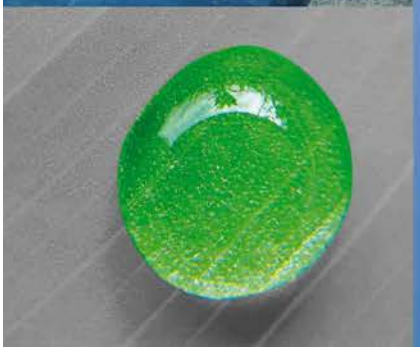
COLETANCHE®



INSTALLATION GUIDE

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Appendix A

- Roll Acceptance Form
- Site Preparation Checklist

1. ROLLS

1.1. Layout

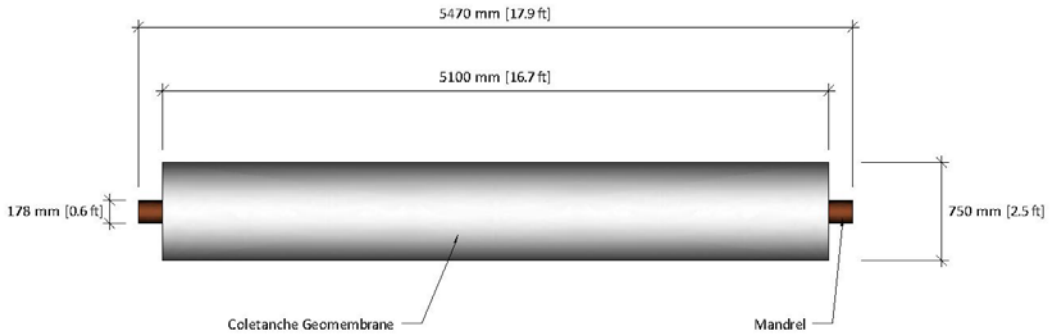
A drawing showing the layout of each roll must be prepared to determine the amount and size of each roll in order to minimize excess material. A 20 cm (8 inch) seam overlap needs to be considered for the welding between liners, as well as other distance considerations for anchoring surfaces and cuts.

1.2. Standard Packaging

In standard packaging, the rolls have the following dimensions:

Type	**ES 1**	**ES 2**	**ES 3**	**ES 4**
Length (m/*ft*)	90/*295*	80/*262*	65/*213*	55/*180*
Width (m/*ft*)	5.10/*16.7*	5.10/*16.7*	5.10/*16.7*	5.10/*16.7*
Surface mass (g/m^2)/ *(oz/yd^2)*	4200/*124*	4850/*143*	5800/*171*	6400/*189*

Dimension of the rolls



The standard length of the steel mandrels is 5470 mm (17.9 ft), with inner diameter of 168 mm (6.6 inches), and outer diameter of 178 mm (7 inches).

A 20 cm (8 inch) strip, located under the left side of the membrane in standard production, is covered with a PE silicone film instead of terphane, in order to protect the seam edge.

Most of the rolls are one single piece. However, due to manufacturing constraints some may have a transversal cut (no more than 20% for deliveries over 12 rolls). A cut roll is identified by a marker tape and the roll identification label.

1.3. Position of the PE Silicone Film

While unrolling, the PE silicone film is positioned on the **left side** of the strip. For some applications (canals, etc.) where the overlapping of seams must be installed in the flow direction, it may be necessary for the PE silicone film to be positioned on the other side.

Note: If the PE silicone film is needed to be positioned on the other side, it should be requested prior to ordering the membrane.

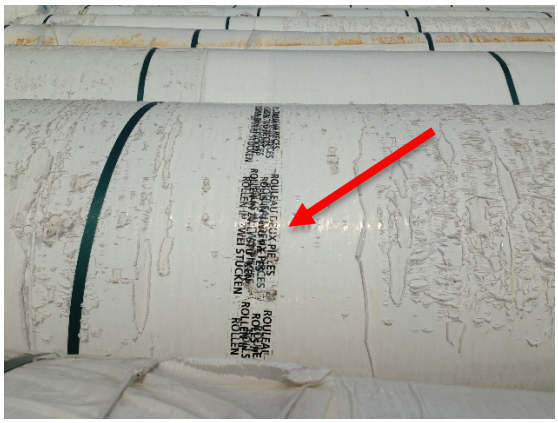
PE Silicone Film

1.4. Labelling

The rolls are marked with the following labels:

- Identification label, with the following information :
  - Type of COLETANCHE
  - Length of the section(s)
  - Serial number
- ASQUAL label (for the certified membranes),
- "Rouleau présentant une coupe – Roll in two pieces" label when relevant.

Identification Label



Cut rolls indicator

1.5. Unloading

1.5.1. Access to Site

Before unloading, access conditions to the site must be studied carefully to avoid wasting time while bringing in the rolls. The main concern is space because the delivery trucks and machinery (loader, forklift, crane or excavator) need room to be able to rotate. They could have special additional equipment, such as an unloading pin or a spreader bar.

