STRONGHOLD THERMOPLASTIC ROOFING SYSTEMS FIELD GUIDELINES

BITEC offers the following guidelines for successful heat-welding of our StrongHold Thermoplastic Roof Membrane Systems. As site-specific conditions may vary, please adjust accordingly to ultimately provide a minimum lap weld as described in our standard specifications.

I. STANDARD SPECIFICATIONS

If seams have become dirty or contaminated, clean them using the specified membrane cleaner and allow to dry prior to heat welding. Weld all seams at the sides and ends of membrane rolls to have a width of 1 to 1.5 inches (25 to 38 mm). Calibrate all heat-welding equipment according to ambient conditions to achieve consistent, continuous welds with no voids or over-/under-heated seams. Hand-roll the membrane seams immediately if using a hand-welder. Apply cover patches at all T-joints where membrane head laps intersect with the adjacent course of membrane. Cover all burns and scorch marks with patches to ensure that the membrane has an aesthetically pleasing appearance.

II. WELDING EQUIPMENT AND ELECTRICAL REQUIREMENTS

A typical hot-air welding operation requires an adequate electrical power source, an automatic or handheld hot-air welding unit, and appropriately sized electrical extension cords. Current-generation automatic welders are strongly recommended because older equipment may lack the controls necessary to consistently produce acceptable seams. All welding equipment shall be operated, maintained, and adjusted in accordance with the equipment manufacturer's published instructions.

III. ESTABLISHING WELDING EQUIPMENT SETTINGS

Initial Equipment Calibration

Proper adjustment of automatic hot-air welding equipment is an essential part of producing a durable, properly fused membrane seam. Before beginning production welding, conduct trial welds to identify a suitable combination of operating temperature, travel speed, and applied pressure. Equipment settings shall be established through actual weld testing rather than relying exclusively on predetermined operating values.

Frequency of Test Welds

Trial welds shall be performed at the beginning of each welding period and whenever conditions may affect welding performance. At a minimum, testing shall occur:

a. Before production welding begins each morning.
b. Following the lunch break or another extended interruption.
c. Whenever significant environmental changes occur, including variations in ambient temperature, wind conditions, or cloud cover.

Evaluating Weld Quality

Determine suitable operating temperatures and travel speeds by producing trial welds using different equipment settings. Once the welded material has cooled sufficiently, evaluate the seam by applying peeling force to separate the bonded membrane layers.

An acceptable weld will exhibit a film-tearing bond, where separation occurs through the membrane material and exposes the internal reinforcing scrim. A weld that separates cleanly between the adjoining membrane surfaces indicates inadequate fusion and shall not be considered acceptable.

Adjusting for Environmental and Material Conditions

The operating speed and temperature required to produce acceptable welds will vary according to membrane thickness, weather conditions, and the characteristics of the welding equipment. Thicker membranes, lower ambient temperatures, and cloudy conditions generally require slower welding speeds than thinner membranes installed during warmer, sunny weather.

Reducing travel speed increases the amount of heat delivered to the seam and may compensate for conditions that draw heat away from the welding area. Final adjustments must be established through trial welding and examination of the completed seams. Newer welding equipment may operate successfully at higher temperatures and faster travel speeds. Settings must be adjusted as necessary to account for the equipment model, membrane thickness, and prevailing jobsite conditions.

IV. TRIAL WELDING AND WELD VERIFICATION

1. Preparing Test Specimens

Obtain two pieces of newly unwrapped roofing membrane, each approximately 18 inches (457 mm) long. Use membrane from the material intended for installation rather than previously exposed or weathered scrap material.

2. Preliminary Equipment Settings

Establish initial heat and travel speed settings for the automatic welding equipment. For full-size automatic welders, the referenced starting operating range is:

Welding temperature: 800°F to 1,148°F (427°C to 620°C).
Travel speed: 10 to 16 feet per minute (3.05 to 4.88 m/min).

Some newer equipment may be capable of operating at higher temperatures or travel speeds while maintaining acceptable weld quality.

3. Establishing the Welding Range

The following procedure may be used to determine the appropriate welding range for the equipment and membrane being installed.

a. Estimate the initial travel speed using the ambient temperature formula: FPM = (Ambient Temperature °F ÷ 10) + 2.
b. As an example, begin with a travel speed of 10 FPM and a welding temperature of 600°F (315°C). Produce a trial weld.
c. Maintain the same travel speed and increase the welding temperature to 700°F (371°C). Produce an additional trial weld.
d. Continue increasing the welding temperature in approximately 100°F increments while keeping the travel speed unchanged. Repeat the trial welding process until the upper operating range of the equipment is reached, typically approximately 1,148°F (620°C).
e. Examine the completed test welds to identify the temperature range producing acceptable membrane fusion.
f. Once the acceptable welding range has been established, adjust the equipment to operate near the midpoint of that range.

Actual operating conditions, membrane thickness, and equipment characteristics may require further adjustments.

4. Cooling and Testing the Weld

a. Heat-weld the two 18-inch (457 mm) membrane specimens together.
b. Allow the welded assembly to cool for at least 10 minutes before evaluating the bond.
c. Cut test strips approximately 1 inch (25 mm) wide across the completed welded seam.
d. Apply peeling force to the test strips to determine the quality of the membrane fusion
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5. Acceptable Weld Characteristics

A properly fused seam will exhibit a film-tearing bond (FTB), meaning the membrane separates through its surface material and exposes the reinforcing scrim rather than separating at the welded interface. The acceptable film-tearing bond width shall be between 1 inch (25 mm) and 1½ inches (38 mm).

6. Unacceptable Weld Characteristics

A seam that separates between the two adjoining membrane surfaces without producing a film-tearing bond is considered a deficient weld. This condition is commonly referred to as a cold weld or false weld and indicates that adequate membrane fusion was not achieved.