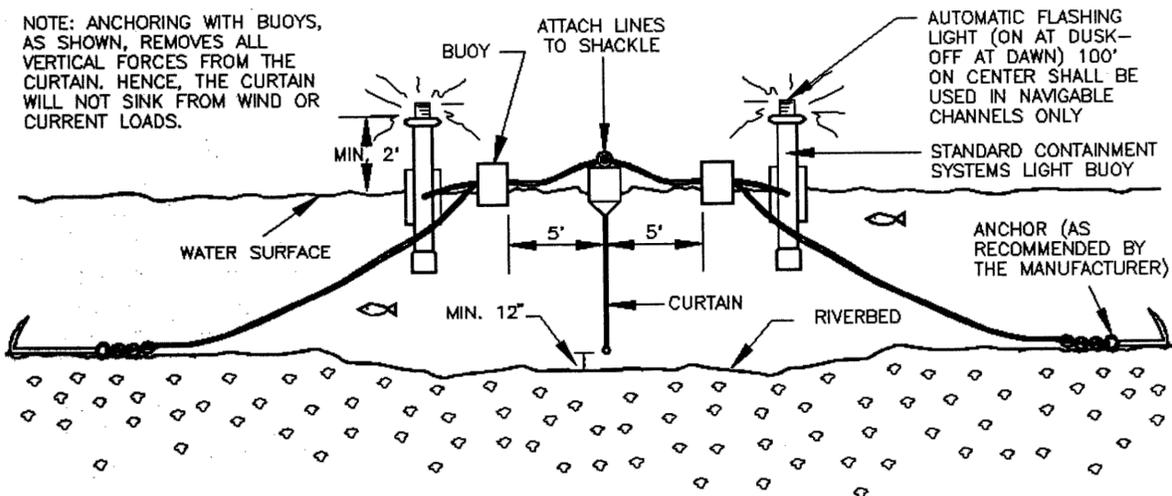


ORIENTATION WHEN INSTALLED (TIDAL SITUATION – TYPE III)



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DESIGN ENGINEERING

ENVIRONMENTAL DETAIL

TURBIDITY CURTAIN DETAIL

DRAWING NO. MVP-ES43.4	REV. P
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POST-CONSTRUCTION STREAM CROSSING STABILIZATION FOR M.V.P.

Definition

A series of erosion and sediment control measures to limit the formation of rills and/or gullies in the landscape approaching the edge of a stream, river and other waterbody, within the permanent natural gas pipeline right-of-way.

Purpose

To minimize erosion potential along the edge of stream, river or other water body as a result of the change in land use in the permanent right-of-way of a pipeline.

Conditions Where Practice Applies

Applicable to stream, river or other water body crossings within the natural gas pipeline right-of-way.

Planning Considerations

Permanent water bars with compost filter socks and sump filters with discretionary streambank swales are required at all stream, river and other waterbody crossings in accordance with the spacing and sizing requirements shown on Plates 1-4

Based on visual observation of the post-construction field conditions by MVP Design Engineering and the MVP Environmental Inspector, the necessity for and location of streambank swales will be determined. Considerations will include but are not limited to locations where there is visual evidence of existing (or formation of) rills and/or gullies along the streambank and/or concentrated flow along the streambank with anticipated potential for erosion.

Sediment must be periodically removed from the sump filter and compost filter sock to maintain the required depth. Plans shall detail how excavated sediment is to be disposed of, such as by use in fill areas on site or removal to an approved off-site location.

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Design Criteria

As detailed on Plates 1-3, design criteria per specific erosion and sediment control measures include:

Water Bars / Slope Breakers

Permanent water bars will be installed twenty-five (25) feet from edge of stream, river or other waterbody crossing as shown on Plate 2. Slopes greater than 65% may require site specific stabilization measures based on field conditions as approved by MVP Design Engineering and MVP Environmental Inspector.

Excavation of Sump Filter

Side slopes of sump filter should be no steeper than 1:1. The minimum depth of excavation should be one (1) foot.

Compost Filter Sock

Since the sump filter will function as a pre-treatment for sediment removal, calculation of the 2-year velocity over the compost filter sock size conservatively assumes that the sump filter is full of sediment and in need of maintenance and that no flow is occurring through the sock due to clogging or sediment deposition.

The outfall velocity from this BMP should be non-erosive for the 2-year design storm. The 2-year velocities shall meet the criteria in Table 3.99-D-A. Due to the anticipated small size of contributing drainage area, the Rational Method shall be used to calculate discharge:

$$Q = CiA$$

where,

$$Q = \text{discharge (ft}^3/\text{sec)}$$

$$i = \text{Rainfall intensity (inches/hour)}$$

$$A = \text{Contributing drainage area (acres)}$$

Discharge over the compost filter sock is calculated using the broad-crested weir equation:

$$Q = C_d L H^{3/2}$$

where,

$$Q = \text{Discharge over weir (ft}^3/\text{sec)}$$

$$C_d = \text{Weir Coefficient}$$

$$L = \text{Length of weir crest (ft)}$$

$$H = \text{Overtopping depth (ft)}$$

The velocity over the weir is calculated using the following equation:

$$v = Q/A$$

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where,

$$v = \text{Velocity (ft/sec)}$$

$$Q = \text{Discharge over weir (ft}^3\text{/sec)}$$

$$A = \text{Flow area over weir (ft}^2\text{)}$$

TABLE 3.99-D-A
PERMISSIBLE VELOCITIES FOR EARTH LININGS

Soil Types	Corrected Permissible Velocities (ft./sec.)
Fine Sand (noncolloidal)	2.0
Sandy Loam (noncolloidal)	2.0
Silt Loam (noncolloidal)	2.4
Ordinary Firm Loam	2.8
Fine Gravel	4.0
Stiff Clay (very colloidal)	4.0
Graded, Loam to Cobbles (noncolloidal)	4.0
Graded, Silt to Cobbles (colloidal)	4.4
Alluvial Silts (noncolloidal)	4.4
Alluvial Silts (colloidal)	4.0
Coarse Gravel (noncolloidal)	4.8
Cobbles and Shingles	4.4
Shales and Hard Pans	4.8

NOTE: Correction factor value = 0.8 for flow depths less than one foot has been applied to original table.
Source: Chapter 5, Engineering Calculations: Table 5-22 and Plate 5-39, *Virginia Erosion and Sediment Control Handbook*, 3rd Ed., 1992.

Example

Given: A one-acre drainage area in Giles County, an 18-inch diameter compost filter sock with an effective level weir length of 8 feet, in a Sandy Loam soil installed per details in Plate 2.

Solution:

1. Calculate the discharge:

$$Q = CiA = 0.9 * 4.07 \text{ inches/hour} * 1 \text{ acre} = 3.66 \text{ ft}^3\text{/sec}$$

2. Rearranging the weir equation to solve for overtopping depth:

$$H = (Q / (C_D * L))^{\frac{2}{3}} = (3.66 \text{ ft}^3\text{/sec} / (2.99 * 8 \text{ ft}))^{\frac{2}{3}} = 0.29 \text{ ft}$$

3. Calculate the velocity over the compost filter sock:

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$$v = Q/A = 3.66 \text{ ft}^3/\text{sec} / (0.29 \text{ ft} * 8 \text{ ft}) = 1.60 \text{ ft/sec}$$

4. Verify that the velocity is non-erosive in Table 3.99-D-A for Sandy Loam soil.
 $1.60 \text{ ft/sec} < 2.0 \text{ ft/sec}$

Streambank Swale

Minimum thickness (T, as shown on Streambank Swale Typical Cross Section on Plate 3) shall be two (2) times the D₅₀. For drainage areas one (1) acre or less, rock shall have a minimum D₅₀ = 6" and T = 12 inches for stream banks with a slope of 1:1 or flatter (i.e. S_o=1.0 ft/ft). If the contributing drainage area is greater than one (1) acre or if the swale is steeper than 1:1 (1.0 ft/ft), the plans shall provide calculations to determine an appropriate size stone and minimum thickness. Rock may be salvaged on-site materials and may contain topsoil, fines, sand, gravel in a mix with at least 60% rock with a D₅₀ of at least 6".

Calculations (from VDOT Drainage Manual Appendix 7B-5)

Given: A one-acre drainage area in Giles County from previous example.

Solution:

CHANNEL DATA

Q = 3.66 (cfs) P = 3.02 (ft.) n = 0.069

S_o = 1.00 (ft/ft) R = 0.18 (ft.)

d_n = 0.37 (ft.) V_n = 6.81 (fps)

A = 0.54 (ft²) Side Slope = 4:1

ASSUMED ROCK SIZE - D50 = 0.5 ft

VERIFY ASSUMED ROCK SIZE

φ = 41.2° (Appendix 7E-1)

Side Slope = 4: 1 θ = 14°

K₁ = [1 - (sin² θ / sin² φ)]^{0.5}

K₁ = [1 - (sin² 14° / sin² 41.5°)]^{0.5} = 0.93

For Specific Gravity = 2.65 and Stability Factor = 1.2

D50 = 0.001 * V_a³ / (d_{avg}^{0.5} * K₁^{1.5})

D50 = 0.001 * 6.81³ / (0.5^{0.5} * 0.93^{1.5}) = 0.45 ft.

D50 Computed (0.45) < D50 Assumed (0.5)

Therefore, assumed D50 is appropriate.

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Construction Specifications

General

1. All trees, brush, stumps, roots, obstructions and other unsuitable material shall be removed and disposed of properly.
2. Disturbed areas will be returned to pre-construction contours. Topsoil shall be replaced in accordance with the Mountain Valley Pipeline Project Specific Standards and Specifications.
3. Existing suitable stream substrate shall be salvaged and replaced to streambed at pre-construction contours.
4. The swale shall be excavated or shaped to the proper grade and cross-section.
5. Any excess soil shall be removed and disposed of properly.

Water Bars / Slope Breakers

1. Water bars / slope breakers shall be installed in accordance with WATER BAR, TYPICAL SLOPE BREAKER (SB), Std. & Spec. MVP-17 and MVP-18.
2. Permanent water bars are required at all stream, river and other waterbody crossings, as well as upslope from roadway and roadbed cut slopes.
3. Construct permanent water bars with compost filter sock after completion of grading in accordance with the water bar spacing and sizing requirements shown on plan and in table on Plate 3.
4. Water bar closest to stream top of bank shall be located twenty-five (25) feet maximum upslope from top of bank.
5. Water bars shall have a slope of one to four percent.
6. Water bars on retired roadways, skidtrails, and right-of-ways shall be left in place after permanent stabilization has been achieved.

Compost Filter Socks

1. Compost filter socks shall be installed in accordance with COMPOST FILTER SOCK, Std. & Spec. MVP ES-3.
2. Compost filter socks shall extend at least ten feet upslope from the uppermost limit of the sump filter.

Sump Filters

1. Sump filters to be installed at end of water bars. Refer to sump filter detail on Plate 2.
2. Sump filter shall be located entirely within the permanent right-of-way.
3. Sediment storage area shall be excavated to a minimum dimension of one-foot-deep by three-feet-wide by six-feet-long. Additional storage, if required due to a larger contributing drainage area, will either be added through increasing the sump filter dimension or stacking compost filter sock to increase BMP height.

Streambank Swales

Streambank swales shall be installed at locations determined by MVP Design Engineering and the MVP Environmental Inspector based on their visual observation of the post-construction field conditions.

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Locations shall include but are not limited to locations where there is visual evidence of formation of rills and/or gullies along the streambank and/or evidence of concentrated flow along the streambank with anticipated potential for erosion.

1. On-site salvaged rock and/or riprap, if on-site rock is not salvageable, shall be installed in accordance with RIPRAP, Std. & Spec. 3.19.
2. Erosion control fabric shall be installed along the edges of the riprap-lined channel as shown on Plate 3 in accordance with SOIL STABILIZATION BLANKETS AND MATTING, Std. & Spec. 3.36.

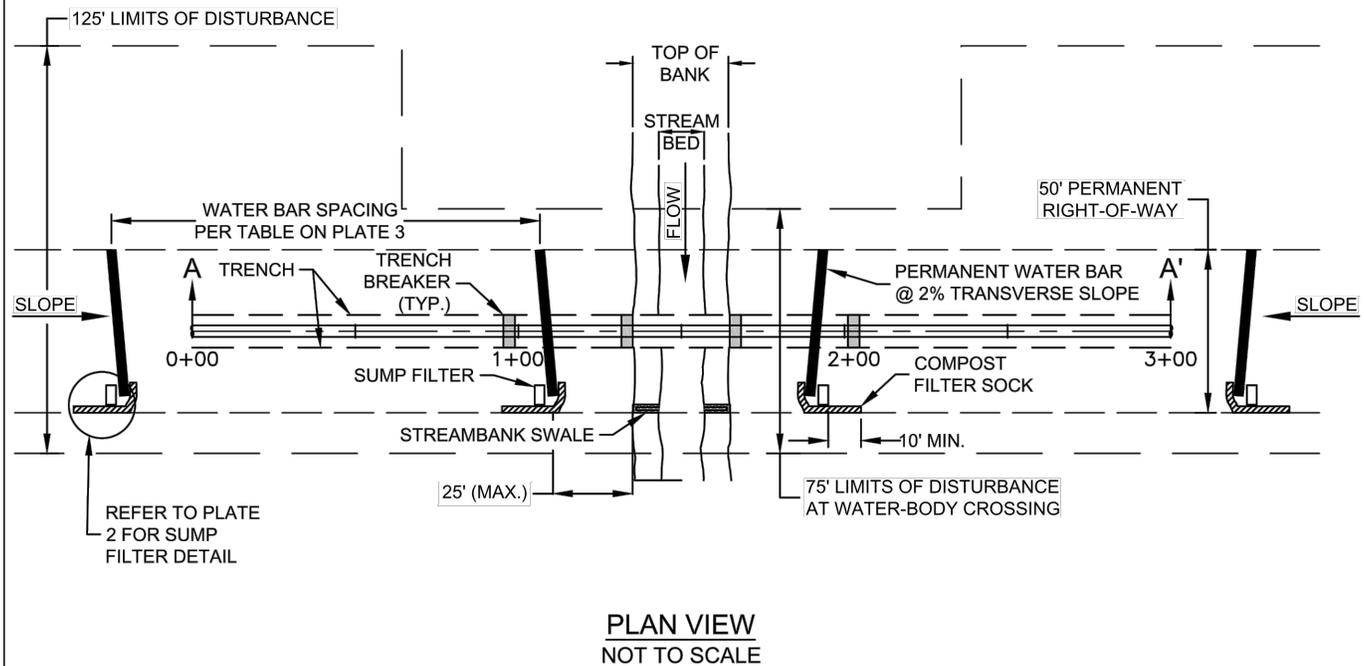
Inspections and Maintenance

1. Inspections shall be conducted at a frequency of (i) at least once every four business days or (ii) at least once every five business days and no later than 48-hours following a measurable storm event.
2. Damaged or eroded water bars shall be restored to original dimensions within 24-hours of inspection.
3. Compost filter sock shall be inspected for sediment accumulation, integrity, and maintained as necessary. Accumulated sediment shall be removed when it reaches no more than half the aboveground height of the sock and disposed in the manner described elsewhere in the plan. Damaged socks shall be repaired according to manufacturer’s specifications or replaced within 24 hours of inspection.
4. Sump filter shall be inspected for sediment accumulation and proper operation. Sediment shall be removed and the sump filter restored to original dimensions when sediment has accumulated to half the design depth. Sediment removal from the sump shall be deposited in a suitable area and in such a manner that it will not erode and cause sedimentation problems.
5. Streambank swales shall be inspected for integrity and proper operation. Damaged or eroded streambank swales shall be restored to original dimension within 24-hours of inspection.
6. If during inspection, additional rills and/or gullies are observed, streambank swales shall be installed in accordance with the construction specifications herein at these locations within 24-hours of inspection.
7. Maintenance of water bars, compost filter socks and sump filters shall be provided until roadway, skidtrail, or right-of-way has achieved permanent stabilization.

Post Stabilization

Once permanent stabilization has been achieved, sediment storage should be seeded with permanent seed mix in accordance with the Mountain Valley Pipeline Project Specific Standards and Specifications. Compost filter socks shall remain to decompose in place and streambank swales shall remain in place.

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POST-CONSTRUCTION STREAM CROSSING STABILIZATION DETAIL

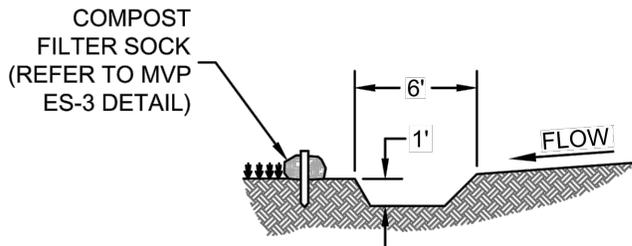
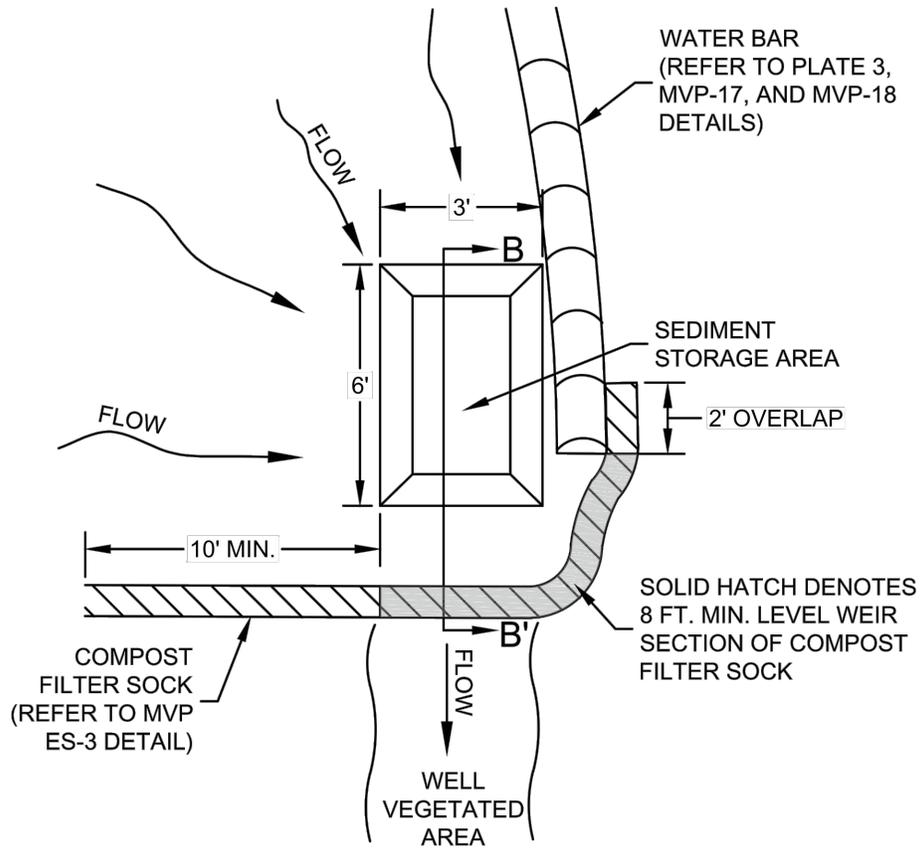
PLATE 1

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XS: B-B'

SUMP FILTER DETAIL
NOT TO SCALE

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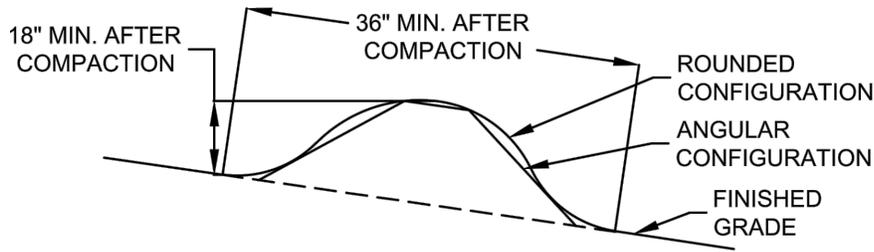


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POST CONSTRUCTION STREAM CROSSING STABILIZATION

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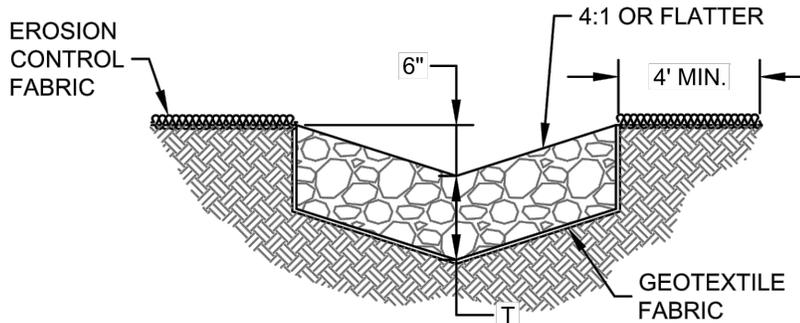


MINIMUM SPACING FOR PERMANENT WATER BARS	
PIPELINE GRADE	DISTANCE (FEET)
<2%	2,3
2-5%	400
6-15%	200
16-30%	100
>31%	50 ⁴

NOTES:

1. REFER TO MVP-17 AND MVP-18 DETAILS (WATER BAR, TYPICAL SLOPE BREAKERS).
2. PERMANENT WATER BARS WILL BE INSTALLED AS NEEDED BASED ON FIELD CONDITIONS.
3. PERMANENT WATER BARS WILL BE INSTALLED 25 FEET FROM EACH WATERBODY BOUNDARY REGARDLESS OF SLOPE CONDITIONS.
4. SLOPES GREATER THAN 65% MAY REQUIRE SITE SPECIFIC STABILIZATION MEASURES BASED ON FIELD CONDITIONS AS APPROVED BY MVP DESIGN ENGINEERING AND MVP ENVIRONMENTAL INSPECTOR.

PERMANENT WATER BAR DETAIL
NOT TO SCALE



NOTES:

1. IF THE CONTRIBUTING DRAINAGE AREA IS GREATER THAN 1 ACRE OR IF THE SWALE IS STEEPER THAN 1:1 (1.0 FT/FT), THE PLANS SHALL PROVIDE CALCULATIONS TO DETERMINE AN APPROPRIATE SIZE STONE, MINIMUM THICKNESS, AND CHANNEL SIZE.
2. MINIMUM THICKNESS, T, SHALL BE TWO TIMES THE D50.
3. FOR DRAINAGE AREAS 1 ACRE OR LESS, D50 = 6 INCHES AND T = 12 INCHES.
4. SWALE SIDE SLOPES SHALL BE 4:1 OR FLATTER.

STREAMBANK SWALE TYPICAL CROSS SECTION
NOT TO SCALE

POST-CONSTRUCTION STREAM CROSSING STABILIZATION DETAIL

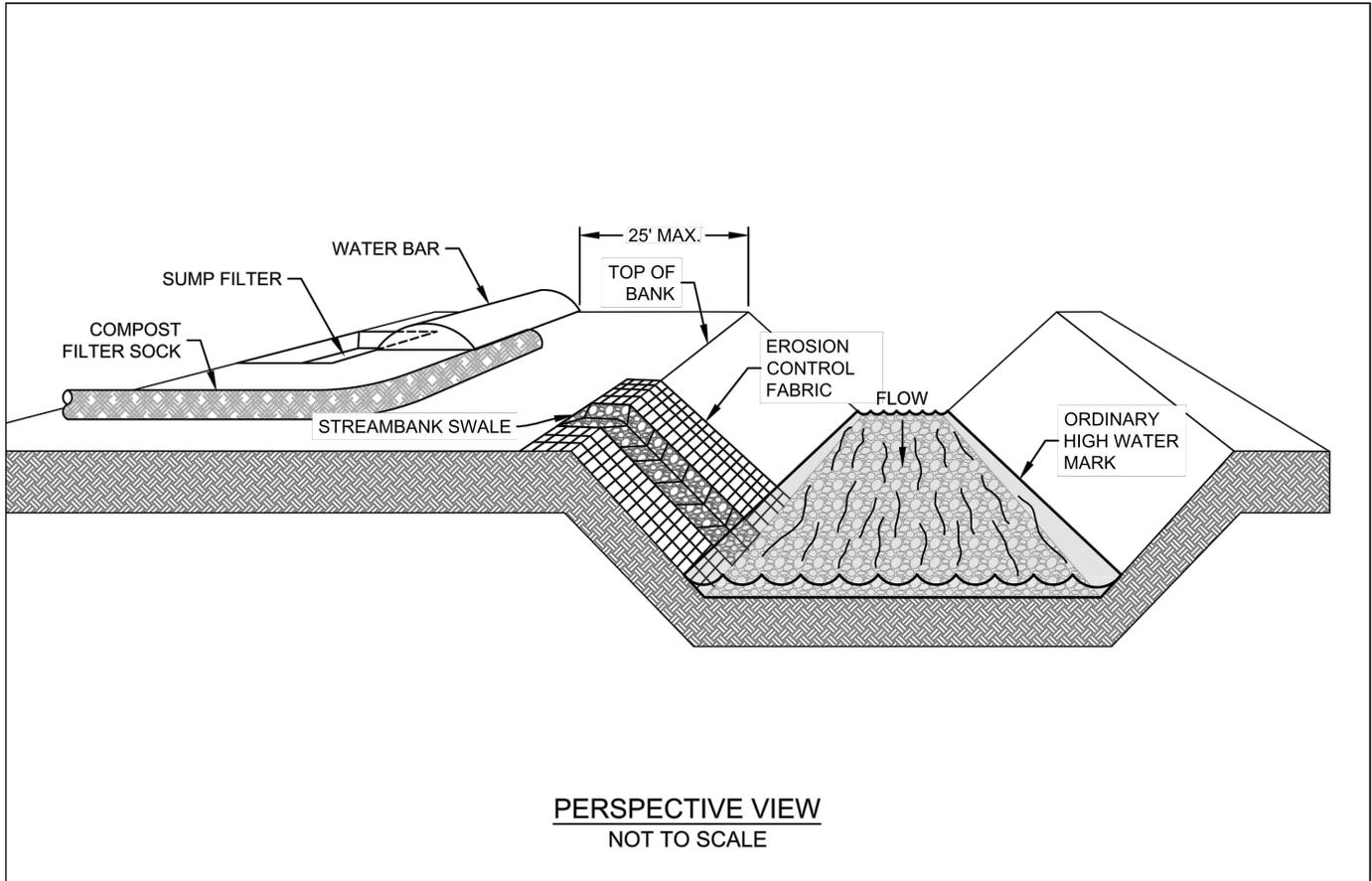
PLATE 3

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DESIGN ENGINEERING

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POST-CONSTRUCTION STREAM CROSSING STABILIZATION DETAIL

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ENVIRONMENTAL DETAIL

POST CONSTRUCTION STREAM CROSSING STABILIZATION

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MULCHING

Definition

Application of plant residues or other suitable materials to the soil surface.

Purposes

1. To prevent erosion by protecting the soil surface from raindrop impact and reducing the velocity of overland flow.
2. To foster the growth of vegetation by increasing available moisture and providing insulation against extreme heat and cold.

Conditions Where Practice Applies

1. Areas which have been permanently seeded (see Appendix B – Typical Construction Details MVP-ES11.1 through ES12.3) should be mulched immediately following seeding.
2. Areas which cannot be seeded because of the season should be mulched to provide some protection to the soil surface. An organic mulch should be used, and the area then seeded as soon weather or seasonal conditions permit. It is not recommended that fiber mulch be used alone for this practice; at normal application rates it just simply does not provide the protection that is achieved using other types of mulch.
3. Mulch may be used together with plantings of trees, shrubs, or certain ground covers which do not provide adequate soil stabilization by themselves.
4. Mulch shall be used in conjunction with temporary seeding operations as specified in TEMPORARY SEEDING, Std. & Spec. 3.31

Planning Considerations

Mulches are applied to the soil surface to conserve a desirable soil property or to promote plant growth. A surface mulch is one of the most effective means of controlling runoff and erosion on disturbed land.

Mulches can increase the infiltration rate of the soil, reduce soil moisture loss by evaporation, prevent crusting and sealing of the soil surface, modify soil temperatures, and provide a suitable microclimate for seed germination.

Organic mulch materials, such as straw, wood chips, bark, and fiber mulch have been found to be the most effective.

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Chemical soil stabilizers or soil binders should not be used alone for mulch. These materials are useful to bind organic mulches together to prevent displacement.

A variety of manufactured SOIL STABILIZATION BLANKETS AND MATTING (see Std. & Spec. 3.36) have been developed for erosion control in recent years. Some of these products can be used as mulches, particularly in critical areas such as waterways. They also may be used to hold other mulches to the soil surface.

The choice of materials for mulching will be based on the type of soil to be protected, site conditions, season and economics. It is especially important to mulch liberally in mid-summer and prior to winter, and on cut slopes and southern slope exposures.

Organic Mulches

Straw - The mulch most commonly used in conjunction with seeding. The straw should come from wheat or oats (free of troublesome weed seeds) and may be spread by hand or machine. Straw can be windblown and must be anchored down by an acceptable method.

Hay - Hay shall not be used as mulch for Project activities.

Com Stalks - These should be shredded into 4- to 6-inch lengths. Stalks decompose slowly and are resistant to displacement.

Wood Chips - Suitable for areas that will not be closely mowed, and around ornamental plantings. Chips decompose slowly and do not require tacking. They must be treated with 12 pounds of nitrogen per ton to prevent nutrient deficiency in plants; however, can be a very inexpensive mulch if chips are obtained from trees cleared on the site.

Bark Chips, Shredded Bark - These are by-products of timber processing which are used in landscaped plantings. Bark is also a suitable mulch for areas planted to grasses and not closely mowed. It may be applied by hand or mechanically and is not usually toxic to grasses or legumes; additional nitrogen fertilizer is not required.

Fiber Mulch - Used in hydroseeding operations and applied as part of the slurry. It creates the best seed-soil contact when applied over top of (as a separate operation) newly seeded areas. These fibers do not require tacking, although tacking agents or binders are sometimes used in conjunction with the application of fiber mulch. This form of mulch does not provide sufficient protection to highly erodible soils. Additionally, fiber mulch will not be considered adequate mulch when used during the dry summer months or when used for late fall mulch cover. Use straw mulch during these periods. Fiber mulch may be used to tack (anchor) straw mulch. This treatment is well suited for steep slopes, critical areas, and areas susceptible to displacement.

There are other organic materials which make excellent mulches but are only available locally or seasonally. Creative use of these materials can reduce costs.

Chemical Mulches and Soil Binders

A wide range of synthetic, spray-on materials are marketed to stabilize and protect the soil surface. These are emulsions or dispersions of vinyl compounds, rubber or other substances which are mixed with water and applied to the soil. They may be used alone in some cases as temporary stabilizers, or in conjunction with fiber mulches or straw.

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When used alone, chemical mulches do not have the capability to insulate the soil or retain soil moisture that organic mulches have. This soil protection is also easily damaged by traffic. Application of these mulches is usually more expensive than organic mulching, and the mulches decompose in 60-90 days.

Blankets and Matting

Field experience has shown that plastic netting, when used alone, does not retain soil moisture or modify soil temperature. In some cases it may stabilize the soil surface while grasses are being established, but is primarily used in grassed waterways and on slopes to hold straw or similar mulch in place.

Jute mesh and other soil stabilization blankets are good choices for mulching on difficult slopes and in minor drainage swales. Most of the soil stabilization mattings (used to create a permanent matrix for root growth within the soil) must receive mulching in order to properly stabilize an area. Notably, some manufacturers have recently developed permanent mattings which include self-contained, temporary mulching materials; however, these measures will have to meet the requirements noted in Std. & Spec. 3.36, SOIL STABILIZATION BLANKETS AND MATTING, before they can be recommended for use on steep slopes and in channel flow situations.

The most critical aspect of installing blankets and mats is obtaining firm, continuous contact between the material and the soil. Without such contact, the material may fail and thereby allow erosion to occur. It is important to use an adequate number of staples and make sure the material is installed properly in order to maximize soil protection. These products are discussed in more detail in Std. & Spec. 3.36, SOIL STABILIZATION BLANKETS & MATTING.

MVP will utilize hydraulically applied soil stabilization blankets and matting (i.e. Earthguard, Flexterra, or equivalent) as an alternate to the rolled ESC blanket material identified under STD & SPEC 3.36. Information regarding the hydraulically applied blankets is provided under Appendix B MVP-ES40 and MVP-ES40.1.

Specifications

Organic Mulches

Organic mulches may be used in any area where mulch is required, subject to the restrictions noted in Table 3.35-A.

Materials: Select mulch material based on site requirements, availability of materials, and availability of labor and equipment. Table 3.35-A lists the most commonly used organic mulches. Other materials, such as peanut hulls and cotton burs, may be used with the permission of the local Plan-Approving Authority.

Prior to mulching: Complete the required grading and install needed sediment control practices.

Lime and fertilizer should be incorporated and surface roughening accomplished as needed. Seed should be applied prior to mulching except in the following cases:

- a. Where seed is to be applied as part of a hydroseeder slurry containing fiber mulch.
- b. Where seed is to be applied following a straw mulch spread during winter months.

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TABLE 3.35-A			
ORGANIC MULCH MATERIALS AND APPLICATION RATES			
MULCHES:	RATES:		NOTES:
	Per Acre	Per 1000 sq. ft.	
Straw	1 ½ - 2 tons (Minimum 2 tons for winter cover)	70 – 90 lbs.	Free from weeds and coarse matter. Must be anchored. Spread with mulch blower or by hand.
Fiber Mulch	Minimum 1500 lbs.	35 lbs.	Do not use as mulch for winter cover or during hot, dry periods.* Apply as slurry.
Corn Stalks	4 – 6 tons	185 – 275 lbs.	Cut or shredded in 4-6" lengths. Air-dried. Do not use in fine turf areas. Apply with mulch blower or by hand.
Wood Chips	4 – 6 tons	185 – 275 lbs.	Free of coarse matter. Air-dried. Treat with 12 lbs nitrogen per ton. Do not use in fine turf areas. Apply with mulch blower, chip handler, or by hand.
Bark Chips or Shredded Bark	50 – 70 cu. yds.	1-2 cu. yds.	Free of coarse matter. Air-dried. Do not use in fine turf areas. Apply with mulch blower, chip handler, or by hand.
* When fiber mulch is the only available mulch during periods when straw should be used, apply at a minimum rate of 2000 lbs./ac. Or 45 lbs./1000 sq. ft.			

Source: Va. DSWC

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Mountain Valley PIPELINE

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Application: Mulch materials shall be spread uniformly, by hand or machine.

When spreading straw mulch by hand, divide the area to be mulched into approximately 1,000 sq. ft. sections and place 70-90 lbs. (n to 2 bales) of straw in each section to facilitate uniform distribution.

Mulch Anchoring: Straw mulch must be anchored immediately after spreading to prevent displacement. Other organic mulches listed in Table 3.35-A do not require anchoring. The following methods of anchoring straw may be used:

1. Mulch anchoring tool (often referred to as a Krimper or Krimper Tool): This is a tractor-drawn implement designed to punch mulch into the soil surface. This method provides good erosion control with straw. It is limited to use on slopes no steeper than 3:1, where equipment can operate safely. Machinery shall be operated on the contour.
2. Fiber Mulch: A very common practice with widespread use today. Apply fiber mulch by means of a hydroseeder at a rate of 500-750 lbs./acre over top of straw mulch or hay. It has an added benefit of providing additional mulch to the newly seeded area.
3. Liquid mulch binders: Application of liquid mulch binders and tackifiers should be heaviest at edges of areas and at crests of ridges and banks, to prevent displacement. The remainder of the area should have binder applied uniformly. Binders may be applied after mulch is spread or may be sprayed into the mulch as it is being blown onto the soil.

The following types of binders may be used:

- a. Synthetic binders - Formulated binders or organically formulated products may be used as recommended by the manufacturer to anchor mulch.
- b. *Asphalt - Any type of asphalt thin enough to be blown from spray equipment is satisfactory. Recommended for use are rapid curing (RC-70, RC-250, RC-800), medium curing (MC-250, MC-800) and emulsified asphalt (SS-1, CSS-1, CMS-2, MS-2, RS-1, RS-2, CRS-1, and CRS-2).

Apply asphalt at 0.10 gallon per square yard (10 gal./1000 sq. ft. or 430 gal./acre). Do not use heavier applications as it may cause the straw to "perch" over rills. All asphalt designations are from the Asphalt Institute Specifications.

*Note: This particular method is not used as commonly today as it once was in the past. The development of hydraulic seeding equipment promoted the industry to turn to synthetic or organically based binders and tackifiers. When this method is used, environmental concerns should be addressed to ensure that petroleum-based products do not enter valuable water supplies. Avoid applications into waterways or channels.

