WARREN

THE WARREN GROUP, INC. FORENSIC ENGINEERS & CONSULTANTS
7805 ST. ANDREWS ROAD | PO BOX 1608 | IRMO, SOUTH CAROLINA 29063
TEL 803.732.6600 FAX 803.732.7576 WARRENFORENSICS.COM

Contractor Fails to Install Manhole in Accordance with Standard Specifications

By Roger E. Davis, P.E., CFEI

Breaks of large water mains can sometimes cause a lot of damage if water flows into areas that should have been kept dry. One such break involved a water main under construction, flooding a basement parking garage and electrical equipment room.

The construction of a high-rise building in the downtown area of a major southern city required the installation of a new 16-inch water main. The city required the developer to build the line to their standard specifications, and then deed the water main to the city after a specified warranty period. Since the water main was dead-ended temporarily until subsequent construction completed a looped main, a temporary blow-off was required to be installed at the dead-end. The blow-off is required to properly flush the line.

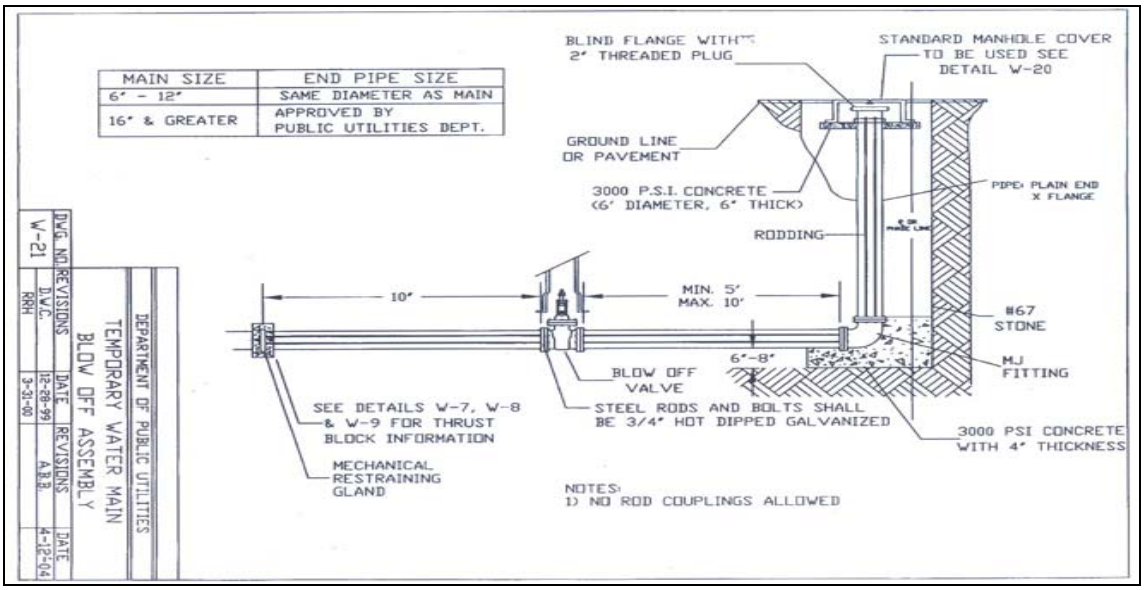
Construction of a blow-off requires the installation of a valve at the dead-end and a riser the same size as the main that terminates such that the end cap will be accessible from the surface. When flushing is performed, the cap will then be removed and the valve opened to start the flow of water through the blow-off.

With all the specifications and required approvals in hand, the contractor built the water main with a temporary blow-off. The blow-off terminated in an area that was to be paved at a loading dock for the building. The contractor field-fabricated eye bolts to use with all-thread rod for securing the end cap on the blow-off assembly.

After the water main was placed in service, the loading dock was put into use. During the early morning hours, the water main suddenly burst, releasing water into the street. The water flowed a short distance to an underground vault for a transformer. From the vault, the water flowed through conduits leading into the basement of an adjacent property, flooding the basement and an electrical equipment room. In addition to the equipment damage, several cars parked in the garage suffered flood damage.

A view of a 16-inch water main that burst due to improper construction and operations.

Since the new water main had not been turned over to the City at the time of the incident, drawings of the valves to shut off the water flow were not readily available. Consequently, the water ran for some time, causing additional damage.



A view of the Temporary Water Main Blow-Off Assembly.

Once the water flow was stopped, the release of water was found to have occurred when the end cap on the temporary dead end line blew off. Although the contractor used only two all-thread rods and eye bolts to secure the cap, calculations showed that the attachment means should have easily withstood the internal water pressure. The cap blew off because the eyebolt was deformed, probably by a wheel load, allowing the securing nut to slip through the eye.

As is often the case, more than one thing went wrong to cause the incident. In this instance, the contractor failed to turn off the valve at the temporary blow-off, subjecting the end cap to continuous internal pressure. The valve is intended to be opened only for flushing the line, and should otherwise remain closed. The other thing that went wrong was that the contractor failed to build the temporary blow-off in accordance with city specifications when he failed to install a manhole frame and cover to protect the termination of the blow-off. If the frame and cover had been installed, wheel loads would have been transferred to the earth surrounding the blow-off riser, rather than impinging directly on the eyebolt that secured the end cap. The resulting loss ran well into six figures and could have been avoided with proper construction and operation.