

DAMAGES DUE TO CORROSION BEYOND PROJECT SCOPE FINDINGS AS OF 08/16/2023 DURING REMOVAL OF THE EASTBOUND LINE 20" DIP WATER MAIN REHABILITATION PROJECT CITY OF MIAMI BEACH

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SUMMARY

The project consists of the replacement and rehabilitation of the existing Ductile Iron Pipe (DIP) 20-inch watermain installed along the Mac Arthur Causeway East Bridge. The project includes the rehabilitation of the two aerial watermains installed on each side of the bridge. The eastbound watermain includes the removal and replacement of 80' between Piers 29 and 32, and 220' between Piers 4 and 9.

These waterlines are composed of 20' long, 20" diameter and $\frac{3}{4}$ " thick sections connected to each other through mechanical joints, and supported by hangers anchored to the bridge slab.

These lines start and end at each side of the bridge and are located approximately 8' above seawater at the lowest point, more than 30' at the highest point. They are exposed to the sun and heat, wind, ultraviolet radiation, salinity, humidity, condensation, and biological waste from the local flora and fauna, among others. With these conditions, the site should be classified as highly corrosive by industry standards.

Observations in the field show that there are dissimilar metals touching each other, namely the stainless steel hangers supporting the iron pipe. Three hangers have been found broken, and a possible cause of this failure is the galvanic corrosion due to this field condition.

During the preparation phase for the replacement of the designated pipe, the existing eastbound watermain was observerd in more detailed from Pier 4 to the west end of the bridge. This segment was partially covered with vegetation. The project team found the waterline west of Pier 4 in the condition depicted in the pictures attached.

Considering the high level of deterioration found beyond Pier 4 to the west, and the fact that the original scope did not include the replacement of this segment; proceeding with the original scope could originate system failures of the line in the future, a recommendation to replace 135' of additional pipe was presented to the City.





Cutting line West end East bound line. Start 135' of additional replacement top surface of pipe corroded.



Severe corrosion on the inside surface of the pipe.



Pipe flanges at joint with severe corrosion.



Proferts Aug 16, 2028 TO DT 16 6 AM EDT

Joint flanges underneath with severe corrosion.

Uniform and peeling corrosion.





Internal corrosion at the joint.



Scamming corrosion on the top surface of the pipe.





Pitting corrosion and separation of existing paint.



Severe corrosion at joint.





High degradation of pipe and loss of thickness at top.



Uniform rounded holes corrosion.





Stress corrosion caused cracking failure of the flange at joint.



Pitting and crevice corrosion at joint.







Pitting corrosion on pipe. Joint flange and bolts with severe corrosion.

Surface corrosion and thickness tapping.





40% of thickness loss.



Tapping showing variable thickness loss.





25% of thickness loss.



Tapping showing internal corrosion of pipe.



30% of thickness loss.





41% of thickness loss.

