Firestone PondGard Lining Systems
Installation Guidelines

Firestone

BUILDING PRODUCTS COMPANY

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0 INTRODUCTION

This manual contains information on lining systems using Firestone PondGard synthetic rubber membrane. Apart from general recommendations on the use of the sheet, it also gives general information on site preparation, design considerations, and excavation works.

At first sight, the design and the execution of a hydraulic construction may look simple. For this reason, the contractor, the designer, and the installer may be in for a rude awakening if all the parameters regarding the design and the installation are not taken into account.

Generally, for simple projects the design may be carried out by the owner or the contractor. However, in the case of larger ponds/water features the problem is often considerably more complex, and the owner or contractor should request the advice of a specialist in hydraulic structures.

The contractor may use the first part of this manual as a general guide for preparing the project.

The specialist should be able to answer specific questions on excavation, drainage, protection of the liner, etc.

Before initiating any project, a study of the site should be carried out for the purpose of obtaining site information regarding the following:

- *the nature of the soil*
- *the presence of cavities (karst terrain)*
- *the depth to and the variation of the groundwater level*
- *the presence of gases in the soil (peat, organic matter,...)*
- *the risk of differential settling (poorly consolidated soil, recent backfill, landfills, ...)*
- *the risk of internal erosion (karst soil, sands,...)*

In any case, the rules of soil mechanics shall be complied with in order to ensure the stability of the supporting subsoil and consequently, a reliable, long-term seepage control system. All of these subjects are covered in the first part of this manual.

The second part of this manual deals with the installation of the PondGard lining system. This section covers site preparation, compaction of the soil, installation of the drainage system if required, installation of the PondGard membrane, seaming, execution of details, etc.

Finally, the manual is completed with two attachments dealing respectively with:

- *Attachment 1 :* *technical data sheets*
- *Attachment 2 :* *application tools*

The PondGard membrane must be installed by a contractor/installer. The installation by the contractor shall comply with Firestone's recommended procedures and applicable specifications. If you require assistance in locating a contractor/installer consult Firestone Building Products Company at 800/428-4442 and request the Specialty Products Department.

1 DESIGN

1.1 APPLICATIONS

The recommendations in this manual mainly apply to decorative and landscape streams, ponds, lakes and water features.

Applications should be avoided where gas generation or hydrostatic pressure might disturb the function of the PondGard membrane.

Firestone should be contacted for any additional information required, especially with regard to chemical resistance.

1.2 SITE SELECTION

When selecting the construction site, there are numerous design elements that must be considered to ensure long-term performance of the system and to avoid any future problems. Site selection is the responsibility of the design engineer.

The following is a general overview of a few of the critical site selection parameters which should be investigated:

NATURE OF SOIL

A thorough investigation of the site should be carried out in order to ensure underlying soil stability under all circumstances.

The type of soil (classification), permeability, thickness of the strata, and depth under the lining system must be known. Table 1 outlines some risks associated with general soil type.

TABLE 1

SOIL TYPE	RISK	SOLUTION
• Compressible (peat, fine sand, ...) • Loose backfill	• Considerable gas generation • Pressure under PondGard • Settling • Over-consolidation of backfill materials • Differential settlement and tearing of PondGard	• Gas drainage • Slope must be adapted to facilitate gas drainage • Appropriate compaction methods
• Soil containing organic matter (old sugar or paper industry ponds, landfill)	• Decomposition/gas generation • Pressure under membrane (gas)	• Gas drainage
• Soil with internal erosion potential (backfill material containing waste, limestone-type soil, gypsum chalk)	• Dissolution of the soil by liquid due to a leaking lining system • Collapse caused by eroding water	• Change sites or provide a good geological assessment to find cavities, if any • Special reinforcement, double waterproofing or compaction
• Soft clay, silt	• Absorption capacity • Differential settling and tearing of the PondGard	• An intermediate layer • Particular drainage and special compacting around penetrations
• Coarse subgrade soil	• Puncture of PondGard	• Provide geotextile protection

GROUNDWATER LEVEL

If the groundwater level is higher than the bottom of the water feature, the PondGard lining system will be subject to hydrostatic back pressure. Also, air may be entrapped, causing gas pressure if the groundwater level rises.

The depth of the groundwater table must be known (both the average level and the extreme level). If the groundwater elevation exceeds the PondGard elevation, the PondGard membrane risks being lifted and the functioning of the gas drainage system (if installed) may be disturbed. In this case, an appropriate drainage system under the PondGard membrane, including ballast on top of the PondGard membrane, should be provided. Ground water drainage systems must be designed by the design engineer.

1.3 SITE LAYOUT GEOMETRY

BOTTOM

A slope of 1 to 2% is recommended for the following:

- *correct operation of the drainage system*
- *easy maintenance of the pond (if unprotected)*
- *positive gas movement*

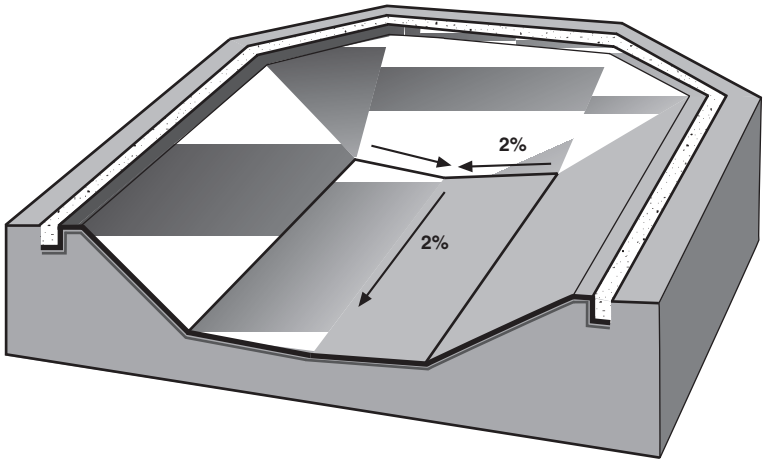


Figure 1: Bottom Slope Example

Side Slopes or Embankment Incline

Stability of the impoundment are geotechnical and geosynthetic issues. The presence of groundwater and the nature of the soil play an important part in the stability of side slopes. The PondGard lining system is not to be used to provide stability of side slopes.

The stability study shall deal with the following:

- *the stability of the drainage system and of other layers between the bottom of the pond and the PondGard membrane*
- *effects of waves*
- *consequences of rapid drop in water level*
- *consequences of excessive leakage*
- *stability of the protection layer, if any*
- *ease of installation*

If no slope stability study is carried out, the contractor shall provide a maximum slope of 2:1 is recommended. If the height of the embankment (above the base of the pond) is between 15 and 30 ft (4.6 and 9.2 m), a maximum slope of 3:1 is recommended when a soil cover is to be used. The values in the table below may be used as a general guide for exposed linings. These values are given according to a uniform type of soil. They should be considered with extreme care for the reasons mentioned above.

TABLE 2

TYPE OF SOIL	INCLINE (SLOPE)
Clay	2.5H:1V
Sandy Clay	3H:1V
Sandy Gravel	2H:1V
Soft Rock	1.5H:1V

TOP OF SLOPE CREST

The crest shall have a minimum width of the following:

- *5.0 ft (1.5 m) for installation of the anchor trench*
- *5-15 ft. (1.5-4.5 m) if vehicles are used during the construction and operation of the water feature*

If a minimum width cannot be obtained, alternate anchoring methods should be used. Also, a slight incline of 1% towards the outside of the water feature is recommended for drainage.

MAXIMUM WATER FEATURE LENGTH AND WAVE ACTION

Waves created by the wind or by boats cause an impact on the side slopes. The greater the length of the pond in the direction of the prevailing winds and the steeper the slope, the stronger the wave action will be.

Wave impact may be reduced by the following:

- *building a smaller but deeper water feature*
- *selecting another shape, with a shorter dimension in the direction of the prevailing winds*
- *building several smaller water features instead of one large water feature.*

Depending on the specific height of the waves, the type of soil and the slope of the embankments, one or a combination of the following is recommended:

- *PondGard protection adapted to the slope (concrete, rip rap, soil cover)*
- *adequate anchoring of the PondGard lining system*
- *adequate compaction of the base soil*
- *geotextile protection under the PondGard lining system*

MAXIMUM LIQUID LEVEL

The higher the liquid level in the pond, the higher the hydrostatic pressure. The risks of the base soil settling and the membrane tearing are also increased. Even when considering the high elongation at break properties (500%) of the PondGard lining systems, cavities may be present in the soil that could cause the membrane to be perforated, especially if the soil contains rock. To avoid this risk, a fine grained intermediate layer of sand or clean soil and/or the installation of a geotextile underlayment is recommended.

1.4 SOIL PREPARATION

NATURAL SOIL

The support soil layer in immediate contact with the PondGard membrane shall be clean, compacted, and regular surface free of aggressive angle changes, stone, and small cavities. This layer should also be able to compensate for the differential settling of the soil and facilitate the installation of a drainage system, if required.

Adequate support may be realized in the following ways:

- *excavated the water feature base after removing rock, vegetation, etc., follow by smoothing and compacting of the base*
- *backfill with layers of controlled particle size which are compacted (sand, select fill material)*

Vegetation

All plant growth should be removed from the base soil prior to compaction in order to avoid any gas generation and compressible areas. Depending on the conditions, the use of an approved herbicide is recommended. The herbicide must not contain any chemicals which might affect the PondGard lining system.

Compaction

The PondGard lining system support soil should be compacted to between 85% and 95% of standard Proctor density either by equipment or by mechanical compacting.

Geotextile

Installation of a geotextile between the support soil and the PondGard is recommended. It is an absolute necessity on slopes where deposition of an additional support layer is often difficult. Depending on the type of soil and roughness of the surface, the mass of the geotextile may vary between 4-1/2 and 15 oz/yd^2 (150 and 500 g/m^2). The typical geotextile is non woven, needle punched fabric.

When the geotextile also has a drainage function, it should be checked for sufficient flow under load. There are other types of geosynthetics, such as geonets, that provide higher planar flow rates. Consult geotextile manufacturer or Firestone for details.

HARD SUBSTRATES (CONCRETE, TREATED SOILS,. . . .)

On hard substrates such as concrete, it is always necessary to install a protection layer, unless the PondGard membrane is fully adhered. On a bituminous support (bituminous concrete, bitumen emulsion stabilized soil), a geotextile of at least 8.0 oz/yd^2 or multiple layers of a lighter weight geotextile equaling 8 oz./yd. or more (270 g/m^2) should be used.

SOIL AROUND CONCRETE STRUCTURES

The PondGard liner fixed to a concrete structure must absorb any stress caused by soil settlement. Compacting of the natural soil around such structures must be performed with particular care to limit settling as much as possible. Backfill material around the structure shall be compacted to 95% of standard Proctor density.

INSPECTION OF THE SUPPORT SURFACE

As part of Construction Quality Assurance (CQA) and before installing the PondGard membrane, quality of the soil type and the surface should be examined to determine the preparation steps required for installing the PondGard lining system.

1.5 DRAINAGE SYSTEM

The need for a drainage layer depends on local site conditions. In all cases where liquid may cause an instability of the subsoil, the amount of water in the soil should be minimized. This may be done by means of a drainage system, a double lining system with a drainage layer between the two PondGard membranes, or by covering the embankment crest with PondGard membrane in order to avoid infiltration in back of the lining system.

APPLICATION CRITERIA

The application of a drainage system is not required if the permeability of the supporting layer exceeds 10^{-4} m/s, or if no gas pressure is anticipated.

Water/gas drainage is always required under the following conditions:

- *when water flows are possible under the PondGard, in soils where erosion may be possible (karst soil,...)*
- *soils containing organic matter (gas generation)*
- *slopes containing clay (stability when emptying...)*
- *whenever variations of groundwater level can be anticipated*
- *whenever the PondGard membrane is not fixed and can move (wind...)*
- *pond containing organic matter*

Figure 2 summarizes the main causes of pressures under PondGard.

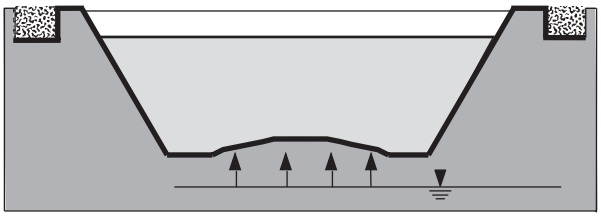


FIG. 2.1

2.1 Rise of the groundwater level/gas entrapment

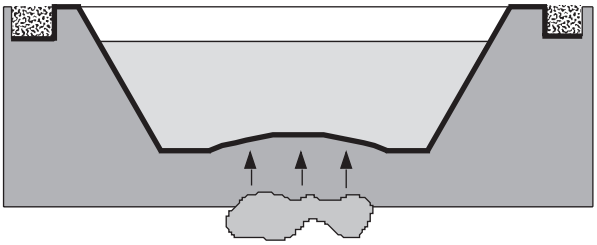


FIG. 2.2

2.2 Decomposition of organic matter

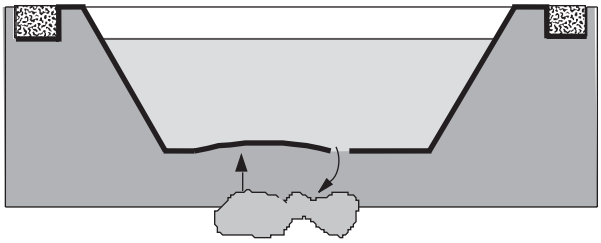


FIG. 2.3

2.3 Presence of organic matter due to PondGard leakage

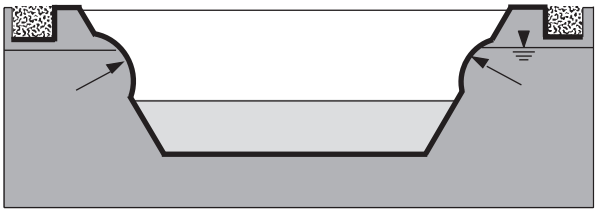


FIG. 2.4

2.4 Groundwater level exceeding the pond water level

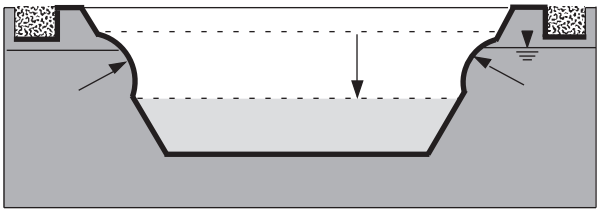


FIG. 2.5

2.5 Rapid emptying of the pond with high groundwater level

Figure 2. Some causes of excessive back pressure.

