DIPRA CASE STUDY

dipra Ductile Iron Pipe Research Association

Ductile Iron Pipe Stays Resilient Against Wildfire Temperatures

This research was featured in the December 2023 issue of the American Water Works Associations (AWWA) Opflow Journal. This journal has over 35,000 readers and is a popular outlet among water industry leaders. The article can be read at this link: https://www.wileyjournalebooks.com/Opflow/2023/December/#p=24

Figure 1

Figure 3

Figure 2

In recent years, there have been many reports of incidences where wildfires have caused serious damage to homes, water systems and infrastructure. For example, in the fall of 2020, the CZU Lightning Complex Fire in Santa Cruz, CA, which melted seven miles of an HDPE pipeline that carried raw water to the San Lorenzo Valley Water District treatment plant. As stated in a Wildfire Today article, the average wildfire "can reach temperatures of 800°C (1,472°F)." This temperature is well below the melting point of ductile iron. But to address potential concerns regarding the resilience of Ductile iron pipe when exposed to the wildfire-like temperatures we decided to conduct some of our own tests.

On May 3, 2022, a test was conducted in Birmingham, AL to evaluate the resilience of Ductile iron pipe under wildfire temperatures. As seen in Figure 1, 12 feet of 8-inch ductile iron pipe was assembled using a restrained push-on joint with a standard SBR gasket. The joint was located at the center of the assembly and each end was provided with restraining caps to allow water to flow through the pipe during the test. The assembly was about 44-inches above the floor to provide room for the introduction of heat using propane gas. The pipe was filled with city water, and thermocouples were placed to monitor the temperature of the water as it exited the assembly and 5/8-inches directly below the restrained push-on joint at the point of application of heat. Heat was applied using a propane burner located 6-inches below the bell of the restrained joint and approximately centered beneath the location of the gasket (see Figure 2). Once the applied heat was sustained at a minimum of 1,500° F, a timer was started for 45 minutes.

Figure 4

Figure 5

Figure 6

At the conclusion of this part of the study, the pipe was allowed to cool and was subjected to an internal pressure of 500 psi for 5 minutes (Figure 3). The joint was then disassembled, and the gasket and restraining devices were examined for evidence of damage or deterioration. The results of this test demonstrated that the performance of the standard elastomeric gaskets used in Ductile iron pipe joints would not be compromised when exposed to temperatures that are typical of those found in wildfire events. The pipe suffered no observable physical damage, and the joint did not leak during the 45-minute exposure to 1500° F and subsequently held an internal pressure of 500 psi without leaking. Upon disassembly of the joint, the gasket was found to be in excellent condition with no visible signs of deterioration. (See Figures 4, 5, and 6.)

1 https://abc7news.com/czu-complex-san-lorenzo-valley-water-district-bay-area-wildfires-contamination/6398103/

2 Gabbert, Bill, 2011 – "At what temperature does a forest fire burn?" Wildfire Today, February 26, 2011.

3 https://www.uspipe.com/u-s-pipe-fire-resistant-ductile-iron-pipe/

For more details on this case study or to discuss the benefits of Ductile iron pipe contact one of DIPRA's Regional Engineers at https://www.dipra.org/contact-dipra/ask-an-engineer