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BFGOODRICH VELVET-RIDE®

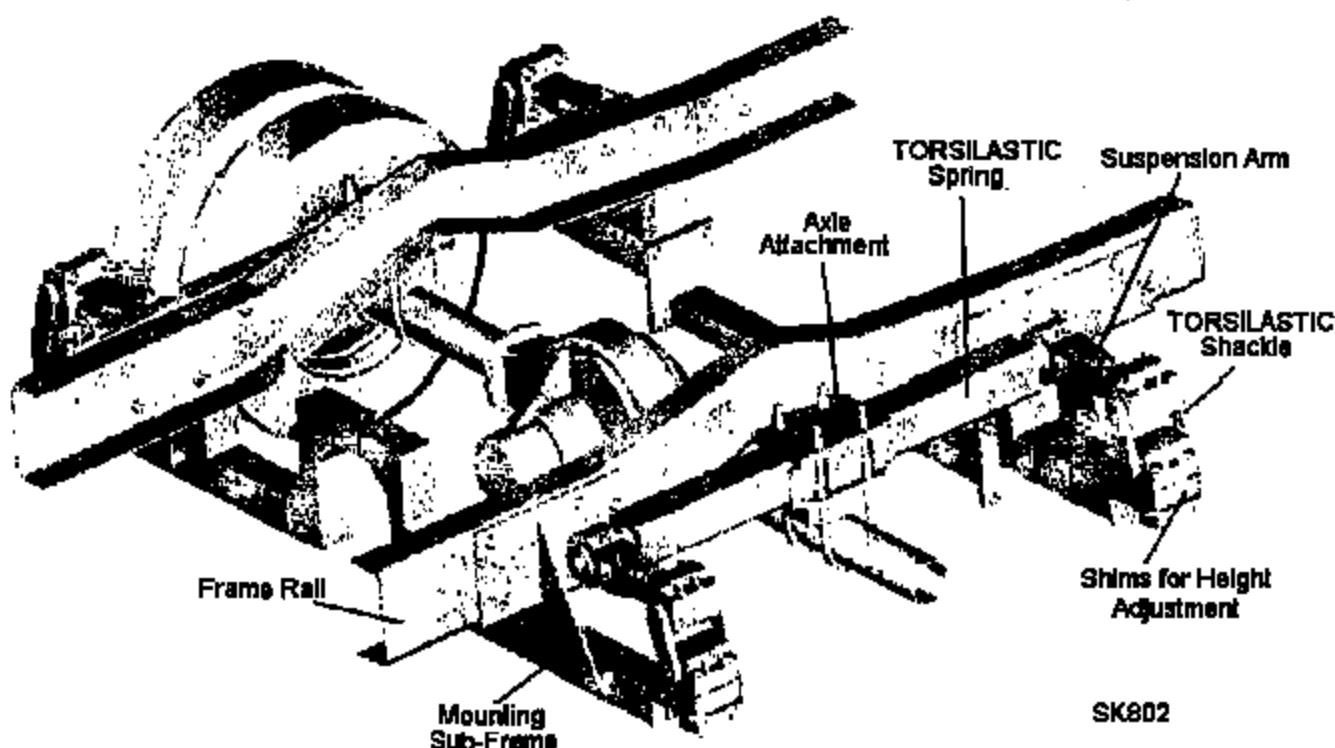
REAR SUSPENSION SYSTEM

INSTALLATION & MAINTAINANCE GUIDE: 06811026

99-01 Ford E-450

Revision D

RECEIVED
EFFECTS INVESTIGATION
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BFGOODRICH VELVET-RIDE® SUSPENSION SYSTEM INSTALLATION & MAINTAINANCE GUIDE

Specification: 06811026, Rev. D

Vehicle: 1999-2001 Ford E-450
GVWR: 14,050 lbs.
GAWR/Rear: 9,450 lbs.

