PS Flood Barriers®

TEST PROCEDURES

FLOOD PROTECTION BARRIER

Recommended Flood Barrier & Flood Door Field Testing Procedures

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Hours of Operation
8 A.M. to 5 P.M. CT
Monday – Friday

IMPORTANT! Read entire Field Testing Procedure prior to conducting testing.

NOTICE Unauthorized modification of or to the Product voids this Limited Warranty. Authorized modifications, received in writing from PS Industries® Incorporated, as long as the modification is accomplished in strict accordance with PS Industries' instructions, does not void warranty. If this product is modified or altered without manufactures permission, manufacturer is no longer responsible for the product design, engineering, or performance and owner assumes all responsibility. To request product modifications contact PS Industries Incorporated, 1150 S. 48th Street, Grand Forks, ND 58201, phone 877-446-1519, email: 4psinfo@psindustries.com

I. Introduction

A. Field testing of PS Flood Barriers® Flood Barriers allows the user to validate the function, performance, and installation of the watertight system after final installation.
   1. PS Flood Barriers' flood protection products are designed and factory tested to be substantially impermeable to the passage of water. Depending on installation conditions and tolerances, leakage may occur and precautions should be taken to mitigate damage on the dry side of barriers during testing.

B. PS Flood Barriers' flood protection products are classified as Type 2 Closures by the U.S. Army Corps of Engineers Flood Proofing Regulations EP1165-2-314, 15 Dec 1995, Sec. 701.1.2 "Type 2 Closures - shall form essentially dry barriers or seals, allowing only slight seepage during the hydrostatic pressure conditions of flooding to the Regulatory Flood Datum (RFD)".

C. Retain this document for future reference.

D. Product registration is an essential step to protecting your product, register Online at psindustries.com/contact/register-your-product/

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II. Testing Qualifications

A. A flood barrier shall be capable of withstanding the hydrostatic loads caused by floodwaters.

B. Acceptable leakage rates through opening barriers shall be determined by the customer based on their specific site conditions and requirements.

1. Leakage rates in excess of 0.01* gallons per minute (GPM) per linear foot of wetted perimeter may indicate improper barrier function.
2. The wetted opening perimeter is defined as the length of the opening width plus two times the water depth.

C. In the case of Pedestrian Flood Doors, subjected to water height above door hardware penetrations, leakage rates will be dependent upon customer's door hardware type and options.

1. In all cases, leakage rates must be within the leakage rates established by the project specifications.
2. If the lockset is submerged during a field test of flood event, it must be removed, dried, and re-lubricated. Additionally, the hardware chamber inside the door panel may accumulate water and must be completely dried with a vacuum or rag before reinstalling lockset. Damage to the lockset caused by water is not covered under warranty.

CRITICAL DO NOT EXCEED THE MAXIMUM DESIGN WATER PROTECTION HEIGHT OF THE PRODUCT.

III. Hydrostatic Test-Field Procedure

STEP 1. Ensure flood barrier is installed according to PS Flood Barriers' installation instructions and tolerances.

STEP 2. Construct a test enclosure apparatus to subject the wet-side of the flood barrier and adjacent installation interface to hydrostatic loading.

a. Design the apparatus in a way to minimize the volume of water required to reach the water height required for the test.

b. The apparatus can be constructed of various materials including wood, metal, sandbags, or other materials to support the water loading up to the desired water test level.

c. Poly sheet, tapes, expanding foam, and seasonal sealant (removable) may assist in waterproofing the test apparatus.

STEP 3. Fill the test apparatus with water to the determined test level and no greater than the maximum design water protection height as specified by PS Flood Barriers.

a. In the case of PD-520 pedestrian (walk door) flood doors, if the test will require water submersion above door hardware elevation, the sealed hardware compartment must be manually emptied of water after the test by removing the door hardware and siphoning, vacuuming, and air drying prior to re-installing door hardware.

STEP 4. Commence test: With the test apparatus filled with water to the test level, remove all prior leakage on dry-side of flood barrier and begin a timed 15 minute leakage collection test if leakage is present.

a. Use a wet vacuum or other means to collect water leakage for a 15 minute interval and measure volume with a device capable of precision to the nearest ounce.

STEP 5. Calculate resulting leakage rate in terms of (Gallons)/(Minute)/(Feet of wetted perimeter).

a. The wetted opening perimeter is defined as the length of the opening width plus two times the water depth.

b. The formula for leakage rate is provided below:

$$\frac{\text{Gallons}}{\text{Minute}} / \text{foot} = \frac{\text{Ounces Leakage}}{128\ (\frac{\text{oz}}{\text{gal}})} \times \frac{1}{15\ \text{Minutes}} \times \frac{1}{\text{Feet of wetted perimeter}}$$

STEP 6. Determine if the calculated leakage rate is less than the predetermined allowable leakage rate.

a. Document test results. If leakage exceeds the acceptable level refer to the *Troubleshooting Leakage* section in this document and repeat **STEP 3** through **STEP 6**.

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IV. Hose Test-Field Procedure

A. In applications where the Hydrostatic Test-Field Procedure is not practical, the Hose Test-Field Procedure can assist in verifying that the product achieves continuous gasket compression and that installation junctions are watertight. The test is developed to subject the perimeter gasket, installation joints, and other potential leak paths to a low-pressure laminar hose stream. If leakage is found during the test procedure, it can be an indication that the door is not achieving adequate or continuous initial gasket contact. High pressure or turbulent hose streams shall not be used for the hose test procedure because the turbulent water pressure may cause leakage that is not representative of how the flood barrier will perform in actual hydrostatic test conditions where rising flood water compresses gaskets further as water pressure builds up on the flood barrier surface area. Hose stream tests that have not been tested and approved by PS Flood Barriers may not provide results that are meaningful to the validation of the flood barrier installation. Only a full hydrostatic field test can provide performance data that mimics how the flood barrier will perform under real world flooding conditions.

