

METHOD STATEMENT

1 SCOPE

This document covers the application of **MasterSeal 753THE** TPO membrane waterproofing system for canal, lake lining, and water containment structures application. All materials and method involved in the execution of the waterproofing work is described.

2 RESOURCES

2.1 Materials

Item	Description
MasterSeal 753THE	Synthetic TPO membrane
MasterSeal 957	Polypropylene non-woven geotextile, 370 g/m ²
MasterSeal NP 472	Polyurethane based elastomeric joint sealant

2.2 Tools and Equipment

Item	Equipment Description	Minimum Quantity Required
1	Twinny S/T automatic hot air double seam welding machine	2
2	Triac hot air manual welding machine	1
3	Rubber pressure roller 40mm wide	4
4	40mm, 20 and 5mm wide hot air gun nozzles	4
5	Wire brush	4
6	Chamfer tool	4
7	Utility knife	4
8	Measuring tape	4
11	Pressure testing needle with gauge	2
12	Electrical air pump	2

3 PROJECT EXECUTION STRATEGY / SEQUENCE OF WORKS

3.1 MasterSeal 753THE – General Application

3.1.1 Substrate Preparation

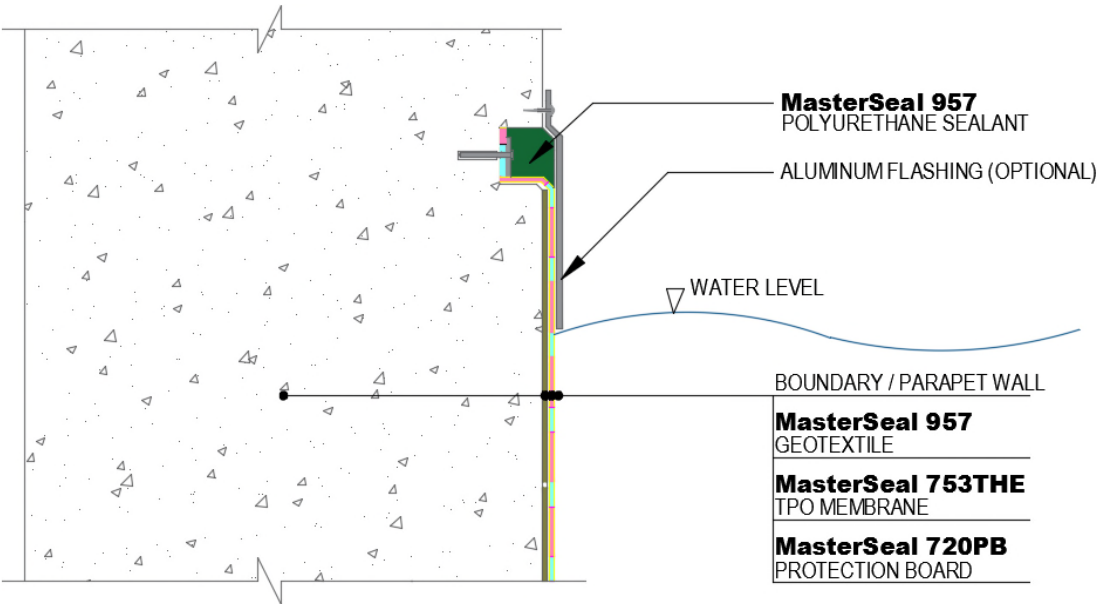
- Two types of substrates are typically found in the hydraulic works sector: natural compacted soil or concrete. The surface of the structural element must be smooth and free from debris or irregularities that may puncture the waterproofing layers.
- All sharp edges to be chamfered (30mm) and internal corners to be filled with sand cement fillet at 50mm by 50mm.
- Surface should be sufficiently dry, standing water must be removed.