Suspension: Layout: TP1458
VRSS Assembly Specification: 06814052
Typical use load range of this suspension system: 7,000-8,000 lbs.
Maximum load rating of the components of this suspension system: 9,500 lbs.

The optimum ride is designed for a vehicle with a 7,000 to 8,000 pound load on the rear wheels.

Tool Requirements:	3/4" socket	socket wrench or impact driver
	7/8" deep socket	3/4" wrench
	15/16" deep socket	15/16" wrench
	drill, 1/4" and 1/2" bit	torque wrench
	9/16" bit	11/16" bit
	punch & punch	plumb-bob

1. Prior to Removing the OEM Suspension: Park the vehicle on a relatively level surface to install the suspension system. Chock the front and rear sides of both front wheels. Prior to removal of the OEM suspension system, measure and note the ride height of the vehicle (ground to top of frame measurement). Also punch mark the frame rail with the axle location on both sides of the vehicle by dropping a plumb bob aligned to the front edge of the axle. These punch marks will be used to check and verify the axle's alignment (Figure 1).

2. Remove Existing Suspension and Exhaust. Remove the existing suspension system components including the front spring hanger brackets, overload brackets, shock absorbers and anti-roll bar, if present. Remove the jounce bumper bracket and mount the jounce bumper directly to the lower frame flange. The rear spring hanger brackets need not be removed for this chassis. Remove the muffler, heat shield and tail pipe at the clamped connection just forward of the muffler. Remove the tail pipe hanger near the fuel tank.

3. Ensure Clearance Around Suspension: NO BRACKETS OR OBSTRUCTIONS CAN BE INSTALLED ABOVE THE SPRING TO THE HIGHEST POINT AT THE TOP OF THE FRAME. If the suspension system is installed on a vehicle that already has a body in place, mark any compartments and splashguards to give the suspension system the required clearances. These clearances should be 25" fore and aft of the axle center, 19" out from the frame and even with the top of the frame. Using a reciprocating saw or other cutting device notch the compartments that produce interference. After the suspension system is installed fabricate and install covers for the notched areas and reroute and re-attach the tail pipe. When the suspension system is installed on a bare chassis the aforementioned clearances should be built into the body.

