



OHIO RIVER INTERCEPTOR (ORI) EMERGENCY REHABILITATION

DATTA SHIRODKAR , P.E – BOYER INC

UCT The Underground Utilities Event



Underground Construction Technology | January 28-30, 2020 | Fort Worth, TX

- HISTORY & BACKGROUND
- INVESTIGATION & DESIGN
- ANTICIPATED CHALLENGES
- CONSTRUCTION OVERVIEW
- LESSONS LEARNED
- QUESTIONS

HISTORY & BACKGROUND

- OHIO RIVER INTERCEPTOR(ORI)
- REINFORCED CONCRETE SEMI-ELLIPTICAL COMBINED SEWER
- 4TH & MAIN ST , LOUISVILLE KY
- BUILT IN LATE 1950's
- SERVICES 40% OF LOUISVILLE MSD SERVICE AREA , ADF 40 MGD



HISTORY & BACKGROUND , Cont'd

- PROJECT TEAM
 - OWNER – LOUISVILLE MSD
 - GC – ULLIMAN SCHUTTE CONSTRUCTION
 - EOR – BROWN & CALDWELL
 - BYPASS SUBCONTRACTOR – BLUE TANK RENTAL
 - LINING SUBCONTRACTOR – BOYER INC

INVESTIGATION

- MULTI SENSOR INSPECTION OF 2-MILE SECTION – DECEMBER 2017
 - CONCRETE & REBAR LOSS
 - STRUCTURAL ASSESMENT BASED ON MULTI SENSOR INSPECTION

- CCTV INSPECTION - JUNE 2018
 - SEVERE DETERIORATION DUE TO H₂S INDUCED CORROSION
 - LOSS OF CONCRETE & REBAR
 - PIPE APPEARS TO BE IN STABLE CONDITION

- CCTV INSPECTION - AUGUST 2018
 - HOLE IN THE WALL OF THE PIPE
 - DIRT & DEBRIS AT THE BOTTOM OF THE PIPE
 - ENTIRE CROSS SECTION OF PIPE LOST
 - TUNNEL SHORING VISIBLE



INVESTIGATION , Cont'd

- HUGE VOID BETWEEN THE ROAD SURFACE & OUTSIDE OF ORI
- VIBRATIONS FELT IN THE PAVEMENT
- HOLE PLUGGED IN THE SIDE OF ORI
- VOID FILLED USING 650 CY OF FLOW FILL