WATER DRAINAGE

Water drainage and gas drainage are often combined. For this reason, a slope of 1 to 2% of the base toward the side slopes is recommended.

The water drainage may be facilitated by means of one of the following:

- *layer of permeable material with a minimum thickness of 12 in. (300 mm)*
- *permeable geosynthetic material*
- *a network of drainage pipes linked to each other covered with a permeable geotextile or a layer of permeable material*

In order to prevent drain blockage, a natural or synthetic filter must be installed between the soil and the drainage layer. Rules for correct filter design should be complied with.

Water should be collected by a network of primary and secondary collection pipes placed at the lower points of the pond or a layer of geonet composite placed over the entire pond bottom. For larger structures a compartmentalized drainage network is recommended to facilitate leak detection.

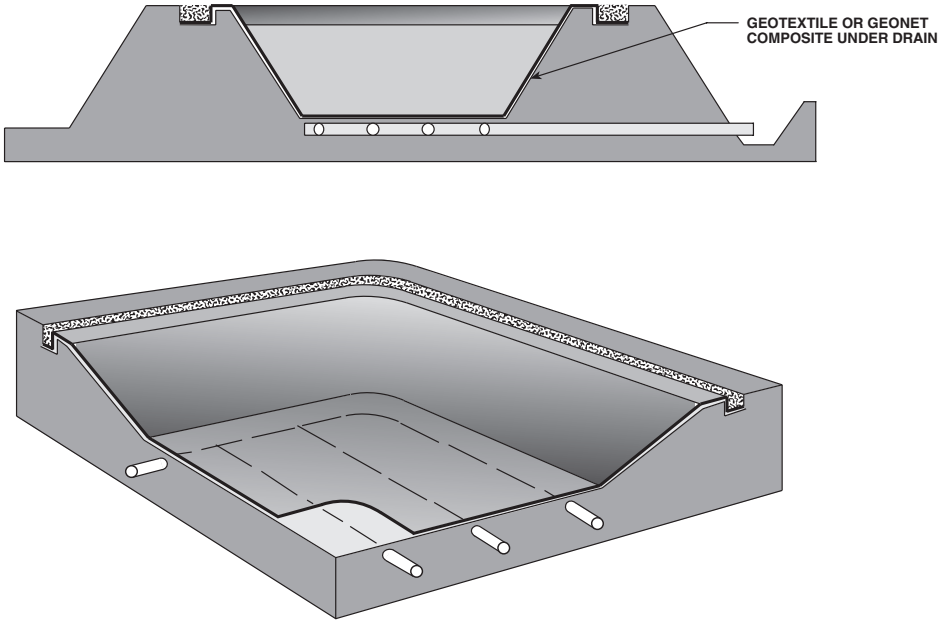


Figure 3. Water drainage under a raised embankment reservoir lining

Size and gradient of the water drainage system depends on the following factors:

- *leak flow rate that is acceptable*
- *flow rate of water coming from outside the pond*
- *maximum pressures that are acceptable under the geomembrane*

For smaller projects the use of perforated drain pipes with a minimum diameter of 2.5 in. (60 mm) is recommended. For larger structures, the size and the density of the network, as well as the compressive strength of the drain pipes, must be carefully designed. Consult the pipe manufacturer for details.

GAS DRAINAGE

The application of perforated pipes is recommended in less permeable soils. The distance between the pipes should be designed for under-pressure caused by gases. A porous sand layer, a geotextile or other permeable geosynthetic (geonets) should be placed between the pipes. A flat synthetic drainage system may be used as an alternative (geonet composite). Any direct contact between the PondGard membrane and abrasive surfaces of the drainage systems should be avoided and protected using a geotextile underlayment.

Gas vents are always located at the higher points of the slopes and should be protected by a vent cap.

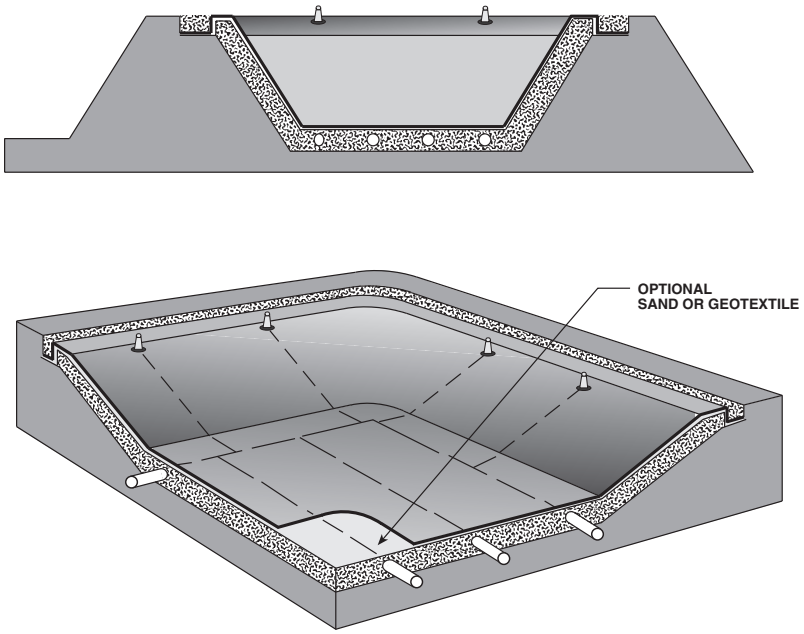


Figure 4. Gas drainage - Pipes, or pipes/geosynthetic layer

1.6 PONDGARD LINER

PRODUCT INFORMATION

All elements of the PondGard lining system shall be Firestone products as described in the Technical Data Sheets or products which are approved by Firestone.

The Firestone PondGard membrane is a fish friendly synthetic rubber membrane. The panels are assembled in the factory prior to vulcanization in order to limit on-site field seaming. The panels are folded and rolled on cores 10.8 ft. (3.30 m) long.

The factory panels are available in the following sizes:

- *width (ft.) - 10; 20; 30; 40; 50* *width metric (m.) - 3.05; 6.10; 9.15; 12.20; 15.25*
- *length (ft.) - 50; 100; 150; 200* *length metric (m.) - 15.25; 30.50; 45.75; 61.00*
- *thickness (in.) - .045; .060* *thickness metric (mm.) - 1.15; 1.52*

Each roll is labeled with the membrane type, thickness, dimensions, manufacture date, and production lot, and an arrow indicating direction of unrolling. Firestone also offers a reinforced liner in 10 feet (3.05 m) wide panels and the lengths shown above.

TRANSPORT AND STORAGE

Care should be taken not to damage the PondGard membrane during transport, loading, and unloading. The rolls must be stacked on a flat, clean surface, free of sharp protrusions.

PondGard does not require any special protection against weather conditions.
However, all accessories need to be stored in a dry and cool place (between 50°F and 77°F (10°C and 25°C), protected against extreme weather conditions.

PANEL LAYOUT

The installation contractor shall provide a panel layout drawing. This plan shall be made based on the specification and detail plans, and will indicate the position of the panel field seams. The placement of the panels will proceed according to this plan. Most panel deployments begin on the upwind side of the water feature and proceed to the downwind side. Most plans use the prevailing wind for the season and location of installation.

PONDGARD ANCHORING

The PondGard membrane must be kept in place to prevent down slope movement and/or wind uplift. Depending on the situation, the PondGard membrane may be anchored in various ways, at the top of the embankment, at the bottom, or at an intermediate bench.

TOP ANCHORS

The top of slope anchors can be accomplished by burying the PondGard membrane in a trench or by holding it in place through ballasting. The dimensions of the trench depend on the expected stress. The minimum section should be 1.0 ft. (0.30 m) wide x 1.3 ft. (0.40 m) deep in cohesive soil, depending on the length (L) of the PondGard liner between two anchor points, the distance between the top anchor trench and the water level, the wind speed, etc. The top of the slope should be rounded to provide a smooth transition for the liner to reduce stress.

The PondGard membrane should extend on the bottom of the trench over at least 12 in. (300 mm) and up the back of the trench 6 in. (150 mm).

Table 3 below shows some approximate values for the trench section in compacted cohesive soil. However, it is recommended to calculate pullout requirements, especially for soil covered slopes, based on industry design standards.

TABLE 3

LENGTH OF SLOPE (M)	SECTION OF TRENCH (M^2)	
	Low or medium wind (<100 km/hr)	High wind speed (>100 km/hr)
<3	0.12	0.12
3-5	0.12	0.12
5-15	0.12	0.25
15-40	0.25	0.36
>40	0.36	0.49

Note: 1.0 m^2 = 10.75 ft^2
1.0 m = 3.28 ft
100 km/hr = 62.1 mph

An alternative using ballast at the top of the slope is possible if necessary measures are taken for the ballast not to erode over time (see drawings).

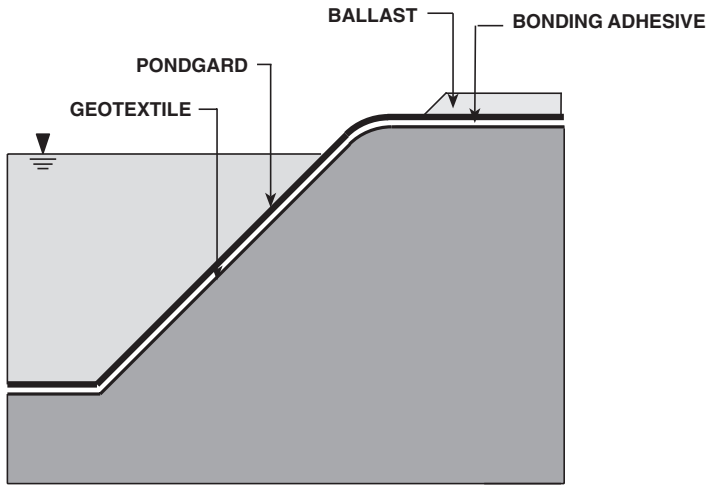


Figure 5. Top of slope ballast

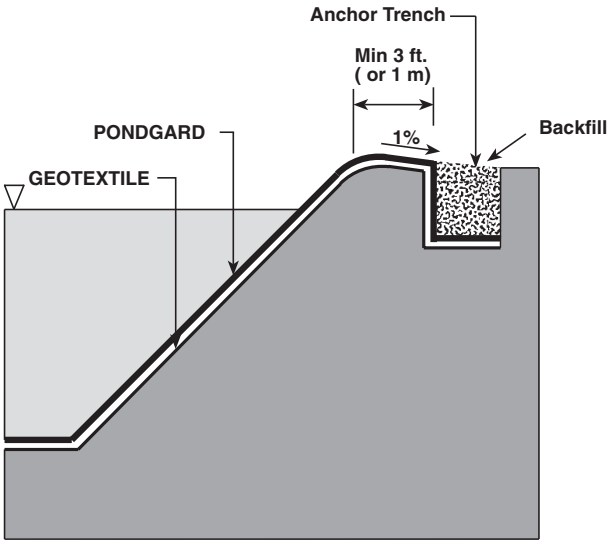


Figure 6. Top of slope anchor trench

INTERMEDIATE ANCHORS

If the embankment is high, it may be necessary to provide an intermediate anchor to accommodate the potential for PondGard membrane movement. A bench may be added to the incline in order to provide slope stability of the embankment. The PondGard should be held in place by ballast, anchor trench, or cover soil.

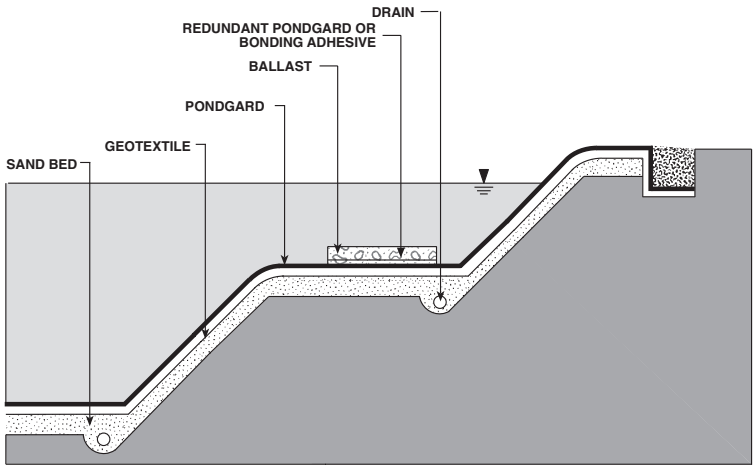


Figure 7. Intermediate ballast at slope benches

TOE OF SLOPE ANCHOR

If the natural soil of the pond bottom is sufficiently low in permeability (clay, geological layer,...), side slope lining and ballasting at the toe of slope may be sufficient to provide adequate waterproofing.

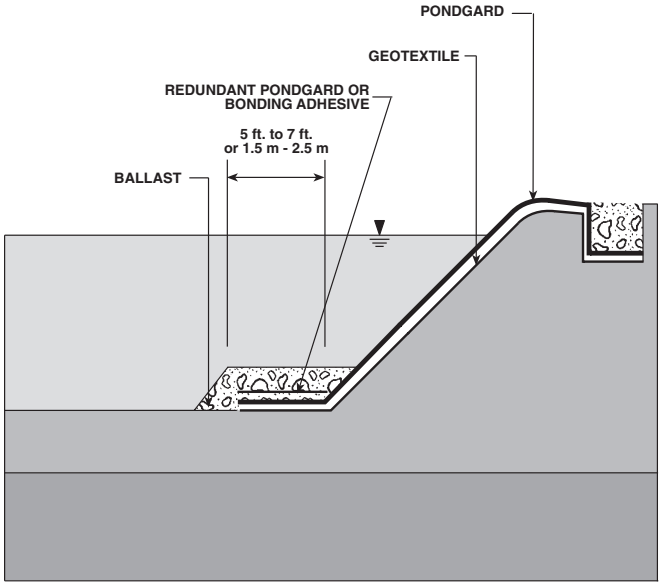


Figure 8. Toe of slope anchors

PROTECTION OF THE PONDGARD DURING SERVICE

Under all operating conditions, protection of the PondGard will be required. Table 4 below shows some recommendations for the protection against possible damage.