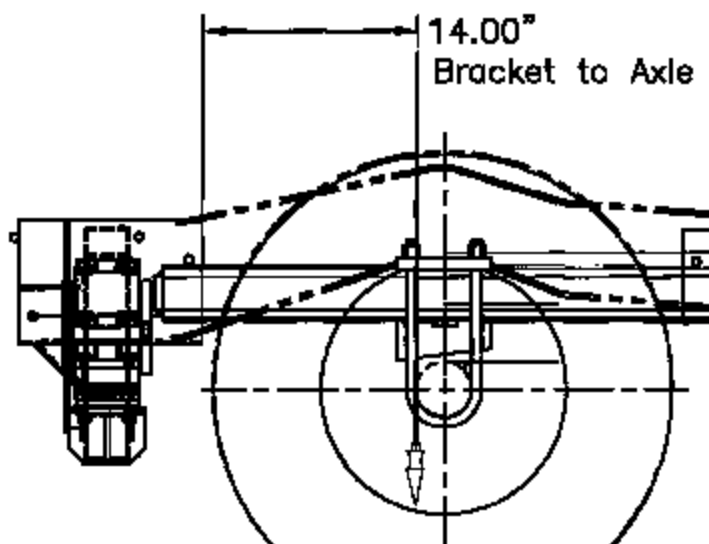


FIGURE 1

4. Attach Sub-frames: Ream out the diameter of the eight (four each side) front OEM leaf spring bracket holes to $\frac{1}{2}$ inch diameter. Position the front sub-frame (2) (see Figure 5) forward of the axle with the sub-frame end plate away from the axle. Guide the sub-frame in and over the drive shaft and then upward with the brackets to the outside of the frame. Position the bracket by aligning the sub-frame's holes to the front OEM leaf spring bracket holes in the frame. Attach the front sub-frame (2) to the frame using the OEM leaf spring bracket holes with eight $\frac{1}{2}$ "-20 x 1-3/4" Gr. 8 bolts (13), nuts (15), and washers (14). Install the bolts with a flat washer on each side of the frame rail and with the bolt heads on the outside of the frame and the nuts on the inboard side of the frame rail. Torque the $\frac{1}{2}$ " nuts to 90-100 ft-lbs. (ALL TORQUES IN THIS BULLETIN ARE FOR DRY TORQUES). Prior to installing the rear sub-frame (3), lower and remove the fuel tank in order to attach the sub-frame to the frame rail. Ream out the diameter of the two most forward holes in the frame for the rear OEM leaf spring bracket to $\frac{1}{2}$ inch diameter. Position and align the rear sub-frame by lining up the rear-most 2 holes in the sub-frame bracket with the two most forward holes of the OEM rear leaf spring bracket. Attach the sub frame using four $\frac{1}{2}$ "-20 x 1-3/4" Gr. 8 bolts with nuts and washers. Two additional holes in the sub-frame bracket should then align with two smaller holes in the frame rail, ream these holes out to $\frac{1}{2}$ inch diameter and then secure with $\frac{1}{2}$ "-20 x 1-3/4" Gr. 8 bolts, nuts and washers. Torque the $\frac{1}{2}$ " nuts to 90-100 ft-lbs. Raise and reattach the fuel tank.

1. Slide spring arm assembly over the end of the spring shaft.
2. Install 5" long bolts from the bottom up.

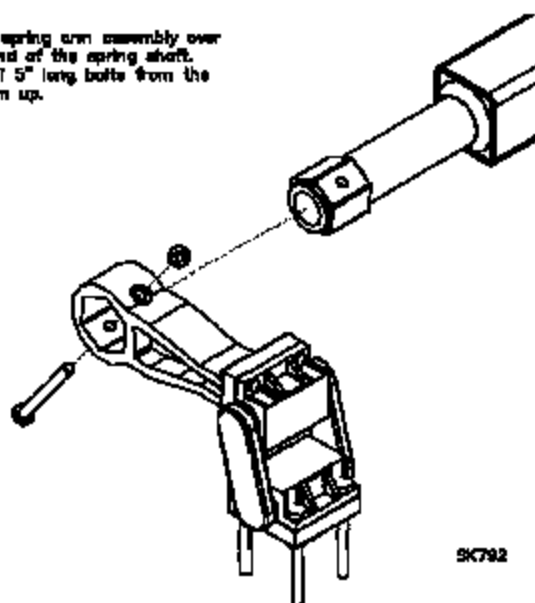


FIGURE 2

5. Assemble Springs, Arms and Shackles. Slide the arm/shackle assemblies (5) onto the hex adapters of the main springs (4) (Figure 2) with the center pins and shackles pointing downward. Insert the four $\frac{1}{2}$ "-20 x 5" Gr. 8 bolts (10) through the arm and hex holes and secure them with $\frac{1}{2}$ " nuts (15) torqued to approximately 100 ft-lbs.

6. Attach Spring/Arm/Shackle Assemblies. Place the Axle Spacer Blocks (11) on the perch on the axle with the pin of the block inserted in the hole in the axle perch. The spacer block's thicker edge must be toward the front of the vehicle. Remove the loose 9/16" nuts and washers (28 & 29) from the 9/16" x 6" long bolts (26) of the shackle assemblies. DO NOT

remove the bolts. Position the spring/arm/shackle assembly above the mounting pads with the spring next to and parallel to the frame rail. Insert the bolts (26) through the shackle shell (23) and the shackle mounting pad (24) and through the holes in the chassis bracket attachment pads. Pull the bolts completely down so that one of the flats of the hex head of each bolt is against the side of the shackle shell (23). Slip on each washer (28) and twist on the nuts (29) to engage only a few threads.

