



TUFF-N-DRI® on the outside guarantees a dry, cozy basement inside.

A resilient waterproofing membrane and effective drainage board work together for unsurpassed performance.

Before you build another home with a basement, it's important to consider how the basement will be protected from water damage. Dampproofing doesn't guarantee a dry basement; it can crack and allow water to seep through the foundation. For a guaranteed dry basement, TUFF-N-DRI® Exterior Foundation Waterproofing System is your best choice.

TUFF-N-DRI® Exterior Foundation Waterproofing System consists of two components: TUFF-N-DRI® Waterproofing Membrane and WARM-N-DRI® Drainage and Insulation Board.

TUFF-N-DRI Membrane is a unique polymer-enhanced asphalt which creates a highly elastomeric, monolithic waterproof membrane when applied to poured concrete and block foundation walls. The membrane is tougher and more resilient than dampproofing materials commonly used on residential foundations. At the same time, it is priced very competitively with other waterproofing products.

WARM-N-DRI Foundation Board, a rigid fiberglass board manufactured by Owens-Corning, acts as a drainage medium to relieve hydrostatic pressure from the foundation walls. The board also adds insulating value to the foundation and protects the waterproofing membrane during construction and backfilling.

TUFF-N-DRI Waterproofing System was introduced to the residential housing market in 1983. Our history includes over 175,000 satisfied homeowners nationwide. These homeowners

are enjoying the benefits of dry, affordable, lower level living space — perfect for a home theater, exercise room, kids' playroom, or a protective haven from severe weather.

Spray installation for seamless results.

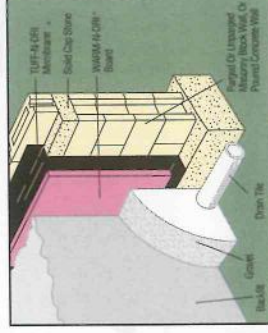
TUFF-N-DRI Membrane is spray applied to foundation walls, forming a continuous film. There are no gaps or seams through which water can enter the foundation.

Excellent adhesion ensures bond.

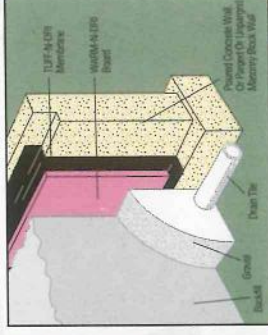
TUFF-N-DRI Membrane has unique polymer enhancements that provide a strong bond to poured concrete, parged masonry block, and unparged masonry block foundations.

Superior durability means long life.

Resilient TUFF-N-DRI Membrane resists mold growth, bacterial and chemical attack. Unlike many dampproofing products, TUFF-N-DRI



Typical installation of TUFF-N-DRI® System on concrete block wall.



Typical installation of TUFF-N-DRI® System on poured concrete wall.

Membrane will not break down as a result of prolonged contact with water and soil. And the superior elongation properties allow TUFF-N-DRI Membrane to span minor cracks over years of service.

Guaranteed for 10 years.

TUFF-N-DRI Waterproofing System comes with a transferable 10-year performance warranty when applied to residential below grade foundation walls by a TUFF-N-DRI Selected Waterproofing Contractor. See the warranty for specific coverage and limitations.

Enhanced foundation drainage assures dry comfort.

WARM-N-DRI Foundation Board provides a direct path for water percolating through the soil to be directed to the perimeter drainage system. This eliminates hydrostatic pressure on the basement walls. TUFF-N-DRI Waterproofing System installations require a functioning perimeter drainage system to move the water drained by WARM-N-DRI away from the foundation.

Protected from condensation and damage.

WARM-N-DRI Foundation Board keeps foundation walls closer to the air temperature of the basement. This helps reduce condensation. Reduced condensation ensures a less humid, more comfortable basement. The placement of WARM-N-DRI on the wall's exterior also helps reduce the risk of damage due to freeze/thaw cycles, particularly if WARM-N-DRI is extended to the sill plate.

In addition, WARM-N-DRI will protect TUFF-N-DRI Membrane from damage during backfilling or damage from other construction trades. The compressibility of WARM-N-DRI will also absorb moderate soil expansion and help protect the basement wall.

Meets high energy efficiency and Model Energy Code requirements.

WARM-N-DRI Foundation Board is available in $\frac{3}{4}"$, $1\frac{3}{16}"$, $2\frac{3}{8}"$ thicknesses providing R-values of 3.1, 5.0, 10.0 respectively. WARM-N-DRI can be terminated at grade or extended to the sill plate. Computer analysis of home energy use indicates that a considerable portion of a typical home's energy loss is represented by heated, uninsulated basements. By installing WARM-N-DRI to the sill plate, the entire basement wall is insulated, and energy efficiency is maximized.

Many states have adopted the Model Energy Code. Because WARM-N-DRI provides insulating performance, it assists with compliance to this code.

TUFF-N-DRI® System Application

Expert Installation

TUFF-N-DRI Waterproofing System is installed only by TUFF-N-DRI Selected Waterproofing Contractors. These contractors undergo extensive training and are monitored for quality performance to insure the highest quality application.

Surface Preparation

The wall surface should be smooth and monolithic. Remove loose aggregate and sharp protrusions from the wall. Voids, spalled areas and exposed aggregate should be patched with a suitable mastic before spraying. TUFF-N-DRI Membrane does not require any priming or special preparation.

System Application

TUFF-N-DRI Membrane is sprayed evenly over the entire foundation wall. After the surface has had adequate time to set-up, WARM-N-DRI Foundation Board is applied over the waterproofing membrane.

TUFF-N-DRI Waterproofing System can be applied when ambient temperatures are as low as 20°F, allowing for fewer construction delays. TUFF-N-DRI Membrane may be applied on poured concrete and block foundations. On poured concrete basements, TUFF-N-DRI System can be applied as soon as the forms are removed, and on block basements, as soon as the mortar is dry.

Considerations

TUFF-N-DRI Membrane should not be exposed to sunlight for more than 15 days. TUFF-N-DRI Membrane should not be applied at an



ambient temperature below 20°F. WARM-N-DRI Foundation Board is required for all warranted TUFF-N-DRI Waterproofing

System installations. WARM-N-DRI Board must extend to the footing and connect through gravel or channels to a functioning perimeter drainage system.

Maintenance

TUFF-N-DRI Waterproofing System products do not require maintenance as long as they are installed according to the manufacturer's recommendations and are unaltered by other job site trades.

Environmentally-friendly and safe

TUFF-N-DRI Waterproofing System is environmentally friendly to the air and ground water on the job site. TUFF-N-DRI Membrane uses a non-flammable, water-based carrier that meets VOC regulations in all 50 U.S. states. It has been thoroughly tested by independent labs using Federal EPA standards for leaching. The results prove that no harmful leaching of the TUFF-N-DRI Membrane occurs.



Nothing protects your basement better than TUFF-N-DRI Exterior Foundation Waterproofing System.



Black TUFF-N-DRI Waterproofing Membrane:

- Protects your basement from dampness, even after it settles.
- Seals across cracks up to 1/16".
- Eliminates water seepage into the foundation.

