



FIRE PROTECTION LABS

DyneTM

2357 Ventura Drive, Suite 108
Woodbury, MN 55125
(651) 917-0644
(800) 632-2304 Toll Free
(651) 917-0646 Fax
dyne.lab@nfpaglobal.com

Antifreeze Testing Explanation

Physical Properties

The physical properties described below are tested on antifreeze solutions sent to Dyne Fire Protection Labs. The physical properties are not a measurement of performance and as such will not cause the sample to FAIL. If the value is outside of the specification, it is simply noted as OUT OF SPEC.

Physical Property Test Type	Definition	Possible Reasons Why Value is Out of Spec
Appearance	Appearance is the description of the color and consistency. The visible presence of sediment, particulates, or rust may also be reported.	The appearance can indicate the type of antifreeze. If the appearance is different than the requirement, it can indicate that the sample is a different type of antifreeze than indicated or that another material with a different color has contaminated the sample. Other issues that may be found during the appearance test but will appear as a comment on the foam report: Sediment, particulates, or rust-coloring which are often the result of corrosion.
Refractive Index	The refractive index is a measurement of the angle in which light bends as it passes through the sample.	The refractive index is proportional to the amount of antifreeze in the sample and will increase as the concentration of antifreeze increases. * Please note the refractive index of tap water is approximately 1.3330 at 20 °C. If the refractive index of the antifreeze solution is too low (too close to water), Dyne may not be able to determine the type of antifreeze.
Density (Specific Gravity)	The density is a measurement of the weight of a specified volume and is reported in grams per milliliter. Some labs report this as specific gravity, which is the relative density compared to water.	The density is proportional to the amount of antifreeze in the sample and will increase as the concentration of antifreeze increases. * Please note the density of tap water is approximately 0.998 grams/milliliter at 20 °C. If the density of the antifreeze solution is too low (too close to water), Dyne may not be able to determine the type of antifreeze.
pH	The pH value determines the acidity/basicity (ion activity) of the sample.	Typical pH range limits are 6.0-9.5: • A pH below 6.0 means that the sample is acidic • A pH above 9.5 means the sample is basic • A pH outside of 6.0-9.5 often indicates corrosion within the sprinkler piping or contamination of the antifreeze.

Performance Properties

The type and concentration of the antifreeze solution are the only properties which can fail. It is the responsibility of the system owner to ensure the freeze point of the antifreeze solution is low enough to remain a liquid under all the anticipated environmental conditions.

Performance Test Type	Definition										
Estimated Concentration by Volume	The type of antifreeze solution and the concentration - by volume - is determined by the physical properties of the solution in addition to the freeze point verification test. The acceptable concentration of the various antifreeze materials is determined by the National Fire Protection Standard 25, 2023 Edition - Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems. For additional details, see NFPA 25 Section 5.3.4: <table><tr><th><u>Antifreeze</u></th><th><u>When Can it Be Used?</u></th></tr><tr><td>Diethylene Glycol</td><td>Prohibited in any system</td></tr><tr><td>Ethylene Glycol</td><td>Prohibited in any system</td></tr><tr><td>Propylene Glycol*</td><td>Prohibited for use in chlorinated polyvinyl chloride (CPVC) piped systems. Allowed in non-CPVC piped systems provided the percent by volume does not exceed 30 percent. Premixed solutions exceeding 30 percent by volume are permitted for use in ESFR sprinklers given that the sprinklers are listed for such use.</td></tr><tr><td>Glycerine*</td><td>Allowed in both chlorinated polyvinyl chloride (CPVC) and non-CPVC piped systems provided the percent by volume does not exceed 38 percent.</td></tr></table> *If any samples exhibit values outside the allowable percent by volume range or if the system is drained for any other reason, the system must be drained completely and refilled with a listed antifreeze product.	<u>Antifreeze</u>	<u>When Can it Be Used?</u>	Diethylene Glycol	Prohibited in any system	Ethylene Glycol	Prohibited in any system	Propylene Glycol*	Prohibited for use in chlorinated polyvinyl chloride (CPVC) piped systems. Allowed in non-CPVC piped systems provided the percent by volume does not exceed 30 percent. Premixed solutions exceeding 30 percent by volume are permitted for use in ESFR sprinklers given that the sprinklers are listed for such use.	Glycerine*	Allowed in both chlorinated polyvinyl chloride (CPVC) and non-CPVC piped systems provided the percent by volume does not exceed 38 percent.
<u>Antifreeze</u>	<u>When Can it Be Used?</u>										
Diethylene Glycol	Prohibited in any system										
Ethylene Glycol	Prohibited in any system										
Propylene Glycol*	Prohibited for use in chlorinated polyvinyl chloride (CPVC) piped systems. Allowed in non-CPVC piped systems provided the percent by volume does not exceed 30 percent. Premixed solutions exceeding 30 percent by volume are permitted for use in ESFR sprinklers given that the sprinklers are listed for such use.										
Glycerine*	Allowed in both chlorinated polyvinyl chloride (CPVC) and non-CPVC piped systems provided the percent by volume does not exceed 38 percent.										
Estimated Freeze Point in Degrees Celsius and Degrees Fahrenheit	The estimated freeze point in °C and °F indicates the temperature at which the solution will begin to freeze. It is not recommended that systems be exposed to temperatures below this freezing point for any extended time period.										

Listed Antifreeze Verification

Ion chromatography is used to quantify the concentration of a variety of unique components that distinguish listed solutions apart and from legacy solutions. Due to nondisclosure agreements, the exact chemical composition of listed antifreeze samples cannot be reported. Therefore, Dyne Fire Protection Labs simply reports (PASS or FAIL) whether the chemical composition matches the chemical composition of the antifreeze specified on the report.