Connections, T-pieces and Valves

We now know how HDDs work and how we drill wells, but these still need to be connected together. Also, next to Bronland there is already a section of existing HCS pipework; this also needs to be connected to the new ring circuit. Heijmans' cables and pipes team takes care of this. They also install the pipework that does not need to be installed using HDD, but can be laid in an open trench.

What challenges do they face? And what are the valves for? And how do you ensure that everything is properly connected together and watertight? We put these questions to Jan Roijmans, Cables and Pipes Foreman at Heijmans.

Together with Leon, the crane operator, Jan forms a frequently-seen duo on the campus. From the work planning department, Jan receives drawings on which are indicated:

- How the pipes have to run in the open trenches;
- How and where the wells are to be connected to the pipes;
- How the HDDs are to be connected together;
- Where a branch needs to be made;
- Where a valve needs to be sited.

Fig. 1: The assemblies are put together in the depot. This assembly weighs approximately 2200 kilos.

Based on these drawings, Jan and Leon get to work putting the **assemblies** together. This is assembling the necessary **joints**, **flanges**, **valves** and **T-pieces**. For each location, the assembly and the angle at which the parts need to be positioned is different. Once all the materials are present and checked, they get to work with the assembly, with Leon using the crane to hold the heavy cast-iron T-pieces and valves in position, so that Jan can get at them properly and connect the correct parts together.

Once the assembly is put together, it can go to the location to be installed. The pipes that are pulled through with HDD come out at surface level and must be connected to the pipes that lie around 1.5 m below the surface. Fortunately, all the pipes are made of **HDPE** (High Density PolyEthylene), which is a relatively flexible material. Before they are connected together, Leon positions a heavy bigbag on the end of the pipe, so that it is easily taken to the correct depth.

Fig. 2: Bigbags are used to bend the pipes installed by HDD to the correct depth.

Fig. 3: Using the crane, the pipework is brought to the right place.

From this point, Jan and Leon are joined by the welding duo Martin and Elwin. A **collar piece** needs to be welded on to the end of the pipe with a flange behind it. For this, both the ends are secured with a clamp and held tightly together. The end of the collar piece and that of the pipe are smoothed off exactly parallel with a kind of plane. Then Martin positions a red-hot **mirror** (a flat plate at 200°C) between the two ends. This heats up the HDPE on both sides. Once the hot mirror is pulled out, the pipes are forced against each other by the hydraulic clamp and they fuse together. Finally, the solidified **ripples** that have formed in the pipe are planed off and the connection between the collar piece and the pipe is rock solid! These connections are guaranteed tension proof and watertight.

Fig. 4: The pipe ends are planed off parallel and can now be welded together.

Fig. 5: The hot mirror is placed between the pipes, after which these can be welded to each other.

The flanges can then be bolted together. This needs to be done securely, because you do not want to have a leak in your ring circuit. To be sure there is no leakage anywhere, the ring circuit is tested in phases. Firstly, a **foam pig** is introduced into the pipe; this is a sort of flexible plug that wipes the pipes entirely clean by water pressure. After removing the foam pig, the actual testing can start. A section of the pipe is closed off and filled with water. Using a **press**, the water pressure is slowly increased up to 8 bar. This pressure is monitored over a longer period, so it can be seen whether we are losing pressure somewhere, which could indicate a leak. By doing this in phases, you can inspect each section of pipework and so test the connections.

Fig. 6: Various sizes of foam pig waiting, ready to clean out the pipes.

Surveying

Once all pipework is in position, Thijs (the surveyor and assistant foreman) comes along to survey everything. It may well be that during the job a pipe has ended up a little higher or lower, or slightly to the left or right. This all needs to be surveyed, so that **WUR** (Wageningen University & Research) knows exactly where every pipe runs and a subsequent building contractor knows what he might encounter in the ground. Maintenance to the ring circuit, or excavating a valve for example, is also made easier by this.

Fig. 7: Once everything is in position, Thijs surveys the exact location of the pipes, every weld and all the valves, couplers and T-pieces.

Valves

There are valves in various places in the ring circuit. This allows a section of the ring to be closed off. This is useful for example if we want to connect the already existing HCS pipework to the new ring circuit, or maintenance is needed somewhere. But there are also lots of valves that are at the dead end of a section of pipe. These are installed here so that another connection can be made to a building in the future for example. During this project, not all the existing buildings are being connected immediately. This will only happen when a building system reaches the normal time for replacement, or in case of expansion plans. A number of buildings are already being fully connected to the ring circuit.

You can read about which buildings will be fully connected to the ring circuit and how we do this in the next article.

Fig. 8: Branch with shut-off valve

Fig. 9: Branches with valves have already been installed for future connections. Everything is in position, so the trench can be filled in.

HANDY POINTS

- The assemblies are made of cast iron; the heaviest one weighs over two tonnes, but even a small valve weighs a good 40 kg.
- The greatest challenge in making the connections is the location where you have to work – this is below ground water level. To keep the work pit dry, Heijmans employs well-point drainage. We use this to keep the groundwater level low.
- In total, around 16,500 bolts have been ordered for putting the assemblies together and connecting to the pipes.
- There is a weld between pipes every 20 m; all these must be surveyed.