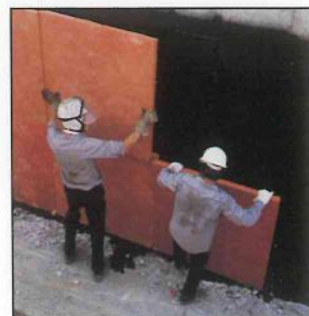
Pink WARM-N-DRI® Drainage and Insulation Board:

- Drains water away from your basement walls.
- Relieves hydrostatic pressure on walls.
- Insulates for a warmer, more comfortable living area.

Professionally trained contractors install the TUFF-N-DRI system to assure quality results. They begin by installing the black TUFF-N-DRI patented elastic waterproofing membrane that seals basement walls and protects your basement from dampness. The pink WARM-N-DRI

Drainage and Insulation Board is installed next. This high-quality insulation board not only insulates the basement walls, it also protects the waterproofing membrane from damage. More

importantly, it relieves hydrostatic pressure and drains water away. Only the TUFF-N-DRI system combines these two important layers to protect your home and assure a dry, comfortable basement living area.



Professionally trained TUFF-N-DRI contractors install the patented elastic waterproofing membrane that seals basement walls across cracks up to 1/16", then the high-quality insulation board that drains water away.

Dampproofing vs. TUFF-N-DRI Waterproofing.

There's no comparison.

Dampproofing is little more than a vapor barrier. It retards water penetration, but will not bridge shrinkage cracks or stop water under hydrostatic pressure. As a result, dampproofing cannot assure dry basement walls. Only TUFF-N-DRI assures you a dry, comfortable basement.



Dampproofing can allow water damage to occur as shown. TUFF-N-DRI assures a dry basement.

Because unlike dampproofing, TUFF-N-DRI uses a patented elastic membrane that can actually stretch over cracks up to 1/16". So even if the foundation walls of your house crack, the TUFF-N-DRI system helps seal cracks to keep your basement walls dry. And only TUFF-N-DRI is backed by a 10-year limited warranty.

Professionally-installed, the TUFF-N-DRI system also includes an insulation board that helps keep your basement warm, dry and comfortable. The WARM-N-DRI Drainage and Insulation Board relieves hydrostatic pressure on your basement walls and drains water away from your home.

The TUFF-N-DRI system protects your home in more ways than one.

• Condensation protection

Not only does TUFF-N-DRI protect your home from dampness and leakage, WARM-N-DRI Drainage and Insulation Board helps keep foundation walls closer to the air temperature of the basement which can help reduce condensation. The insulation can also help reduce the risk of damage due to freeze/thaw cycles.



TUFF-N-DRI is the best for your home. Backed by industry's best 10-year warranty.

• Energy efficiency

WARM-N-DRI Drainage and Insulation Board also helps save energy by providing insulation value of R-3.1 to R-10. When the board is installed to full plate, it insulates the entire basement wall and reduces energy use.

• Foundation protection

Finally, WARM-N-DRI Drainage and Insulation Board protects the waterproofing membrane from damage caused by the backfill or damage from construction trades. It also will absorb moderate expansion and help protect the basement wall.

The Key to Healthy Homes.



Mold takes to water. Then to the air.

Damp conditions found in many ordinary basements offer an ideal breeding ground for mold and mildew. No wonder one of the environmental factors most often associated with respiratory disease is building dampness.²

The different varieties of molds number in the thousands, yet they have one trait in common. To reproduce, they fling millions of tiny spores into the air. And that means mold growing in the basement can spread spores throughout the entire home.

Some mold spores are known to trigger a variety of health problems – especially among children and the elderly. The effects can include respiratory allergies, asthma, headaches, meningitis, skin rashes and sleep disorders. The American Lung Association reports that the increase in asthma alone has grown more than 72% among children and 62% among adults in a single decade.

But don't fret. There's an effective way to help protect your new home and guard your family against these potential health hazards.

TUFF-N-DRI® keeps water out. So mold can't get a foothold.

To minimize basement mold and mildew, you need to minimize basement moisture. A thorough waterproofing system is your basement's first and best line of defense. The reason? Unlike methods such as ventilation and dehumidifying, waterproofing prevents moisture from getting in rather than removing moisture that's already there. And no other option is more effective than TUFF-N-DRI to stop leaks, seepage and condensation.

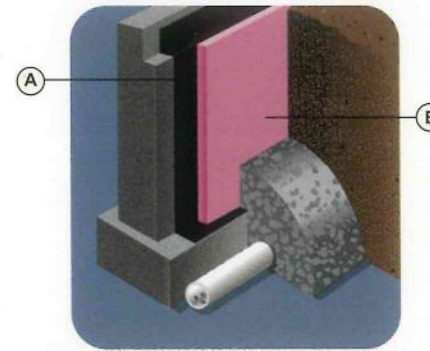
The secret is TUFF-N-DRI's special two-part system (see diagram). The flexible waterproofing membrane prevents water entering from the outside, while a quality foundation board reduces condensation from forming on the inside of basement walls.



The protection of TUFF-N-DRI is so strong, it's backed by a 15-year transferable performance warranty.* So you can enjoy a healthier home right away, and a healthier resale value down the road.

Your basement can be more than healthy. It can be beautiful.

TUFF-N-DRI delivers other attractive advantages in addition to keeping your home healthier. With a Guaranteed Dry Basement, you'll have the confidence to transform your lower level space into areas of luxury living.



A) TUFF-N-DRI's flexible membrane is spray-applied to seamlessly seal out water penetration. B) A quality foundation board protects the membrane, insulates for energy efficiency, reduces interior condensation and helps drainage.

Have your builder add a spacious home theater. Design a luxurious guest suite. Build a modern home office with room to get the job done. Use your imagination to make the most of your TUFF-N-DRI basement. You'll not only live healthier. You can live it up.

Talk to your builder about TUFF-N-DRI.

Make sure you build a healthier, happier home from the basement up. Insist that your builder include the TUFF-N-DRI Basement Waterproofing System. For more details about TUFF-N-DRI, talk to your builder or your local select waterproofing contractor (see back of brochure). Or visit www.TUFF-N-DRI.com.

*See actual warranty for full details.



SPEC DATA®

This Spec-Data sheet conforms to editorial style prescribed by The Construction Specifications Institute. The manufacturer is responsible for technical accuracy.

1. PRODUCT NAME

TUFF-N-DRI® Exterior Foundation Waterproofing System

2. MANUFACTURER

Koch Materials Company
Waterproofing Products Group
PO Box 2155
Heath, OH 43056-1132
Phone: (800) 379-2768

3. PRODUCT DESCRIPTION

Basic Use: TUFF-N-DRI Exterior Foundation Waterproofing System consists of a single component fluid-applied membrane combined with a rigid fiberglass insulation board for vertical below grade concrete or masonry foundation walls.

TUFF-N-DRI® Membrane forms a tough, resilient elastomeric film that will bridge non-structural cracks commonly found in concrete substrates. TUFF-N-DRI Membrane can be applied as soon as the concrete forms are pulled or the mortar is dry. The monolithic coating on the substrate eliminates any concern for seams, wrinkles or "fish-mouths" in the waterproofing membrane.

