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**Building Materials Evaluation
Commission**

**Commission d'évaluation des
matériaux de construction**

BMEC AUTHORIZATION: 15-02-376

Eljen™ GSF System

Date of Authorization: September 24, 2015
Date of Expiry¹: September 24, 2020
Date of Amendment January 26, 2017 (update design and install manual)

1. Applicant

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USA 06108

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2. Manufacturing Facility

Eljen GSF Modules
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Engineering and Design
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3. Authorization

The Eljen™ GSF System primarily consists of a septic tank, an effluent filter, the GSF A42 modules, an anti-siltation filter fabric, and a layer of specified system sand. The Eljen™ GSF System can be installed in-ground, partially raised, or fully raised.

The Eljen™ GSF System is authorized as a combined treatment and dispersal system. This authorization is not an approval for the use of the Eljen™ GSF System as a treatment unit, where treatment units are permitted for use with Class 4 sewage systems.

¹ This Authorization expires on the date shown. It is the responsibility of Authorization holders to make a complete application considering the time for review and complexity of the new application.

Reports and assessments provided by the Applicant demonstrate that if the Eljen™ GSF System is manufactured, designed, constructed, installed, and maintained in accordance with the manufacturer's instructions and limitations, and the specific terms and conditions stated in this authorization, the use of Eljen™ GSF System shall be deemed to not be a contravention of Division B, Section 8.6. "Class 4 Sewage System" and 8.7. Leaching Beds" of Division B of the Building Code.

All other requirements pertaining to the manufacture, design, construction, installation, and maintenance are subject to the requirements of the Building Code, and subject to the following terms and conditions contained below.

4. Specific Terms and Conditions

1.0 Definitions

A word or phrase used in this Authorization has the following meaning for the purposes of this Authorization:

- 1.1. Raised or Partially Raised means a sewage system in which any part of the system is above the natural ground elevation.
- 1.2. Vertical Separation means the depth of unsaturated soil below the system, as measured from the bottom of the Eljen™ GSF Specified System Sand, to a limiting layer such as a high groundwater table, bedrock, or soil with a percolation time (T) greater than 50 min/cm.

2.0 Installation Requirements

- 2.1. The Eljen™ GSF System shall be installed as per the manufacturer's installation instructions as found in the "GSF® ELJEN GSF SYSTEM, Ontario: Design and Installation Manual", dated November 2016.
- 2.2. The Eljen Corporation's installation manual "GSF® ELJEN GSF SYSTEM, Ontario: Design and Installation Manual", dated November 2016, shall be placed on site and remain on site during the installation of the Eljen™ GSF System.
- 2.3. No person shall operate the Eljen™ GSF System unless the person has entered into an agreement whereby the servicing and maintenance of the Eljen™ GSF System and its related components will be carried out by a person who is authorized by the manufacturer to service and maintain the Eljen™ GSF System, and who shall:

Inspection

- 2.3.1. Conduct and record at least once during every twelve (12) month period, an inspection and servicing, as specified by the Applicant, Eljen Corporation and Enviro-STEP technologies, "Eljen GSF System Maintenance Agreement – Ontario", dated December 2014; and

Testing

- 2.3.2. The Eljen™ GSF System shall be tested in accordance with the requirements set out in Article 8.9.2.4. "Sampling of Treatment Units" of Division B of the Building Code.

