PROGRAM	**TRDP v1.1**	**Sheet no.**	1 of 1
PROJECT	70/71 6R	**Date**	4/7/2020
LOCATION	City of Columbus		
DESIGNED BY	Josh Fuchs		
CHECKED BY			
COMPANY	ms consultants, inc.		
DESCRIPTION	11 Horz & 11 Up Bend		

Pipeline Information

Pipe Type (ECP, LCP, BWP, RCP)	LCP		Cylinder Outside Diameter, D_y	42.5	in.
Internal Diameter, ID	36	in.	Minimum Cylinder Thickness	0.0598	in.
Core Thickness, h'_c	2.25	in.	Bend Angle, Δ	11.2	deg
Mortar Coating Thickness, h_m	1	in.	Centerline Length of Fitting, L_b	3	ft
Core Outside Diameter, OD	40.5	in.	Pipe Laying Length (First Pipe), L_{p1}	20	ft
Pipe Outside Diameter, D_o	42.5	in.	Pipe Laying Length (Typical Pipe), L_p	20	ft

Joint Properties

Joint Type (Welded or Harnessed)	Welded	
Joint Diameter, D_j	41	in.
Joint Slack	0	in.

Material Properties

Concrete Strength, f'_c	4500	psi
Steel Cylinder Yield Strength, f_{yy}	36000	psi

Pressures

Working Pressure, P_w	150	psi
Transient Pressure, P_t	100	psi
Field Test Pressure, P_{ft}	150	psi
$P_{weff} = \max(P_w, P_{ft}/1.25, (P_w + P_t)/1.4)$	179	psi

Soil Information (Table 9-1 - Soil Type Selection Guide)

Soil Type (I through V)	V	
Soil Stiffness, k	425	psi
Soil Unit Weight, γ	110	pcf
Pipe to Soil Friction Coefficient, μ	0.3	in.
Soil Cover, H	6	ft
Angle of Internal Friction, φ	20	deg

Bend Angle (deg)	Centerline Length of Fitting (ft)	Thrust (kip)	Total Footage Required (one side)	Total Heavy Gage Footage (one side)
11.2	3	58	57	0

Required Lengths for One Side

Cylinder Thickness (in.)	0.5	0.4375	0.375	0.3125	0.25	0.1875	0.1644 (8 GA)	0.1345 (10 GA)	0.1046 (12 GA)	0.0747 (14 GA)	0.0598 (16 GA)
Length Needed (ft)	0	0	0	0	0	0	0	0	0	0	57
Number of Pipes	0	0	0	0	0	0	0	0	0	0	3

PROGRAM	**TRDP v1.1**	**Sheet no.**	1 of 1
PROJECT	70/71 6R	**Date**	4/7/2020
LOCATION	City of Columbus		
DESIGNED BY	Josh Fuchs		
CHECKED BY			
COMPANY	ms consultants, inc.		
DESCRIPTION	22 Horz & 22 Up Bend		

Pipeline Information

Pipe Type (ECP, LCP, BWP, RCP)	LCP		Cylinder Outside Diameter, D_y	42.5	in.
Internal Diameter, ID	36	in.	Minimum Cylinder Thickness	0.0598	in.
Core Thickness, h'_c	2.25	in.	Bend Angle, Δ	22.5	deg
Mortar Coating Thickness, h_m	1	in.	Centerline Length of Fitting, L_b	3	ft
Core Outside Diameter, OD	40.5	in.	Pipe Laying Length (First Pipe), L_{p1}	20	ft
Pipe Outside Diameter, D_o	42.5	in.	Pipe Laying Length (Typical Pipe), L_p	20	ft

Joint Properties

Joint Type (Welded or Harnessed)	Welded	
Joint Diameter, D_j	41	in.
Joint Slack	0	in.

Material Properties

Concrete Strength, f'_c	4500	psi
Steel Cylinder Yield Strength, f_{yy}	36000	psi

Pressures

Working Pressure, P_w	150	psi
Transient Pressure, P_t	100	psi
Field Test Pressure, P_{ft}	150	psi
$P_{weff} = \max(P_w, P_{ft}/1.25, (P_w + P_t)/1.4)$	179	psi

Soil Information (Table 9-1 - Soil Type Selection Guide)

Soil Type (I through V)	V	
Soil Stiffness, k	425	psi
Soil Unit Weight, γ	110	pcf
Pipe to Soil Friction Coefficient, μ	0.3	in.
Soil Cover, H	6	ft
Angle of Internal Friction, φ	20	deg

Bend Angle (deg)	Centerline Length of Fitting (ft)	Thrust (kip)	Total Footage Required (one side)	Total Heavy Gage Footage (one side)
22.5	3	115	95	32

Required Lengths for One Side

Cylinder Thickness (in.)	0.5	0.4375	0.375	0.3125	0.25	0.1875	0.1644 (8 GA)	0.1345 (10 GA)	0.1046 (12 GA)	0.0747 (14 GA)	0.0598 (16 GA)
Length Needed (ft)	0	0	0	0	0	0	0	0	17	15.5	62.2
Number of Pipes	0	0	0	0	0	0	0	0	1	1	3

PROGRAM	**TRDP v1.1**	**Sheet no.**	1 of 1
PROJECT	70/71 6R	**Date**	4/7/2020
LOCATION	City of Columbus		
DESIGNED BY	Josh Fuchs		
CHECKED BY			
COMPANY	ms consultants, inc.		
DESCRIPTION	45 Horz & 45 Up Bend		

Pipeline Information

Pipe Type (ECP, LCP, BWP, RCP)	LCP		Cylinder Outside Diameter, D_y	42.5	in.
Internal Diameter, ID	36	in.	Minimum Cylinder Thickness	0.0598	in.
Core Thickness, h'_c	2.25	in.	Bend Angle, Δ	45	deg
Mortar Coating Thickness, h_m	1	in.	Centerline Length of Fitting, L_b	3	ft
Core Outside Diameter, OD	40.5	in.	Pipe Laying Length (First Pipe), L_{p1}	20	ft
Pipe Outside Diameter, D_o	42.5	in.	Pipe Laying Length (Typical Pipe), L_p	20	ft

Joint Properties

Joint Type (Welded or Harnessed)	Welded	
Joint Diameter, D_j	41	in.
Joint Slack	0	in.

Material Properties

Concrete Strength, f'_c	4500	psi
Steel Cylinder Yield Strength, f_{yy}	36000	psi

Pressures

Working Pressure, P_w	150	psi
Transient Pressure, P_t	100	psi
Field Test Pressure, P_{ft}	150	psi
$P_{weff} = \max(P_w, P_{ft}/1.25, (P_w + P_t)/1.4)$	179	psi

Soil Information (Table 9-1 - Soil Type Selection Guide)

Soil Type (I through V)	V	
Soil Stiffness, k	425	psi
Soil Unit Weight, γ	110	pcf
Pipe to Soil Friction Coefficient, μ	0.3	in.
Soil Cover, H	6	ft
Angle of Internal Friction, φ	20	deg

Bend Angle (deg)	Centerline Length of Fitting (ft)	Thrust (kip)	Total Footage Required (one side)	Total Heavy Gage Footage (one side)
45	3	226	134	61

Required Lengths for One Side

Cylinder Thickness (in.)	0.5	0.4375	0.375	0.3125	0.25	0.1875	0.1644 (8 GA)	0.1345 (10 GA)	0.1046 (12 GA)	0.0747 (14 GA)	0.0598 (16 GA)
Length Needed (ft)	0	0	0	0	0	0	0	6.4	36.5	18.2	73.1
Number of Pipes	0	0	0	0	0	0	0	1	2	1	3