



Master Builders Solutions -Technical Bulletin

Watertight Construction Systems - Hot air welding.



The issue of welding synthetic membrane seams (PVC / TPO) continues to be a concern when installing synthetic membranes. Plastic welding is a very technical operation which requires expertise by the installer and vigilance on the part of the Quality Assurance monitor. When a waterproofing system leaks, 9 time out of 10, the product manufacturer, product or equipment usually get the blame, when often the problem is the poor installation or welding of the system.

One of the main issues in the GCC region is the lack of skilled technicians. Many applicators only have one or two technicians that are properly trained, and the rest are unskilled workers that are trained on site to carry out the welding. With so many poorly trained technicians installing the waterproofing membrane incorrectly is one of the main causes of leaks to the waterproofing system. This is where the problem really begins.

The Master Builders Solutions Technical Bulletins are informative documents that present application recommendations and other technical details to better understand the use of construction chemicals products, often from BASF's portfolio.

This is the Technical Services Bulletin No. 04

One of the main issues is that the installer's technicians don't understand the correct way to weld the membrane. Often they don't use the hot air welding guns correctly. Using the equipment incorrectly as well as the damage caused by follow-on trades are probably the primary causes of leaks.

There are a number of methods to weld synthetic membranes. They include hot air hand welding, hot air automatic machine welding, hot wedge welding, high frequency welding, etc. Hot air hand welding and hot air automatic welding machine are being addressed play a major role in on-site welding of basement tanking waterproofing and will be studied in detail hereinafter.

Hot-air welding equipment

The hot air method makes use of a device consisting of a resistance heater, a blower and a temperature controller to blow hot air between the two membranes to be welded by melting the opposing surfaces. Immediately following the melting of the surfaces, pressure is applied to form the bond between the two sheets.

Hand held hot air gun / welder

- Hand welder with 45°C to 650°C heat settings.
- Nozzles with 5 mm, 20 mm or 40 mm slots.
- Silicone rubber / teflon roller – 20mm & 40mm
- Brass Roller 5 mm

Hand-held hot air welding gun and silicone roller are primarily used to carry-out repairs, detailing or where the automatic welder is inappropriate.

Hand welded seams are completed in three stages:

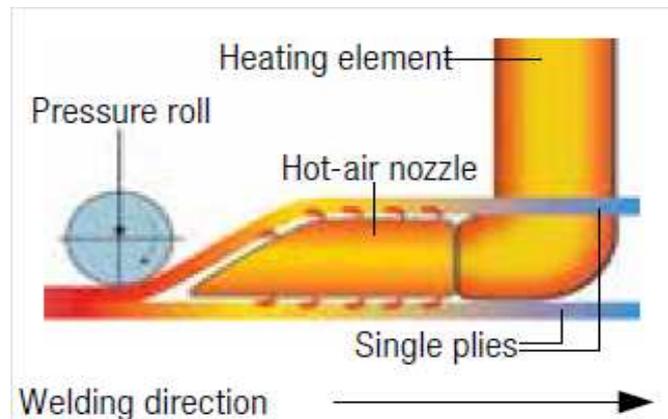
- Tack welding membrane in position.
- Pre-weld (continuous) to prevent the loss of hot air during the final welding.
- Main welding.

Temperature, pressure and speed

All types of membrane welding require clean and dry conditions.

The ambient temperature is important to welding. The setting of the welding parameters will depend on the ambient temperatures and have an effect on the speed setting. It is therefore important to make a test weld each day before starting the actual welding job.

The technician must keep visual contact with the temperature controls on the welder and on the overlap of the section so that he can make adjustments when necessary in order to maintain a consistent weld.



Hot-air welding

Welding parameters

The three important parameters in heated hot air welding are:

- Temperature
- Pressure
- Speed

Equally critical, are:

- Operator skill and training;
- Seam cleanliness and overlap;
- Ambient temperature

Pressure

The pressure necessary to produce a good weld is provided by adjusting the drive rollers. The drive rollers have an embossed surface to assist with grip and is an indication of balance between each track of the weld that the roller indentations on both weld tracks on the surface of the liner should be similar.



Automatic Welder - Nip rollers

If the roller marks are uneven, it indicates that the pressure setting is uneven. If the roller marks are very heavy or deep, it indicates that there is too much pressure. The ideal situation is for a slight impression on the surface of the liner, which looks the same on both tracks.



Hand Held Hot air Blower and

Speed

The speed of the hot air welder is set by adjusting the motor that controls the drive rollers, by adjusting the dial on the hot air welder upwards or downwards.

The welding speed will typically be in the range of 0.7m per minute up to 4.0m per minute depending on the thickness of the membrane being welded and the ambient conditions. The thicker the sheet, the slower the welding speed.



Welding operation - hand welder

Use a hand-held hot air welder and silicone covered roller to complete welds and details where the automatic welder is inappropriate.

When the parameters are adjusted correctly, a fine bead of molten material of the sheet's underside becomes visible outside the upper membrane's edge. When welding, there is a certain development of smoke and the surface of the lower sheet turns shiny when heated correctly.

A change of color or the formation of ashes on the nozzle or the welding zone indicates that the welding temperature is too high.

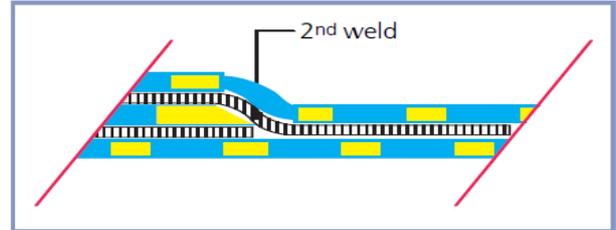
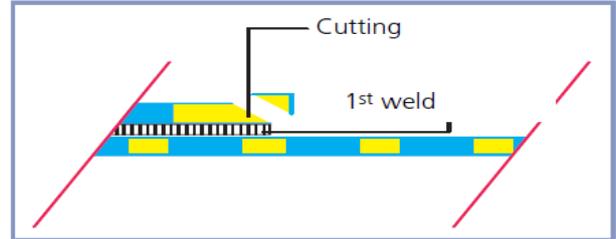
Air pressure channel testing

Air Testing is accomplished by sealing both ends of the seam and introducing air pressure into the channel between the two parallel welds. The seam is pressurized to 2 bar pressure.

The pressure is monitored to ensure weld integrity throughout the seam. As a matter of practice, a passing seam will hold pressure immediately, whereas a poor seam will continue to lose pressure as the weld gradually peels open.

Testing: Non-destructive

Nondestructive testing methods for membrane seams commonly include air pressure channel testing, vacuum box testing and mechanical probing.



Non-destructive testing – Seam (mechanical) Probing

Carry out the test, using the welding tester (seam probe) on cooled material. Pass the seam probe along the welding line, exerting sufficient pressure to identify defective seams. In the case of defective seams, reweld as necessary. In extreme situations, it is necessary to weld a 15 – 20 cm strip over the existing welding line after cleaning.

When overlapping more than two layer of membrane (T joints) the leading edge of the welding seam should be chamfered or milled.

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- No. 01. Grouting on an industrial scale
- No. 02. Fast Track Screed - Doing it Right
- No. 03. Ucrete Primer FS – recommended application
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- No. 05. Trouble-Free watertight substructure

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