TABLE 4

PROTECTION AGAINST	PRECAUTIONS
Wind	• ballast at the bottom or on slopes • correct section of anchor trench depending on pullout calculation
Waves	• mechanical protection of the embankments depending on slope (rock covering, concrete pavement, cast concrete)
Floating objects (dead wood)	• small ponds: cleaning • large ponds: protection of slide slopes
Ice	• mechanical protection of embankments
Animals	• ladders • fence around reservoir • geotextile under the PondGard on slopes
Vandalism	• enclosure around reservoir • mechanical protection of embankments
Operating vehicles	• protection of the PondGard with soil or a sand bed (min. 18 in (450 mm)) • access ramp protection of embankments
Local turbulence with water speed exceeding 3.28 ft/sec (1 m/sec) (internal agitator or canals)	• Protection with designed cover system or ballast

Protection of the geomembrane may be realized in the following ways:

Base

- ***sand bed*** *(minimum thickness: 12 in. (300 mm))- protection with geotextile not required*
- ***gravel*** *(minimum thickness 12 in. (300 mm)) - protection with geotextile required*
- ***prefabricated blocks*** *- protection with geotextile required*

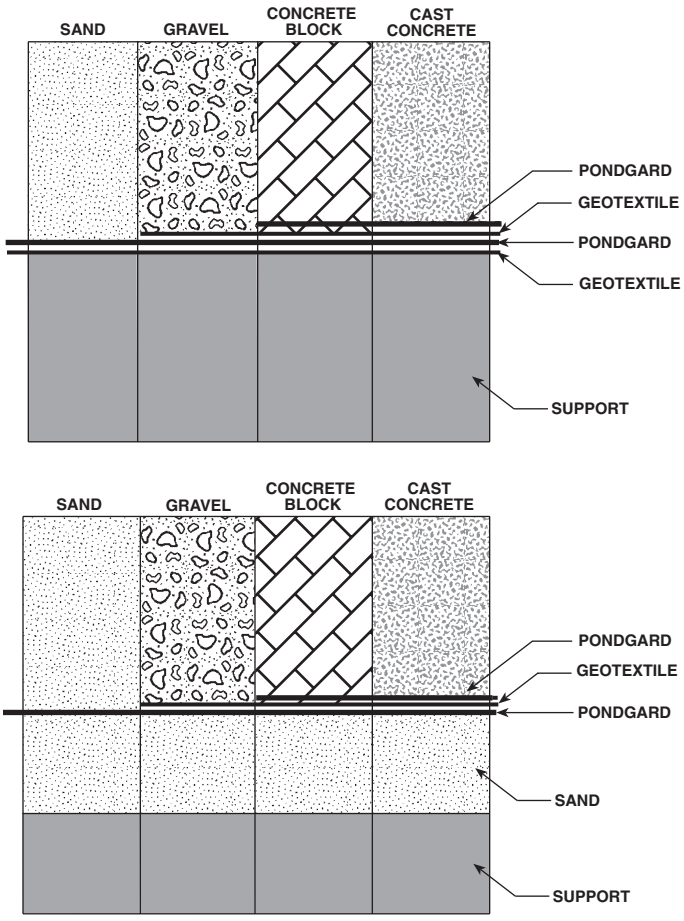


Figure 9. Protection of PondGard

Slopes

- **Rock covering** - This solution is applicable for slopes less than 3:1. A transition layer (geotextile plus sand bed) with a minimum thickness of 12 in. (300 mm) is required. Rock size depends on the level of the impacting forces, such as wave height.
- **Prefabricated blocks** - Stability investigations of prefabricated blocks and installation of a redundant layer of EPDM is required.
- **Cast-in-place concrete** - Stability investigations and installation of a redundant layer of EPDM are required.

1.7 DETAILS

GENERAL

If possible, avoid cutting the PondGard membrane at details. In some cases, however, as with corner details against concrete walls, pipe connections, etc., a cut in the PondGard liner will simplify the installation. In such cases, Quickseam FormFlash (unvulcanized EPDM sheet) will be used to provide a tight connection when properly installed according to the manufacturer's instructions.

CONNECTION TO CONCRETE STRUCTURES

Connections of the PondGard membrane to concrete structures shall comply with the following:

- *soil around the concrete shall be compacted*
- *connection surfaces shall be smooth, clean and free of any sharp protrusions*
- *PondGard membrane shall be fully adhered to the walls using bonding adhesive or splice adhesive*
- *corners are installed with QuickSeam Corner Flashings.*
- *detail of the PondGard membrane connection with the wall shall not permit any leakage*
- *PondGard membrane is fixed at the ends or top using termination bars and fasteners adapted to concrete. Firestone Water-Block sealant is placed between the geomembrane and the wall as shown in Figure 10:*

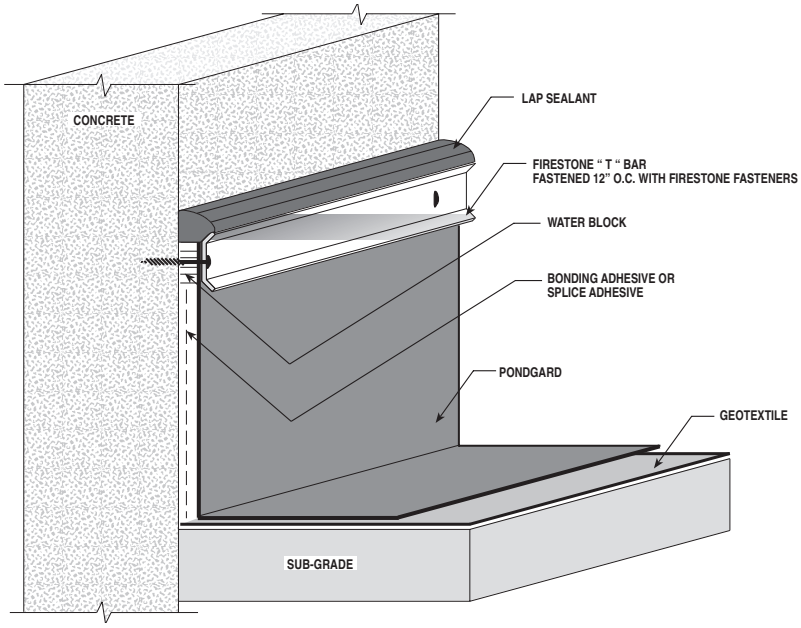


Figure 10. Connections to concrete (above the waterline)

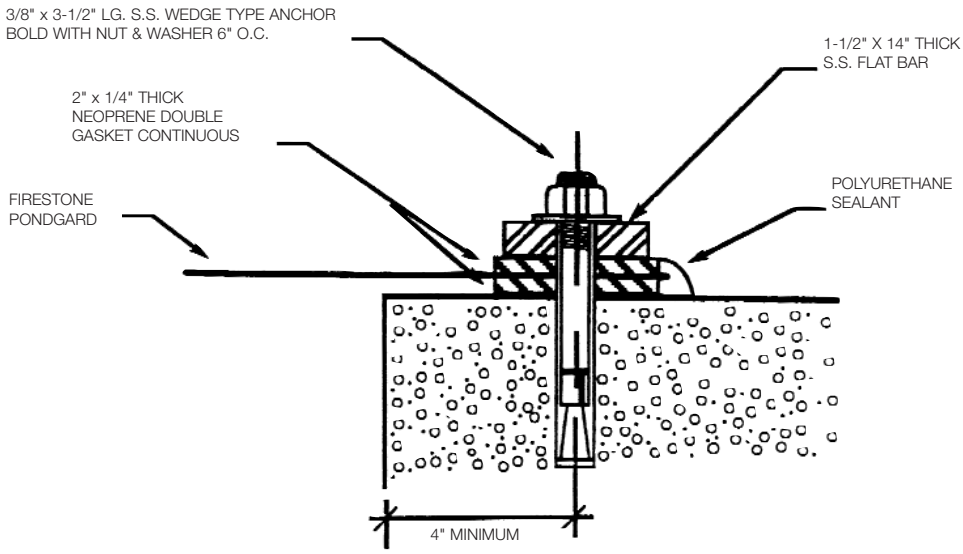


Figure 10. Connections to concrete (below the waterline)

PIPE CONNECTIONS

For larger diameter pipes, connections to pipes shall be made by means of unvulcanized EPDM sheet, QuickSeam FormFlash, as follows:

- *pipe must be firmly anchored and the pipe wall temperature must not exceed 175°F (80°C) during service*
- *make a circular cut-out in the PondGard membrane, measuring 80% of the pipe diameter*
- *pull the PondGard membrane over the pipe*
- *pipe and PondGard membrane are sealed by means of a piece of QuickSeam FormFash as shown in figure 11 and 12.*
- *mechanically secure the connection with a stainless steel clamping collar*
- *PondGard membrane must be adhered to concrete thrust blocks with splice adhesive.*

See Figures 11 and 12.

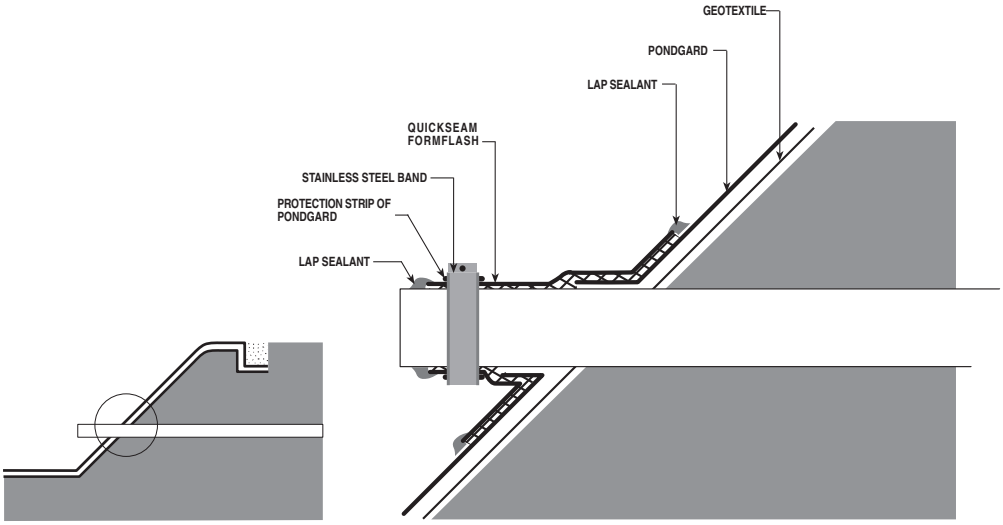
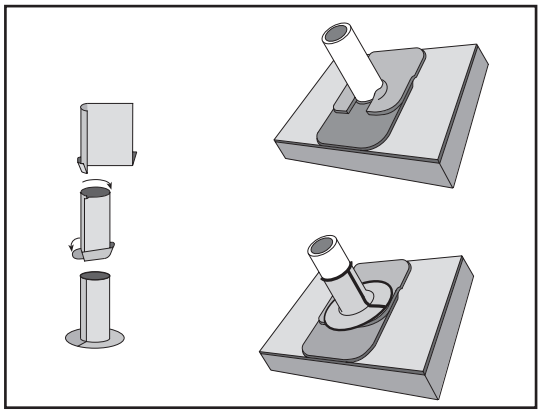


Figure 11. Connection around an accessible pipe



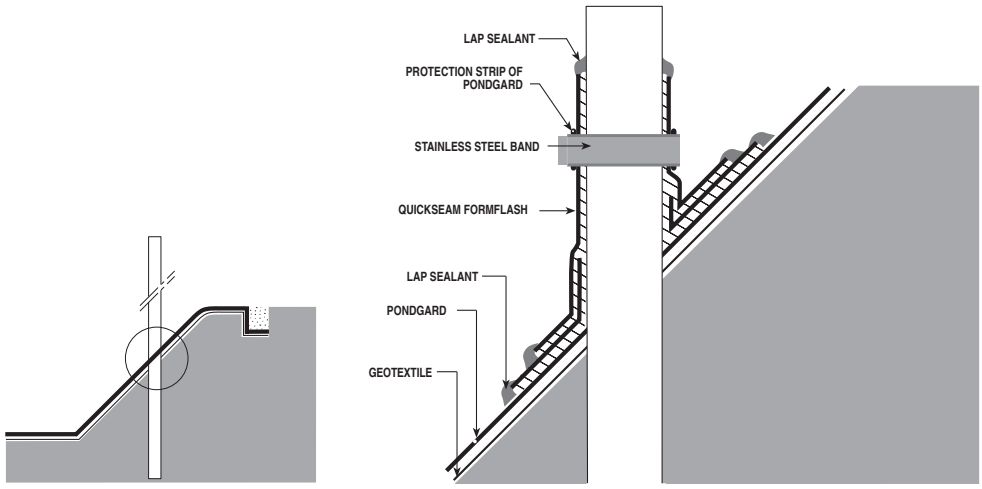


Figure 12. Connection around a non-accessible pipe

BOTTOM DRAINS

The PondGard shall be mechanically fastened at the location of water discharge. This detail requires the installation of a concrete base at the location of the drain.

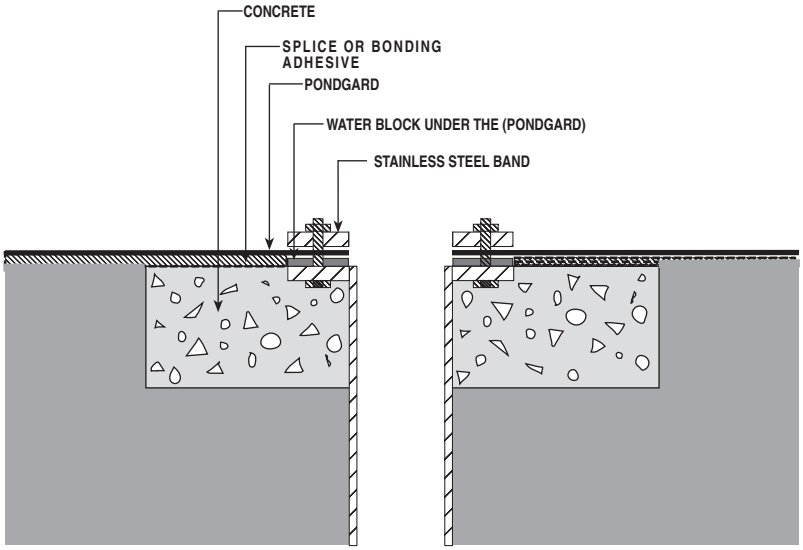


Figure 13. Water discharge with steel flange collar

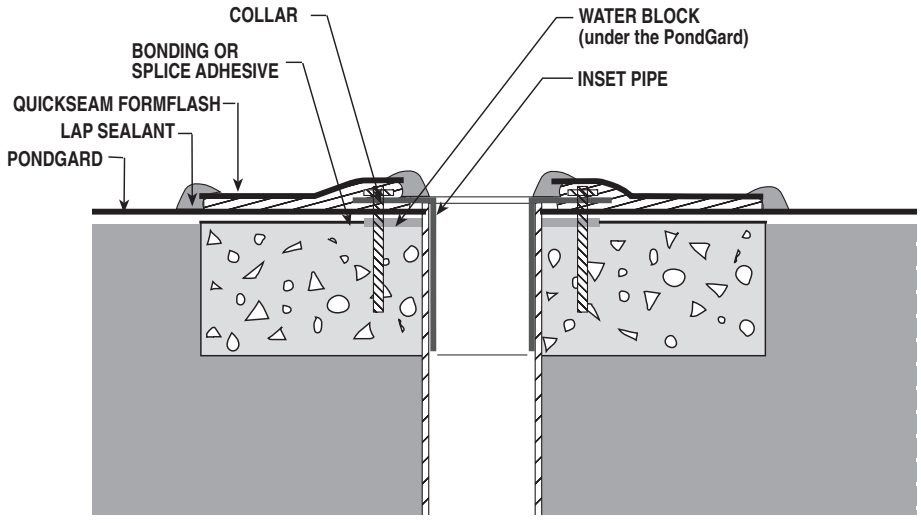


Figure 14. Water discharge with inset pipe

2 INSTALLATION

2.1 EARTHWORK

SITE LAYOUT

The layout of the water feature may be executed by means of one of the following methods:

- *fully excavating natural soil*
- *building raised embankments*
- *partial excavation with raised embankments*

Table 5 below shows the advantages and disadvantages of the three systems.