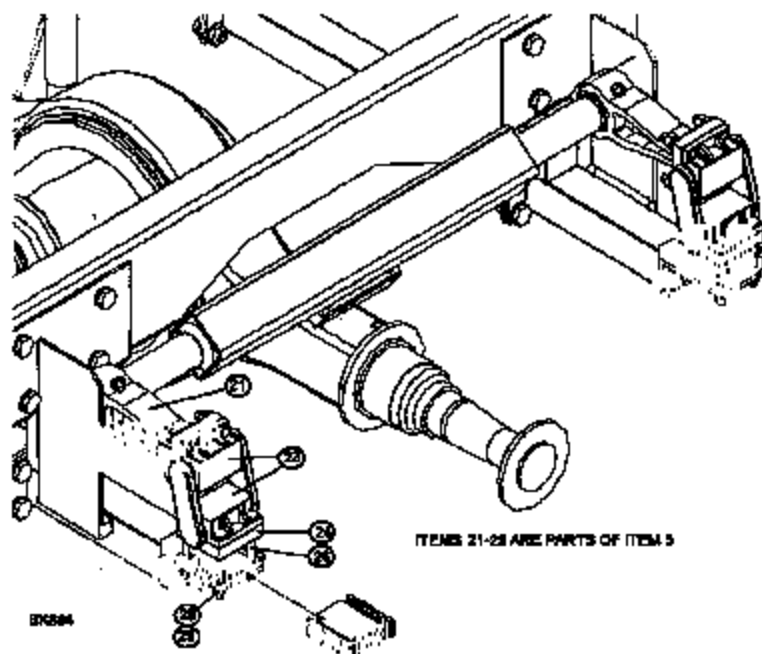


FIGURE 3

7. Install Shims. Lift up each shackle assembly (5) along with the shackle mounting pad (24) (Figure 3) and slide a stack of ten shims (12) between the shackle mounting pad and the substructure mounting pad. Lower the shackle assembly and make sure the shackle rubber is seated squarely between the shackle shell (23) and the shackle mounting pad (24) and that the shims are aligned. Tighten the nuts evenly using the criss-cross method and torque the sixteen nuts to 110 - 120 ft-lbs. The main spring (4) should be suspended in the air by the shackle torsion.

8. Attach Springs to Axle: Place each upper axle spacer (11) onto the axle spring seat with the thicker sides at the front and the dowel pin inserted. Using a long 4" open-end wrench or pipe wrench, twist each main spring housing (Figure 4) so that it moves downward (so that the top surface of the square spring is horizontal) and the two center-pins of each main spring (4) fit into the two slotted holes of the axle spacer blocks (11). Place a bearing plate (7) on the top center of each main spring (4). From the bottom, slide two 5/8" U-bolts (8) up around the axle and through the holes in the bearing plate brackets (7). Screw the 5/8", high hex nuts (9) onto the U-Bolts and tighten the nuts until the brackets are held snugly together around the axle. **Note:** Make sure that the two spring pins are inserted into the axle block holes and that the dowel pin is inserted in the axle housing, prior to tightening the U-bolts. Also, Do not torque the U-bolts until Step 9 after the axle is aligned.

