

***Seaman® Corporation***

***FiberTite Membrane Waterproofing System***

***For Green Roofs***

***FT-GRS-09***

*Note: This specification may be utilized for membrane roofing/waterproofing for conventional roof decks applications involving extensive garden or vegetated roofing systems. Project with slopes in excess of 1/4-in per foot should not utilize this specification without prior written approval/confirmation from FiberTite Technical Customer Services.*

## PART 1 - GENERAL

### 1.01 DESCRIPTION

This specification is applicable to extensive green roofs for conventional roofing applications. The waterproofing system utilizes FiberTite thermoplastic membranes and may be loose laid, adhered or mechanically fastened as the project dictates and includes all integral flashing and related accessories as manufactured and supplied by:

Seaman Corporation,  
1000 Venture Blvd., Wooster, Ohio 44691.  
Telephone: 1-800-927-8578  
Fax: 1-800-649-2737

#### A. Definitions

1. Extensive Green Roof Systems. Extensive Green Roof Systems are defined as low to no maintenance green roof systems that incorporate a waterproofing membrane that is “covered” with soil and vegetation in a growing medium that is less than six inches in depth and typically limits access to that required for maintenance of the garden and roof-top equipment. Extensive systems incorporate the following items within the assembly; Deck/substrate, insulation, leveling mat, waterproofing membrane, flashing membrane, sealant and adhesives, metal flashing, protection layer, drainage layer, filter fabric, growing medium, and plants/vegetation.
- \* The growing medium and selection of appropriate vegetation is critical to the system’s performance and must be properly engineered for each application. Seaman Corporation does not provide engineering for the garden/vegetated system and strongly recommends the use of a qualified landscape architect/engineer.

#### B. Scope

Furnish and install FiberTite membrane waterproofing system for application within a roof top garden, including insulation, cover-board, integral flashing protection layer, drainage medium and engineered garden system components as may be required.

The work included but is not necessarily limited to the following:

1. Substrate Preparation
2. Insulation
3. Waterproofing membrane
4. Membrane Flashing
5. Metal Flashing
6. Sealants and Adhesives
7. Protection Layer
8. Drainage Layer
9. Installation of Engineered Soil or Pre-packaged Garden System

#### C. Design Considerations

1. This specification is to be applied, without variation, to only those building roofs having deck structures capable of supporting the loads associated with this type of installation.
2. The building owner shall secure a Statement of Sound Roof Structure, and submit to **FiberTite Technical Customer Services (FTCS)**, indicating that the structure will accommodate the live and/or dead loads.
3. All applications require review and acceptance FTCS before any modification of this specification is valid.
4. FiberTite Notification of Award / Warranty Request Form (**FTR-WRF**) must be completed, signed by appropriate parties, submitted to, and approved by FTCS prior to any consideration for warranty.
5. Green Roof areas subject to maintenance traffic should be designed with proper access “paths”.
6. Excess “ponding” and/or water retention due to improper drainage design.
7. Conditions within an existing structure or roof, which would prohibit a successful application.
8. This specification does not provide code or jurisdiction acceptance as to wind, fire, etc. as they relate to Green Roofs.