TABLE 5

SYSTEM METHOD	ADVANTAGES	DISADVANTAGES
Fully excavated	• lowest cost • little soil movement (naturally consolidated)	• removing the excavated earth • water drainage problems
Raised embankments	• easier drainage • installation is above the water table	• higher cost • engineered fill required • risk of unstable embankment
Partial excavation	• combines both methods	• moderate cost

PREPARATION OF SUPPORTING SOILS

All soils supporting PondGard should be compacted to 85% to 95% of standard proctor density. The density is achieved by either equipment travel or by mechanical methods. In the latter case, the soil material is deposited in layers of 6 to 12 in. (150 to 300 mm) and compacted with a vibratory roller or other methods.

The supporting surface should not contain any loose stone with a diameter exceeding 3/8 in. (10mm) . The final surface should be smooth and uniform with no abrupt changes in elevation.

An additional layer of sand should be provided and/or a geotextile underlayment of at least 8.0 oz/yd^2 (270 g/m^2) should be installed. On embankments and on any type of rough support (concrete, masonry) a geotextile underlayment of at least 8.0 oz/yd^2 (270 g/m^2) should be installed.

ANCHOR TRENCH

An anchor trench must be excavated around the entire perimeter of the impoundment. The excavated soil material can be placed next to the trench for backfilling after PondGard placement. The anchor trench should be a minimum of 3.0 ft. (0.9 m) back from the top of slope. The edge of the trench should be rounded and free of protrusions to reduce stress on the PondGard.

COMPACTING AROUND CONCRETE STRUCTURES

In order to avoid any differential settling, the backfill around the structures should be placed in successive layers, each compacted to 95% standard Proctor density.

2.2 PONDGARD INSTALLATION

GEOTEXTILE PROTECTION

If required, geotextiles are to be installed with an overlap of at least 12 inches (300 mm). Alternatively, the overlaps may be thermally welded in an overlap of 4 inches (100 mm). To avoid any wind uplift, the geotextile should be temporarily ballasted.

PONDGARD PLACEMENT

The panels are unrolled or unfolded into the position indicated on the layout plan. Generally, side slope panels are placed and temporarily ballasted first, followed by the bottom panels.

The PondGard panels are unrolled from the trench down the side slopes and the membrane is temporarily anchored to avoid movement down slope.

No rocks or sharp objects are allowed under the geomembrane during placement. Damage to the supporting soil or geotextile underlayment must be avoided.

The side slope panels should extend a minimum of 3.0 ft. (0.9 m) out onto the pond bottom for connecting with adjoining panels.

All PondGard panels must be allowed to relax at least 30-45 minutes before seaming or attachment to structures.

ANCHORING THE PONDGARD MEMBRANE

If considerable soil movements are expected during the filling of the pond, temporary anchoring should be provided at the crest so that the PondGard underlayment can move without being subjected to excessive tension. Partial ballasting in the anchor trench is immediately provided and final backfill is done at a later stage. To avoid movement and wind uplift of the PondGard membrane during installation, a temporary ballast (sand bags) is recommended. Such ballasting also facilitates the seaming operations.

PONDGARD SEAMING

The seaming of adjacent panels should be performed immediately after the relaxation of the PondGard membrane.

All panels must be installed without tension and without wrinkles overlapping by at least 4 in. (100 mm). All seams on slopes must be run up and down the slope with no horizontal seams allowed.

For soft or rough subsoils a board or piece of conveyor belt is used under the PondGard membrane in the area of the seam. The seaming board is moved by means of a rope as the seaming process progresses.

Seams should not be made under the following conditions:

- *moisture*
- *soft subgrade soil*
- *condensation on the primer or on the membrane*
- *rainfall*
- *ponded water*
- *other containments*

Moisture in the seam will cause failure of the seam.
Use only Firestone approved products. Non-Firestone products cannot be approved to make seams.

2.3 SEAMING PROCEDURES
2.3.1 - 6.0 INCH (150MM) WIDE COVER STRIP SEAMING TAPE SYSTEM

STEP 1: POSITION THE PONDGARD MEMBRANES

- Both adjacent panels are positioned with sufficient overlap 4 in. (100 mm).
- The panels should lay flat and without any tension.

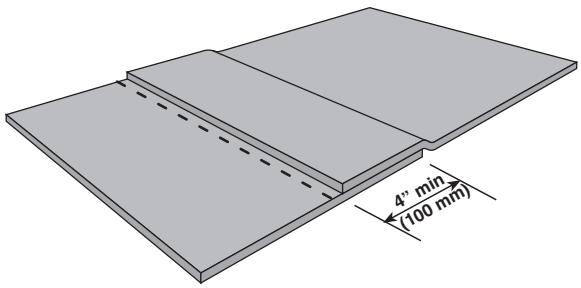


Figure 14.1

STEP 2: CLEAN THE OVERLAP

- If there is dirt in the overlap area, clean the overlap area using a clean cotton cloth. Soil should not be allowed to contaminate the PondGard membrane in the splicing area.

STEP 3: APPLY THE QUICKPRIME

- Stir the QuickPrime Plus before and during use and transfer a small quantity 0.4 gal. (1.5 l) to a bucket. The Primer is applied with a scrubbing pad.

- Immerse the scrubbing pad in the QuickPrime Plus, keeping the pad horizontal and let excess of QuickPrime Plus drip off the pad.

- Each pad immersed in QuickPrime Plus will cover an area of about 3.0 ft. (0.9 m) in length, over a width 4 in. (100 mm (one side)).

- Change scrubbing pads every 200 ft. (61 m) or when the primer has dried on the pad. Used pads are to be discarded at the end of the working day.

- Additional priming is required at factory seams, at the intersection of two seams and to areas covered with adhesive.

- Both sides to be seamed are treated simultaneously so as to obtain an identical drying time.

- Test QuickPrime Plus for readiness. Allow the primer to flash off. The primer needs to dry completely (approximately 5-10 minutes) before installing the tape. Check its dryness by touching the primed surface with a clean and dry finger (as indicated in the sketch) to be certain that the primer does not string. When touching the primer, push forward on the primed surface at an angle to ensure that the primer is dry through out its thickness. If either motion exposes a stringy primer when the finger is lifted, then the splice is not ready for installing the tape. Flash-off time will vary depending on ambient air conditions (relative humidity, wind...).

STEP 4: APPLY THE QUICKPRIME PLUS TO THE OVERLAP

- Prime a minimum of 3 in. (75 mm) on either side of the overlap edge.

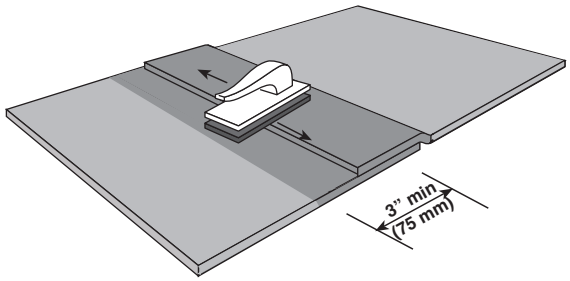


Figure 14.2

STEP 5: INSTALL THE COVER STRIP

- Place the roll of QuickSeam Cover Strip on ground a few feet ahead of the overlap starting point, positioned so that it unrolls from the top of the roll (release paper will be on top).

- Starting a minimum of 3 in. (75 mm) ahead of the edge of the panel, center the QuickSeam Cover Strip roll on the overlap edge and unroll onto the clean and primed surface.

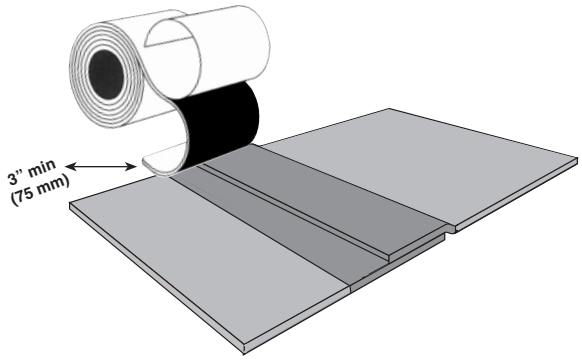


Figure 14.3

- Advance the roll keeping the cover strip centered over the overlap edge. Peel the release paper as you apply the cover strip.

- When it is necessary to cover a longer overlap edge than the length of one roll of cover strip, it is required to overlap the next roll a minimum of 1 in. (25 mm) onto the installed roll before continuing to unroll the second roll. When the end of the over lap is reached, extend the cover strip 3 in. (75 mm) before cutting.

STEP 6: ROLL THE COVER STRIP

- Apply pressure along the entire length of the cover strip by hand to completely mate the two surfaces. Using a 1-1/2" (38 mm) wide silicone rubber roller, roll the QuickSeam Cover Strip with positive pressure towards the outside edge then along the entire length of the cover strip.

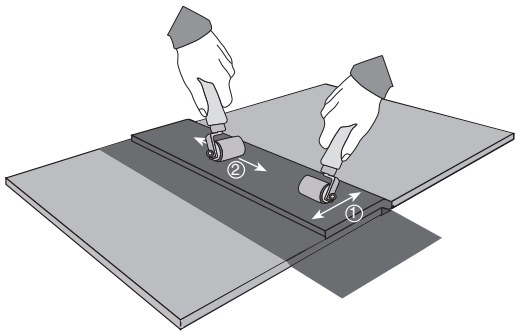


Figure 14.4

STEP 7: INSTALL COVER STRIP AT THE END OF SEAMING RUNS OR T-JOINTS

- At the 1 in. (25 mm) laps of the cover strip it is required to install a 12 in. (300 mm) long section of cover strip parallel with the lap edge and centered over it. Before installing the cover strip, the area to be covered must be cleaned and primed in the normal fashion.

- When cover strips intersect at any point, a 12 in. (300 mm) long section of cover strip shall be installed centered over each T-joint area.

- Round the corners on the 12 in. (300 mm) section and then install it onto the dry-primed area. Roll with the silicone rubber roller in the same manner as done to the cover strip.

STEP 8: APPLY QUICKPRIME PLUS TO THE COVER STRIP SECTION

- Use the QuickScrubber to apply the primer a minimum of 1 in. (25 mm) on either side of the cover strip section edge.

STEP 9: APPLY LAP SEALANT TO THE COVER STRIP SECTION EDGE

- At the end of seaming runs and T-joints, allow the primer to flash off. Apply a continuous bead of Lap Sealant 3/8 in. x 1/4 in. (9.52 mm x 6.35 mm) around the cover strip section edge. Using the supplied Lap Sealant tool, feather the Lap Sealant immediately, taking care to leave a mound of sealant directly over the cover strip section edge.

2.3.2 - DOUBLE FACED OVERLAP INSEAM TAPE SYSTEM

Two overlapping PondGard panels are seamed by means of a patented splicing tape or cap strip system. Section 2.3 provides details of the various steps required for correct seam procedures for the PondGard membrane.

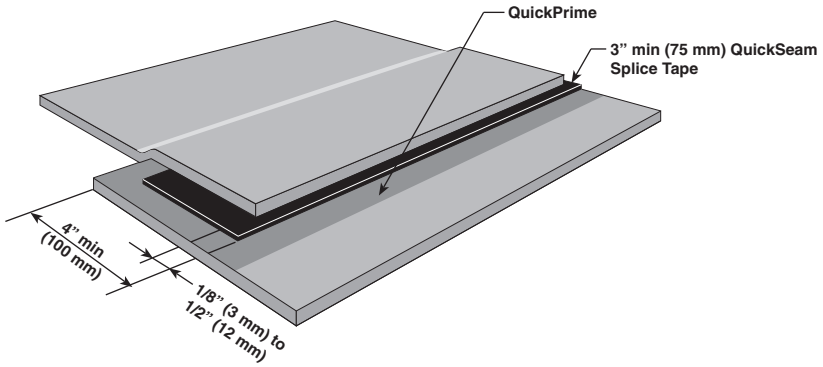


Figure 15 EPDM seam

STEP 1: POSITION THE PONDGARD

- *Both adjacent panels are positioned with a minimum overlap of 4 in. (100mm).*
- *The panels should lay flat and without any tension.*
- *A marker is used to indicate on the lower sheet the exact location where the splice tape is to be installed.*
- *The mark shall be situated at between 0.4 to 0.8 in. (10 and 20mm) from the edge of overlapping sheets, and is repeated every 3.0 ft. (0.9m) of seam length.*

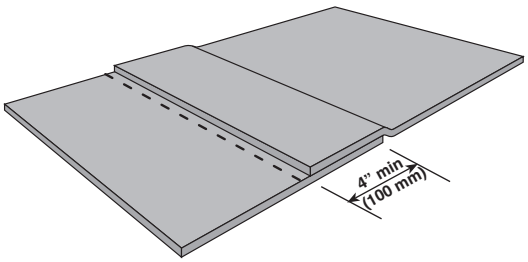


Figure 15.1

STEP 2: TACK-BACK THE OVERLAP

- The upper PondGard membrane panel edge is folded back 10 in. (25 mm) and the fold is tacked down every 3.0 ft. (0.9 m) with QuickPrime Plus.

- If there is dirt in the overlap area, clean the overlap area using a clean cotton cloth soaked in QuickPrime Plus. Soil should not be allowed to contaminate the PondGard membrane in the splicing area.

STEP 3: APPLY THE QUICKPRIME

- Stir the QuickPrime Plus before and during use and transfer a small quantity 0.4 gal. (1.5 l) to a bucket. The Primer is applied with a scrubbing pad.

- Immerse the scrubbing pad in the QuickPrime Plus, keeping the pad horizontal and let excess of QuickPrime Plus drip off the pad.