3.1.2 Membrane Application

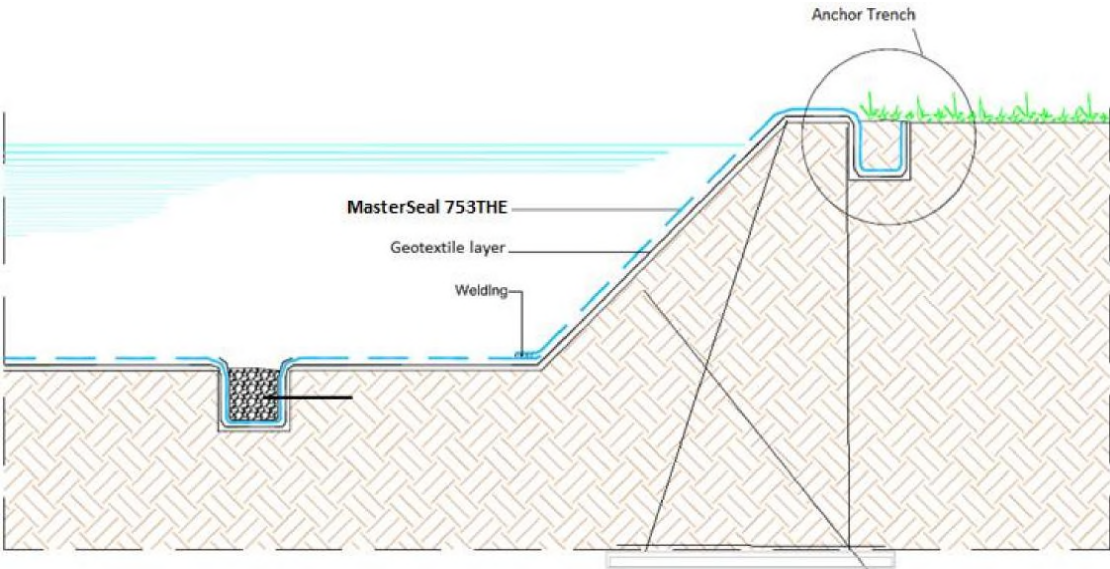
- Lay a cushion layer of non-woven geotextile, **MasterSeal 957** with 100mm overlap and spot welded by hot air gun to keep the overlap in place. It is ideal to start installation from the side towards the middle portion of the area.
- **MasterSeal 753THE**, shall be cut as per required length to cover each working zone. The membrane, which were extruded with two different colors should always be unrolled with the black color side facing the prepared substrate. The signal (colored) layer shows damage and aids visual inspection.
- Membrane overlap is between 80-100mm.
- Overlaps to be cleaned properly by dry or damp cloth. If contaminants do not go off, clean the membrane with a proper cleaning solvent.
- Membrane overlaps shall be welded by automatic double seam welder.
- On areas where the double seam welder is not possible to use, hot air hand welder could be used with a minimum overlap of 80mm.
- All vertical, horizontal, internal or external corners should be folded and formed from membrane with nominal hand pressure to ensure a close fit to the substrate profile and avoid hollows under membrane.
- All welding intersection should be chamfered, and patch welded with a minimum size of 100mm by 100mm.
- All welds to be inspected. Inspection methods are discussed in section 4.

3.1.3 Membrane Termination

- The membrane shall be terminated at the highest point of the boundary or at least 300mm above the water level.
- Termination detail may vary from case to case due to landscaping and structure finishes, but generally done on boundary / parapet wall by tucking-in the membrane on a 30mmx30mm groove, mechanically fastened inside the groove with a 20mm aluminum or stainless-steel strips, then filled with **MasterSeal NP 472** sealant. The termination can be protected with an aluminum flashing for possible mechanical damage.
- On locations where there is no vertical termination on perimeter, a 400mm x 400mm perimeter trench must be created for the termination. Which can be filled with soil or round gravel. Please see following sketches.
- In some cases where membrane requires anchoring, a 400mm x 400mm trench can also be made at the bottom of the slope, filled with round gravel or concrete, to keep the membrane in place.



TERMINATION ON BOUNDARY / PARAPET WALL



PERIMETER TRENCH TERMINATION



WATERPROOFING SYSTEM INSTALLATION



OPERATIONAL CONDITION OF AN ARTIFICIAL LAKE

3.1.4 Visual Work Inspection and Tests

- Clear the area from dust and any debris for inspection.
- Inspect the membrane for accidental damage before placing of upper layer of protection layer.
- Repair small holes and punctures by applying square patch of membrane centered over the damaged area. Patch must extend 100mm in each direction from damaged area and must be carefully welded by manual hot air gun.
- Testing method by air pressure for double seam welding ensures an objective check of the welding seams. During the pneumatic test at 2 Bar-pressure, the pressure loss shall not exceed 20% over a period of 5 minutes.
- Manually welded joints can be verified by picking the welded joints using a probe tester or screwdriver.

