

**Barton
&Loguidice**

How You Spray May Delay the Day

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Presentation Overview

- Project Background
- Background on CCCP vs Shotcrete
- Lessons Learned



Project Background

After suffering a catastrophic failure in one area, the City evaluated the entire West Trunk Sewer system and found that repair was needed.

- 36-inch southern interceptor
- 60-inch overflow
- 48-inch by 72-inch overflow box culvert



Cracking, infiltration, and roots were present in the sewers, along with rocks and heavy debris



Missing clay tiles and bricks as well as settled bricks were causing flow and structural issues



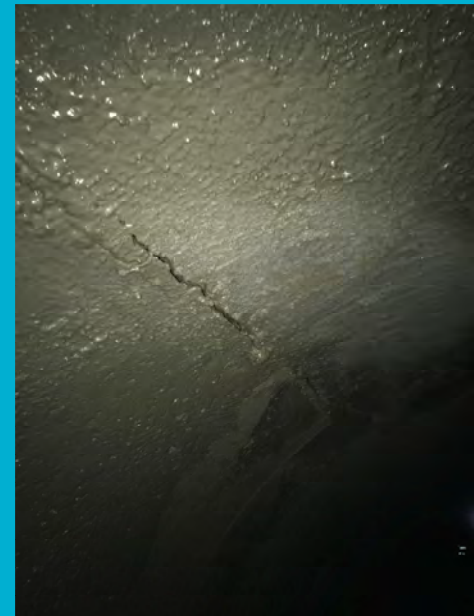
When a structural repair is needed, there are multiple options, however each has benefits and drawbacks

- Cost
- Capacity
- Feasibility
- Durability

Heavily damaged areas get addressed prior to shotcrete



Shotcrete is a labor intensive process and needs solid inspection to ensure quality results



In the end a solid pipe remains for many years of use by the City

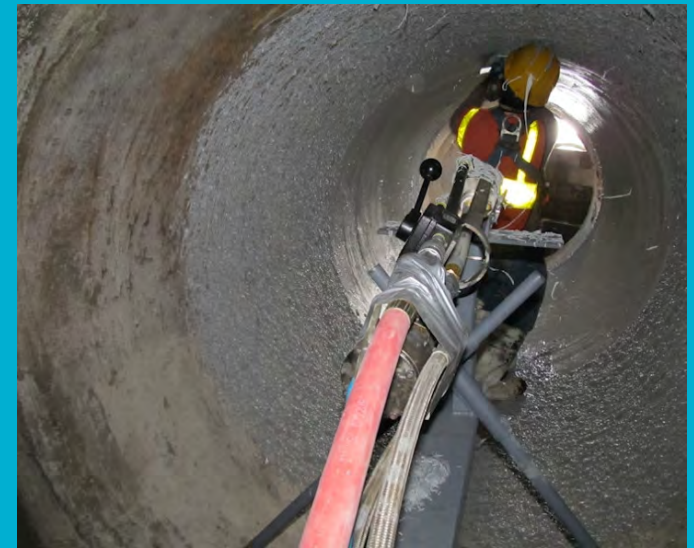


The background features a light blue field with a diagonal band of a darker blue color. A horizontal grey bar is centered across the image, containing the title text.

Centrifugally Cast Concrete Pipe (CCCP) vs Shotcrete

CCCP and shotcrete are both effective means of providing a new structural pipe by utilizing trenchless means of installation

- CCCP utilizes a spincaster that applies the material at a uniform rate by using a computer controlled motor that adjusts as the unit is retracted
- Shotcrete utilizes a trained technician to apply the material to the pipe and utilizes manual pins to ensure thickness requirements are met



It is not that one option is better than the other, but rather that the same steps are done differently

- Need to know thickness (even with computer control)
- Compaction
- Multiple passes
- Quality control



Material properties are similar for various options, however installation control is the biggest variance

DESIGN THICKNESS for 60"	MANNING COEFFICIENT	COMPRESSIVE STRENGTH	FLEXURAL STRENGTH	SPLITTING-TENSILE STRENGTH	SLANT SHEAR	BOND STRENGTH	CON-SHIELD Protective Additive	FIBER Durability Additive	CEMENT TYPE DEP Requires Type-Y	ASTM
PS312-KR Specified Materials										
1.5"	.018	8000	1080	682	2100	NOT ADVERTISED	YES	YES Micro	Portland Cement Type Not Advertised Believed to be Type II	C-109 (Lab Test)
Depth 20' = 1.5" Depth 25' = 1.7"	NOT ADVERTISED	8000	1500	800	NOT ADVERTISED	2500	NOT ADVERTISED	YES Size Fiber Not Advertised	Portland Cement Type Not Advertised	C-109 (Lab Test)
PS312-KR Material Substitution for Miliken Geospray										
1.5"	NOT ADVERTISED	8000	1300	>900	NOT ADVERTISED	>5000	NOT ADVERTISED	YES Size Fiber Not Advertised	Not Advertised Believed to be Type III Portland Cement	C-109 (Lab Test)
Material Substitution - Shotcrete										
1.5"	.013	* 8304	1100	825	4000	>1000	YES	YES Micro or .75"	Silica Fume Type IP	C42 C1604 C1140 (Field Test)

High quality spraying is essential to success, however methods can vary

Consideration	CCCP	Shotcrete
Air	Use centrifugal velocity to compact without adding large volumes of air at nozzle	With shotcrete mix, air can be verified with field testing, however you will get more air at nozzle
Thickness	Controlled and is can be applied in measurable layers	Success relies on quality of operator and suggest using depth indicators to verify minimum thicknesses are met
Weakened Mortar / Cracking	Not troweling reduces chance of too much water being brought to the surface, however crystalline admix is added to speed autogenous healing	Since troweling is used, need to ensure not to over work the mortar



Lessons Learned

Upfront support and inspection is important to results

- Calibrate thickness: either manual pre-spray, computer controlled, or test post spray
- Ensure the mix is what is needed for your application and do not accept less quality
- Do not give on testing; hold to the specifications
- If competition is desired, specify both clearly
- Old sewers can vary in size; verify quantities



Although it took a while to go from identifying the need to constructing the solution, the City now has a rehabilitated sewer



Conclusion

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- Background on CCCP vs Shotcrete
- Lessons Learned

The experience to
listen
The power to
solveSM

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