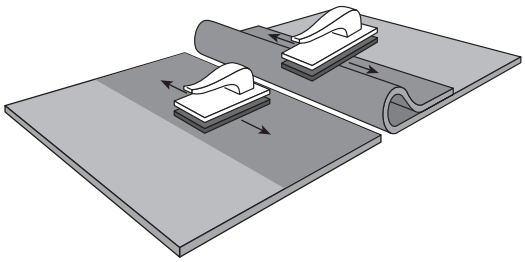


Figure 15.2

- Apply the QuickPrime Plus uniformly along the length of the overlap seam area, with long back and forth strokes, both to the lower face of the top sheet and the upper face of the lower sheet, until the surfaces become a dark gray in color. Avoid traces and wet spots. Each pad immersed in QuickPrime Plus will cover an area of about 3.0 ft. (0.9 m) in length, over a width of 4 in. (100 mm (one side)).

- Change scrubbing pads every 200 ft. (61 m) or when the primer has dried on the pad. Used pads are to be discarded at the end of the working day.

- Additional priming is required at factory seams, at the intersection of two seams and to areas covered with adhesive.

- Both sides to be seamed are treated simultaneously so as to obtain an identical drying time.

- Test QuickPrime Plus for readiness. Allow the primer to flash off. The primer needs to dry completely (approximately 5-10 minutes) before installing the tape. Check its dryness by touching the primed surface with a clean dry finger to be certain that the primer does not string. When touching the primer, push forward on the primed surface at an angle to ensure that the primer is dry throughout its thickness. If either motion exposes a stringy primer when the finger is lifted, then the splice is not ready for installing the tape. Flash-off time will vary depending on ambient air conditions (relative humidity, wind...).

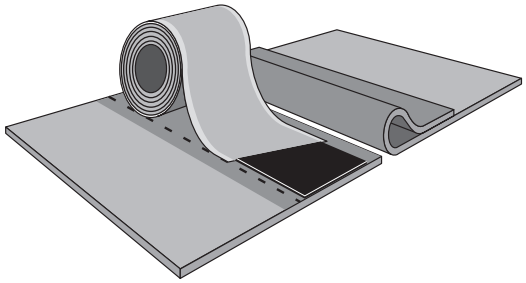


Figure 15.3

STEP 4: INSTALL THE TAPE

- Apply the QuickSeam Splice Tape (with release paper intact) on the bottom sheet, aligning the edge of the release paper with the markings.

- Immediately roll the splice with a 4 in. (100 mm), wide silicone sleeved hand roller or other methods to achieve 100% bond area.

- When it is necessary to start a new roll of tape to continue seaming, it is required to overlap the installed tape by 1 in. (25 mm) minimum before unrolling the second roll.

STEP 5: CHECK THE SPLICE TAPE ALIGNMENT

- The PondGard membrane is released and the seam is closed by hand. To avoid wrinkling, close the splice gently with a movement perpendicular to the splice. The upper sheet must fall without wrinkling or tension onto the lower sheet. Allow the top sheet to rest on top of the tape's paper backing.
- Trim the top sheet as necessary to assure that 0.4 to 0.6 in. (10 to 15 mm) of the QuickSeam Splice Tape will be exposed on the finished splice

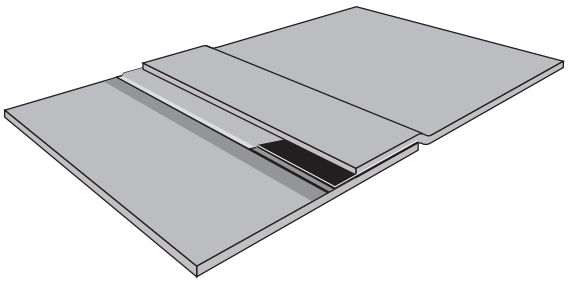


Figure 15.4

STEP 6: REMOVE PAPER BACKING

- To remove the paper backing from the tape, first roll back the upper PondGard panel. Peel the paper backing off the QuickSeam Splice Tape by pulling against the weight of the bottom sheet at approximately a 45° angle to the tape.

- Allow the top sheet to fall freely onto the exposed QuickSeam Splice Tape. Mate the entire length of the seam as the release paper is being removed.

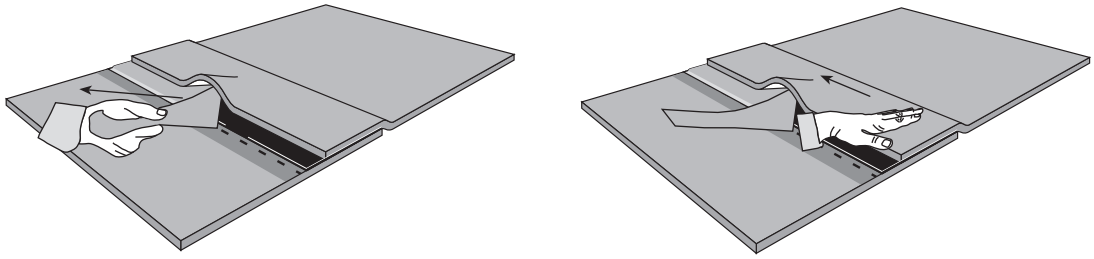


Figure 15.5

STEP 7: ROLL THE OVERLAP SEAM

- Finally, roll the seam area by means of a 1-1/2" wide (38 mm) silicone rubber roller, first across the splice and then along the entire length of the splice.

- For uneven or soft subgrades, a seaming board is required directly under the seam area. The seaming board is moved as the seam is completed.

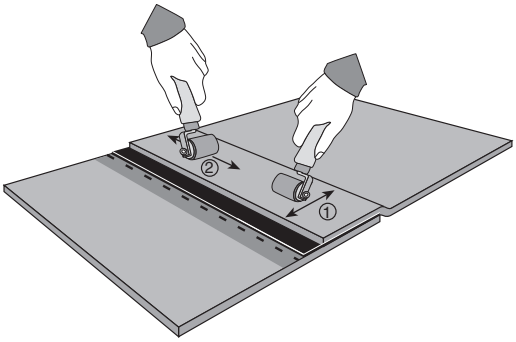


Figure 15.6

STEP 8: INSTALL QUICKSEAM JOINT COVERS OR COVER STRIP AT THE END OF SEAMING RUNS AND T-JOINTS

- Install a 5.75 in. (145 mm) QuickSeam Joint Cover over end laps or T-joints. Before installing the Joint Cover, the area to be covered must be cleaned and primed in the normal fashion. Roll the Joint Cover with the silicone rubber roller in the same manner as the overlap seam.
- At 1 in. (25 mm) laps in the seam tape it is required to install a 6 in. x 6 in. (150 mm x 150 mm) section of cover strip centered over the seam edge and over the lap. Before installing the cover strip, the area to be covered must be cleaned and primed in normal fashion.

- Trim seam so that the edge of seam tape and the edge of the membrane are flush beneath the T-joint area. Apply a 9 in. (225 mm) long section of cover strip centered over the seam step-off.

- Round the corners of the cover strip section and then install it onto the dry-primed area. Be sure to center the cover strip so that it extends 3 in. (75 mm) in each direction from the center of the overlap and the edge of the seam. Roll with the silicone rubber roller in the same manner as done with the overlap seam.

STEP 9: APPLY QUICKPRIME TO THE COVER STRIP SECTION

- Use the QuickScrubber to apply the primer a minimum of 1 in. (25 mm) on either side of the cover strip section edge.

STEP 10: APPLY LAP SEALANT TO THE COVER STRIP SECTION EDGE AT THE END LAPS

- After the primer has dried, apply a continuous bead of Lap Sealant 3/8 in. x 1/4 in. (9.52 mm x 6.35 mm) around the cover strip section edge. Using the supplied Lap Sealant tool, feather the Lap Sealant immediately, taking care to leave a mound of sealant directly over the cover strip section edge.

REPAIR PROCEDURES

A small tear or hole in the PondGard membrane may be repaired by placing a piece of the 6" cover strip over the area to be repaired with an overlap of 1 in. (25 mm) extending all directions beyond the repair. The patch must be round, oval, or contain rounded corners. QuickSeam Joint Cover patches may also be used.

- Clean the damaged area by scrubbing with a cloth soaked in QuickPrime Plus. The surface should be dark gray in color with no streaking. Allow the area to dry.

- Repair the larger tears or holes by cutting a piece of PondGard membrane that extends beyond the tear or hole by a minimum of 4 in. (100 mm) extending all directions beyond the repair. Tape all edge seams as per section 2.3.1 - 6.0 inch (150 mm) wide cover strip seaming tape system.

SPECIAL CONSIDERATIONS

- When the seam is greater in length than the tape, the overlap between the two adjoining tapes should be at least 1 in. (25 mm). A protective sealant - Lap Sealant - is applied over a length of 3 in. (75 mm) on either side of the overlap.

- When several membranes meet at a common point, only three sheets may overlap each other. Apply a QuickSeam Formflash reinforcement (9 x 9 in. (225 x 225 mm)) over this joint area.

- Apply a QuickSeam Formflash reinforcement (9 x 9 in.(225 x 225mm)) over the area where a field splice runs from the horizontal area into the slope of the embankment.

- Clean the seam area with water and dry before applying the QuickPrime Plus, if it is contaminated (mud, etc.).

- Stop the application of the QuickSeam tape and FormFlash when the atmospheric conditions are unfavorable (humidity, condensation on the QuickPrime Plus or rain).

- Movement of the PondGard membrane during application of the QuickSeam Splice Tape and during the first few minutes after application should be avoided.

- Positioning of a larger number of panels than can be spliced in one day is not allowed.

- Field seams on side slopes must be parallel with the slope (i.e., up and down the slope). Horizontal field seams on slopes are not allowed.

2.4 SEAM TEST PROCEDURES

TEST SEAM OR TRIAL SEAM - DESTRUCTIVE MECHANICAL TESTING

At the start of a shift or at the beginning of each day, the seaming crew should complete a trial seam of approximately 10 ft. (3 m) in length. From the trial seam, 1.0 in. (25 mm) wide strips are cut for testing in the field tensometer - 3 in peel and 3 in shear. Shear and peel tests are carried out in general accordance with ASTM D413 and D4437 NSF modified with the exception of strain rate which is 20 in./min. (500 mm/min.) for both peel and shear due to the elastometric properties of PondGard. The minimum requirements are as follows:

Shear: 35 lb/inch (6.15 kn/m) at 200 percent strain.

Peel: 14 lb/inch (2.45 kn/m) in cohesive bond mode.

The same minimum requirements can be expected for specimens taken from a destructive field seam cut out when required.

NON-DESTRUCTIVE TEST (NDT) PROCEDURE

Air Lance Test – Inspect all field seams for unbonded areas using an air nozzle directed on the upper seam edge and surface to detect loose edges, riffles indicating unbonded areas within the seam, or other undesirable seam conditions. Check all bonded seams using a minimum 50 psi (345 kPa) (gage) air supply directed through a $^{3}/_{16}$ in. (4.8 mm) (typical) nozzle, held not more than 2 in. (51 mm) from the seam edge and directed at the seam edge.

3 ATTACHMENTS

ATTACHMENT 1:

TECHNICAL INFORMATION SHEETS (TIS)

ATTACHMENT 2:

TOOLS FOR APPLYING FIRESTONE PONDGARD

Attachment 1

TECHNICAL INFORMATION DATA SHEETS

- PondGard Membrane
- QuickSeam FormFlash
- Splice Adhesive
- Bonding Adhesive
- LVOC Water Based Bonding Adhesive
- QuickSeam 3" Splice Tape
- QuickSeam 6" Tape Cover Strip
- Lap Sealant
- LVOC Lap Sealant
- Water-Block Seal
- QuickPrime Plus
- LVOC QuickPrime
- Termination Bar
- Protection Mat
- QuickSeam Corner Flashing
- QuickSeam Joint Covers

PRODUCT DESCRIPTION

The Firestone PondGard waterproofing system for lining of ponds, lakes, water holes and other water features uses a complete range of materials including sheet, adhesives, tape, sealants, cleaning products, unvulcanized EPDM strips and prefabricated accessories in order to guarantee the homogeneity of the system.

MEMBRANE

- ***PondGard sheet:*** the main component of the system consists of the PondGard membrane. The raw material EPDM (ethylene, propylene, diene monomer rubber) is blended with oils, vulcanizing agents and fillers (carbon black). The PondGard sheet is manufactured by calendaring and vulcanizing. The sheet has a thickness of .045 or .060 in. (1.15 or 1.52 mm).

ADHESIVES AND PRESSURE SENSITIVE TAPE

- ***Bonding Adhesive:*** neoprene or water based contact adhesive used for bonding PondGard sheets or Formflash to non EPDM surfaces (wood, metal, concrete and others).
- ***Splice Adhesive:*** butyl based contact adhesive, use for splicing Formflash or PondGard flashings to each other.
- ***QuickSeam Splice Tape:*** double sided butyl based adhesive tape for splicing EPDM panels.
- ***QuickSeam Formflash:*** self-vulcanizing EPDM strips laminated to QuickSeam Tape which can be shaped and adapted to irregular shapes such as corners, pipes, etc.

SEALANTS

- ***Lap Sealant:*** EPDM based sealant for sealing splices edges, when Splice Adhesive is used.
- ***Water Block Seal:*** butyl based sealant, for making a waterproof seal when executing waterproofing details.

CLEANING PRODUCTS

- ***QuickPrime Plus:*** product for treating the PondGard sheet prior to applying the QuickSeam Splice Tape.

ACCESSORIES

- ***Termination Bar:*** aluminum or stainless steel bar for terminating the PondGard sheet against a concrete structure.
- ***Protection Mat:*** a nominal 4.5 oz. per square yard black (150 grams per M^2) polypropylene, non-woven, needle-punched fabric. It may be used as a liner under membrane and over substrate.

Technical Information Sheet: PONDGARD MEMBRANE

1. DESCRIPTION

The Firestone PondGard membrane is a cured single-ply synthetic membrane made of ethylene, propylene, diene, terpolymer specifically compounded to be safe for fish, plants and wildlife. Depending on the dimensions of the project, the waterproofing surface may be seamless. In other situations, field seams can be made using the in-seam tape or cover strip seam system.

2. PREPARATION

Product: Allow the membrane panels to relax for approximately 30 minutes before seaming.

Substrate: The substrate needs to be smooth, dry and free of sharp objects, oil, grease and other materials that may damage the membrane.

3. APPLICATION

Install PondGard membrane in accordance with current specifications and details.

4. COVERAGE

The dimensions of the PondGard membrane are calculated to cover the base of the project, slope and anchor trenches, including seam overlaps.