3.1.5 Laying of Protection Screed (If required)

- For some instances where the horizontal membrane needs to be protected, a layer of protection screed can be laid.
- Once the system is properly installed, welded and tested, the protection screed layer with a minimum thickness of 50mm must be carefully laid over the membrane with a slip/protection layer of 1000-gauge polythene sheet.
- Avoid heavy vibration and compaction that may cause damage to the membrane.
- The maximum aggregate size of the protection screed should not exceed 10mm.

3.2 Joint Welding

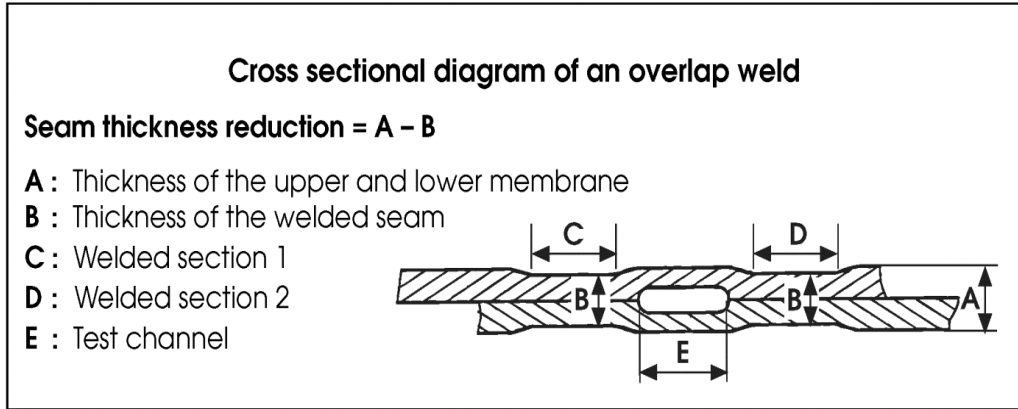
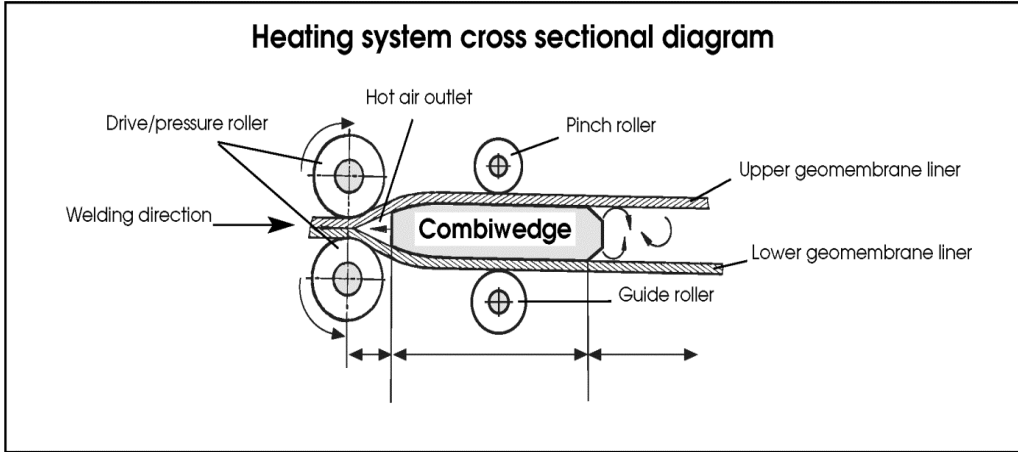
For continuation of pre-formed sheet membranes, joints have to be connected by special welding tools. The methods are discussed as follows.