ANTICIPATED CHALLENGES

- LOCATION
- SAFETY
 - ACCESS (INGRESS & EGRESS)
 - VENTILATION
- GROUTING
- HARD DEADLINE

UCT The Underground Utilities Event



Underground Construction Technology | January 28-30, 2020 | Fort Worth, TX

LOCATION

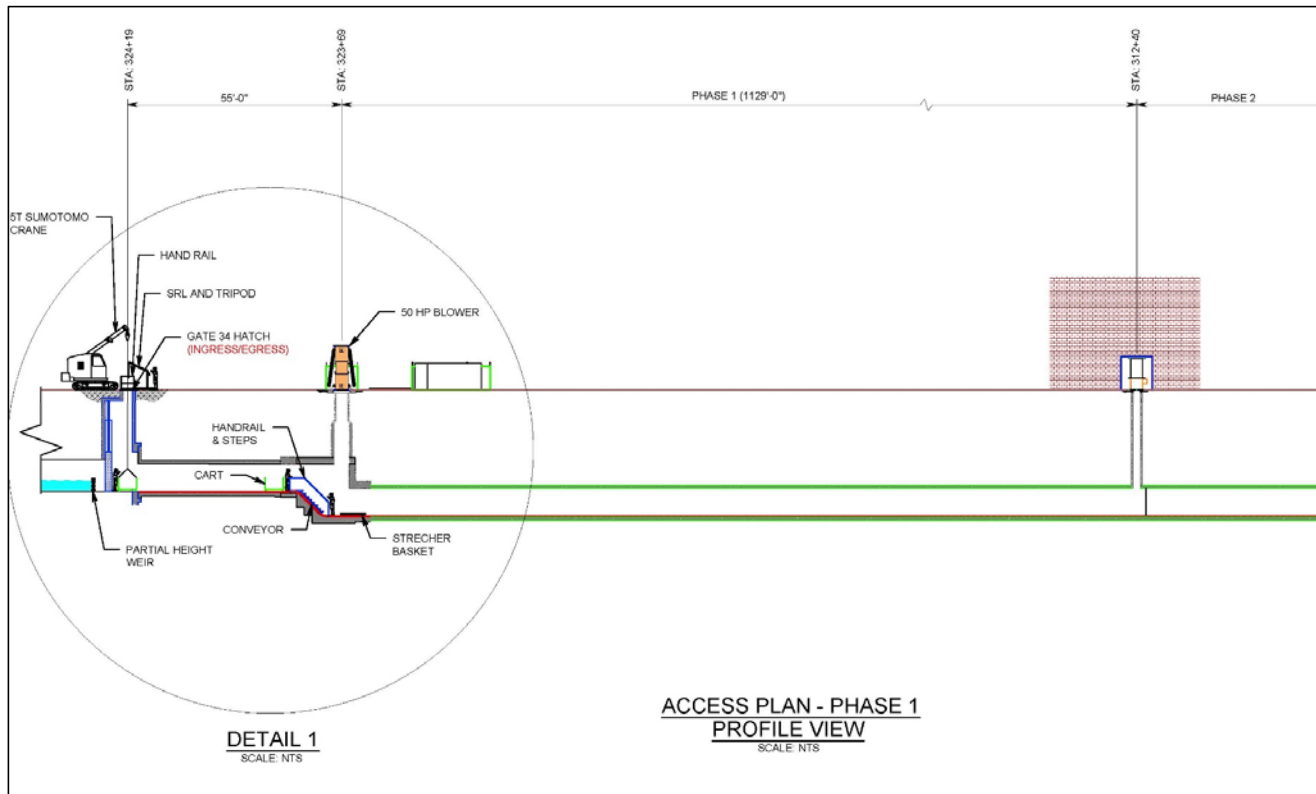




The Underground Utilities Event

Underground Construction Technology | January 28-30, 2020 | Fort Worth, TX

ACCESS (INGRESS & EGRESS)

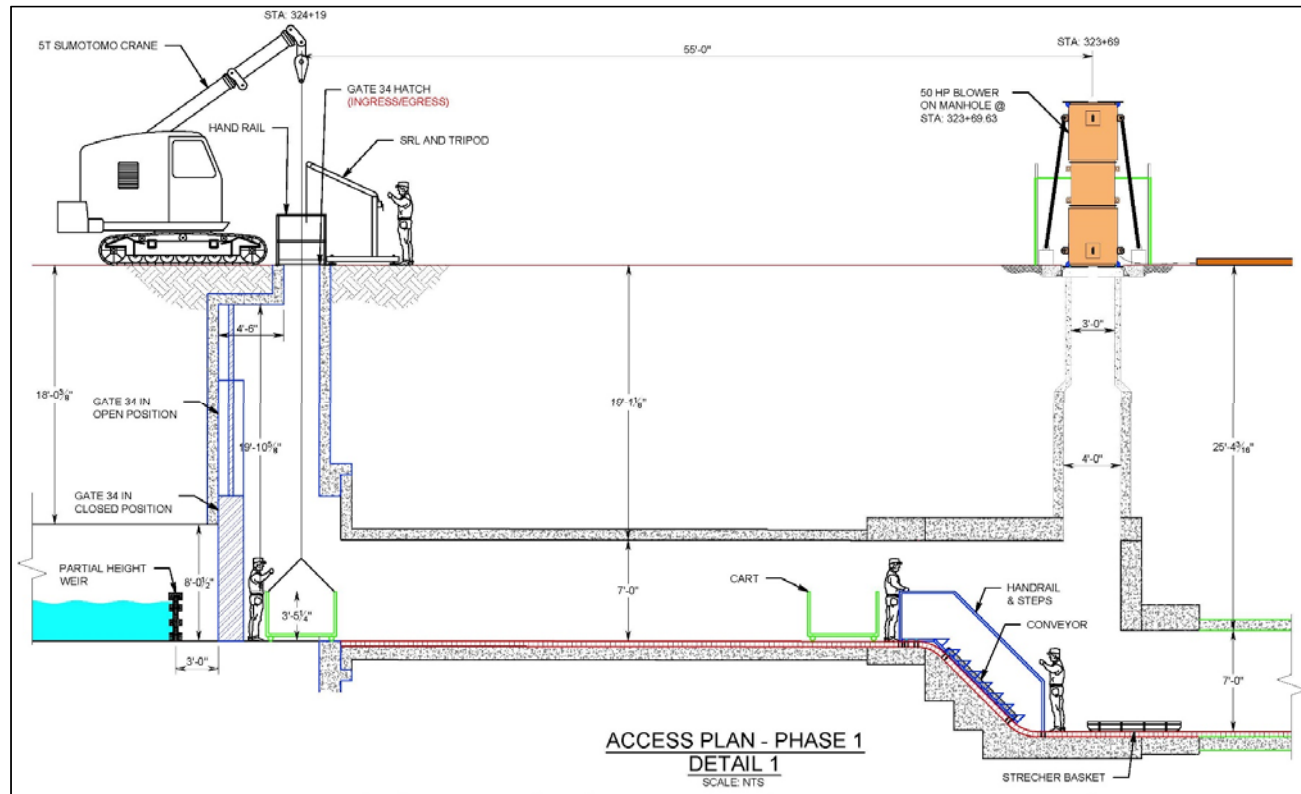




The Underground Utilities Event

Underground Construction Technology | January 28-30, 2020 | Fort Worth, TX

ACCESS (INGRESS & EGRESS)