1.5.2. Delivery

1.5.2.1 Container Delivery

The delivery will be carried out by regular 6m (20 ft) sea-containers, each containing 9 rolls maximum.

Characteristics of a Container

Weight	2,300 kg/ 5070 lbs		
Internal dimensions	*Length*	5.90 m	19.3 ft
	Width	2.34 m	7.7 ft
	Height	2.38 m	7.8 ft
External dimensions	*Length*	6.10 m	20 ft
	Width	2.45 m	8 ft
	Height	2.60 m	8.5 ft

Delivery Container

Unloading the Container

The container must be unloaded by the installer or the purchaser at his own expense at the site entrance within two hours of its arrival (extra charge applicable for late unloading). A loader or a forklift equipped with a special pin to fit inside the mandrels is required for the unloading procedure. If necessary, the fabrication drawings to build the unloading pin can be provided.

The unloading pin is not manufactured in our facilities due to the variability of the attachment to the construction machines (loader or forklift). The pin will have to be fabricated on-site or at a nearby location. The drawings provided must be adapted according to the construction machine used.

Diameter of the pin is 13cm or 5 inches, and the length is 390 cm or 153 inches.

Unloading Pin

Steps for Unloading :

Step 1: Attachment to the machinery

Step 2: Insert the pin inside the mandrel

Step 3: Slightly lift the roll

Step 4: Pull the roll carefully

1.5.2.2 Truck Delivery

When making a delivery by truck, mostly flatbeds are used. They can hold up to 12 rolls (2 pyramids of 6).

Flatbed Trucks Delivery

Unloading is done using a spreader bar equipped with adapted slings or clamps to avoid damaging the roll. Unload using a hydraulic or manual beam safely, even if it can be cumbersome.

Use of forklift forks are prohibited!

The use of a forklift fork is prohibited because forks may puncture the rolls. Patching a puncture can give the installer a fair amount of additional work.

Unloading using a spreader bar

1.5.3. Quality Control

Each delivery is accompanied by a delivery note detailing the serial numbers of the corresponding rolls. The person in charge of receiving the delivery should verify that the delivery note is in accordance with the numbers indicated on the rolls and the order.

Perform a visual inspection of the rolls and carefully look for possible damage, such as a puncture in the protection film. Consult Appendix A for an example of the roll acceptance form.

Sign the delivery note only after careful inspection of the delivery.

In order to document the final quality control report, pictures of each load should be taken before unloading the rolls.

1.6. Temporary Storage

1.6.1 Access

Proper access must be planned in advance to avoid time loss. The access roads should be strong enough to bear the weight of the rolls and to allow the flow of vehicles handling the rolls.

1.6.2 Temporary storage area

1.6.2.1 Surface Area

Each roll occupies a surface area of 5 m² (54 ft²), thus, the dimensions of the storage area will be calculated depending on the projected installation output. An entire container (9 rolls) will require 45 m² (485 ft²) and a full flatbed (12 rolls) needs a 60 m² (646 ft²) storage area. Additional space for handling varies depending on the vehicle used (shovel, crane, loader or crane truck).

1.6.2.2 Operations

The rolls should not be stored directly on the ground due to the risk of puncture that can occur through the various layers of the roll. They should lay on adapted rigid supports such as:

- Concrete blocks
- Reinforced concrete safety barrier
- Metal trestles or I-beams
- Wooden beams

Storage using concrete blocks

Storage using reinforced concrete safety barrier

Storage using metal I-beams

Storage using wooden beams

Storage using concrete blocks and wooden beams

When storing rolls, the distance between the bottom of the roll and that of the mandrel, which is approximately 35 cm (14 in), must be taken into consideration.

In addition, by taking into account the future installation order on site (sorted by type of membrane, length, position of the PE silicone film, rolls in two pieces), sorting the rolls out in the temporary storage area could avoid unnecessary movement later on.

1.6.3 Storage on construction site

When the site is completely set up, the rolls should be removed from the temporary storage area and then transferred to the construction site; as close as possible to the installation site. They should be stored on two layers of concrete blocks, reinforced concrete beams, metal trestles or wooden beams.

Example of storage with wooden beams

Roll distribution according to used surfaces

1.7. Transfer of the rolls to the installation area

Transfer the rolls from the storage area and distribute them evenly along the site.

The circulation road for vehicles supplying the rolls are generally at the top of the embankment, where circulation problems are anticipated. A sufficiently large width (minimum 5m or 16.4 ft. is recommended) should be guaranteed to allow the following:

- Supplying vehicle access,
- Storage of rolls,
- Refuelling the vehicles;
- Location of an anchorage trench (approximately 1.5 m or 4.9 ft).

The most convenient equipment to use is a boom truck, with an arm able to handle 2 tons at a 3 metre distance.

Example of machinery used to transfer the rolls

1.8. Mandrels

A deposit is held per mandrel, and is refunded when the mandrels are returned to the factory, provided they are in good condition:

- they should not be bent in the middle
- the edges should not be flattened out
- no welds or cuts around the three holes at the end of the mandrels (as these holes are used to tension the membrane when rolling up during manufacture).