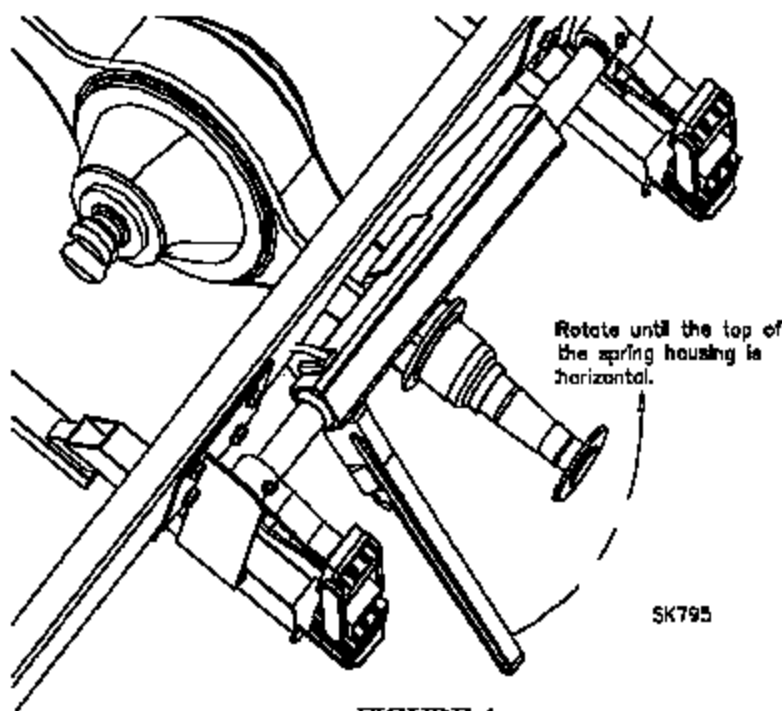


FIGURE 4

9. Align Axle. Using a plumb bob aligned to the punch marks on the frame rails check the alignment of the axle and adjust if necessary (+/- 1/8 inch) with the U-bolts loose (Figure 1). Then tighten the 5/8" U-bolt nuts to a torque of approximately 125 -150 ft-lbs. From the back edge of the front sub-frame bracket to the front edge of the axle should measure 14.00 inches. The right and left sides should be within 1/4 inch of one another.

10. Adjust Ride Height. A new Torsilastic® spring will undergo a slight amount of settling or "creep" under loaded conditions during its first 10,000 miles of operation. Therefore, the initial ride height should be set approximately 1" to 1-1/2" higher than ultimately desired to accommodate this settling activity. Also keep in mind that the weight of additional equipment will reduce the ride height approximately one inch for every 1400-1600 pounds added to the rear.

If initial height adjustment is required then unload the suspension approximately 50%, and for each side loosen, but **DO NOT REMOVE**, the eight shackle attachment nuts (29). The shackle bolts (26) will be pulled upward with the shackle (22) by the torsion of the main spring. After the nuts are loosened, add shims to lower the vehicle or remove shims to raise it. Each shim equals 1/4" change in height.

Note: If, during the life of your vehicle it becomes necessary to adjust the ride height, follow the procedure above.

11. Install Shock Absorbers: Re-install the OEM shock absorbers using OEM hardware.
(Note: Optional shock absorber is KONI P/N 82-2466)

12. Inspect Suspension: Before placing the vehicle back into service, thoroughly inspect the suspension and recheck the nut torques to ensure that all connections are secure.

NOTE: RECHECK THE TORQUE VALUES OF THE NUTS AFTER INSTALLATION, AFTER THE FIRST THIRTY (30) DAYS OF SERVICE, AND ANNUALLY AFTER THAT.

ILLUSTRATED PARTS LIST
Suspension Assembly Spec. Number 06814052

99-01 Ford E-450

Use this IPL with Figure 5

ITEM	DESCRIPTION	PART NO.	QTY
2	Front Sub-Frame Bracket	MP7229	1
3	Rear Sub-Frame Bracket	MP7230	1
4	Spring/Housing Assembly	06816080	2
5	Suspension Arm & Shackle Assembly	06815014	4
	Hardware Kit Box	06819052	
7	Bearing Plate	MP7203	2
8	0.625-18 UNF x 12.50" LG "U" Bolt	MP7265	4
9	0.625-18 UNF High Hex Nut	06818145	8
10	0.500-20 UNF x 5.00" LG Hex Bolt	MP6316	4
11	Axle Spacer	MP7262	2
12	Adjustment Shim	MP6319	40
13	0.500-20 UNF x 1.75" LG Hex Bolt	06818092	32
14	½" Hardened Flat Washers	06818099	64
15	0.50-20 UNF "Stover" Lock Nuts	06818173	32
16	BFGoodrich Placard	MP7038	1
17	99-01 E-450 Installation Guide	06811026	1