## 1.02 QUALITY ASSURANCE

- A. FiberTite membrane waterproofing system for green roofs shall be installed only by an authorized FiberTite Roofing Contractor. Contractor authorization must be prior to bid and / or contract award.
- B. Installation of the waterproofing membrane, insulation, integral flashing, protection layer, drainage layer and engineered soil and/or prepackaged garden system shall be the responsibility of the authorized roofing contractor to ensure undivided responsibility.
- C. FiberTite membrane waterproofing system for garden roofs may include but are not limited to, the FiberTite membrane, flashing, protection layer, insulation, drainage layer, and applicable overburden. FiberTite membrane waterproofing systems shall be installed in accordance with current FiberTite Roofing System Specifications (GRS-06 and Addenda and Details) as amended to suit roof top garden conditions and/ or authorized by **FTCS**.
- D. Primary waterproofing materials shall be obtained from Seaman Corporation and shall be FiberTite brand.
- E. There shall be no deviations from approved contract specifications or shop drawings without prior written approval by the owner/owner representative and FTCS.
- F. A quality assurance inspection of the membrane system shall be performed by FTCS for acceptance and approval, if a FiberTite warranty is required on the project. The membrane application must be 100% complete and the inspection shall be coordinated prior to the installation of the above membrane "green roof" components.
- G. Water Testing of the completed membrane system for a minimum 24-hour duration is required for all material and labor warranties. The testing must be accomplished the presence of FTCS or an authorized representative appointed by Seaman Corporation. Written confirmation and acceptance of the test results by all parties is required.

## 1.03 SUBMITTALS

- A. The following information shall be submitted to FTCS for review before warranty consideration or acceptance.
  - 1. The project specifications or authorized applicator's proposal outlining the design parameters.
  - 2. Complete list of accessories or materials not manufactured or expressly authorized for use in Seaman Literature.
  - 3. Dimensioned outline of the roof system/green roof indicating all detail references.
  - 4. Dimensioned shop drawings illustrating non-FiberTite details. Details that do not conform with standard FiberTite details shall be returned with appropriate recommendations.
  - 5. Acceptance of the structural loading by a qualified engineer or design professional.
- B. At the time of contract award, the authorized contractor shall submit to the owner/owner's Representative the following:
  - 1. Most recent published technical literature and specifications issued by FTCS.
  - 2. Sample FiberTite warranty and letter from Seaman, authorizing the contractor.
  - 3. Contractor's approved copy of submittal form *FTR-WRF*.
  - 4. Dimensioned shop drawings, including roof plan detailing perimeter enhancement, flashing methods, terminations, and acceptance by FTCS.
  - 5. Material Safety Data Sheets (MSDS) relating to all products, and chemicals.

## 1.04 DELIVERY & STORAGE

- A. Deliver all materials to the job site in manufacturer's original, unopened containers, with legible labels and in sufficient quantity to allow for continuity of work.
- B. Select and operate material handling equipment in a safe manner, guarding against damage to existing construction or newly applied membrane/accessories and conforming to manufacturer's recommendations for handling and storage.

- C. All rolls of membrane shall be stored, lying down, elevated above the roof deck and completely protected from moisture with tarpaulins. (Manufacturer's packaging is not considered adequate protection from moisture.)
- D. Insulation shall be stored on pallets, fully protected from moisture with tarpaulins. (Manufacturer's packaging is not considered adequate protection from moisture.)
- E. Adhesives shall be safely stored, at temperatures above 40°F.
- F. Flammable materials shall be stored in a cool, dry area away from sparks and open flames. Follow all precautions as outlined in manufacturer's Material Safety Data Sheets.
- H. Materials, having been determined by the owner/owner's representative to be damaged, shall be immediately removed from the construction site and replaced at no cost to the owner.

#### 1.05 JOB CONDITIONS

- A. Take all necessary precautions regarding worker health and safety when using solvents and adhesives.
- B. Comply with all OSHA requirements for construction.
- C. The contractor must take precautions to prevent overloading of the structure or structural components.
- D. Coordinate installation among various trades to avoid and/or limit access and utilization of the newly installed membrane for material storage, construction staging, and mechanical and/or excessive foot traffic.
- E. Daily production schedules of new waterproofing membrane shall be limited to only that which can be made 100% watertight at the end of the day, including all flashing and night seals.

#### 1.06 COORDINATION

- A. Prior to installation of materials, a pre-construction conference will be held with the authorized contractor, Seaman Corporation representative, other trades and owner/owner's representative(s) to discuss the specified membrane waterproofing system, its proper application and the expectations of all parties involved. The authorized contractor and the owner/owner's representative shall notify all parties a minimum of fourteen days prior to the meeting.
- B. FiberTite Technical Customer Services shall be available for the pre-construction meeting and to make recommendations necessary to insure compliance with project specifications and/or any specification alternatives due to unforeseen job conditions.