5. CHARACTERISTICS

The PondGard membrane is a rubber material with the following properties:

PHYSICAL

- Elastomeric membrane combining high elasticity with tensile strength
- Water-resistant
- Temperature stable from-49°F to 176°F (-45°C to 80°C.)
- Retains its elasticity at low temperature and resistance to temperature shocks up to 250°F.
- Excellent resistance to a variety of liquids.
- Excellent resistance to U.V. radiation and ozone concentration.
- Safe for fish and wildlife.

6. TECHNICAL SPECIFICATIONS

Property	Test Method	Units	Typical Value
Thickness - nominal	ASTM D-5199	in.	.045
Specific Gravity	ASTM D-792		1.10
Unit Weight	ASTM D-5261	lb/ft.^{2}	.28
Tensile Properties:			
Break Strength (min.)	ASTM D-882	lb./in.	50
Break Elongation (min.)	ASTM D-882	%	500
Tear Resistance (min.)	ASTM D-1004	lb.	9
Puncture Resistance (min.)	ASTM D-4833	lb.	35
Multiaxial Elongation (min.)	ASTM D-5617	%	100
Oven Aging - 100°C for 170 hours	ASTM D-573		
% Retained Tensile Break Strength	ASTM D-882	%	90
% Retained Tensile Break Elongation	ASTM D-882	%	75
Resistance to ozone 7 days/100 ppphm @ 100°F with 50% extension	ASTM D-1149		No Cracks
Brittleness Temp.	ASTM D-2137	°F	-49
Water Resistance Change in weight after Immersion 7 days @ 150°F, %	ASTM D-471	%	8
Water Vapor Permeability (max.)	ASTM E-96	perm-mils	2.0 (max)
Dimensional Stability (max.)	ASTM D-1204	%	1.0 (max)
Specialty Testing	FBP - 1094	Test Method for the Chronic Toxicity of Shubunkin Ornamental Goldfish in PondGard Lined Ponds.	

Technical Information Sheet: QUICKSEAM® FORMFLASH

1. DESCRIPTION

Firestone RubberGard QuickSeam FormFlash consists of 9" uncured EPDM flashing factory laminated to QuickSeam Tape. It is designed to flash inside and outside corners or field fabricated pipe flashings.

2. PREPARATION

A. Refer to Material Safety Data Sheets.
B. Use heat guns (without ignition sources) to heat QuickSeam FormFlash when cloudy conditions below 60° F occur. This will ensure good formability of the QuickSeam FormFlash to the primed substrate.
C. On sunny days less that 70° F, place QuickSeam FormFlash on roof (prior to application) with flashing side up to allow QuickSeam FormFlash to gain heat to ensure good formability.

3. APPLICATION

Refer to Firestone installation/instructions for flashing. The edge of each splice has to be protected with Lap Sealant.

4. CHARACTERISTICS

1. Excellent moisture resistance
2. Excellent resistance to heat and cold.
3. Excellent green tack.
4. QuickSeam FormFlash is 9" wide, 50' in length, packaged 2 rolls per carton.

TECHNICAL SPECIFICATIONS: Tape

Property	Minimum Performance
Base:	Rubber Polymer
Color:	Black
Solvents:	None
Percent Solids:	100%
Specific Gravity:	98±.02 (H_2O = 1)
Cured State:	Cured
Thickness:	.030" ± .005"
V.O.C. Content:	0 grams/liter (maximum)

TECHNICAL SPECIFICATIONS: EPDM Flashing

Property	Minimum Performance
Base:	EPDM
Color:	Black
Solvents:	None
Percent Solids:	100%
Specific Gravity:	1.15±.05
Cured State:	Semi-Cured
Thickness:	.065" ± .005"
V.O.C. Content:	0 grams/liter (maximum)

STORAGE/SHELF LIFE

1. Store in original unopened cartons at temperatures between 60°F(15°C) and 80°F (27°C) until ready for use.
2. Do not store on roof in direct sunlight or at temperatures above 80°F (27°C).
3. When exposed to lower temperatures, restore to room temperature prior to use.
4. Shelf life of six month scan be expected when stored at temperatures between 60°F and 80°F in original unopened containers indoors.
5. Shelf life will be shortened when exposed to elevated temperatures.

Technical Information Sheet: 9" QUICKSEAM® FORMFLASH

1. DESCRIPTION

Firestone EPDM-Formflash is a self-curing EPDM rubber strip, adaptable to irregular shapes and designed to flash the PondGard system details in accordance with Firestone's specifictions.

2. PREPARATION

Product: During cold weather (<15°C) the FormFlash may be installed using a heat gun to improve its workability.

Substrate: Must be clean, dry, smooth, free of sharp edges, loose or foreign materials, oil, grease and chemical products that could affect PondGard.

3. APPLICATION

Refer to Firestone installation instructions for flashing. The FormFlash material is to be adhered using Splice Adhesive. The edge of each splice has to be protected with Lap Sealant.

4. CHARACTERISTICS

PHYSICAL

- easily adaptable to irregular shapes and surfaces
- superior weathering characteristics
- self-curing EPDM-material, with the same characteristics as PondGard membrane after 12 months

TECHNICAL

- Base: EPDM
- Color: Black
- Solvents: None
- Solids (%): 100
- State: uncured
- Thickness (mm.): .095 in./2.4 mm
- Packaging

Width (in.)	**Length** (ft.)	**Packaged**	**Weight** (lbs./ft²)
9	50	2 rolls/ctn	.35 (1.32 kg/m²)

- Storage/Shelf Life

1. Store in original unopened cartons at temperatures between 60°F(15°C) and 80°F (27°C) until ready for use.
2. During hot weather, do not expose to sunlight/elevated temperatures until use.
3. Rotate your stock to insure stored material will not go beyond the shelf life of twelve months from listed date of manufacture.
4. A shelf life of twelve months from listed date of manufacture can be expected when stored at temperatures between 60°F and 80°F until ready for use.
5. Shelf life will be shortened when exposed to elevated temperatures.

5. TECHNICAL SPECIFICATIONS

Property	Test Method	Minimum Performance
Specific Gravity	ASTM D-297	1.15 ± .05
Tensile Strength	ASTM D-412	1305 psi minimum
Elongation	ASTM D-412	300% minimum
Tear Resistance	ASTM D-624	150 lbs/in minimum
Ozone Resistance 7 days @ 50% extension at 100°F	ASTM D-1149	No Cracks
Heat Aging 28 days @ 240°F	ASTM D-573	1205 psi (tensile) 200% min. (elongation)
Brittleness Temp.	ASTM D-746	-49°F (-45°C)
Resistance to Water change in weight after immersion 7 days @ 150°F, %	ASTM D-471	+8, -2
Weight		.35 lb/ft^2 (1.32 kg/m^2)

6. PRECAUTIONS

1. Keep away from fire and ignition sources during storage and installation.
2. Use of heat guns during cold weather will improve workability of flashing, but a wide nozzle should be used and care should be taken note to localize heat, as a hole in the flashing can result.
3. Review material safety data sheet prior to use.

Technical Information Sheet: SPLICE ADHESIVE (SA-1065)

1. DESCRIPTION

Firestone Splice Adhesive is designed for field splicing of PondGard membrane panels and Formflash to EPDM membrane

2. PREPARATION

Product: stir the adhesive before and during use. Restore the adhesive to room temperature prior to use, if exposed to temperatures lower than 59°F (15°C.)

Substrate: the adhered surfaces must be cleaned with Splice Wash using cotton cloths. An alternative of QuickPrime may be used.

3. APPLICATION

Apply in a thick, even, smooth coat with a 3" to 4" (75 to 100 mm.) wide solvent resistant paint brush. Do not use circular motions for applying Splice Adhesive (no paint rollers); allow the adhesive to flash off. In cold weather, moisture contamination of the adhesive can occur when condensation/frost forms on the adhesive while the solvents flash off. For further instructions refer to the splicing section.

4. COVERAGE

1 gallon per 49 ln. ft. (15 lin.m.) of Formflash one foot width, both sides (width 300 mm - both sides). A uniform application is required to avoid mixed results. Thinning of the adhesive is not allowed.

5. CHARACTERISTICS

PHYSICAL

- Excellent moisture resistance
- Excellent resistance to heat and cold
- Excellent green tack

Storage/Shelf life

1. Store in original cartons at temperatures between 60°F (15°C) and 80°F (27°C)until ready for use.
2. During hot weather, do not expose to sunlight/elevated temperatures until use.
3. Rotate your stock to insure stored material will not go beyond the shelf life of six months.
4. Shelf life of six months can be expected if stored in original sealed container at temperatures between 60°F (15°C) and 80°F (27°C).
5. Shelf life will be shortened to elevated temperatures.

6. TECHNICAL SPECIFICATIONS

Property	Minimum Performance
Base	Synthetic Polymers
Color	Black
Solvents	Hexane, Toluene, Xylene
Solids (%)	26% Minimum
Viscosity	2900-3700 Centiposies, R.V.F. #3 Spindle @ 10 RPM
Weight/Gallon	735 lb./gallon ± .37 lb/gallon (3.33 kg/gallon)
Specific Gravity	0.89 ± 5%
Flash Point	0° F

7. PRECAUTIONS

1. Flammable. Keep away from sources of ignition. Do not smoke when using.
2. Store and use the material in well ventilated areas.
3. May cause sensitization by inhalation.
4. Avoid prolonged contact with skin. Gloves should be worn (OSHA approved).
5. After can has been opened once and closed, use remainder of adhesive within one week.
6. Thinning is not allowed.
7. Do not contaminate with foreign materials.
8. For professional use only.
9. Red caution labels required when shipping.
10. Review material safety data sheet prior to use.

Technical Information Sheet: BONDING ADHESIVE (BA-2004)

1. DESCRIPTION

Firestone Bonding Adhesive is a neoprene-based adhesive designed for bonding Firestone PondGard membrane to wood, metal, masonry and other acceptable non-EPDM substrates.

2. PREPARATION

Product: Stir the adhesive. Restore the adhesive to room temperature prior to use, if exposed to cold temperatures 59°F (<15°C).

Substrate: surfaces on which bonding adhesive is to be applied must be clean, smooth, dry and free of sharp edges, loose materials, oil, grease and other contaminants. The mating surface of the membrane shall be cleaned with a brush or clean rag.

3. APPLICATION

Stir the adhesive thoroughly before and during use. Apply adhesive in an even, smooth coat on both surfaces with a solvent-resistant paint roller or brush and avoid globs and puddles. Allow adhesive to flash off until tacky (15 to 45 minutes). Test the adhesive for its dryness, using the push touch test procedure. In cold weather moisture contamination of the adhesive can occur while the solvents flash off. Re-apply BA-2004 when condensation conditions no longer exist, and proceed. For further instructions refer to splicing section. If the adhesive is ready, mate both surfaces and press with a brush.

4. COVERAGE

Coverage is 55 to 70 sq. ft. (5 to 6.5 m^2 per gallon) per gallon according to the substrate. The adhesive must be applied at a uniform rate to both the back of the membrane and substrate. If the applicator can place a finger or hand directly on the adhesive without feeling some degree of tackiness, the application is too then and the adhesive should be re-applied. Thinning of the adhesive is not allowed.

5. CHARACTERISTICS

PHYSICAL	• Excellent resistance to aging • Excellent adhesive strength to different applications • Good resistance to heat, cold and water
Packaging	5 gallon cans

Storage/Shelf life

1. Store in unopened cartons at temperatures between 60°F and 80°F until ready for use.
2. Rotate your stock to insure stored material will not go beyond the shelf life of one year.
3. Shelf life of one year can be expected if stored in original sealed container at temperature between 60°F (15°C) and 80°F (27°C). If exposed to lower temperatures, restore to room temperature prior to use.
4. Shelf life will be shortened if exposed to elevated temperatures.

6. TECHNICAL SPECIFICATIONS

Property	Minimum Performance
Base	Neoprene
Color	Amber
Solvents	Acetone, Textile Spirits, Toluol, Xylol and Aliphatic Hydrocarbons
Solids (%)	23% (min.)
Viscosity	2300-3000 Centipoises, R.V.F. Brookfield, #3 Spindle @ 20 RPM
Weight/gallon	7.05 ± .35 pounds (3.2 kg/gallon)
Specific gravity	0.845 ± 5%
Flash Point	Less than 0°F (-18°C)

7. PRECAUTIONS

1. Flammable. Keep away from fire and open flame and other possible ignition sources during storage and use. Do not smoke when using.
2. Red caution labels required when shipping.
3. Avoid prolonged contact with skin. Gloves should be worn (OSHA approved).
4. Use only in well ventilated areas.
5. Do not contaminate with foreign materials.
6. For professional use only.
7. Review Material and Safety Data Sheet specified on the Bonding Adhesive container label.
8. Keep out of reach of children.
9. Thinning is not allowed.
10. Recommended cleaner is Toluene (while fluid).

Technical Information Sheet: WATER BASED BONDING ADHESIVE

1. DESCRIPTION

Firestone Water Based Bonding Adhesive is a contact adhesive designed for bonding PondGard liner membranes to wood, metal, masonry and acceptable substrates. When current application procedures are followed, Firestone Water Based Bonding Adhesive is an acceptable alternative to Firestone solvent based bonding adhesive (BA-2004).

2. METHOD OF APPLICATION

Surfaces on or against which Water Based Bonding Adhesive is to be applied must be clean, smooth, dry, free of sharp edges, loose and foreign materials, oil, grease and other contaminants. Sweep the mating surface of the membrane with a stiff broom to remove excess dusting agent, if present, or other contaminants from the mating surface. Ambient temperatures shall be 40°F and rising. Do not attempt to use Water Based Bonding Adhesive when there is a possibility of freezing temperatures with 48 hours after application.

Stir the adhesive thoroughly before and during use. Apply Water Based Bonding Adhesive at about the same time to both the exposed underside of the sheet and the substrate to which it will be adhered to allow approximately the same drying time. Apply Water Based Bonding Adhesive with a solvent resistant paint roller and roll the adhesive on both mating surfaces. Apply Water Based Bonding Adhesive evenly to avoid globs and puddles of adhesive. Water Based Bonding Adhesive may also be spray applied, followed by rolling to ensure 100% coverage by the bonding adhesive. Take care not to apply bonding adhesive over an area that will later be cleaned and spliced to another sheet or flashing.

Allow bonding adhesive to flash off until tacky. Touch the bonding adhesive surface with a clean, dry finger to be certain the adhesive does not stick or string. As you are touching the adhesive, push straight down to check for stringing, also push forward on the adhesive at an angle to ensure that the adhesive is ready throughout its thickness. If either motion exposes wet or stringy adhesive when the finger is lifted, it is not ready for mating. In addition, Water Based Bonding Adhesive will change from grey to dark translucent color as the carrier evaporates. Flash off time will vary depending on substrate temperatures and ambient air conditions.