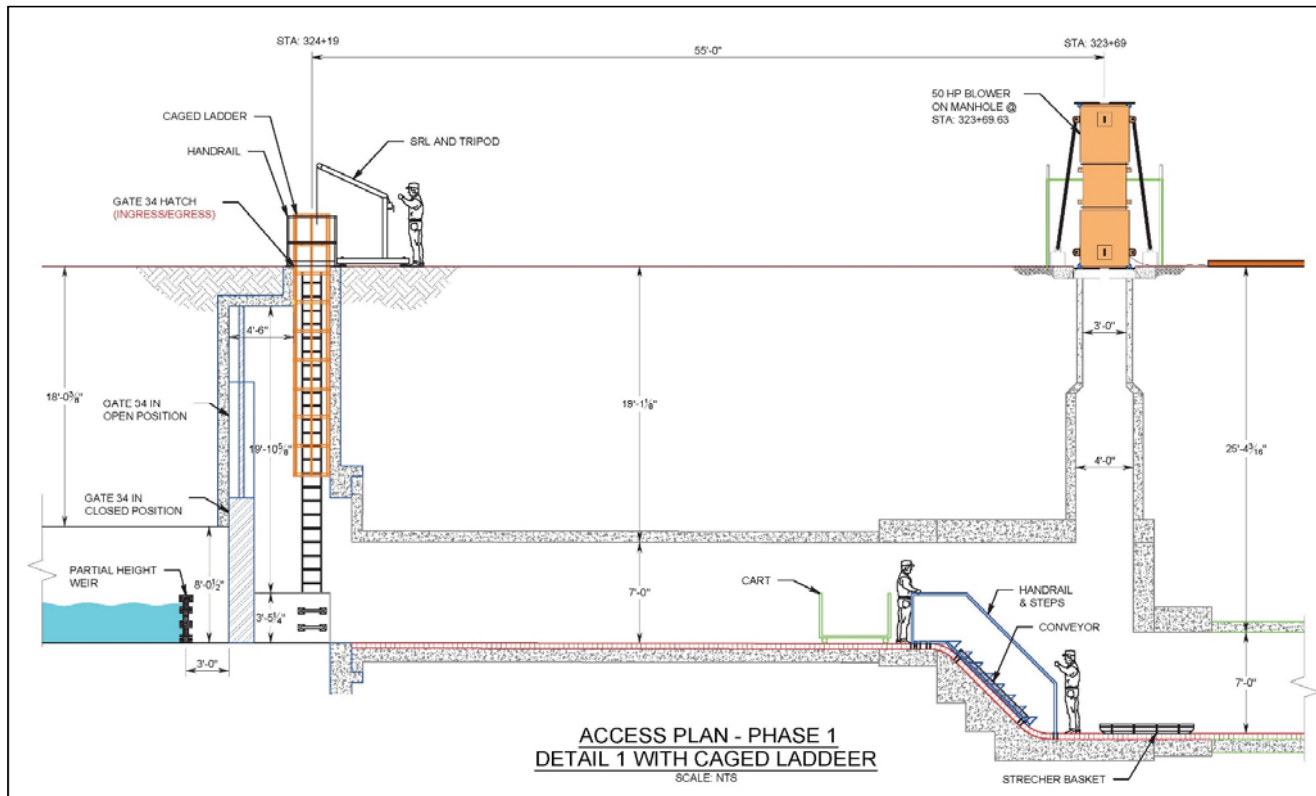




The Underground Utilities Event

Underground Construction Technology | January 28-30, 2020 | Fort Worth, TX

ACCESS (INGRESS & EGRESS)