3.0. System Requirements

- 3.1. The Eljen™ GSF System Components - there are seven (7) main components to the Eljen™ GSF System, and they are:
 - 3.1.1. The Septic Tank;
 - 3.1.2. The Effluent Filter;
 - 3.1.3. The Distribution System;
 - 3.1.4. The Eljen™ GSF A-42 modules;
 - 3.1.5. Anti-Siltation Filter Fabric;
 - 3.1.6. The Eljen™ Specified Sand, and
 - 3.1.7. The Sampling Device.
- 3.2. The Septic Tank - The Eljen™ GSF System shall be designed to receive septic tank effluent. All raw sewage shall enter into a septic tank sized in accordance with Article 8.2.2.3. "Septic Tanks" of Division B, of the Building Code.
- 3.3. The Effluent Filter - An effluent filter, meeting the requirements of Article 8.6.2.1. "Septic Tank Systems" of Division B of the Building Code, shall be connected to the outlet of the septic tank.
- 3.4. The Distribution System - The distribution system may include a distribution box and equalizer, a combination of distribution valve and distribution box, a network of perforated PVC pipe, or a low pressure distribution system.
- 3.5. The Eljen™ GFS A-42 Module
 - 3.5.1. The Eljen™ GFS A-42 module consists of a cusped plastic core and corrugated geotextile fabric shaped as an accordion to form a mattress 1200 mm long x 600 mm wide x 175 mm high.
 - 3.5.2. The Eljen™ GSF A-42 modules shall be placed level, end to end, with the white demarcation line facing up, and form rows.
 - 3.5.2.1. Each row of Eljen™ GSF A-42 shall be fed with a perforated PVC pipe centred over the modules, and this pipe shall be secured over the middle of each module using a u-shaped clamp,
 - 3.5.2.2. When multiple rows are used, each row of the Eljen™ GSF A-42 modules shall be evenly spaced over the receiving infiltrative surface, and
 - 3.5.2.3. The Eljen™ GSF A-42 modules shall not be cut.

3.6. Anti-Siltation Filter Fabric

- 3.6.1. The anti-siltation filter fabric shall be spread lengthwise over the perforated PVC pipe, and down the sides of the Eljen™ GSF A-42 modules,
- 3.6.2. The anti-siltation filter fabric shall be secured using the Eljen™ System Specified Sand along the sides of the modules,
- 3.6.3. The anti-siltation filter fabric shall drape vertically over the pipe and must neither block the holes nor be stretched from the top of the pipe to the outside edge of the modules,
- 3.6.4. When modules are placed end to end, with a space in between, the fabric shall be cut and allowed to drape over and protect the ends of each module, and
 - 3.6.4.1. The anti-siltation filter fabric shall not be a continuous run from end to end.

3.7. The Eljen™ GSF System Specified Sand

- 3.7.1. All Eljen™ GSF System configurations require Eljen™ System Specified Sand under and in between the Eljen GSF modules.
- 3.7.2. The Specified Sand shall:
 - 3.7.2.1. be a minimum depth of 150 mm under the modules,
 - 3.7.2.2. be placed between the rows of modules and be the same height of the modules,
 - 3.7.2.3. extend a minimum of 150 mm around the perimeter and end of each row, and
 - 3.7.2.4. meet the sand requirements set out in ASTM C33 “Standard Specification for Concrete Aggregates”, as set out in Table 3.7.

Table 3.7.

Eljen GSF Specified Sand Requirements		
<i>Excerpt from ASTM C33 “Standard Specification for Concrete Aggregates</i>		
Sieve Size	Sieve Square Opening	Specification % Passing
0.375”	9.5 mm	100.0
#4	4.75 mm	95.0 – 100.0
#8	2.36 mm	80.0 – 100.0
#16	1.18 mm	50.0 – 85.0
#30	600 µm	25.0 – 60.0
#50	300 µm	5.0 – 30.0
#100	150 µm	0.0 – 10.0
#200	75 µm	0.0 – 5.0

Request a sieve analysis from the material supplier to confirm that the system sand meets the specifications requirements listed above

4.0 Design

Vertical Separation

- 4.1. The percolation time (T) of the native soil shall determine the minimum vertical distance from the bottom of the Eljen™ GSF System Specified Sand to the high ground water table, bedrock, or soil with a percolation time (T) less than 1 min/cm or greater than 50 min/cm:
 - 4.1.1. if T is less than or equal to 6 min/cm, or greater than 50 min/cm, then the vertical separation distance shall be at least 600 mm, or
 - 4.1.2. if T is greater than 6 min/cm, or less than or equal to 50 min/cm, then the vertical separation shall be at least 450 mm.

