

IAPMO IGC 413-20xx



PUBLIC REVIEW DRAFT

Industry Standard for
**Denitrifying Technology for Insert into
Septic Tanks**



IAPMO Standard

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Preface

This is the first edition of IAPMO IGC 413, Denitrifying Technology for Insert into Septic Tanks.

This Standard was developed by the IAPMO Standards Review Committee (SRC) in accordance with the policies and procedures regulating IAPMO industry standards development, Policy S-001, Standards Development Process. This Standard was approved as an IAPMO Industry Standard on Month, day, year

Notes:

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- (4) *During its development, this Standard was made available for public review, thus providing an opportunity for additional input from stakeholders from industry, academia, regulatory agencies, and the public at large. Upon closing of public review, all comments received were duly considered and resolved by the IAPMO Standards Review Committee.*
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 - (a) *standard designation (number);*
 - (b) *relevant section, table, or figure number, as applicable;*
 - (c) *wording of the proposed change, tracking the changes between the original and the proposed wording;*
and
 - (d) *rationale for the change.*
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 - (a) *the edition of the standard for which the interpretation is being requested;*
 - (b) *the definition of the problem, making reference to the specific section and, when appropriate, an illustrative sketch explaining the question;*
 - (c) *an explanation of circumstances surrounding the actual field conditions; and*
 - (d) *the request for interpretation phrased in such a way that a "yes" or "no" answer will address the issue.*
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H. Aguilar	IAPMO <i>Ontario, California, USA</i>	<i>Secretary</i>

IAPMO IGC 413-20xx

Denitrifying Technology for Insert into Septic Tanks

1 Purpose

- 1.1 The purpose of this Standard is to establish a performance standard for technology designed for installation inside septic tanks for the purpose of reducing the concentration of nitrogen compounds and organic loads released into soil-based disposal systems. The intent is to serve as a guide for producers, distributors, architects, engineers, contractors, installers, inspectors and users; to promote understanding regarding materials, manufacture and installation, and to provide for identifying technologies complying with this standard.
- 1.2 The provisions of this standard are not intended to prevent the use of any alternate material or method of construction provided that any such alternate meets the requirements of the standard.

2 Scope

- 2.1 This standard covers reference standards, definitions, general requirements, testing requirements, installation instructions, and marking and identification for nitrogen reducing technology. Technology covered by this standard includes aeration systems designed to initiate the oxidation of ammonia to nitrite or nitrate, anaerobic components designed to denitrify nitrite or nitrate, special bacterial blends to achieve enhanced conversion of nitrite or nitrate to nitrogen gas, either aerobically or anaerobically so that the concentration of total nitrogen in the effluent leaving the tank will be reduced by at least one-half of that of the raw influent introduced into the tank. The technology shall be designed to fit in standard septic tanks, either new or previously installed, such that no structural change to the septic tank shall occur.

3 Reference Standards

- 3.1 The standards referenced herein shall be the current edition of the standards, as published in Table 14-1 of the Uniform Plumbing Code.

ASTM D1785

Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120

ASTM D2665

Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings

ASTM D3034

Type PSM Poly (VinylChloride) (PVC) Sewer Pipe and Fittings

ASTM F810

Smooth wall Polyethylene (PE) Pipe for Use in Drainage and Waste Disposal Absorption Fields

CSA B1800

Thermoplastic nonpressure piping compendium

CSA B181.1

Acrylonitrile-butadiene-styrene (ABS) drain, waste, and vent pipe and pipe fittings

CSA B181.2

Polyvinylchloride (PVC) and chlorinated polyvinylchloride (CPVC) drain, waste, and vent pipe and pipe fittings

CSA B182.2

PSM type polyvinylchloride (PVC) sewer pipe and fittings

CSA B182.6

Profile polyethylene (PE) sewer pipe and fittings for leak-proof sewer applications

UL 1450

Motor-Operated Air Compressors, Vacuum Pumps, and Painting Equipment

UL 1951

Standard for Electric Plumbing Accessories

4 Definitions

- 4.1 Denitrifying Technology** – Denitrifying Technology consists of a manufactured unit or system designed for installation inside a standard septic tank. Any such unit or system shall result in a biological conversion from soluble nitrogen compounds in the liquid content of the tank to gaseous forms of nitrogen that can escape the liquid, thereby reducing the concentration of nitrogen in the effluent discharged from the tank.
- 4.2 Denitrification** – The biological process including the oxidation of ammonia to nitrate or nitrite that is followed by the bacterial activity that strips oxygen from the nitrate or nitrite in such a fashion that results in a gaseous form of nitrogen, such as N₂ gas, which escapes the liquid.
- 4.3 Total Kjeldahl Nitrogen (TKN)** – a measure of the amount of nitrogen in a sample, including both organic and inorganic nitrogen.
- 4.4 Total Nitrogen (TN)** – a measure calculated as the total of Total Kjeldahl Nitrogen plus Nitrite and Nitrate.