When the bonding adhesive is ready to be mated, start at the fold and roll the previously coated portion of the sheet into the coated substrate slowly and evenly to minimize wrinkles. To ensure proper adhesion, compress the bonded portion of the sheet to the substrate with a stiff push broom or heavy roller such as a linoleum roller.

3. PRODUCT DATA

Base:	Latex/Neoprene Blend
	Grey (when first applied)
	Dark translucent (when carrier evaporates)
Solids:	50% (min)
Viscosity:	14,500 ± 2,500 centipoises, R.V.F.
	Brookfield #4 Spindle @ 10 rpm
Weight/Gallon:	8.6 lb.gal (14.8 kg/l) (nominal)
Specific Gravity:	1.03 (nominal)
Flash Point:	170°F
V.O.C.:	250 gm/liter (77°C) (maximum)

4. COVERAGE RATE

Standard Application Method: 100-125 sf/gal (9.3-11.6 m^2/gal) (nominal) both surfaces (Roller Application)

Note: Water Based Bonding Adhesive may be spray applied using conventional spray equipment used to apply Firestone's Solvent Based Bonding Adhesive (BA-2004).

Some insulation surfaces are more uneven and porous, and will result in a lower coveraged rate while smooth less porous facers will result in higher coverage rates. Rates are based on total, finished coverage rate.

5. PRECAUTIONARY DATA

1. Thinning is not permitted and will affect the adhesives performance.
2. Review Material Safety Data Sheet prior to use.
3. Keep away from eyes. If contact occurs, flush generously with water. Contact physician.
4. Avoid prolonged contact with skin.
5. Avoid prolonged or repeated breathing of vapors.
6. Do not take internally.
7. Keep container closed when not in use.
8. Use only in well ventilated areas.
9. Do not contaminate with foreign materials.
10. For professional use only.
11. Keep out of reach of children.
12. Recommended cleaner is water (while adhesive is fluid).
13. Use only when temperatures will <u>not</u> fall below freezing at <u>any</u> time 48 hours after mating of EPDM. Do not allow to freeze.

6. STORAGE

1. Store in original unopened cartons, at temperatures between 60°F (150°C)
2. Do not allow to freeze.
3. Rotate your stock to ensure stored material will not go beyond the shelf life of six months.

7. SHELF LIFE

1. Shelf life of six months can be expected if stored in original sealed containers at temperatures between 60°F (15°C) and 80°F (27°C) until ready for use.
   If exposed to lower temperatures, restore to room temperature prior to use.
2. Shelf life will be shortened if exposed to elevated temperatures.
3. Do not allow to freeze.

Technical Information Sheet: QUICKSEAM 3" SPLICE TAPE

1. DESCRIPTION

Firestone QuickSeam 3" (76mm) Splice Tape is designed for field splicing of Firestone PondGard membrane panels.

2. PREPARATION

Product: Restore the tape to room temperature prior to use if exposed to temperatures below <59°F (15°C) for prolonged periods.

Substrate: The PondGard surfaces must be prepared with QuickPrime Plus. Alternatively clean with QuickPrime Plus, followed with a layer of Splice Adhesive is allowed.

3. APPLICATION

Refer to splicing for specific installation instructions. Use of Firestone QuickPrime Plus and Quick Scrubber is required.

4. CHARACTERISTICS

PHYSICAL

- Excellent moisture resistance
- Excellent resistance to heat and cold
- Excellent green tack

5. TECHNICAL SPECIFICATIONS

Property	Minimum Performance
Base	Rubber Polymers
Color	Black
Solvents	None
Solid	100%
Specific gravity	0.98 ± 0.02(H_2O=1)
Cure state:	Cured
Thickness	37 mils ± 8 mils
Packaging	Length: 100 lineal feet (328 ln.m) Width: 3 inches wide (76mm) Packaged: 4 rolls per box

Storage/Shelf life

1. Store in original unopened cartons indoors at temperatures between 60°F (15°C) and 80°F (27°C).
2. Do not store on the roof indirect sunlight or at temperatures above 80°F (27°C).
3. When exposed to lower temperatures restore to room temperature prior to use.

4. Shelf life of 12 months can be expected when stored at temperatures between 60°F (15°C) and 80°F (27°C) and 80°F (27°C) in original unopened cartons.
5. Shelf life will be shortened if exposed to elevated temperatures.

6. PRECAUTIONS

Refer to Material Safety Data Sheets prior to use.

Technical Information Sheet: QUICKSEAM COVER STRIP 6" TAPE

1. DESCRIPTION

Firestone QuickSeam 6" (152mm) tape is designed for field seaming of Firestone PondGard membrane panels.

2. PREPARATION

Product: Restore the batten cover to room temperature prior to use if exposed to temperatures below <59°F (15°C) for prolonged periods.

Substrate: The EPDM surfaces must be prepared with QuickPrime to clean and prime membrane panels.

3. APPLICATION

Refer to specific installation instructions. Use of Firestone QuickPrime and QuickScrubber is required.

4. CHARACTERISTICS

PHYSICAL

- Exhibits superior ozone and ultraviolet resistance.
- Excellent long term weathering qualities.
- Remains flexible over wide temperature variations.
- Application temperature range is between -10°F (-23°C) and 120°F (49°C).

5. TECHNICAL SPECIFICATIONS

	Tape		PondGard
Property	**Minimum Performance**	**Property**	**Minimum Performance**
Base	Rubber Polymers	Base	EPDM
Color	Black	Color	Black
Solvents	None	Solvents	None
Solid	100%	Solids	100%
Specific Gravity	0.98 ± 0.02(H_2O=1)	Specific Gravity	1.15 ± .05
Cure State	Cured	Cure State	Cured
Thickness	.035" ± .005" (9 mm ± 2 mm)	Thickness	.060" ± .005" (18 mm ± 2 mm)
Width:	6 1/8" +3/8", -0" (169 mm ± 51 mm)	Width	6" +0", -1/8" (152 mm ± 1 mm)

Packaged: 100' rolls, 2 rolls per carton

Storage/Shelf life

1. Store in original unopened cartons indoors at temperatures between 60°F (15°C) and 80°F (27°C).
2. Do not store on the roof indirect sunlight or at temperatures above 80°F (27°C).
3. When exposed to lower temperatures restore to room temperature prior to use.

6. PRECAUTIONS

Refer to Material Safety Data Sheet prior to use.

Technical Information Sheet: LAP SEALANT

1. DESCRIPTION

Firestone Lap Sealant is designed to seal the exposed edge of all field fabricated PondGard membrane laps made with Splice Adhesive.

2. PREPARATION

Product: Restore to room temperature prior to use, if exposed to lower temperatures (<59°F)(<15°C) for a prolonged period.

Substrate: Surfaces on which Lap Sealant is to be applied must be clean, dry, free from loose and foreign materials, oil and grease and primed with Splice Adhesive. Wait minimum 4 hours between splicing and application of Lap Sealant. Under bad weather conditions Lap Sealant must be applied before leaving project.

3. APPLICATION

Apply a 0.4 x .25 in. (10 mm x 6 mm) bead of Lap Sealant along the properly cleaned, exposed membrane lap edge. A preformed tool shall be used to feather the bead of sealant. Feathering must take place immediately after Lap Sealant is applied. Do no apply ballast over freshly applied Lap Sealant.

4. COVERAGE

Coverage rates of 20-22 lineal feet (6 lin.m.) of 3/8" x 1/14" bead, per 10 oz. (296 cc) tube. Thinning is not allowed.

5. CHARACTERISTICS

PHYSICAL

- Excellent resistance to ozone, ultra violet and general weathering
- Excellent resistance to heat, cold and water
- Good adhesion to PondGard sheet, metals, wood and concrete
- Good slump resistance

Storage/Shelf life

1. Store in original unopened containers, at temperatures between 60°F (15°C) and 80°F (27°C) until ready for use.
2. When exposed to lower temperatures, restore to room temperature prior to use.
3. Shelf life of one year can be expected when stored in original sealed containers at temperatures between 60°F (15°C) and 80°F (27°C).
4. Shelf life will be shortened if exposed to elevated temperatures.

6. TECHNICAL SPECIFICATIONS

Property	Minimum Performance
Base	EPDM Rubber
Color	Black
Solvents	Light Aliphatic Solvent
Solids	50% (minimum)
Viscosity	900,000 + 1,300,000 Centipoises, R.V.F. Brookfield, #7 Spindle #2 RPM
Weight/gallon	9.35 Pounds - Nominal (4.24kg/gallon)
Specific gravity	1.120 - Nominal
Flash Point	52° F (28°C)
Packaging	25 tubes/carton

7. PRECAUTIONS

1. Flammable. Keep away from fire and open flames during storage and use. Do not smoke when using.
2. Red caution labels required when shipping.
3. Avoid contact with skin. Neoprene gloves should be worn when handling.
4. Use only in well ventilated areas.
5. Do not contaminate with foreign materials.
6. For professionals use only.
7. Review material safety data sheet prior to use.

Technical Information Sheet: WATER-BLOCK SEAL(S-20)

1. DESCRIPTION

Firestone Water-Block Seal is designed to provide a watertight seal as indicated in the details.

2. PREPARATION

Product: Restore to room temperature prior to use, if exposed to cold temperatures 60°F (<15°C.).

Substrate: Surfaces onto which Water Block Seal is applied shall be free from loose parts of concrete, stone, mortar, foreign materials, and other contaminants.

3. APPLICATION

Apply a 1/4 in. 10 mm. to 1/2 in. 13 mm. bead onto the substrate surface. Roll or press the flashing membrane firmly against the seal and substrate avoiding wrinkles to assure a complete seal. Install the appropriate Firestone detail as per Firestone's current specification.

4. COVERAGE

3 Lineal meters per tube.

5. CHARACTERISTICS

Physical

- Excellent resistance to aging
- Good resistance to heat, cold and water
- Non-drying, adheres well to PondGard sheeting, metals, wood and concrete
- Good slump resistance

Storage/Shelf life

1. Store in original unopened containers, at temperatures between 60°F (15°C) and 80°F (27°C) until ready for use.
2. When exposed to lower temperatures, restore to room temperature prior to use.
3. Shelf life of one year can be expected if stored in original sealed container at temperatures between 60°F (15°C) and 80°F (27°C).
4. Shelf life will be shortened if exposed to elevated temperatures.

6. TECHNICAL SPECIFICATIONS

Property	Minimum Performance
Base	Butyl rubber
Color	Gray
Solvents	Heptane
Solids	86%
Viscosity @ 80°F	1,600,000 ± 300,000 cps
Weight/Gallon	11.00 (Nominal)
Specific Gravity	1.33 (Nominal)
Flash Point	14°F, closed cup (ASTM 56-82)
Packaging	25 tubes/carton
	29 lbs/carton (13.15 kg./carton)

7. PRECAUTIONS

1. Flammable. Keep away from fire and open flames during storage and use. Do not smoke when using.
2. Red caution labels required when shipping.
3. Avoid prolonged contact with skin.
4. Use only in well ventilated areas.
5. Do not contaminate with foreign materials.
6. For professional use only.
7. Review Material Safety Data Sheet prior to use.
8. Keep out of reach of children.
9. Thinning is not allowed.
10. Recommended cleaner is QuickPrime Plus.
11. Water-Block Seal (S-20) is not designed to be used as an exposed caulk - it is to be used as a compression seal for specific details.

Technical Information Sheet: QUICKPRIME PLUS

1. DESCRIPTION

Firestone QuickPrime Plus is designed to clean and prime PondGard membrane in seaming areas, before application of the QuickSeam Splice Tape. The Primer activates the membrane surface and ameliorates the seam quality.

Firestone QuickPrime Plus must be applied with a QuickScrubber. It may also be used to clean the EPDM membrane prior to the application of Firestone Splice Adhesive.

2. PREPARATION

Product: Stir thoroughly before and during use.

Substrate: Surfaces to be primed must be clean, dry, and free of foreign materials, talc and dirt. Clean with broom if required.

3. APPLICATION

Apply QuickPrime Plus to the PondGard surfaces with QuickScrubber or QuickScrubber Plus using long back and forth strokes with moderate to heavy pressure along the length of the area until surfaces become a dark gray in color with no streaking or puddling. Allow the primed surfaces to dry completely (usually less than 10 minutes) before applying QuickSeam Splice Adhesive.

4. COVERAGE

±1 gallon per 100 ft. (10 m^2) (2 sides) or ± 200 lineal feet (60 lin. m.) of seam. Thinning is not allowed.

5. CHARACTERISTICS

PHYSICAL

- Excellent resistance to aging
- Excellent resistance to heat and cold
- Excellent cleaner/primer for membrane when using QuickSeam products and Splice Adhesive.
- QuickPrime is translucent when dry which allows guide marks to show through after application.

Storage/Shelf life

1. Store in original unopened cartons indoors at temperatures between 60°F (15°C) and 80°F (27°C).
2. When exposed to lower temperatures restore to room temperature prior to use.
3. Keep the material out of direct sunlight until ready for immediate application.
4. Shelf life of 9 months can be expected if stored in original unopened container at temperatures between 60°F (15°C) and 80°F (27°C).
5. Shelf life will be shortened if exposed to elevated temperatures.

6. TECHNICAL SPECIFICATIONS

Property	Minimum Performance
Base	Synthetic Rubber Polymers
Color	Translucent Gray
Solvents	Heptane, Toluene, Xylene
Solids	15% (nominal)
Viscosity	Very thin, free flowing
Weight/Gallon	6.50 pounds (2,948kg/gallon) (nominal)
Specific Gravity	0.778 Nominal (H_2O=1)
Flash Point	0.0°F
Packaging	3 gallon (9.54 kg) and 1 gallon/4 pails (3.18 kg/gallon) to a carton

7. PRECAUTIONS

1. Thinning is not allowed.
2. Flammable. Keep away from fires (open flame) and other possible ignition sources during storage and use. Do not smoke when using.
3. Red caution labels are required when shipping.
4. For professional use only.
5. Use only in well ventilated areas.
6. Use of neoprene or nitrile gloves and eye protection with side shield is recommended.
7. Use only in conjunction with QuickScrubber. Do not apply with rollers, brushes or rags.
8. Mix thoroughly before and during use.
9. Refer to Material Safety Data Sheets for additional precautionary data.

Technical Information Sheet: TERMINATION BAR

1. DESCRIPTION

Firestone Termination Bar is designed for attaching PondGard membrane and sealing flashing terminations as per Firestone's current specifications.

2. PREPARATION

Product: When field cutting is necessary, remove any burrs from bar and clean up shavings, etc.
Substrate: Must be free from dust, dirt, oil, water and other contaminants prior to installation and need to provide the required pull-out resistance.

