CT EXPANSION PROJECT

SILT FENCE DESIGN CRITERIA AND METHODOLOGY

CONNECTICUT LOOP

Submitted by:

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INTRODUCTION

The following description of silt fence design criteria and methodology was performed as part of a comprehensive erosion and sedimentation control design of the Connecticut Expansion Pipeline (Project) within Connecticut. Tennessee Gas Pipeline Company ("Tennessee") is filing an application for a certificate of public convenience and necessity with the Federal Energy Regulatory Commission ("Commission" or "FERC") for the Project in Albany County, New York, Berkshire and Hampden Counties, Massachusetts and Hartford County, Connecticut. The proposed Project involves the construction of two sections of new 36-inch pipeline looping totaling 1.4 miles in New York and 3.8 miles in Massachusetts, and one section of new 24-inch pipeline looping totaling 8.1 miles in Massachusetts and Connecticut. To the extent that it is practicable, feasible, and in compliance with existing law, Tennessee proposes to locate the pipeline loops within or adjacent to the right-of-way ("ROW") associated with its existing pipelines designated as the 200 and 300 Lines. Tennessee proposes to begin construction of the Project facilities in 2015 and to place the facilities in-service by November 2016.

DESIGN CRITERIA AND METHODOLOGY

In order to reduce runoff velocity and effect deposition of transported sediment load, both standard and reinforced silt fencing has been specified for use in the Connecticut portion of the Tennessee Pipeline Construction areas.

As per the Connecticut Guidelines for Soil and Sediment Control (2002, section 5-11-35), silt fencing placement is applicable where small disturbed areas where the contributing drainage area is less than 1 acre. The maximum slope length for 20" reinforced silt fence is:

Slope Steepness	Slope Steepness (%)	Maximum Slope Length (ft)
2:1 to 3:1	50 to 33	50
3:1 to 5:1	33 to 20	75
5:1 or flatter	20 or less	100

As there are no Connecticut State standards for silt fence specification where either maximum slope steepness or slope length is exceeded (as in noted in the above table), Tennessee specifies the use of reinforced silt fence and super silt fence with the following maximum allowable slope length (see standard environmental details at the end of this document):

Maximum Slope Length (ft) Above Fence [1]		
Slope Steepness	**Slope Percent (%)**	**Super Silt Fence**
2:1	50	50
-	45	60
-	40	75
-	35	85
-	30	100
4:1	25	135
5:1	20	275
-	15	215
10:1	10	325
20:1	5	500
50:1	2	1000

[1]This table is based on the table 4.4 Maximum Slope Length for Silt Fence of the PA DEP Erosion and Sediment Pollution Control Manual, 2012, page 76.

Locations where reinforced silt barrier slope steepness or slope length are exceeded (as noted in the above table), Tennessee will be utilizing a swale to intercept runoff up gradient of the construction areas, sized appropriately to either transfer flow to a nearby waterbody, if appropriate or directed via storm drainage pipe through the construction area and outletting in a preferred down gradient location.

Finally, Silt fence materials will be according to specifications as noted in the Best Management Practices (BMPs) for Construction Activities in Connecticut.

Tennessee Gas Pipeline Company, L.L.C.
a Kinder Morgan company

Tennessee Gas Pipeline Comapany, L.L.C.
Connecticut Expansion Project
Sediment Barrier Backup Calculations
Connecticut Loop - Table 1