#### 1.07 WARRANTY

##### A. *Inspections*

1. FiberTite Technical Customer Service Representative shall inspect the completed membrane waterproofing system on all systems requiring a FiberTite labor and material warranty. Upon acceptance, Seaman Corporation shall issue the specified warranty, subject to the terms and conditions of the sample warranty, which was accepted, as a portion of the submittal package.

##### B. *Available Warranties*

1. ***FiberTite Membrane Warranty*** provides the building owner coverage against the cost of repairing defects in the membrane only. This ten year limited warranty is offered at no cost to the owner.
2. ***FiberTite 10, 15 Or 20-Year Material and Labor Warranty*** provides the building owner coverage against the cost of repairing leaks as a direct result of either defects in the FiberTite waterproofing membrane or the workmanship involved in its installation.

### **C. Accessibility for Warranty Service**

1. It shall be the responsibility of the owner to remove and replace the overburden (garden system and all related components) to expose the membrane waterproofing system for any and all warranty services.

## **PART 2 - PRODUCTS**

### **2.01 GENERAL**

- A.** All products and components for the FiberTite membrane waterproofing system shall be supplied and/or approved in writing by Seaman Corporation.
- B.** Components other than those manufactured and or supplied by Seaman Corporation shall be submitted for review, prior to ordering. The performance of any product(s) not specifically authorized in writing for the project by Seaman Corporation shall be excluded from the warranty.
- C.** Additional components listed within this section may be used for extensive roof top garden applications. Not all products are required for each or all applications.

### **2.02 WATERPROOFING MEMBRANE**

#### **A. Approved Membrane**

1. Roofing membrane shall be nominal 0.036 inch thick FiberTite (KEE) alloy, reinforced with knitted polyester fabric as manufactured by Seaman Corporation conforming to the physical properties as outlined in Table 1 of this specification.
2. Roofing membrane shall be nominal 0.045 inch thick FiberTite-SM (KEE) alloy, reinforced with knitted polyester fabric as manufactured by Seaman Corporation conforming to the physical properties as outlined in Table 2 of this specification.

#### **B. Flashing Membrane**

Nominal 0.036 inch FiberTite or nominal 0.045 inch FiberTite-SM shall be used for all membrane flashing requirements.

### **2.03 ADDITIONAL MEMBRANE WATERPROOFING PRODUCTS**

Additional products for the membrane waterproofing system include all FiberTite brand roofing system accessories, including but not limited to, adhesives, mastics, sealants, fasteners, stress plates, termination bars, and pre-molded flashing accessories included by reference and as listed in Seaman Corporation Guide Specification for the Installation of FiberTite Roofing Systems FTR-GS06.

### **2.04 PROTECTION LAYER**

Minimum 12-oz/yd non-woven polypropylene geotextile fabric. Specifically engineered for roof top gardens and installed directly over the waterproofing membrane as protection against mechanical damages.

### **2.05 ROOF TOP GARDEN COMPONENTS (by others)**

- A.** The following components may or may not be included as part of the above membrane garden roof assembly.
  - 1. Drainage Board**  
Pre-formed polystyrene or polypropylene composite panels to promote water drainage and retention with and without integrated filter fabrics.
  - 2. Filter Fabric**  
Non-woven polypropylene fabric to prevent the passage of particles and/or growth medium into the water reservoirs.

**3. Polystyrene Insulation**

Minimum 40/60 psi moisture resistant closed cell polystyrene foam insulation with pre-cut drainage channels along the board edges and/or bottom to promote drainage at the membrane level.

**4. Moisture Retention Mat**

Thick, synthetic fibrous mat designed to retain moisture.