WARM-N-DRI® Insulation/Drainage Board is used to protect TUFF-N-DRI Membrane during construction and backfilling. WARM-N-DRI Board acts as a drainage medium to prevent hydrostatic pressure from building up on the foundation walls and adds thermal resistance (R-5 per nominal 1" thickness). WARM-N-DRI Board adheres directly to the TUFF-N-DRI Membrane. Mechanical fasteners may be used as needed.

Limitations: TUFF-N-DRI Waterproofing Membrane should not be applied where it will be exposed to sunlight for more than 15 days. The TUFF-N-DRI Membrane should only

be applied to substrates with a surface temperature above 20°F. If WARM-N-DRI Board is installed above grade, it must have an exterior covering. TUFF-N-DRI Membrane and WARM-N-DRI Board are not designed for horizontal use.

Composition and Materials: TUFF-N-DRI Membrane is a polymer-modified asphalt that is fluid-applied.

WARM-N-DRI Board is an unfaced, rigid fiberglass board hav-

ing protection, drainage and insulation characteristics.

Sizes: WARM-N-DRI Board is available in 4' x 4' and 4' x 8' sizes with nominal thicknesses of 3/4", 1 3/16" and 2 3/8".

4. TECHNICAL DATA

Refer to tables.

5. INSTALLATION

Storage: TUFF-N-DRI Membrane should be stored in a dry area where the temperatures do not exceed 90°F

TUFF-N-DRI Membrane

Properties	Typical Results	Test Methods
Color	Black	
Application Thickness	60 mils [wet]¹	
Adhesion to Concrete	Exceeds	ASTM C 836-89a
Elongation	800%	ASTM D 412-92
Low Temperature Flexibility	Flexible to -10°F	See²
Crack Bridging Ability	Exceeds 10 Cycles to 1/8" at -15°F	ASTM C 836-89a
Water Vapor Permeance	0.08 Perms for 40-mil Dry Coating (grain/ft²/hr. in Hg)	ASTM E 96-94 Dry method
Liquid Water Absorption	0.3% (wt.)	ASTM D 1228³
Resistance to Degradation in Soil	Good	ASTM E 154-88
Mold Growth and Bacterial Attack	No Degradation	ASTM D 3273-94 ASTM D 3274-88
Resistance to Hydrostatic Head (ft. of water)	Could not Generate Hydrostatic Pressure	See⁴

Footnotes:

1. Membrane cures [drys] to 40 mils.
2. Bend waterproofing compound around 1" mandrel.
3. 72 hour water soak 1" x 2" x 0.040" samples of waterproofing compound.
4. When WARM-N-DRI board was applied to the TUFF-N-DRI membrane the water drained away at a faster rate than the surrounding soil percolated eliminating any hydrostatic build-up.

TUFF-N-DRI is a registered trademark of Koch Materials Company.
WARM-N-DRI is a registered trademark of Owens-Corning Corporation.



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This unit has been updated to indicate references to both MasterFormat™ 1995 Edition and MASTERFORMAT® 1988 Edition. The references to the numbers and titles in MasterFormat 1995 Edition are indicated above the references to the numbers and titles in MASTERFORMAT 1988 Edition.

95: 07100
88: 07100

WARM-N-DRI Board

Type	Unfaced Rigid Fiberglass Board
Physical Appearance	Pink, Unfaced
Board Size	4' x 4', 4' x 8'
Board Thickness	3/4", 1 3/16" and 2 3/8"
Thermal Resistance	3/4" - R-3.1 1 3/16" - R-5.0 2 3/8" - R-10.0

Drainage Ability	Board Thickness	gal./hr/lin. ft.
Hydraulic gradient of 1.0	3/4"	74
	1 3/16"	118
	2 3/8"	237

Compression Properties of WARM-N-DRI Board¹

Pressure lbs./sq. ft.	% Compression For 3/4", 1 3/16" and 2 3/8"	Depth These Pressures Are Found	
		Clay ²	Wet Sand ³
200	4%	4'	10'
400	8%	8'	20'
600	11%	12'	30'
800	15%	16'	40'

At 65% compression, WARM-N-DRI board has the drainage capabilities of coarse sand.

¹ For depths greater than above, please consult Koch Materials Technical Manager at (800) 379-2768.

² Angle of Repose of 25°, Density of 120 lbs./cu. ft.

³ Angle of Repose of 46°, Density of 122 lbs./cu. ft.

5. INSTALLATION

Storage: TUFF-N-DRI Membrane should be stored in a dry area where the temperatures do not exceed 90°F for an extended period of time. Store all materials away from sparks or flames. Minimum storage temperature is 50°F.

Surface Preparation: Concrete surfaces should be smooth and clean and dry. Remove loose aggregate and sharp protrusions from the wall. Footings should be swept of all loose aggregate. Voids, spalled areas and exposed aggregate should be patched with a suitable mastic before spraying.

Application: TUFF-N-DRI Membrane is spray-applied, without the use of a primer, to the foundation walls as soon as the forms have been removed or mortar is dry.

WARM-N-DRI Board should be applied over TUFF-N-DRI while the membrane is still tacky.

Protection of Membrane: WARM-N-DRI Board is required for all TUFF-N-DRI applications. WARM-N-DRI Board protects the waterproofing membrane during construction and backfilling. It also provides drainage directly to the drain tile, as well as insulating the foundation wall.

WARM-N-DRI Board must extend all the way to the footing and must connect through a gravel fill to a positive drainage system.

6. AVAILABILITY AND COST

Availability: The TUFF-N-DRI system is available through a national network of Koch Selected Waterproofing Contractors.

Cost: The TUFF-N-DRI system is competitively priced. For further information, call Koch Materials Company at (800) 379-2768.

7. WARRANTY

Koch warrants that TUFF-N-DRI Membrane and WARM-N-DRI Board, if installed in accordance with our instructions, will meet our published specifications and will be free from defects in material or workmanship for a period of one (1) year following date of original delivery by us. Call for details on the availability of extended product warranties.

Should any material be otherwise than as warranted, our liability under this warranty shall be limited to replacement of such material to the point of our original delivery. The foregoing constitutes our exclusive obligation and we make no express or implied warranties, or any warranty of merchantability or fitness for any particular purpose whatsoever, except as stated above. In no event shall Koch Materials Company be liable for incidental, indirect or consequential damages. This warranty is expressly limited to the contractors, and is not intended as a consumer warranty.

8. MAINTENANCE

None required.

9. TECHNICAL SERVICES

Koch waterproofing products are backed by a technical support staff that is available to provide information and assistance in selection or reviewing waterproofing and insulation requirements. Call (800) 379-2768.

History: TUFF-N-DRI system has been installed on schools, churches, airports, hotels and other commercial jobs since 1983.

10. FILING SYSTEMS

- SPEC-DATA® II
- Additional product information available upon request.

JERRY'S BASEMENT
WATERPROOFING, INC.