2. SUBGRADE PREPARATION

2.1. Surface

The subgrade layer must be:

- Free from sharp edges that might damage the membrane (sharp stones, etc).
- Free from vegetation or organic content whose decomposition may lead to gas production and soil compressibility degradation.
- Free from ruts where the membrane might get stretched under the weight of the protective layer and the load of the structure.
- Carefully and uniformly compacted. A special attention must be brought around solid structures (concrete walls, footings, pipes, etc.) where a manual compaction is necessary.

Evenness defects on a large scale can be tolerated up to 5cm (2 inch) over a 3m (10 ft) length, but no defects can be tolerated over a length of a few centimeters.

Prepare the subgrade carefully, with levelling and mechanical compaction, and clearing the surface with a rake.

Fill voids either with sand on the horizontal parts, or with lean mortar on the slopes.

Depending on the grading and the angularity of the embedded stones inside the subgrade, it may be necessary to lay a protection geotextile between the subgrade and the geomembrane (with a mass per unit area between 300 and 700gm/m2 or 8.9 to 20.7 oz/yd2) or to use a higher grade COLETANCHE.

2.2. Slopes

The COLETANCHE membrane can be laid on slopes up to a ratio of 3 horizontal to 2 vertical.

However, small areas with a steeper slope can be covered with COLETANCHE provided they are fully bonded by anchoring to the concrete support, by evenly spaced metal fixings or by intermediate anchoring.

2.3. Transition area at base of slope

The transition between the slope and the bottom of the structure must be as smooth as possible, with a rounded shape of minimum 20cm (8 inch) radius.

The bottom of a reservoir or pond area must have a 3 to 4 % gradient in order to properly drain the site, or for future drainage.

2.4. Bearing Capacity

The purpose of the membrane is to **guarantee the waterproofing of the structure,** while it does not increase the structural capacity.

The subgrade needs to have a good bearing capacity:

- CBR above 10
- Stiffness modulus greater than 50MPa

2.5. Subgrade Acceptance

Before starting the waterproofing operations, perform a visual inspection of the subgrade together with the client and the company in charge of the construction of that layer.

Indicate all possible problems (quality of the subgrade, damage to concrete, etc.) on the support layer acceptance form and sign it.

Do not hesitate to refuse a subgrade if its quality is not as requested.

3. INSTALLATION

3.1. Laying the membrane

Laying COLETANCHE is in most cases carried out with the terphane (clear plastic film) downwards.

Remove the polyethylene separating film.

Lay the COLETANCHE membrane starting from the highest slope and according to the layout scheme previously established.

Hold the membrane either with blacksmith clamps or through notches at the end of the strips.

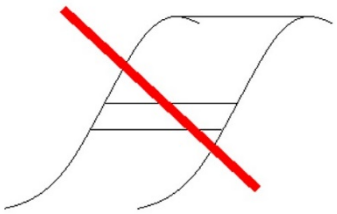
3.2. Overlap Width

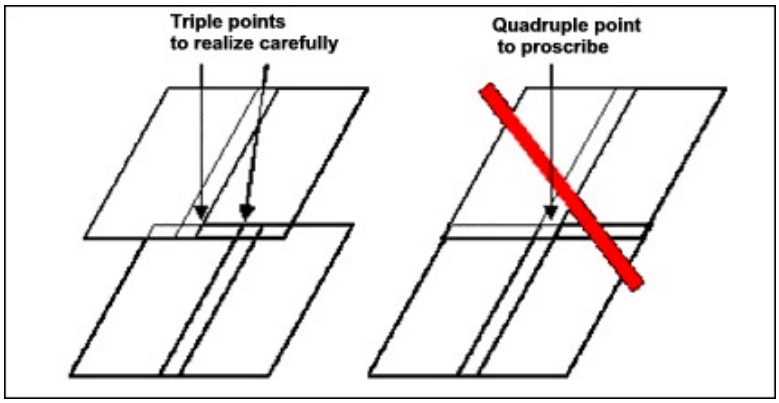
There is a green marking indicator as to where to place the overlap for full uncut rolls. For cut rolls, it is necessary to mark the position of the membrane with builder's line or painted marks, to define a minimum 20cm (8 inch) overlap.

3.3. Transverse Joints

Lay the strips in such a way to avoid:

- Transverse seams on slopes (except in exceptional cases).
- Quadruple overlaps due to misaligned roll ends. Triple overlaps will be covered with an additional membrane to secure the weld.





Avoid transverse seams on slope

3.4. Weather Conditions

DO NOT lay the membrane**:**

- If the wind speed is above 50 km/h (13.9 miles/h).
- When the air temperature is above 40°C (40 F), because the shoes of the workers will leave prints on the surface.
- When the air temperature is below -40°C (-40 F), because the membrane becomes too stiff.