**5. Root Barrier**

**Not required in FiberTite membrane waterproofing systems for roof top gardens.**

**6. Growth Medium**

Engineered mixtures of mineral and organic soil components “specifically” selected by the landscape professional or architect/designer for the intended vegetation.

**7. Vegetation**

Low growing prairie grasses, sedums, herbs or flowers selected by the landscape professional or architect/designer as intended for the application with proper consideration given to geography and climate.

**B. PRE-ENGINEERED ROOF GARDEN SYSTEM.**

1. The following manufacturers offer pre-engineered systems and components that are approved for use with a FiberTite membrane waterproofing system for roof top gardens.

- a. GreenGrid – Weston Solutions, Inc
- b. Roofscapes

Green Roof Blocks; Florissant, MO

**2.06 RELATED MATERIALS**

**A. Hardscape**

- 1. Concrete Pavers – minimum 2’ x 2’ x 2” thick freeze thaw resistant pre-cast concrete paver blocks used for pathways and retention of growing medium.
- 2. Stone Ballast – nominal 2/1/2-in diameter river washed stone gradation #2, conforming to ASTM D448. Used for membrane ballast (see FiberTite Specifications FTR BA06) and/or drainage.
- 3. Pre-cast stone, wood timbers and other landscape items as necessary and/or appropriate to create transitions between the roof top garden and other roof areas.

**B. Vapor Retarder**

1. The decision regarding the inclusion of a vapor retarder within the garden roof system shall fall within the responsibility of the design professional.

**3.00 EXECUTION**

**3.01 GENERAL**

- A. The authorized contractor shall be responsible for providing a suitable substrate surface for the proper installation of FiberTite membrane waterproofing system, and specified components.
- B. Application of the FiberTite constitutes an agreement that the authorized contractor has inspected and found the substrate suitable for the installation of the membrane waterproofing system.
- C. The authorized contractor shall be responsible for coordinating the installation to insure that the system remains watertight at the end of each working day.

**3.02 SUBSTRATE PREPARATION**

- A. The contractor shall be responsible for verifying that the deck condition and/or existing roof construction are suitable for the specified installation of the FiberTite membrane waterproofing system.

- B. Examine surfaces for areas that will not drain properly, foreign material, unevenness or any other defect, which would prevent the proper execution and quality application of the FiberTite membrane waterproofing system as specified.
- C. Prepared substrate shall be smooth and levels properly cured, dry, and free of debris and/or any other irregularities.
- D. All substrates must have written acceptance from a design or structural specialist attributing to the fact that the structural components will provide suitable strength and integrity to support the anticipated dead and live loads.

### 3.03 INSTALLATION

#### A *Membrane Installation*

- 1. Refer to and follow Seaman Corporation General Guide Specification for the Installation of FiberTite Roofing Systems (FTR GS06) and appropriate addenda for the specific substrate and membrane application method(s) as dictated by project specifications; mechanically fastened (FTR MA06); adhered (FTR AD06) and/or ballast (FTR BA06).
- 2. FiberTite membrane waterproofing system shall utilize customized/pre-fabricated rolls when ever and where ever feasible. Use of roll goods must be reviewed and accepted for warranty consideration by FTCS.

#### B. *Hot Air Welding*

##### 1. *General*

- a. All field seams exceeding 10 ft. in length shall be welded with an approved automatic welder.
- b. All field seams must be clean and dry prior to initiating any field welding.
- c. Remove foreign materials from the seams (dirt, oils, etc.) with Acetone, MEK, or approved alternative. Use CLEAN WHITE COTTON cloths and allow approximately five minutes for solvents to dissipate before initiating the automatic welder. ***Do not use denim or synthetic rags for cleaning.***
- d. All welding shall be performed only by qualified personnel to ensure the quality and continuity of the weld.

