Exploration and Practice of Installation of Thin Wall Stainless Steel Pipes

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KEYWORDS

The thin wall stainless steel pipes; bending deformation; leakage

ABSTRACT

This article introduces the installation process of thin wall stainless steel pipes, which explores and summarizes lots of aspects, including pipes transportation and lifting, construction preparation, the installation of tough parts, the installation of stainless steel valves, the installation in the tube well, the installation of water segregators, the construction management, and the pipeline pressure test. It is meaningful and valuable to the installation of thin wall stainless steel pipes.
INTRODUCTION


(1) Project Summary

The water supplying project of Shengyueju Community was started in September 2017, and finished in March 2018, totally about 6 months (not including investigation and preparation work). The project address is Shengyueju Community, Shengli North Road No.132, Pengjiang District, Jiangmen City. It includes 236 resident users and 41 business users. The part of project which uses thin wall stainless steel pipes includes part of the water meters, part of the stand pipes in the water well, part of the horizontal pipes in the garage. The main material used in the project is shown in table 1.

<table>
<thead>
<tr>
<th>Type of the material</th>
<th>Specifications</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>thin wall stainless steel pipes</td>
<td>DN100</td>
<td>167 meters</td>
</tr>
<tr>
<td>thin wall stainless steel pipes</td>
<td>DN80</td>
<td>336 meters</td>
</tr>
<tr>
<td>thin wall stainless steel pipes</td>
<td>DN65</td>
<td>696 meters</td>
</tr>
<tr>
<td>thin wall stainless steel pipes</td>
<td>DN50</td>
<td>210 meters</td>
</tr>
<tr>
<td>water segregators</td>
<td>DN50</td>
<td>64 meters</td>
</tr>
</tbody>
</table>
(2) The Advantages of Thin Wall Stainless Steel Pipes.

(1) The thin wall stainless steel pipes which are much lighter than the steel-plastic composite pipes are able to reduce the labor intensity dramatically.

(2) The thin wall stainless steel pipes are not easy to rust, which makes water much cleaner and safer.

(3) The service life of the thin wall stainless steel pipes is very long. The surface of the stainless steel is very dense, which makes it resist corrosion by water and air. The data of anti-corrosion tells that the service life of the thin wall stainless steel pipes is long enough that little maintenance is required. It makes lower cost of material happen.

(3) The Exploration of the Installation and Matters Needing Attention:

(3.1) the Transportation and Lifting of the Pipes

Since the wall of this kind of pipes is thin, it is easy to deform. We should make it avoid high compression in the transportation. Overloading the truck is not permitted. We should pay attention to the process of lifting. The way of single point lifting in the middle of the pipes is likely to bend the pipes. Multipoint lifting can protect the pipes as much as possible. Lifting too many pipes at the same time is also likely to bend the pipes. At the first time of material purchase in the project, we found that as much as 90% of the DN50 thin wall stainless steel pipes (δ=1.2mm) were bent, 28 of 31 pipes were able to be used in the project anymore. It still happened at the second time. Analyzing the case, on the one hand, the DN50 thin wall stainless steel pipes are much weaker than the other specifications of pipes; on the other hand, the logistics company pays less attention on the pipes protection. So it is important to strengthen the checking system, communicate more about the material protection with the logistics company. Only if we try our best to reinforce the management, errors will be less. Some of the thin wall stainless steel pipe fittings are unqualified, as we see in picture 1.
(3.2) The Construction Preparation

In this project, the pipeline connection is cartridge connection. Polishing the edge of the cut pipes is needed, in order to avoid hurting the O-ring seal. The thin wall stainless steel pipe fittings are bigger than the screwed pipe fittings and the lathe dog pipe fittings by size. For example, when using two DN100 90° elbows to change the pipeline center position, the combination of lathe dog pipe fittings needs more than 25cm, while the combination of thin wall stainless steel pipe fittings needs more than 37cm. The problem that the thin wall stainless steel pipe elbows have a larger radius of turning circle will increase the difficulty of construction in the altitude limited garage or the place where the pipelines meet intensively. In order to bypass the air duct and pass through a narrow space, special types pipe fittings like B type pipe fittings and 45° elbows will be used much more frequently, as shown in picture 2. It will challenge the construction technique of workers; on the other hand, a larger storage is needed.

Picture 1: Workers found unqualified fittings during construction

Picture 2: Special pipe fittings
The thin wall stainless steel pipes should not be contacted with cement paste, cement, mortar or mixed concrete directly. The protection of casing pipes is necessary when the thin wall stainless steel pipes cross the concrete wall. In this project, we used UPVC pipes as the casing pipes, and used neutral glass cement as sealant. Rubber gaskets were used to separate pipes from angle iron bracket, in order to avoid electrochemical corrosion happening. According to the code for fire protection of buildings, metal casing pipes should be used when pipes crossing the walls of the fire compartments and the floor of the pipe well. Cement is bad for the stainless steel pipes as sealant because it will corrode the pipes. It is better to use fireproof mud as sealant.