4. Mulch nettings: Lightweight plastic, cotton, or paper nets may be stapled over the mulch according to manufacturer's recommendations.
5. Peg and twine: Because it is labor-intensive, this method is feasible only in small areas where other methods cannot be used. Drive 8- to 10-inch wooden pegs to within 3 inches of the soil surface, every 4 feet in all directions. Stakes may be driven before or after straw is spread. Secure mulch by stretching twine between pegs in a criss-cross-within-a square pattern. Turn twine 2 or more times around each peg.

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Chemical Mulches

Chemical mulches* may be used alone only in the following situations:

- a. Where no other mulching material is available.
- b. In conjunction with temporary seeding during the times when mulch is not required for that practice.
- c. From March 15 to May 1 and August 15 to September 30, provided that they are used on areas with slopes no steeper than 4:1, which have been roughened in accordance with SURFACE ROUGHENING, Std. & Spec. 3.29. If rill erosion occurs, another mulch material shall be applied immediately.

*Note: Chemical mulches may be used to bind other mulches or with fiber mulch in a hydroseeded slurry at any time. Manufacturer's recommendations for application of chemical mulches shall be followed.

Maintenance

All mulches and soil coverings should be inspected periodically (particularly after rainstorms) to check for erosion. Where erosion is observed in mulched areas, additional mulch should be applied. Nets and mats should be inspected after rainstorms for dislocation or failure. If washouts or breakage occur, re-install netting or matting as necessary after repairing damage to the slope or ditch. Inspections should take place up until grasses are firmly established. Where mulch is used in conjunction with ornamental plantings, inspect periodically throughout the year to determine if mulch is maintaining coverage of the soil surface; repair as needed.

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TOPSOILING & SOIL HANDLING FOR M.V.P.

Definition

Methods of preserving and using the surface layer of undisturbed soil, often enriched in organic matter, in order to obtain a more desirable planting and growth medium.

Purposes

To provide a suitable growth medium for final site stabilization with vegetation and promote successful reforestation.

Conditions Where Practice Applies

1. Where the preservation or importation of topsoil is determined to be the most effective method of providing a suitable growth medium.
2. Where the subsoil or existing soil presents the following problems:
 - a. The texture, pH, or nutrient balance of the available soil cannot be modified by reasonable means to provide an adequate growth medium.
 - b. The soil material is too shallow to provide an adequate root zone and to supply necessary moisture and nutrients for plant growth.
 - c. The soil contains substances potentially toxic to plant growth.
3. Only on slopes that are 2:1 or flatter unless other measures are taken to prevent erosion and sloughing.

Planning Considerations

Topsoil is the surface layer of the soil profile, generally characterized as being darker than the subsoil due to the presence of organic matter. It is the major zone of root development, carrying much of the nutrients available to plants, and supplying a large share of the water used by plants.

Although topsoil provides an excellent growth medium, there are disadvantages to its use. Stripping, stockpiling, and reapplying topsoil, or importing topsoil, may not always be cost-effective. Topsoiling can delay seeding or sodding operations, increasing the exposure time of denuded areas. Most topsoil contains weed seeds, and weeds may compete with desirable species.

Advantages of topsoil include its high organic matter content and friable consistence, water-holding capacity, and nutrient content.

In site planning, the option of topsoiling should be compared with that of preparing a seedbed in subsoil. The clay content of subsoils does provide high moisture availability and deter leaching of nutrients and, when properly limed and fertilized, subsoils may provide a good growth medium which is generally free

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of weed seeds. In many cases topsoiling may not be required for the establishment of less demanding, lower maintenance plant material. Topsoiling is strongly recommended where ornamental plants or high-maintenance turf will be grown. Topsoiling is a required procedure when establishing vegetation on shallow soils, soils containing potentially toxic materials, and soils of critically low pH (high acid) levels.

If topsoiling is to be done, the following items should be considered:

1. Whether an adequate volume of topsoil exists on the site. Topsoil will be spread at a compacted depth of 2 to 4 inches (depths closer to 4 inches are preferred).
2. Location of the topsoil stockpile so that it meets specifications and does not interfere with work on the site.
3. Allow sufficient time in scheduling for topsoil to be spread and bonded prior to seeding or planting.
4. Care must be taken not to apply topsoil to subsoil if the two soils have contrasting textures. Clayey topsoil over sandy subsoil is a particularly poor combination, as water may creep along the junction between the soil layers, causing the topsoil to slough. Sandy topsoil over a clay subsoil is equally as likely to fail.
5. If topsoil and subsoil are not properly bonded, water will not infiltrate the soil profile evenly and it will be difficult to establish vegetation. Topsoiling of steep slopes should be discouraged unless good bonding of soils can be achieved.

Specifications

Materials

Field exploration of the site shall be made to determine if there is sufficient surface soil of good quality to justify stripping. Topsoil shall be friable and loamy (loam, sandy loam, silt loam, sandy clay loam, clay loam). It shall be free of debris, trash, stumps, rocks, roots, and noxious weeds, and shall give evidence of being able to support healthy vegetation. It shall contain no substance that is potentially toxic to plant growth.

In areas where revegetation is of concern based on existing soil conditions and determined by the MVP Environmental Inspector (EI), topsoil samples shall be taken for analysis. Samples will be collected by the MVP EI and sent to a recognized laboratory for analysis of the following criteria:

Organic matter content shall be not less than 1.5% by weight.

pH range shall be from 6.0-7.5. If pH is less than 6.0, lime shall be added in accordance with soil test results or in accordance with the recommendations of the vegetative establishment practice being used.

Soluble salts shall not exceed 500 ppm.

Soil samples collected and sent for analysis will be identified by the MVP Construction Spread # and pipeline station from which the sample was obtained. Areas that fail to revegetate following restoration will be sampled and analyzed based on the above parameters.

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Topsoil Importing

Topsoil would be imported as needed in residential areas only. If additional off-site topsoil is needed, it must meet the standards stated above.

Stripping

Topsoil operations should not be performed when the soil is wet or frozen. Stripping shall be confined to the immediate construction area. A 4-to 6-inch stripping depth is common, but depth may vary depending on the particular soil. All perimeter dikes, basins, and other sediment controls shall be in place prior to stripping.

Stockpiling

Topsoil shall be stockpiled in such a manner that natural drainage is not obstructed and no off-site sediment damage shall result. Stabilize or protect stockpiles in accordance with MS #2.

Excavated subsoil shall be stockpiled separately from topsoil.

Side slopes of the stockpile shall not exceed 2:1.

Perimeter controls must be placed around the stockpile immediately; seeding of stockpiles shall be completed within 7 days of the formation of the stockpile, in accordance with Std. & Spec. 3.31, TEMPORARY SEEDING if it is to remain dormant for longer than 14 days (refer to MS #1 and MS #2).

Site Preparation Prior to and Maintenance During Topsoiling and Excavation

Before topsoiling or excavation, establish needed erosion and sediment control practices such as diversions, grade stabilization structures, berms, dikes, level spreaders, waterways, sediment basins, etc. These practices must be maintained during topsoiling and excavation.

Grading: Previously established grades on the areas to be topsoiled shall be maintained according to the approved plan.

Liming: Where the pH of the subsoil is 6.0 or less, or the soil is composed of heavy clays, agricultural limestone shall be spread in accordance with the soil test or the vegetative establishment practice being used.

Bonding: After the areas to be topsoiled have been brought to grade, and immediately prior to dumping and spreading the topsoil, the subgrade shall be loosened by disking or scarifying to a depth of at least 4-6 inches to ensure bonding of the topsoil and subsoil. Refer to 2.8.3 Soil Compaction Mitigation within the Project Standards and Specifications for additional information.

Applying Topsoil

Topsoil shall not be placed while in a frozen or muddy condition, when topsoil or subgrade is excessively wet, or in a condition that may otherwise be detrimental to proper grading or seeding. The topsoil shall be uniformly distributed to a minimum compacted depth of 2 inches on 3:1 or steeper slopes and 4 inches on flatter slopes or to mimic existing conditions present in the adjacent undisturbed areas. (See Table 3.30-A to determine volume of topsoil required for application to various depths). Any irregularities in the surface, resulting from topsoiling or other operations, shall be corrected in order to prevent the formation of depressions or water pockets.

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Once the topsoil has been applied to the subgrade the topsoil should be disked and raked. Excess rock will be removed from at least the top 12 inches of soil to the extent practicable in all cultivated or rotated cropland, managed pastures, hayfields, and residential areas, as well as other areas at the landowner's request. The size, density, and distribution of rock on the construction work area shall be similar to adjacent areas not disturbed by construction. The landowner or land management agency may approve other provisions in writing. Refer to Standards and Specifications Section 2.8 Final Grading for additional information.

DEPTH (INCHES)	PER 1,000 (SQUARE FEET)	PER ACRE
1	3.1	134
2	6.2	268
3	9.3	403
4	12.4	537
5	15.5	672
6	18.6	806

SOURCE: Va. DSWC

Soil Sterilants

No seed shall be placed on soil which has been treated with soil sterilants until sufficient time has elapsed to permit dissipation of toxic materials.

Special Soil Related Requirements for Working in Wetlands

Norfolk District 2017 Nationwide Permit Regional Conditions, dated March 20, 2017 (subject to revision in Spring of 2017), NWP 12 – Utility Line Activities items 3.b.iii, 5.a, and 5.b require the following:

1. Minimizing clearing of wetlands. Grubbing shall be limited to the permanent easement for underground utility lines. Outside of the permanent easement, wetland vegetation shall only be removed at or above the ground surface unless written justification is provided and the impacts are reviewed and approved by the Corps.
2. Whenever practicable, excavated material shall be placed on a Corps confirmed upland site. However, when this is not practicable, temporary stockpiling is hereby authorized provided that:
 - a. All excavated material stockpiled in a vegetated wetland area is placed on filter cloth, mats, or some other semi-permeable surface. The material will be stabilized with straw bales, filter cloth, etc. to prevent reentry into any waterway.
 - b. All excavated material must be placed back into the trench to the original contour and all excess excavated material must be completely removed from the wetlands within 30 days after the pipeline has been laid through the wetland areas. Permission must be granted by the District Commander or his authorized representatives if the material is to be stockpiled longer than 30 days.

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BARE ROOT SAPLING AND SHRUB PLANTING

Definition

The establishment of riparian buffer areas and forested or scrub-shrub wetland areas using bare root seedling plantings to supplement the permanent riparian seed mix.

Purposes

To establish target native tree species comparable to the region, site characteristics (e.g., topography; soil characteristics; adjacent vegetation), and adjacent forest composition in order to encourage the timely reestablishment of habitat removed during Project construction in select areas of the Project. Tree and shrub species intended for use in bare root plantings are identified in Appendix B – MVP-ES11.6 and MVP-ES11.7.

Conditions Where Practice Applies

Specific areas disturbed by Project activities along pipeline corridor. Locations where bare root plantings will be implemented at waterbody crossings are identified in Appendix B – MVP-ES11.8 and 11.9.

Planning Considerations

Storage

Ideally bare root seedlings should be planted immediately upon delivery. Keep seedlings in original sack or box from the nursery to preserve moisture within the package. Seedlings shall be stored in a cool, damp, and shady location that will not receive direct sunlight and is sheltered from the wind. Refrigerated trailer storage is preferred. Leave air gaps between boxes or sacks when stacking seedlings and only stack up to 3 high.

Handling

It is important to handle bare root seedlings with care due to the fragile nature of the exposed roots and stems. Do not plant any seedling that has been damaged.

Carefully examine each seedling prior to planting and discard if any of the following are present:

- Broken stems or main root
- Mold or mildew
- Stems that are without bark
- Desiccated roots
- A root system less than 5 inches long

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CHECKED	DATE		<p style="margin: 0;">BARE ROOT SAPLING AND SHRUB PLANTING</p>				
APP'D	DATE						
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JOB NO.			<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">DRAWING NO.</td> <td style="width: 40%;">REV.</td> </tr> <tr> <td style="text-align: center;">MVP-ES47</td> <td style="text-align: center;">P</td> </tr> </table>		DRAWING NO.	REV.	MVP-ES47
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Specifications

Planting

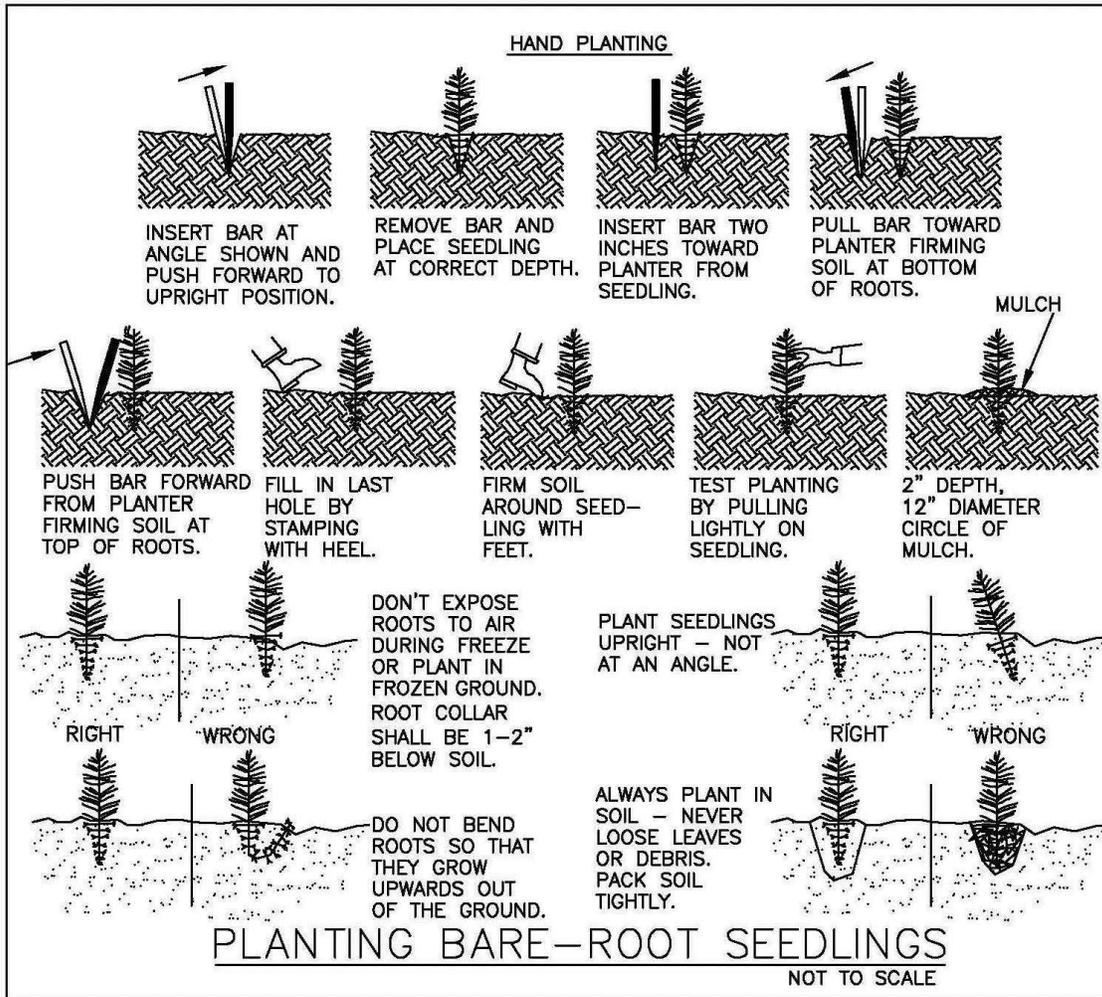
- Planting of bare root seedlings shall only take place between October 1st and April 30th.
- Planting shall take place after seeding application.
- A spade, planting bar, or shovel shall be used to plant all bare root seedlings.

Steps for Planting Bare Root Seedling

1. The planting hole shall be dug 8-10 inches deep and 4-5 inches wide. The hole shall be deep enough to fit the entire bare root system without bending.
2. All bare root seedlings shall be treated with root dip absorbent polymers and mycorrhizal root dip inoculates in accordance with manufacturer’s recommendations.
3. Carefully separate the seedlings and place one seedling per planting hole. Discard any that have any of the defects outlined above.
4. For seedling with root systems longer than the depth of the planting hole, prune roots back to a length of 8-10 inches below root collar. Bare root pruning shall take place in a cool, shaded location out of the wind. After bare root pruning, re-moisten the seedling before planting. If not planting the seedling immediately, re-moisten and store appropriately in original packaging.
5. Insert the roots of the seedling to the bottom of the planting hole and lift upward slightly so that the root collar is at or slightly below finished grade. This will ensure that the root system is planted without bending.
6. Fertilize each bare root seedling with a 5 gram tablet of controlled release fertilizer.
7. The seedling shall be maintained in an upright position when filling the planting hole. To fill the planting hole insert the spade, planting bar, or shovel behind the planting hole and tilt back to close the bottom of the planting hole. Next tilt the tool forward to close the top of the hole. Gently pack soil to fill any remaining void space in the planting hole.

If a definite browse line exists in the adjacent forest all bare root seedlings shall be planted in tree tubes tall enough to protect the seedlings from deer browse (a minimum of 5’ tall).

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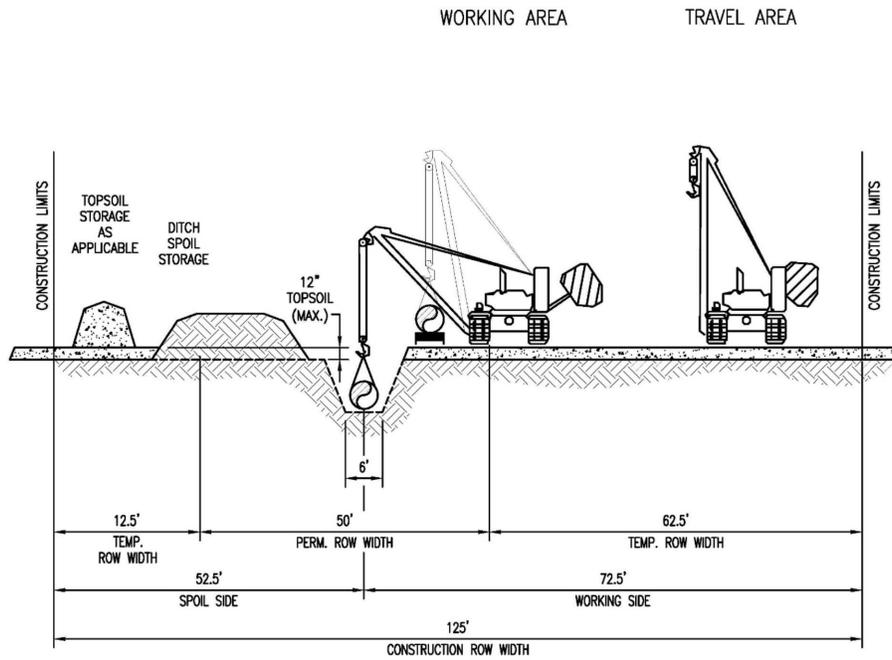


DESIGN ENGINEERING

ENVIRONMENTAL DETAIL

BARE ROOT SAPLING AND SHRUB PLANTING

DRAWING NO.	REV.
MVP-ES47.2	P



THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

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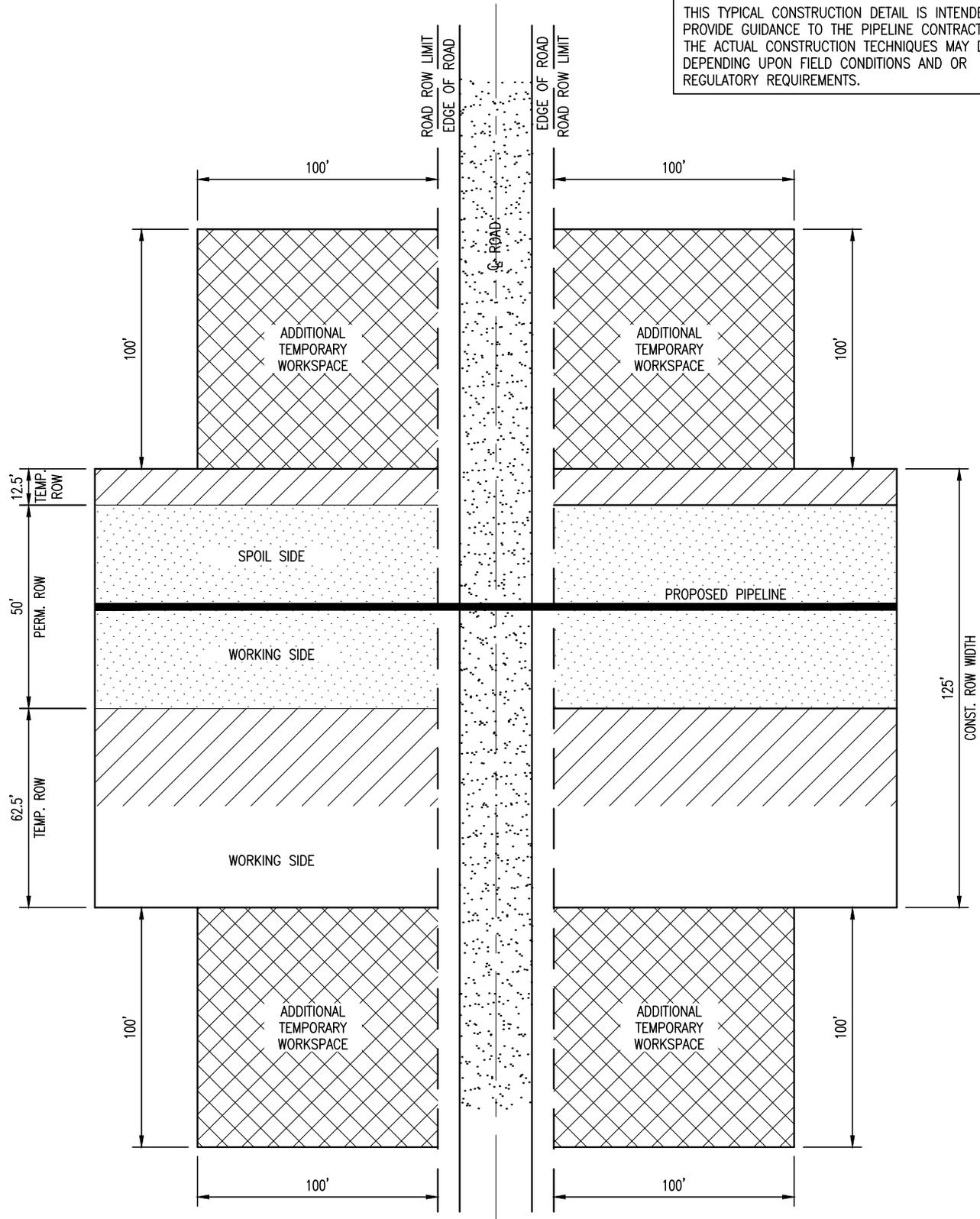
DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

MAINLINE CONSTRUCTION
NON-PARALLEL CONSTRUCTION WITH
TOPSOIL SEGREGATION

DRAWING NO.	REV.
MVP-2	0

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.



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DESIGN ENGINEERING

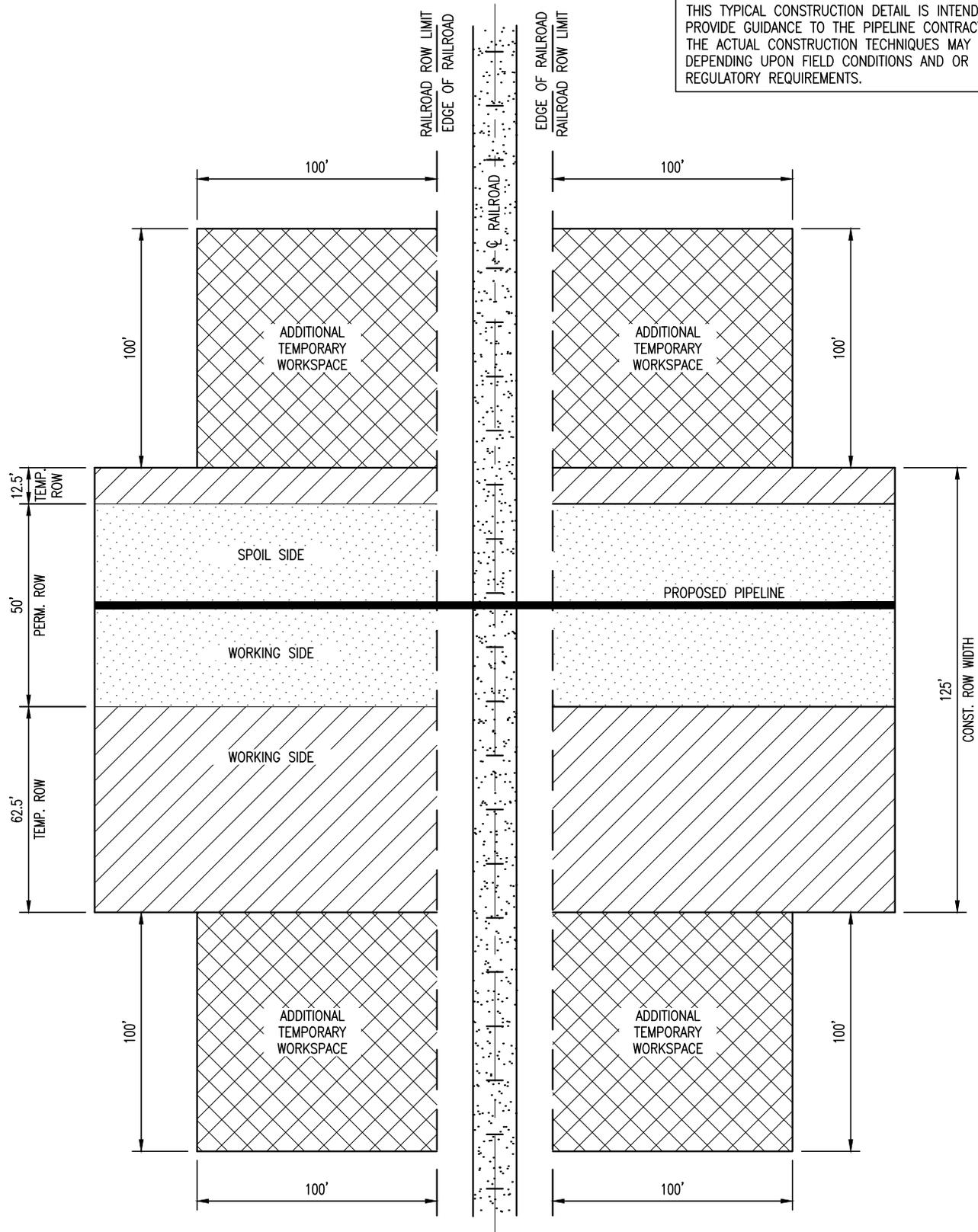
TYPICAL CONSTRUCTION DETAIL

MAINLINE CONSTRUCTION
ROAD CROSSING BORED
TYPICAL

DRAWING NO.
MVP-4

REV.
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DESIGN ENGINEERING

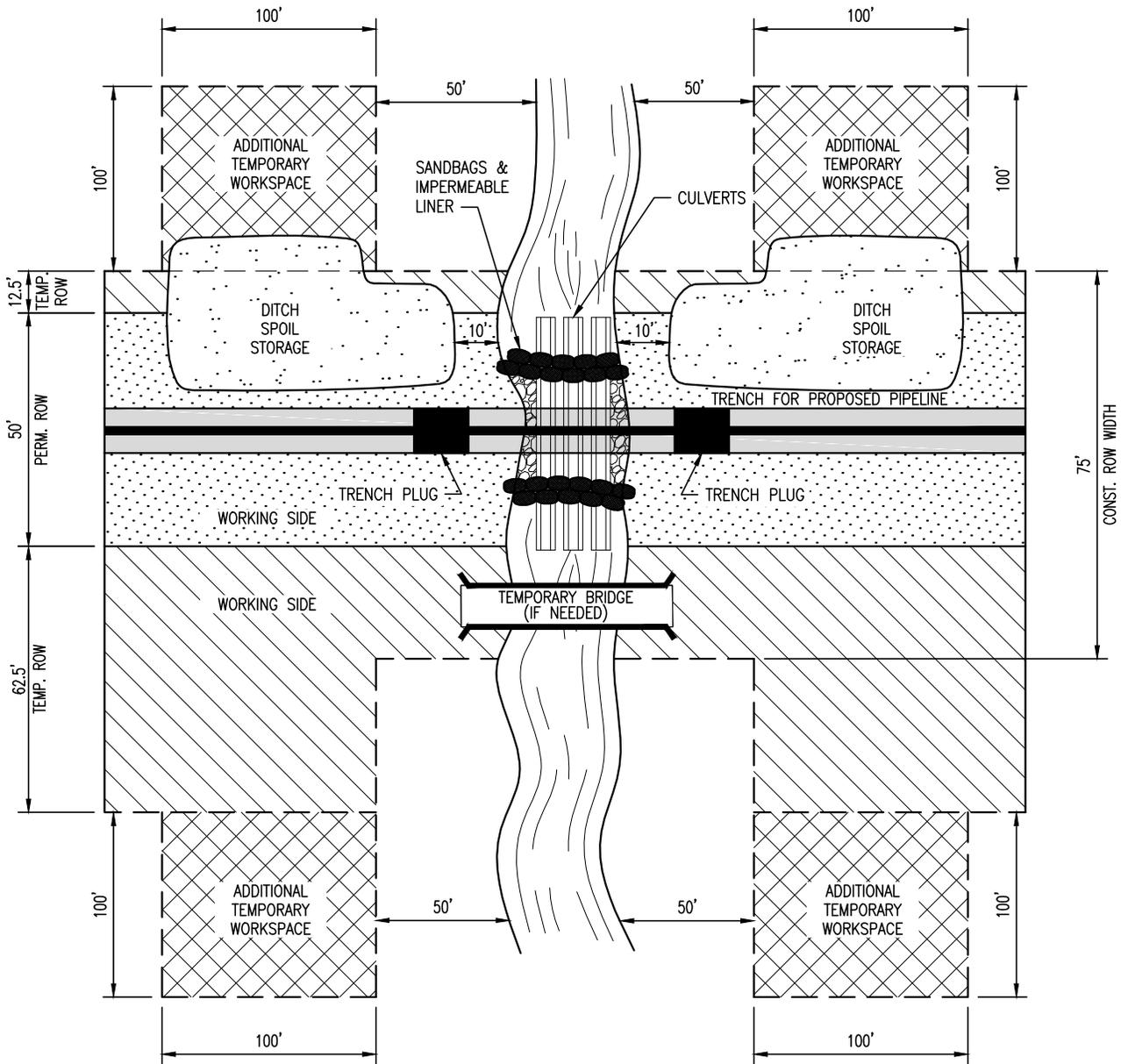
TYPICAL CONSTRUCTION DETAIL

MAINLINE CONSTRUCTION
RAILROAD CROSSING BORED

DRAWING NO.
MVP-5

REV.
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THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.



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DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

MAINLINE CONSTRUCTION
WATERBODY CROSSING
OPEN CUT – FLUME

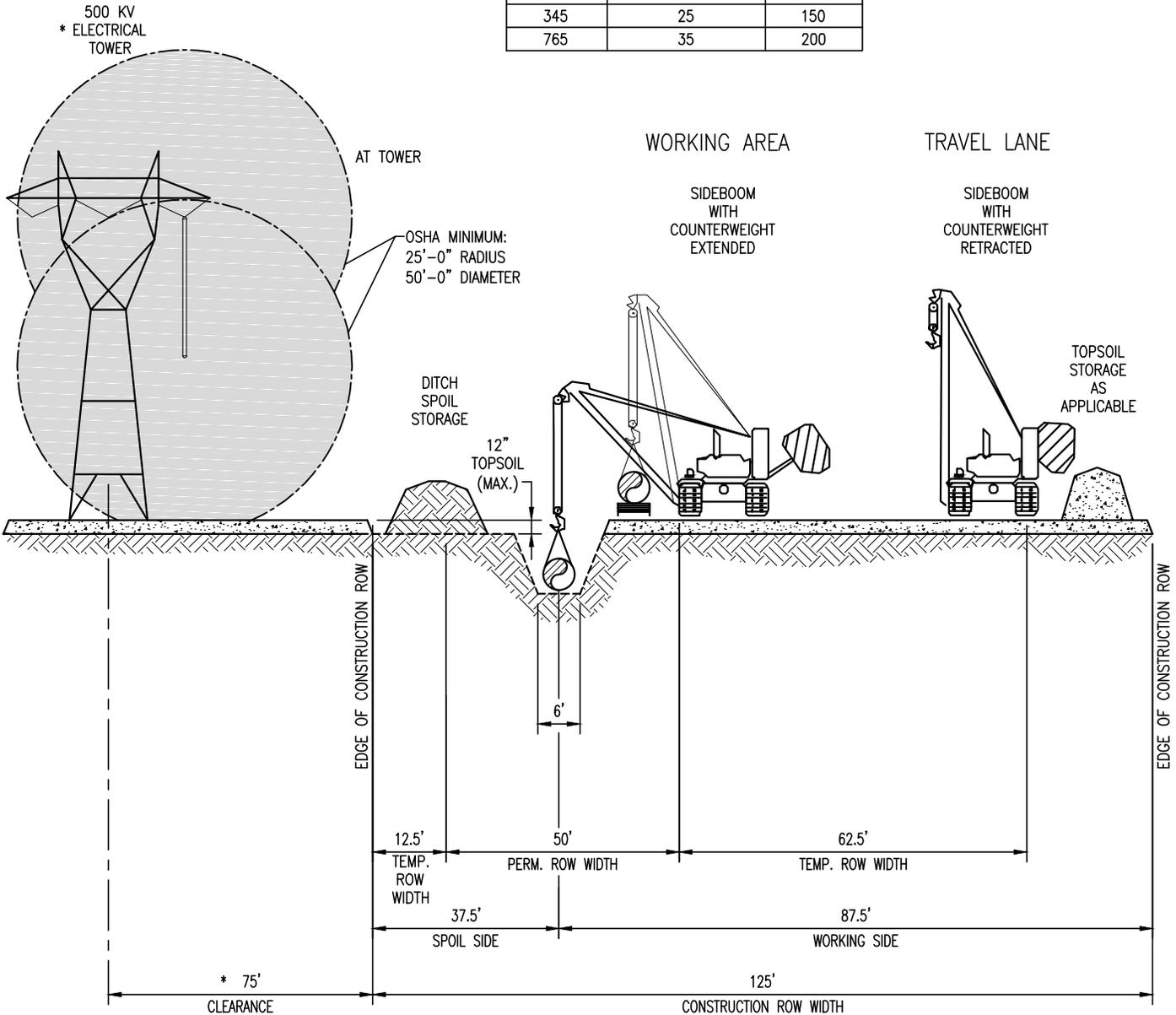
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REV.

