



BUILDINGS 2021-017 BULLETIN TECHNICAL

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PURPOSE: This document establishes acceptance criteria, installation, and maintenance requirements for heat transfer nanofluids used in hydronic closed-loop HVAC systems.

SUBJECT(S): Innovation Challenge, Heat Transfer Nanofluid, Hydronic Close-Loop HVAC System

RELATED CODE SECTIONS: AC 28-113, MC 1207

I. INNOVATION CHALLENGE COMPETITION

In 2020, the Department of Buildings launched the **Carbon Neutrality Innovation Challenge** competition. The competition sought ideas for increasing energy efficiency and cutting emissions among NYC's buildings. The Department's website provides a [list of the winning technologies](#).

One of the competition's winning technologies is a heat transfer nanofluid. This Bulletin describes how heat transfer nanofluids, that comply with the description and acceptance criteria of this Bulletin, can be utilized in building mechanical systems in compliance with the NYC Construction Codes.

In accordance with Administrative Code §28-113, acceptable equipment and materials must be used as prescribed by the Code or approved by the Commissioner. A registered design professional must determine when the use of heat transfer nanofluids comply with this Bulletin.

II. BACKGROUND

The NYC Mechanical Code section 1207 prescribes the basic requirements for heat transfer fluids. However, the Code does not address toxicity, which is a specific concern for heat transfer nanofluids.

In accordance with Administrative Code §28-113, acceptable equipment and materials must be used as prescribed by the Code or approved by the Commissioner.

III. DESCRIPTION

Heat transfer nanofluids are a class of nanotechnology-based heat transfer fluid that disperse nanometer-sized particles (typically ranging from 1-100 nm) in traditional heat transfer fluids. Heat transfer nanofluids are used with hydronic closed-loop HVAC systems in buildings, including in any secondary water system, water boilers, chillers, dry coolers, CRAC units, and run-around loops. The nanoparticles are designed to increase the speed and the effectiveness of the overall heat transfer process. As a result, operating target temperatures are expected to be satisfied in a shorter amount of time, thereby requiring less energy when compared to conventional heat transfer mediums.

IV. USES

Heat transfer nanofluids must be used only in hydronic closed-loop HVAC systems.

Restrictions: Heat transfer nanofluids must not be used in open loop systems. (i.e. cooling towers).

V. EVALUATION SCOPE

NYC Construction Codes

VI. ACCEPTANCE CRITERIA

Acceptable heat transfer nanofluids must comply with the following:

Flash point threshold. Heat transfer fluids, including heat transfer nanofluids, must comply with MC §1207 (Transfer Fluid), which states, in pertinent part: “The flash point of transfer fluid in a hydronic piping system shall be a minimum of 50°F (28°C) above the maximum system operating temperature.” MC §1207 applies to all hydronic piping systems, including both open and closed loop system.

Toxicity Limits. Some nanofluids, such as heat transfer nanofluids have been identified to have toxic properties. For safe handling and operation, building-related commercial nanofluid must acquire HT1 (Incidental Food Contact) and HT2 (Nonfood Contact Heat Transfer Fluid) registrations from the National Sanitary Foundation (NSF) and be authorized to bear the NSF International Registration Mark to clear FDA's toxicology standards. The NSF International's HT1 and HT2 categories are specifically designed by Food & Drug Administration and structured under FDA CFR 21.

VII. ADDITIONAL CONDITIONS FOR SIGNOFF AND MAINTENANCE

Installation and maintenance of heat transfer nanofluids in NYC must comply with all applicable Codes, laws and rules, and the following applicable requirements:

A. Installation

1. The system must be flushed and drained prior to installation of the nanofluid.
2. The concentration of the nanofluid added to the system must be in accordance with the manufacturer's instructions.
3. Installation requirements must be in accordance with the manufacturer's installation instructions.

B. Maintenance

1. The freeze point and pH level of the nanofluid must be checked semi-annually by the building maintenance staff.
2. An overall visual exterior system check to detect possible leakage must be performed semi-annually by the building maintenance staff.
3. Annual testing and rebalancing of the chemical composition of the nanofluid must be performed by the nanofluid supplier.
4. Every two years, a chemical analysis of the nanofluid system must be performed by the nanofluid supplier.
5. Building owner must keep all balancing and testing records on-site in the superintendent's office.