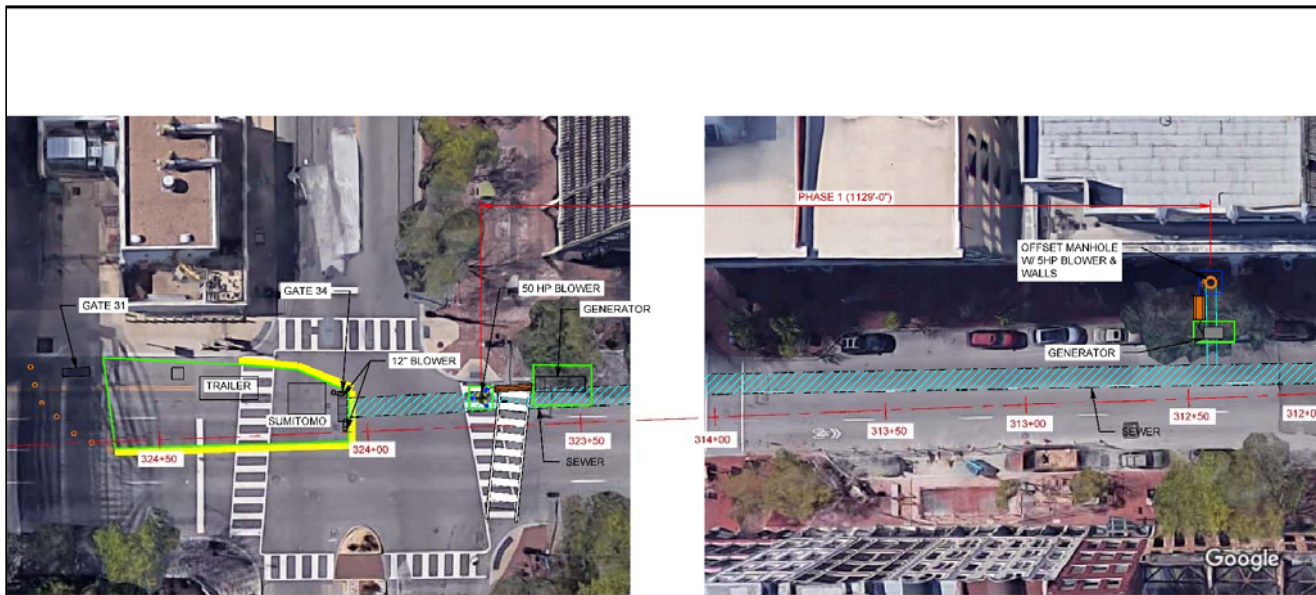




The Underground Utilities Event

Underground Construction Technology | January 28-30, 2020 | Fort Worth, TX

VENTILATION



PHASE 1 VENTILATION PLAN - PLAN VIEW
(STA: 323+69 TO 312+40)