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POWER LINE VOLTAGE KV	MINIMUM ALLOWABLE APPROACH DISTANCE FEET	TYPICAL ROW WIDTH FEET
34	10	50
69	12	70
138	15	100
345	25	150
765	35	200



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* SEE TABLE AT TOP OF PAGE

DRAWING ASSUMES TYPE "B" SOIL

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DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

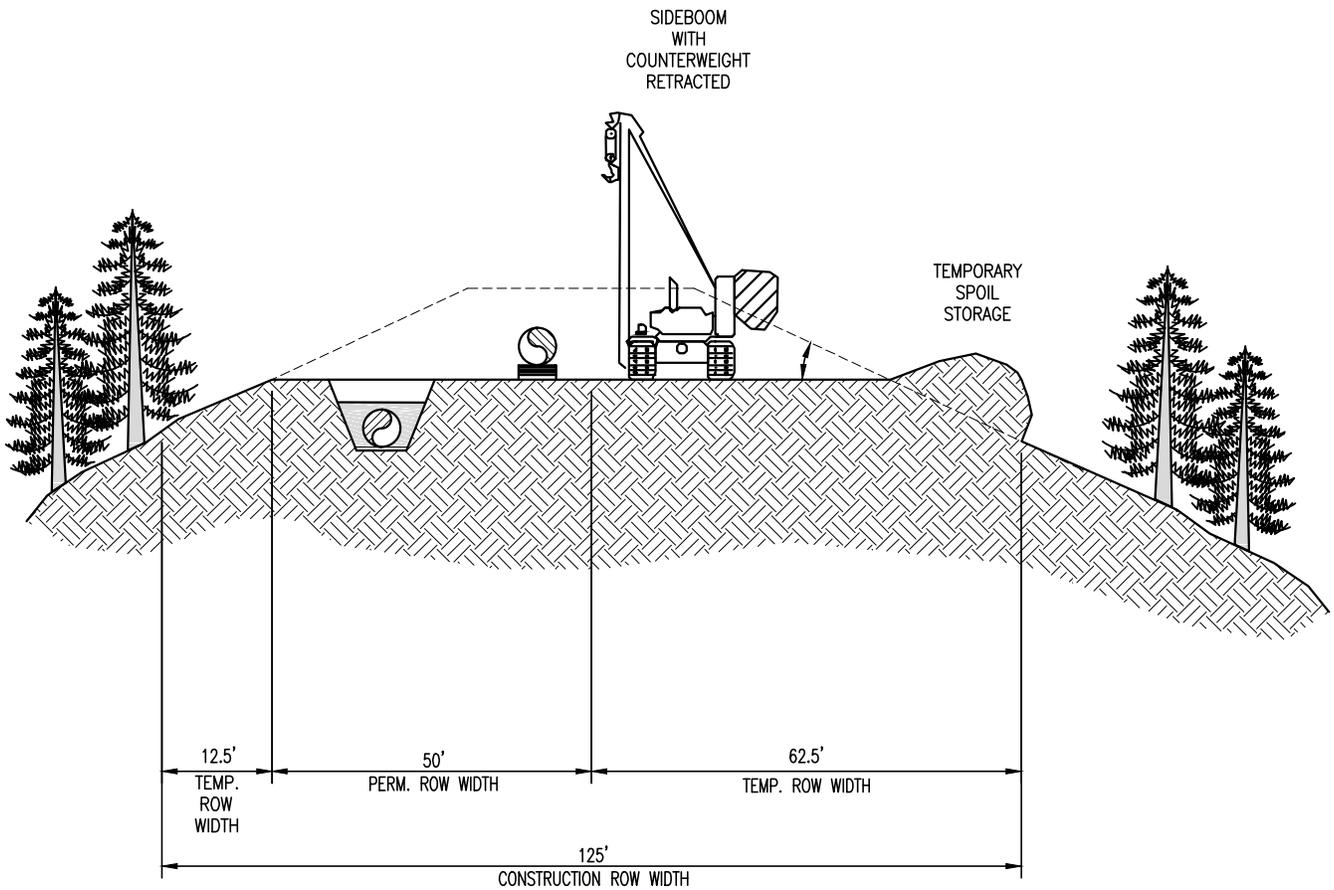
MAINLINE CONSTRUCTION
PARALLEL TO POWER LINES
RIGHT-OF-WAY

DRAWING NO.

MVP-7

REV.

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THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWING ASSUMES TYPE "B" SOIL

DRAWN	JDM	DATE	3/17/15
CHECKED	RRR	DATE	10/01/15
APP'D	RLM	DATE	10/01/15
SCALE	N.T.S.	SHEET	1 OF 1
JOB NO.			
PROJECT ID:			
PXXXX			



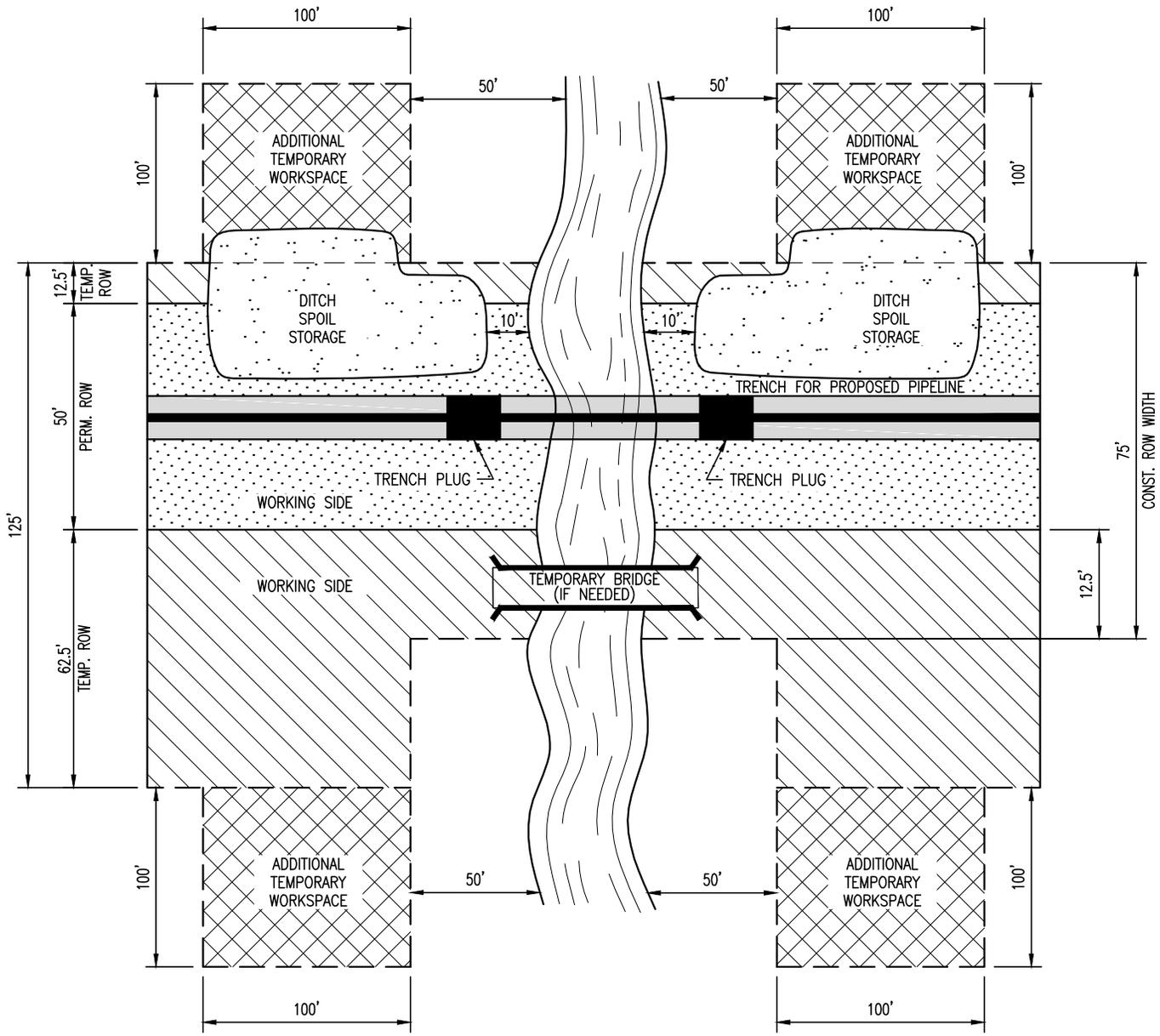
DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

MAINLINE CONSTRUCTION
TYPICAL CROSS SECTION
FOR LARGE DIAMETER PIPE
RIDGE

DRAWING NO.	REV.
MVP-8	0

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.



DRAWN	JDM	DATE	3/17/15
CHECKED	RRR	DATE	10/01/15
APP'D	RLM	DATE	10/01/15
SCALE	N.T.S.	SHEET	1 OF 1
JOB NO.			
PROJECT ID:			
PXXXX			

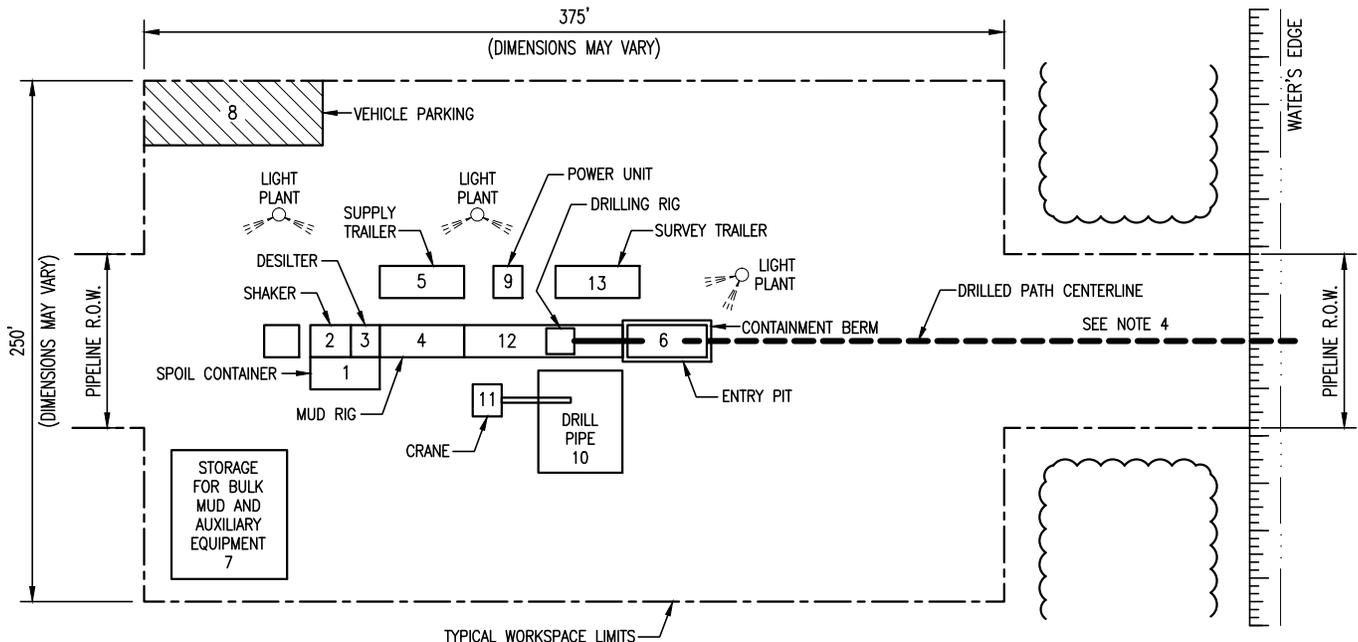


DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

MAINLINE CONSTRUCTION
WATERBODY CROSSING
OPEN CUT – WET DITCH
RIGHT-OF-WAY

DRAWING NO.	REV.
MVP-9	0



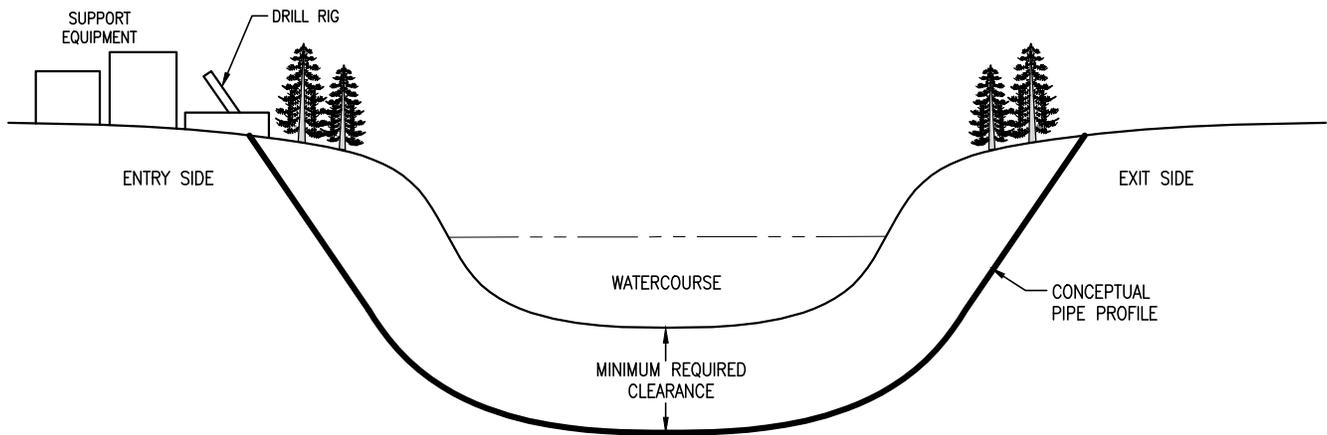
EQUIPMENT:

1. SPOIL CONTAINER: 8' X 20'
2. SHAKER: 8' X 12'
3. DESILTER: 8' X 8'
4. MUD RIG: 8' X 25'
5. SUPPLY TRAILER: 8' X 25'
6. ENTRY PIT: 8' X 20'
7. STORAGE: 30' X 30'
8. VEHICLE PARKING: 15' X 50'
9. POWER UNIT: 8' X 10'
10. DRILL PIPE: 30' X 30'
11. CRANE: 8' X 8'
12. DRILLING RIG: 8' X 45'
13. SURVEY TRAILER: 8' X 25'

NOTES:

1. EQUIPMENT ORIENTATION MAY VARY DEPENDING ON CONTRACTOR OR SITE CONDITIONS.
2. EQUIPMENT TO BE SUPPORTED ON THE GROUND SURFACE OR TIMBER MATS AS CONDITIONS DICTATE.
3. SILT FENCE, BERMS AND/OR STRAW BALE BARRIER TO BE USED AS REQUIRED TO PREVENT IMPACTS FROM OCCURRING OUTSIDE OF PROJECT LIMITS.
4. HAND CLEARED ACCESS PATH WILL BE USED TO OBTAIN WATER FROM SOURCE WHERE PERMITTED.

ENTRY SITE PLAN
SCALE: N.T.S.



THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

PROFILE
SCALE: N.T.S.

GENERAL NOTES:

1. PIPE DEPTHS MAY VARY.

DRAWING ASSUMES TYPE "B" SOIL

DRAWN	JDM	DATE	3/18/15
CHECKED	RRR	DATE	10/01/15
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SCALE	N.T.S.	SHEET	1 OF 1
JOB NO.			
PROJECT ID: PXXXX			



DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

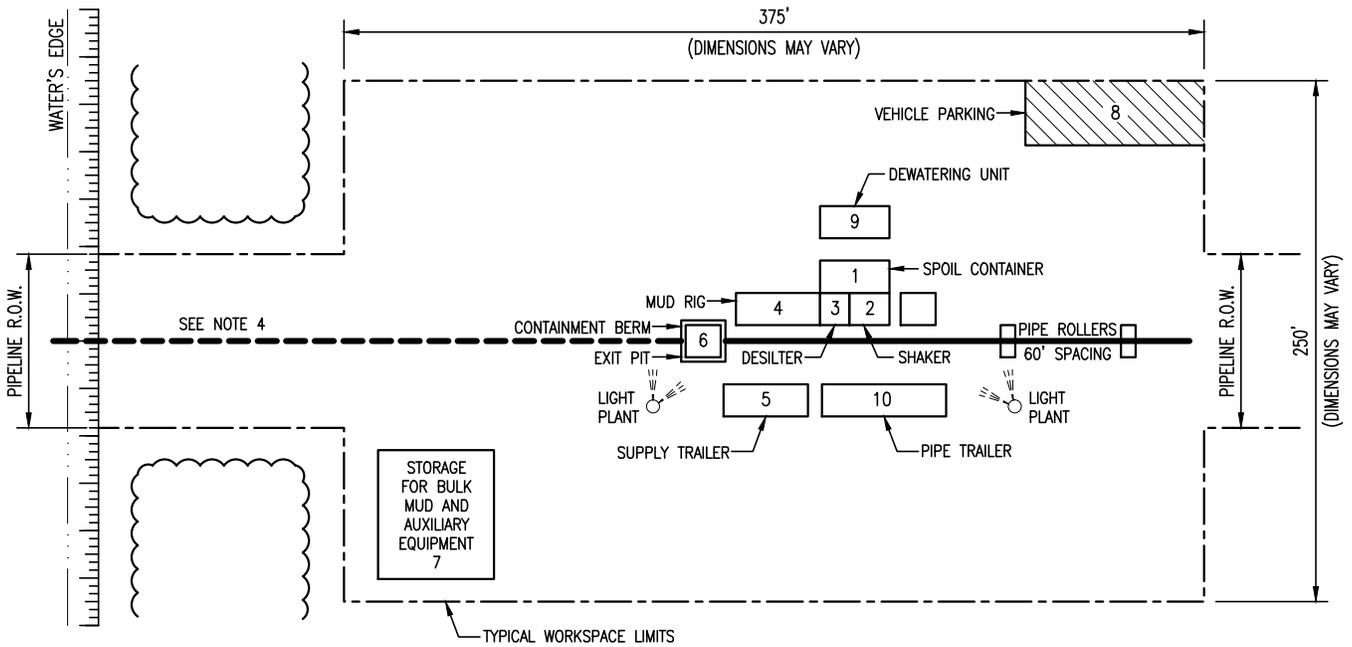
MAINLINE CONSTRUCTION
TYPICAL DIRECTIONAL DRILL
ENTRY SITE PLAN & PROFILE

DRAWING NO.

MVP-10

REV.

0



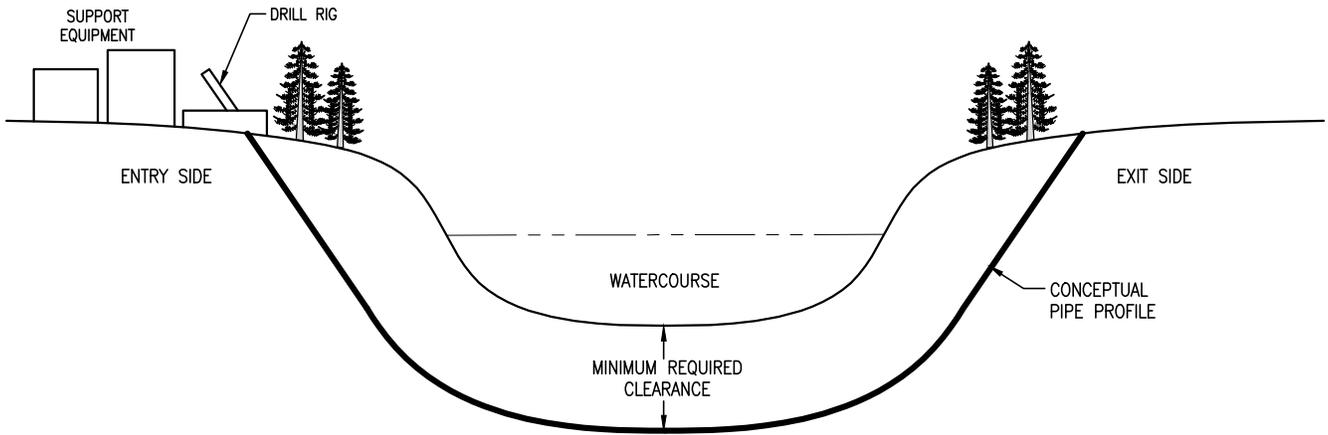
EQUIPMENT:

1. SPOIL CONTAINER: 8' X 20'
2. SHAKER: 8' X 12'
3. DESILTER: 8' X 8'
4. MUD RIG: 8' X 25'
5. SUPPLY TRAILER: 8' X 25'
6. EXIT PIT: 8' X 10'
7. STORAGE: 30' X 30'
8. VEHICLE PARKING: 15' X 50'
9. DEWATERING UNIT: 8' X 20'
10. PIPE TRAILER: 8' X 40'

NOTES:

1. EQUIPMENT ORIENTATION MAY VARY DEPENDING ON CONTRACTOR OR SITE CONDITIONS.
2. EQUIPMENT TO BE SUPPORTED ON THE GROUND SURFACE OR TIMBER MATS AS CONDITIONS DICTATE.
3. SILT FENCE, BERMS AND/OR STRAW BALE BARRIER TO BE USED AS REQUIRED TO PREVENT IMPACTS FROM OCCURRING OUTSIDE OF PROJECT LIMITS.
4. HAND CLEARED ACCESS PATH WILL BE USED TO OBTAIN WATER FROM SOURCE WHERE PERMITTED.

EXIT SITE PLAN
SCALE: N.T.S.



THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

PROFILE
SCALE: N.T.S.

GENERAL NOTES:

1. PIPE DEPTHS MAY VARY.

DRAWING ASSUMES TYPE "B" SOIL

DRAWN	JDM	DATE	3/18/15
CHECKED	RRR	DATE	10/01/15
APP'D	RLM	DATE	10/01/15
SCALE	N.T.S.	SHEET	1 OF 1
JOB NO.			
PROJECT ID:			
PXXXX			



DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

MAINLINE CONSTRUCTION
TYPICAL DIRECTIONAL DRILL
EXIT SITE PLAN & PROFILE

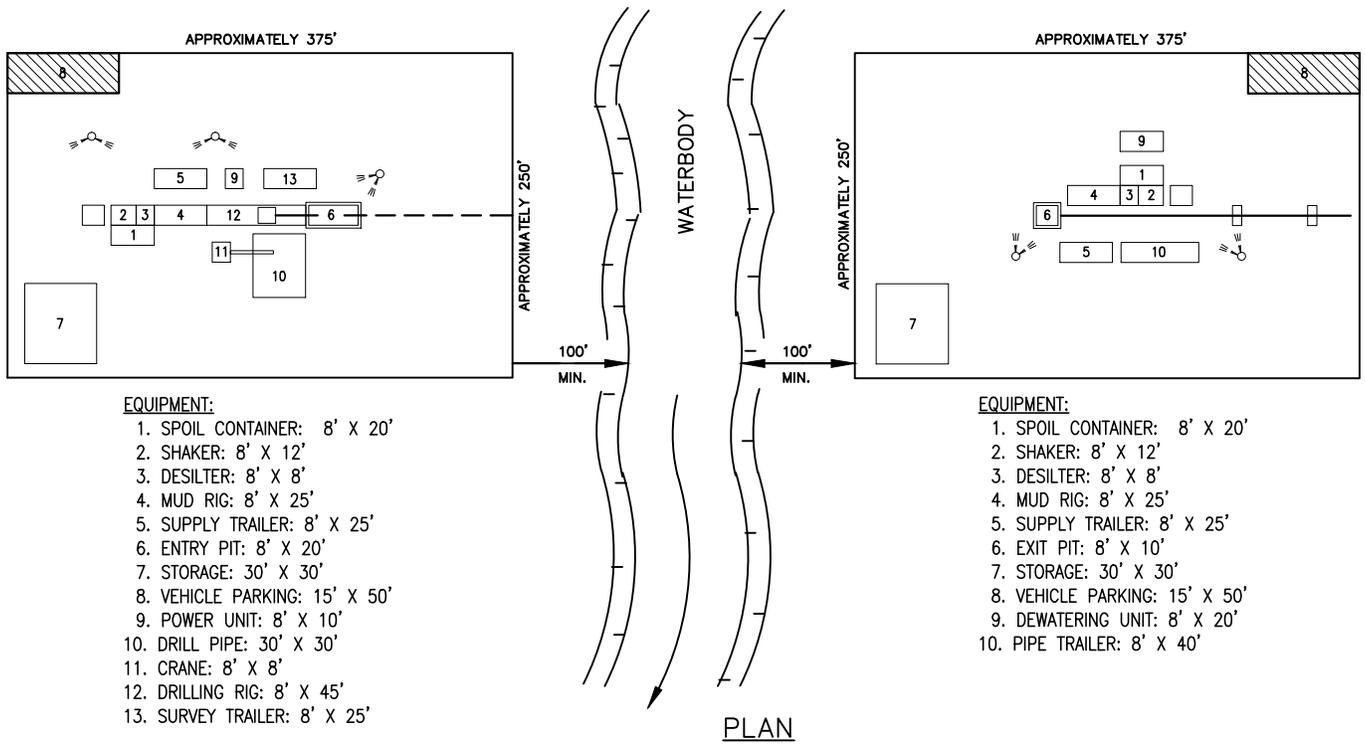
DRAWING NO.

MVP-11

REV.

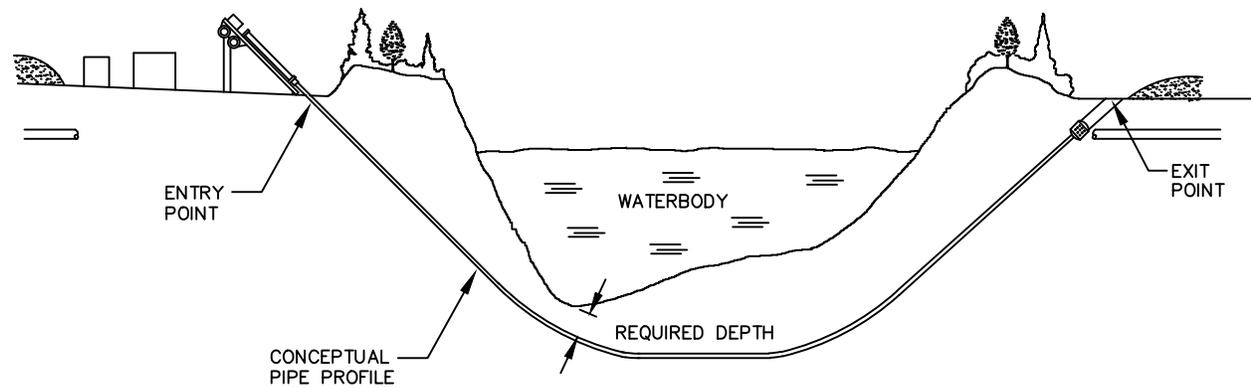
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HORIZONTAL DIRECTIONAL DRILL METHOD 7



- EQUIPMENT:**
1. SPOIL CONTAINER: 8' X 20'
 2. SHAKER: 8' X 12'
 3. DESILTER: 8' X 8'
 4. MUD RIG: 8' X 25'
 5. SUPPLY TRAILER: 8' X 25'
 6. ENTRY PIT: 8' X 20'
 7. STORAGE: 30' X 30'
 8. VEHICLE PARKING: 15' X 50'
 9. POWER UNIT: 8' X 10'
 10. DRILL PIPE: 30' X 30'
 11. CRANE: 8' X 8'
 12. DRILLING RIG: 8' X 45'
 13. SURVEY TRAILER: 8' X 25'

- EQUIPMENT:**
1. SPOIL CONTAINER: 8' X 20'
 2. SHAKER: 8' X 12'
 3. DESILTER: 8' X 8'
 4. MUD RIG: 8' X 25'
 5. SUPPLY TRAILER: 8' X 25'
 6. EXIT PIT: 8' X 10'
 7. STORAGE: 30' X 30'
 8. VEHICLE PARKING: 15' X 50'
 9. DEWATERING UNIT: 8' X 20'
 10. PIPE TRAILER: 8' X 40'



NOTES:

1. SET UP DRILLING EQUIPMENT A MINIMUM OF 100 FEET FROM THE EDGE OF THE WATERCOURSE. DO NOT CLEAR OR GRADE WITHIN THE 100 FOOT ZONE.
2. ENSURE THAT ONLY BENTONITE BASED DRILLING MUD IS USED. DO NOT ALLOW THE USE OF ANY ADDITIVES TO THE DRILLING MUD WITHOUT THE APPROVAL OF COMPANY INSPECTOR.
3. INSTALL SUITABLE DRILLING MUD TANKS OR SUMPS TO PREVENT CONTAMINATION OF WATERCOURSE.
4. INSTALL BERMS DOWNSLOPE FROM THE DRILL ENTRY AND ANTICIPATED EXIT POINTS TO CONTAIN ANY RELEASE OF DRILLING MUD.
5. DISPOSE OF DRILLING MUD IN ACCORDANCE WITH THE APPROPRIATE REGULATORY AUTHORITY REQUIREMENTS.
6. A SEDIMENT BARRIER SHALL BE PLACED ON THE DOWN SLOPE SIDE OF RIGHT-OF-WAY, PER THE PROJECT NARRATIVE.

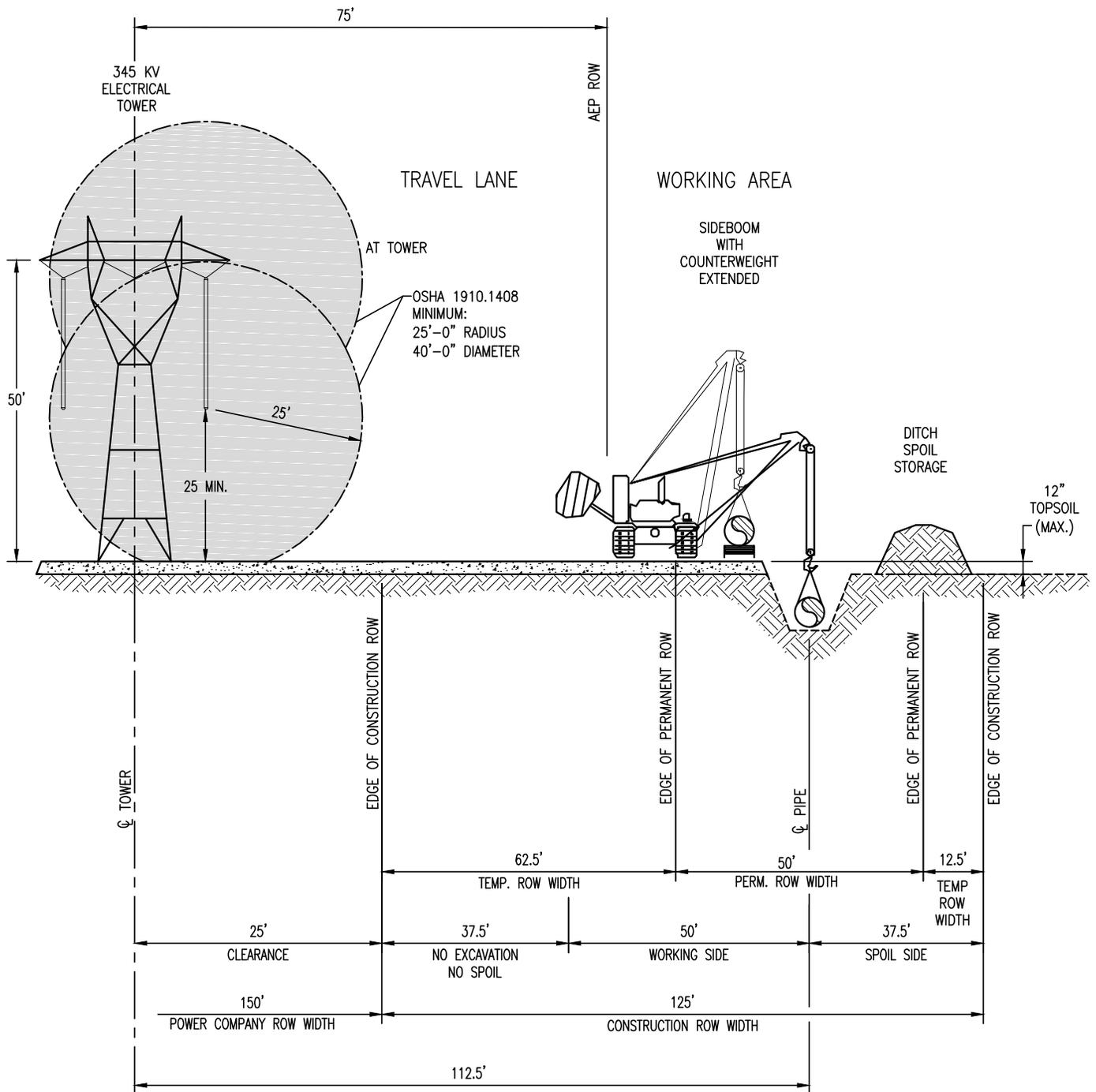
THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWN	JDM	DATE	3/18/15
CHECKED	RRR	DATE	10/01/15
APP'D	RLM	DATE	10/01/15
SCALE	N.T.S.	SHEET	1 OF 1
JOB NO.			
PROJECT ID: PXXXX			



DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL	
HORIZONTAL DIRECTIONAL DRILL (HDD)	
DRAWING NO. MVP-12	REV. 0



THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWN	JDM	DATE	5/27/15
CHECKED	RRR	DATE	10/01/15
APP'D	RLM	DATE	10/01/15
SCALE	N.T.S.	SHEET	1 OF 1
JOB NO.			
PROJECT ID: PXXXX			

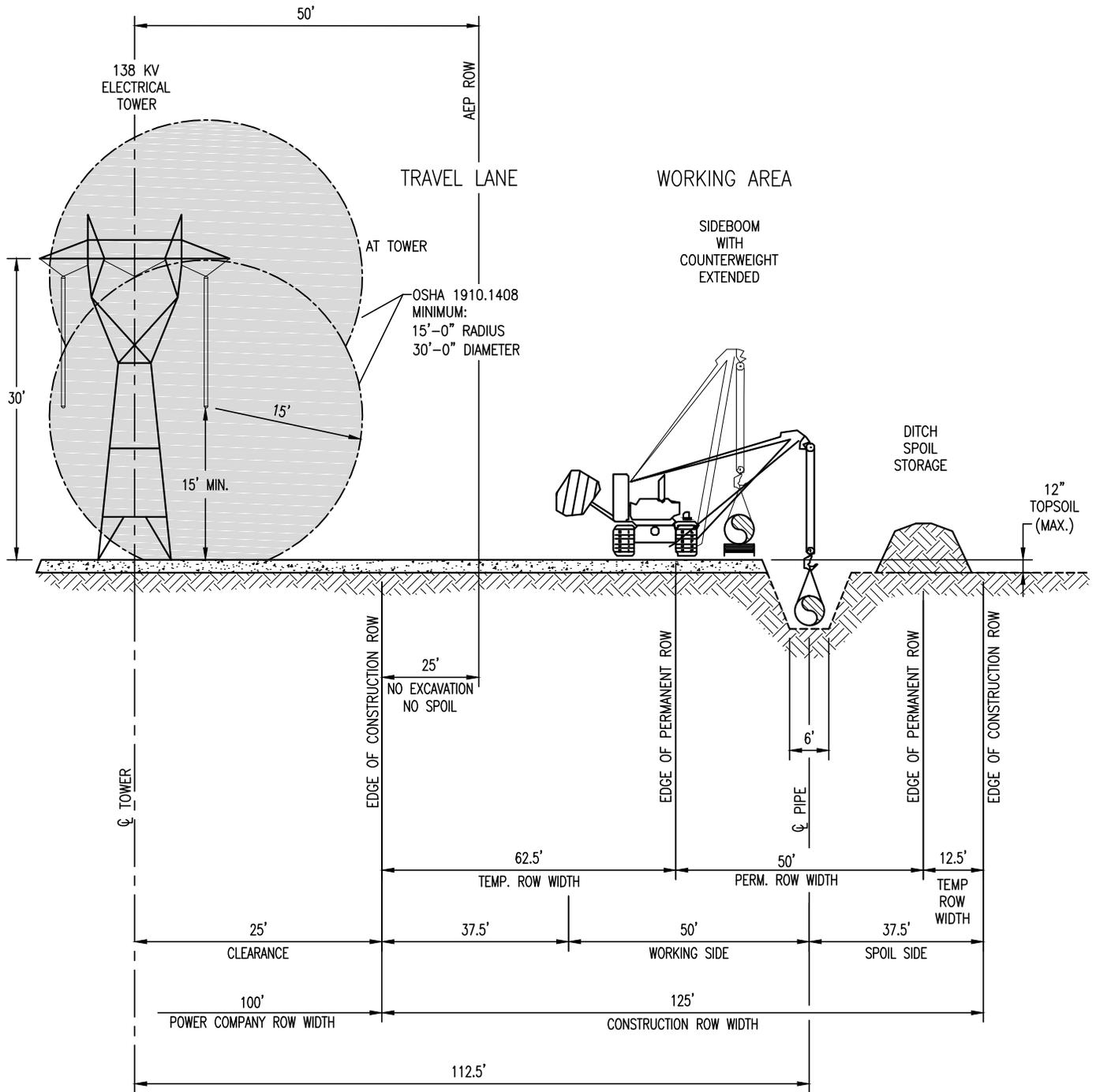


DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

MAINLINE CONSTRUCTION
PARALLEL TO POWER LINES - 345KV
RIGHT-OF-WAY

DRAWING NO. MVP-13	REV. 0
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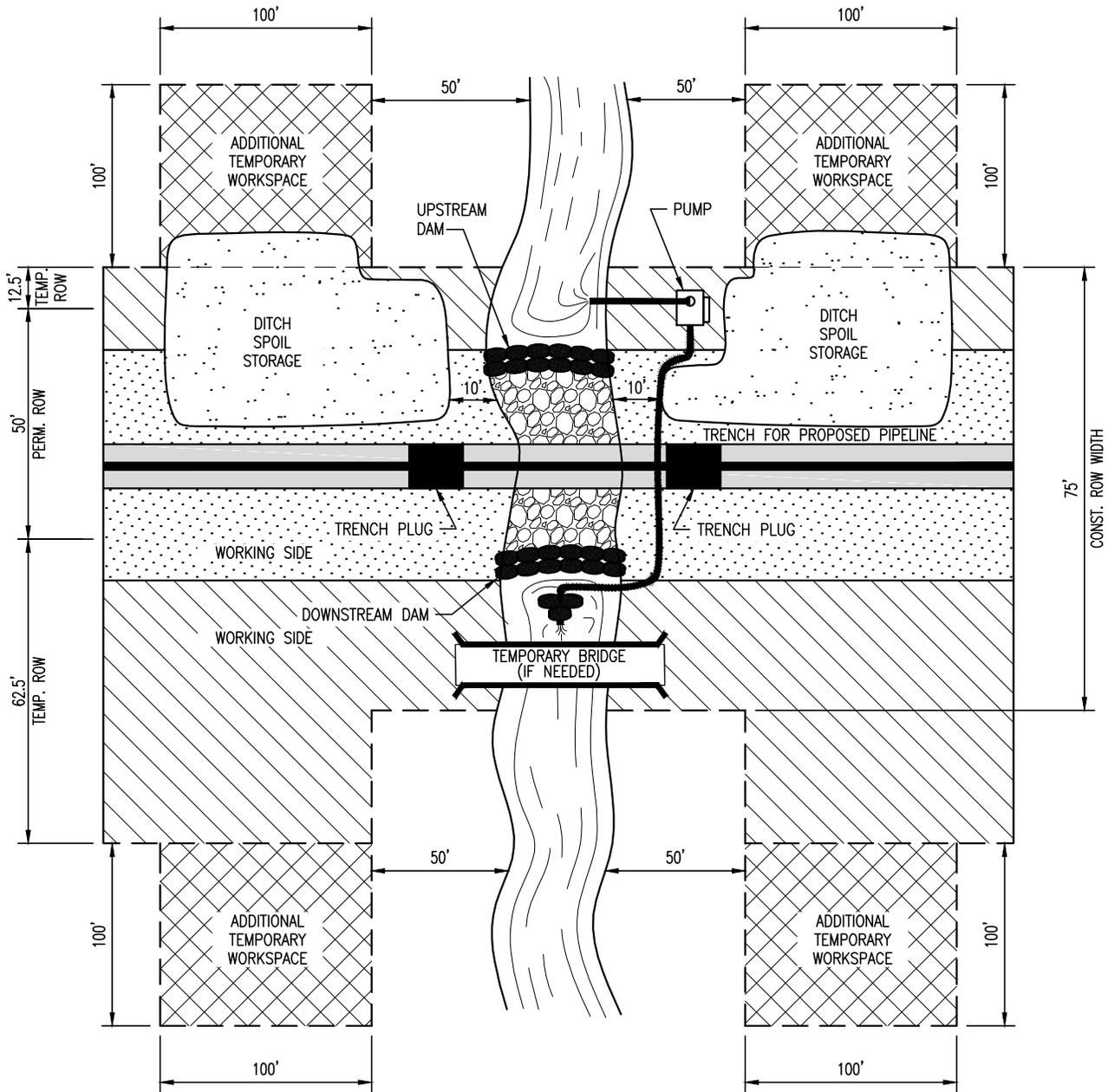
THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWN	JDM	DATE	5/27/15
CHECKED	RRR	DATE	10/01/15
APP'D	RLM	DATE	10/01/15
SCALE	N.T.S.	SHEET	1 OF 1
JOB NO.			
PROJECT ID: PXXXX			



DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL	
MAINLINE CONSTRUCTION PARALLEL TO POWER LINES - 138KV RIGHT-OF-WAY	
DRAWING NO. MVP-14	REV. 0



THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWN	JDM	DATE	08/20/15
CHECKED	RRR	DATE	10/01/15
APP'D	RLM	DATE	10/01/15
SCALE	N.T.S.	SHEET	1 OF 1
JOB NO.			
PROJECT ID: PXXXX			



DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

MAINLINE CONSTRUCTION
WATERBODY CROSSING
OPEN CUT – DRY/DAM AND PUMP
RIGHT-OF-WAY

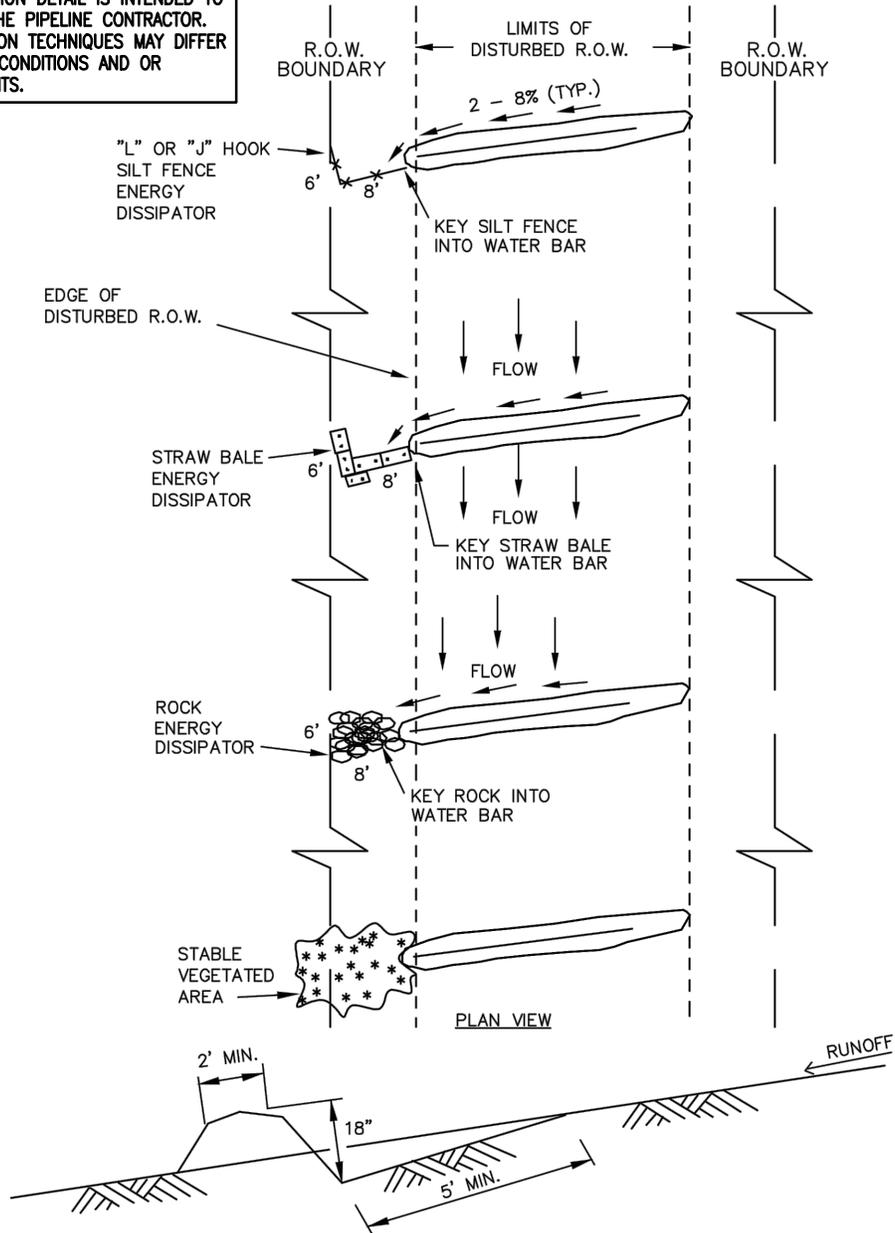
DRAWING NO.

MVP-15

REV.

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THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.



NOTES:

1. SLOPE BREAKERS SHALL BE CONSTRUCTED OF COMPACTED NATIVE SOIL AND INSTALLED AT LOCATIONS AS SHOWN ON THE CONSTRUCTION DRAWINGS OR AS DIRECTED BY THE COMPANY'S INSPECTOR.
2. SLOPE BREAKERS SHALL BE ORIENTED AS SHOWN OR OTHER PATTERN AS DIRECTED BY THE COMPANY'S INSPECTOR TO DIRECT THE WATER OFF THE R.O.W.
3. SLOPE BREAKERS SHALL BE CONSTRUCTED AT A 2-8% GRADIENT ACROSS THE SLOPE.
4. THE SLOPE BREAKERS SHALL BE 18" DEEP (AS MEASURED FROM THE TROUGH TO THE TOP OF THE SLOPE BREAKER). THE TROUGH WILL BE A MINIMUM OF 5' WIDE ACROSS THE WIDTH OF THE RIGHT-OF-WAY.
5. THE OUTLET OF THE SLOPE BREAKER MUST FREELY DISCHARGE RUNOFF OFF FROM THE DISTURBED RIGHT-OF-WAY INTO A STABLE, WELL VEGETATED AREA OR INTO AN ENERGY DISSIPATER.
6. WHERE SLOPE BREAKERS EXTEND BEYOND THE EDGE OF THE CONSTRUCTION R.O.W. DIRECT RUNOFF INTO STABLE, WELL VEGETATED AREAS, THESE LOCATIONS MUST BE APPROVED BY THE COMPANY'S INSPECTOR.

DRAWN	JL	DATE	10/6/2016
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APP'D	XXX	DATE	10/6/2016
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JOB NO.			
PROJECT ID:			
PXXXX			

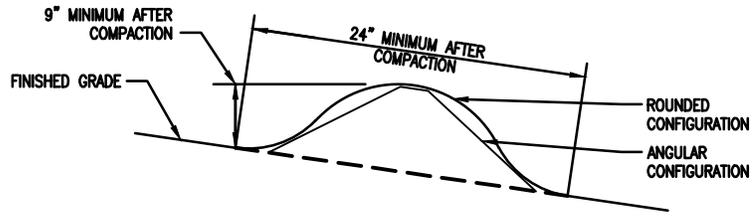


DESIGN ENGINEERING

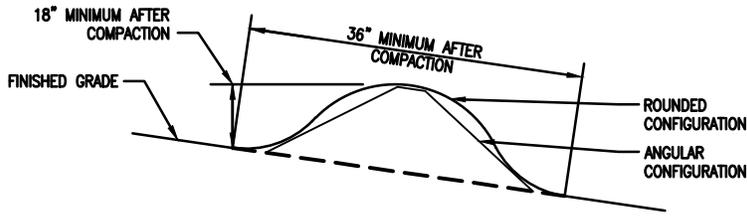
TYPICAL CONSTRUCTION DETAIL

SLOPE BREAKER/RIGHT-OF-WAY DIVERSION/WATERBAR

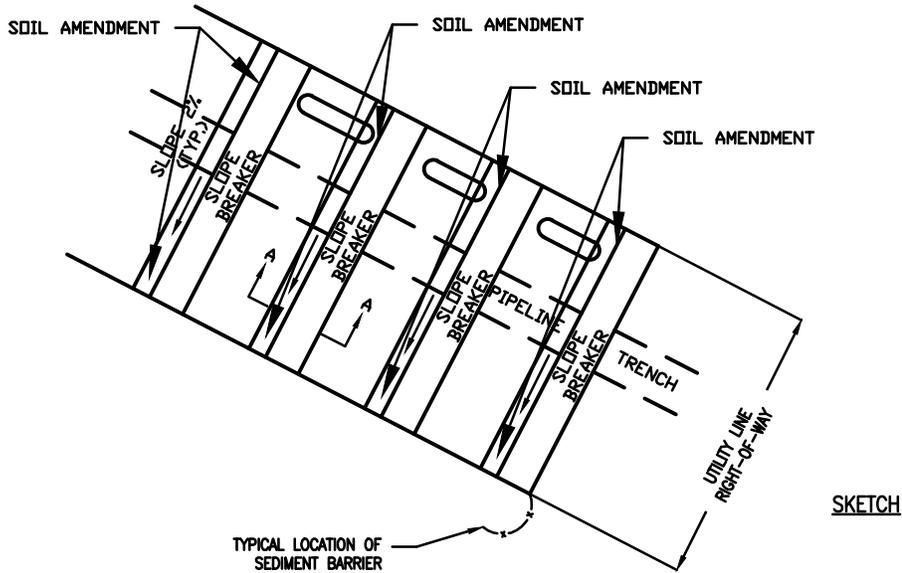
DRAWING NO.	MVP-17	REV.	0
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SECTION A-A
(TEMPORARY INSTALLATION)



SECTION A-A
(PERMANENT INSTALLATION)



SKETCH

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWN	JL	DATE	10/6/2016
CHECKED	MMF	DATE	10/6/2016
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DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

SLOPE BREAKER/RIGHT-OF-WAY
DIVERSION/WATERBAR

DRAWING NO.	REV.
MVP-17.1	0

RECOMMENDED MAXIMUM SPACING FOR PERMANENT SLOPE BREAKERS	
PIPELINE GRADE	DISTANCE (FEET)
<2%	- 1, 2
2-5%	400
6-15%	200
16-30%	100
>31%	50 ³

¹ PERMANENT SLOPE BREAKERS WILL BE INSTALLED AS NEEDED BASED ON FIELD CONDITIONS.

² PERMANENT SLOPE BREAKERS WILL BE INSTALLED 25 FEET FROM EACH WATERBODY BOUNDARY REGARDLESS OF SLOPE CONDITIONS.

³ SLOPES GREATER THAN 65% MAY REQUIRE SITE SPECIFIC STABILIZATION MEASURES BASED ON FIELD CONDITIONS AS APPROVED BY MVP DESIGN ENGINEERING AND MVP ENVIRONMENTAL INSPECTOR.

NOTES:

WATERBARS SHALL BE INSPECTED WEEKLY (DAILY ON ACTIVE ROADS) AND AFTER EACH RUNOFF EVENT. DAMAGED OR ERODED WATERBARS SHALL BE RESTORED TO ORIGINAL DIMENSIONS WITHIN 24 HOURS OF INSPECTION

MAINTENANCE OF WATERBARS SHALL BE PROVIDED UNTIL ROADWAY, SKIDTRAIL, OR RIGHT-OF-WAY HAS ACHIEVED PERMANENT STABILIZATION

WATERBARS ON RETIRED ROADWAYS, SKIDTRAILS, AND RIGHT-OF-WAYS SHALL BE LEFT IN PLACE AFTER PERMANENT STABILIZATION HAS BEEN ACHIEVED

SUMP FILTERS TO BE INSTALLED AT END OF WATERBARS. REFER TO SUMP FILTER DETAIL ON SHEET 0.09 FOR MORE DETAIL.

OUTLET PROTECTION/COMPOST FILTER SOCK SHOULD BE INSTALLED AT THE OUTLET OF ALL WATERBARS.

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWN	JL	DATE	10/6/2016
CHECKED	MMF	DATE	10/6/2016
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PXXXX			



DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

SLOPE BREAKER/RIGHT-OF-WAY
DIVERSION/WATERBAR

DRAWING NO.	REV.
MVP-17.2	0

STRAW MULCH

1. STRAW MULCH SHALL BE INSTALLED AT LOCATIONS IDENTIFIED ON THE CONSTRUCTION DRAWING AND/OR AS DIRECTED BY THE COMPANY'S INSPECTOR TO PROTECT SOIL FROM EROSION. AREAS TARGETED FOR STRAW MULCH INCLUDE THE FOLLOWING:
 - 10-40% SLOPES WITH LESS THAN 40% SURFACE COVER.
 - 0-10% SLOPES WITH SOILS RATED BY APPLICABLE COUNTY AS HIGH IN WIND ERODIBILITY AND LESS THAN 40% SURFACE COVER AND IF DIRECTED BY COMPANY'S INSPECTOR.
2. WHEAT, OAT, BARLEY, RYE OR FLAX STRAW WILL BE USED, WHERE APPROPRIATE, DEPENDING UPON AVAILABILITY.
3. ONLY CERTIFIED "NOXIOUS WEED-FREE" STRAW MULCH SHALL BE APPLIED AT A RATE OF:
 - 1,780 TO 2,225 LB/AC WHEAT, OAT, BARLEY OR RYE STRAW
 - 2,670 TO 3,560 LB/AC FLAX STRAW
4. AREAS WHERE RESPREAD TOPSOIL EXHIBITS AN ADEQUATE COVER FROM RESPREAD OF PLANT DEBRIS AND COARSE FRAGMENTS, MULCH RATES MAY BE REDUCED OR ELIMINATED BY THE COMPANY'S INSPECTOR.

STRAW CRIMPING

1. STRAW CRIMPING WILL BE UTILIZED ON NONCULTIVATED, WIND EROSION PRONE SOILS, AND ON CULTIVATED, WATER EROSION PRONE SOILS AS IDENTIFIED ON THE ALIGNMENT SHEETS, UNLESS OTHERWISE DIRECTED BY THE COMPANY'S INSPECTOR. STRAW CRIMPING AT ADDITIONAL LOCATIONS IDENTIFIED BY THE COMPANY'S INSPECTOR MAY BE REQUIRED.
2. EQUIPMENT SPECIFICALLY DESIGNED TO CRIMP STRAW (SUCH AS A STRAW MULCH CRIMPER MANUFACTURED BY FINN CORPORATION OR AN APPROVED EQUIVALENT) SHALL BE USED TO CRIMP STRAW FIBERS TO A DEPTH OF TWO TO THREE INCHES. STEEP SLOPES INACCESSIBLE WITH A CRIMPER SHALL BE CRIMPED BY TRACKING WITH A CRAWLER RUNNING PERPENDICULAR TO THE SLOPE. DISCS SHALL NOT BE ALLOWED FOR CRIMPING EXCEPT AS STATED IN NOTE 3.

- WHERE EXCESSIVE STONINESS IS ENCOUNTERED TO THE EXTENT THAT THE SPECIALIZED CRIMPING EQUIPMENT IS NOT USEABLE, ATTEMPT TO ANCHOR THE STRAW BY INCORPORATION WITH AN AGRICULTURAL DISC OR CULTIVATOR. WHERE FROZEN GROUND CONDITIONS ARE ENCOUNTERED TO THE EXTENT THAT THE CRIMPING OPERATION IS NOT FEASIBLE, SPREAD STRAW AT DOUBLE THE NORMAL RATE.
- 3.

- CRIMP OR ANCHOR STRAW INTO THE SOIL TO AN APPROXIMATE DEPTH OF 2". STRAW SHOULD STAND VERTICALLY 2" TO 8" OUT OF THE GROUND IN ROWS SPACED APPROXIMATELY 6" APART.
- 4.

- IN HIGHLY ERODIBLE SANDY LOCATIONS, WHERE DIRECTED BY THE COMPANY'S INSPECTOR, DOUBLE THE STRAW APPLICATION RATE AND MAKE TWO PASSES TO ANCHOR THE STRAW, ONE PASS PERPENDICULAR TO THE OTHER OR CRISS-CROSSED.
- 5.

- STRAW FOR CRIMPING WILL BE APPROVED BY COMPANY AND THE LANDOWNERS AND OCCUPANTS OR APPROPRIATE REGULATORY AUTHORITIES WHERE APPLICABLE. CRITERIA FOR THE SELECTION OF STRAW IS AS FOLLOWS:
- 6.

- FOR EACH LOT OF BALES, TO THE EXTENT FEASIBLE, THE FIELD WHERE THE BALES WERE OBTAINED WILL BE INSPECTED BEFORE IT IS HARVESTED, OR THE STUBBLE WILL BE INSPECTED IMMEDIATELY AFTER HARVEST AND A SAMPLE OF GRAIN WILL BE INSPECTED FOR WEED SEEDS.
- THE STRAW MUST HAVE BEEN HARVESTED WITH A CONVENTIONAL COMBINE, NOT A ROTARY COMBINE.
- THE STRAW MUST HAVE A MINIMUM FIBRE LENGTH OF 8", 12" IS PREFERRED.
- THE STRAW MUST BE FREE OF NOXIOUS OR RESTRICTED WEEDS AND UNDESIRABLE SPECIES WHICH WOULD HAMPER RECLAMATION EFFORTS.
- TO THE EXTENT FEASIBLE, BALES OBTAINED FROM LOW LYING WEEDY AREAS WILL BE IDENTIFIED AND AVOIDED.

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWN	JDM	DATE	9/8/2015
CHECKED	RRR	DATE	10/01/15
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SCALE	N.T.S.	SHEET	1 OF 1
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DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

EROSION CONTROL
STRAW MULCH
(STM)

DRAWING NO.

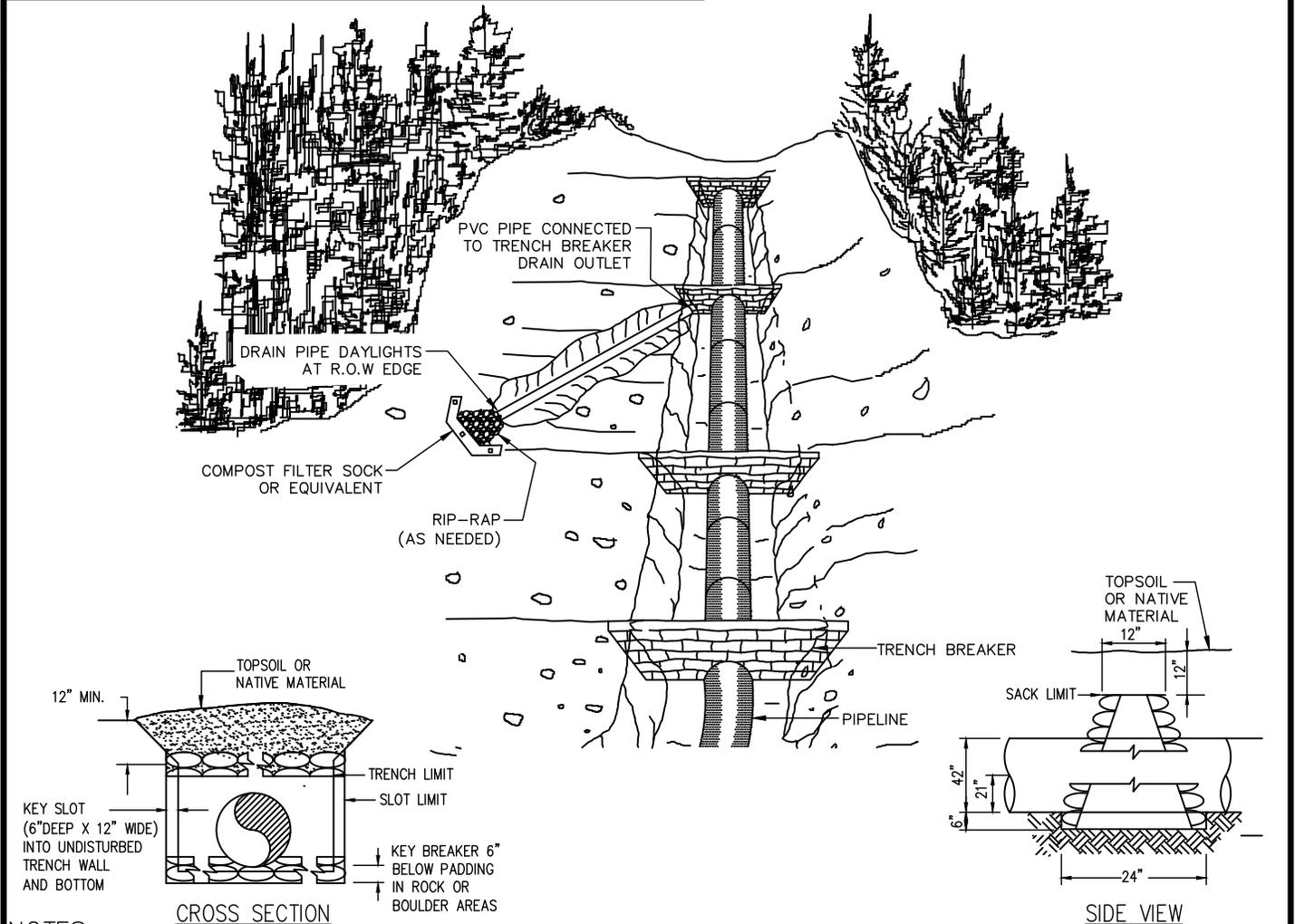
MVP-19

REV.

0

SLOPE %	DISTANCE	PLUG MATERIAL
0% - 5%	SEE NOTE 6	CONCRETE FILLED SACKS
5% - 15%	500 FT	SANDBAGS OR CONCRETE FILLED SACKS
15% - 25%	300 FT	SANDBAGS OR CONCRETE FILLED SACKS
25% - 35%	200 FT	SANDBAGS OR CONCRETE FILLED SACKS
35% - 100%	100 FT	SANDBAGS OR CONCRETE FILLED SACKS
> 100%	50 FT	CONCRETE FILLED BAGS (WETTED)

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.



NOTES:

- TRENCH BREAKERS SHALL BE INSTALLED:
 - ON SLOPES ALONG THE TRENCH LINE WHERE THE NATURAL DRAINAGE PATTERN, PROFILE, AND TYPE OF BACKFILL MATERIAL MAY RESULT IN LOSS OF BACKFILL MATERIAL OR ALTERATION OF THE NATURAL PATTERN;
 - AT THE BASE OF SLOPES ADJACENT TO WATERBODIES AND WETLANDS;
 - WHERE NEEDED TO AVOID DRAINING A WETLAND;
 - ON UPLAND SLOPES, AT THE SAME SPACING AS SLOPE BREAKERS AND UP SLOPE OF SLOPE BREAKERS;
 - IN CULTIVATED LAND AND RESIDENTIAL AREAS WHERE PERMANENT SLOPE BREAKERS ARE NOT TYPICALLY INSTALLED, AT THE SAME SPACING AS IF PERMANENT SLOPE BREAKERS WERE REQUIRED.
- MATERIALS APPROPRIATE FOR USE AS PERMANENT TRENCH BREAKERS INCLUDE SANDBAGS OR CONCRETE FILLED SACKS. TOPSOIL SHALL NOT BE USED FOR TRENCH BREAKERS.
- TRENCH BREAKERS INSTALLED AT WATERBODY AND WETLAND CROSSINGS SHALL BE CONSTRUCTED OF IMPERVIOUS MATERIALS (CONCRETE FILLED SACKS).
- BREAKER SPACING AND CONFIGURATION MAY BE CHANGED AS DIRECTED BY MVP. DEPTH OF DITCH MAY VARY WITH SITE CONDITIONS.
- ALL MATERIALS SHALL BE SUPPLIED BY CONTRACTOR.
- TRENCH BREAKERS ARE REQUIRED AT ALL WATERBODY CROSSINGS REGARDLESS OF TRENCH SLOPE. OTHERWISE NOTE REQUIRED AT SLOPES < 5%.
- SINGLE TRENCH BREAKERS WILL BE A MINIMUM WIDTH OF 24" AND DOUBLE TRENCH BREAKERS WILL BE A MINIMUM WIDTH OF 36".
- FOR SUBSURFACE AND TRENCH BREAKER DRAINAGE DETAILS INCLUDING THOSE FOR STEEP SLOPES, SEE LANDSLIDE MITIGATION TYPICAL DETAILS.
- FOR SLOPES EXCEEDING 50%, CONCRETE FILLED SACKS ARE REQUIRED UNLESS OTHERWISE APPROVED BY MVP.

DRAWN	JDM	DATE	9/8/2015
CHECKED	RRR	DATE	10/01/15
APP'D	RLM	DATE	10/01/15
SCALE	N.T.S.	SHEET	1 OF 1
JOB NO.			
PROJECT ID:			
PXXXX			



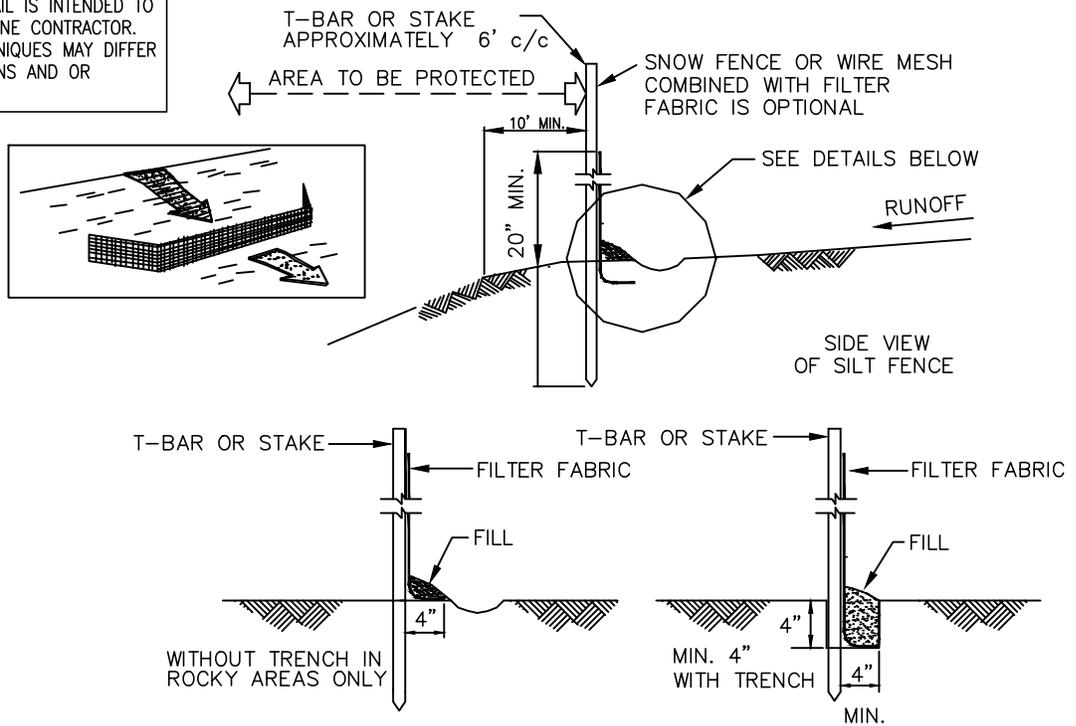
DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

TYPICAL TRENCH BREAKER REQUIREMENTS

DRAWING NO.	MVP-20	REV.	0
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THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.



NOTE:

1. GENERALLY WHEN A LONG SEDIMENT BARRIER IS REQUIRED, SILT FENCE WILL BE UTILIZED RATHER THAN STRAW BALES AT:
 - THE BASE OF ALL SLOPES ABOVE ROADS, SPRINGS, WETLANDS, IMPOUNDMENTS AND PERENNIAL AND INTERMITTENT STREAMS.
 - THE DOWN SLOPE RIGHT-OF-WAY EDGE WHERE ANY OF THE ABOVE MENTIONED LOCATIONS ARE ADJACENT TO THE RIGHT-OF-WAY.
 - BETWEEN TOPSOIL/SPOIL STOCKPILES AND PERENNIAL OR INTERMITTENT STREAMS OR WETLANDS WHERE BUFFER ZONE REQUIREMENTS CANNOT BE MET.
 - ALONG R.O.W. BOUNDARIES OF WETLAND CONSTRUCTION.
 - AS SPECIFIED IN THE SPILL PREVENTION, CONTAINMENT, AND COUNTERMEASURE PLAN.
 - AS DIRECTED BY THE COMPANY'S INSPECTOR.

2. THE SILT FENCE SHALL BE CONSTRUCTED AS FOLLOWS:
 - FABRIC USED FOR THE SILT FENCE SHALL BE A "STANDARD STRENGTH" GEOTEXTILE, SUCH AS MIRAFI 100X OR AN APPROVED EQUIVALENT.
 - THE FABRIC SHALL BE CUT FROM A CONTINUOUS FABRIC ROLL.
 - THE HEIGHT OF THE FENCE SHALL NOT EXCEED 24".
 - SPLICES SHALL ONLY BE DONE AT POSTS AND SHALL CONSIST OF A MINIMUM OF 6" OF OVERLAP WITH BOTH ENDS SECURED TO THE POST.
 - POSTS SHALL BE POSITIONED A MAXIMUM OF 6' APART.
 - POSTS SHALL CONSIST OF 2"X2" WOODEN STAKES OF SUFFICIENT LENGTH TO EXTEND A MINIMUM OF 12" INTO THE GROUND.
 - FABRIC SHALL BE STAPLED OR WIRED TO POSTS A MAXIMUM OF EVERY 9".

3. THE SILT FENCE SHALL BE INSTALLED AS SPECIFIED BY THE MANUFACTURER OR AS FOLLOWS:
 - A TRENCH, 4" WIDE AND 4" DEEP, SHALL BE EXCAVATED ALONG THE CONTOUR. THE POST SHALL BE DRIVEN INTO THE BOTTOM OF THE TRENCH ON THE DOWNSTREAM SIDE OF THE FILTER FABRIC. THE TRENCH SHALL BE BACK FILLED AND COMPACTED, ENSURING 4" OF FENCE IS BURIED WITHIN THE TRENCH.
 - IN AREAS WHERE THE TERRAIN IS TOO ROCKY FOR TRENCHING, A 4" GROUND FLAP WITH ROCK FILL TO HOLD IT IN PLACE SHALL BE USED.

DRAWN	JDM	DATE	9/8/2015
CHECKED	RRR	DATE	10/01/15
APP'D	RLM	DATE	10/01/15
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JOB NO.			
PROJECT ID:			
PXXXX			



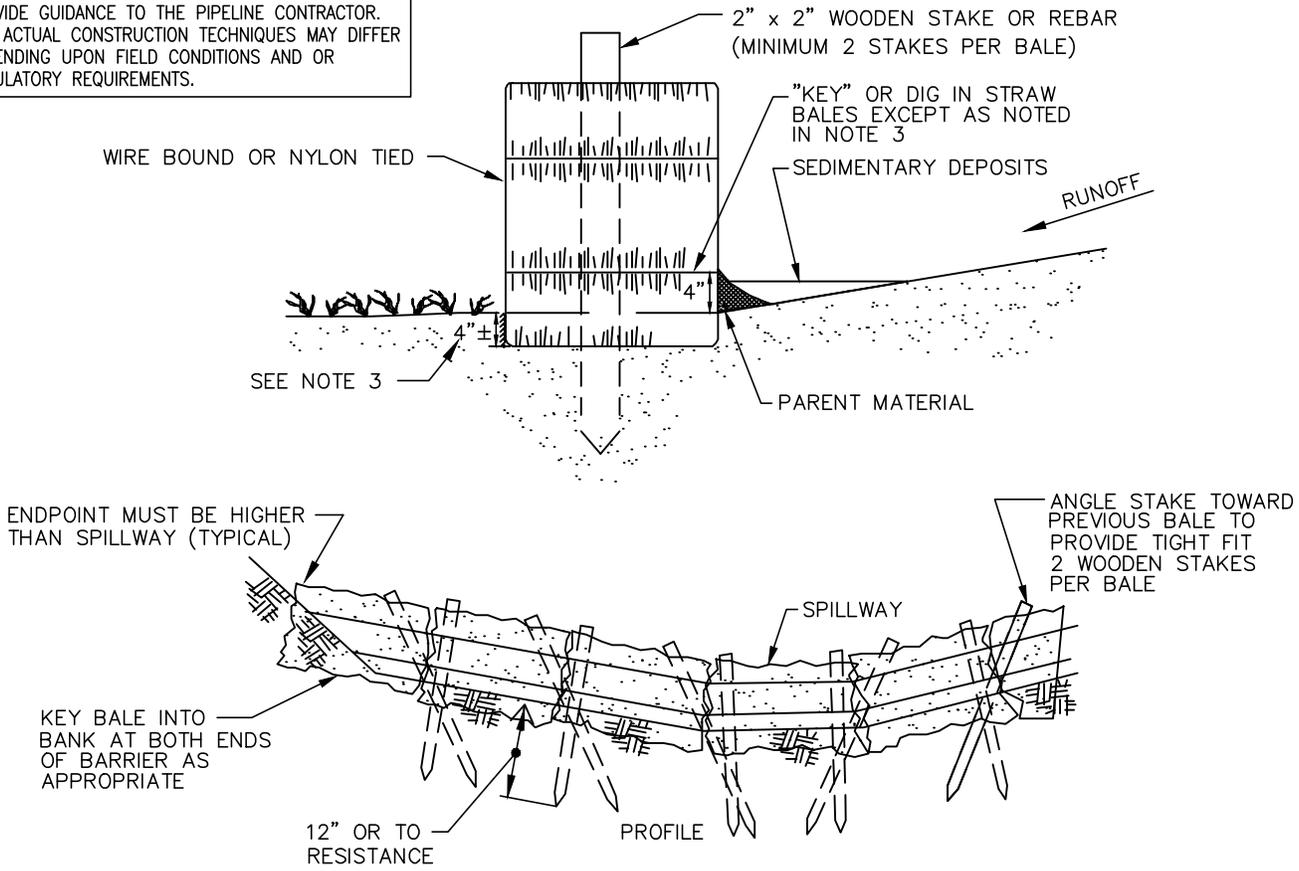
DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

EROSION CONTROL
SILT FENCE SEDIMENT BARRIER
(SFB)

DRAWING NO.	REV.
MVP-21	0

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.



