

Pressurised pipes: explosions

Version 1.0

Context

FAME H&S Notices are real-world examples of incidents, provided anonymously by FAME members, that highlight learning opportunities for the sector to improve our health and safety working. However, they are not designed to replace existing guidance.

The Incidents

1st Near-miss

A FAME member had a team on site recording industrial archaeology adjacent to a small canal embankment which had been cut back by the groundworks contractor for a new revetment wall. At one point the cut back exposed water pipes which ran almost parallel to the canal embankment. It was not flagged during the utility search because the clients believed the pipes were in a different area of the site based on evidence from the maps provided by the water company.

The team carried on investigating and recording archaeological remains for three weeks in close proximity to these exposed pipes until an inspector from the local water company came to site and ordered the immediate stoppage of work, and backfill of the revetment foundation trench next to the pipes. The water mains were pressurised (c.10 bar) and the inspector was concerned that the pipes might become cracked due to exposure to weather and/or proximity to machines/excavator buckets, and then explode.

Exposure of water pipes did not flag up concerns with the client's engineers, with the onsite groundwork contractors or with archaeologists, until the water inspector came on site and stopped all work and required backfilling over it.

2nd Near-miss

Later that week the pipe, backfilled and unexposed, did explode, fortunately, over the weekend when no one was on site. The force of the explosion excavated a large hole around and under the pipe (Figure 1), stripping away the clay and spreading sand for c.10m. The actual explosion spread gravel c. 2 – 3m.

It did explode during a cold snap, which might be the reason for its failure. However, it is possible that the changes in backfill may have caused differential ground settlement and increased stress on the pipe, which could have caused the explosion too.

Figure 1: Results of the explosion with several square metres of soil blown out exposing the pipes.



3rd Near-miss

The following weekend, again fortunately when workers were offsite, the second water main exploded (Figure 2). The water company had inspected this pipe after the first explosion and said that it was fine. The cause of these failures are still being investigated.

Figure 2: The second water main bursting and spraying water.



Key Take Aways

- While most water and sewer lines are not usually pressurised, those that are present significant risk of injury from explosions:
 - the jet of water from a main can be of sufficient pressure and intensity to injure a person;
 - the jet may also contain stones or other hard objects ejected by the explosion;
 - the water can affect adjacent services and reduce support for other structures;
 - flooding i.e. risk of drowning or the rapid collapse of support to the sides of an excavation.
- These risks can result in death. Individuals were recently killed in the United States, Australia, Sri Lanka and Democratic Republic of Congo due to water pipe explosions;
- Besides explosions there is the risk of pinhole leaks that shoot out streams of liquid at such pressure that the liquids can penetrate the skin causing severe tissue damage (see FAME H&S notice on pressurised injection injuries);
 - Note – PPE clothing may not provide any protection from such events if the force is significant enough.
- When conducting utilities check see if any of the water pipes are pressurised – if so treat them with extreme caution, similar to how you would approach other pressurised pipes. The resources section below contains links to further guidance on these matters;

- Be careful when backfilling around these pipes, it could cause additional stress on the pipes which can cause them to fail.

Resources

HSE (United Kingdom): Avoiding danger from underground services

<https://www.hse.gov.uk/pubns/books/hsg47.htm>

HSA (Republic of Ireland) Code of Practice for Avoiding Danger from Underground Services

https://www.hsa.ie/eng/publications_and_forms/publications/construction/code_of_practice_for_avoiding_danger_from_underground_services.html