3030 Keystone Drive

OMAHA, NE 68134-4843

Phone - (402) 392-2211

Fax - (402) 392-4661

SPECIFICATIONS



**JERRY'S BASEMENT
WATER PROOFING, INC.**
3030 Keystone Drive
OMAHA, NE 68134-4843
Phone - (402) 392-2211
Fax - (402) 392-4661
1-800-335-3779

Your local select waterproofing contractor

MEMBRANE PROPERTIES

Type Polymer-enhanced asphalt liquid-applied membrane

Color Black	
Solids 61 (percent by weight)	
Density 8.1 lbs/gal	
Application Airless spray	
Application Temperature Minimum 20° F	
Cure Time 16-24 hrs	
Thickness 60 mils (wet) ¹	
Adhesion to Concrete	<i>Results Exceeds</i>
Elongation	<i>Results</i> 800%
Low Temperature Flexibility	<i>Results</i> Flexible to -10° F
Crack Bridging Ability	<i>Results</i> Exceed 10 Cycles to 1/8 in. at -15° F
Water Vapor Permeance	<i>Results</i> 0.08 perms for 40-mil dry coating (grains/sf/hr) <i>Method</i> ASTM E-96 Dry Method
Liquid Water Absorption	<i>Results</i> 0.3% (wt.) <i>Method</i> ASTM D-1228 ³
Resistance to Degradation in Soil	<i>Results</i> Good <i>Method</i> ASTM E-154
Mold Growth and Bacterial Attack	<i>Results</i> No Degradation <i>Methods</i> ASTM D-3273, ASTM D-3274
Resistance to Hydrostatic Head (ft. of water)	<i>Results</i> Could not generate hydrostatic pressure <i>Method</i> See ⁴

1. Membrane cures (dries) to 40 mils. 2. Bend waterproofing compound around 1 in. mandrel. 3. 72-hour water soak 1" x 2" x 0.40" samples of waterproofing compound.
4. When foundation board was applied to TUFF-N-DRI the water drained away at a faster rate than the surrounding soil percolated, eliminating any hydrostatic build-up.

BOARD PROPERTIES

Type Pink unfaced rigid fiber glass board

Board Size	4' x 8'	4' x 4'	
Board Thickness	3/4"	1-3/16"	2-3/8"
Drainage ability (Hydraulic gradient of 1.0)			
<i>Board Thickness</i>	3/4"	1-3/16"	2-3/8"
<i>Gallons/Hour/Lineal Foot</i>	74	118	237
Thermal Resistance			
<i>Board Thickness</i>	3/4"	1-3/16"	2-3/8"
<i>Resistance</i>	R-3.1	R-5.0	R-10.1
Foundation Board Compression Properties¹			
<i>Compression Pressure lbs./sq. ft.</i>	200	400	600
<i>% Compression 3/4", 1-3/16", 2-3/8"</i>	4%	8%	11%
<i>Depth These Pressures are Found Clay²</i>	4'	8'	12'
<i>Depth These Pressures are Found Wet Sand³</i>	10'	20'	30'
			40'

At 65% compression, foundation board has the drainage capabilities of coarse sand. 1. For depths greater than above, please consult a TUFF-N-DRI Technical Manager at 800-DRY-BSMT.
2. Angle of Repose of 25° Density of 120 lbs./cu.ft. 3. Angle of Repose of 46° Density of 122 lbs./cu.ft.



Exterior Residential Basement Insulation Fact Sheet

RIGID FIBERGLAS® INSULATION BOARD

This is an unfaced rigid Fiberglas® insulating board. It is to be professionally applied by an Owens-Corning Certified Independent Waterproofing Contractor.

R-Value*	Thickness	Size	Pieces/Package	Sq. Ft./Package
5.0	1 3/16"	4' x 8'	38	1216
10.0	2 3/8"	4' x 8'	19	608

*The above R-Values are for Fiberglas® insulating board as manufactured. Compression of the board by backfill material and wetting of the board will give a lower effective R-Value.

READ THIS BEFORE YOU BUY

What You Should Know About R-Values

The chart shows the R-Value of this insulation. R means resistance to heat flow. The higher the R-Value, the greater the insulating power. Compare insulation R-Values before you buy.

These are other factors to consider. The amount of insulation you need depends mainly on the climate you live in. Also, your fuel savings from insulation will depend upon the climate, the type and size of your house, the amount of insulation already in your house and your fuel use patterns and family size. If you buy too much insulation, it will cost you more than what you'll save on fuel.



OWENS-CORNING FIBERGLAS
Protective Coatings Business
Fiberglas Tower Toledo, Ohio 43659
(419) 248-7550

Product Performance Sheet

Jerry's Basement Waterproofing
3030 Keystone Dr
Omaha, NE 68134
(402) 392-2211
(800) 335-3779

WARM-N-DRI® Insulation-Protection- Drainage Board

WARM-N-DRI® insulation-protection-drainage board is a dense fiberglass board engineered for use on the exterior of foundation walls. WARM-N-DRI board is a unique product that provides a combination of protection against damage due to harsh backfill, a drainage path to the drain tile, and thermal insulation for the protected space.

Questions arise in the marketplace from builders, architects, general contractors, specifiers, code officials, and building inspectors as to the long-term performance of WARM-N-DRI board. The following information will explain how these properties are retained over time.

WARM-N-DRI Construction:

WARM-N-DRI insulation-protection-drainage board consists of glass fibers, somewhat intertwined, but predominantly oriented in laminar layers parallel to the plane of the board. There is a small degree of intertwining of fibers from layer to layer, but the greatest amount of entanglement occurs

among the fiber bundles in each lamina. Binder droplets that collect and cure at the fiber intersections give the board its strength and resiliency. The predominantly laminar orientation of the fibers gives the board excellent in-plane drainage capability while the fiber entanglement provides sufficient compressive strength and abuse resistance to stand up to the random impact and shear loads that occur during the backfilling and settling of the soil.

History of Fiberglass Boards in Canada and Sweden

Glass fiber board insulation has been used in below-grade applications for the past 30 years in Europe and for over 25 years in Canada. Research verifying the in-service performance of glass fiber insulation appeared in technical documents published in technical documents published in Sweden in 1972 and in Canadian technical journals in 1976.

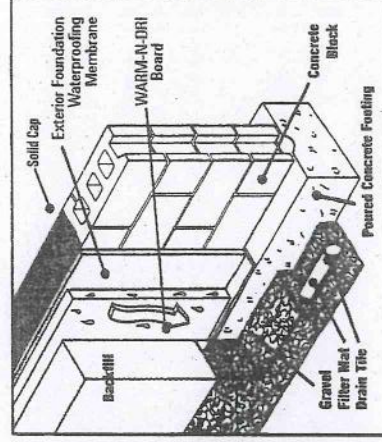
This initial research demonstrated that, after an extended period in service:

1. The drainage ability of the fiber glass insulation had not been significantly altered.
2. Small amounts of silt collected on the outmost layers of fibers but did not measurably affect the drainage capacity.
3. The depth of soil penetration into the fiberglass material was significantly small, 2 to 3 mm on the average, even though a part of the material surface was intentionally torn or cut with grooves to increase soil penetration.
4. The drainage rate in the plane of the fiber board continued to be 200 to 300 percent greater than the drainage rate through the face of the board.