NOTES:

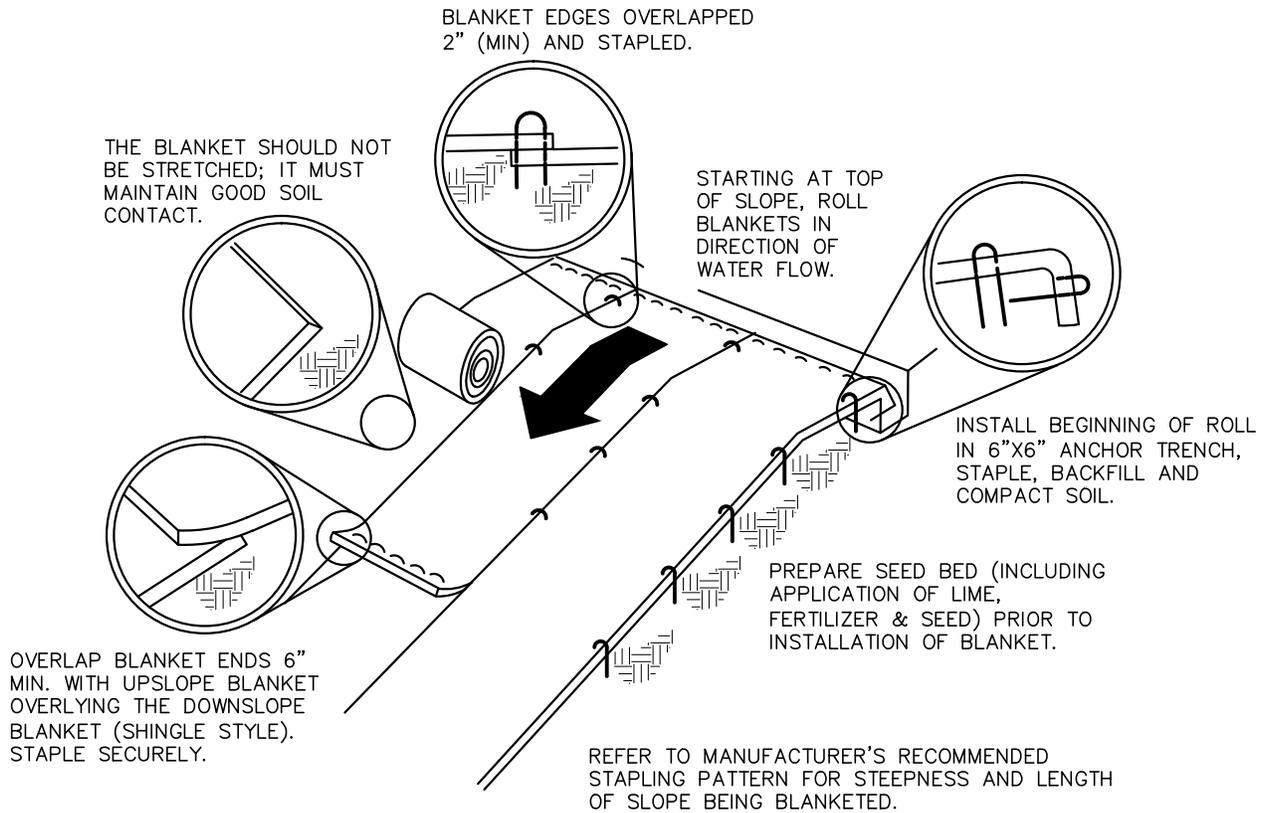
1. STRAW BALE SEDIMENT BARRIERS SHALL BE INSTALLED AT THE FOLLOWING LOCATIONS:
 - THE BASE OF ALL SLOPES ABOVE ROADS, SPRINGS, WETLANDS, IMPOUNDMENTS AND FLOWING STREAMS.
 - THE DOWNSLOPE RIGHT-OF-WAY EDGE WHERE ANY OF THE ABOVE-MENTIONED LOCATIONS ARE ADJACENT TO THE RIGHT-OF-WAY.
 - BETWEEN TOPSOIL/SPOIL STOCKPILES AND STREAMS OR WETLANDS AS NEEDED.
 - ALONG R.O.W. BOUNDARIES IN WETLAND CONSTRUCTION.
 - AS SPECIFIED IN THE SPILL PREVENTION, CONTAINMENT, AND COUNTERMEASURE PLAN.
 - AS DIRECTED BY THE COMPANY'S INSPECTOR.
2. STRAW BALE SEDIMENT BARRIERS SHALL CONSIST OF A ROW OF STRAW BALES, PLACED ON THE FIBER-CUT EDGE (TIES NOT IN CONTACT WITH THE GROUND). BALES SHALL BE TIGHTLY ABUTTED TO ONE ANOTHER. THE BARRIER SHALL BE ONE BALE HIGH. ONLY CERTIFIED "NOXIOUS WEED-FREE" STRAW SHALL BE USED WHENEVER POSSIBLE.
3. ENTRENCH ("KEY") STRAW BALES INTO THE GROUND TO A DEPTH OF 4" EXCEPT IN FROZEN, SATURATED, OR EXTREMELY ROCKY SOILS. PLACE PARENT MATERIAL ON UPSTREAM SIDE OF STRAW BALES TO PREVENT UNDERMINING.
4. WALK ON STRAW BALES TO INSURE ADEQUATE BALE-TO-SOIL CONTACT.
5. ANCHOR STRAW BALES SECURELY IN PLACE WITH TWO WOODEN OR STEEL REBAR STAKES DRIVEN THROUGH THE TOPS OF THE BALES. THE STAKES SHALL PENETRATE THE GROUND A DISTANCE OF 12" UNLESS ROCK OR AN IMPERMEABLE LAYER IS ENCOUNTERED:
 - THE FIRST, CENTER AND END BALES OF THE BARRIER SHALL HAVE STAKES DRIVEN VERTICALLY THROUGH THE BALE.
 - BALES, OTHER THAN THOSE LOCATED AT THE ENDS OR CENTER OF THE BARRIER, SHALL HAVE THE FIRST STAKE DRIVEN THROUGH THE TOP OF THE BALE AT AN ANGLE SO THAT THE STAKE PASSES THROUGH THE PREVIOUSLY PLACED BALE, IN ORDER TO PROVIDE TIGHT CONTACT BETWEEN BALES. THE SECOND STAKE SHALL BE DRIVEN VERTICALLY THROUGH THE TOP OF THE BALE.

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PROJECT ID: PXXXX			



DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL	
EROSION CONTROL STRAW BALE SEDIMENT BARRIER (SBB)	
DRAWING NO. MVP-22	REV. 0



SEED AND SOIL AMENDMENTS SHALL BE APPLIED ACCORDING TO RATES IN THE PLAN DRAWINGS PRIOR TO INSTALLING THE BLANKET.

PROVIDE ANCHOR TRENCH AT TOE OF SLOPE IN SIMILAR FASHION AT THE TOP OF SLOPE.

SLOPE SURFACE SHALL BE FREE OF ROCKS, CLODS, STICKS AND GRASS.

BLANKET SHALL HAVE GOOD CONTINUOUS CONTACT AND UNDERLYING SOIL THROUGHOUT ENTIRE LENGTH. LAY BLANKET LOOSELY AND STAKE OR STAPLE TO MAINTAIN DIRECT CONTACT WITH SOIL. DO NOT STRETCH BLANKET.

BLANKET SHALL BE STAPLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

BLANKET AREAS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT UNTIL PERENNIAL VEGETATION IS ESTABLISHED TO A MINIMUM UNIFORM 70% COVERAGE THROUGHOUT THE BLANKETED AREA. DAMAGED OR DISPLACED BLANKETS SHALL BE RESTORED OR REPLACED WITHIN 4 CALENDAR DAYS.

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWN	JDM	DATE	9/8/2015
CHECKED	RRR	DATE	10/01/15
APP'D	RLM	DATE	10/01/15
SCALE	N.T.S.	SHEET	1 OF 1
JOB NO.			
PROJECT ID: PXXXX			



DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

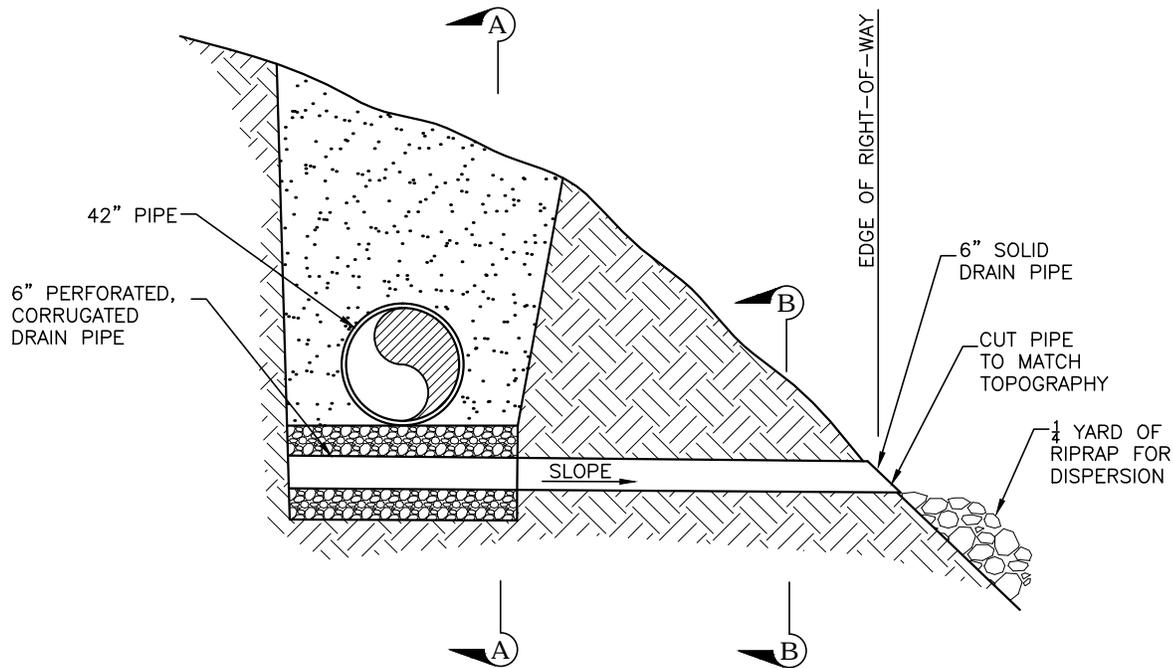
SLOPE INSTALLATION

DRAWING NO.

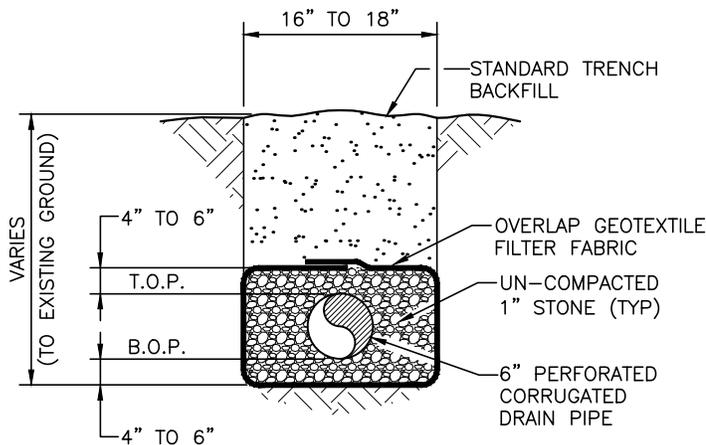
MVP-23

REV.

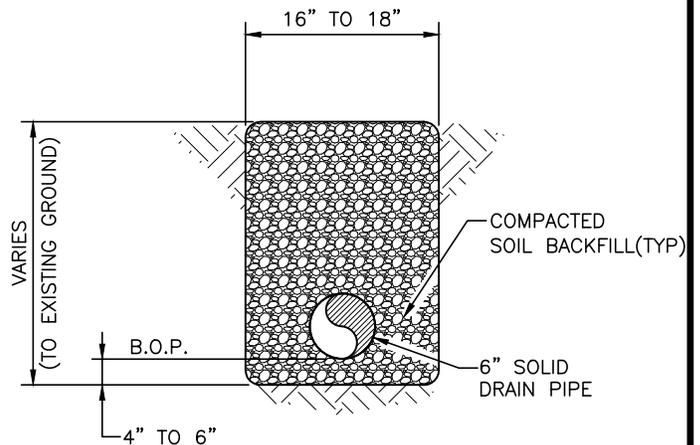
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MAINLINE CROSS SECTION



SECTION A-A



SECTION B-B

NOTES

1. LOW POINT DITCH DRAINS SHALL BE INSTALLED AT LOCATIONS SPECIFIED IN THE APPROVED EROSION & SEDIMENTATION CONTROL PLAN, AND AS DIRECTED BY THE ENVIRONMENTAL INSPECTOR.
2. FILL STONE SHOULD BE 1" AGGREGATE WITHOUT FINES, CRUSHER RUN WITHOUT FINES, OR EQUIVALENT.
3. DRAIN PIPE TO BE CONNECTED USING STANDARD PIPE COLLARS.

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWN	JIL	DATE	10/6/2016
CHECKED	MMF	DATE	10/6/2016
APP'D	xxx	DATE	10/6/2016
SCALE	N.T.S.	SHEET	1 OF 1
JOB NO.			
PROJECT ID:			
PXXXX			

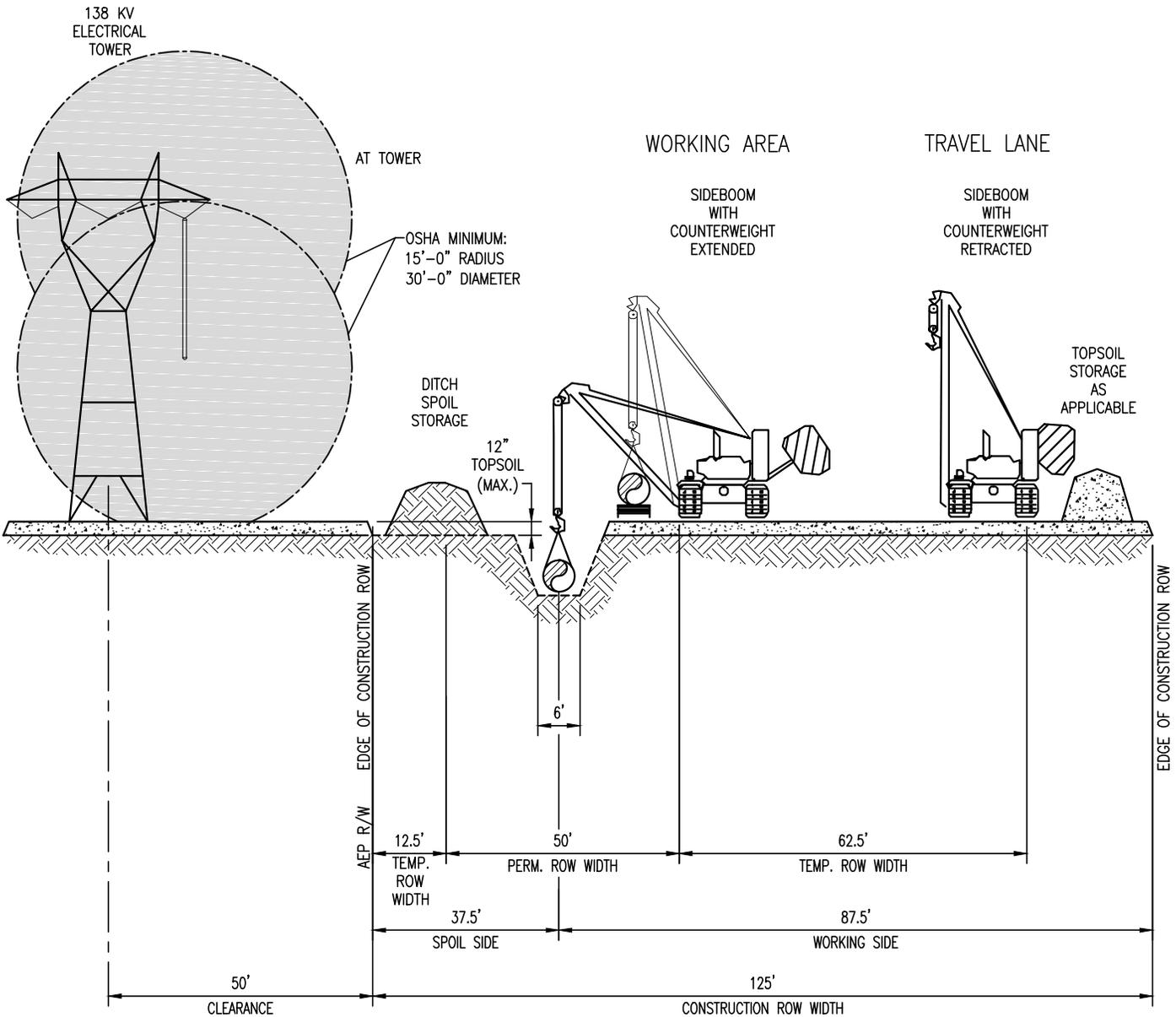


DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

SIDEHILL LOW-POINT DRAIN
TYPICAL

DRAWING NO.	REV.
MVP-24	0



THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWING ASSUMES TYPE "B" SOIL

DRAWN	JDM	DATE	3/17/15
CHECKED	RRR	DATE	10/01/15
APP'D	RLM	DATE	10/01/15
SCALE	N.T.S.	SHEET	1 OF 1
JOB NO.			
PROJECT ID: PXXXX			

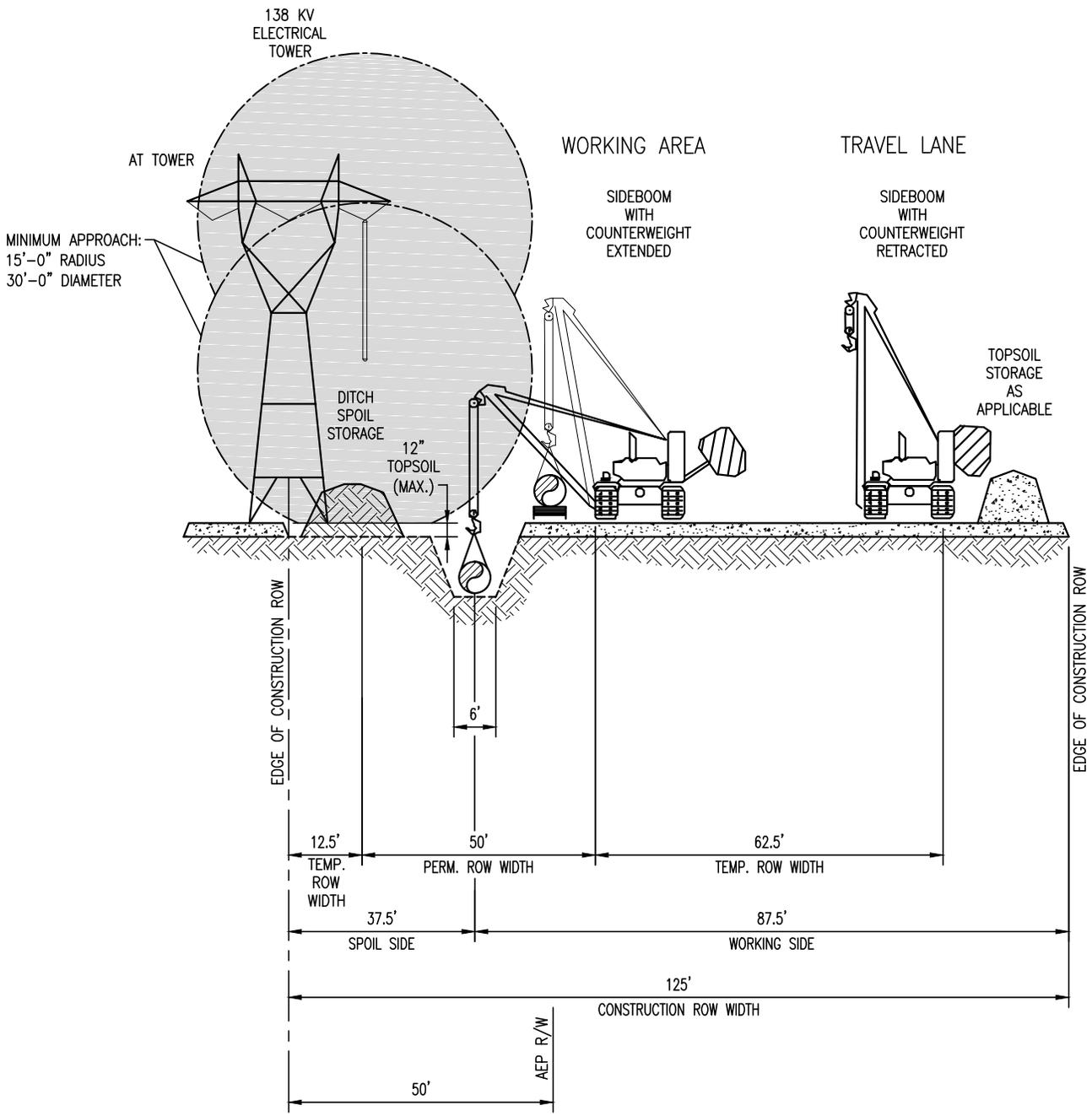


DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

MAINLINE CONSTRUCTION
PARALLEL TO POWER LINES
RIGHT-OF-WAY

DRAWING NO. MVP-25	REV. 0
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THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

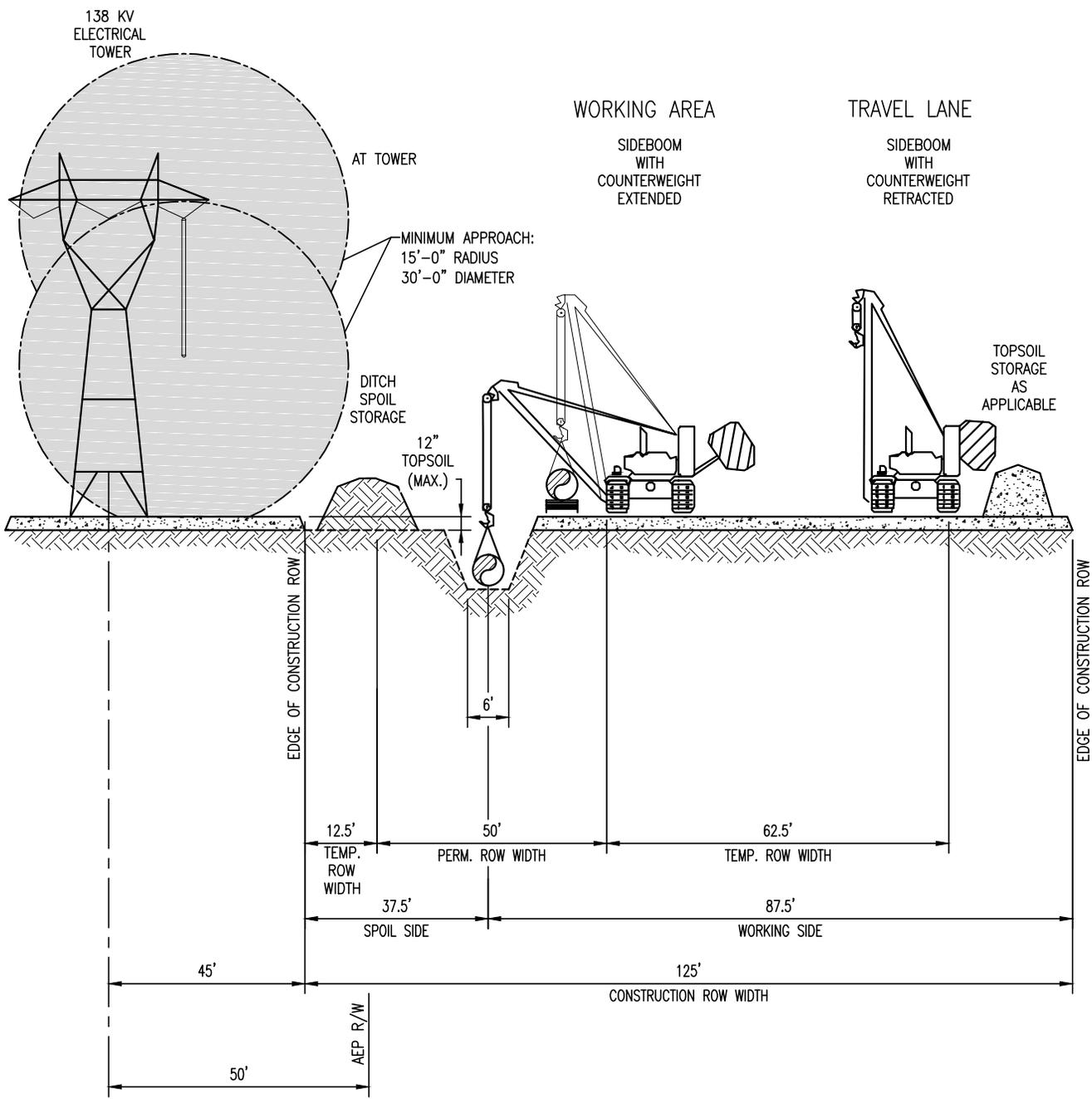
DRAWING ASSUMES TYPE "B" SOIL

DRAWN	JDM	DATE	3/17/15
CHECKED	RRR	DATE	10/01/15
APP'D	RLM	DATE	10/01/15
SCALE	N.T.S.	SHEET	1 OF 1
JOB NO.			
PROJECT ID:			
PXXXX			



DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL	
MAINLINE CONSTRUCTION PARALLEL TO POWER LINES RIGHT-OF-WAY	
DRAWING NO.	REV.
MVP-26	0



THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

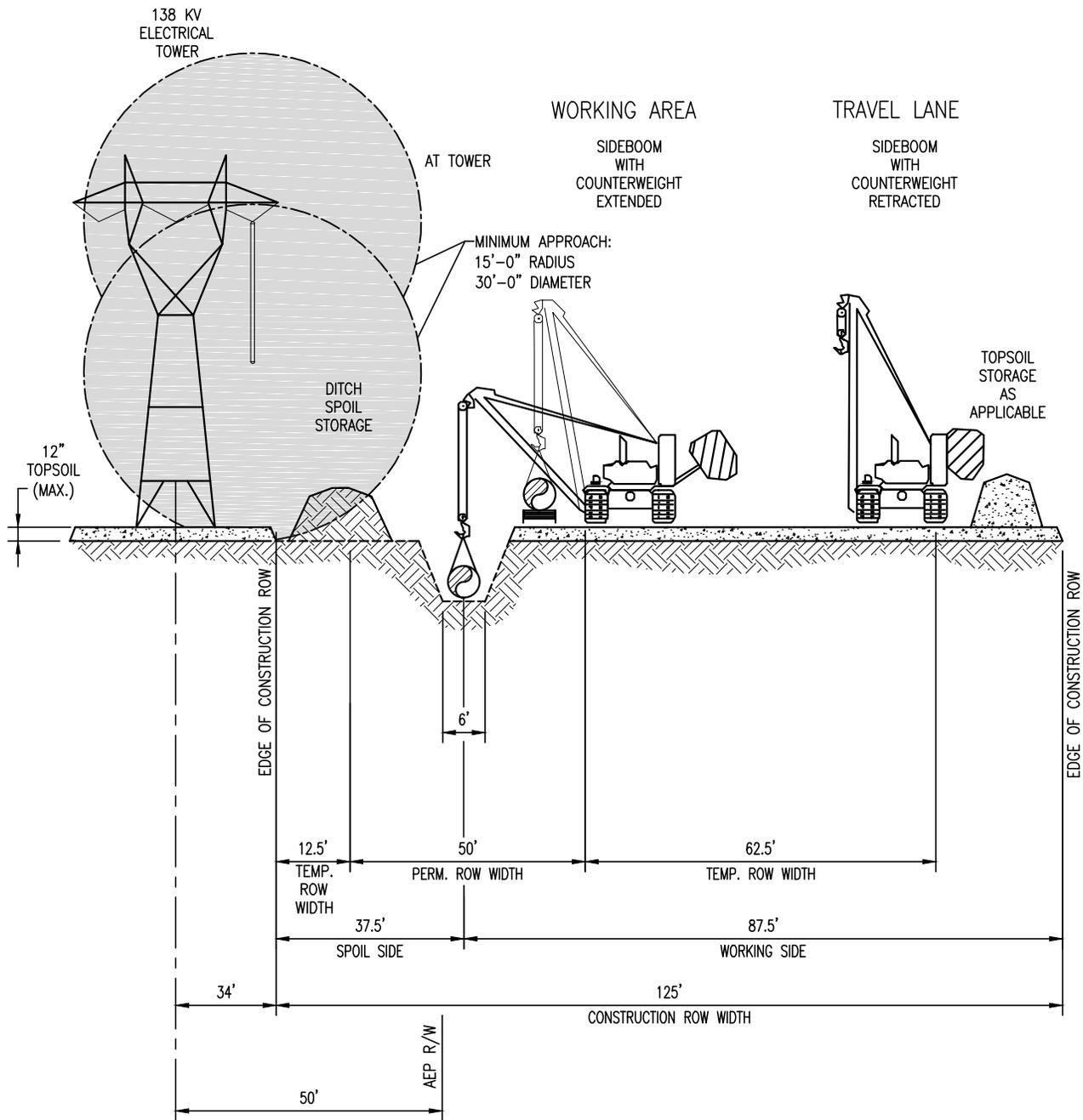
DRAWING ASSUMES TYPE "B" SOIL

DRAWN	JDM	DATE	3/17/15
CHECKED	RRR	DATE	10/01/15
APP'D	RLM	DATE	10/01/15
SCALE	N.T.S.	SHEET	1 OF 1
JOB NO.			
PROJECT ID: PXXXX			



DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL	
MAINLINE CONSTRUCTION PARALLEL TO POWER LINES RIGHT-OF-WAY	
DRAWING NO. MVP-27	REV. 0



THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWING ASSUMES TYPE "B" SOIL

DRAWN	JDM	DATE	3/17/15
CHECKED	RRR	DATE	10/01/15
APP'D	RLM	DATE	10/01/15
SCALE	N.T.S.	SHEET	1 OF 1
JOB NO.			
PROJECT ID:			
PXXXX			



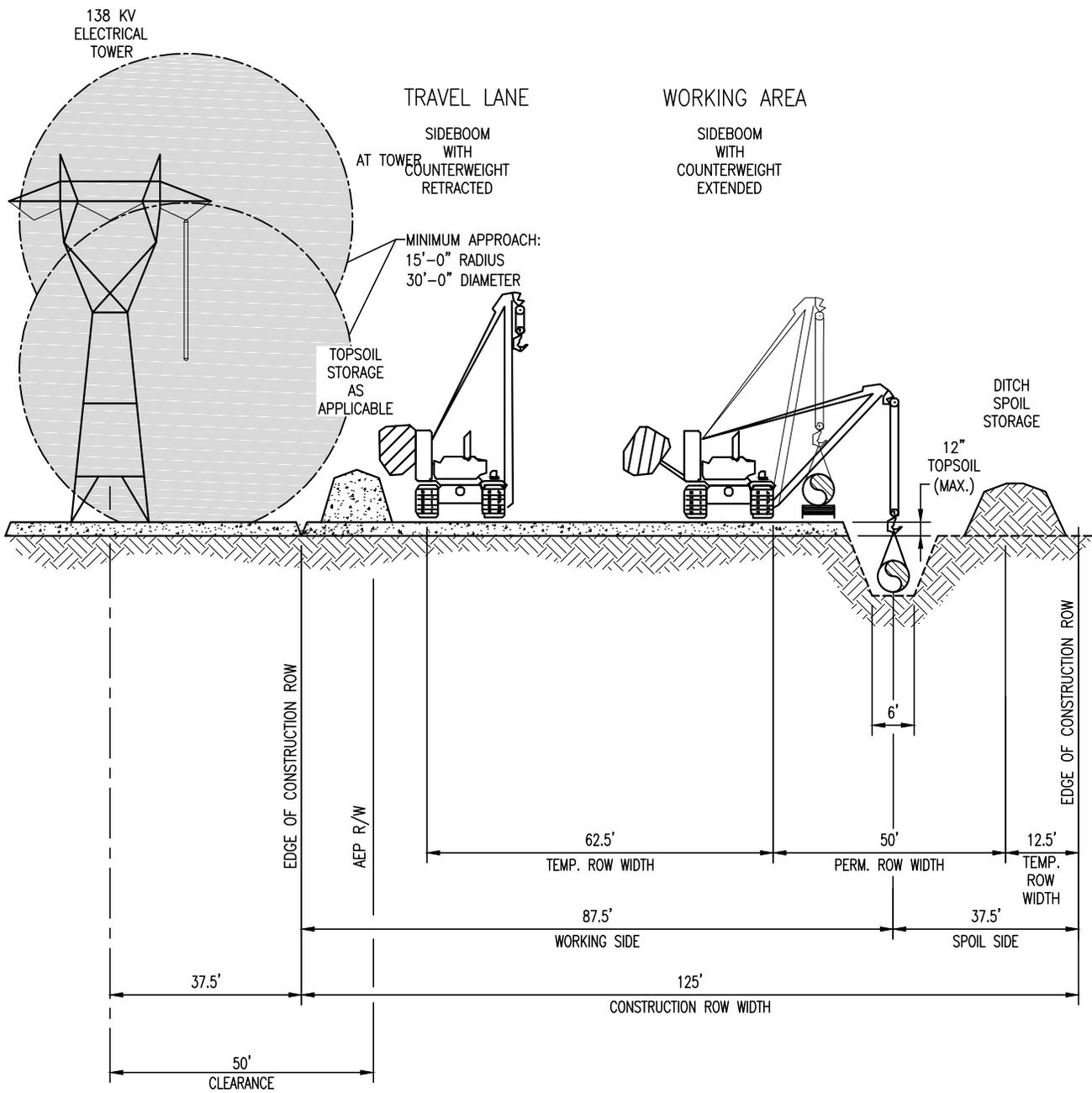
DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

MAINLINE CONSTRUCTION
PARALLEL TO POWER LINES
RIGHT-OF-WAY

DRAWING NO.	MVP-28
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REV.	0
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THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWING ASSUMES TYPE "B" SOIL

DRAWN	JDM	DATE	3/17/15
CHECKED	RRR	DATE	10/01/15
APP'D	RLM	DATE	10/01/15
SCALE	N.T.S.	SHEET	1 OF 1
JOB NO.			
PROJECT ID: PXXXX			

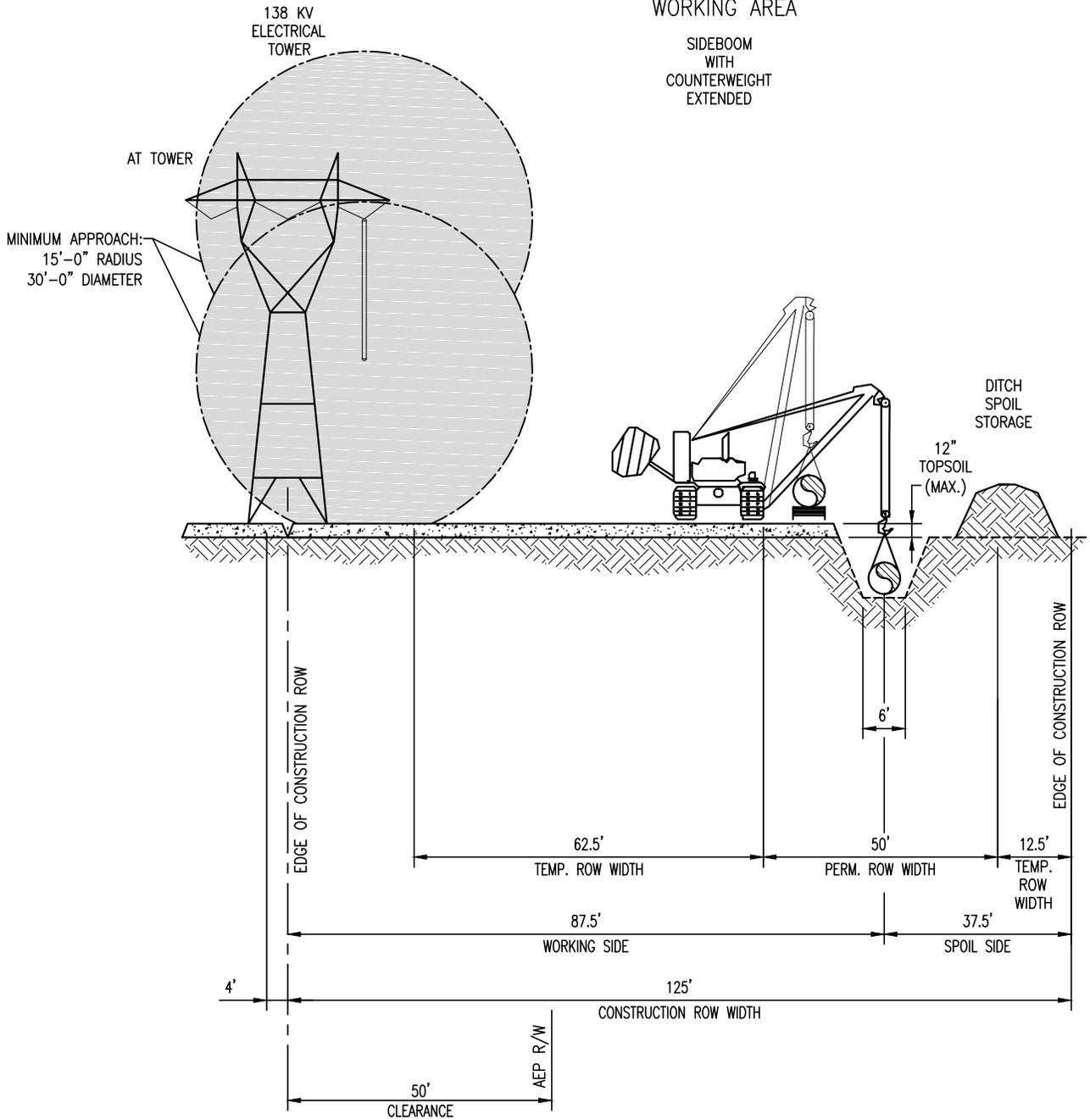


DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

MAINLINE CONSTRUCTION
PARALLEL TO POWER LINES
RIGHT-OF-WAY

DRAWING NO. MVP-29	REV. 0
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THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWING ASSUMES TYPE "B" SOIL