3.5. Crew

A typical laying crew includes:

- a foreman
- three operatives for membrane handling and temporary anchoring
- an excavator driver

If the unrolling beam is not equipped with a hydraulic motor, at least two additional workers must be provided to pull the strips.

If the support layer quality is bad (sharp stones or ruts), and requires correction just before laying the membrane, additional workers with rakes are needed.

3.6. Heavy Equipment

Rolls are handled with a 20 to 25 ton hydraulic excavator that is tracked, if possible.

There are two kinds of handling beams:

- **Hydraulic beams**- connected to the hydraulic pipe of the bucket.
- **Manual beams**- more or less sophisticated, which requires pulling on the membrane. There is a risk of unrolling of the membrane to run out of control, so these beams must be equipped with a braking system.

It may also be necessary to provide a winch on the opposite side of the site when long lengths are installed, due to the friction effect between the membrane and the ground.

3.7. Personal Protection Equipment

General construction safety regulations apply to membrane installation projects.

Personal protection equipment includes:

- Safety shoes or boots
- Safety helmets for staff within the roll handling area
- Safety jackets and safety harness with anchoring system
- Handling gloves and heat resistant gloves

3.8. Small Equipment

The small equipment consists of:

- Vise-grip cutters with hooked blades for knife. Flat blades are not suitable for cutting COLETANCHE due to its internal geotextile
- knife
- Builders line
- Measuring tape
- Aerosol paint
- Rope ladders
- Wax marker

4. ANCHORING & BALLASTING

4.1. Effects of Wind

If windy, temporary ballasting of the strips must be carried out with particular care as soon as they are laid and also at the end of each day if all welds are not completed.

4.2. Temporary Ballasting

Temporary ballasting of the membrane is carried out with 10 to 20kg (22 to 44 lbs) sand bags, concrete blocks, filled tires or non-sharp materials. The temporary ballast should be evenly distributed on the membrane surface, and especially adjacent to the laps to reduce the effect of wind during the construction phase.

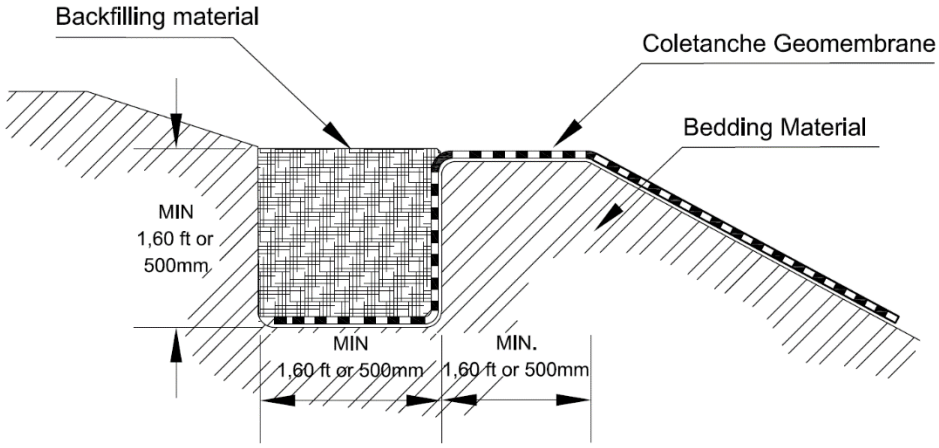
If sand bags are used, they can be hanged on the slope with a rope attached on the crest.

4.3. Final Ballasting (Anchoring)

The proper execution of this task is essential to the behaviour of the membrane and to prevent creases along the slope.

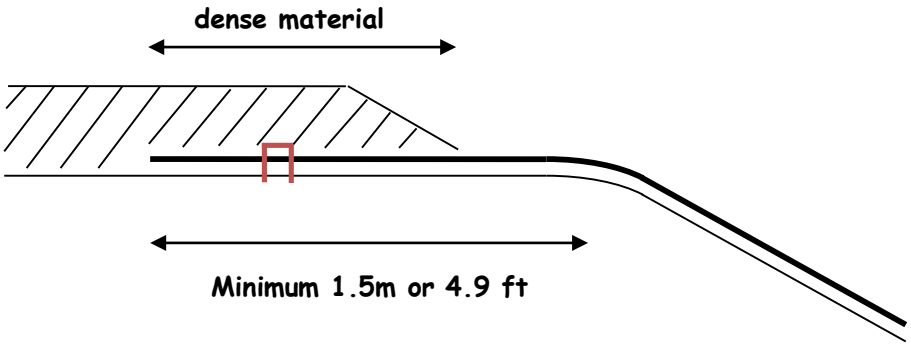
4.3.1. Trench Anchoring (most common)

Bury a section of membrane in a trench dug either by hand or with an excavator or grader, depending on the access to the crest. It should be prepared whenever possible before laying the membrane, to avoid unnecessary and potentially damaging movements of the membrane. A temporary staple can be used at the base of the trench to keep the liner in place if not backfilling immediately.



4.3.2. Anchoring Through Flat Ballasting

Hold the geomembrane in place with ballasting materials to avoid erosion effects.



