

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

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Colorado Department
of Public Health
and Environment

May 23, 2014

Kevin Dufresne
GE Power and Water
3239 Dundas Street West
Oakville, ON, Canada
L6M 4B2

Subject: Acceptance of the GE Power and Water ZeeWeed® 1500-550 and 1500-600 Membrane Modules as an Alternative Filtration Technologies to meet the *Colorado Primary Drinking Water Regulations* requirements for *Giardia lamblia* and *Cryptosporidium* Removal

Dear Mr. Dufresne;

The Colorado Department of Public Health and Environment's Water Quality Control Division ("the Department") has received and reviewed the information for GE Power and Water's pressure filtration system utilizing the ZeeWeed® 1500-550 and ZeeWeed® 1500-600 Membrane Modules 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 ZeeWeed 1500-550 and 1500-600 modules meet or exceed 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 ZeeWeed® 1500-550 and ZeeWeed® 1500-600 modules and Z-Pak 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 ZeeWeed® 1500-550 and ZeeWeed® 1500-600 modules dated June 3, 2013.

This acceptance addresses the following items:

- GE Power and Water ZeeWeed® 1500-550 and ZeeWeed® 1500-600 modules
- GE Power and Water Z-PAK filtration skids

This acceptance applies only to the ZeeWeed® 1500-550 and ZeeWeed® 1500-600 modules 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.

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:

- California Department of Public Health Conditional Acceptance Testing For ZeeWeed® 1500 Membrane, December 2010
- California Department of Public Health Conditional Acceptance Testing For ZeeWeed® 1500-600 Membrane, April, 2013
- GE Z-Pak-350 Submittal Package for CDPHE prepared by Grant MacInnis, March 27, 2013
 - Mar-13 O&M Manual (skid O&M manual)
 - ZW-1500 product manual
 - P&I, Process Skid, Z-PAK 350, 480/3/60, Drawing 1305786, August, 2009.
 - P&I drawings for 12 and 24 module racks, backwash, and CIP systems
- NSF Website – GE ZeeWeed 1500 module

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 ZeeWeed® 1500-550 and ZeeWeed® 1500-600 modules, materials of construction, or 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: ZeeWeed® 1500-550 and ZeeWeed® 1500-600 Technical Specifications and Conditions of Acceptance

Filter Manufacturer	GE Power & Water	
Filter Model	ZW 1500-550	ZW 1500-600
Surface area per module (ft ²)	550	600
Maximum Flux (gfd -gallons per sq. ft. per day) @ 20 °C	100	90
Maximum Flux (gfd) @ 1 °C	57	51
Max Transmembrane Pressure lbs per square inch differential (psid)	45	
Alarm Transmembrane Pressure (psid)	40	
Maximum Inlet Pressure – lbs per square inch gauge (psig)	55	
Minimum direct integrity test (DIT) pressure to be exceeded throughout the DIT	11.4 psig	11.4 psig
Direct integrity testing failure criteria NOTE: Each installation must calculate	Calculated Log Removal Value* (LRV) < Log Removal Credit (above)	Calculated Log Removal Value* (LRV) < Log Removal Credit (above)
Prefiltration	500 micron pre-screen	
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.		

2. The public water system must keep records of the following operational parameters (available for Department review):
 - a. Integrity test date, results (pass or fail), and initials of person performing the test
 - b. Calculated LRV for each integrity test
 - c. Clean in place (CIP) dates with clean water permeability and integrity test result.
 - d. Filter maintenance and fiber repair results
 - e. Filter replacement date and reason for replacement.
3. Public water systems must maintain an operation and maintenance manual for the micro/ultrafiltration system. All integrity tests and CIP procedures must follow manufacturer prescribed procedures.

Table 2: Pre-Accepted Z-Pak Skids Conditions of Acceptance:

Skid Type	GE Power & Water Z-Pak			
Skid Model Number	Z-Pak-350 12 module		Z-Pak-350 24 module	
Number of Modules	12		24	
Modules	ZW 1500-550	ZW 1500-600	ZW 1500-550	ZW 1500-600
Maximum Flow (gpm) Based on max flux @ temperature – See Table 1	260	255	520	510
Cross connection control (DCPWS 4.3.8.8(b)(vii))	Verified. Based on the Process and Instrumentation Diagrams provided, the following block and bleed valves are required: During CIP or Enhanced BW: Permeate: FV301 and FV302 closed during CIP, ½" valve FV303 open. During Operation: CIP Recirc and Backwash Isolation: Valves FV601, 602, 704, and 705 closed with drain valves FV603 and 706 open.			
Individual Skid Effluent Turbidity (DCPWS 4.3.8.10(a)and (d))	Verified. Via 22-HV-304 – turbidity monitored on each skid. Combined filter effluent must be specified on each submittal.			
Flow Control (DCPWS 4.3.8.10 (c) and (e))	Verified on P&ID.			
Pre-screen	Model Number and NSF Certification must be provided (along with anticipated head loss calculation)			

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

Kevin Dufresne
GE Water and Power
May 23, 2014
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If you have any questions or comments, please call Tyson Ingels at 303-692-3002.

Sincerely,

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