DRAWN	JDM	DATE	3/17/15
CHECKED	RRR	DATE	10/01/15
APP'D	RLM	DATE	10/01/15
SCALE	N.T.S.	SHEET	1 OF 1
JOB NO.			
PROJECT ID:			
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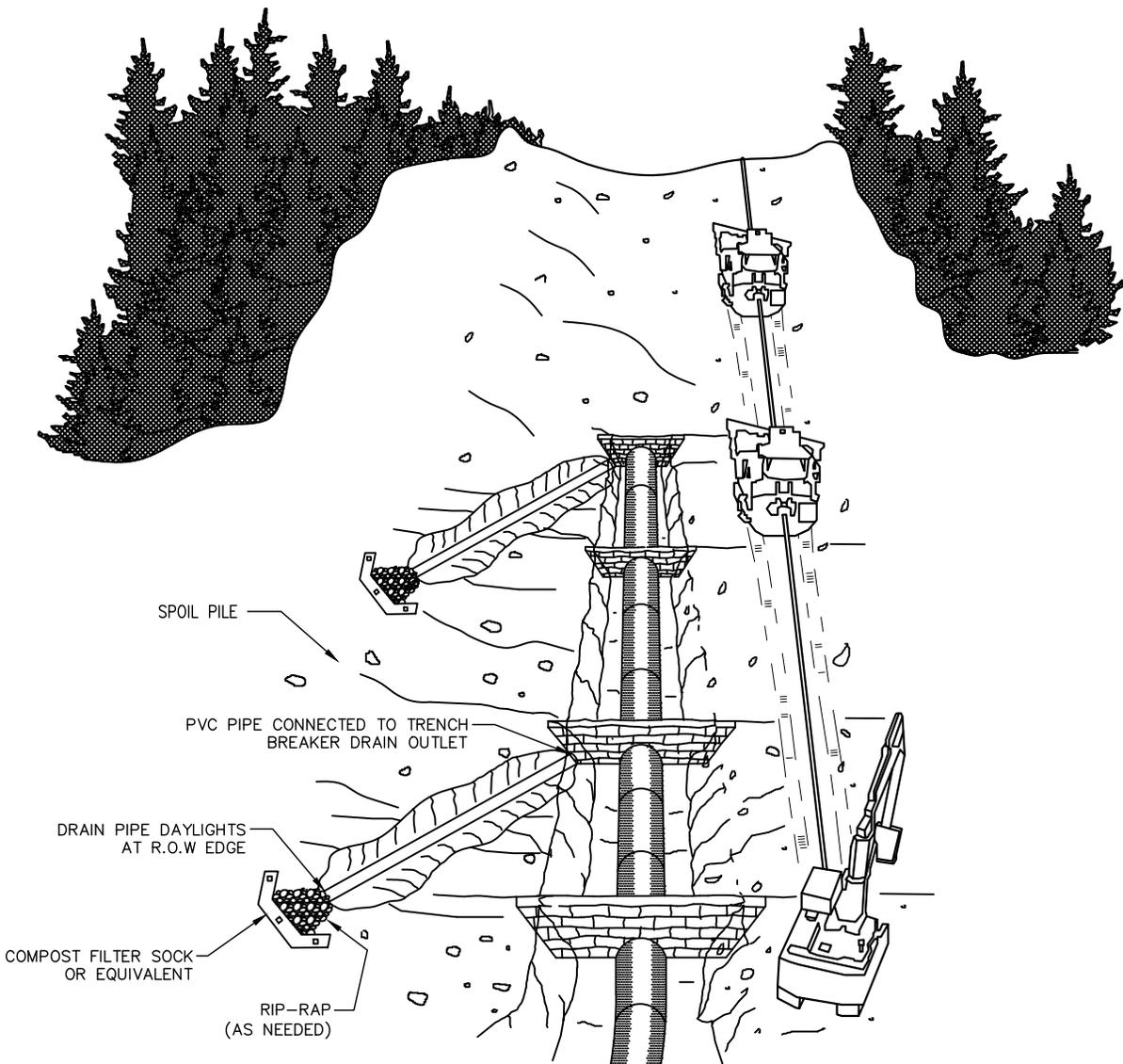


DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

MAINLINE CONSTRUCTION
PARALLEL TO POWER LINES
RIGHT-OF-WAY

DRAWING NO.	REV.
MVP-30	0



NOTES:

1. WINCHES MAY BE REQUIRED FOR MOVING EQUIPMENT AND MATERIAL, AND DURING CONSTRUCTION ON STEEP LONGITUDINAL SLOPES.
2. WINCHES WILL EITHER BE FIXED WINCHES OR TRACKED EQUIPMENT WITH WINCHES.
3. WINCHES WILL TYPICALLY BE REQUIRED FOR SLOPES OF 30% (17°) AND UP.

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWING ASSUMES TYPE "B" SOIL

DRAWN	JDM	DATE	03/28/16
CHECKED	RRR	DATE	04/06/16
APP'D	RLM	DATE	04/06/16
SCALE	N.T.S.	SHEET	1 OF 1
JOB NO.			
PROJECT ID:			
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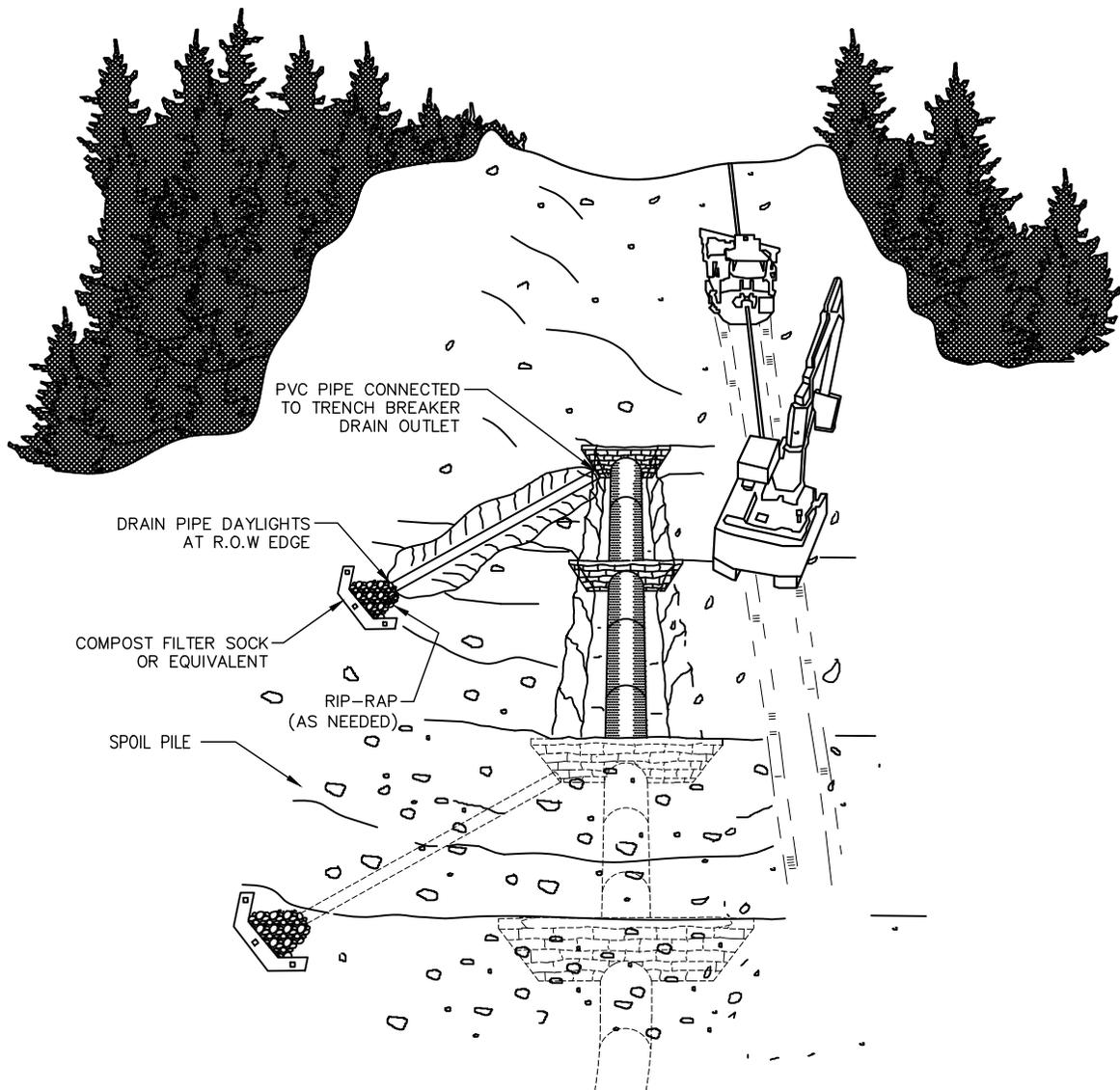


DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

MAINLINE CONSTRUCTION
 STEEP HILL PARALLEL CONSTRUCTION
 NO TOP SOIL SEGREGATION

DRAWING NO.	REV.
MVP-31	0



NOTES:

1. WINCHES MAY BE REQUIRED FOR MOVING EQUIPMENT AND MATERIAL, AND DURING CONSTRUCTION ON STEEP LONGITUDINAL SLOPES.
2. WINCHES WILL EITHER BE FIXED WINCHES OR TRACKED EQUIPMENT WITH WINCHES.
3. WINCHES WILL TYPICALLY BE REQUIRED FOR SLOPES OF 30% (17°) AND UP.

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWING ASSUMES TYPE "B" SOIL

DRAWN	JIL	DATE	06/23/16
CHECKED	RRR	DATE	06/23/16
APP'D	RLM	DATE	06/23/16
SCALE	N.T.S.	SHEET	1 OF 1
JOB NO.			
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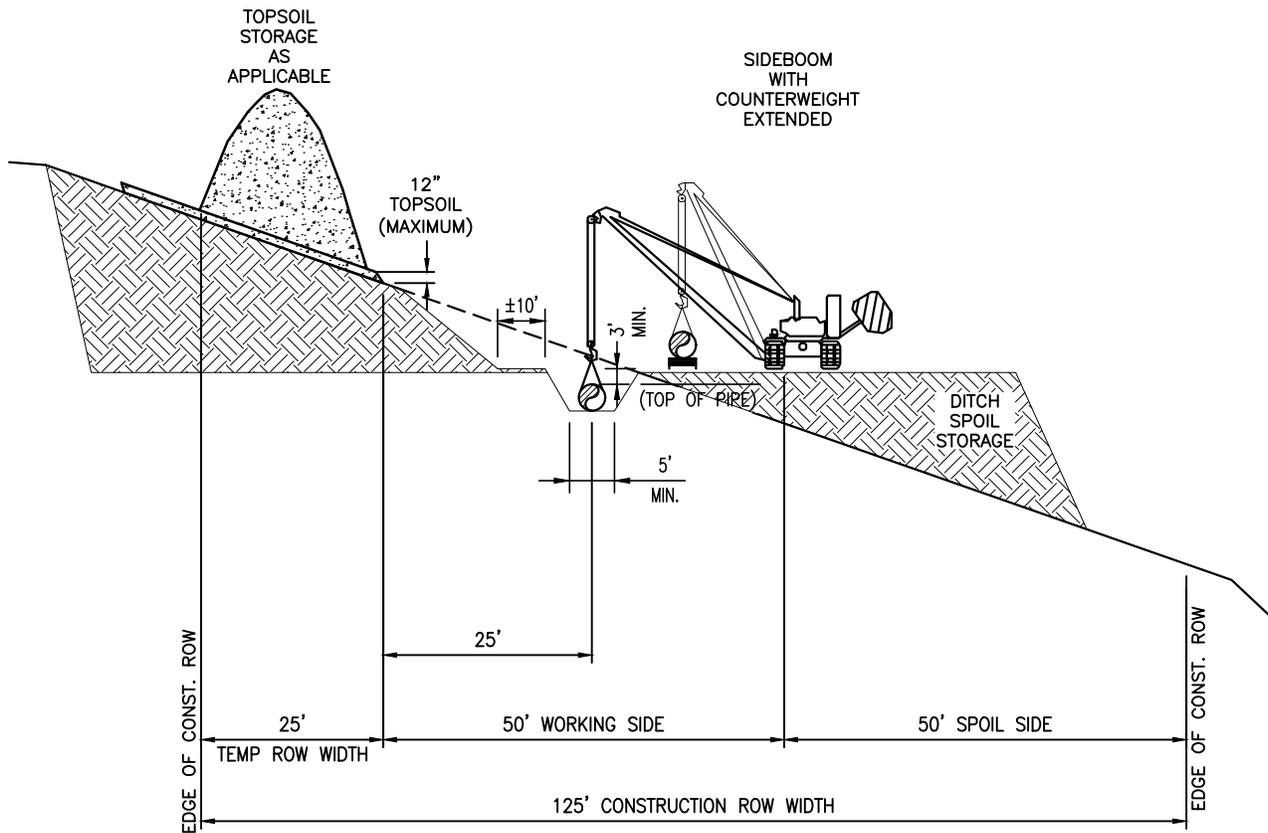


DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

MAINLINE CONSTRUCTION
 STEEP HILL STOVE PIPE CONSTRUCTION
 JEFFERSON NATIONAL FOREST
 NO TOP SOIL SEGREGATION

DRAWING NO.	REV.
MVP-32	0



NOTES:

1. SEEPS OR SPRINGS ENCOUNTERED IN THE EXCAVATION SHALL BE INTERCEPTED BY TRANSVERSE TRENCH DRAINS, CUTOFF DRAINS, OR SIMILAR, AND DIRECTED OUT OF THE PIPELINE DITCH TO AN ENERGY DISSIPATING STRUCTURE (SUCH AS A RIPRAP APRON).
2. BACKFILL MATERIAL SHALL EXCLUDE ORGANIC MATERIAL, VEGETATION, STUMPS, ROOT SYSTEMS, FROZEN MATERIAL, AND ROCKS LARGER THAN THREE INCHES IN DIAMETER.
3. BACKFILL OPERATIONS SHALL BE PERFORMED WHEN SOIL MOISTURE CONTENT IS SUITABLE FOR COMPACTION, AT OR NEAR OPTIMUM MOISTURE CONTENT (I.E., NOT IMMEDIATELY FOLLOWING A LARGE PRECIPITATION EVENT OR WHEN SOIL IS EXCESSIVELY DRY).
4. BACKFILL MATERIAL SHALL BE PLACED IN COMPACTED LIFTS NO GREATER THAN 12 INCHES THICK.
5. BACKFILL COMPACTION SHALL BE ACCOMPLISHED USING THE BACK OF AN EXCAVATOR BUCKET, SHEEP'S FOOT ROLLER, OR SIMILAR.
6. WHERE A TEMPORARY CUT AND FILL SURFACE IS REQUIRED, ANY GROUND FRACTURES FORMING NEAR THE CUT/FILL LINE OR THE PIPELINE DITCH SHALL BE REPAIRED TO PREVENT WATER INFILTRATION.
7. ALL STREAMS, GULLIES, NATURAL DRAINS, FIELD ROADS OR TRAILS, AND OTHER WATER CONVEYING FEATURES SHALL BE PROPERLY RECONTOURED SUCH THAT THE PERMANENT RIGHT-OF-WAY IS PROTECTED FROM PREFERENTIAL WATER ACCUMULATION AND INFILTRATION.

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWN	EPG	DATE	10/06/16
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APP'D	RLM	DATE	10/06/16
SCALE	N.T.S.	SHEET	1 OF 1

JOB NO.
PROJECT ID:
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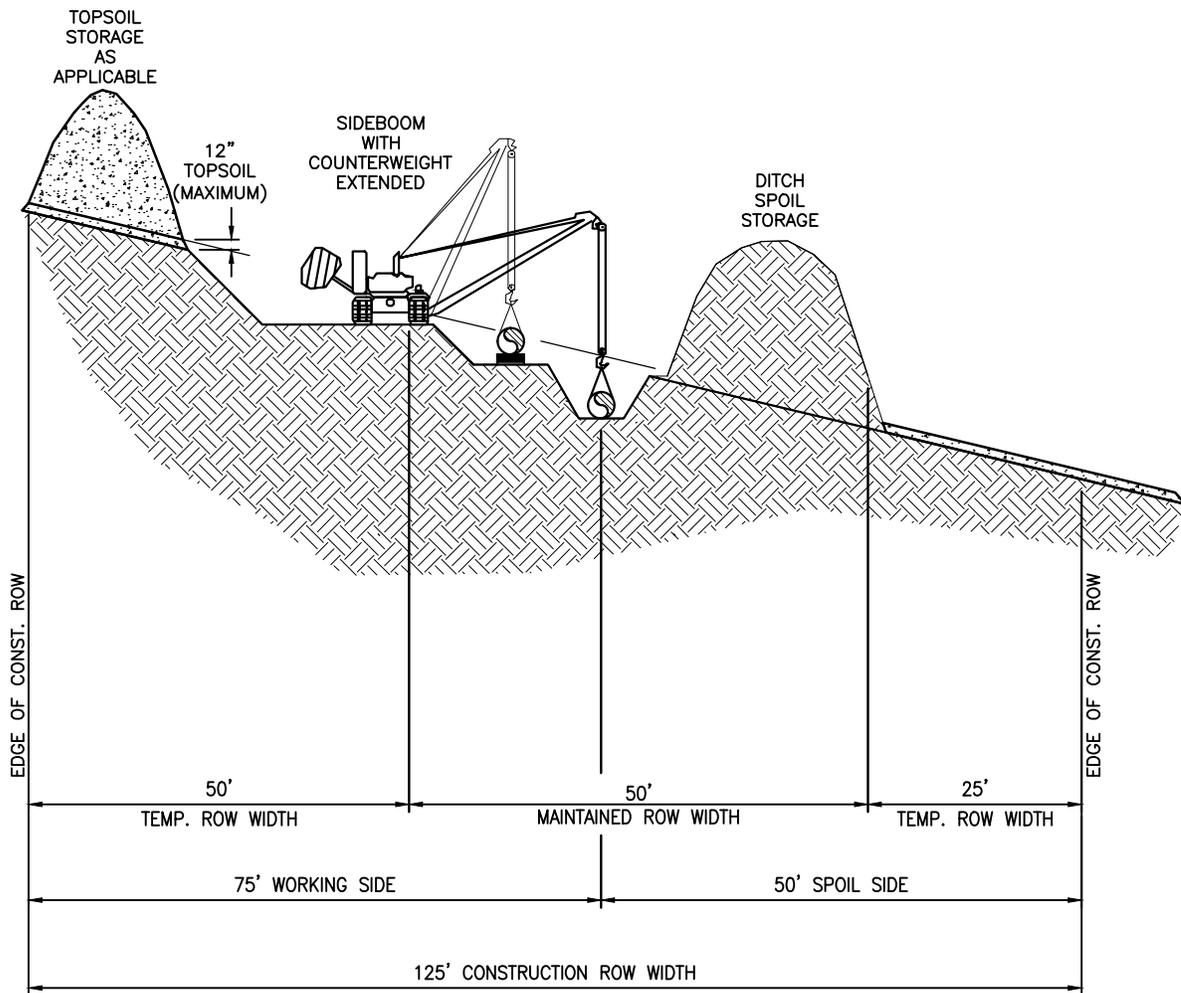


DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

MAINLINE CONSTRUCTION
SIDE HILL CONSTRUCTION
RIGHT OF WAY

DRAWING NO. MVP-33	REV. 0
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NOTES:

1. SEEPS OR SPRINGS ENCOUNTERED IN THE EXCAVATION SHALL BE INTERCEPTED BY TRANSVERSE TRENCH DRAINS, CUTOFF DRAINS, OR SIMILAR, AND DIRECTED OUT OF THE PIPELINE DITCH TO AN ENERGY DISSIPATING STRUCTURE (SUCH AS A RIPRAP APRON).
2. BACKFILL MATERIAL SHALL EXCLUDE ORGANIC MATERIAL, VEGETATION, STUMPS, ROOT SYSTEMS, FROZEN MATERIAL, AND ROCKS LARGER THAN THREE INCHES IN DIAMETER.
3. BACKFILL OPERATIONS SHALL BE PERFORMED WHEN SOIL MOISTURE CONTENT IS SUITABLE FOR COMPACTION, AT OR NEAR OPTIMUM MOISTURE CONTENT (I.E., NOT IMMEDIATELY FOLLOWING A LARGE PRECIPITATION EVENT OR WHEN SOIL IS EXCESSIVELY DRY).
4. BACKFILL MATERIAL SHALL BE PLACED IN COMPACTED LIFTS NO GREATER THAN 12 INCHES THICK.
5. BACKFILL COMPACTION SHALL BE ACCOMPLISHED USING THE BACK OF AN EXCAVATOR BUCKET, SHEEP'S FOOT ROLLER, OR SIMILAR.
6. WHERE A TEMPORARY CUT AND FILL SURFACE IS REQUIRED, ANY GROUND FRACTURES FORMING NEAR THE CUT/FILL LINE OR THE PIPELINE DITCH SHALL BE REPAIRED TO PREVENT WATER INFILTRATION.
7. ALL STREAMS, GULLIES, NATURAL DRAINS, FIELD ROADS OR TRAILS, AND OTHER WATER CONVEYING FEATURES SHALL BE PROPERLY RECONTOURED SUCH THAT THE PERMANENT RIGHT-OF-WAY IS PROTECTED FROM PREFERENTIAL WATER ACCUMULATION AND INFILTRATION.

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWN	EPG	DATE	10/06/16
CHECKED	MMF	DATE	10/06/16
APP'D	RLM	DATE	10/06/16
SCALE	N.T.S.	SHEET	1 OF 1
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DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

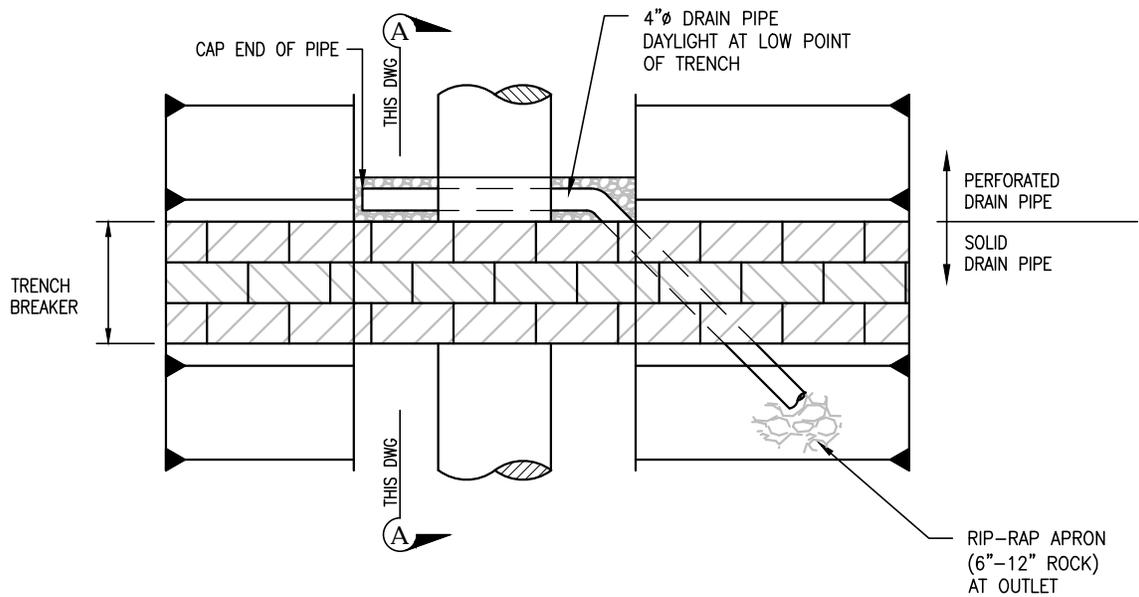
MAINLINE CONSTRUCTION
TWO TONE METHOD
RIGHT OF WAY

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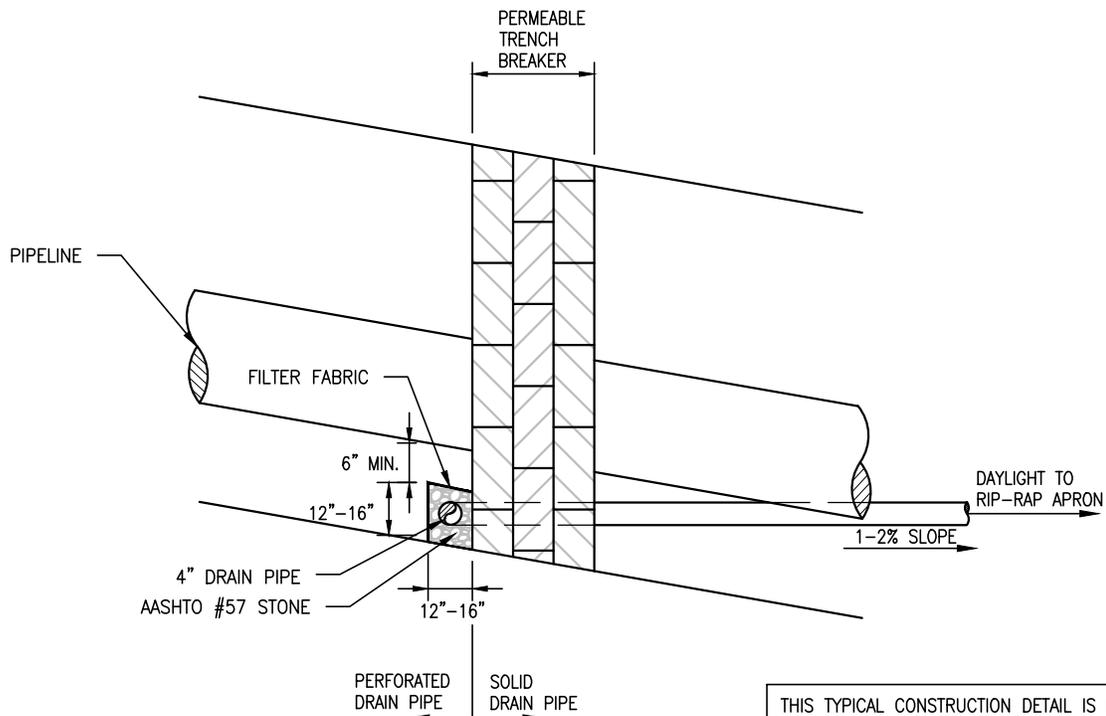
MVP-34

REV.

0



PLAN
SCALE: NOT TO SCALE



SECTION A-A
SCALE: NOT TO SCALE

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

Plotted by: Lutz, Keith on: October 18, 2016 - 3:37 PM

DRAWN	TDD	DATE	2/03/2016
CHECKED	MMF	DATE	2/03/2016
APP'D		DATE	
SCALE	N.T.S.	SHEET	1 OF 1
JOB NO.			
PROJECT ID:	PXXXX		

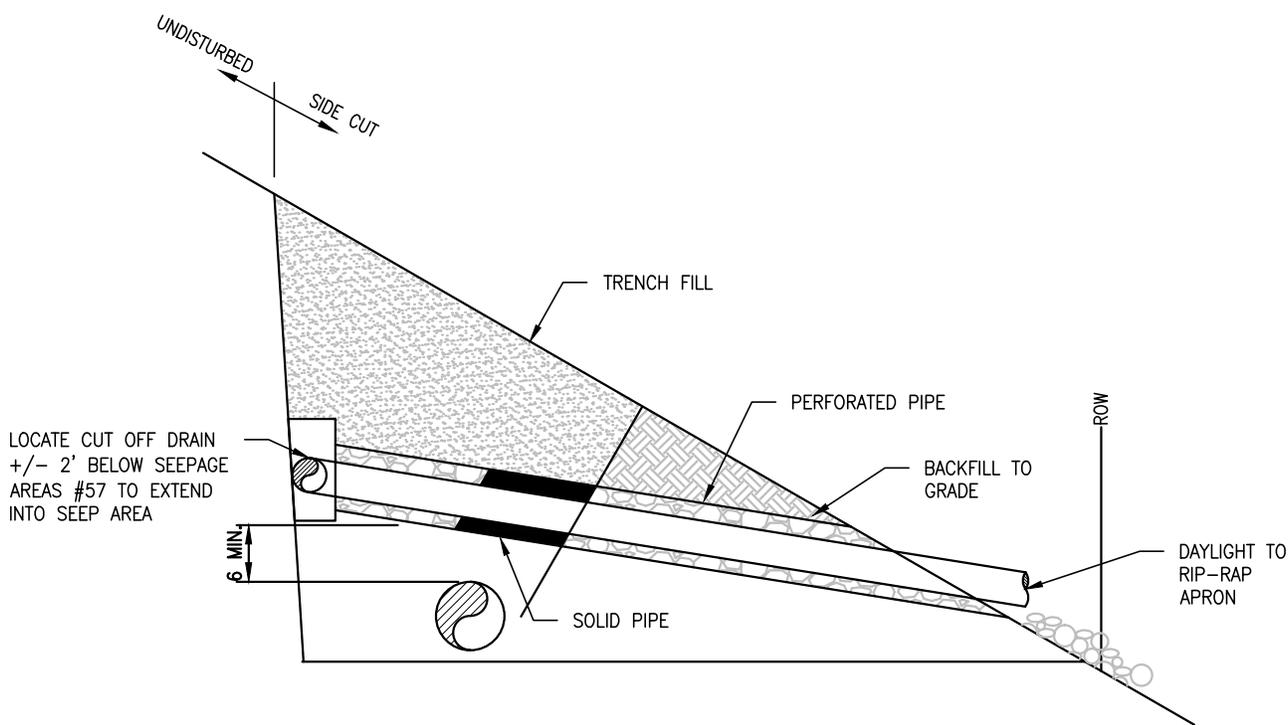
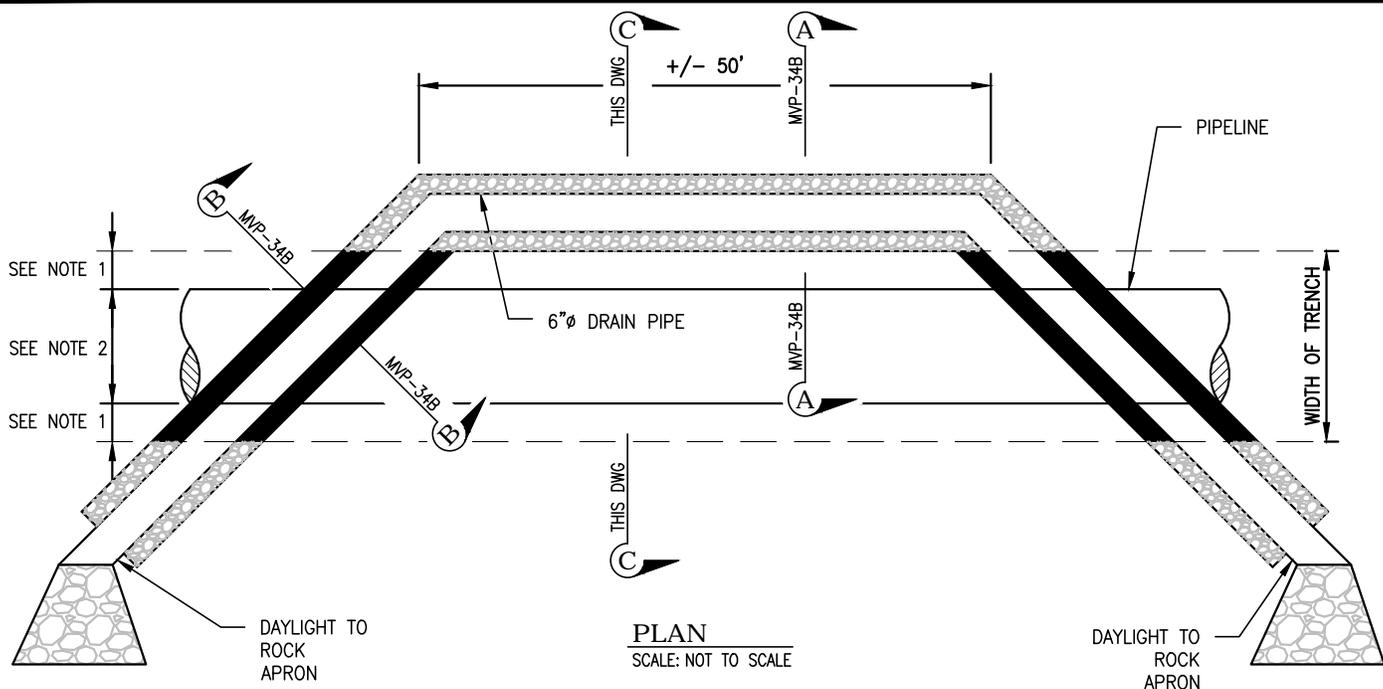


DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

TRENCH BREAKER DAYLIGHT DRAIN

DRAWING NO.	REV.
MVP-35	0



NOTES:

1. PERFORATED PIPE SURROUNDED BY #57 STONE.
2. SOLID PIPE (IN TRENCH) SURROUNDED BY TRENCH BACKFILL.

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

Plotted by: Lutz, Keith on: October 18, 2016 - 3:37 PM

DRAWN	TDD	DATE	2/03/2016
CHECKED	MMF	DATE	2/03/2016
APP'D		DATE	
SCALE	N.T.S.	SHEET	1 OF 2
JOB NO.			
PROJECT ID:	PXXXX		



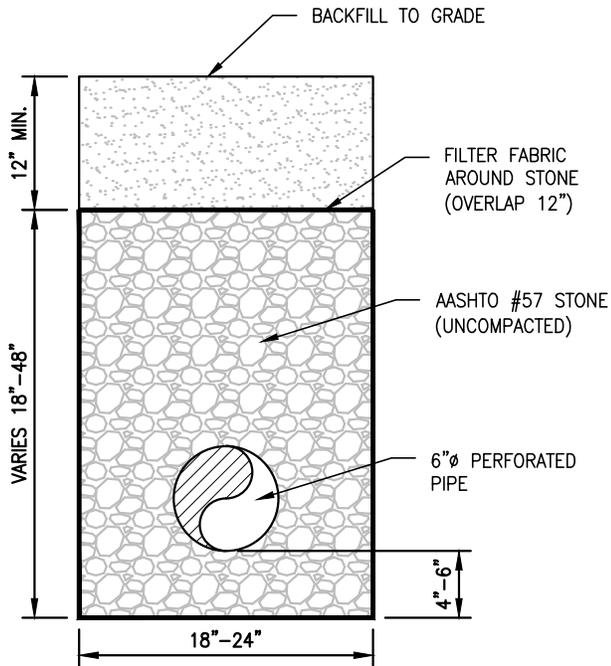
DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

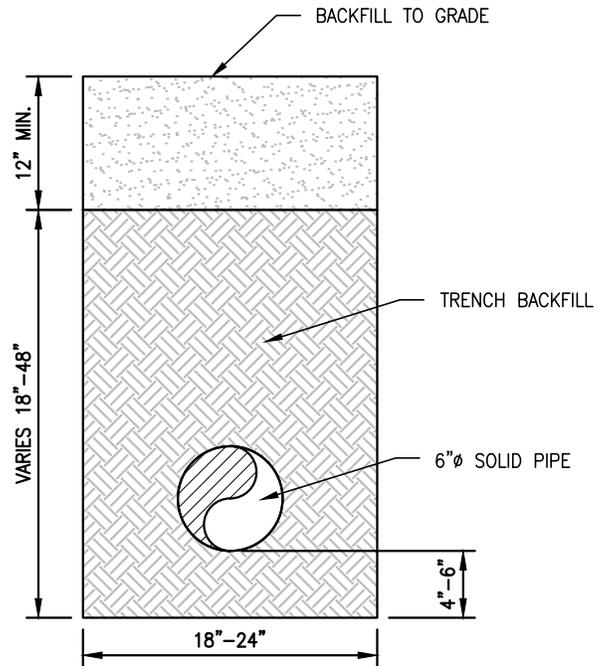
CUTOFF DRAIN-SIDEHILL

DRAWING NO. MVP-36A

REV. 0



SECTION A-A
SCALE: NOT TO SCALE
FROM MVP-34A



SECTION B-B
SCALE: NOT TO SCALE
FROM MVP-34A

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

Plotted by: Lutz, Keith on: October 18, 2016 - 3:38 PM

DRAWN	TDD	DATE	2/03/2016
CHECKED	MMF	DATE	2/03/2016
APP'D		DATE	
SCALE	N.T.S.	SHEET	2 OF 2
JOB NO.			
PROJECT ID:			
PXXXX			



