

# Guide Specification

## Elastoseal EPDM Geomembrane

### Part 1 general

#### 1.1 Scope of work

This Guide Specification consists of providing and installing non-reinforced vulcanized rubber sheets made from EPDM (ethylene propylene diene monomer) and EPDM/TPO (ethylene propylene diene monomer/thermoplastic olefine) for use as Geomembranes.

#### 1.2 References

1. ASTM D 882 – Standard Test Method for Tensile Properties of thin Plastic Sheet.
2. ASTM D 792 – Standard Test Method for determining the Specific Gravity and Density of Plastics by displacement.
3. ASTM D 1004 – Standard Test Method for determining the Initial Tear Resistance of Plastic Film and Sheeting.
4. ASTM D 4437 – Standard Practice for determining the Integrity of Field Seams used in joining Flexible Polymeric Sheeting.
5. ASTM D 4833 – Standard Test Method for index puncture resistance of Geotextiles, Geomembranes and related Products.
6. ASTM D 5199 – Standard Test Method for measuring nominal thickness of Geotextiles and Geomembranes.
7. ASTM D 5617 – Standard Test Method for multi-axial tension test for Geosynthetics.
8. ASTM D 6392 – Standard Test Method for determining the integrity of Nonreinforced Geomembrane Seams produced using Thermo-Fusion Methods.

#### 1.3 Submittals

- A. Manufacturer's certification that quality control data for rolls used in the fabrication of panels are in compliance with these specification requirements.
- B. Manufacturer's, Fabricators and Installer's Qualifications.
- C. Geomembrane design panel layout, termination and detail drawings.
- D. Geomembrane completion "as-built" drawings showing panel numbers, seam numbers, repairs, destructive test locations, penetrations and results of non-destructive air channel testing.
- E. Geomembrane Installation Certification.
- F. Results of Geomembrane Installation Quality Control Tests.
- G. Geomembrane Installation Warranty.

#### 1.4 Factory Fabrication

- A. The fabricator shall be an experienced firm customarily engaged in factory fabrication of EPDM or similar roll goods into large prefabricated panels by thermo-fusion and/or hot bond vulcanisation methods. The fabricator shall, if other than the manufacturer, be approved by the EPDM manufacturer.
- B. Prior to factory seaming, all roll goods shall be thoroughly inspected.
- C. All factory seams shall be made by means of vulcanisation or thermo-fusion methods using equipment and procedures approved by the manufacturer. Seam width shall be minimum 25 mm.
- D. All factory seams shall not have any overlapping material or flaps on the top side of the panel.
- E. All roll goods and seams shall be 100 % visually inspected during fabrication.
- F. All seams shall be non destructively tested by the air lance method in accordance with ASTM D 4437.
- G. Each welding machine used in panel fabrication shall be tested prior to each shift by fabricating a 1,0 m long sample. A minimum of two specimens shall be taken from the sample and tested in peel in accordance with ASTM D 6392 and shall meet or exceed the values in Table 1 of these specifications.
- H. The fabricator shall maintain panel fabrication QC documentation to include the following:
  1. Project number, associated panel number and size, date of fabrication.
  2. Panel numbers and all associated EPDM roll numbers with Manufacturers documentation. (ie. roll, lot and batch numbers, date of manufacture, etc.)
  3. QC documentation on all seam testing and the result and/or repair.
- I. The fabricator shall provide written certification that the factory seams were inspected and tested in accordance with these specifications.
- J. Each panel shall be rolled and/or folded and packaged with protective cardboard or plastic or rubber membrane wrapping with prominent and unique identification as to panel number and markings indicating direction of unrolling/unfolding to facilitate layout and positioning according to the panel layout drawings.

# Guide Specification

## Elastoseal EPDM Geomembrane

### 1.5 Construction Quality Control

A. Field inspection and testing will be performed under the provisions of this specification as a minimum.

B. Geomembrane installation by Installation Contractor shall include:

1. Visual inspection for installation damage and conformance with this specification.
2. Destructive and Non-destructive seam testing in accordance with this specification.

C. Equipment used in the performance of installation and seaming shall be in accordance with geomembrane manufacturer's recommendations and shall be maintained in optimum working condition.

### 1.6 Qualifications

A. Manufacturer:

The manufacturer shall have at least 10 years continuous experience in the manufacture of EPDM membrane roll goods.