Number of Eljen™ GSF A-42 Modules Required

- 4.2. Each Eljen™ GSF A-42 Module has the capacity to treat 95 L per day.
 - 4.2.1. The formula to determine the number of Eljen™ GSF modules required is: $Q/95$.

Where:

Q is the total daily design sanitary sewage flow in litres, and

- 4.2.2. The number of Eljen™ GSF modules must be rounded up at all times.

Modules Spacing Requirements

- 4.3. The Eljen™ GSF A-42 modules shall be spaced using the following criteria:
 - 4.3.1. The modules shall be placed with the white demarcation line up,
 - 4.3.2. The white line demarcations on the modules, in any one row, shall run end to end creating a line,
 - 4.3.3. The modules shall be evenly spaced to over the Eljen™ Specified System Sand area,
 - 4.3.4. The rows shall be spaced a minimum of 300 mm, calculated side to side,
 - 4.3.5. The rows shall start and finish with a minimum separation of 150 mm of Specified Sand, and
 - 4.3.6. The modules may be placed on an angle to follow site contours.

Dispersal Surface (A) – In-ground, partially raised, or above ground

- 4.4. The area to be covered by the specified system sand in the Eljen™ GSF modules shall be equal or larger than the area determined by the formula:

$$A = QT/400$$

Where:

- A is the area of contact in m²
T is the percolation time of the underlying native soil in min/cm to a maximum of 50, and
Q is the total daily design sanitary sewage flow in litres, and

- 4.4.1. All Eljen™ GSF System designs shall meet the minimum spacing requirements of 4.3. above,
- 4.4.2. Where the area determined using QT/400 is larger than that required by the minimum spacing required by 4.3. above, the Eljen™ GSF modules shall be evenly spaced over the entire area of the Eljen™ Specified System Sand,
- 4.4.3. The dispersal surface shall have the long dimension perpendicular to the direction in which effluent entering the soil will move horizontally, and
- 4.4.4. When the native soil has a T of 50 min/cm or greater, the Eljen™ GSF System shall be raised.

Other

- 4.5. The Eljen™ GSF System shall be designed, installed, constructed, operated, and maintained using these criteria:
- 4.5.1. Eljen™ GSF System shall not be installed in an area where the original ground has a slope is more than 25%,
- 4.5.2. Where the Eljen™ GSF System is fed by gravity, each row shall not exceed a maximum length of 18 m,
- 4.5.3. Where the Eljen™ GSF System is fed by low pressure system, each row shall not exceed a maximum length of 30 m,
- 4.5.4. All Eljen™ GSF Systems that are dosed by pumping shall use differential venting, and the venting shall be located at the far end of one of the Eljen™ GSF System rows,
- 4.5.5. Except when used with a “Low Pressure Distribution System”, Eljen™ GSF Systems that are dosed by pumping shall use a velocity reducer located in the distribution box,

- 4.5.6. The Eljen™ GSF System shall have a sampling device, for the purpose of sampling effluent, and it shall be installed as described in the “GSF® ELJEN GSF SYSTEM, Ontario: Design and Installation Manual”, dated November 2016,
- 4.5.7. The site shall be protected from erosion by proper grading, mulching, seeding, and runoff control,
- 4.5.8. No reduction in size of the Eljen™ GSF System shall be permitted with the use of a treatment device beyond that of a septic tank, and
- 4.5.9. The Eljen™ GSF System, measured from the centre of the pipes, shall meet the setback requirements outlined in Article 8.2.1.4. of Division B, of the Building Code.