(3.3) The Pipeline Installation and Construction

(1) The installation in the narrow space

In this project, the pipes went through the floor of the pump house, and then got into the garage. While the plat fond of this place was very low, the clearance was about 2.7 meters only. The height that the pipes to the floor are no less than 2.2 meters in a normal garage. We had only 50 centimeters to make the pipes turn 90° when flange interface took over about 15 centimeters. Usually, we will install a cartridge flange first, and then connect with an A type 90° cartridge elbow. But in fact, it worked bad and makes a strong sense of depression since the height was just 2.1 meters. It will make the parking lots useless. Therefore, we thought of another way to solve this problem. Finally, we had a good idea that we cut the A type 90° cartridge elbow and weld it to the flange which is shown in picture 2. The clearance became to be 2.3 meters, and made it feel less sense of depression, as shown in picture 3.
(2) The Installation of Stainless Steel Minor-Caliber Thread Valve

In order to know this new material well, we made experiments with thin wall stainless steel pipes and valves. According to the water pressure tests, we found that the leakage probability of threaded connection between stainless steel pipes and valves is very high, so that it can hardly be used to the actual project by normal caulkng technology. Analyzing the cause: the thread depth of stainless steel pipes and valves which is produced in factories is deeper than the thread depth of steel-plastic composted pipes which make thread in the construction plant. The normal caulkng technology which use hemp silk and PTFE tape as sealant cannot meet the requirement of design water pressure test. So we saw the leakage happened. According to the experiments, the thread tightness of DN15/DN20 pipe fittings is qualified while others are not qualified. Also we asked the manufacturer technical personnel for help. They provided the reason that the friction coefficient is too small to drive hemp silk and PTFE tape into the deepest place of the thread. The bigger the pipe diameter, the more difficult it is to plug. At last, the manufacturer technical personnel suggest using liquid PTFE tape as sealant. But the weakness of liquid PTFE tape is that it will be hard to disassemble after solidification and the untried surface touching with air which making a bad look and feel. In consideration of that the valves need to be maintained regularly. Liquid PTFE tape is not suitable for the fact, instead, the connection of the mix by flange and cartridge which allow disassembling easily is much better received.

(3) The Installation in the Pipes Well

The cartridge pipe fittings need special tools to be assembled. It is called pipe tongs which using a hydraulic pump to tight the O-ring seal. The hydraulic pump is heavy and the pipe tong is bigger than normal tool. In this project, as shown in picture 4, the pipe well is so small that we must arrange the pipes tightly and the innermost pipe can hardly be disassembling if it leaks. As a result, we suggest that the pipe well should be designed 1.2 meters long and 0.7 meters wide at less.
(4) The Installation and Construction Management of Water Segregator

The number of water segregator fittings reduces by using stainless steel water segregators, as shown in picture 5. It makes the installation easier, the labor intensity lighter, the leakage risk lower. The stainless steel measuring short tubes before and after the water meter are much lighter and softer than the steel-plastic ones, so that the follow-up constructors like drain workers, hole-sealing workers, electrician might trample it and make it bend. It is very hard to collect evidence when the measuring tubes are got harm, and usually little compensate will be made by this. So it requires higher construction management for the manager to avoid all kinds of potential risks. We should make a right order to protect our conduct as much as possible. After assembling the standing pipes, the sealing, drain, electric ion, waterproof should be constructed, and the water meters which are the weakest things in the pipe well should be assembled at last.

(3.4) The Pipes Pressure Test

In this project, the number of pressure zones is 3. The testing pressures are 1.0 mPa, 1.0 mPa, 1.2mPa respectively. The pressures should be stable in 15 minutes and no pressure drop is allowed. In this project, we have tried many pressure tests, once we found the situation that some of the leak less fittings turn to be leak after being pressure boost and drop many times. We need to have another compacting to fix it. We haven’t tried higher pressure test which up to be zone 5. The thin wall stainless steel pipes can bear the zone 5 working pressure for a long period or not? All these things are doubtful and need for observation.
CONCLUSION

The thin wall stainless steel pipes are not easy to rust. It is in favor of the water quality and safety. The promotion using it is meaningful to people’s health. The installation of the thin wall stainless steel pipes should comply with the standard strictly. Keeping studying new technology and method, summarizing the experience are benefit to improve work efficiency so that we can ensure a better construction quality and finishing in time. This article is an exploration and summary to the installation of thin wall stainless steel pipes. We share the experience with everybody by our practice. Some of the information is valuable for reference. We hope to have better suggestion by experts and colleagues.

REFERENCE