B. Fabricator:

The Fabricator shall be approved by the Manufacturer.

C. Installer:

The Installer shall be an approved installer for the manufacturer.

### 1.7 Warranties

A. Material:

Manufacturer and Fabricator to provide a written 10 year material only warranty from date of delivery, on quality of material and factory seams.

B. Installation:

Installer to provide a written 2 year installation only warranty from date of completion, on quality of workmanship.

### 1.8 Delivery, storage and handling

A. Packing and Shipping:

Geomembrane panels shall be packed and shipped by appropriate means to prevent damage to the material and to facilitate handling.

B. Storage and Protection

1. The site owner/general contractor shall provide on-site storage for geomembrane panels from time of delivery until installation.
2. Store and protect geomembrane panels from dirt, vandalism, UV and sun light exposure and other sources of damage. Place geomembrane panels on smooth, elevated surfaces and provide waterproof covering for all stored panels.

C. On-site handling

1. Unloading, on-site handling and storage of the geomembrane is the responsibility of the General Contractor/Installation Contractor.
2. Use only Manufacturer approved handling equipment when off-loading or moving geomembrane panels to prevent any damage.
3. Inspect and report any observed damage to the Engineer of the Site Owner.

## Part 2 products

### 2.1 Geomembrane

A. Geomembrane shall be EPDM and/or EPDM/TPO produced in rolls and fabricated into panels free of pinholes, holes, blisters, delaminations or any sign of contamination by foreign matter.

B. The EPDM Geomembrane and seams shall have the following minimum values:

**TABLE 1 Membrane -Physical Properties**

Property	Units	Value	Test
Nominal Thickness	mm	0,80/1,00/1,50	ASTM D 5199
Minimum Thickness	mm	0,70/0,90/1,40	ASTM D 5199
Density	g/cm <sup>3</sup>	1,20 +/- 0,05	ASTM D 792
Tensile Strength	MPa	min. 7,0	ASTM D 882/ISO 37
Elongation at break	%	min. 300	ASTM D 882/ISO 37
Multiaxial Strain at break	%	min. 100	ASTM D 5617
Tear Resistance	kN/m	min. 30	ASTM D 1004

### Seam Properties

Property	Units	Value	Test
Shear Strength	kN/m	min. 6,0*	ASTM D 6392 (500 mm/min)
Peel Strength	kN/m	min. 2,0*	ASTM D 6392 (500 mm/min)

\* or membrane break only or min 300 % elongation have been reached without break in the seam.

# Guide Specification

## Elastoseal EPDM Geomembrane

### Part 3 execution

#### 3.1 Surface Acceptance

A. The General Contractor/Installer shall remove all debris, stones etc. from the surface prior to installation of the geomembrane. Stones larger than 20 mm and other debris that could damage the membrane shall be removed. A geotextile, weight 400-800 g/sqm is recommended to install under the geomembrane for mechanical protection.

B. The surface shall be compacted, dry, smooth and free of soft wet areas with standing water. Equipment track deformations shall not be greater than 40 mm in depth.

C. Anchor Trenches: Only the amount of trench required in one day shall be excavated. Trench corners shall be rounded to avoid sharp edges. Loose soil, stones greater than 20 mm and other debris shall be removed from the upper edge of the trench that will be in contact with the membrane.

D. The Installer shall provide written acceptance for the surface on which the geomembrane is to be installed on a daily basis.

#### 3.2 Equipment

A. Only rubber tracked low ground pressure equipment with contact pressure less than 17,5 kPa shall be used for geomembrane deployment over the geosynthetics when required.

B. Equipment used shall not damage the geomembrane or other geosynthetics by handling, trafficking or other means. Damage to the geosynthetics caused by installation procedures shall be repaired at no cost to the site owner.

C. Direct equipment contact with the geomembrane shall be minimized. The geomembrane shall be protected by extra layer of materials, plywood or other suitable means in high traffic areas.

#### 3.3 Placement

A. General:

1. Methods used to unroll and unfold panels shall not cause damage to the geomembrane. Damaged geomembrane shall be removed and replaced at no cost to the site owner.
2. Only those panels that can be anchored and seamed the same day shall be deployed.
3. Methods used to place and unfold the panels shall minimize wrinkles and folds.
4. Place adequate loading (ie. sand bags) to prevent uplift by wind.