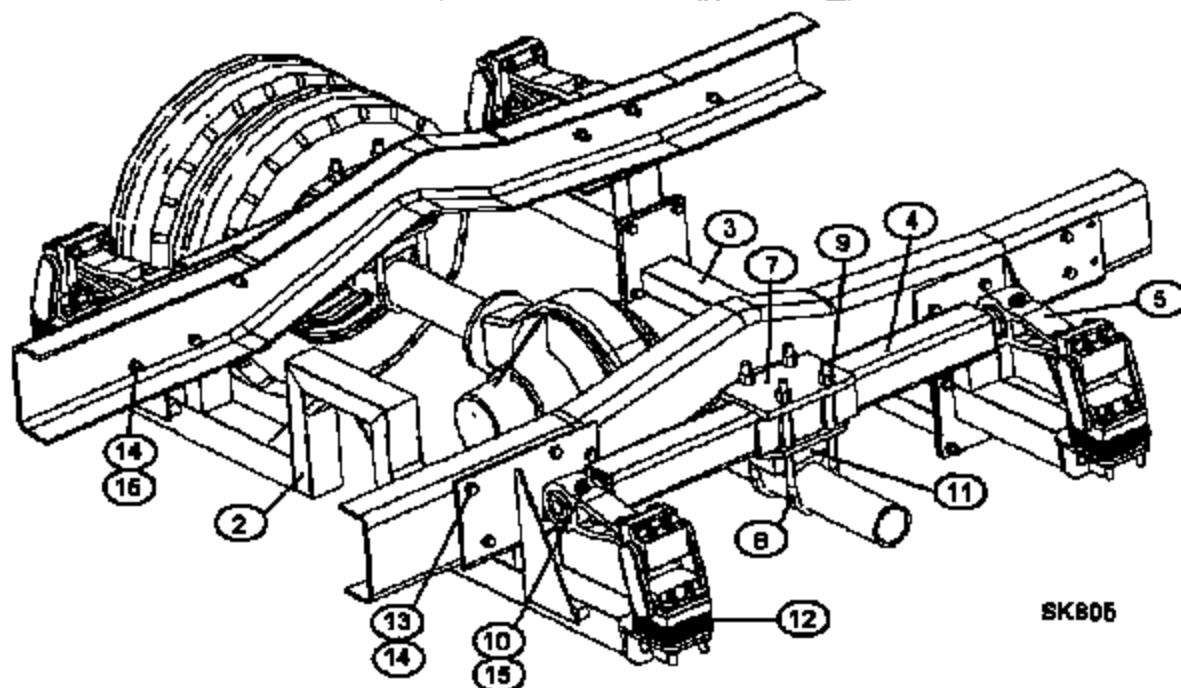


FIGURE 5

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ENGINEERED POLYMER PRODUCTS

6461 BFGOODRICH BLVD

JACKSONVILLE, FL 32226

August 1, 1996

VELVET-RIDE® SUSPENSION SYSTEM

LIMITED WARRANTY

BFGoodrich warrants its VELVET-RIDE Suspension System to be free from defects in material and workmanship under normal use and service in the U.S.A. and Canada.

PARTS:

All Chassis

A) 5 years or 100,000 miles whichever comes first.

B) Extended warranty available.

LABOR:

All Chassis:

No Warranty Coverage

Normal use and service means that the suspension will be installed, operated, inspected and maintained in accordance with the applicable BFGoodrich owner's installation instructions.

SERVICE DATES:

The starting date for the warranty period is the date of purchase of the suspension by the end user. Proof of purchase is the responsibility of the end user. If the purchase date can not be established to BFGoodrich's satisfaction, the ship date from BFGoodrich determined by invoices will be used as the effective starting date.