Left or Right of Baseline		SEDIMENT BARRIER LOCATION NEW (STA to STA)		Length of Barrier (FT)	SEDIMENT BARRIER TYPE	ACTUAL SLOPE PERCENT ABOVE BARRIER (%)	ACTUAL SLOPE LENGTH ABOVE BARRIER (FT)	ALLOWABLE SLOPE LENGTH ABOVE BARRIER (FT)	REMAINING SLOPE LENGTH (FT)	PERCENTAGE OF SLOPE LENGTH REMAINING	RESULT	Comments
RIGHT		0	180	159	20 INCH SILT FENCE	1	50	100	50	50%	OK	SIDESLOPE
		180	550	872	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
	LEFT	460	780	367	20 INCH SILT FENCE	8	50	100	50	50%	OK	SIDESLOPE WITH WATERBAR
		790	860	292	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
	LEFT	850	1130	290	SUPER SILT FENCE	4	250	500	250	50%	OK	SIDESLOPE
		1125	1600	982	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		1950	1980	385	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		2025	3950	4828	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		4050	4060	93	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		4250	4325	100	20 INCH SILT FENCE	2	50	100	50	50%	OK	ROAD CROSSING
		4310	4480	100	20 INCH SILT FENCE	2	50	100	50	50%	OK	ROAD CROSSING
		4425	4480	178	20 INCH SILT FENCE	2	50	100	50	50%	OK	ROAD CROSSING
RIGHT		4825	5050	205	20 INCH SILT FENCE	1	50	100	50	50%	OK	SIDESLOPE
		5050	6425	2860	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		6425	6560	382	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		6650	7000	875	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		7000	7080	164	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		7180	7380	532	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		7250	7300	121	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		7450	7630	530	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		7670	7750	330	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		7760	7790	102	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		7840	8440	1526	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		8480	8590	398	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
RIGHT		8600	8780	168	20 INCH SILT FENCE	2	50	100	50	50%	OK	SIDESLOPE
		8780	9050	653	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		8850	9630	1679	SUPER SILT FENCE	4	930	500	0	0%	NO GOOD	WETLAND, SWALE REQ'D
	LEFT	9580	9700	61	20 INCH SILT FENCE	4	100	100	0	0%	OK	SIDESLOPE
		9700	10350	1459	SUPER SILT FENCE	3	598	500	0	0%	NO GOOD	WETLAND, SWALE REQ'D
		10450	10500	200	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		10500	10600	158	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND
RIGHT		10500	10640	114	20 INCH SILT FENCE	1	50	100	50	50%	OK	SIDESLOPE
		10650	11000	804	SUPER SILT FENCE	3	432	500	68	14%	OK	WETLAND
		11050	13680	5682	SUPER SILT FENCE	16	200	175	0	0%	NO GOOD	WETLAND, SWALE REQ'D
		13650	13720	165	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND
		13760		100	20 INCH SILT FENCE	1	50	100	50	50%	OK	ROAD CROSSING
		13810		100	20 INCH SILT FENCE	1	50	100	50	50%	OK	ROAD CROSSING
		13825	14780	1707	SUPER SILT FENCE	1	150	1000	850	85%	OK	WETLAND WITH WATERBAR
		14800	15400	1447	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		15400	15950	912	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR

Tennessee Gas Pipeline Company, L.L.C.
a Kinder Morgan company

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Connecticut Expansion Project
Sediment Barrier Backup Calculations
Connecticut Loop - Table 2

Left or Right of Baseline		SEDIMENT BARRIER LOCATION NEW (STA to STA)		Length of Barrier (FT)	SEDIMENT BARRIER TYPE	ACTUAL SLOPE PERCENT ABOVE BARRIER (%)	ACTUAL SLOPE LENGTH ABOVE BARRIER (FT)	ALLOWABLE SLOPE LENGTH ABOVE BARRIER (FT)	REMAINING SLOPE LENGTH (FT)	PERCENTAGE OF SLOPE LENGTH REMAINING	RESULT	Comments
		17000	17700	1475	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		17800	18250	1062	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		19300	19250	2263	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		19250	19390	100	20 INCH SILT FENCE	1	50	100	50	50%	OK	ROAD CROSSING
		19350	19380	100	20 INCH SILT FENCE	1	50	100	50	50%	OK	ROAD CROSSING
		19430	20030	1323	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		20400	21150	1721	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		21200	21250	567	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		21350	21730	864	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
LEFT		21700	21900	177	SUPER SILT FENCE	3	330	500	170	34%	OK	SIDESLOPE
		21900	21950	205	SUPER SILT FENCE	3	340	500	160	32%	OK	WETLAND WITH WATERBAR
		22000	22480	1072	SUPER SILT FENCE	6	130	325	195	60%	OK	WETLAND WITH WATERBAR
		23250	23250	555	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		24150	24550	967	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		25080	25400	774	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		25400	25500	216	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		25700	27400	3839	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		27430	27540	416	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		27650	28630	2044	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		29050	29650	1458	SUPER SILT FENCE	3	1424	500	0	0%	NO GOOD	WETLAND, SWALE REQ'D
LEFT		29700	29850	180	SUPER SILT FENCE	4	678	500	0	0%	NO GOOD	SIDESLOPE, SWALE REQ'D
		29900	30000	307	SUPER SILT FENCE	5	306	500	194	39%	OK	WETLAND
			30050	100	20 INCH SILT FENCE	1	50	100	50	50%	OK	ROAD CROSSING
			30030	100	20 INCH SILT FENCE	1	50	100	50	50%	OK	ROAD CROSSING
		30050	30150	295	20 INCH SILT FENCE	4	100	100	0	0%	OK	WETLAND
		30230	30700	1191	SUPER SILT FENCE	4	1186	500	0	0%	NO GOOD	WETLAND, SWALE REQ'D
		30700	31000	670	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		31280	31400	394	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		31500	31680	545	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		31750	33450	3505	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		33500	33000	298	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		33800	33950	455	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		34080	34150	361	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		34200	34730	1146	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		34930	36950	4280	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		37150	37350	675	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		37550	37630	298	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		37800	38050	618	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		38150	38225	302	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		38360	38450	280	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR