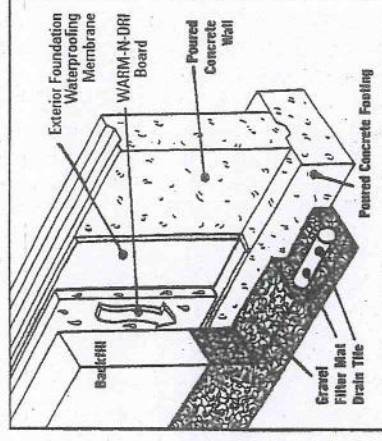
In 1981, testing of WARM-N-DRI board was conducted at the Owens Corning Technical Center. This testing confirmed these performance properties.



®Trademark registered
Owens Corning Fiberglas Corp.



Typical installation of WARM-N-DRI board
on concrete block wall.



Typical installation of WARM-N-DRI
board on poured concrete wall.

Granville Test Program — Verification of WARM-N-DRI® Board in Service Performance

Performance:

WARM-N-DRI board retains its long-term thermal insulation property due to the rapid drainage of water from the internal air spaces in the board. To ensure the long-term, below-grade drainage and thermal performance of WARM-N-DRI board, the internal air spaces must not be excessively compressed due to backfill pressures or become filled with silt and clog the drainage paths.

To substantiate the long-term performance of the WARM-N-DRI board, tests were done in 1981 in the test facility at the Owens Corning Technical Center in Granville, Ohio. There, WARM-N-DRI boards were installed on an eight-foot-deep masonry unit foundation. The boards were instrumented with thermocouples, compression indicators, and thermal flux meters. The WARM-N-DRI boards were mounted flush against the vertical walls and rest in a slotted plastic pipe at the footing. The drainage from each section of boards was carried through plastic pipe to separate sumps so drainage flows can be monitored. The data from these instruments showed that the R-value and drainage capacity of the boards had not changed since installation in 1981.

This data substantiates several of the benefits of the fiberglass-insulation-protection board:

1. R-value is based upon the thickness of the fiber insulation board and is a result of the voids within the board. The constancy of the monitored R-value of the board verifies that the thickness is not changing and that the voids in the fiber insulation are not being filled with water or silt.
2. The constancy of drainage to

the sumps substantiates that the board is not being compressed and the board's void spaces remain open and freely draining.

Verification of WARM-N-DRI Board Drainage Rates:

The drainage of WARM-N-DRI board is due to the laminar orientation of the fibers. Water can enter the board either through the top surface (if the board is cut off at grade) or through the face of the board. Due to the greater degree of entanglement in the laminar planes, the water flow through the face and across the thickness of the board is much less than the flow of water down along the laminar fiber layers.

Samples of WARM-N-DRI board were sent to GeoSyntec Consultants, Inc., a geotextile consulting and testing firm in Atlanta, GA. Vertical hydraulic transmissivity tests of

WARM-N-DRI board samples were performed in accordance with ASTM D 4716 Test Method for Determining Hydraulic Transmissivity (in-plane flow) of Geotextiles and Related Products. A copy of the test results and details of the test procedure are available upon request. GeoSyntec Consultants also performed tests to measure through-face hydraulic transmissivity and face silting tests. The results of these tests show that the through-face transmissivity is approximately twice the in-plane transmissivity and that the WARM-N-DRI board *does not* become clogged with silt which would prevent the board from draining. The silting tests were done with two graded soils: 10 percent and 30 percent of the soil particles were finer than the equivalent opening size of the board.

The silting test results show approximately a 10 percent decrease in transmissivity over time, after which steady state drainage was achieved. This result also verifies that WARM-N-DRI board *does not* become clogged with silt that would prevent drainage.

The drainage capacity of WARM-N-DRI board on a per-unit basis is equivalent to fine gravel. To maintain performance over the life of the structure, it is mandatory that the WARM-N-DRI board be connected to a perimeter-foundation-drainage system. The usual approach to meeting this requirement is to install a foundation footing drain tile and gravel system, with the gravel covering the drain tile 8 to 12 inches high and extending to and up the face of the WARM-N-DRI board. If the tile is placed off the footing, the gravel should cover the tile, the footing, and 8 to 12 inches up the face of the WARM-N-DRI board.

Resistance to Siltting:

WARM-N-DRI board, being a three-dimensional fabric, has more volume of porous material than a single layered filter fabric. Particles may embed or become trapped among the surface fibers of the WARM-N-DRI board; however, since the particles can be at various depths in the board, WARM-N-DRI board should continue to provide a drainage function long after a single layered fabric is plugged. Note that if the soil placed against the WARM-N-DRI is clay or highly silty, and the percolation rates through this soil exist at a sufficient rate for a long period of time, WARM-N-DRI board could also become plugged.

WARM-N-DRI boards installed on the foundation walls of the test facility in 1983 have not shown any evidence of plugging.

Preservation of R-value:

WARM-N-DRI board provides thermal insulating protection to a foundation wall in two ways. The fibers are small and not continuous, hence the conduction path is very long. The air spaces entrapped among the fibers are small, minimizing convective heat transfer. The temperature differences below grade are so small that radiative transfer is negligible. If the WARM-N-DRI board is not crushed or damaged so the thickness is reduced, the conductive transfer does not change. As long as the air spaces do not become filled with water or other material, the conductive transfer does not change. WARM-N-DRI board is basically providing a protective stagnant air space between the outside environment and the inside space. During the transient periods when water may be flowing through the pores while traveling down the board to the drain tile, there is a variation in the conductive transfer, but this change is of such short duration that it is not detectable.

Even if the board should become filled with water for whatever reason, after the water drains out of the board, the conductive path returns. This is because the spaces between the entangled fibers empty and provide the insulating property of still air. WARM-N-DRI board can be immersed in water, removed from the water, and placed vertically, and the water drains from the board. The weight gain of the board after immersion is approximately two percent. This two-percent weight gain represents water molecules on the fiber surfaces and small droplets attached to the fiber crossover points. The air spaces remain and maintain the thermal insulating property of the board.

Exterior vs. Interior Placement of Insulation:

Foundation insulation is commonly applied to the inside of the foundation wall. In the case of an existing foundation where backfill and landscaping has been completed, this is the most cost-effective approach to insulating the foundation wall. This approach does have some drawbacks. The major temperature drop occurs across the insulation; therefore, the foundation wall temperature will be about the same as the surrounding soil temperature or, in the case of above-grade exposed areas, the surrounding air temperature. A vapor barrier is sometimes placed over top of the insulation. Moisture that diffuses through the foundation wall condenses on the inside of the wall and within the insulation, resulting in odor and mildew. During the winter months, ice may form in the insulation placed over the above grade portion of the wall.

Installing insulation to the exterior of the foundation wall results in the whole mass of the foundation being near the temperature of the interior space. The major temperature drop occurs across the insulation that is outside the foundation wall.

The condensation point, i.e., the dew point, is now located outside the foundation wall, hence no condensation occurs on the inside of the foundation and no ice forms during the winter months. Also, insulating the exterior of the foundation wall provides more usable space inside the foundation. To install interior finish to the walls such as paneling or gypsum board, thin furring strips may be used, since cavities to hold interior insulation are not needed.

