# STATE OF COLORADO

John W. Hickenlooper, Governor
Larry Wolk, MD, MSPH
Executive Director and Chief Medical Officer

Dedicated to protecting and improving the health and environment of the people of Colorado

4300 Cherry Creek Dr. S.
Denver, Colorado 80246-1530
Phone (303) 692-2000
Located in Glendale, Colorado

www.colorado.gov/cdphe

Colorado Department
of Public Health
and Environment


May 23, 2014

Reid Staton
Krüger Inc.
401 Harrison Oaks Blvd. Ste. 100
Cary, NC 27513

Subject: Acceptance of the Krüger/Metawater KCM269 Ceramic Membrane Module as an Alternative Filtration Technology to meet the *Colorado Primary Drinking Water Regulations* requirements for *Giardia lamblia* and *Cryptosporidium* Removal

Dear Mr. Stanton;

The Colorado Department of Public Health and Environment's Water Quality Control Division ("the Department") has received and reviewed the information for the Krüger/Metawater KCM269 Ceramic Membrane Module in accordance with Section 11.8(2)(b)(ii) and 11.10(5)(j) of the *Colorado Primary Drinking Water Regulations* (Regulation 11), 5 CCR 1002-11. The Krüger/Metawater KCM269 Ceramic Membrane Module meets or exceeds the requirements of the *State of Colorado Design Criteria for Potable Water Systems* (DCPWS) Sections 1.11, 4.3.8 and the requirements of Regulation 11. The technology is conditionally accepted for use as an Alternative Filtration Technology and granted the removal credit in Table 4.1, Section 4.3.8.2 of the DCPWS. The technical specifications and conditions of acceptance for the Krüger/Metawater KCM269 Ceramic Membrane Module and the Kruger Fitlration Skids are outlined in Tables 1 and 2 as well as Section 4.3.8 of the DCPWS.

This acceptance supersedes the previous acceptance of the Krüger/Metawater KCM269 Ceramic Membrane Module dated May 14, 2012.

This acceptance addresses the following items:

- Krüger/Metawater KCM269 module
- Model 8R10E, 10R10E filtration skids

This acceptance applies only to the the Krüger/Metawater KCM269 Ceramic Membrane Module and does not constitute construction approval for installation at any public water system. Each individual submittal to the Department must demonstrate conformance with Section 4.3.8 of the DCPWS for each installation of the filters and filtration skids. **Review and approval for the design of any public water system proposing to use this technology will be handled on a case-by-case basis by the Department as required by Section 11.4 of Regulation 11.**

As part of this review, the Department has evaluated the following documents:

- NGK Insulators, Inc. Alternative Filtration Technology Acceptance Letter and associated submittal material (October 25, 2007)
- Email correspondence between the Division and Krüger, March 1, 2012
- P&ID Diagrams for KCM Skid (March 1, 2012)
- http://www.nsf.org – Metawater materials certification for membrane components

Any addenda that will modify the modules must be submitted to the Department for review and acceptance prior to use in Colorado by a regulated public water system. This requirement includes any changes made to the membrane modules, materials of construction and associated interfaces with process piping. The Department will review any additional third party verification reports and issue a revised acceptance letter if appropriate.

**Table 1: Technical Specifications and Conditions of Acceptance**

| **Filter Manufacturer** | **Krüger/Metawater** |
|---|---|
| **Filter Model** | **KCM269** |
| Maximum Flux (gfd -gallons per sq. ft. per day) @ 20 °C | 175 |
| Maximum Flux (gfd) @ 1 °C | 100 |
| Max Transmembrane Pressure lbs per square inch differential (psid) | 55 |
| Maximum Inlet Pressure – lbs per square inch gauge (psig) | 290 |
| Minimum direct integrity test pressure (starting pressure) | 20 psig |
| Direct integrity testing failure criteria | >1.0 psig per 10 minute monitoring period – per approved protocol |
| Prefiltration | None – up to 2000 NTU raw water. |
| **Additional Operations and Maintenance Criteria** | |
| 1. If a filter fails an integrity test, the filter must be removed from service immediately and replaced with a functional filter or repaired prior to being returned to operation.<br>2. The public water system must keep records of the following operational parameters (available for Department review):<br>a. Integrity test date, results (pass or fail), and initials of person performing the test<br>b. Clean in place (CIP) dates with clean water permeability and integrity test result.<br>c. Filter maintenance and fiber repair results<br>d. Filter replacement date and reason for replacement.<br>3. Public water systems must maintain an operation and maintenance manual for the micro/ultratfiltration system. All integrity tests and CIP procedures must follow manufacturer prescribed procedures. | |

**Table 2: Pre-Accepted Skids Conditions of Acceptance:**

| **Skid Type** | **Evoqua** | |
|---|---|---|
| **Skid Type** | **Krüger/Metawater KCM** | |
| **Skid Model Number** | **8R10E** | **10R10E** |
| Maximum Daily Production (gallons) Based on max flux @ 20°C – See Table 1 | 3,766,000 | 4,707,500 |
| Cross connection control (DCPWS 4.3.8.8(b)(vii)) | Verified. **Permeate Valve Schedule: Block Valves: AV-3110123 and AV-311003 – Bleed Valves: AV-311024** | |
| Individual Skid Effluent Turbidity (DCPWS 4.3.8.10(a)and (d)) | Not Verified. | |
| Flow Control (DCPWS 4.3.8.10 (c) and (e)) | Not Verfied. | |

Please be aware that any point source discharges of water from treatment facilities are potentially subject to a discharge permit under Colorado's State Discharge Permit System. Any point source discharges to state waters without a permit are subject to civil or criminal enforcement action.

Please direct any further correspondence regarding this acceptance to:

Tyson Ingels, P.E.
Colorado Department of Public Health and Environment
Water Quality Control Division
4300 Cherry Creek Drive South
Denver, CO 80246

If you have any questions or comments, please call Tyson Ingels at 303-692-3002.

Sincerely,

Digitally signed by Tyson Ingels, P.E.
DN: cn=Tyson Ingels, P.E., o, ou, email=tyson.ingels@state.co.us, c=US
Date: 2014.05.23 11:07:57 -06'00'

Tyson Ingels, P.E.
Lead Drinking Water Engineer
Engineering Section
Water Quality Control Division
Colorado Department of Public Health and Environment