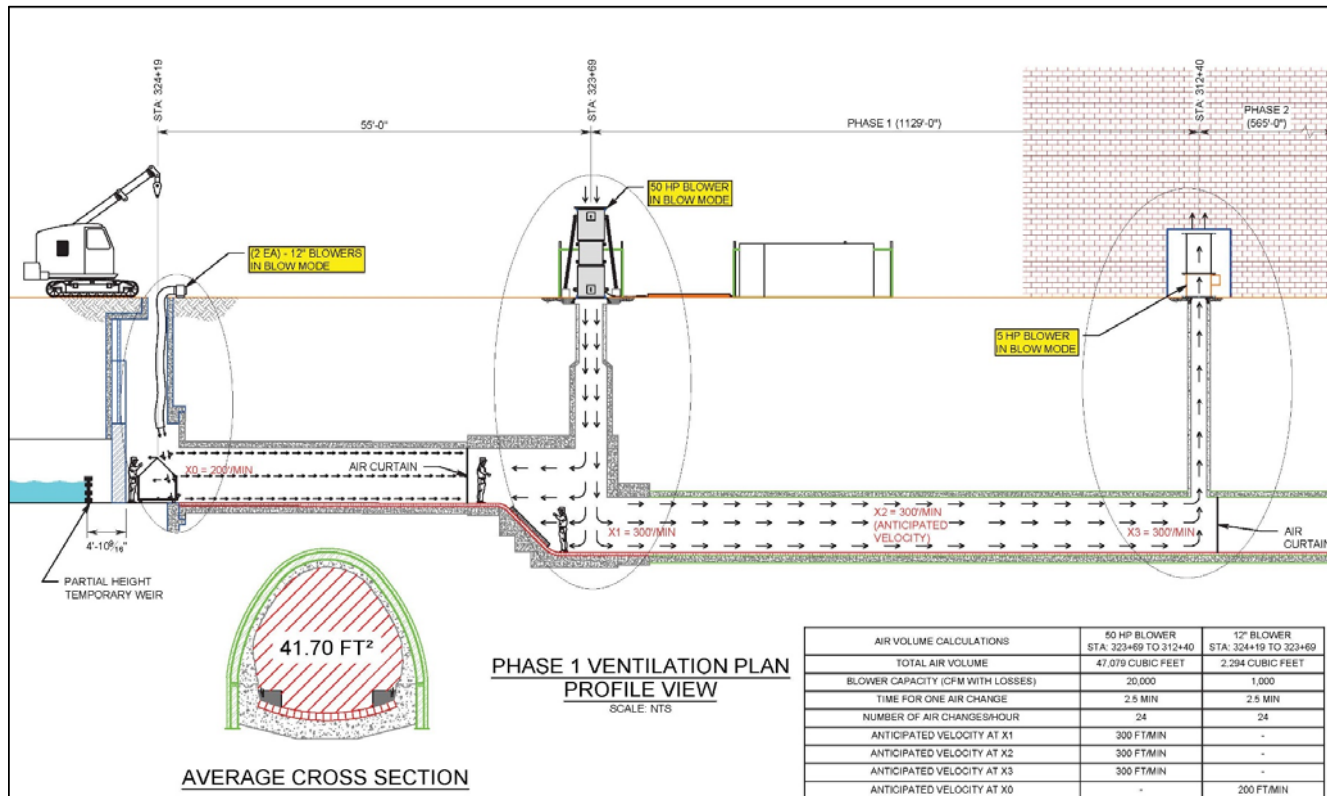
SCALE: NTS



The Underground Utilities Event

Underground Construction Technology | January 28-30, 2020 | Fort Worth, TX

VENTILATION





GROUTING

- PUMPING DISTANCE – 1400 LF
- READY MIX SUPPLIERS
- CONSISTENCY OF GROUT
- MIX DESIGN
- TRAVEL TIME BETWEEN BATCH PLANT & JOBSITE



COMPLETION DATE

FIRST WEEK OF DECEMBER 2018

CONSTRUCTION OVERVIEW

- INSTALLATION OF TEMPORARY WEIR & PERMANENT GATE
- CLEANING & HYDROBLASTING
- INSTALLATION OF PROTECTIVE SHIELD
- CURB INSTALLATION
- INTERNAL BYPASS/FLOW DIVERSION
- REBAR INSTALLATION
- LINER INSTALLATION
- GROUTING



The Underground Utilities Event

Underground Construction Technology | January 28-30, 2020 | Fort Worth, TX

INSTALLATION OF WEIR & GATE

INSTALL PARTIAL HEIGHT WEIR

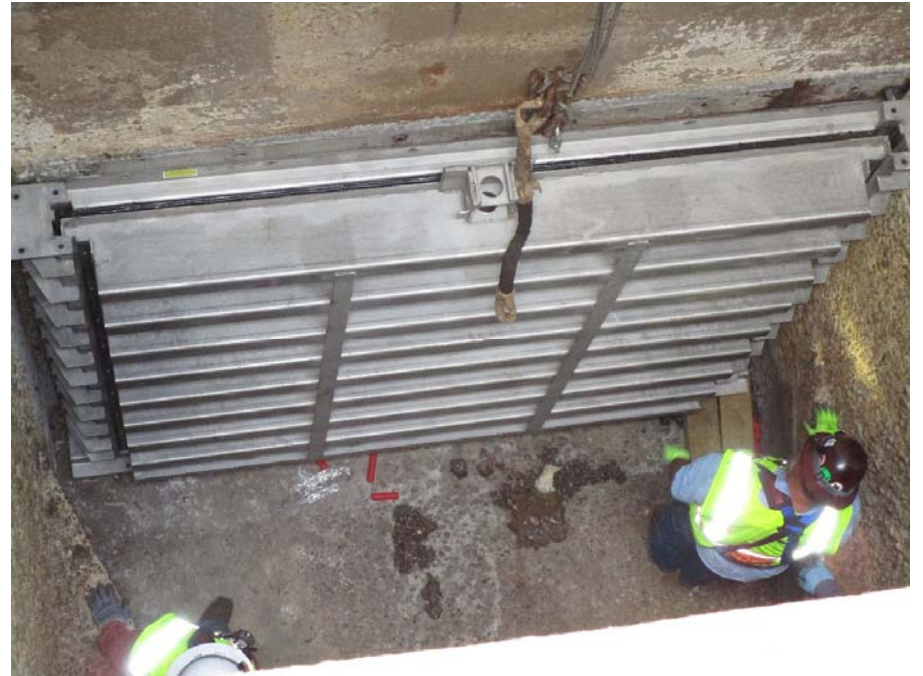


REMOVE & REPLACE SLUICE GATE





GATE INSTALLATION



INSTALLATION OF PROTECTIVE SHIELD

- INSTALL PROTECTIVE SHIELD FOR 150 FT
- RING BEAMS & CHANNEL
- DESIGNED & FABRICATED WITHIN A WEEK
- HAND CARRY & INSTALL IN PLACE 4-FT AT A TIME