Guidelines for WARM-N-DRI Use:

WARM-N-DRI glass fiber drainage and insulation board can be used in all areas of the country. Use of WARM-N-DRI is not limited by section 23041.4 of the SBCCI Building Code, which states:

Foam plastics including, but not limited to, extruded or expanded polystyrene or polyisocyanurate shall not be installed below grade on the exterior of slab foundations where hazard of termite damage is very heavy.

WARM-N-DRI is also not subject to section 2304.2 of the SBCCI Building Code that requires:

A minimum of 6" clearance between earth and foam plastics applied to above grade exterior walls.

For any further information on WARM-N-DRI board or any other waterproofing product from Tremco Barrier Solutions, Inc., please call 800-DRY-BSMT.

Physical Property Data - WARM-N-DRI® Board

Type	Unfaced rigid fiber glass board	
Physical appearance	Pink, unfaced	
Board sizes	4 ft x 4 ft, 4 ft x 8 ft	
Board thickness	3/4 in., 1 3/16 in., 2 3/8 in.	
Thermal resistance ⁽¹⁾	3/4 in.	R=3.2
	1 3/16 in.	R=5.0
	2 3/8 in.	R=10.1
Drainage ability, hydraulic gradient 1.0	Board thickness	Gallons/hour/lineal foot ⁽²⁾
	3/4 in.	74
	1 3/16 in.	118
	2 3/8 in.	237

Compression Properties
of WARM-N-DRI Board⁽³⁾

Pressure Lbs./Sq. Ft	% Compression 1-3/16" & 2-3/8"	Depth these Pressures are found Clay ⁴ Wet Sand ⁵
200	4%	4 ft 10 ft
400	8%	8 ft 20 ft
600	12%	12 ft 30 ft

At 65% compression, WARM-N-DRI Board has the drainage capabilities of coarse sand.

⁽¹⁾ R means resistance to heat flow. The higher the R-value, the greater the insulation power.

⁽²⁾ Drainage rates measured on boards compressed 10% using ASTM D4716.

⁽³⁾ For depths greater than 12 ft., use minimum of 1 3/16" WARM-N-DRI Board.

⁽⁴⁾ Angle of Repose of 25°, Density of 120 lbs/cu. Ft.

⁽⁵⁾ Angle of Repose of 46°, Density of 122 lbs/cu. Ft.

The preceding data represents WARM-N-DRI properties for the conditions listed and should be representative of most applications. However, instances may exist in which local soil conditions and/or restricted foundation drainage could affect drainage rates.
Tremco Barrier Solutions makes no claims regarding the ability of WARM-N-DRI to reduce external loads on the building foundation, whether caused by hydrostatic pressure, expansive soil, or any other cause.

WARM-N-DRI board is manufactured by Owens Corning. It is used as a component of the TUFF-N-DRI® Basement Waterproofing System sold and warranted by Tremco Barrier Solutions.

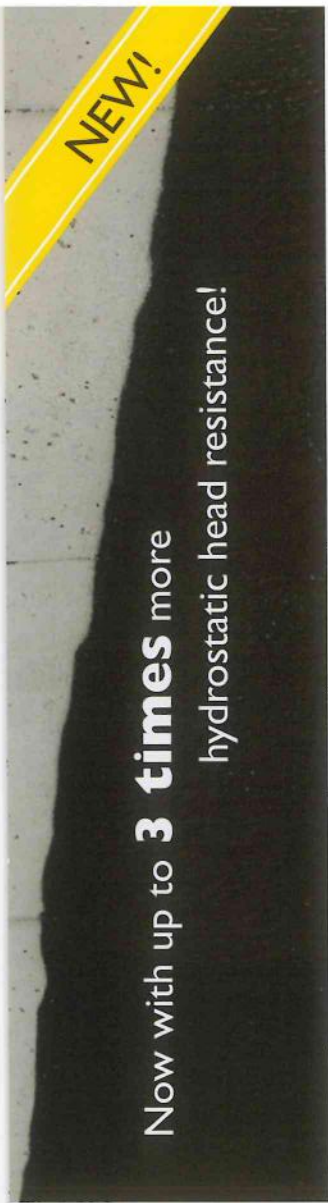
For more information on WARM-N-DRI and TUFF-N-DRI, please call 800-DRY-BSMT.



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WARM-N-DRI is a registered trademark of Owens Corning.



Now with up to **3 times** more
hydrostatic head resistance!



WATCHDOG H3 waterproofing membrane introduces a higher level
of protection against foundation wall leaks and seepage.

1. Hang Strength

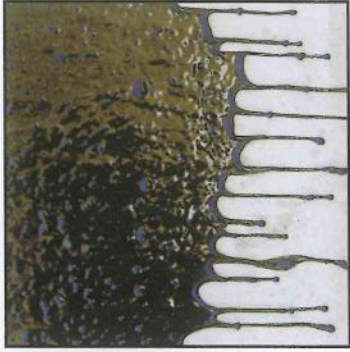
Enables Consistent Cured Membrane Thickness of 40 Mils

WATCHDOG H3 (left) and a competing asphalt emulsion waterproofing product (right) were sprayed on the same foundation wall to a thickness of about 60 mils wet. After 10 minutes, the new WATCHDOG H3 stayed in place, while the competitor's product ran down the wall. The superior hang strength of WATCHDOG H3 enables the membrane to maintain a constant thickness for maximum performance when it cures to 40 mils.

With little hang strength, the sagging competitor can't deliver the minimum code-required 40 mils of cured membrane. Equally important, that thin membrane cannot deliver any of their minimal published performance specifications.



WATCHDOG H3 hangs tough!



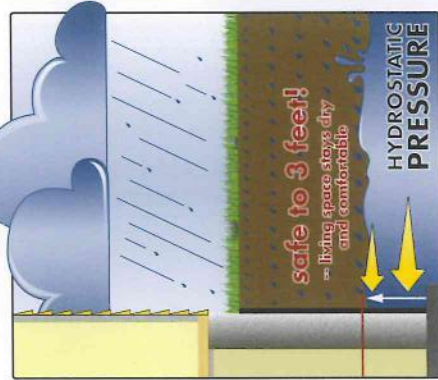
Competitive product slides away!



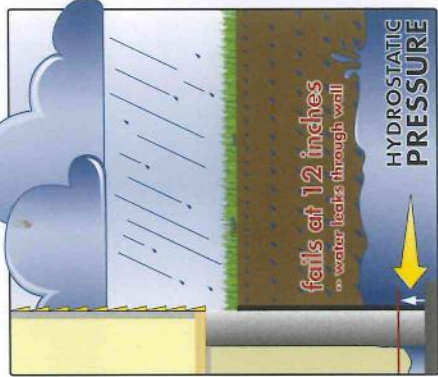
WATCHDOG H3
No Leaks!

Membrane elongates to span a shrinkage crack, and effectively resists hydrostatic pressure.

Competitive Product
Leaks at less than 12" HH.