INSTALLER AND END USER RESPONSIBILITIES:

The installer is responsible for installing the product according to BFGoodrich's approved procedures, providing the end user (either directly or through their dealer) with a copy of the BFGoodrich VELVET-RIDE Suspension System installation manual advising the end user of proper use and maintenance for the product. The end user is responsible for operating, inspecting and maintaining the suspension in accordance with the BFGoodrich owner's installation manual.

LIMITATIONS:

No warranty applies in the event that components, parts or accessories not obtained from or approved by BFGoodrich are used in the installation or improper installation, maintenance, repair or abuse including but not limited to overloading, or improper alterations or modifications.

THE WARRANTIES REFERENCED IN THIS SECTION ARE EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE, EVEN IF SUCH PURPOSE IS KNOWN TO BFGOODRICH, AND IN LIEU OF ANY OTHER OBLIGATIONS OR LIABILITY ON THE PART OF BFGOODRICH. BFGOODRICH NEITHER ASSUMES (NOR HAS AUTHORIZED ANYONE TO ASSUME FOR IT) ANY OTHER WARRANTY OR LIABILITY IN CONNECTION WITH ITS PRODUCTS.

In the event BFGoodrich determines that any Product supplied by BFGoodrich does not meet any warranty during its applicable warranty term, Customer shall be entitled to remedies under the following conditions:

- Customer shall have notified BFGoodrich in writing prior to the warranty expiration date and shall have received a written Returned Goods Authorization (RGA) from BFGoodrich referencing the Product(s) covered by warranty; and
- Customer shall have returned such Product(s) to BFGoodrich, referencing Customer's RGA, freight prepaid via common carrier specified by BFGoodrich, PROVIDED, however, that BFGoodrich shall reimburse such freight expenses in the event Customer's warranty claim is honored.

If BFGoodrich determines that a returned Product is covered under BFGoodrich's warranty and if such Product is received by BFGoodrich within 30 days of the date such Product demonstrates a defect in materials or workmanship, then BFGoodrich shall repair or replace the Product or repair any defects in the material or workmanship reported during the warranty period, BFGoodrich retaining the option of furnishing new or exchange replacement parts or assemblies when providing such warranty service, or (at its option) BFGoodrich may refund the purchase price.

CUSTOMER'S SOLE REMEDIES RELATING TO THE PRODUCTS ARE SET FORTH HEREIN. BFGOODRICH WILL HAVE NO LIABILITY UNDER ANY CIRCUMSTANCES FOR ANY CONSEQUENTIAL, INCIDENTAL OR SPECIAL DAMAGES BY REASON OF ANY ACT OF OMISSION ARISING OUT OF OR IN CONNECTION WITH THE PRODUCTS, OR THE SALE, DELIVERY, INSTALLATION, MAINTENANCE, OPERATION, PERFORMANCE, OR USE OF THE PRODUCTS, INCLUDING (BY WAY OF EXAMPLE AND NOT BY WAY OF LIMITATION) DAMAGES, EXPENSES, OR LOSSES INCURRED BY REASON OF LOSS OF USE, LOST REVENUES, LOST PROFITS, DAMAGE TO ASSOCIATED EQUIPMENT OR TO FACILITIES, COSTS OF CAPITAL, COSTS OF SUBSTITUTE PRODUCTS OR FACILITIES COSTS OF REPLACEMENT PRODUCTS, COSTS ASSOCIATED WITH DOWN TIME, AND ANY SIMILAR AND DISSIMILAR DAMAGES, EXPENSES, OR LOSSES, WHETHER ANY SUCH LIABILITY IS BASED ON CONTRACT, TORT, OR OTHER LEGAL OR EQUITABLE PRINCIPLES, AND IN NO EVENT SHALL BFGOODRICH'S LIABILITY EXCEED THE PURCHASE PRICE OF THE PRODUCT(S) IDENTIFIED OR INVOLVED IN ANY DISPUTE.

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