

Water, Ice, Hydrogen Bonds, and Roof Systems.

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Chicagoland winters can get very cold and harsh. Quite the opposite extreme from what we discussed in our Summer 2010 edition. The large temperature differences between the seasons result in the expansion and contraction of roof systems. In particular large temperature “swings”, especially around the freezing point of water, can significantly damage roof systems. Even a small amount of moisture that has infiltrated the system can greatly accelerate damage. Water’s chemical composition is known to many of us and is illustrated in Figure 1. It has been shown that water molecules form weak hydrogen bonds between the two hydrogen atoms and the oxygen atom of another water molecule (Figure 2). This type of bonding results in properties that are unique to water.

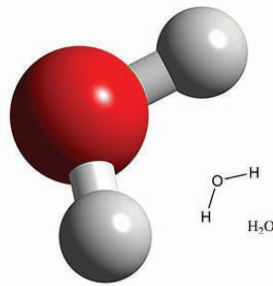


Figure 1. Representation of the water molecule.

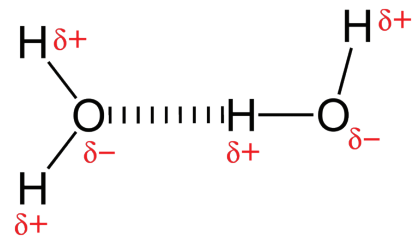


Figure 2. Hydrogen bonding in water.

At low-temperatures water becomes a solid like other substances. However, unlike most other substances, water becomes less dense (the volume increases) when it transitions into a solid crystalline state due to hydrogen bonding. A small amount of water in a roof system will expand and split the system open. As an example, Figure 3 illustrates a can of Coke that has been left in the freezer a little too long. One of the main reasons why we communicated the importance of roof inspections in our Fall 2010 edition was because we wanted to ensure that your roof system and roof drains were free of any water. Figure 4 illustrates a roof that we needed to clear of both ice and water this past December. We hope you stay warm the rest of winter and, as always, please let us know if we can be of service or if you have any questions about protecting your roof!



Figure 3. A Coke can that has split after freezing.



Figure 4. Water and ice cleared from a roof this past December.