Estimate of the required ballast:

Length of the slope	*Little or moderate wind*	*Strong winds*
0 to 3m / *0 to 9.8 ft*	**0.04/***1.6*	**0.06/***2.4*
3 to 5m / *9.8 ft to 16.4 ft*	**0.09/***3.5*	**0.16/***6.3*
5 to 15m / *16.4 to 49 ft*	**0.16/***6.3*	**0.35/***13.8*
More than 15m / *49 ft*	**0.25/***9.8*	**0.36/***14.2*

*Ballast in **m^2 / m** ($inch^2$/inch), for a 2 ton per cubic metre material (around 20 KN / m^3)*

Anchoring must be carried out with metal pins, driven into the ground, which will remain in place after the final anchoring.

Backfill the anchoring trench to avoid water accumulation that might destabilise the ground due to precipitation.

Wait until the structure is put into operation if the support layer is likely to settle, so that the membrane reaches its final position with minimal internal tensions.

5. SEAMS

5.1. Welding Crew

A typical manual welding crew includes:

- A welder
- A helper for rolling
- Possibly an additional worker if needed for seam preparation (clear dirty membranes exposed to mud or wind, etc.)

The welder leads the operation, setting the pace and directing the helper.
For safety reasons, even if only a few strips are involved, a welder must never operate alone on a site.

5.2. Welding Equipment

The equipment required for manual welding includes:

- Propane gas torch with a 4-hole flat burner, attached with a lance and a trigger handle with adjustable flow.
- Propane gas bottles of 13 or 30kg (29 or 66 lbs), with a hand truck and an adjustable pressure valve between 0 and 3 bars.
- Flexible gas feed pipe that is long enough to allow welding of a whole strip without having to move the propane gas bottle.
- Heatproof gloves in accordance with regulations.
- Small trowel.
- Fire extinguisher with powder or carbon dioxide.

For rolling the seams, the following equipment must be supplied:

- A 20 cm (8 inch) wide metal roller to be used on flat surfaces, weighing 10 to 15 kg (22 to 33lbs)
- A 5kg (11 lbs) roller for the slopes and details
- A bowl of wet rags, possibly mounted on a shaft (mop) for details
- A bucket of water
- A scraper to remove bitumen runoff that may accumulate on the rollers

5.3. Weather Conditions

Do not weld in presence of water. Water boils when in contact with hot bitumen and creates bubbles that will remain within the seam. Only a slight dampness is allowed.

5.4. Technical Detailed Procedure

- Remove any sharp stones that may still lie under the membrane, as their presence would hinder the proper rolling of the seam.
- Carefully brush the seam area to remove loose sand.
- Clean mud traces with a sponge.
- Remove the PE silicone film after the seam area has been cleaned.
- Carefully burn in advance the terphane film where present, after turning the membrane upside down.
- First, weld a 50cm (1.6 ft) long area, and roll the roller on it carefully to join the two strips together.
- While moving at a continuous steady pace with one hand or a hook, lift the upper membrane about 10cm (4 inch) and insert the torch between the two strips, while keeping the flame aligned with the edge in order to heat the 20cm (8 inch) width in one single run.
- Carry out the rolling 1.5 or 2.0 meters (5 or 6.6 ft) behind the burner, about 1.0 meter (3.3 ft) behind the flame.
- Always weld upwards on slopes.
- Roll vigorously, to get a good contact between the two sides.
- Do not step on a hot seam, as footprints will remain on the soft bitumen.
- A bitumen edge must ooze when rolling, to a width up to 3cm (1.2 inch).

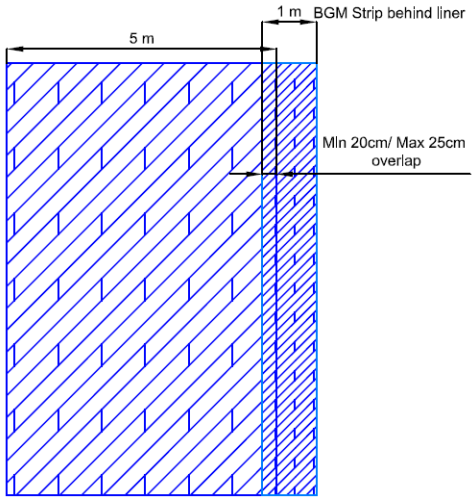
- Do not apply the roller on the bitumen edge; otherwise it will get contaminated, and stick to the upper surface of the membrane.
- Adjust the forward speed and the torch power to control the amount of heat applied to the seam.
- Visually check the seam once it has cooled down.
- Finalize work through reheating the edge and shaping it as a fillet with a small trowel.