STEP 1. Perform a hose test by spraying areas of the product that have leakage potential such as gasket interfaces and between the frame and existing structure.

STEP 2. The water shall be applied to the door with a smooth bore nozzle, with an internal exit diameter of $^{7}/_{16}$ inches at a rate of 4.0 gallons per minute (GPM). The test can be conducted with a simple garden hose and flow rate can be calibrated by filling a measure bucket (i.e. 5 gallon pail) while monitoring a stopwatch.

STEP 3. Test water shall be sprayed perpendicularly to the barrier surface at a distance of no less than 12 inches and no greater than 18 inches. The nozzle shall be moved slowly back and forth for a period of 10 seconds per foot length of tested joint.

STEP 4. Leakage rate shall not exceed the predetermined allowable leakage rate or the leakage allowed by the discretion of the Test Engineer.

NOTICE Leakage to the dry-side of the barrier indicates areas of low or inadequate gasket contact/compression. Inspect these areas to determine if adjustments or repairs are required. Unlike the hose test procedure, during actual flooding scenarios hydrostatic water pressure forces floor barrier panels in towards gaskets, creating more gasket compression as flood waters rise. It should be a consideration of the Test Engineer, that leakage that is present during a hose test that is located higher up on the flood barrier panel may not be problematic in a flood event, because additional gasket compression forces will be accumulated as flood waters rise. Conversely, hose test leakage found at the base of a flood barrier may be more indicative of performance during a real flood scenario, at least until flood waters generate more gasket pressure.

V. Chalk Test-Field Procedure

A. The Chalk Test provides a reasonable means of inspecting for continuous gasket contact after the initial product installation. Use large sidewalk chalk in a color that is easily visible on the gasket and the sealing surface.

STEP 1. Rub chalk onto the sealing surface, not the gasket. Be sure that the surface is evenly coated. Take special care in corners, sealed joints, and on long spans (>15ft).

STEP 2. Slowly close barrier to its fully deployed state to prevent the momentum of the barrier from causing additional gasket compression. Engage and tighten all latching, if present.

STEP 3. Open barrier and check the chalk line on the gasket for gaps in the chalk mark.

STEP 4. If there is a gap, check the corresponding point on the sealing surface where there was a break to determine the cause.

a. Adjusting latches, frame squareness, or repairing critical sealant joints can typically remedy gasket contact issues.

STEP 5. Adjust the barrier as needed, clean chalk off the gasket surface, and repeat **STEP 1** through **STEP 4**.

STEP 6. When there are no breaks in the chalk line, clean chalk off barrier and gasket with a damp rag.

VI. Troubleshooting Leakage

STEP 1. Refer to the Approved for Construction Drawings and Installation Instructions/ Operation and Maintenance Manual to ensure product is installed properly and within manufacturer's acceptable tolerance.

STEP 2. Adjust latching to allow for continuous gasket contact.

STEP 3. Ensure opening area and gaskets are free of debris.

STEP 4. Use a light source on the opposing side of the flood barrier to help identify potential leak paths.

a. The presence of light passing between gaskets sealing surfaces may indicate potential leak paths.

b. Hydrostatic loading on the barrier can provide additional compression to gaskets that can aid in sealing.

STEP 5. Localized leakage at joining gasket junctures or corners of door can often be remedied with the use of manufacture approved sealants to create a smooth sealing surface for gaskets and fill small imperfections in the gasket contacting surfaces.

a. Closely observe leakage to determine the leakage path.

b. Leakage often occurs when a gasket sealing interface transitions from one material to another or where gaskets are required to seal to the existing building structure.

c. With the barrier open or stored, apply sealant using discretion to create a smooth surface for gasket contact near observed leakage region. Where gaskets and jambs contact the floor, use a finger or caulk smoothing tool to create a small radius-ed sealant bead along base of jamb perimeters and floor.

d. Allow sealants time to partially cure prior to using flood barrier.

e. Most minor localized leakage can be remedied with sealant.

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Hydrostatic Testing Data Documentation Table						
PRODUCT SN	MODEL	DATE	WATER TEST HEIGHT (FT)	LEAKAGE COLLECTED IN 15 MINUTE INTERVAL	LENGTH OF WETTED PERIMETER (FT)	GALLONS PER MINUTE PER FOOT OF WETTED PERIMETER

TEST LOCATION: _____

TEST CONDUCTED BY: _____

SIGNATURE: _____

WITNESSED BY: _____

SIGNATURE: _____

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Hose Testing Data Documentation Table						
PRODUCT SN	MODEL	DATE	WATER TEST HEIGHT (FT)	LEAKAGE COLLECTED IN 15 MINUTE INTERVAL	LENGTH OF WETTED PERIMETER (FT)	GALLONS PER MINUTE PER FOOT OF WETTED PERIMETER

TEST LOCATION: _____

TEST CONDUCTED BY: _____

SIGNATURE: _____

WITNESSED BY: _____

SIGNATURE: _____

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Chalk Testing Data Documentation Table						
PRODUCT SN	MODEL	DATE	WATER TEST HEIGHT (FT)	LEAKAGE COLLECTED IN 15 MINUTE INTERVAL	LENGTH OF WETTED PERIMETER (FT)	GALLONS PER MINUTE PER FOOT OF WETTED PERIMETER

TEST LOCATION: _____

TEST CONDUCTED BY: _____

SIGNATURE: _____

WITNESSED BY: _____

SIGNATURE: _____

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