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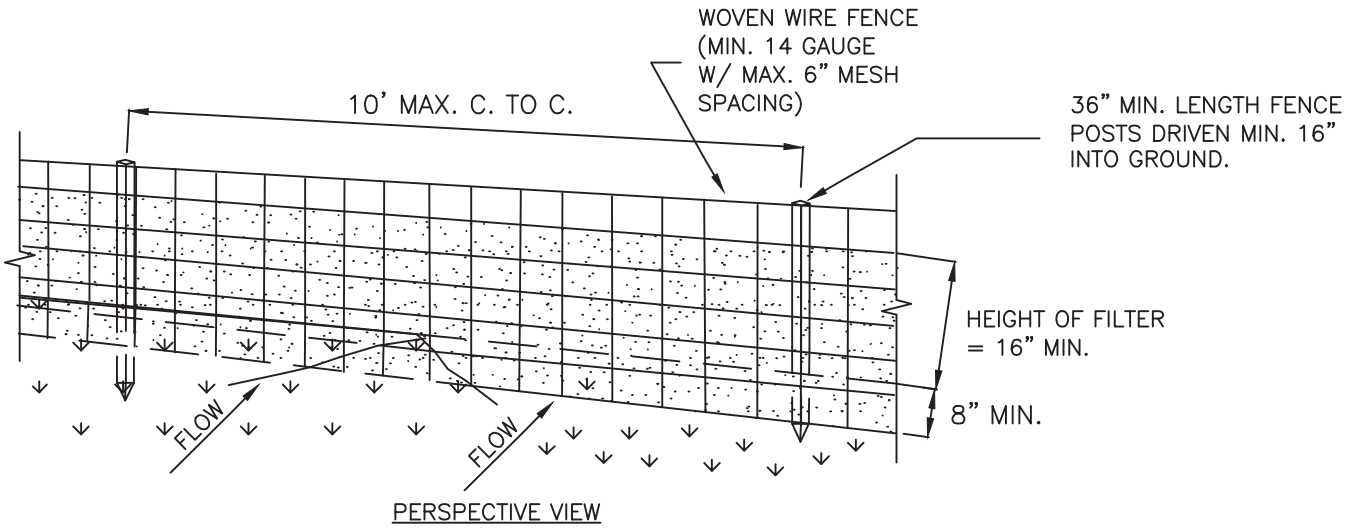
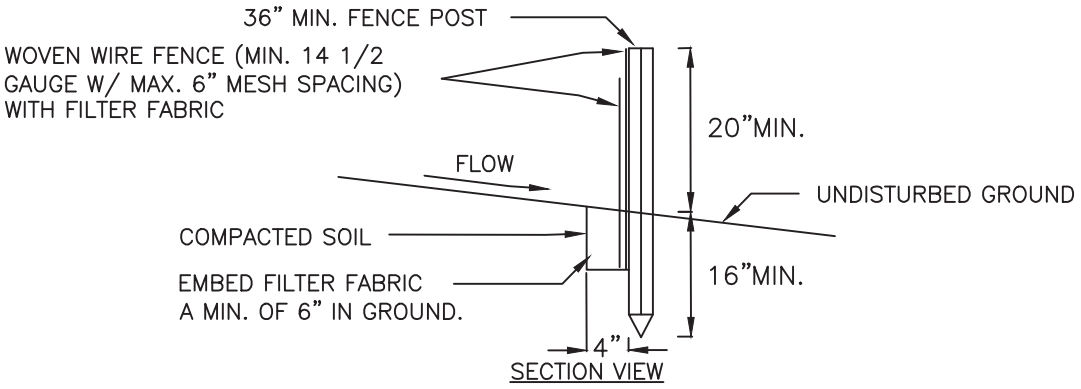
Sediment Barrier Backup Calculations
Connecticut Loop - Table 3