5. General Conditions

1. The use of the Eljen™ GSF System as described in Section 3. and the Specific Terms and Conditions set out in Section 4. must comply with:
 - (a) the *Building Code Act, 1992*, (the “Act”) as amended or re-enacted,
 - (b) except as specifically authorized herein, the Building Code as amended or remade, and
 - (c) all other applicable legislation.
2. A copy of this Authorization shall accompany each application for a building permit and shall be maintained on the site of the construction with the building permit.
3. The Applicant specified in Section 1. shall promptly notify the BMEC of:
 - (a) the failure of the Applicant to comply with any of the Specific Terms and Conditions set out in Section 4.,
 - (b) the failure of the material, system or building design that is the subject matter of this Authorization to
 - (i) comply with any of the Specific Terms and Conditions set out in Section 4., or
 - (ii) provide a satisfactory level of performance in situ, or
 - (c) the occurrence of any of the events described in General Conditions 5.4.(a), (b), (e) or (f).
4. The BMEC may amend or revoke this Authorization at any time on its own initiative, or at the request of the Applicant specified in Section 1. Without restricting the foregoing, the BMEC may amend or revoke this Authorization where it determines that:

- (a) any change has been made to:
 - (i) the name of the Applicant specified in Section 1.,
 - (ii) the address or other contact name information of the Applicant specified in Section 1.,
 - (iii) the ownership of the Applicant specified in Section 2.,
 - (iv) the manufacturing facilities specified in Section 2,
 - (v) the material, system, or building design that is the subject matter of this Authorization, or
 - (vi) a test method relevant to this Authorization,
- (b) the Applicant has failed to comply with any of the terms and conditions set out in this Authorization,
- (c) in the opinion of the BMEC, the use of the material, system or building design authorized herein provides an unsatisfactory level of performance in situ,
- (d) in the opinion of the BMEC, amendment or revocation of the Authorization is appropriate on the basis of potential danger to public health and safety,
- (e) the *Act* or Building Code has been amended, re-enacted or remade in a manner relevant to this Authorization,
- (f) this Authorization was issued on mistaken, false or incorrect information, or
- (g) a revision of an editorial nature is appropriate.

Dated at Toronto this 24th day of September 2015

BUILDING MATERIALS EVALUATION COMMISSION

Edward Link, P.Eng

CHAIR, BUILDING MATERIALS EVALUATION COMMISSION

ATTACHED – “APPENDIX A – SUPPORTING INFORMATION”

Appendix A – Supporting Information

The following is a list of the documents that were submitted and reviewed, but were not limited to:

1. Manufacturer's Literature, Eljen Corporation "Combined Onsite Wastewater Treatment and Dispersal System", undated, 1 page;
2. Manufacturer's Literature, "Eljen GSF – General Description" undated, 4 pages;
3. Manufacturer's Literature, Eljen Corporation, "Eljen GSF Geotextile Sand Filter", undated, 1 page;
4. Manufacturer's Literature, Eljen Corporation, "Eljen GSF System Overview", undated, 2 pages;
5. Test Report, MASSTIC, "Onsite Wastewater Technology Testing Report: Eljen™ GSF/A42", January 2014;
6. Manual, GSF® ELJEN GSF SYSTEM, Ontario: Design and Installation Manual" dated December 2014;
7. Manual, GSF® ELJEN GSF SYSTEM, Ontario: Design and Installation Manual" revised March 2015;
8. Sample Form, "Eljen GSF System Maintenance Agreement – Ontario", dated December 2014;
9. Procedure, Eljen Corporation, "Eljen GSF System – Maintenance Procedure", undated, one page;
10. Video, Eljen Corporation, "Trench Installation";
11. Video, Eljen Corporation, "Pressure Distribution";
12. Approvals from other Authority's Having Jurisdiction:
 - a. Arizona Department of Environmental Quality
 - b. Pitkin County, Environment Health and Natural Resources
 - c. Connecticut Public Health Code
 - d. Indiana State Department of Health
 - e. State of Maine, Department of Health and Human Services
 - f. Massachusetts Energy and Environmental Affairs
 - g. Minnesota Subsurface Sewage Treatment Program
 - h. New York Department of Health
 - i. Commonwealth of Pennsylvania
 - j. Rhode Island Department of Environmental Management
 - k. Commonwealth of Virginia
 - l. Wisconsin Department of Safety and Professional Services
13. Test Results, MASSTIC - Summary Tables, 2008, 2 pages;
14. Sample Calculations, Enviro-STEP Technologies, undated, 2 pages;
15. Letter Report, Enviro-STEP Technologies, "BMEC 2015-01: Eljen GSF System", dated May 25, 2015, 5 pages;
16. Letter Report, Enviro-STEP Technologies, "BMEC 2015-01: Eljen GSF System", dated March 16, 2015, 7 pages;
17. Letter Report, Enviro-STEP Technologies, "BMEC 2015-01: Eljen GSF System", dated April 15, 2015, 4 pages;
18. Letter Report, Gunnell Engineering Ltd, "BMEC Application for the Eljen GSF System", dated December 29, 2014, 4 pages;
19. Drawings, Enviro-STEP Technologies, drawing numbers E-1, E-2 and E-3, dated 2015/03;