#### C. *Flashing*

- 1. All penetrations (walls, curbs, pipes, drains etc.) shall be flashed according to the most current FiberTite Construction Details as published by Seaman Corporation.
- 2. All flashing terminations must extend above the growth media and include metal counter flashing when applicable.
- 3. All flashing shall be fully adhered to properly prepared, approved substrate(s).
- 4. Pipes and/or soil stack flashing and all inside and outside corner flashing details shall utilize Seaman pre-molded flashing components.
- 5. **PITCH PANS** shall not be incorporated into nor accepted as part of the membrane waterproofing system.

#### D. *Roof Drains*

- 1. Flash all drains in accordance with Seaman details.
- 2. Provide transition between the growth medium and the sump area (minimum 12-in all directions) around all drains.
- 3. Fill the transition/sump area with minimum 2.5-in round river washed gravel.
- 4. Perforated viewing boxes with removable lids are recommended for roof top garden assemblies.

#### E. *Inspection*

- 1. The project foreman and/or supervisor shall initiate daily inspections of all completed work which shall include, but is not limited to the probing of all field welding with a dull pointed instrument to assure the quality of the application and insure that any equipment or operator deficiencies are immediately resolved.
- 2. Excessive patching of field seams because of inexperienced or poor workmanship will not be accepted at time of FINAL INSPECTION FOR WARRANTY ACCEPTANCE.
- 3. Any deviation from pre-approved specifications and/or details requires written authorization from the **FTCS** prior to application to avoid any warranty disqualification.

### **3.04 QUALITY ASSURANCE WATER TEST**

- A. Water tests are required on ALL projects requiring a manufacturer's labor and material warranty. FTCS must be present at all water tests.
- B. Plug all drains and flood the associated area to a minimum depth of two inches. Let the water stand for 24 hours.
- C. Remove the water from the test area and thoroughly inspect all the area for leaks or signs of water entry below the waterproofing membrane. This should include both an above and below the surface examination.
- D. The contractor should be prepared to provide test cuts and the associated repairs if and when FTCS and/or the owner's representative request them.
- E. Any areas found to be wet or areas of water entry shall be "opened", dried, repaired to Seaman Corporation standards and retested as described within this section.

### **3.05 PROTECTION LAYER**

- A. The contractor shall loose lay the membrane protection layer over the finished waterproofing membrane.
- B. All seams must be shingled and overlapped a minimum of four inches.

### **3.06 APPLICATION OF GREEN ROOF COMPONENTS**

- A. The contractor shall limit traffic over the completed membrane waterproofing system.
- B. The contractor shall protect the completed membrane waterproofing system during the transportation of roof top garden components and growth medium.
- C. Install roof top garden components in proper sequence and methodology as specified by the landscape professional, architect/designer or roof top garden system manufacturer.

### **3.06 PROJECT CLOSE OUT**

- A. Remove any and all debris, excess materials, and scrap of any kind from the roof and surrounding premises prior to demobilization.
- B. Contractor should provide all appropriate close out documents to the owner's representative in a timely manner. This may include instructions on membrane maintenance, warranties, and punch list completion items.

Table 1; Physical Properties of FiberTite Membrane \* Required for Warranty up to and including 15-Years.