3. APPLICATION

Install Water-Block sealant behind the PondGard membrane. Anchor the bar through pre-punched holes at a rate to maintain a seal to the wall against Water-Block seal. Remove excess flashing material above and install Lap Sealant into channel. Keep each piece 10 feet (3.05 m) of Termination Bar separated from adjoining bar by .25 inch (6 mm) and cut the bar at inside and outside corners.

4. CHARACTERISTICS

Material	.100" thick 3003 - H14, 3105 - H14 or 6063 - T5 aluminum
Length	10'
Width	1.35" (34mm)
Thickness	.100" (2.5mm)
Holes	Pre-punched 3.93 inches (100mm) o.c. with .28" (7mm) x .38" (9mm) slotted holes
Packaging	30 pieces -10' sections per tube (55.8 lbs/tube) (25kg/tube)
Storage	In a dry place

5. PRECAUTIONS

1. Do not use as a batten strip.
2. Where field cutting is necessary, remove any burrs from bar.
3. Clean up shavings, etc., that may occur from field cutting.
4. Install flat side of bar towards flashing so 'lip' forms a reservoir for Lap Sealant.
5. Keep each 10' length of Termination Bar separated form adjoining bar by 1/4" (6mm).
6. Termination bars must be installed directly to the wall surface, not to existing sheet metal, flashings, etc.
7. Install termination bar on hard, smooth surfaces only. Do not install on substrates where seal is lost at mortar joints, etc.
8. Install termination bar vertically where base flashings(s) end.
9. Do not install termination bar to wood or other porous surfaces.
10. At inside and outside corners, termination bars must be cut and continued.
11. Termination bar must be fastened a maximum of 1" (24mm) in from each end of all sections.

Technical Information Sheet: PROTECTION MAT

1. DESCRIPTION

Firestone Protection Mat is a nominal 4.5 oz.-per-square-yard (150g/m^2)black polypropylene, non-woven, needle-punched fabric.

2. CHARACTERISTICS

PHYSICAL	Material Width	15' - 0" (4.5m)
	Material Length	320' (97m)
	Roll Diameter	20" (500mm)
	Gross Weight	200 lbs./roll (90kg/1 roll)
	Area	535 sq. yds. (447 sq. m)

3. TECHNICAL SPECIFICATIONS

Property	**Test Method**	**Minimum Performance**
Tensile Strength	ASTM D-4632	120 lbs. min. (54kg)
Elongation	ASTM D-4632	40% min.
Trapezoidal Tear	ASTM D-4533	50 lbs. min. (22kg)
Burst Strength (mullen)	ASTM D-3786	100 psi min. (689kp)
Puncture Strength	ASTM D-3787	40 lbs. min. (18kg)
Accelerated Weathering (tensile strength retained)	ASTM D-4355	84 lbs. min. (38kg)

4. PRECAUTIONS

1. Flammable, Keep away from flame or ignition source.
2. Do not smoke when using.
3. Do not cover deck openings, open pits, etc., with mat.
4. Refer to material safety data sheet prior to use.

Technical Information Sheet: QUICKSEAM CORNER FLASHING

1. DESCRIPTION

Firestone QuickSeam Corner Flashing consists of uncured EPDM flashing factory laminated to QuickSeam Tape. It is 8.5" diameter, and is designed to flash inside and outside corner areas.

2. CHARACTERISTICS

Physical	• Excellent moisture resistance. • Excellent resistance to heat and cold. • Excellent green tack. • QuickSeam Corner Flashings are 8-1/2" (216mm) in diameter
Packaging	30 units per carton

Storage

1. Store in original unopened cartons at temperatures between 60°F (15°C) and 80°F (27°C).
2. Do not store in direct sunlight or at temperatures above 80°F (27°C).
3. When exposed to lower temperatures, restore to room temperature prior to use.
4. Shelf life of 6 months can be expected when stored at 60°F (15°C) - 80°F (27°C) in original unopened containers indoors.
5. Shelf life will be shortened if exposed to elevated temperatures.

3. TECHNICAL SPECIFICATIONS

	Tape		**EPDM**
Property	**Minimum Performance**	**Property**	**Minimum Performance**
Base	Rubber Polymer	Base	EPDM
Color	Black	Color	Black
Solvents	None	Solvents	None
Solid	100%	Solids	100%
Specific Gravity	0.98 ± 0.02(H_2O=1)	Specific Gravity	1.15 ± .05
Cure State	Cured	Cure State	Semi-Cured
Thickness	.030" ± .005" (7mm ± .1mm)	Thickness	.065" ± .005" (1.6mm ± .1mm)

4. PRECAUTION

Refer to material safety data sheet prior to use.

Technical Information Sheet: QUICKSEAM JOINT COVERS

1. DESCRIPTION

Firestone QuickSeam Joint Cover is FormFlash laminated to two layers of butyl/EPDM adhesive tape. It is designed to cover and seal punctures.

2. METHOD OF APPLICATION

The mating surfaces which are to receive the QuickSeam Joint Cover must be free of dust, dirt, oil, water and other containments. The EPDM may be prepared using one of two (2) methods, depending on the Firestone products that are readily available. The preparation options are using QuickPrime or Splice Wash and Splice Adhesive.

3. CHARACTERISTICS

Physical
- Uncured FormFlash will cure when exposed to heat and time.
- Uncured tape (3" center layer) will cure when exposed to heat and time.

Packaging 100 pieces per carton. Instructions are included in each carton.

Storage

1. Store in original unopened cartons at temperatures between 60°F (15°C) and 80°F (27°C).
2. Do not store on roof in direct sunlight or at temperatures above 100°F (38°C).
3. When exposed to lower temperatures, restore to room temperature prior to use.

Shelf life

1. Shelf life of one year can be expected when stored at temperatures between 60°F (15°C) and 80°F (27°C) in original unopened carton.
2. Shelf life will be shortened if exposed to elevated temperatures.

3. TECHNICAL SPECIFICATIONS

Butyl/EPDM Adhesive Tape

Property	Minimum Performance
Base:	Butyl or EPDM
Color:	Black
Solvents:	None
Solid:	100%
Specific Gravity:	0.98 (nominal)
Cure State:	
Splice Tape:	Cured
3" Center Layer:	Uncured
Thickness:	
Splice Tape:	.037" (.9mm) ± .005" (.1mm)
3" Center Layer:	.037" (.9mm) ± .005" (.1mm)

FormFlash

Property	Minimum Performance
Material: Flashing, Conforming to RMA minimum specifications	Uncured EPDM
Color:	Black
Size:	5.75" (146mm) ± .125 (3mm) Diameter
Thickness	.065" (1.6mm) ± .005" (.1mm)

4. PRECAUTIONS

Refer to material safety data sheet prior to use.

TOOLS FOR APPLYING FIRESTONE PONDGARD RUBBER MEMBRANE

1. MINIMUM REQUIRED

PREPARATION OF THE WORK

Measuring tape and ruler 164 ft. and 16 ft. (50 m. and 5 m.)

Chalk line (with chalk powder)

Scissors

Claw Hammer

CLEANING

Clean cotton rags

Firestone QuickScrubber

Bonding sheets/FormFlash

Brushes 4 in. (short, solvent resistant bristles, 100 mm. wide)

Paint roller 9.375 in. (short, solvent resistant bristles, 225 mm. wide)

Silicone rubber hand roller 2 in. (50 mm. wide: FormFlash) 4 in. (100 mm. wide: Seams)

2. RECOMMENDED

Hot air blower

Electrical extension cable

Rigid, upright push broom

White marker (Mean Streak)

Rubber gloves

Generator

Air Lance equipment

Screwdriver

Tool kit with lock 4 ft. x 6-1/2 ft. x 4 ft. (1.2 m x 2 m x 1.2 m)

PONDGARD CHEMICAL RESISTANCE CHART

PondGard liner Membrane exposure to these chemicals causes no swelling, softening, or surface deterioration of the membrane.

Acetamide
Acryimide (to 140°F)
Acetaldehyde (to 100°F)
Acetophenone (to 140°F)
Acetylene gas (to 200°F)
Alum (to 140°F)
Aluminum acetate
Aluminum chloride
Aluminum nitrate
Aluminum sulfate (to 140°F)
Ammonia
Ammonia gas (cold)
Ammonia gas (hot) (to 140°F)
Ammonia hydroxide (to 10%)
Ammonia hydroxide (concentrated)
Ammonium carbonate
Ammonium chloride
Ammonium nitrate
Ammonium phosphate
Ammonium sulfate
Amyl alcohol
Arsenic acid (to 140°F)
Adipic acid (to 140°F)

Barium chloride (to 176°F)
Barium hydroxide
Barium sulfide
Benzaldehyde (to 200°F)
Benzyl alcohol
Boric Acid (to 140°F)
Borium sulfate (to 70°F)

Calcium acetate
Calcium chloride (to 176°F)
Calcium hydrocholdate (to 20%, to 70°F)
Calcium hydroxide (to 176°F)
Calcium nitrate (to 176°F)
Calcium silicate (to 70°F)
Calcium sulfide (to 176°F)
Caustic soda (to 50%, to 176°F)
Chloroacetone (to 70°F)
Citric acid (to 200°F)
Copper II chloride (to 176°F)
Copper cyanide (to 140°F)
Copper nitrate (to 176°F)
Copper sulfate (to 70°F)
Copper sulfide (to 70°F)

Diiron sulfide
Diisopropyl ketone (to 70°F)
Dimethyl holmiamide
Dibutyl cellosolve adipote (to 200°F)
Dextrose (to 176°F)
Disodium phosphate (to 70°F)
Dioctyl amine (to 120°F)

Ethyl chloride (to 140°F)
Ethyl silicate (to 70°F)
Ethylene glycol (to 212°F)
Ethlendiamine (to 120°F)
Ethyl alcohol (to 200°F)
Ethyl sulfate (to 200°F)

Flurobodc acid (to 140°F)
Formaldehyde (to 40%, to 70°F)
Freon 142B (to 70°F)
Floromethane (to 70°F)

Gelatin
Glucose
Glue (to 176°F)

Hydrochloric acid (to 20%, to 70°F)
Hydrogen peroxide (to 0.5%, to 70°F)
Hydrobromic acid (to 20%, to 200°F)
Hydrogen (to 140°F)
Hydrogen sulfide (to 140°F)
Hydroxybutane (to 70°F)

Iron Sulfate (to 70°F)
Iron II chloride (to 176°F)
Iron II nitrate (to 176°F)
Isobutyl alcohol (to 160°F)
Isobutyl acetate (to 160°F)
Isopropyl alcohol (to 160°F)

Lead sulfate (to 176°F)
Lactic acid (to 100%, to 140°F)
Lead acetate (to 200°F)
Lead nitrate (to 176°F)
Lead sulfamate (to 140°F)
Lead chloride (to 176°F)
Lime, soda (to 70°F)

Magnesium chloride (to 100%, to 176°F)
Magnesium hydroxide (to 176°F)
Magnesium sulfate (to 176°F)
Mercury (to 140°F)
Mercury II chloride (to 140°F)
Methyl alcohol (to 176°F)
Mirabilite (to 70°F)
Magnesium acetate (to 20%, to 120°F)

Nickel acetate (to 70°F)
Nickel chloride (to 176°F)
Nickel sulfate (to 70°F)
Nitric acid (to 25%, to 70°F)
Nitrogen, gas (to 70°F)

Octyl alcohol (to 160°F)
Oxalic acid (to 100%, to 250°F)
Oxygen, cold (to 70°F)
Ozone, [O_3] (to 70°F)
Orthoboric acid (to 70°F)

Phosphoric acid (to 85%, 200°F)
Potassium bichromatre (to 140°F)
Potassium bisulfite (to 176°F)
Potassium carbonate (to 176°F)
Potassium hydroxide (to 100%, to 200°F)
Potassium nitrate (to 100%, to 176°F)
Potassium phosphate (to 70°F)
Propyl alcohol (to 176°F)
Propylene glycol (to 70°F)

Salicylic acid (to 200°F)
Salt solution (to 100%, to 176°F)
Silicone greases (to 140°F)
Silicone oil (to 140°F)
Silver nitrate (to 176°F)
Soap solution (to 212°F)
Sodium bicarbonate (to 100%, 212°F)
Sodium bisulfate (to 176°F)
Sodium bisulfite (to 212°F)
Sodium borate (to 140°F)
Sodium carbonate (to 100%, to 176°F)
Sodium chloride (to 100%, to 176°F)
Sodium hydroxide (to 100%, to 70°F)
Sodium nitrate (to 176°F)
Sodium perborate (to 100%, to 140°F)
Sodium phosphate (to 100%, to 176°F)
Sodium sulfite (to 100%, to 140°F)
Sodium sulfate (to 100%, to 140°F)
Sodium thiosulfate (to 140°F)
Sulfuric acid (to 25%, to 140°F)
Sulfurous acid (to 20%, to 212°F)
Sucrose solution (to 250°F)
Sodium silicate (to 100%, to 176°F)

Tannic acid (to 100%, 140°F)
Triethanol amine (to 160°F)

Vinegar (to 140°F)

Zeolite
Zinc acetate (to 140°F)
Zinc sulfide (to 100%, to 140°F)
Zinc chloride (to 100%, to 176°F)

PondGard liner MEMBRANE IS NOT INTENDED FOR USE AS A WASTE CONTAINMENT LINER. CONTACT FIRESTONE BUILDING PRODUCTS FOR ADDITIONAL INFORMATION.

MSDS SHEETS "FAX ON DEMAND SERVICE" DIAL 800-243-6258

Firestone is pleased to announce the availability of Material Data Safety Sheets (MSDS) for each of FIrestone's systems and accessories via the facsimile machine. Firestone's new toll-free Fax On Demand service will enable you to receive the critical regulatory information that you need immediately, without the delay associated with mailing a complete set of MSDS. With this new system, up to three MSDS sheets can be requested and faxed simultaneously with one simple phone call. --for just in time critical information delivery.

Firestone's toll-free Fax On Demand Service is accessible by phoning 800-243-6258. An audio recording will ask you to enter a four-digit MSDS code that is associated with the specific Firestone product that you need, and your fax number with area code. If you don't know the appropriate MSDS code for a specific product, listen to the audio message for instructions on how to obtain a copy of the master list of MSDS codes.

Firestone MSDS are available via Fax On Demand in both English and Spanish.

The shrink-wrapped books of FIrestone MSDS will still be available. However, with the advent of the new system, the books will only be available in limited quantities.

Should you have a questions or problem with the Fax On Demand system, please phone Mary Ann Spranger at 800-428-4442, ext. 7072. Direct all technical questions concerning specific information on any MSDS sheet to Greg Brandt (ext. 7199) or Arvis McKamie (ext. 7141) at Firestone.

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