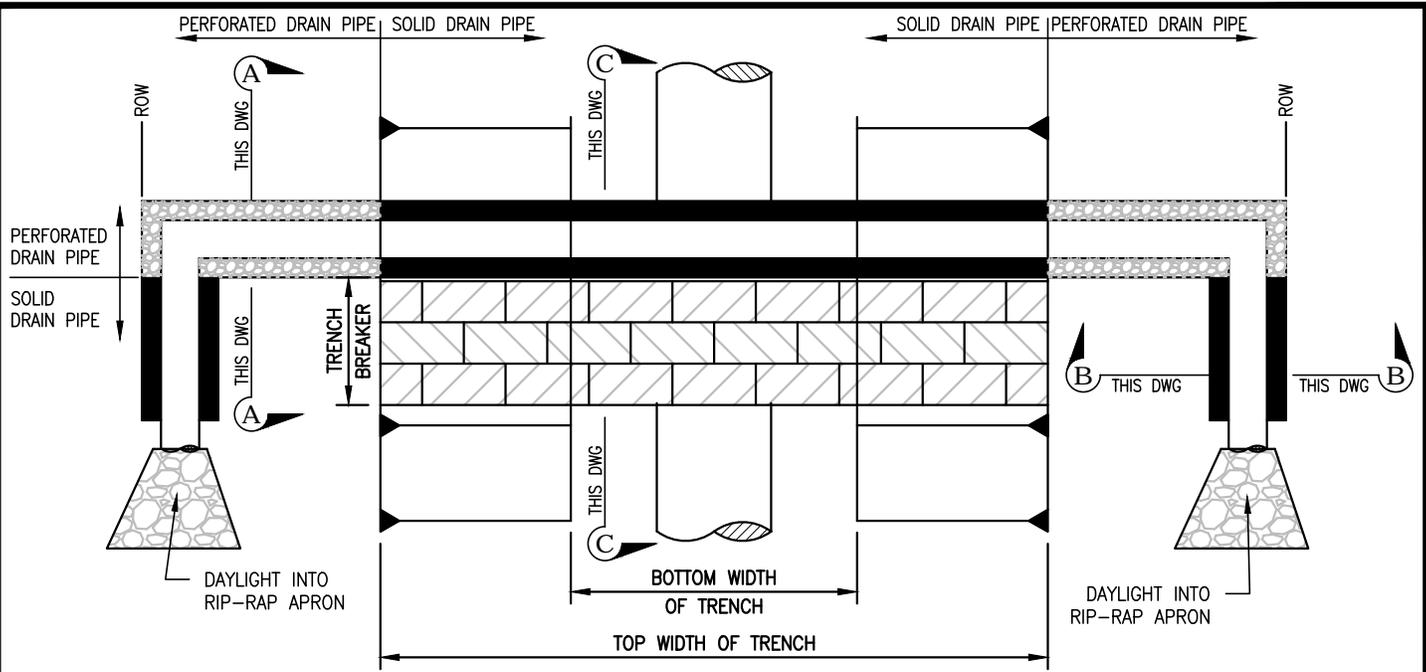
DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

CUTOFF DRAIN-SIDEHILL

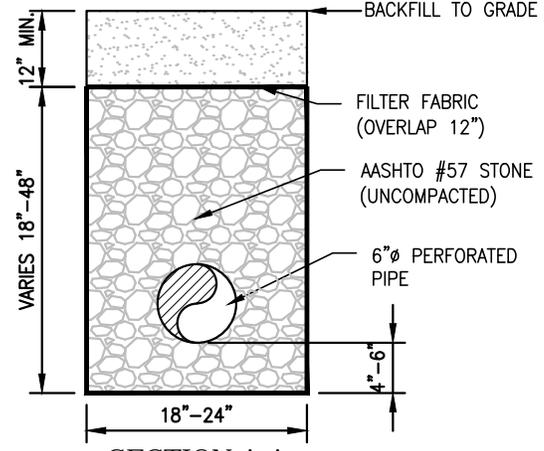
DRAWING NO.	MVP-36B
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REV.	0
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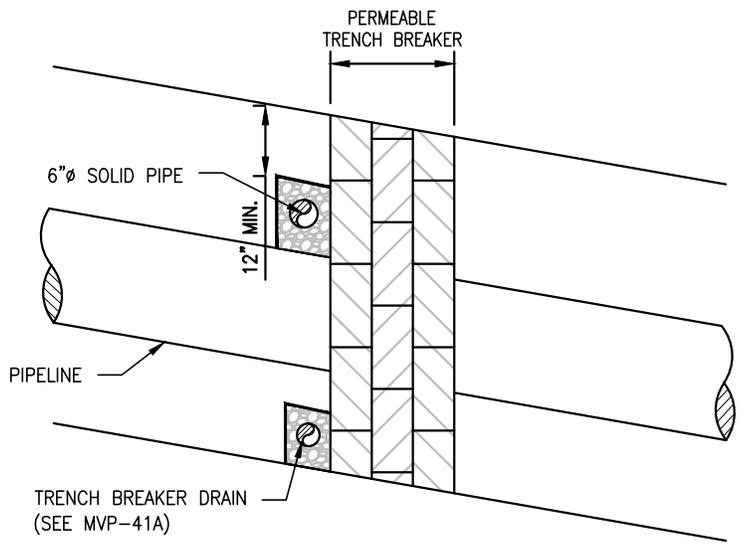


PLAN
SCALE: NOT TO SCALE

NOTES:
1. EACH CUTOFF DRAIN SHALL UTILIZE A TRENCH BREAKER DRAIN (SEE DETAIL 1) TO DRAIN THE TRENCH.

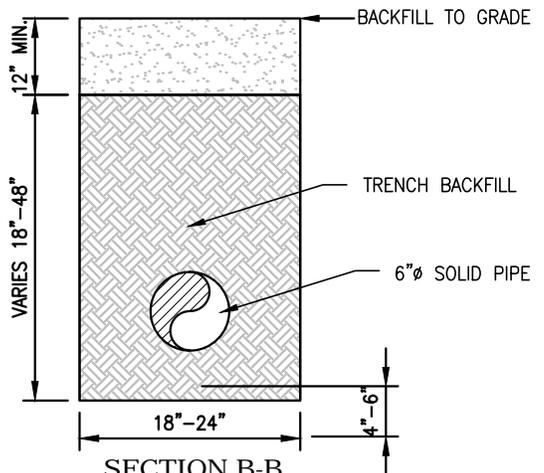


SECTION A-A
SCALE: NOT TO SCALE



SECTION C-C
SCALE: NOT TO SCALE

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.



SECTION B-B
SCALE: NOT TO SCALE

Plotted by: Lutz, Keith on: October 18, 2016 - 3:38 PM

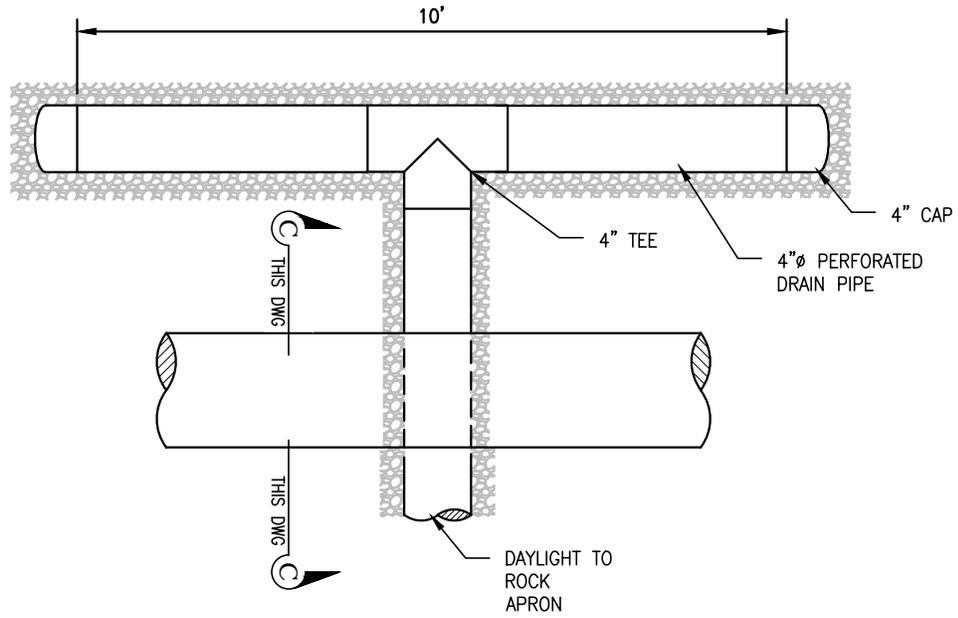
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CHECKED	MMF	DATE	2/03/2016
APP'D		DATE	
SCALE	N.T.S.	SHEET	1 OF 1
JOB NO.			
PROJECT ID:	PXXXX		



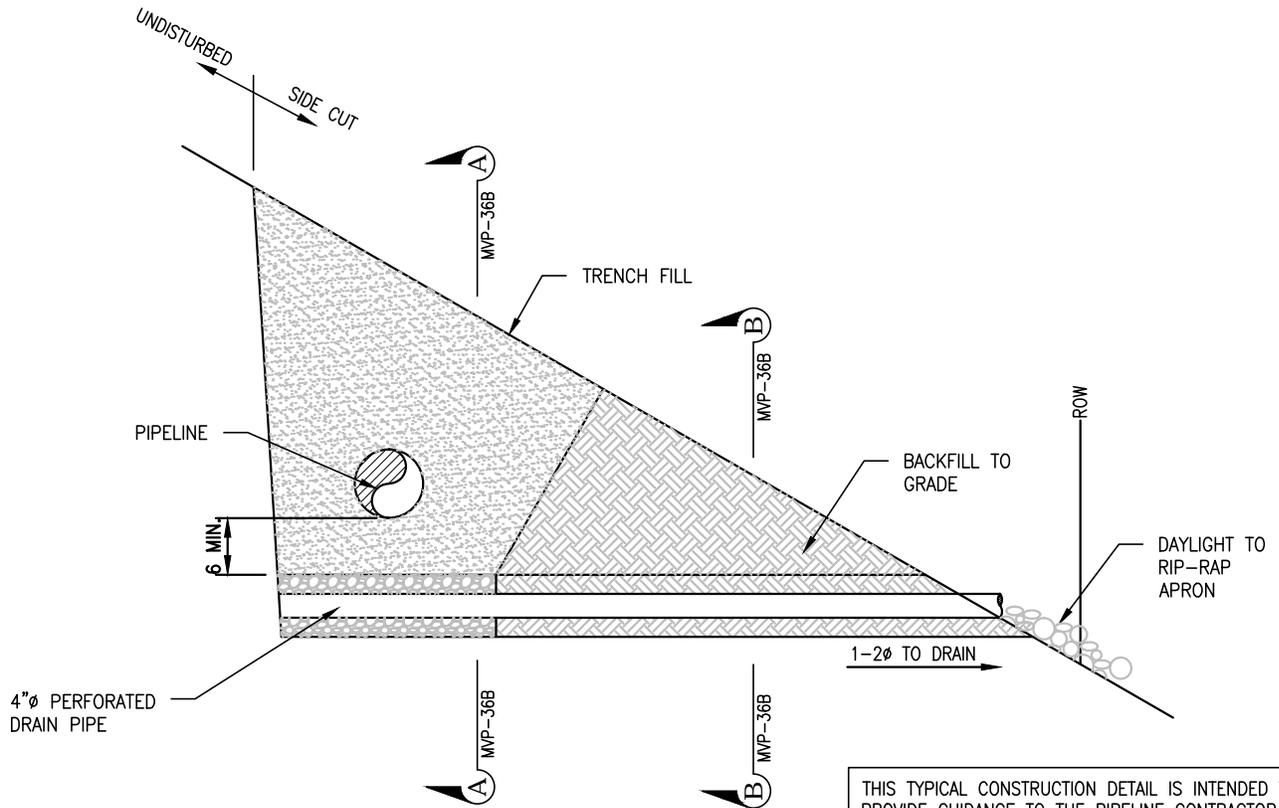
DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

CUTOFF DRAIN-PLANAR	
DRAWING NO.	REV.
MVP-37	0



PLAN
SCALE: NOT TO SCALE



C-C
SCALE: NOT TO SCALE

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

Plotted by: Lutz, Keith on: October 18, 2016 - 3:39 PM

DRAWN	TDD	DATE	2/03/2016
CHECKED	MMF	DATE	2/03/2016
APP'D		DATE	
SCALE	N.T.S.	SHEET	1 OF 2
JOB NO.			
PROJECT ID:	PXXXX		



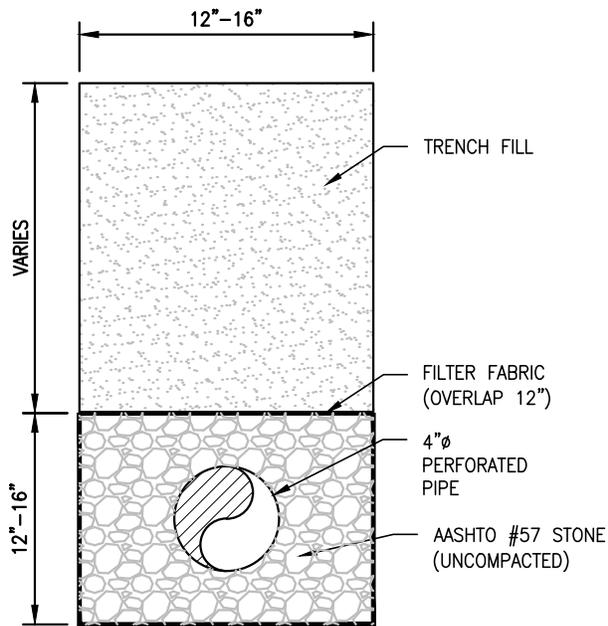
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TYPICAL CONSTRUCTION DETAIL

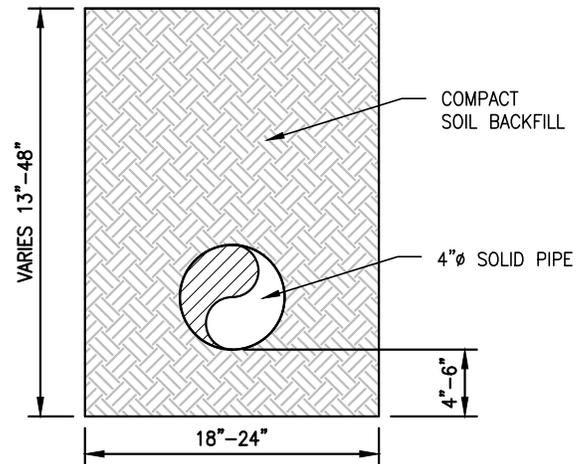
TRANSVERSE TRENCH DRAIN

DRAWING NO.
MVP-38A

REV.
0



SECTION A-A
SCALE: NOT TO SCALE
FROM MVP-36A



SECTION B-B
SCALE: NOT TO SCALE
FROM MVP-36A

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

Plotted by: Lutz, Keith on: October 18, 2016 - 3:39 PM

DRAWN	TDD	DATE	2/03/2016
CHECKED	MMF	DATE	2/03/2016
APP'D		DATE	
SCALE	N.T.S.	SHEET	2 OF 2
JOB NO.			
PROJECT ID:			
PXXXX			



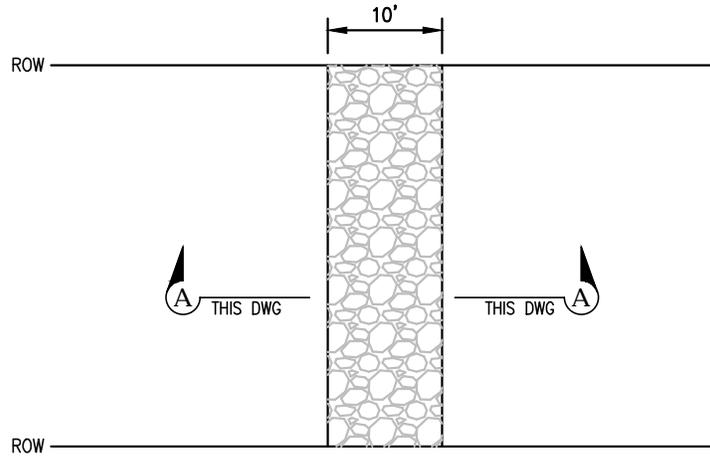
DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

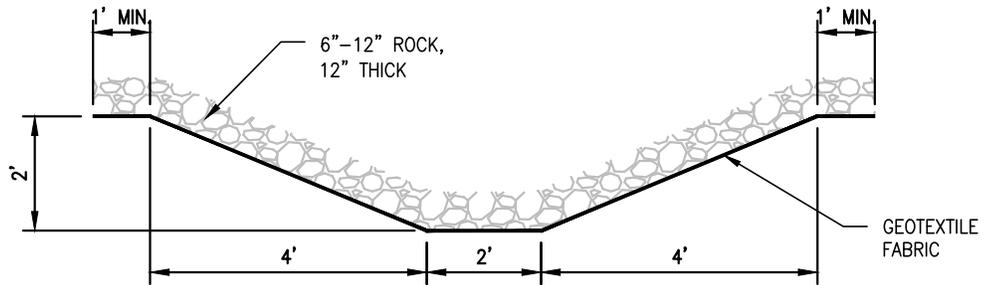
TRANSVERSE TRENCH DRAIN

DRAWING NO. MVP-38B

REV. 0



PLAN
SCALE: NOT TO SCALE



SECTION A-A
SCALE: NOT TO SCALE

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

Plotted by: Lutz, Keith on: October 18, 2016 - 3:39 PM

DRAWN	TDD	DATE	2/03/2016
CHECKED	MMF	DATE	2/03/2016
APP'D		DATE	
SCALE	N.T.S.	SHEET	1 OF 1
JOB NO.			
PROJECT ID:	PXXXX		



DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

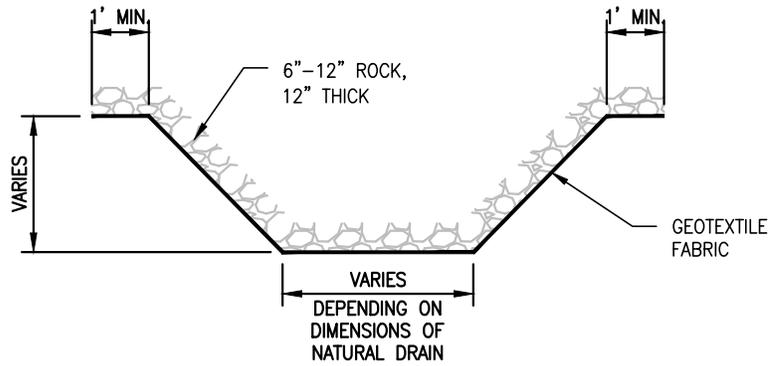
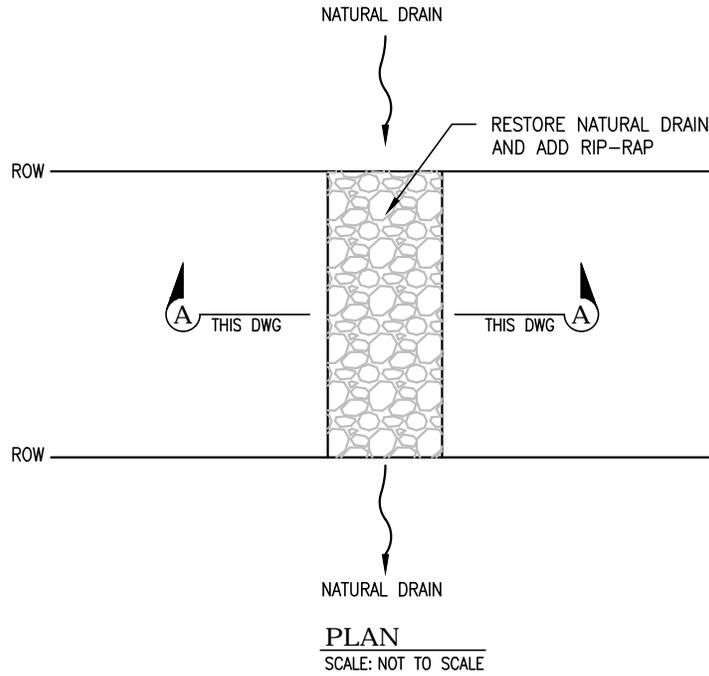
ROCK LINED SWALE

DRAWING NO.

MVP-39

REV.

0



THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

Plotted by: Lutz, Keith on: October 18, 2016 - 3:40 PM

DRAWN	TDD	DATE	2/03/2016
CHECKED	MMF	DATE	2/03/2016
APP'D		DATE	
SCALE	N.T.S.	SHEET	1 OF 1
JOB NO.			
PROJECT ID:	PXXXX		



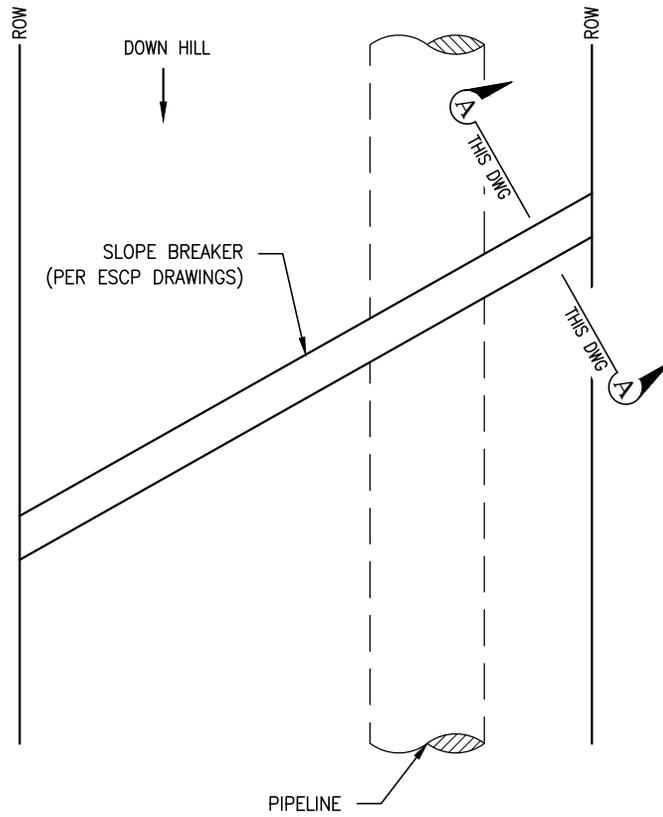
DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

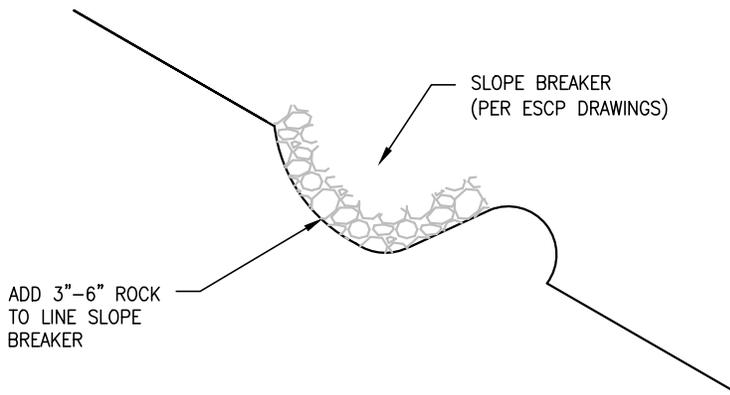
RIP-RAP NATURAL DRAIN

DRAWING NO.	MVP-40
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REV.	0
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PLAN
SCALE: NOT TO SCALE



SECTION A-A
SCALE: NOT TO SCALE

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

Plotted by: Lutz, Keith on: October 18, 2016 - 3:40 PM

DRAWN	TDD	DATE	2/03/2016
CHECKED	MMF	DATE	2/03/2016
APP'D		DATE	
SCALE	N.T.S.	SHEET	1 OF 1
JOB NO.			
PROJECT ID:	PXXXX		

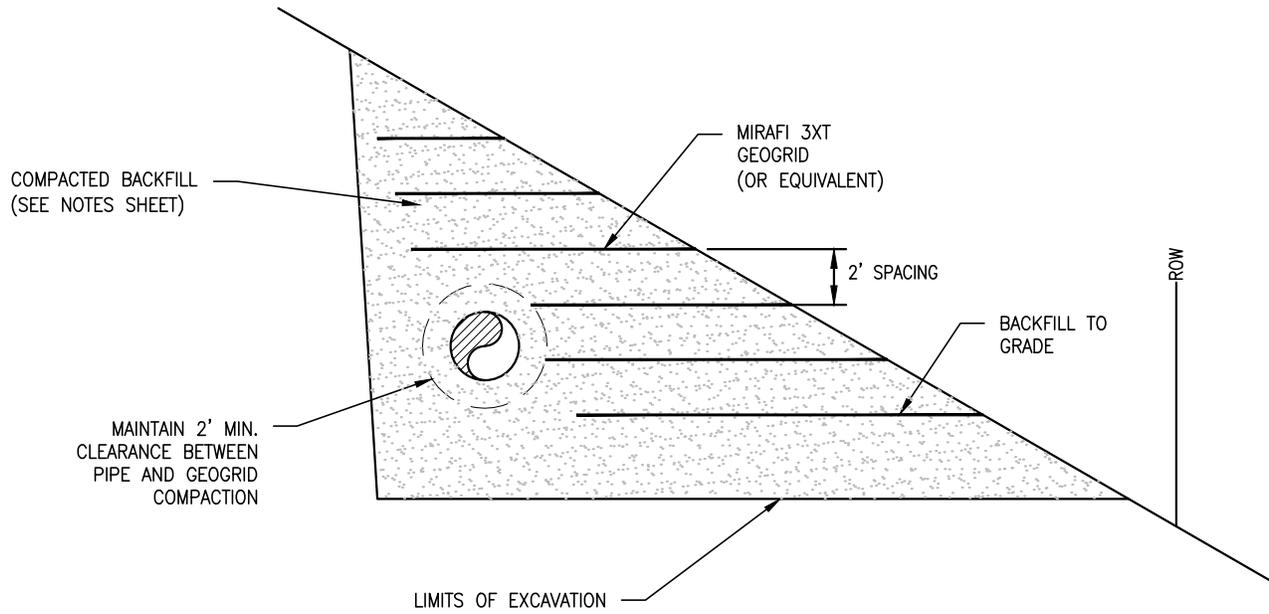


DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

RIP-RAP SLOPE BREAKERS

DRAWING NO.	MVP-41	REV.	0
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THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

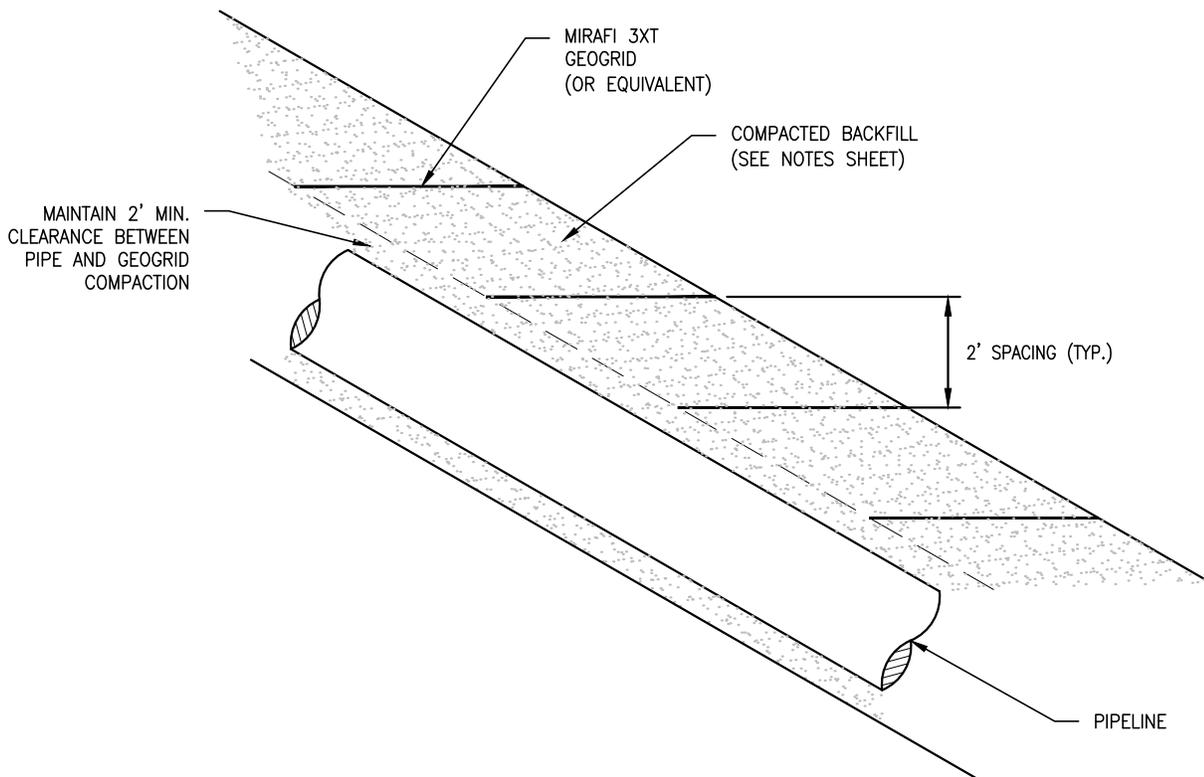
Plotted by: Lutz, Keith on: October 18, 2016 - 3:40 PM

DRAWN	TDD	DATE	2/03/2016
CHECKED	MMF	DATE	2/03/2016
APP'D		DATE	
SCALE	N.T.S.	SHEET	1 OF 3
JOB NO.			
PROJECT ID:			
PXXXX			



DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL	
GEOGRID-SIDEHILL	
DRAWING NO.	REV.
MVP-42A	0



SECTION VIEW
SCALE: NOT TO SCALE

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

Plotted by: Lutz, Keith on: October 18, 2016 - 3:41 PM

DRAWN	TDD	DATE	2/03/2016
CHECKED	MMF	DATE	2/03/2016
APP'D		DATE	
SCALE	N.T.S.	SHEET	2 OF 3
JOB NO.			
PROJECT ID:			
PXXXX			



DESIGN ENGINEERING

SLIDE MITIGATION DETAIL	
GEOGRID-PLANAR	
DRAWING NO.	REV.
MVP-42B	0

COMPACTION NOTES

- 1) ALL ROCKS LARGER THAN 6 INCHES IN SIZE, AND MORE THAN 10 PERCENT BY VOLUME SHOULD BE REMOVED AND PROPERLY DISPOSED FROM THE BACKFILL MATERIAL.
- 2) THE SUBGRADE AT THE BASE OF THE EXCAVATION SHOULD BE PROOFROLLED WITH A PNEUMATIC TIERED ROLLER OR VEHICLE.
- 3) THE EXCAVATED AREA SHALL BE BACKFILLED WITH THE CLEANED EXCAVATED SOIL MATERIAL AND COMPACTED IN PLACE.
- 4) BACKFILL OPERATIONS SHALL BE PERFORMED WHEN SOIL IS SUITABLE FOR COMPACTION (I.E., NOT IMMEDIATELY FOLLOWING A LARGE RAIN, SNOW, OR ICE EVENT). FROZEN FILL SHALL NOT BE USED.
- 5) THE BACKFILL SHALL BE PLACED IN COMPACTED LIFTS NO GREATER THAN 12 INCHES.
- 6) MAINTAIN A MINIMUM 2FT CLEARANCE BETWEEN COMPACTION ACTIVITY AND THE GAS PIPELINE.

GRAVEL DRAIN NOTES

- 1) GEOTEXTILE FABRIC SHALL BE TENCATE MIRAFI 140N OR APPROVED EQUIVALENT.
- 2) THE GEOTEXTILE FABRIC SHALL BE STORED UNDAMAGED PURSUANT TO MANUFACTURERS RECOMMENDATIONS.
- 3) DO NOT OPERATE CONSTRUCTION EQUIPMENT DIRECTLY ON THE GEOTEXTILE FABRIC.
- 4) DRAINAGE AGGREGATE SHALL MEET THE REQUIREMENTS OF AASHTO NO. 57 STONE.
- 5) DRAINAGE AGGREGATE SHALL NOT BE COMPACTED.

GEOGRID NOTES

- 1) GEOGRID REINFORCEMENT SHALL BE TENCATE MIRAFI 3XT OR APPROVED EQUIVALENT.
- 2) THE GEOGRID MATERIAL SHALL BE STORED UNDAMAGED PURSUANT TO MANUFACTURERS RECOMMENDATIONS.
- 3) GEOGRID SHALL BE PLACED HORIZONTALLY ON THE BACKFILL WITH THE PRINCIPAL STRENGTH DIRECTION PERPENDICULAR TO THE FACE OF THE SLOPE. ADJACENT PIECES OF PRIMARY GEOGRID SHALL NOT OVERLAP BUT ARE TO BE BUTTED SIDE TO SIDE.
- 4) REMOVE ALL SLACK IN THE GEOGRID MATERIAL AND ANCHOR AS NECESSARY WITH PINS, OR BAGS TO PREVENT SLACK FROM DEVELOPMENT DURING FILL PLACEMENT AND COMPACTION.
- 5) FILL IS TO BE PLACED AND SPREAD DIRECTLY ON THE GEOGRID MATERIAL WITH RUBBER TIERED EQUIPMENT ONLY. SPEEDS ARE TO BE KEPT SLOW WITH AS FEW STOPS AND TURNS AS PRACTICAL.
- 6) DO NOT OPERATE TRACKED EQUIPMENT DIRECTLY ON THE GEOGRID MATERIAL.
- 7) MAINTAIN A MINIMUM 2FT CLEARANCE BETWEEN GEOGRID MATERIAL AND THE GAS PIPELINE.

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

Plotted by: Rickabaugh, Greg on: April 12, 2017 - 8:57 AM

DRAWN	TDD	DATE	2/03/2016
CHECKED	MMF	DATE	2/03/2016
APP'D		DATE	
SCALE	N.T.S.	SHEET	3 OF 3
JOB NO.			
PROJECT ID: PXXXX			



DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

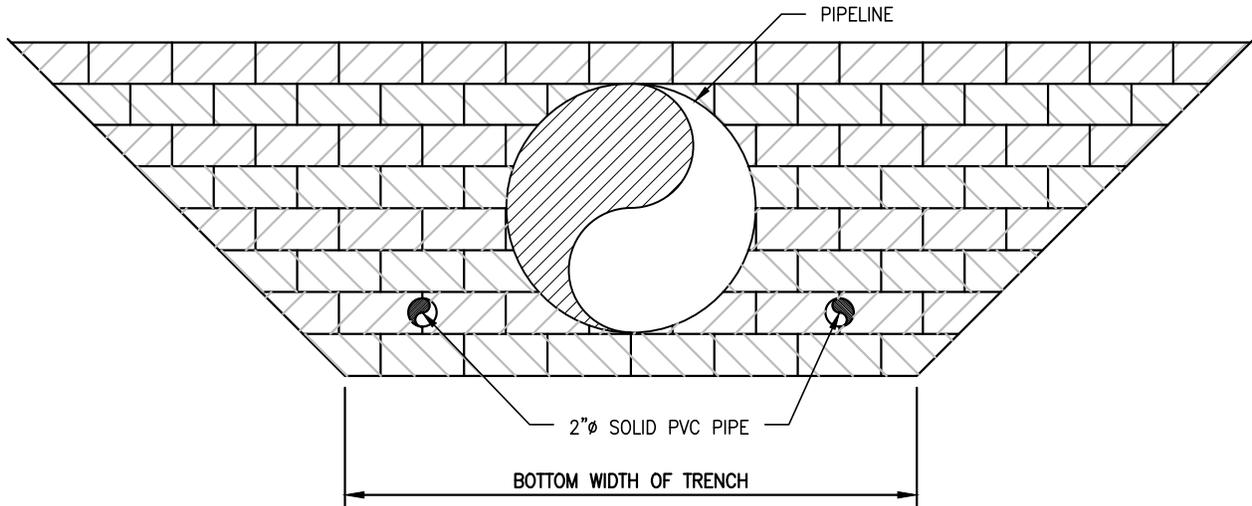
GEOGRID NOTES

DRAWING NO.