5.5. Flame Damage

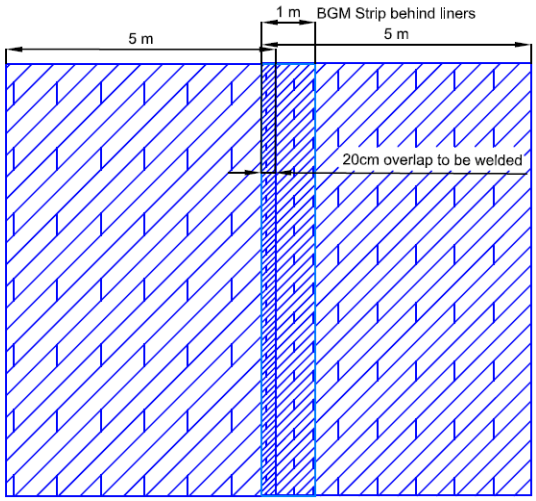
A geotextile can be applied as a protective layer under the geomembrane against flame damage. If it is made of polypropylene, it may be damaged when welding by the heat of the flame and melted by the bitumen run off. The damaged surfaces are generally very small, but nevertheless it may be advisable to lay a thermal protection between the geotextile and the geomembrane.

1m (3.3 ft) wide strips of bituminous geomembrane roofing products or COLETANCHE can be used.

1. Place 1m BGM strip over flammable membrane or geotextile.



2. Place 5m Coletanche roll over the 1m BGM strip with a min 20cm and max 25cm overlap.



3. Place the subsequent 5m Coletanche roll over the 1m BGM strip with the 20cm overlap to be welded (As per the standard Coletanche installation).

5.6. Repairs

Bad quality welds, non-conforming laps, serious creases and any other damage must be repaired with an additional layer of membrane. The patch dimensions must be at least 20cm (8 inch) larger on each side than the defect area as an overlap.

The patch is prepared with **rounded** edges. After carefully burning the terphane, the membrane must be welded on its whole surface. Quality control of seams must then be carried out.

A new membrane can easily be connected to an older one. On existing projects where the membrane has already been covered either by a protective layer, or by waste materials or mud, repairs to the membrane can be carried out in the same way, after carefully cleaning the membrane with high pressure water (50 to 120 bars).

5.7. Quality Control

A quality control program for seams is proposed during and after installation. This program includes the following procedures:

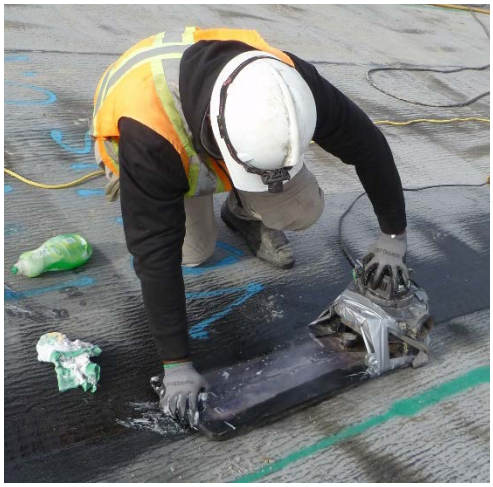
- ***Visual testing by a qualified worker:*** The test is carried out once the bitumen has cooled. The joint is tested with a round-tipped trowel to ensure that the weld is not separating. A special attention must be taken if there is no bitumen bleeding out from the seam. All defects are recorded by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

- ***Ultra-sound testing*** *(non-destructive):* The seams are checked using the Panametrics Epoch 4B 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).

- ***Vacuum testing*** *(non-destructive):* 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.

- ***Destructive testing or mechanical resistance of the seams:*** Tests are done in the field with Leister equipment. A sample of the seam is required for the shear resistance test (ASTM D-7056). The sampled areas are to be repaired by welding a strip of COLETANCHE. The results are noted by the quality supervisor.

Ultra-sound testing



Vacuum testing

6. PROTECTION

6.1. Precautions

Installing a protective layer over COLETANCHE does not create any problems, provided the following points are carefully followed:

- Adapt the protective layer to the structure and its future use (risk of erosion, settlements and puncture by the protective layer).
- Install the protective layer with adequate equipment. Although it is best to lay the protective layer with an excavator from outside the structure (from the crest), or to place it with a small loader or bulldozer, heavy vehicles or trucks can be temporarily allowed on the membrane.

6.2. Protection Techniques

6.2.1. Hot mix asphalt or macadam

Compared to other synthetic membranes, bituminous geomembranes show a major difference in its compatibility with hot mix asphalt or macadam.

With a thickness of 5 to 8cm (2 to 3.2 inch), a maximum grading of 10mm (0.4 inch), and a rich mix-design (bitumen content increased by 0.5 to 1.0% compared to standard recipes), hot mix asphalt can be laid directly upon the membrane, without laying an intermediate geotextile.

When laying hot mix asphalt, temporary creasing may appear, but this does not have any consequence on the membrane behaviour.

Cold asphalt mixes may also be used as a protective layer. If the grading is above 14mm (0.6 inch), it may be necessary to lay an intermediate 250g/m2 (7.4 oz/yd2) polypropylene geotextile to avoid puncturing the thinner COLETANCHE membranes (ES1 and ES2).

