


## Quality Control

Example of specifications, which includes all the standards related to Coletanche (page 2) can be provided upon request. One can notice that there is a complete range of ASTM standards related to bituminous geomembrane (i.e. Coletanche) and also other international standards.

There are specific ASTM tests methods for seams for bituminous geomembranes.

ASTM D7700-Standard Guide for Selecting Test Methods for Geomembrane Seams provides a Table showing all the ASTM standards for the tests methods necessary to evaluate geomembrane seams, applicable to different geomembrane materials:

 D7700 – 15

**TABLE 1 Seam Evaluation Techniques and Their Applicability to Different Geomembrane Materials**

Type of Seam Evaluation Technique	ASTM Test Method/ Type of Geomembrane	Non-Reinforced Polyolefin Geomembranes		Non Reinforced PolyvinylChloride (PVC) and Ethylene Interpolymer Alloy (EIA)	Ethylene Propylene Diene Terpolymer (reinforced and nonreinforced) (EPDM)	Bituminous Geomembranes (PBG)	Other Reinforced Geomembranes
		HDPE	All other types of nonreinforced geomembranes (for example, fPP, LLDPE, VLDPE)				
Destructive	D6214/D6214M Field seams, chemical fusion methods	—	—	X (see Note 1)	—	—	X (see Note 1)
	D6392 Nonreinf GM-Seams Thermo-Fusion Meth	X	X	X	—	—	X (see Note 2)
	D7408 PVC Seam	—	—	X	—	—	—
	D7056 BGM Seams	—	—	—	—	X	—
	D7272 Taped seams evaluation	—	—	—	X	—	—
	D7747 Reinforced GM, Strip Test	—	—	—	—	—	X
	D7749 Reinforced GM, Grab Test	—	—	—	—	—	X
	D5641 Vacuum Chamber (Notes 3 and 4)	X	X	X	—	X	X
Non-Destructive	D4437 Air lance (Note 3)	X (see Note 5)	X (see Note 6)	X	X	X	X
	D4437 Mechanical point stressing	X (see Note 7)	X	X	—	X	X
	D5820 Pressurized Air Channel (Note 3)	X (see Note 8)	X (see Note 8)	X (see Note 8)	—	—	X (see Note 8)
	D6365 Spark Test (Note 3)	X	X	X	—	X	—
	D7177 Air Channel Evaluation of PVC	—	—	X	—	—	—
	D7006 Ultrasonic Testing of Geomembranes (Note 3)	X (see Note 9)	X (see Note 9)	X (see Note 10)	—	X	—
	D7002 Leak location/water puddle/lance	X (see Note 11)	X (see Note 11)	X (see Note 11)	—	X (see Note 11)	X (see Note 11)
Electrical Leak Location	D7007 Leak location/covered geomembranes	X (see Note 11)	X (see Note 11)	X (see Note 11)	—	X (see Note 11)	X (see Note 11)

X = Applicable  
— = Not Applicable

They are classified in destructive, non-destructive, and electrical leak location tests. There are as many standards for bituminous geomembrane as there are for other liners.

## 1. Destructive

### 1.1 Shear testing of the seams:

Tests is carried out in the field using a tensiometer with specific geotextile jaws and according to the standard ASTM D7056. A defined sample of the seam is required for the shear resistance test. The value at which the seam fails is recorded and logged in by the quality supervisor. The sampled areas are to be repaired by welding a patch of Coletanche.



The standard critical values suggested for this test are as follow:

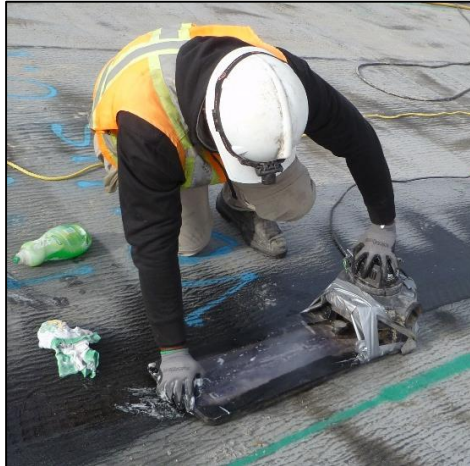
Grade	kN/m
SC1	15
ES1	11
ES2	14
ES3	17
ES4	20

If this test method is chosen, it is recommend to perform it for every 150 linear meters of liner seams.

## 2. Non-destructive testing

### 2.1 Vacuum testing

The seams are checked using a vacuum bell. The test is performed using liquid soap as a leakage indicator. If bubbles appear under the bell, the seamed section must be repaired.



If this test method is chosen, it is recommended to perform it for every 100 linear meters of liner seams.