20. Manufacturer's Literature, "Eljen GSF – Sampling Procedure" undated, 4 pages
21. PowerPoint Presentation, Enviro-STEP Technologies, "Technical Presentation in Support of the BMEC Application", undated, 18 pages;
22. Technical Paper, Oregon TRC Meeting, "Science Behind Geotextile Sand Filter and Soil Loading", Stephen P. Dix, PE, dated 5/24/07;
23. Technical Paper, "Performance of Trenches Receiving Sand Filter Effluent on Slowly Permeable Soils", Loudon and Birnie, 11 pages;
24. Technical Paper, "Modeling Effluent Transport From Eljen Corporation Unit", Dr. Jack Watson, Jan-15, 8 pages;
25. Technical Paper, "The Soil as a Treatment System", Tyler, Laak, McCoy and Sandu, 16 pages;
26. Approval, Bureau de normalisation du Québec, "Eljen GSF-A42 Field of Application: Sheet Level, Validated" Date of expiry: 2018-04-22, 13 pages;
27. Standard Eljen Corporation, "NSF Standard 40 Protocol: Chapter 8, Excerpt and Comparison", date 11/20/13, 7 pages;
28. Correspondence, NSF International, "re: Eljen and NSF Certification", dated June 24, 2015, 1 page;
29. Test Results, "Eljen GSF-AT: MASSTIC – 26 Weeks";
30. Test Results, "Eljen GSF-AT: MASSTIC – 26 Weeks", 4 pages
31. Test Results, "Temp During Testing";
32. Correspondence, MASSTIC, "re: Statistical Information", February 2014;
33. Correspondence, NSF International, "re: Eljen Geotextile Filter System", dated April 14, 2010, 2 page;
34. Correspondence, NSF International, "re: Eljen Geotextile Filter System", dated July 29, 2008, 3 page;
35. Test Report, MASSTIC, "Eljen Geotextile Filter System Demand Dosed Mode", March 2008, 26 pages;
36. Test Report, MASSTIC, "Eljen Geotextile Filter System Time Pressure Dosed Mode", March 2008, 25 pages;
37. Test Report, MASSTIC, "Eljen Geotextile Filter System Gravity Supply Mode", November 2008, 22 pages;
38. Test Results, MASSTIC, "Eljen Geotextile Filter System Time Pressure Dose Mode", June 2007 to January 2008;
39. Test Results, MASSTIC, "Eljen Geotextile Filter System Demand Dosed Mode Mode", June 2007 to January 2008;
40. Test Results, MASSTIC, "Eljen Geotextile Filter System Gravity Supply Mode", September 2007 to March 2008;
41. Letter Report, Gunnell Engineering Ltd, "BMEC Application for the Eljen GSF System – 2015-01", dated July 7, 2014, 2 pages;
42. Letter Report, Enviro-STEP Technologies, "BMEC 2015-01:Eljen GSF System", dated July 7, 5 pages;
43. Letter Report, Enviro-STEP Technologies, "BMEC 2015-01:Eljen GSF System", dated July 10, 2 pages;
44. Letter Report, Gunnell Engineering Ltd, "BMEC Application for the Eljen GSF System – 2015-01", dated July 14, 2014, 1 page; and
45. Manual, GSF® ELJEN GSF SYSTEM, Ontario: Design and Installation Manual" dated November 2016.