6.2.2. Concrete - cobblestones

A protective layer, either rigid (in-situ cast concrete slabs) or supple (cobblestones), can be laid on the COLETANCHE membrane. A 250 to 500 g/m2 (7.4 to 14.8 oz/yd2) polypropylene geotextile is generally laid in between them.

Cobblestones can be contained either by a foot abutment, or anchored with stainless steel cables from the crest.

6.2.3. Gravel - ballast

As for cold mix asphalt, laying a geotextile between the COLETANCHE and the protective layer made of gravel depends upon the aggressiveness of the material (grading, angularity), and mostly upon the type of COLETANCHE used.

Gravel and ballast are laid with a minimal thickness of 20cm (8 inch).

If those materials are laid by pushing forward with a loader or a small bulldozer, then the friction may generate a slight elongation of the membrane. To avoid creases that may then collapse, it is advised to leave one end of the membrane free, and weld it only at the end of the work phase.

6.2.4. Rocks - gabions

The bearing capacity of the subgrade is a key factor when laying rocks or gabions to prevent the membrane from tearing under the weight of the protection.

A thick geotextile of 800 to 1,000g/m2 (23.59 to 29.49 oz/yd2) is often advised between the membrane and the protective layer.

6.2.5. Top soil – grassing – planting

Top-soil covered with grass or planting is another solution to protect COLETANCHE.

Grass, weeds or small tree roots do not puncture the geomembrane due to the anti-root film.

For larger trees, species with flat roots are required.

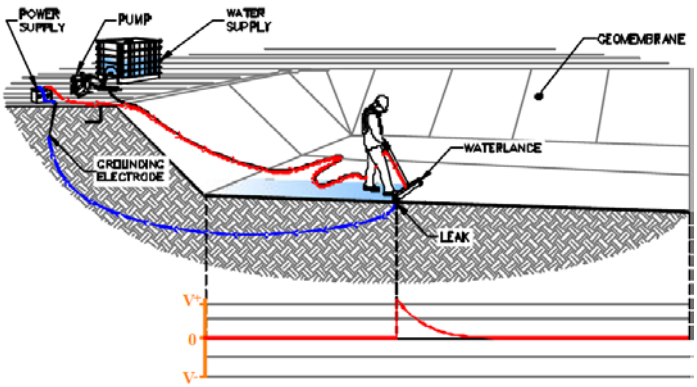
6.3. Quality Control

The installer can apply quality control with the geoelectrical leak location test. This test localises holes in the liner, validates technical concepts and materials of choice and minimizes risks associated with potential leaks.

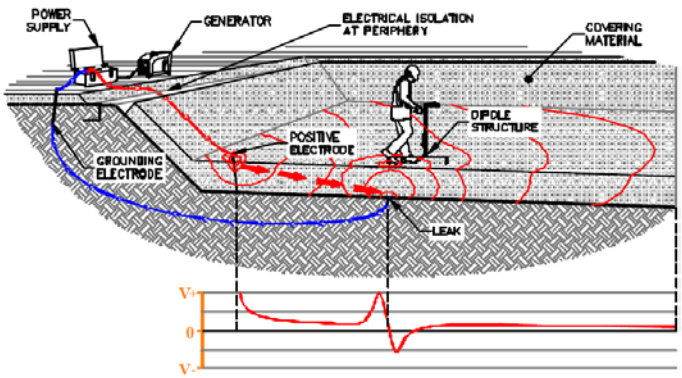
There are two methods:

- *Water lance method:* locates holes when geomembrane is exposed and dry.
- *Dipole method*: 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 (Alphard, 2014)



Dipole Method (Alphard, 2014)

7. CLOSING THE WORK SITE

7.1. Return Equipment

To close the work-site:

- Return the mandrels
  - Verify that they are in good condition
  - Stock them for an easy loading to return
- Return every device used on the site, in good condition
- Have surveyors survey the site to ensure that all the installation work is complete
- Compile the final report of the work site with its appendices

7.2. Forms

The following forms should be filled and included in the final report:

- Subgrade acceptance form
- Roll acceptance form
- Laying summary form
- Seams testing form

The final step is to complete the final report and include the drawing of the final layout.

Appendix A

Roll Acceptance Form

SITE FOLLOW-UP FORM	Site:			
	Date:			
Number of rolls				
Roll number				
Surface	m^2	m^2	m^2	m^2
External aspect				
Acceptance by: **(Print Name)**				