CLEANING & HYDROBLASTING

EXISTING CONDITION



EXISTING CONDITION



CLEANING & HYDROBLASTING

- HYDROBLAST WITH 6-10K PSI WATER PRESSURE
- REMOVE LOOSE CONCRETE , LAITANCE , GREASE TO SOUND CONCTETE





The Underground Utilities Event

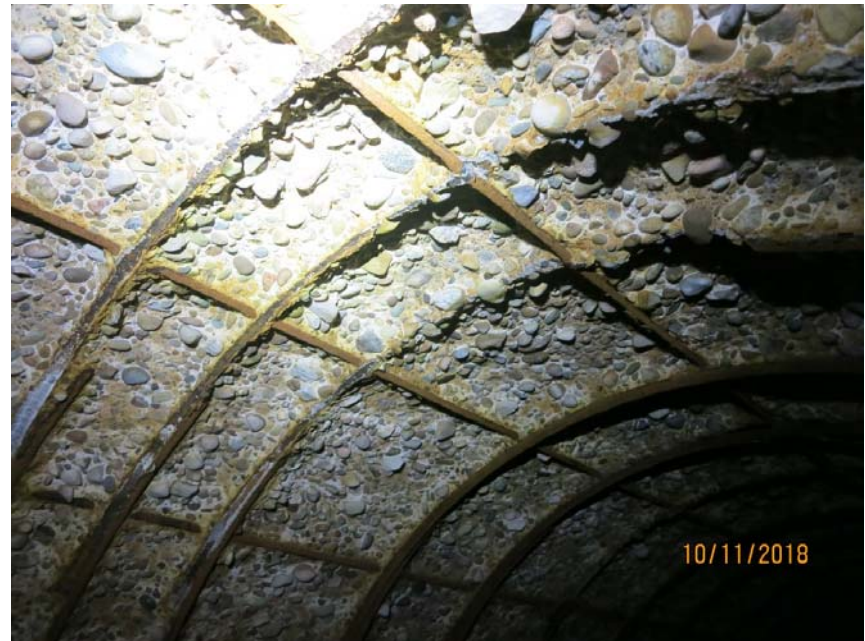
Underground Construction Technology | January 28-30, 2020 | Fort Worth, TX

CLEANING & HYDROBLASTING

BEFORE HYDROBLASTING



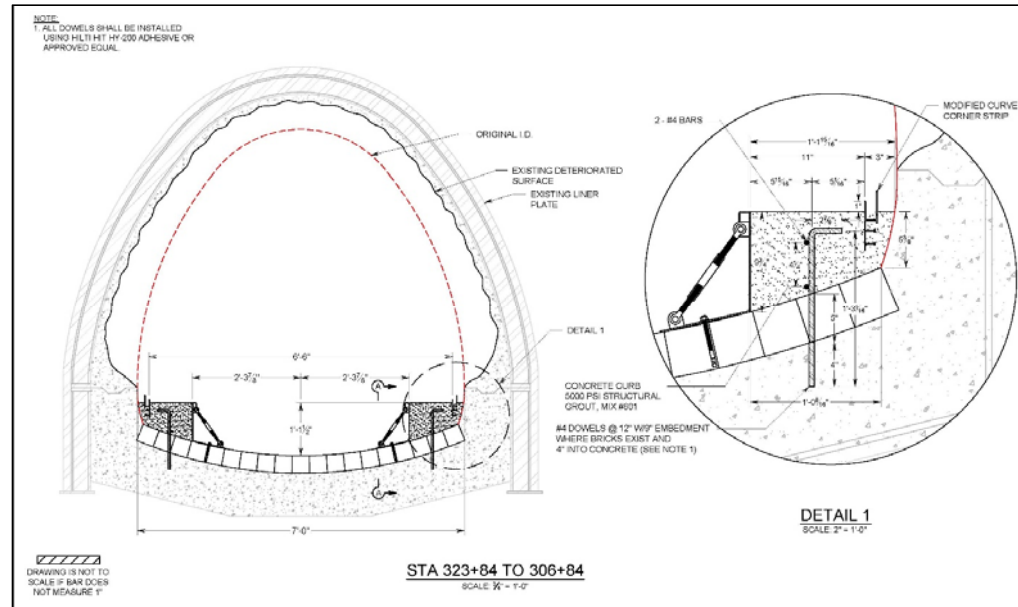
AFTER HYDROBLASTING





CURB INSTALLATION

- 5000 PSI GROUT WITH REBAR
- INSTALLED 200 LF AT A TIME
- CURVED CORNER PANEL EMBEDDED INSIDE THE CURB TO HOLD LINER IN PLACE