5. The geomembrane shall be covered instantly after finished installation if a soil or geosynthetic cover is required.

6. Panels shall be placed as shown on the panel layout drawing.

7. Geomembrane shall be trimmed in the anchor trench to limits shown on the anchor trench detail with excess material discarded.

B. Weather Conditions

1. Do not place or seam panels at higher or lower temperatures than recommended by the manufacturer.

2. Do not place or seam panels during precipitation, in the presence of excessive moisture, in areas of ponded water or during excessive winds.

#### 3.4 Geomembrane Field Seaming

A. Seam Layout

1. In general, orient seams parallel to line of maximum slope, ie. oriented along, not across the slope.

2. No horizontal seams shall be less than 1,0 m from toe of slope.

3. Adjacent panels shall be overlapped a minimum of 100 mm prior to field seaming.

4. Wrinkling between adjacent panels shall be minimized.

B. Seam Preparation

1. Prior to seaming, seam shall be clean and free of moisture, dust, dirt and foreign materials.

2. If required, remove surface oxidation by grinding according to manufacturer instructions.

3. Align seams with fewest possible number of wrinkles, "fishmouths".

C. Seaming Equipment and Products

1. Approved process for field seaming are automated dual track thermo-fusion welding for all field seams or hand held thermo-fusion for patches or repairs.

2. Use only equipment and cleaning methods specifically approved by the geomembrane manufacturer.

3. Seam strength shall meet specification requirements in Part 2, Tabel 1.

D. General Seaming Process

1. Seaming shall extend to the outside edge of panels to be placed in anchor trench.

2. If required, provide a firm substrate directly under seam overlap, ie. a roped hard plastic board to follow the hot wedge machine as it moves along seam.

3. Seaming procedure shall not damage underlying geosynthetics.

# Guide Specification

## Elastoseal EPDM Geomembrane

4. Cut “fish mouths” or wrinkles at seam overlaps along ridge of wrinkle in order to achieve a flat overlap. Seam cut “fishmouths” or wrinkles by thermal fusion methods. Patch any portion where overlap is inadequate with oval or round patch which extends a minimum of 50 mm beyond the cut in all directions.
5. Seam shall be a minimum of 25 mm and shall be a dual track thermo-fusion weld with air channel for non-destructive testing.
6. T-seams shall be bridged according to manufacturers instruction.

### E. Trial Seams

1. A trial seam shall be made on fragment pieces of EPDM to confirm seaming conditions are acceptable. The trial sample shall be a minimum 1.0 m long and 0,3 m wide with the seam centered lengthwise. Six random test pieces will be cut from the trial seam sample, each 25 mm wide. Test specimens in peel (3) and shear (3). The specimen shall not fail. The engineer or installer may order additional trial seams if required.

### F. Non-destructive Seam Continuity Testing

1. Non-destructively test field seams over their full length using the pressurized air channel evaluation according to ASTM D 5820.

### G. Destructive Seam Testing

1. Destructively test field seams as required by the engineer.

### H. Defects and Repairs

1. Clean area to be repaired and remove all oxidation according to manufacturer approved methods.
2. For small defects, holes or cuts, repair with a patch that is round or oval in shape and extends a minimum of 50 mm beyond the edge of the defect or hole in all directions.
3. Non-destructive test all patches using Air Lance Test in accordance with ASTM D 4437.

### 3.5 Anchor Trench

A. The EPDM Geomembrane shall be placed into an anchor trench as shown on drawings. All excess shall be trimmed and removed from the anchor trench prior to backfilling.

B. The anchor trench shall be backfilled with the excavated trench material or select material and compacted in place after completion of the EPDM Geomembrane installation and seaming. Temporary ballast in the anchor trench will be required if backfilling cannot be completed on a daily basis.

### 3.6 Geomembrane Acceptance

A. The Contractor/Installer shall retain ownership and responsibility for Geomembrane until acceptance by the Site Owner or his representative. The geomembrane installation shall be accepted by the owner when:

1. Installation is completed.
2. Documentation of installation is completed.
3. Confirmation of adequacy of field seams, repairs, attachments and all associated testing is complete.

### 3.7 Geomembrane Cover Materials

A. The EPDM Geomembrane shall be covered with the required cover materials as soon as possible after Geomembrane Acceptance, preferably within 7 days.

B. Placement of the cover material shall not damage the geomembrane. Geotextiles are recommended for protection of the geomembrane.