5 General Requirements

- 5.1 Materials** – Nitrogen removal technology shall be constructed of materials capable of resisting biological or physical deterioration within a septic tank. Acceptable materials include PVC, ABS, HDPE.
- 5.1.1** PVC schedule 40 pipe shall comply with the requirements of ASTM D1785 or CSA B137.3.
- 5.1.2** PVC DWV pipe shall comply with the requirements of ASTM D2665 or CSA B181.2.
- 5.1.3** PVC sewer pipe shall comply with the requirements of ASTM D3034 or CSA B182.2.
- 5.1.4** Polyethylene drainage pipe shall comply with the requirements of ASTM F810 or CSA B181.1.
- 5.1.5** ABS DWV pipe shall comply with or exceed the requirements of ASTM D2661 or CSA B181.1.
- 5.2 Unit Size** – Any equipment shall be of a size that it can be installed inside a standard opening of a minimum diameter of 18” without modification of the opening. Recirculation equipment may transfer liquid between compartments of the tank via openings in separate risers that extend above the tank as long as the riser is connected to the upper outside surface of the tank without modification of the tank structure and as long as the riser is sealed to the tank to prevent liquid infiltration. All pipes transferring liquid from riser to riser will also be sealed at the penetration.
- 5.3 Aerobic Conditions** – Aeration shall be provided to the effluent so that ammonia in the liquid can be oxidized through bacterial action.
- 5.4 Electrical Components** - Electrical components, including air pumps, shall comply with UL 1450 or UL 1951.

6 Testing Requirements

- 6.1 Aerator Location** - An aerator may be located outside the tank as long as the pressurized air can be delivered to the liquid in the tank without modifying the structure of the tank proper. Other aeration equipment can be introduced into the tank so long as it does not alter the structure of the tank proper.
- 6.2 Additional Components** – All components, including the aeration components shall be marketed identical to those utilized in the testing.
- 6.3 Effluent Processing Test**
- 6.3.1** Selection of test tanks shall be conducted such that the candidate tank should be a single chamber or multiple chamber septic tank with a volume of at least 1,000 gallons but not more than 1,500 gallons installed in homes with 3-5 residents. The home shall have been operated at the current load for a period of at least 1 year. At least three such sites shall be included in the test protocol. The nutrient concentration shall be no less than 50 mg/l Total Nitrogen.

- 6.3.2** Load entering the tested systems for testing will be determined according to the following protocol:
- 6.3.3** Pre-treatment characterization:
- (a) The septic tank should be pumped and cleaned and allowed to be refilled with household waste.
 - (b) Within one week of complete filling a grab sample should be taken from the inlet chamber of the tank and analyzed for BOD, TSS, Ammonia, Total Kjeldahl Nitrogen, Nitrite and Nitrate to establish baseline influent concentration.
- 6.3.4** Nitrogen reduction technologies can operate on different principles that can either work inside a single chamber tank or require the use of a second chamber for effectiveness. Technologies that can achieve the nitrogen reduction standard in a single chamber tank can be listed for use in single chamber or multiple chamber tanks. Those that require more than one chamber shall be listed only for use in multiple chamber tanks.
- 6.3.5** After the tank(s) has(ve) been refilled and an initial baseline nutrient concentration has been established per 6.3.4b, the device to be tested shall be installed in accordance with the manufacturer's instructions.
- 6.3.6** The tank shall be inspected to confirm that no structural changes have occurred during installation. The device will be turned on and the tank will be allowed to receive load from the household. The device shall operate as normal for a maximum of 30 days prior to the onset of testing to mature the microbiological process in the tank.
- 6.3.7** Technologies that utilize any introduced microbial enhancements shall be allowed to introduce such enhancements according to manufacturer's protocol, however such amendments will be recorded as a required component in the technology's application.
- 6.3.8** Samples will be taken from the effluent at the tank outlet at one-month intervals and analyzed for BOD, TSS, Ammonia, Total Kjeldahl Nitrogen, Nitrite (NO₂), and Nitrate (NO₃). Measurements will be expressed as mg/l and Nitrogen results shall be reported "as Nitrogen". Total Nitrogen (as N) shall be calculated as the total of Total Kjeldahl Nitrogen plus Nitrite and Nitrate.

7 Qualification for Listing

- 7.1** Technologies shall be deemed qualified under this standard if, within 6 months after the maturation period, they demonstrate the following:
- (a) Carbonaceous BOD - 25 mg/l or less
 - (b) Total Suspended Solids - 30 mg/l or less
 - (c) Total Nitrogen (as N – Calculated as TKN added to NO₂ and NO₃) – a concentration of 50%, or less, than the concentration established during the baseline influent concentration.

8 Markings and Accompanying Literature

- 8.1** Devices complying with this Standard shall be marked with the manufacturer's name or trademark.
- 8.2** Markings shall be permanent, legible, and visible after installation.
- 8.3** Devices shall be accompanied by instructions for their installation, care and maintenance, and repair.



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