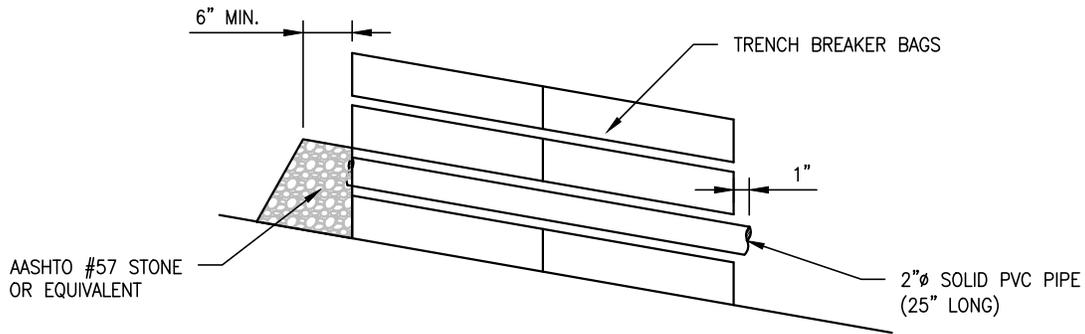
MVP-42C

REV.

0



FRONT VIEW
SCALE: NOT TO SCALE



SECTION VIEW
SCALE: NOT TO SCALE

NOTES:

1. PLACE PVC DRAIN PIPE ON FIRST LAYER OF TRENCH BREAKER BAGS.
2. PLACE PVC DRAIN PIPE EQUADISTANT FROM THE OUTSIDE EDGE OF THE 30" GAS PIPE AND THE BOTTOM LIMITS OF THE TRENCH.
3. EXTEND PVC PIPE THROUGH ENTIRE TRENCH BREAKER AND EXTEND APPROX. 1" PAST END OF BREAKER.
4. AASHTO#57 STONE SHALL BE PLACED TO A MINIMUM 6" THICKNESS UPSLOPE OF THE DRAIN PIPE.

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

Plotted by: Lutz, Keith on: October 18, 2016 - 3:41 PM

DRAWN	TDD	DATE	4/14/2016
CHECKED	MMF	DATE	4/14/2016
APP'D		DATE	
SCALE	N.T.S.	SHEET	1 OF 2
JOB NO.			
PROJECT ID:	PXXXX		



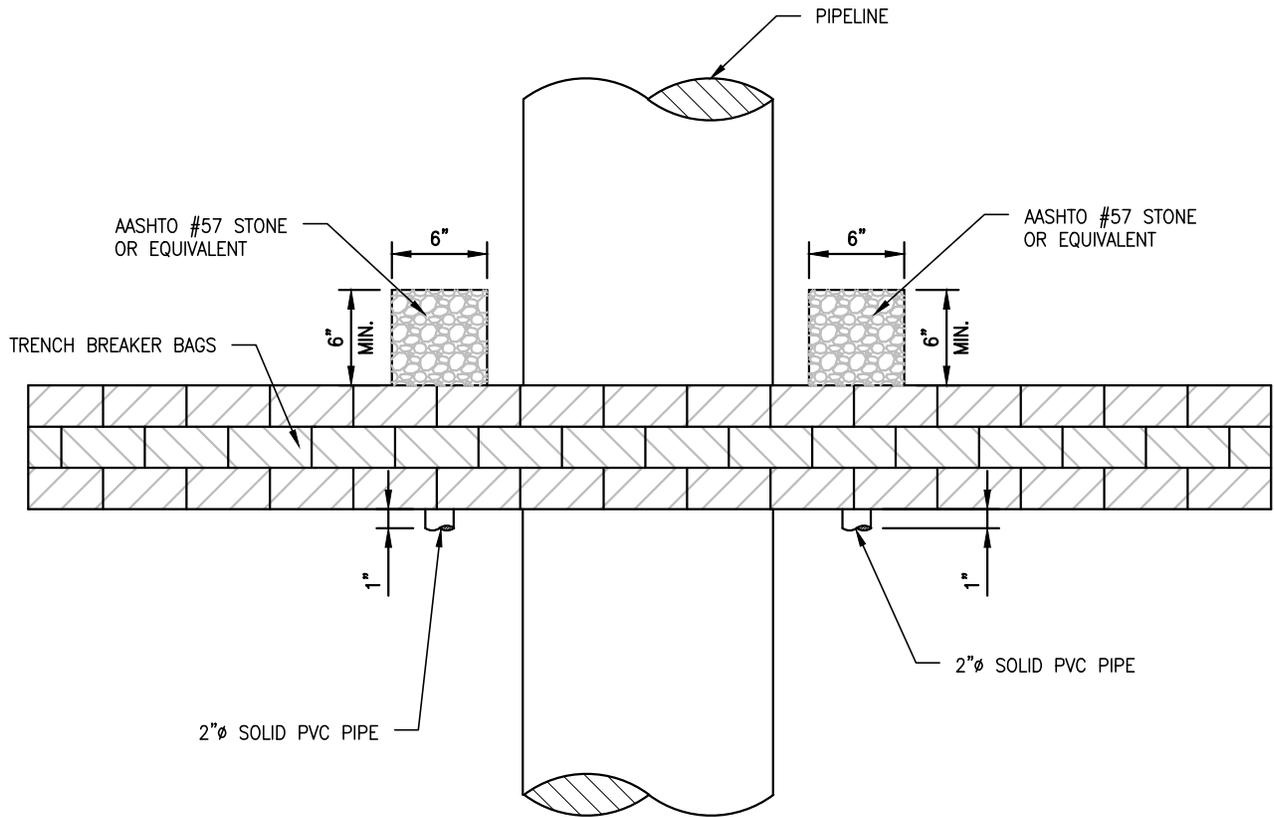
DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

TRENCH BREAKER
PASS-THROUGH DRAIN

DRAWING NO.
MVP-43A

REV.
0



PLAN VIEW
SCALE: NOT TO SCALE

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Plotted by: Lutz, Keith on: October 18, 2016 - 3:42 PM

DRAWN	TDD	DATE	4/14/2016
CHECKED	MMF	DATE	4/14/2016
APP'D		DATE	
SCALE	N.T.S.	SHEET	2 OF 2
JOB NO.			
PROJECT ID:	PXXXX		



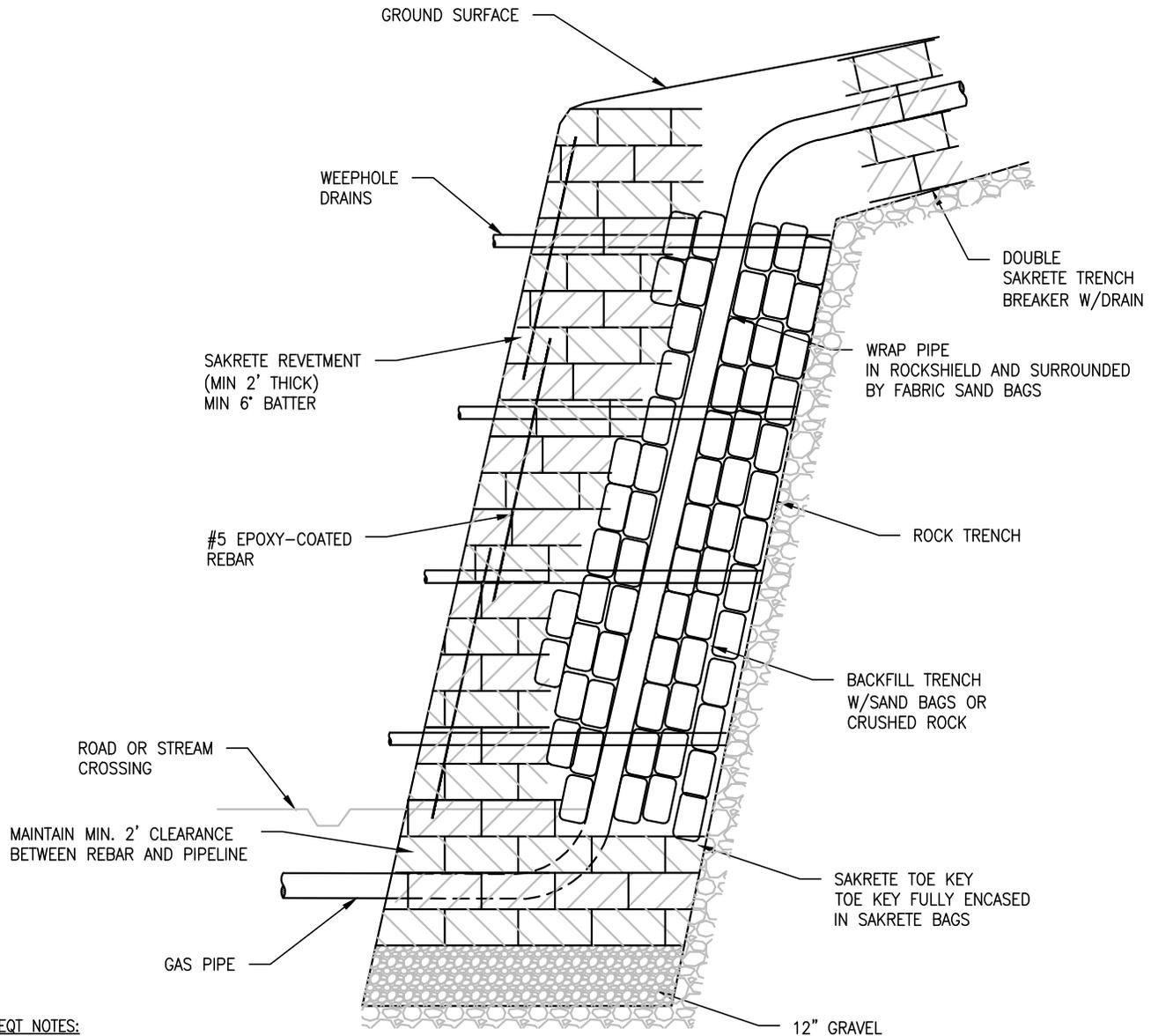
DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

TRENCH BREAKER
PASS-TROUGH DRAIN

DRAWING NO.
MVP-43B

REV.
0



EQT NOTES:

1. SAKRETE BAGS SHOULD EXTEND 4 BAGS DEEP PIPE SHOULD BE COMPLETELY SURROUNDED BY SAND BAGS, OR CRUSHED ROCK (MAX 6").
2. SAKRETE BAGS SHOULD BE STAGGERED IN A MASONRY FASHION. THE FACE OF THE WELL SHALL BE INCLINED 6"-10" FROM VERTICAL.
3. #5 REBAR SHOULD BE DRIVEN THROUGH THE SAKRETE BAGS (SEE DETAIL 1).
4. 2"Ø PVC WEEPHOLE DRAINS SHALL BE INSTALLED EVERY 15 FT.

12" GRAVEL LEVELING BASE
 USE STONE FOR LEVELING ROCK BASE.
 IF BASE IS NOT IN ROCK, USE 12" STONE LAYER FOR BASE.

SIDE VIEW
 SCALE: NOT TO SCALE

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

Plotted by: Lutz, Keith on: October 18, 2016 - 3:42 PM

DRAWN	OL	DATE	6/29/2016
CHECKED	MMF	DATE	-
APP'D		DATE	
SCALE	N.T.S.	SHEET	1 OF 2
JOB NO.			
PROJECT ID:			
PXXXX			



DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

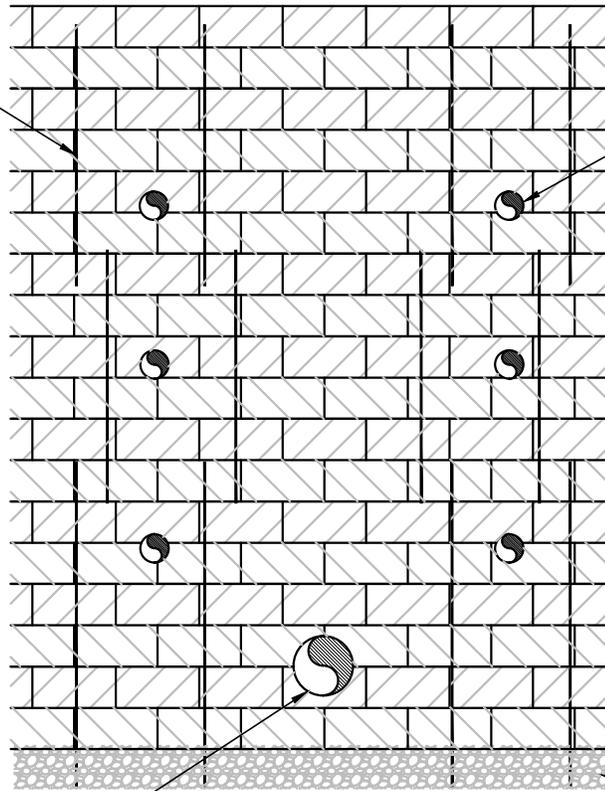
SLIDE MITIGATION
 HIGHWALL REVETMENT
 SIDE VIEW

DRAWING NO. MVP-44A

REV. 0

#5 EPOXY-COATED REBAR DRIVEN INTO PLACE. OVERLAP REBAR MIN. 3 BAGS. SPACE REBAR 12" HORIZONTALLY.

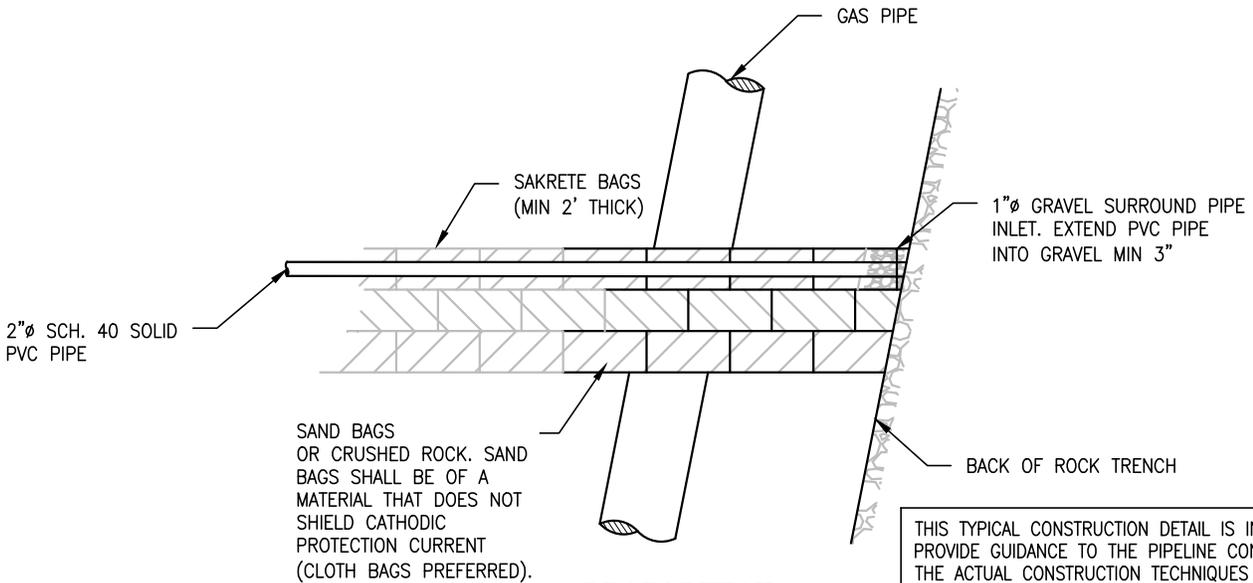
2"Ø PVC WEEPHOLE DRAINS (SEE DETAIL #2)



GAS PIPE (SPACE REBAR TO MAINTAIN MIN. 2' CLEARANCE FROM PIPELINE)

12" STONE LEVELING BASE

FRONT VIEW
SCALE: NOT TO SCALE



2"Ø SCH. 40 SOLID PVC PIPE

SAKRETE BAGS (MIN 2' THICK)

1"Ø GRAVEL SURROUND PIPE INLET. EXTEND PVC PIPE INTO GRAVEL MIN 3"

SAND BAGS OR CRUSHED ROCK. SAND BAGS SHALL BE OF A MATERIAL THAT DOES NOT SHIELD CATHODIC PROTECTION CURRENT (CLOTH BAGS PREFERRED).

BACK OF ROCK TRENCH

DRAIN DETAIL
SCALE: NOT TO SCALE

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

Plotted by: Lutz, Keith on: October 18, 2016 - 3:42 PM

DRAWN	OL	DATE	6/29/2016
CHECKED	MMF	DATE	-
APP'D		DATE	
SCALE	N.T.S.	SHEET	2 OF 2
JOB NO.			
PROJECT ID: PXXXX			



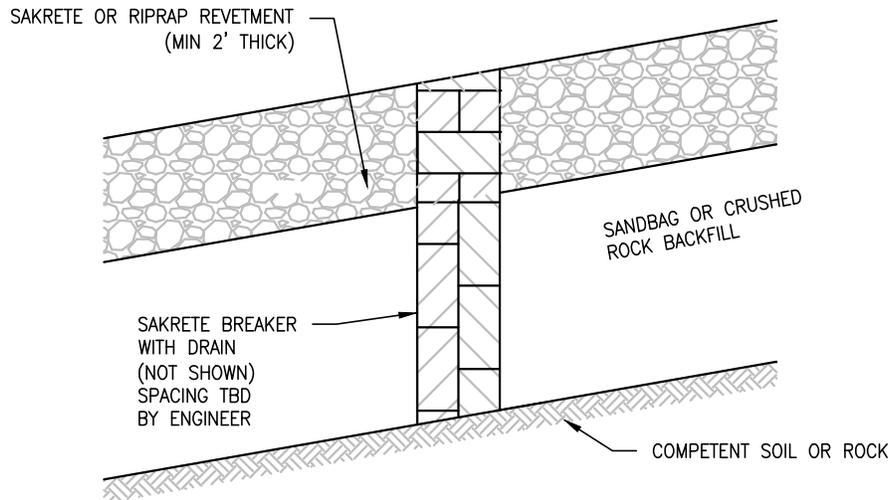
DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

SLIDE MITIGATION
HIGHWALL REVETMENT
FRONT VIEW AND DRAIN DETAIL

DRAWING NO.
MVP-44B

REV.
0



SIDE VIEW
SCALE: NOT TO SCALE

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

Plotted by: Lutz, Keith on: October 18, 2016 - 3:43 PM

DRAWN	TDD	DATE	2/03/2016
CHECKED	MMF	DATE	2/03/2016
APP'D		DATE	
SCALE	N.T.S.	SHEET	1 OF 1
JOB NO.			
PROJECT ID:	PXXXX		



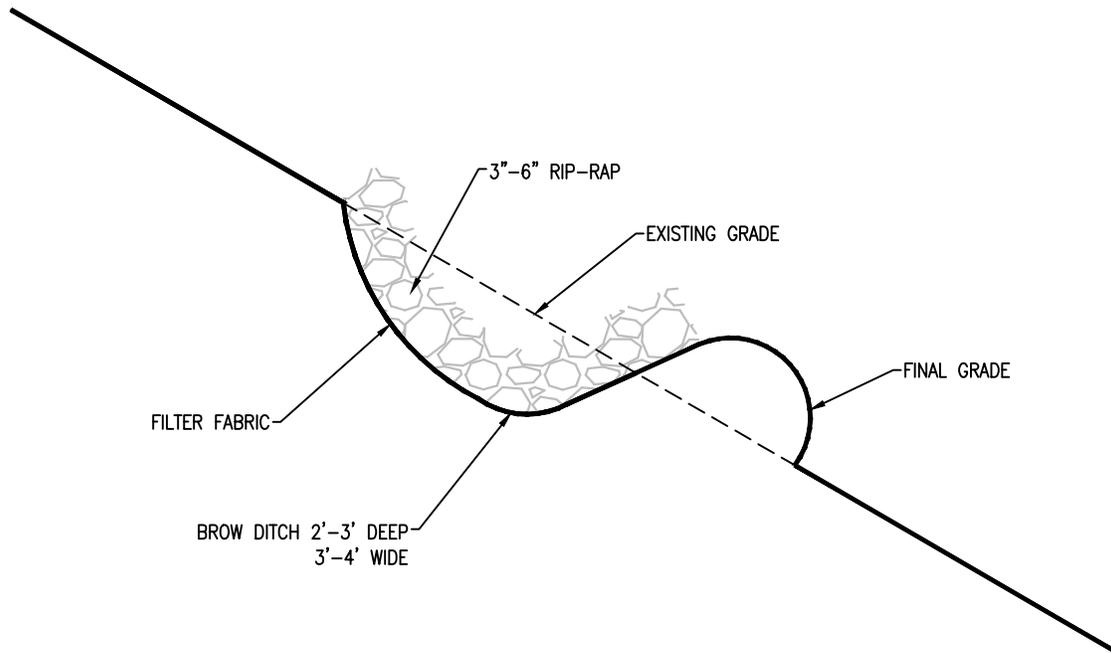
DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

STEEP SLOPE REVETMENT

DRAWING NO.	MVP-45
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REV.	0
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THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

Plotted by: Lutz, Keith on: October 18, 2016 - 3:43 PM

DRAWN	TDD	DATE	7/12/2016
CHECKED	MMF	DATE	7/12/2016
APP'D		DATE	
SCALE	N.T.S.	SHEET	1 OF 1
JOB NO.			
PROJECT ID: PXXXX			

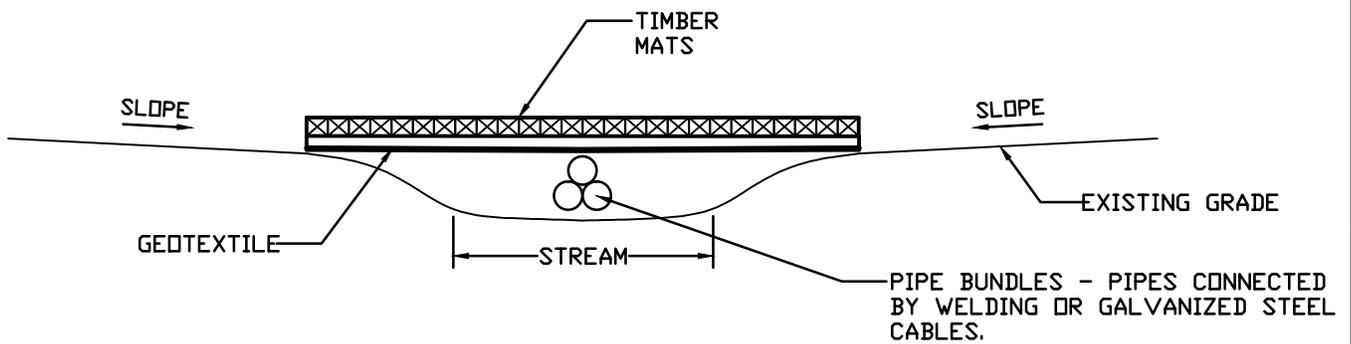


DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

BROW DITCH DETAIL

DRAWING NO. MVP-46	REV. 0
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NOTE:

CFS TO BE INSTALLED AT THE END OF EACH WORKING DAY.

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWN	JL	DATE	10/6/2016
CHECKED	MMF	DATE	10/6/2016
APP'D	XXX	DATE	10/6/2016
SCALE	N.T.S.	SHEET	1 OF 1
JOB NO.			
PROJECT ID:			
PXXXX			

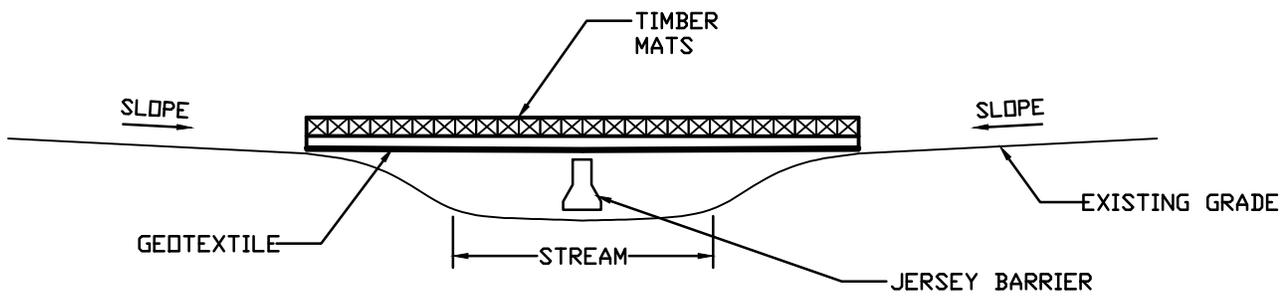


DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

TIMBER MAT AND PIPE BUNDLE
TEMPORARY STREAM CROSSING

DRAWING NO.	REV.
MVP-47	0



NOTE:

CFS TO BE INSTALLED AT THE END OF EACH WORKING DAY.

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWN	JL	DATE	10/6/2016
CHECKED	MMF	DATE	10/6/2016
APP'D	XXX	DATE	10/6/2016
SCALE	N.T.S.	SHEET	1 OF 1
JOB NO.			
PROJECT ID:			
PXXXX			

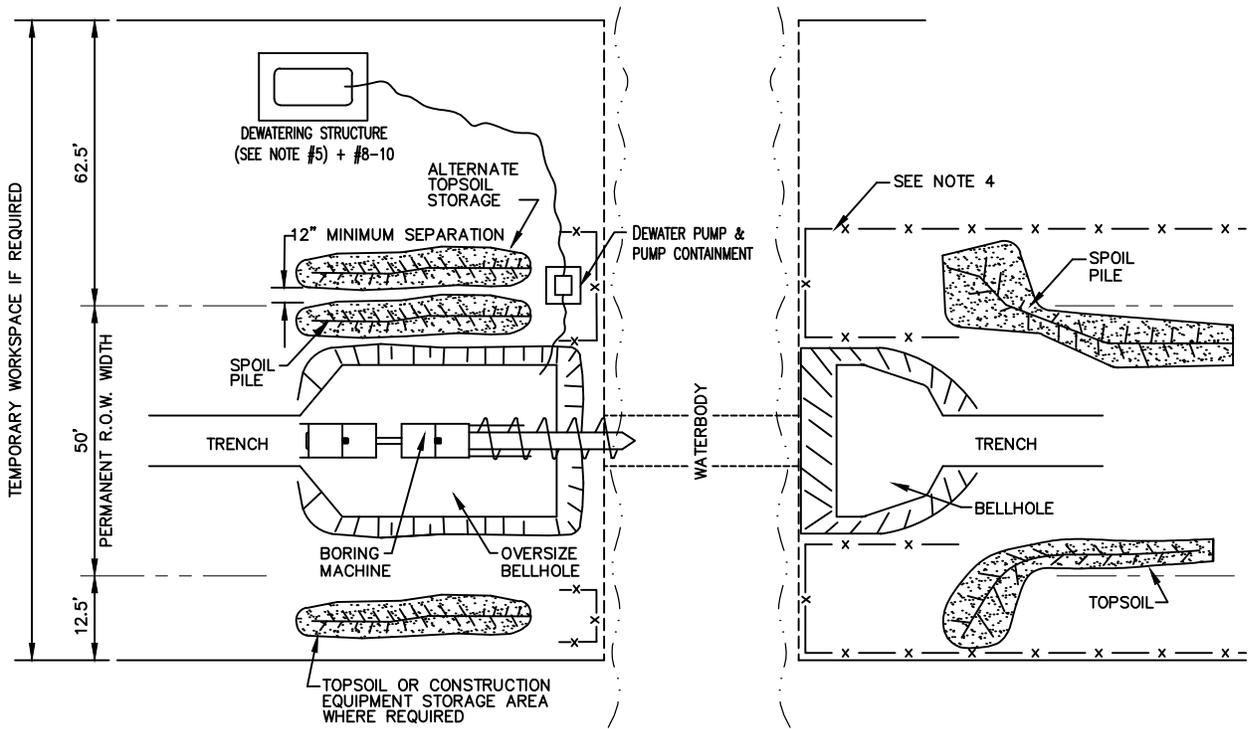


DESIGN ENGINEERING

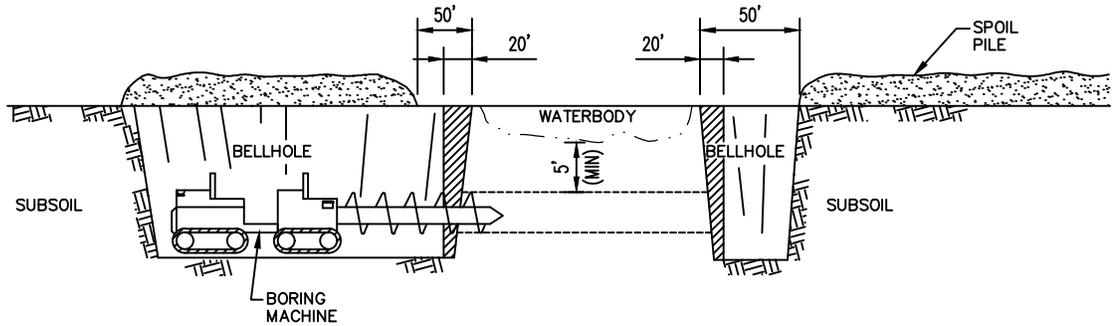
TYPICAL CONSTRUCTION DETAIL

TIMBER MAT AND JERSEY BARRIER
TEMPORARY STREAM CROSSING

DRAWING NO.	REV.
MVP-48	0



PLAN VIEW
(NOT TO SCALE)



PROFILE

NOTES:

1. STRIP TOPSOIL FROM THE BELLHOLE AREA IN UNMANAGED WOODLAND. STRIP TOPSOIL FROM THE BELLHOLE AND SPOIL STORAGE AREA.
2. EXCAVATE BELLHOLE, STORING SPOIL ON OPPOSITE SIDE OF R.O.W. FROM TOPSOIL OR ADJACENT TO TOPSOIL MAINTAINING A MINIMUM 12 INCHES OF SEPARATION TO AVOID MIXING TOPSOIL AND SPOIL.
3. THE SIDES OF THE BORE PITS SHALL BE SLOPED BACK TO STABLE CONFIGURATION UNLESS SUPPORTED BY SHEET PILING OR OTHER SHORING MEANS. INSTALL SAFETY FENCE AROUND BORE PITS AS NECESSARY.
4. INSTALL TEMPORARY EROSION CONTROL PROCEDURES AS SPECIFIED IN THE APPROVED EROSION AND SEDIMENT CONTROL PLAN.
5. DEWATER BORE PIT TO CONTROL SEEPAGE WATER FLOW. DEWATER INTO AN APPROPRIATE DEWATERING STRUCTURE. REFER TO TYPICAL MVP-ES2 PUMPED WATER FILTER BAG AND STD & SPEC 3.26 DEWATERING STRUCTURE.
6. UPON COMPLETION OF PIPE INSTALLATION AND TIE-INS, BACKFILL PIT SPOIL. MINIMIZE POST CONSTRUCTION SETTLEMENT BY COMPACTING BACKFILL USING STANDARD PIPELINE CONSTRUCTION EQUIPMENT AVAILABLE AT SITE. LEAVE A CROWN TO ALLOW FOR SUBSIDENCE OF THE BACKFILL. RESPREAD SALVAGED TOPSOIL AND COMPACT. NO EXCESS SPOIL WILL BE SPREAD WITHIN FLOOD PLAINS OR DELINEATED WETLANDS AREAS.
7. BORE DEPTH WILL BE DETERMINED BASED ON SCOUR ANALYSIS MINIMUM OF 5' SEPARATION BETWEEN TOP OF BORE PROFILE & BOTTOM OF WATERBODY CHANNEL.
8. DEWATERING STRUCTURE WILL BE PLACED IN A STABILIZED AREA AWAY FROM WATERBODY AND WETLANDS.
9. PUMPING RATE WILL NOT EXCEED MFG'S RECOMMENDATIONS AND WILL NOT RESULT IN INCREASED EROSION.
10. DEWATERING ACTIVITY SHALL BE MONITORED DURING OPERATION.

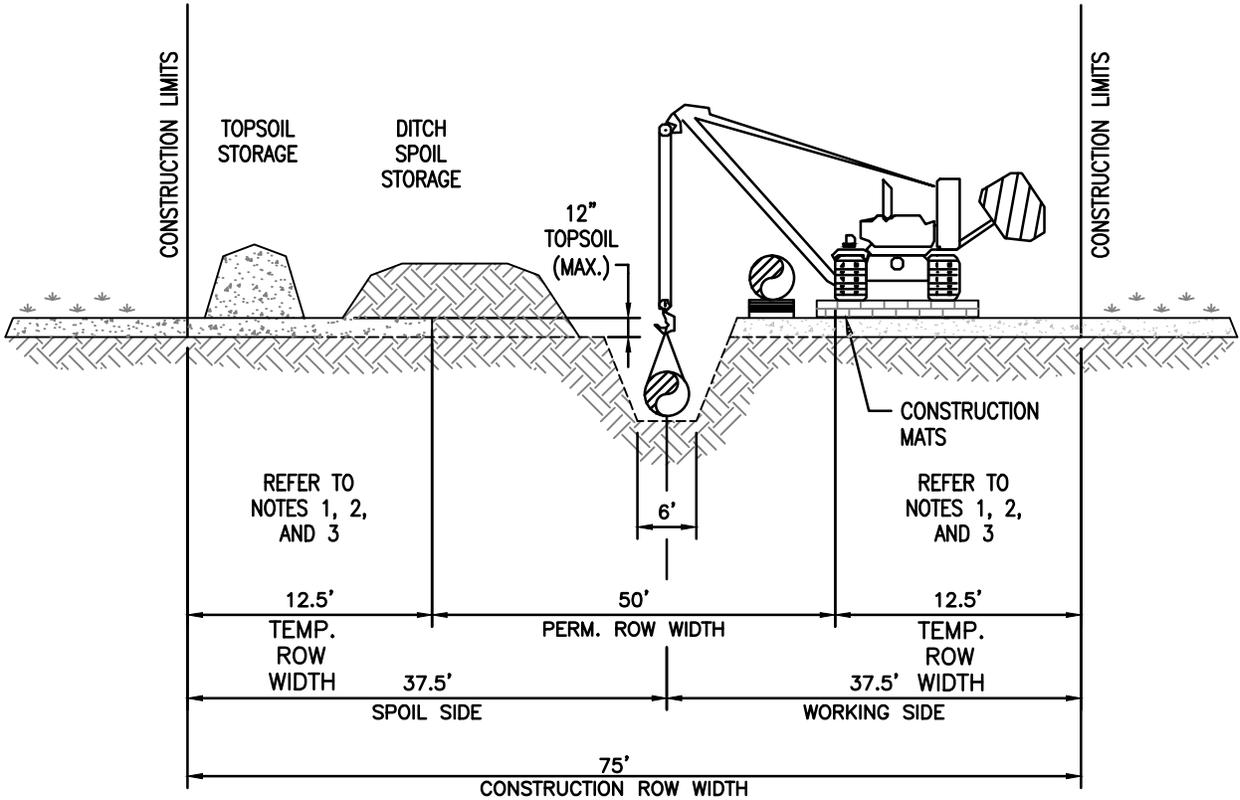
THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

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DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL	
TYPICAL WATERBODY CONVENTIONAL BORE	
DRAWING NO.	REV.
MVP-51	0



NOTES:

1. TOPSOIL SEGREGATION/REMOVAL WILL ONLY BE CONDUCTED WITHIN THE PERMANENT EASEMENT AT ALL WETLAND CROSSINGS IN VIRGINIA.
2. GRUBBING ACTIVITIES SHALL BE LIMITED TO THE PERMANENT EASEMENT AT ALL WETLAND CROSSINGS IN VIRGINIA. OUTSIDE OF THE PERMANENT EASEMENT, WETLAND VEGETATION SHALL ONLY BE REMOVED AT OR ABOVE THE GROUND SURFACE. WOODY VEGETATION WITHIN THE TEMPORARY EASEMENT SHALL BE CUT AT GROUND SURFACE WITH THE STUMPS TO REMAIN IN-PLACE.
3. WETLAND CROSSINGS IN VIRGINIA SHALL BE CONDUCTED IN ACCORDANCE WITH NWP12 GENERAL AND NORFOLK DISTRICT REGIONAL CONDITIONS.

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DESIGN ENGINEERING

TYPICAL CONSTRUCTION DETAIL

WETLAND CROSSING TYPICAL FOR
USACE NORFOLK (VA) DISTRICT

DRAWING NO.	MVP-53	REV.	0
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