Signature _____ Date _____

Site Preparation Checklist

PREPARATION CHECKLIST						
Installer:						
rolls of Coletanche of an area of m2 each or a total area of m2						
	Number		Action done		By whom	Observations
	personnel	others	yes	no		
1 General plans composed of:						
1.1 - Overall plan defining the site:						
The site of the offices, the warehouses...						
Zones of circulation of the trucks						
Zones of unloading of the trucks						
Zone of storage of the Coletanche rolls						
Zone of storage of the mandrels						
Appreciate the distance from storage to the site						
1.2 - Plan of Calepinage						
To define the various phases of work						
To define where one will place each rollers on the site						
2 Transport of the factory						
To know the various dates of each delivery						
Reception of the quality of the rolls						
Checking of quality on arrival of each deliveries,						
3 Unloading						
3.1 - Personnel						
Foreman						
Workers						
3.2 - Heavy Equipment						
Excavator for transport by truck or a container						
Pin in the case of an elevator or uncurler in the case of truck						
3.3 - Small equipment						
Piece of wood or concrete like support of the mandrels of the rolls						
Pairs of slings with hooks						
Safety gloves						
4 Transport from the storage to the site						
4.1 - Personnel						
Foreman						
Workers						
4.2 - Heavy Equipment						
Excavator						
or truck in the case of significant distance						
Manual uncurler						
4.3 - Small equipment						
Piece of wood or concrete like support of the mandrels of the rolls						
Pairs of slings with hooks						
Safety gloves						
5.1 - Personnel						
Workers						
6 Unfolding of the rollers						
6.1 Preparation of the support						
6.1.1 - Personnel						
Foreman						
Workers						
6.1.2. - Small equipment						
Safety gloves						
Rakes						
Small roller or dame						
6.2 Unfolding of the rollers						
6.2.1 - Personnel						
Foreman						
Workers same as & 3.1 plus						
6.2 - Heavy Equipment						
Caterpillar excavator (To recommend caterpillar excavator to avoid the prints)						
Hydraulic beam						
6.3 - Small equipment						
Safety gloves						
Grips						
7 Welding						
7.1 - Personnel for each teams						
Welder						
Worker with a brush before welding						
Worker with a roller to do the"marouflage "						
7.2 - Heavy Equipment						
7.3 - Small equipment						
7.3.1 - Equipment for the welding						

Préparation chantier Porcupine Placer Dome An 1.xls

PREPARATION CHECKLIST

Installer:

rolls of Coletanche of an area of m2 each or a total area of m2

	Number		Action done		By whom	Observations
	personnel	others	yes	no		
Gas pipe and connections to bottles						
Broom (sweeping of the seaming area),						
Torch or mobile machine of welding						
Trowel, typically a "Bullnose Trowel ",						
1 wooden float for asphalt,						
Insulated gloves						
Squeegees to remove water off Coletanche.						
Rope ladder of length adapted to the lengths of the slopes						
7.3.2 - Small equipment						
Roller Marouflor						
Painting roller						
7.3.3 - Small Equipment of drawing and cutting						
Aluminium ruler 5 meters long						
Chalk line to mark sheets for seam overlap distance,						
Extra long tape measure,						
Stanley cutter with nonretractable blades (ref. 199A),						
Cutter with retractable blades (ref. 99-th).						
7.4 - Consumables						
Bottles of propane gas						
Cage to store these bottles						
8 Testing (for each team)						
8.1 - Personnel						
Lab man						
8.2 - Heavy Equipment						
8.3 - Small equipment						
Vacuum bell						
Epoch 4B Ultrasonic Flaw Detector apparatus						
Brush						
8.4 -Consumables						
Water						
Soap						
Sonoglide grade or Glue for wallpaper						
9 Treatment of peculiar points						
9.1 - Anchoring at the top of the slope by pins and weighting down						
9.1.1 - Personnel						
Workers						
9.1.2 - Heavy Equipment						
9.1.3 - Small equipment						
Hammer						
Sand bags of 10 Kg to ballast membrane (or other weight)						
U shaped steel pins of height of 30 cm						
9.2 - Connections to concrete structures						
9.2.1 - Personnel						
Welder						
9.2.2 - Heavy Equipment						
Hilti Machine to make the holes						
Machine to fix the bolts						
9.2.3 - Small equipment						
Gas pipe and connections to bottles						
Broom (sweeping of the seaming area),						
Torch						
Painting roller						
Stainless bar with holes every 30 cm						
Bolts						
9.2.4 - Consumables						
Primer Elastocol 500						
9.3 - Penetrations of pipes of any nature						
9.3.1 - Personnel						
Welder						
9.3.2 - Heavy Equipment						
9.3.3 - Small equipment						
9.3.4 - Consumables						
pieces of Coletanche to make patches						
Sopramastic in small bags						
9.4 - Repairs to unacceptable welds						
9.4.1 - Personnel						

PREPARATION CHECKLIST						
Installer:						
rolls of Coletanche of an area of m2 each or a total area of m2						
	Number		Action done		By whom	Observations
	personnel	others	yes	no		
9.4.2 - Equipment						
9.4.3 - Small equipment						
9.4.4 - Consumables						
see chapter 7.3.4						
pieces of Coletanche to make patches						
10 - To follow the work on the site and Quality plan						
10.1 - Personnel						
Supervisor (full time)						
10.2 - Equipment						
10.3 - Small equipment						
Computer						
Printer						
11 - To follow the environmental standard ISO 14001						
11.1 - Personnel						
One person appointed for Environment						
11.2 - Equipment						
11.3 - Small equipment						
Bag to receive garbage						
Total						