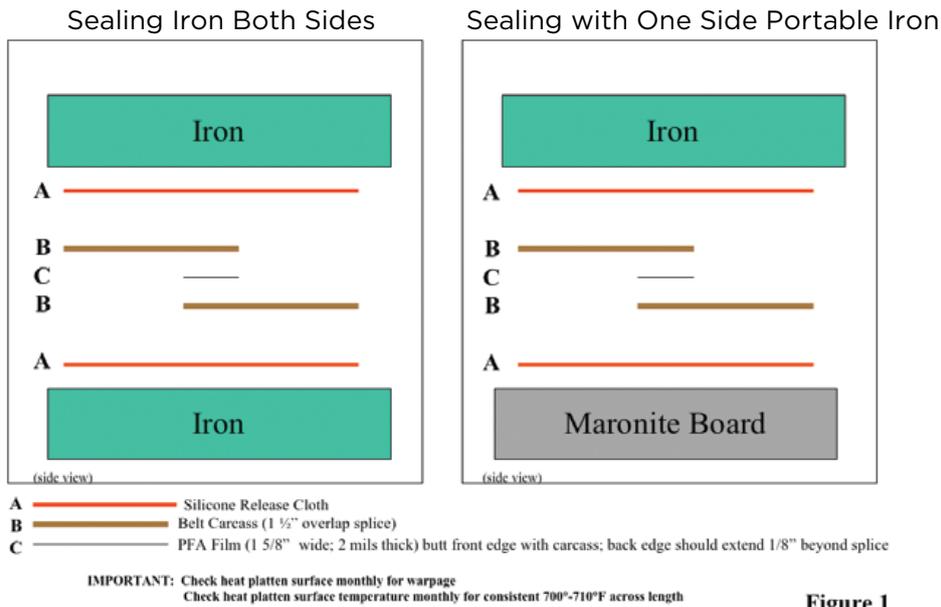
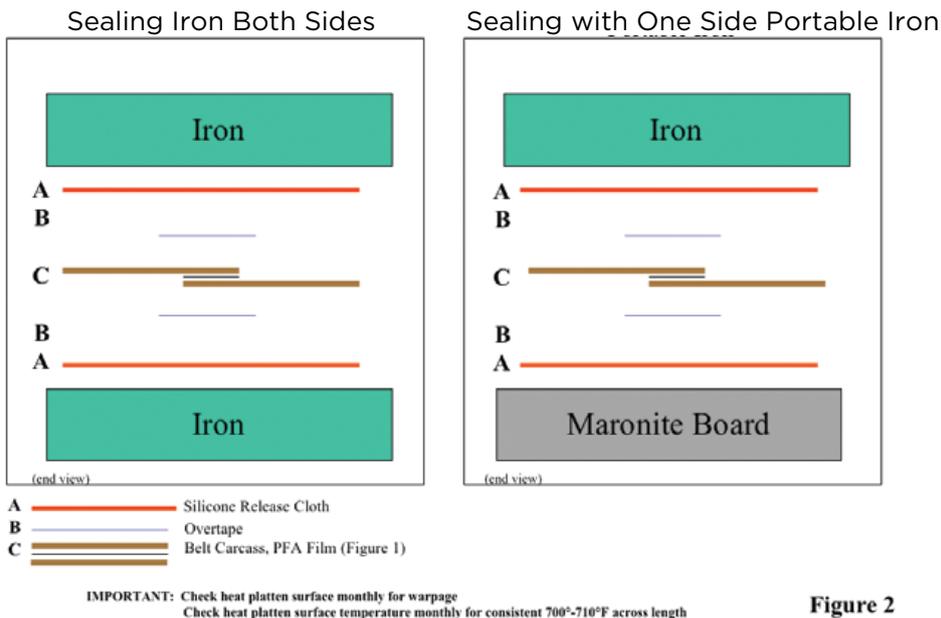


Figure 2

STEP ONE: MAKE OVERLAP SEAM**Figure 1****STEP TWO: ADD OVERTAPE TO SEAM****Figure 2**

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