



3046mm [120"] Diameter Manhole SD1 Use of A Lok Premium Gasket Connection

Project No. 2141805



Introduction

The City of Vancouver Engineering Department Sewers Branch Project DB-3430 Burrard Sewer Upgrade is a sewer upgrade and separation project along Burrard Street from Pacific Avenue to 16th Avenue. Construction phase of the project took place during the spring and summer of 2016. As part of the project the City of Vancouver contracted Diamond Precast to supply a 3046mm [120"] interior diameter manhole designated SD1 with A Lok Premium gasket connections for 900mm and 1500mm reinforced concrete [RC] pipes connected to SD1. Installation of SD1 and connection pipes took place from 8 August 2016 to 12 August 2016. This report documents the installation of the connecting pipes.

Description of Task

Manhole SD1 has three connections, reference Table 1 SD1 Connections for details. SD1 was trucked to site and placed in the excavation on 8 August. Pipe installation took place on 10 August and 11 August. The 1125mm outlet was connected to the existing RC pipe via a cast in place concrete pipe of approximately 1m length during on the 10th and 11th of August. The secondary outlet and inlet connections were installed on the 10th and 11th respectively. Installation of pipe using the A Lok Premium gasket is a three step process. First is to lubricate the pipe. Second is to align the pipe with the gasket. Third is to apply force along the longitudinal axis of the pipe to push the pipe into its final position.

	Invert	Interior Diameter	Pipe	Connector
Inlet	35.45m	1500mm	Reinforced Concrete ASTM C76 CL IV	A Lok Premium Model #2360
Outlet	35.45m	900mm	Reinforced Concrete ASTM C76 CL IV	A Lok Premium Model #1470
Outlet	35.45m	1125mm	Reinforced Concrete Class Unknown	Grout

Table 1 SD1 Connections

A Lok Premium

A Lok Premium is a flexible compression gasket for use in storm and waste water applications. A Lok Premium is produced by A-LOK Products Inc. and manufactured to ASTM C-923 and ASTM F-2510. A Lok can be cast directly into the manhole wall or in a field sleeve. For SD1 the A Lok was cast in a fiber reinforced polymer bell by Predl Systems North America which was itself cast into the wall of SD1 at time of pouring. Diamond Precast recommended the use of A Lok Premiums for this project because of ease of installation, quality of seal and flexible connections. Flexible connections reduce stress on pipes and joints due to differential settling. A Lok models used were #1470 and # 2360 for the 900 and 1500 concrete pipe respectively.

Conduct of Work and Observations

1125mm Cast in Place Connection

The installation of the connection between the existing 1125mm combined sewer reinforced concrete pipe and SD1 was conducted in a piecemeal process from 9 August to 11 August. The cast in place pipe connection was poured in multiple stages. The bottom section of the pipe was poured on August 10th with the upper portion being poured the next day. Due to being poured in multiple stages there is concern of reduced quality due to the discontinuity between the lower and upper sections of the cast in place pipe.



Figure 1 Formwork of Cast in Place Connection



Figure 2 Cast in Place Channel Form Connection

The cast in place connection was a labour intensive and time consuming approach to connecting pipes to manholes. Wooden formwork had to be constructed for the channel, see Figure 2, and to seal the orifice in the manhole. Sand bags were used for exterior walls of the form, which had to be filled and placed, see figure 1. Concrete had to be poured and vibrated. Additionally, with this method consideration must be given to coordinating with external suppliers, specifically delivery of concrete to the work site.

900mm A Lok Connection

The 900mm lateral outlet used an A Lok Premium Model #1470 to connect SD1 to a 900mm interior diameter C76 CL IV reinforced concrete pipe. Maneuvering the pipe through the shoring presented some difficulty and represented the majority of the time spent on installation. The pipe was placed in the hole at 1035h. Once in the hole two workers coated the gasket and 600mm of the pipe with GrandSlam™ a wax based lubricant. The lubrication process took approximately 5 to 10 minutes to complete. The pipe was aligned with hole and held at the proper elevation with an excavator. One person was inside SD1 to direct the alignment of pipe with respect to the gasket. Due to the limited space because of the adjacent manhole D7 limited options were available to provide the requisite force along the longitudinal axis of the pipe to move it into its final position. Jacks were used to apply the necessary force, see Figure 3. Two workers operated the jacks and successfully inserted the pipe into the gasket. Installation was completed at 1102h. Total time from the pipe being lowered into the hole to completed installation was 27 minutes. Despite the lack of familiarity with the A Lok system by the City of Vancouver work crew the installation was performed quickly and effectively.



Figure 3 900mm RCP Being Jacked Into A Lok

1500mm A Lok Connection

The 1500mm inlet used an A Lok Premium Model #2360 to connect SD1 to a 1500mm interior diameter C76 CL IV reinforced concrete pipe. At 1325h the pipe segment was lowered into the excavation. The shoring presenting less difficulty for the placing of the pipe into the hole, however once in the hole a cross brace and wall segment of the shoring limited options for using the excavator to lift the pipe vertically. After the pipe was lowered into position the gasket and 600mm of the pipe was lubricated with GrandSlam™ lubricant. The pipe was aligned with the gasket. While attempting the alignment

the pipe slip and damaged the spigot, see figure 5. The section of the spigot that was damaged was not critical; the spigot was therefore the spigot was able to be trimmed without compromising the connection. However this could have been avoided by providing additional support to the front section of the pipe while attempting realignment. To push the pipe segment into place an excavator was used, see figure 4. The pipe inserted into the gasket smoothly and without difficulty. Installation was completed at 1401h. Total time was 36 minutes.



Figure 4 Excavator Driven Pipe



Figure 5 Spigot Damage

Recommendations

Diamond Precast recommends the use of A Lok Premium for connections of reinforce concrete and vitrified clay pipe to manholes.

A Lok Premium gaskets provide flexible connections, reducing pipe stress and a connection free of cold joints giving a superior seal compared to grouted connections. Diamond Precast recommends A Lok to increase the quality of connections.



A Lok Premium provides an economic alternative to traditional grouted connections. The installation took an average of 31.5 minutes to complete. With a crew of 4 the installations required 2.07 man hours to complete. With greater familiarity with the A Lok system this can be reduced. Once the precast concrete components are on site no additional materials or coordination with third parties are required.

Conclusion

A Lok Premium gasket connections provided an effect and economic method for connecting reinforced concrete pipe to manhole SD1. The City of Vancouver Sewers Department work crew was able to quickly and effectively install two pipes using A Lok Premium connections. It is the recommendation of Diamond Precast that A Lok Premium be used for manhole to reinforce concrete or vitrified clay pipe connections.



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