WATCHDOG H3 Membrane



Competitive Membrane

2. Crack Bridging

Waterproofing Must Resist Hydrostatic Pressure Even When Spanning Cracks in the Foundation Wall

WATCHDOG H3 (tube on left) and a competing waterproofing membrane (tube on right) were applied to 40 mils cured on identical sets of concrete blocks, then separated by 1/16" to simulate a typical shrinkage crack. A column of water was then placed on the portion of membrane spanning the crack to create hydrostatic head. The competitive product failed at 12 inches of hydrostatic head in less than 10 minutes, but WATCHDOG H3 remained leak-free, even with 3 feet of hydrostatic head.

3. Membrane Thickness = Performance

Proper Membrane Thickness Delivers Reliable Hydrostatic Head Resistance

At 40 mils, WATCHDOG H3 delivers 3 feet of hydrostatic head resistance. Competitors provide as little as 12" of hydrostatic resistance, even at 40-mil cured thickness. But with low hang strength, competitors may easily run down the wall and provide less than 40-mil thickness, leaving major portions of the wall unprotected.

Thickness (cured mils)	Hydrostatic Head (inches)		Performance Factor
	WATCHDOG H3	Competitor	
40 mils	36"	12"	3X
35 mils	28.8"	9.6"	
30 mils	21.6"	7.2"	

Hydrostatic resistance, as well as other published performance specifications, decline significantly with reduced thickness.



WATCHDOG
WATERPROOFING®

WATCHDOG WATERPROOFING®

SPECIFICATIONS

MEMBRANE PROPERTIES

Type Polymer-enhanced asphalt liquid-applied membrane	
Color Black	
Solids 62 (percent by weight)	
Density 8.1 lbs/gal	
Application Airless spray	
Application Temperature Minimum 20° F	
Cure Time 24 hrs	
Thickness 60 mils (wet) ¹	
Adhesion to Concrete <i>Results</i> Exceeds	<i>Method</i> ASTM C-836
Elongation <i>Results</i> 500%	<i>Method</i> ASTM D-412
Low Temperature Flexibility <i>Results</i> Flexible to 0° F	<i>Method</i> Sec ²
Crack Bridging Ability <i>Results</i> Exceed 10 Cycles to 1/8 in. at 0° F	<i>Method</i> ASTM C-836
Water Vapor Permeance <i>Results</i> 0.44 perms (grains/sq. ft./hr)	<i>Method</i> ASTM E-96 Wet Method
Resistance to Degradation in Soil <i>Results</i> Good	<i>Method</i> ASTM E-154
Mold Growth and Bacterial Attack <i>Results</i> No Degradation	<i>Methods</i> ASTM D-3273, ASTM D-3274

1. Membrane cures (dries) to 40 mils.

2. Bend waterproofing compound around 1 in. mandrel.

★**DrainStar®** Stripdrain

RECOMMENDED INSTALLATION INSTRUCTIONS

NOTE: DrainStar® can be installed in two positions. Vertical or L-Shape.

All DrainStar connections, splices and core interlocking should be overlapped with additional filter fabric, taped and fastened to the foundation wall. This ensures that the DrainStar maintains a continuous barrier preventing soil entry into the DrainStar.

Vertical Installation Instructions

1. Unwind roll of DrainStar around excavation.

2. Starting at the termination point of DrainStar (at the sump connector tile or daylight exit), place DrainStar vertically against WARM-N-DRI® with the dimples facing the WARM-N-DRI. The flap of filter fabric should face down.

3. Attach DrainStar to the wall with powder actuated fasteners every 4-5 feet, as necessary to keep DrainStar snug against WARM-N-DRI. Fasteners should be installed at a level near the top of the DrainStar, to prevent soil backfill from folding the DrainStar over. For proper fastener type, size and installation tool, contact Tremco Barrier Solutions Technical staff at 1-800-876-5624.

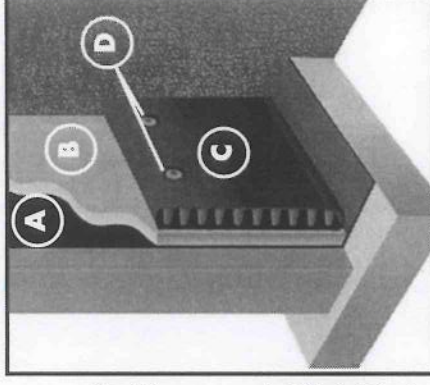
4. DrainStar can be maneuvered to fit inside and outside corners. Do not fasten DrainStar to the foundation wall closer than two feet on either side of corners, unless corner guards are used. It is normal to have a small amount of slack or gap between DrainStar and the wall corners when bending the DrainStar away from the dimple face. When bending toward the dimple face, a tight corner can be made, and the DrainStar will fit snugly into or around the corner.

-Although not required, corner guards are recommended for use with DrainStar when bending DrainStar away from the dimple face at corners.

-For applications with WARM-N-DRI, DrainStar dimple face in, use corner guards for inside corners.

-For membrane only applications, DrainStar dimple face out, use corner guards for outside corners.

-To install corner guards, slit the DrainStar dimple face fabric vertically between the dimples at the location of the corner, bend the DrainStar to a sharp bend and place the corner guard over the open DrainStar fabric slit. Wrap the fabric tightly around the DrainStar and tape to secure; the top fabric edge should wrap over the bottom. The corner guard will be against the Warm-N-Dri board on inside corners, and will be outside the DrainStar on outside corners of membrane only applications.



VERTICAL ILLUSTRATION:

[A] TUFF-N-DRI Waterproofing

[B] WARM-N-DRI Board

[C] DrainStar [D] Actuated Fasteners

5. Continue with installation until reaching the drain exit point(s).

-For daylight or walkout drainage, install a DrainStar universal outlet fitting directly to the end of the DrainStar. Secure the fitting with a powder actuated fastener to ensure it does not become disconnected from the DrainStar. To connect a 4" pipe to the DrainStar universal outlet, fasten the 4" pipe with 3" tape, screws or a 4" interior coupling.

-For sump connections, install a DrainStar universal tee fitting within two feet of the sump sleeve through the footing. Secure the fitting with a powder actuated fastener to ensure it does not become disconnected from the DrainStar. Cut and remove the filter fabric (dimple face out applications) or fabric and core (dimple face in applications) out of the DrainStar around the inside hole of the 4" tee fitting (removing the fabric/fabric and core allows water to exit the DrainStar without restriction). To connect a 4" pipe from the universal tee fitting to the sump sleeve, use 4" corrugated pipe or 4" PVC with elbows. Fasten the 4" pipe with 3" tape, screws or a 4" interior coupling. If possible, backfill the 4" pipe connection with gravel or soil with a shovel to ensure that the pipe is not damaged or disconnected during backfill.

L-Shape Installation Instructions

The L-Shaped installation method requires a minimum of 3" of footing exposed after WARM-N-DRI is installed.

1. Unwind roll of DrainStar around excavation, 12 inch product only.

2. Starting at the termination point of DrainStar (at the sump connector tile or daylight exit), place DrainStar vertically against WARM-N-DRI with the dimples facing the WARM-N-DRI. The flap of filter fabric should face down.

3. Step gently on DrainStar. Apply enough pressure to mold DrainStar into the shape of the letter "L", with approximately 3-4 inches of DrainStar horizontally on the footing and 8-9 inches vertically against WARM-N-DRI. Enough tension should be created in the vertical section of DrainStar to keep it snug against WARM-N-DRI.