Left or Right of Baseline		SEDIMENT BARRIER LOCATION NEW (STA to STA)		Length of Barrier (FT)	SEDIMENT BARRIER TYPE	ACTUAL SLOPE PERCENT ABOVE BARRIER (%)	ACTUAL SLOPE LENGTH ABOVE BARRIER (FT)	ALLOWABLE SLOPE LENGTH ABOVE BARRIER (FT)	REMAINING SLOPE LENGTH (FT)	PERCENTAGE OF SLOPE LENGTH REMAINING	RESULT	Comments
		38350	**38440**	**280**	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		38450	**38580**	**363**	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		38650	**38900**	**661**	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
		38900	**39000**	**126**	SUPER SILT FENCE	3	1408	500	0	0%	NO GOOD	SIDESLOPE, SWALE REQ'D
			39040	**100**	20 INCH SILT FENCE	1	50	100	50	50%	OK	ROAD CROSSING
			39060	**100**	20 INCH SILT FENCE	1	50	100	50	50%	OK	ROAD CROSSING
		39100	**39280**	**455**	SUPER SILT FENCE	4	450	500	50	10%	OK	WETLAND WITH WATERBAR
		39250	**39380**	**90**	20 INCH SILT FENCE	1	50	100	50	50%	OK	SIDESLOPE WITH WATERBAR
		39380	**40510**	**2740**	SUPER SILT FENCE	1	500	1000	500	50%	OK	WETLAND WITH WATERBAR
		40550	**40575**	**235**	SUPER SILT FENCE	6	225	325	100	31%	OK	WETLAND WITH WATERBAR
	Left	**40575**	**41500**	**1210**	SUPER SILT FENCE	2	660	1000	340	34%	OK	WETLAND WITH WATERBAR
		42600	**42650**	**110**	20 INCH SILT FENCE	25	25	75	50	67%	OK	WETLAND WITH WATERBAR



PERSPECTIVE VIEW



SECTION VIEW

CONSTRUCTION SPECIFICATIONS

1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES. POSTS SHALL BE STEEL EITHER "T" OR "U" TYPE OR HARDWOOD.
2. FILTER CLOTH TO BE TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION. FENCE SHALL BE WOVEN WIRE, 14 GAUGE, 6" MAXIMUM MESH OPENING.
3. WHEN TWO SECTIONS OF FILTER FABRIC ADJOIN EACH OTHER THEY SHALL BE OVER–LAPPED BY SIX INCHES AND FOLDED. FILTER FABRIC SHALL BE EITHER FILTER X, MIRAFI 100X, STABILINKA T140N, OR APPROVED EQUIVALENT.
4. PREFABRICATED UNITS SHALL BE GEOFAB, ENVIROFENCE, OR APPROVED EQUIVALENT.
5. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.
6. MAXIMUM DRAINAGE AREA FOR OVERLAND FLOW TO A SILT FENCE SHALL NOT EXCEED 1/4 ACRE PER 100 FEET OF FENCE.
7. MAXIMUM ALLOWABLE SLOPE LENGTHS CONTRIBUTING RUNOFF TO SILT FENCE PLACED ON A SLOPE ARE AS FOLLOWS:

SLOPE STEEPNESS	MAXIMUM LENGTH (FT)
2:1	25
3:1	50
4:1	75
5:1 OR GREATER	100

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

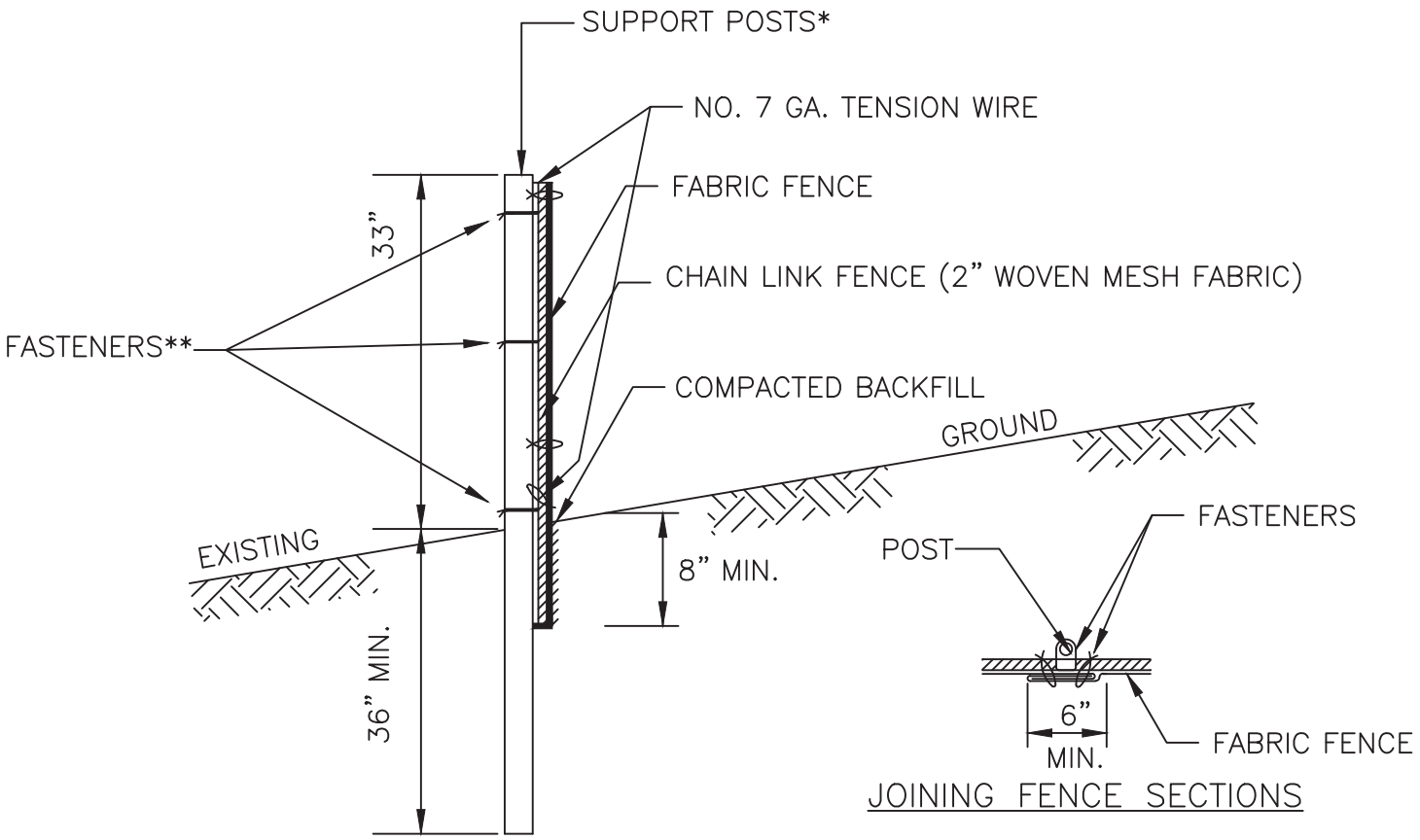
TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
REINFORCED SILT FENCE

Tennessee Gas Pipeline Company, L.L.C.
a Kinder Morgan company

FIG. NO. 31

Sheet: 31 of 127
Type:

STANDARD CONSTRUCTION DETAIL #22
Super Filter Fabric Fence



* POSTS SPACED @ 10' MAX. USE 2 1/2" DIA. GALVANIZED OR ALUMINUM POSTS.

** CHAIN LINK TO POST FASTENERS SPACED @ 14" MAX. USE NO. 6 GA. ALUMINUM WIRE OR NO. 9 GALVANIZED STEEL PRE–FORMED CLIPS. CHAIN LINK TO TENSION WIRE FASTENERS SPACED @ 60" MAX. USE NO. 10 GA. GALVANIZED STEEL WIRE. FABRIC TO CHAIN FASTENERS SPACED @ 24" MAX. C TO C.

NO. 7 GA. TENSION WIRE INSTALLED HORIZONTALLY AT TOP AND BOTTOM OF CHAIN–LINK FENCE.

FILTER FABRIC FENCE MUST BE PLACED AT EXISTING LEVEL GRADE. BOTH ENDS OF THE BARRIER MUST BE EXTENDED AT LEAST 8 FEET UPSLOPE AT 45 DEGREES TO THE MAIN BARRIER ALIGNMENT.

SEDIMENT MUST BE REMOVED WHEN ACCUMULATIONS REACH 1/2 THE ABOVE GROUND HEIGHT OF THE FENCE.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
SUPER SILT FENCE (1)

Tennessee Gas Pipeline Company, L.L.C.
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FIG. NO. 32

Sheet: 32 of 127
Type: