



January 14, 2014

DIAMOND WATER CONDITIONING
JOHN GRIESBACH / DAN SCHLENZ
N1022 QUALITY DRIVE
PO BOX 170
GREENVILLE WI 54942

Re: Description: WATER TREATMENT DEVICE - MIXED BED ION EXCHANGE
Manufacturer: DIAMOND WATER CONDITIONING
Product Name: DTRS SERIES FREEDOM TANNIN REMOVAL SYSTEMS
Model Number(s): DTRS-100, DTRS-150, DTRS-200, DTRS-250 AND DTRS-300
Product File No: 20140010

The specifications and/or plans for this plumbing product have been reviewed and determined to be in compliance with chapters SPS 382 through 384, Wisconsin Administrative Code, and Chapters 145 and 160, Wisconsin Statutes.

The Department hereby issues an approval based on the Wisconsin Statutes and the Wisconsin Administrative Code. This approval is valid until the end of January 2019.

This approval is contingent upon compliance with the following stipulation(s):

- This product has undergone sufficient testing to document the product's ability to reduce only those contaminants and/or substances as specified in this approval letter when the product is installed and maintained in strict accordance with the manufacturer's published instructions.
- Where the Department of Natural Resources (DNR) has jurisdiction, a written approval may be required prior to installation of this product in a water supply system to reduce the concentration of a contaminant that exceeds the primary drinking water standards contained in ch. NR 809, Wis. Admin. Code, the enforcement standards contained in ch. NR 140, Wis. Admin. Code, or for a water supply system that is subject to a written advisory opinion by the DNR. For more information contact the DNR Section of Private Water Systems, P.O. Box 7921, Madison, WI 53707, telephone (608) 267-9787.
- If these approved devices are modified or additional assertions of function or performance are made, then this approval shall be considered null and void, unless the change is submitted to the department for review and the approval is reaffirmed.
- Operation of these devices at flow rates above the rated service flow rates specified within this approval letter are not supported or acknowledged by this approval. The rated service flow rates are the flow rates at which these devices were tested.

Because the level of treatment obtained is, in part, a function of how long the water is in contact with the treatment media within these devices, arbitrary increases in the flow rates above the rated service flow rates may compromise the quality of the treated water.

- These devices are not approved for the reduction of bacterial, colloidal or organically bound forms of iron.

The water must be tested to speciate the iron present to determine if these devices can provide adequate treatment.

- The department does not recommend the use of water softeners for reducing dissolved iron concentrations in excess of 3.0 mg/l. This is because applying water softeners in this way sacrifices long-term water softener performance and efficiency. The use of water softeners for reducing dissolved iron concentrations exceeding 3.0 mg/l also generates excessive, and otherwise avoidable, quantities of chloride and dissolved solids which are subsequently discharged to ground and/or surface water supplies. Once present in ground and/or surface water supplies, chloride and dissolved solids tend to remain in the water resource and may travel great distances from the original point source. Presently, there are no economically viable methods to remove chloride and dissolved solids from water supplies because available technologies generate waste streams of their own, further concentrating the problem. It has been established by the Wisconsin Department of Natural Resources that chloride is chronically toxic to representative aquatic organisms, including forage and sport fish, at 395 mg/l, and acutely toxic at 757 mg/l.
- Plumbing systems must be protected via one of the following methods:
 1. Alkalinity must be restored downstream of these devices; or
 2. the treated water must be monitored for copper and lead corrosion.

This is required because the anion exchange resin contained within these devices will reduce alkalinity (i.e. carbonate, bicarbonate). Alkalinity is a required for the formation of a passivating layer on internal pipe surfaces. If alkalinity is low or absent, then the passivating layer may not form correctly and copper water supply systems may corrode. Common methods of restoring alkalinity include, but aren't limited to, the chemical injection of sodium carbonate [aka soda ash (Na₂CO₃)] and calcite tank filters. If monitoring is selected, then copper/lead samples must be collected in accordance with the pertinent aspects of 40 CFR 141.86 (b):

<http://www.gpo.gov/fdsys/pkg/CFR-2010-title40-vol22/pdf/CFR-2010-title40-vol22-sec141-86.pdf>

Based on testing data submitted to and reviewed by the department, this approval recognizes that these plumbing products will reduce the concentration of contaminants as specified on pages 1 through 3 of this letter.

**AESTHETIC CONTAMINANT CAPABILITIES
 PRODUCT FILE NUMBER 20140010
 TABLE 1 OF 2**

Flow rates: DTRS-100 = 3.0 gallons per minute (gpm) @ 5.6 pounds per square inch – gauge (psig)
 DTRS-150 = 3.0 gpm @ 2.7 psig
 DTRS-200 = 5.0 gpm @ 3.9 psig
 DTRS-250 = 5.0 gpm @ 3.2 psig
 DTRS-300 = 10.0 gpm @ 6.9 psig

Tannin Reduction Capacities @ 10lb./ft.³ Salt Dosage: DTRS-100 = 1,250 parts per million - gallons (ppm-gals.)
 DTRS-150 = 1,250 ppm-gals.
 DTRS-200 = 2,500 ppm-gals.
 DTRS-250 = 2,500 ppm-gals.
 DTRS-300 = 5,000 ppm-gals.

Dissolved Iron Reduction Capacities @ 10lb./ft.³ Salt Dosage: DTRS-100 = 4,125 ppm-gals.
 DTRS-150 = 5,500 ppm-gals.
 DTRS-200 = 8,250 ppm-gals.
 DTRS-250 = 11,000 ppm-gals.
 DTRS-300 = 11,000 ppm-gals.

Tested Contaminant	Avg. Influent Concentration (mg/l) ¹	Avg. Effluent Concentration (mg/l) ¹
Tannin (naturally occurring tannins and lignin)	1.3	0.1
Dissolved iron (FeSO ₄ ·7H ₂ O)	4.1	0.1

ppm-gals = parts per million – gallons. This is an abstract unit of measure not commonly used. To determine the capacity for a given site, divide the ppm-gals value by the observed on site concentration. For example, for the DTRS-100 model, for tannin reduction, if the actual; onsite tannin concentration was 0.5 ppm, then the capacity would be 1250 ppm-gals./0.5 ppm = 2,500 gals. The average influent concentrations displayed above should not be exceeded.

¹ = milligrams per liter (mg/l) are equivalent to parts per million (ppm)

**WATER SOFTENING CAPABILITIES
 PRODUCT FILE NUMBER 20140010
 TABLE 2 OF 2**

Model Numbers	Capacity				Maximum Rated Service Flow
	Rating 1		Rating 2		
	Metered				
DTRS Series	Grains	Pounds	Grains	Pounds	gpm @ psig
DTRS-100	18,750	10.0	22,500	15.0	3.0 @ 5.6
DTRS-150	25,000	15.0	30,000	19.0	3.0 @ 2.7
DTRS-200	37,500	20.0	45,000	30.0	5.0 @ 3.9
DTRS-250	50,000	25.0	60,000	38.0	5.0 @ 3.2
DTRS-300	50,000	30.0	60,000	45.0	10.0 @ 6.9

*Softener capacity ratings are based on grains of hardness, due to calcium and magnesium cations, removed (as calcium carbonate) while producing soft water between successive regenerations and are related to the pounds of salt required for each regeneration. The tests run to generate the hardness reduction data for table 1 were conducted in accordance with NSF Standard 44.

This device was tested under controlled laboratory, or field, conditions. The actual performance of this device for a specific end use installation will vary from the tested conditions based on local factors such as water pressure, water temperature and water chemistry.

The department is in no way endorsing this product or any advertising, and is not responsible for any situation which may result from its use.

Sincerely,

Glen W. Schlueter
 Environmental Engineer - Plumbing Product Reviewer
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 Division of Industry Services
 Bureau of Technical Services
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