### 2.2 Air Lance Method

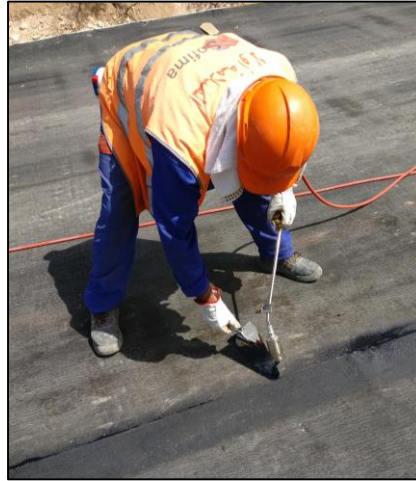
This test consists in check the sealing and quality of the weld. With an air lance a jet of air is fed to the edge of the weld. If the weld is continuous and free of defects (air bubbles, dirt) the air will not detach the membrane. In the case of a defect, the air jet will detach the membrane. If there are any leaks, they will be located and repaired. Refer to ASTM D4437 section 4.2 for the test procedure.



If this test method is chosen, it is recommended to perform it on 100% of liner seams.

### ***2.3 Mechanical point stressing***

The test is carried out once the bitumen has cooled. The joint is tested with a round-tipped trowel to ensure that the weld is not separating. A special attention must be taken if there is no bitumen bleeding out from the seam. All defects are recorded by the site supervisor in a Data Sheet and clearly marked for repair.



If this test method is chosen, it is recommend to perform it on 100% of liner seams.

### ***2.4 Ultra-sound testing***

The seams are checked using an ultra-sound device. After a calibration test, the ultra-sound machine is placed on the joint with a sufficient quantity of coupling agent to make sure contact between the probe and the membrane is good. To control the seams, the probe must be carried out over the total width of the seam. The results are recorded by the site supervisor and in the case of a defect, additional tests along the same seam are required (in between the failed test and the nearest passed test – both sides).



If this test method is chosen, it is recommend to perform it for every 150 linear meters of liner seams.

### 3. Electrical leak location

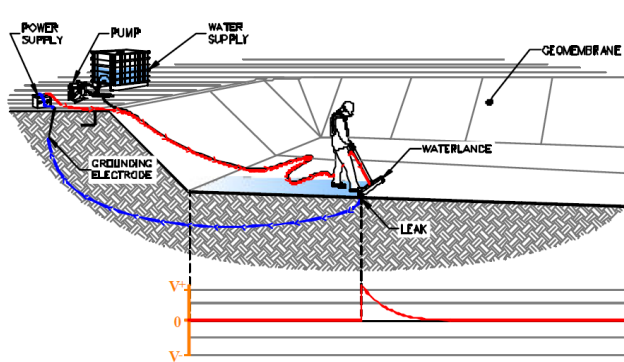
#### 3.1 Water lance

Water lance method: locates holes when geomembrane is exposed and dry.

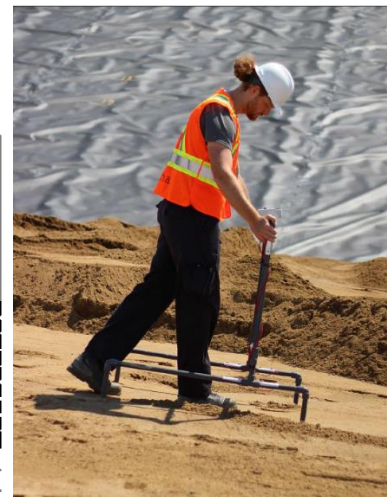
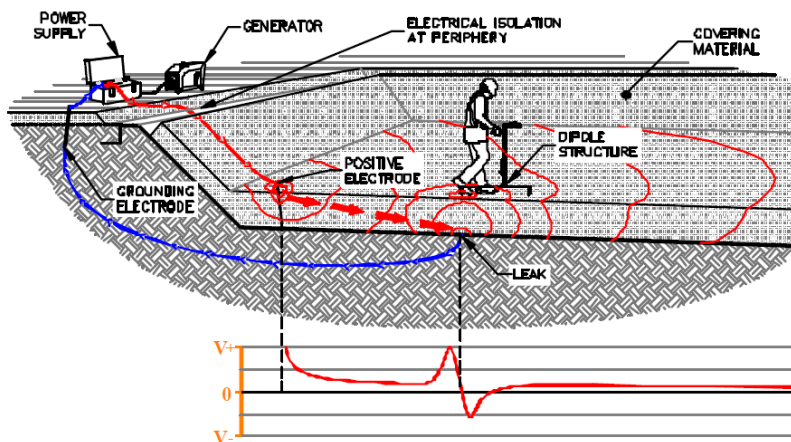
#### 3.2 Dipole method

It locates holes in the liner after it has been covered by water or soil.

Specialised workers are needed to complete these tests.



Water Lance Method



Dipole Method

If this test method is chosen, it is recommend to perform it on 100% of liner seams.