The Underground Utilities Event

Underground Construction Technology | January 28-30, 2020 | Fort Worth, TX

CURB INSTALLATION





The Underground Utilities Event

Underground Construction Technology | January 28-30, 2020 | Fort Worth, TX

INTERNAL FLOW DIVERSION



REBAR INSTALLATION

- TRANSVERSE REBAR
 - #4 @ 12" O.C
- LONGINTUDINAL REBAR
 - #4 @ 12" O.C



LINER INSTALLATION

- DANBY PVC LINER
- CORROSION RESISTANT
- 12" WIDE PANELS , 15' LONG
- LOCKED TOGETHER BY JOINER STRIP

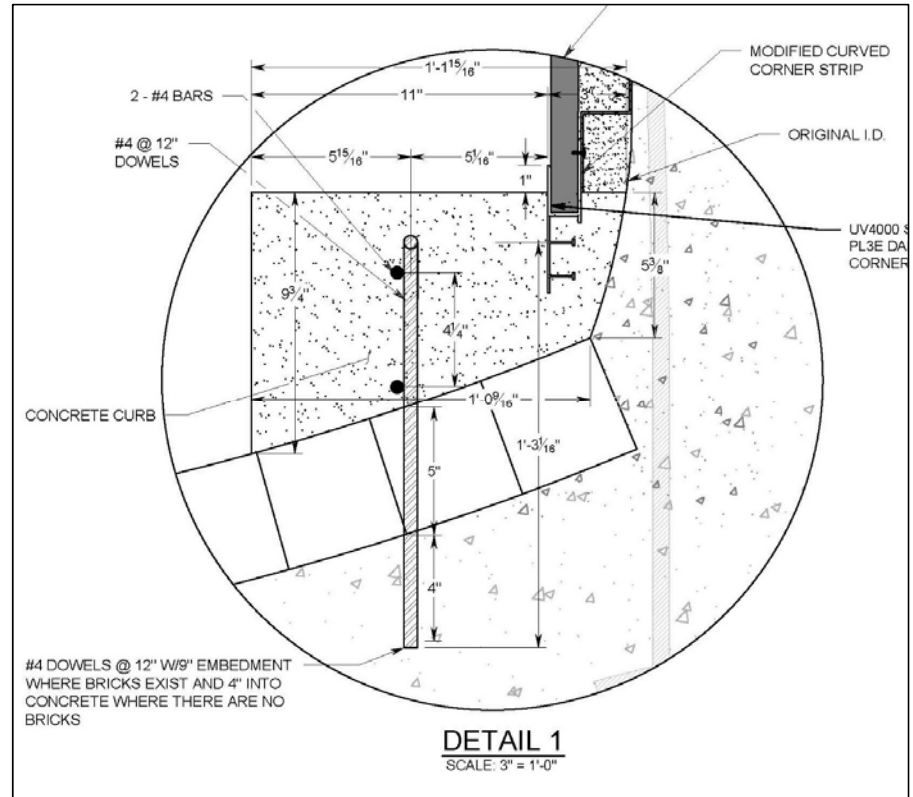
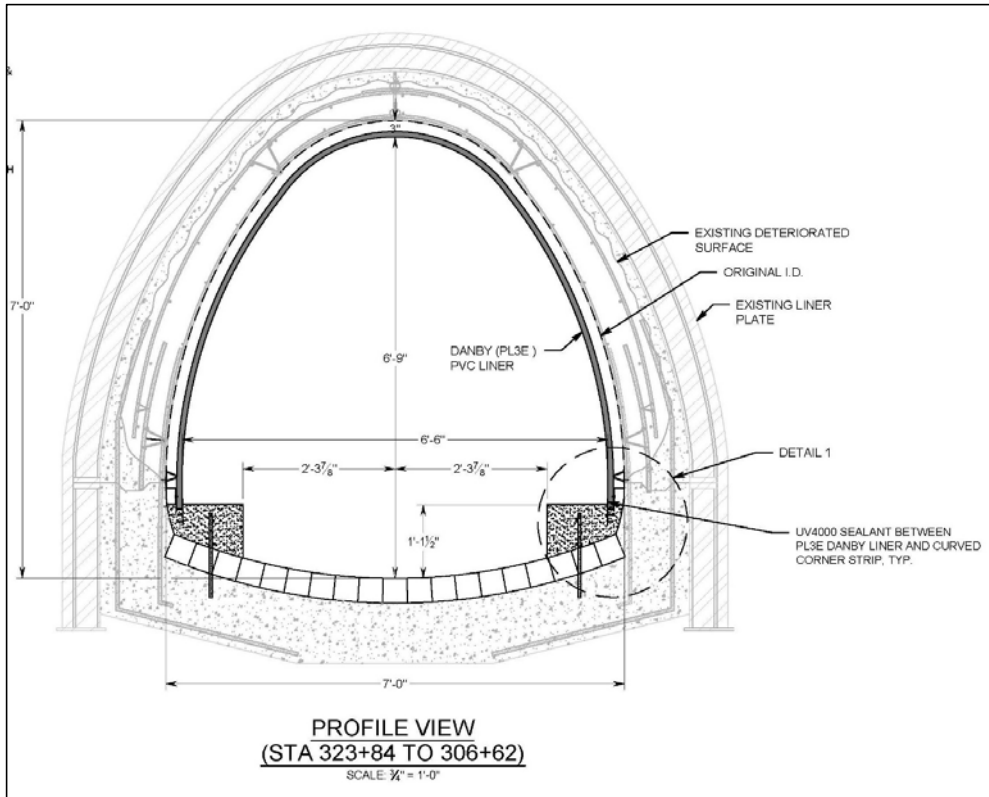