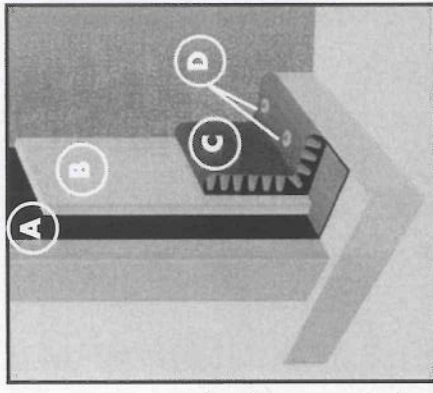
4. Use a powder actuated fastener to secure DrainStar to the footing every 4-5 feet, or as required to maintain firm contact of DrainStar to WARM-N-DRI.

5. DrainStar can be maneuvered to fit inside and outside corners. Fasten DrainStar to the footing approximately one foot on each side of corners. It is normal to have a small amount of slack or gap between DrainStar and the wall corners. Corner guards are not recommended for L-shape application.

6. Continue with installation until reaching the drain exit point(s).

-For daylight or walkout drainage, install a DrainStar universal outlet fitting directly to the end of the DrainStar. Secure the fitting with a powder actuated fastener to ensure it does not become disconnected from the DrainStar. To connect a 4" pipe to the DrainStar universal outlet, fasten the 4" pipe with 3" tape, screws or a 4" interior coupling.

-For sump connections, install a DrainStar universal tee fitting within two feet of the sump sleeve through the footing. Secure the fitting with a powder actuated fastener to ensure it does not become disconnected from the DrainStar. Cut and remove the filter fabric (dimple face out



L-SHAPED ILLUSTRATION:

(A) TUFF-N-DRI Waterproofing

(B) WARM-N-DRI Board

(C) DrainStar (D) Actuated Fasteners

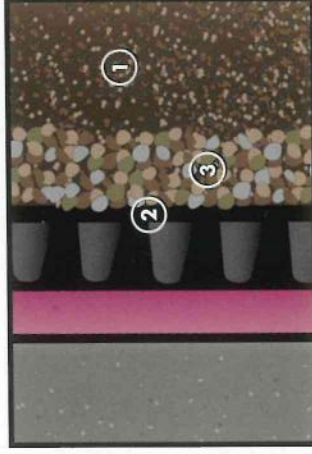
DrainStar® The smart way to drain.

Installed by experts.

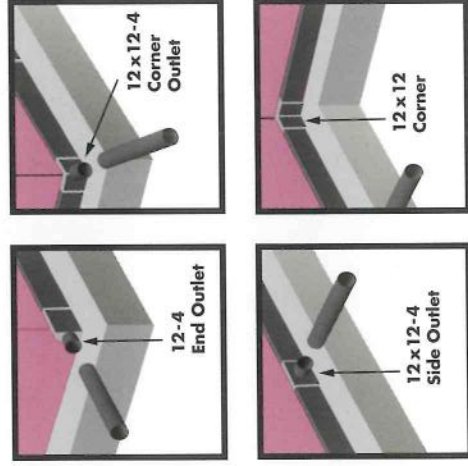
DrainStar is designed to be used in combination with TUFF-N-DRI® and WATCHDOG WATERPROOFING® products. Your select waterproofing contractor has the experience and extensive training to ensure the highest quality application of DrainStar and the waterproofing product you prefer (see diagrams, far right).

Flow characteristics.

DrainStar provides a flow quotient of 170 gallons/min./ft. (when tested to ASTM D4716-95 with hydraulic gradient of 1 with confining stress of 3600 PSF).



Backfill soil (1) typically contains many different particle sizes. When the soil comes into contact with the DrainStar filter fabric (2), the larger particles bridge the smaller particles to form a "filter cake" (3). The filter cake helps block the encroachment of finer soil particles to prevent clogging or blinding of the filter fabric for long-term filtration performance.



Replaces gravel and drain tile.

DrainStar is an effective replacement for traditional foundation drain tile and gravel systems. In fact, no gravel is required when DrainStar is installed on the footing next to a minimum 24-inch height of quality foundation drainage board (see diagrams, far right).

With DrainStar, there's no more scheduling of gravel deliveries. No carrying gravel in buckets or wheelbarrows. No gravel scattered around the jobsite to become a nuisance. So you save time and aggravation.

Check out DrainStar today.

For more information about DrainStar talk to your select waterproofing contractor, call Koch Waterproofing Solutions at **800-DRY-BSMT** or visit **www.GuaranteedDryBasements.com**.

DrainStar offers a full array of fittings that make the system fast, easy and versatile to install. End, corner and side outlets are available for your choice of drainage exits. And corner fittings help DrainStar follow 90° angles while maintaining water flow.

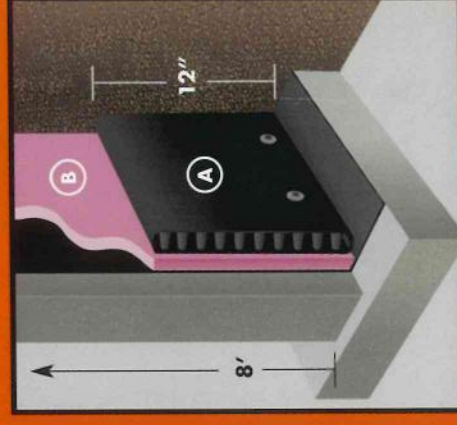
Your local select waterproofing contractor is:

JERRY'S BASEMENT WATERPROOFING, INC

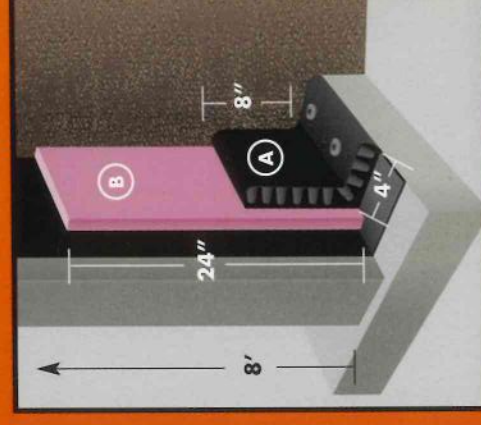
3030 Keystone Drive
Omaha, NE 68134-4843
Phone – (402) 392-2211
Fax – (402) 392-4661
1-800-335-3779



Drain tile and gravel system



Vertical DrainStar installation (with TUFF-N-DRI system)



L-shaped DrainStar installation (with WATCHDOG membrane)

Drain tile and gravel systems (top) have a water collection area of 24 inches or more in length. By combining DrainStar (A) with at least 24 inches of a quality foundation drainage board such as WARM-N-DRI® (B), you'll match the water collection area of a drain tile and gravel system. WARM-N-DRI board has over a 30-year track record of below-ground drainage performance. Depending on your application needs, DrainStar may be installed in a vertical (middle) or L-shaped (bottom) design.



WATERPROOFING SOLUTIONS, INC.

MAKERS OF TUFF-N-DRI® and WATCHDOG WATERPROOFING®

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