- **Automatic Welding Machine** - (Double seam fusion by automatic equipment)

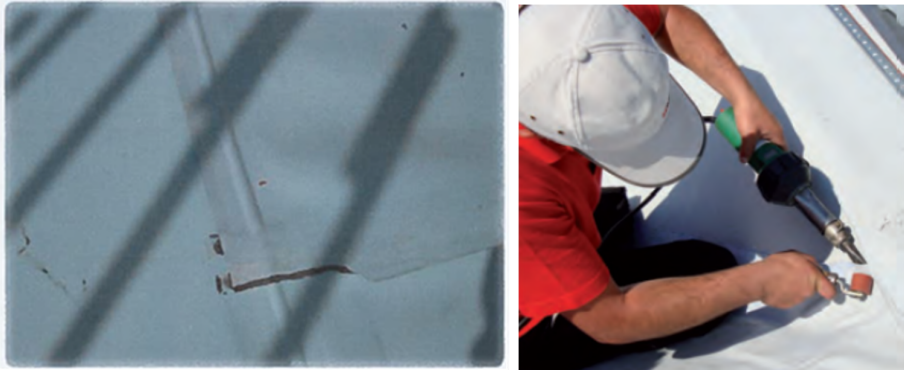
Automatic double seam fusion will be performed using hot air. The welding process will form a double seam that provides a channel in between which can be pressurized for testing using an air pump and a pneumatic air pressure gauge.



The fusion temperature is approx. 350°C, however, it may vary due to ambient temperature and surface temperature of the membrane. The automatic fusion machines should be set on site and a sample fused seam should be made prior to start of installation to ensure proper setting.



Leading edges and overlap details → Where there are more than two layers of liner, e.g. at T joints or cross joints, a special chamfering tool is used to prepare the seams by cutting the angle of the leading edge. All sharp edges at the leading edges must be rounded using scissors or hooked knife.



3.2.1 Recommended Machines and Tools

For continuous welding quality, it is recommended to run welding equipment connected with its own circuit or using its own generating set.

Welding machine operators should be trained and experienced in heat welding technology according to local regulations and to operate electrical devices in wet or humid conditions.

Automatic welding machine for horizontal and vertical waterproofing area

- Automatic, self-propelled, type Leister Twinny S, or Leister Twinny T, 120/230V, (adjustable temperature, speed and pressure).



Manual welding

- Hand held welding gun type Leister Triac S, or type Leister Triac PID, 120/230V, (adjustable temperature).
- Hot air nozzles 40mm and 20mm all purpose-nozzle.
- Hand held pressure (Silicone) roller with ball bearing width 20mm and 40mm
- Reserve heating element



4 INSPECTION AND TEST PLAN

4.1 Inspection Process

The membrane should be cleaned and inspected before installation of subsequent protection layers.

This procedure will be performed step by step at every completion of each application zone.

The site personnel handling welding machines must have undergone training and should bear a certificate from MBS Technical Services.

A representative from the waterproofing contractor, main contractor and consultant should inspect the complete works.

The inspection shall be recorded in a written report and to be signed by all parties.

4.2 Substrate Inspection (Prior to Geotextile Installation)

- Check for any surface irregularities or any material that could damage the waterproofing.
- Check if the substrate is sufficiently dry.

4.3 Geotextile Inspection (Prior to membrane installation)

- Geotextile should be laid tight to substrate.
- Geotextile overlaps should be joined by hot air gun to keep it in place.
- No loose materials / debris or any unnecessary items over the geotextile.

4.4 Membrane Visual Inspection (Membrane surface and manual welding)

- Visually check the membrane from damages.
- Internal and external corners details should be properly laid and welded.
- Burn marks and gaps in welding. Use probe tester or screwdriver to check integrity of manual welds. Repair if weak points are found.

4.5 Membrane Welding Inspection by Air Pressure Test (Double seam welding)

- Close the end of weld channels with the use of vice grips or by welding it with a hot air gun fitted with a 5mm nozzle.
- Insert the needle of the air pressure testing gauge into the channel in between the two weld lines.
- Connect the air pressure testing gauge to an air pump and start building up air pressure to 2 Bar.
- Within 5 minutes of holding the pressure, it should not drop more than 20% for a successful test.
- If failed, check for any leaks on the insertion of needle or on both ends of the air channel. Smearing the possible leak points with liquid soap solution will aid in finding leaks.
- Re-test if pressure drop is due to leakage from insertion needle and closure of channels.
- Failed joints due to poor welding should be repaired by patching the full joint with a 200mm wide piece of membrane. Loose ends of the membrane from double seam welding should be cut or welded prior to patching.

4.6 Membrane Damage Repair

- Damaged area should be patch welded with a piece of membrane extending at least 100mm around the damage.
- Clean the membrane with damp cloth prior to repair. If contaminants do not go off, clean the membrane with proper cleaning solvent.

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