UCT The Underground Utilities Event



Underground Construction Technology | January 28-30, 2020 | Fort Worth, TX

LINER INSTALLATION





The Underground Utilities Event

Underground Construction Technology | January 28-30, 2020 | Fort Worth, TX

LINER INSTALLATION



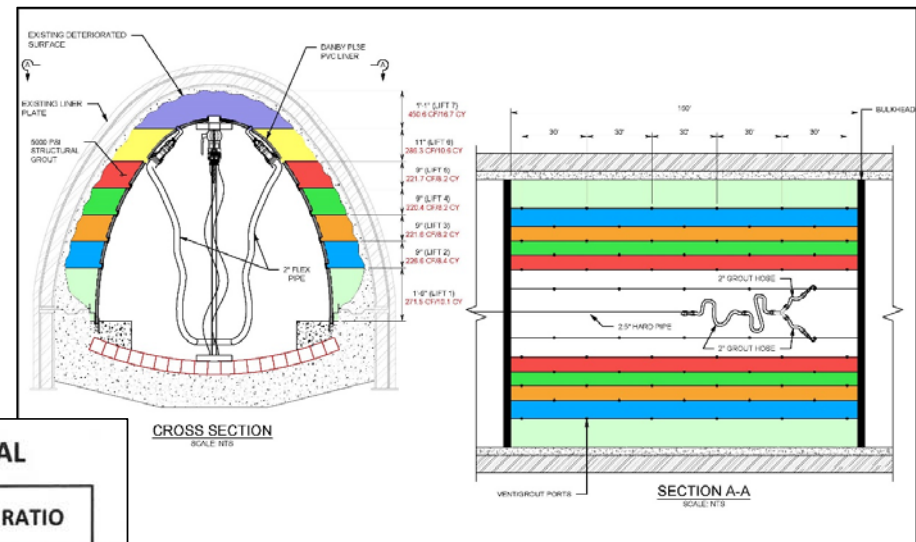


The Underground Utilities Event

Underground Construction Technology | January 28-30, 2020 | Fort Worth, TX

GROUTING

- 5000 PSI STRUCTURAL GROUT
- INSTALLED IN 12" LIFTS
- MADE ON SITE
- 14-20 SECONDS FLOW CONE



DANBY GROUT MIX DESIGN FOR 1000 LBS OF CEMENTITIOUS MATERIAL

| MATERIAL | SPECIFIC GRAVITY | DENSITY (LBS/CF) | WEIGHT (LBS) | GAL | VOLUME CF | W/C RATIO |
|---------------------------|------------------|------------------|--------------|-----|-----------------|-------------|
| TYPE I/II PORTLAND CEMENT | 3.125 | 195 | 600 | | 3.1 | 0.33 |
| CLASS "F" FLY ASH | 2.5 | 156 | 400 | | 2.6 | |
| WATER | 1 | 62.4 | 333.6 | 40 | 5.3 | |
| ADVAFLEX | 1.07 | 66.6 | 4.7 | 0.5 | 0.1 | |
| TOTAL VOLUME | | | | | 11.06 CF | |

NOTE : The product will be mixed on site using a colloidal mixer with Cement & Flyash delivered in 1000 lbs supersacks.

GROUTING

- 17 CF COLLOIDAL MIXER
- HOLDING TANK
- SCREW AUGER CONVEYOR
- WATER & ADMIXTURE TANK
- MIXING TIME – 5 MINUTES
- PLC CONTROLLED





LESSONS LEARNED

- PERIODICALLY INSPECT SANITARY SEWER LINES
- ALWAYS HAVE A BACK UP PLAN
- COLLABORATION BETWEEN OWNER, ENGINEER & CONTRACTOR = SUCCESSFUL PROJECT

UCT The Underground Utilities Event



Underground Construction Technology | January 28-30, 2020 | Fort Worth, TX