MATERIAL PROPERTY	TEST METHOD	ASTM D 6754-02 (min)	FIBERTITE TYPICAL
Fabric - Type	ASTM D 751	N/A	Polyester
- Weight	(oz.)	N/A	5.0
Thickness	ASTM D 75 (inches)	0.031	0.036 (nominal)
Root Barrier	FLL Guidelines (DIN 16 726/12/86)	N/A	pass
Breaking Strength	ASTM D 751 <i>Strip</i> (lbf)	265	>300
Breaking Strength	ASTM D 751 <i>Grab</i> (lbs.)	N/A	375 x 350
Tensile Strength	ASTM D 882 (psi.)	N/A	8500
Elongation	ASTM D 751 (%)	15	20 x 30
Seam Strength	ASTM D 751 <i>Grab</i> (%) of Breaking Strength	N/A	100
Tear Strength	ASTM D 751 (lbs.)	75	100
Puncture Resistance	Fed. Std. 101B / (lbs)	N/A	250
Dynamic Puncture	ASTM D 5635 (J) (ft - lbf)	10 7.4	25 18.4
Static Puncture	ASTM D-5602 (33 lbf)	Pass	Pass
Water Vapor Transmission	ASTM E-96 Proc. A (gm/m <sup>2</sup> /24hrs)	N/A	1.3
Water Absorption	ASTM D-471 (%) <i>one side exposure</i>	0.0, +6.0	± 3.0
Dimensional Stability	ASTM D-1204 (%)	1.3	0.5
Low Temperature Flexibility	ASTM D-2136 (F)	-30	-30
Shore "A" Hardness	ASTM D-2240	N/A	80
Hydrostatic Resistance	ASTM D 751 A (psi)	500	500
Accelerated Weathering	ASTM G155 Xenon Arc <i>cracking or crazing</i>	5,000 hr none	10,000 hr none
	ASTM G 154 QUV <i>cracking or crazing</i>	5,000 hr none	10,000 hr none
Fabric Adhesion	ASTM D 751 (lbf/in)	13	cannot peel
Fungi Resistance	ASTM G 21, 28 days sustained growth discoloration	none none	none none
Oil and Hydrocarbon Resistance	MIL-C 20696C <i>swelling, cracking or leaking</i>	N/A	none

Table 2; Physical Properties of FiberTite-SM Membrane \* Required for 20-Year Warranty.

MATERIAL PROPERTY	TEST METHOD	ASTM D 6754-02 (min)	FIBERTITE-SM TYPICAL
Fabric - Type	ASTM D 751	N/A	Polyester
- Weight	(oz.)	N/A	5.0
Thickness	ASTM D 75 (inches)	0.031	0.045 (nominal)
Root Barrier	FLL Guidelines (DIN 16 726/12/86)	N/A	pass
Breaking Strength	ASTM D 751 <i>Strip</i> (lbf)	265	>300
Breaking Strength	ASTM D 751 <i>Grab</i> (lbs.)	N/A	375 x 350
Tensile Strength	ASTM D 882 (psi.)	N/A	8500
Elongation	ASTM D 751 (%)	15	20 x 30
Seam Strength	ASTM D 751 <i>Grab</i> (%) of Breaking Strength	N/A	100
Tear Strength	ASTM D 751 (lbs.)	75	100
Puncture Resistance	Fed. Std. 101B / (lbs)	N/A	250
Dynamic Puncture	ASTM D 5635 (J) (ft - lbf)	10 7.4	30 22.3
Static Puncture	ASTM D-5602 (33 lbf)	Pass	Pass
Water Vapor Transmission	ASTM E-96 Proc. A (gm/m <sup>2</sup> /24hrs)	N/A	1.3
Water Absorption	ASTM D-471 (%) <i>one side exposure</i>	0.0, +6.0	± 3.0
Dimensional Stability	ASTM D-1204 (%)	1.3	0.5
Low Temperature Flexibility	ASTM D-2136 (F)	-30	-40
Shore "A" Hardness	ASTM D-2240	N/A	80
Hydrostatic Resistance	ASTM D 751 A (psi)	500	500
Accelerated Weathering	ASTM G155 Xenon Arc <i>cracking or crazing</i>	5,000 hr none	10,000 hr none
	ASTM G 154 QUV <i>cracking or crazing</i>	5,000 hr none	10,000 hr none
Fabric Adhesion	ASTM D 751 (lbf/in)	13	cannot peel
Fungi Resistance	ASTM G 21, 28 days sustained growth discoloration	none none	none none
Oil and Hydrocarbon Resistance	MIL-C 20696C <i>swelling, cracking or leaking</i>	N/A	none