

<b>ALASKA</b> <b>PipelineProject</b>	ALASKA PIPELINE PROJECT PRELIMINARY DRAFT RESOURCE REPORT 1	USAG-UR-SGREG-000002 APRIL 2011

## APPENDIX 1E: TYPICAL DRAWINGS

DRAFT

**ALASKA PIPELINE PROJECT  
APPENDIX 1E  
TYPICAL DRAWINGS INDEX  
PRELIMINARY DRAFT FERC APPLICATION**

<b>TYPICAL DRAWING NUMBER</b>	<b>REV.</b>	<b>DRAWING CATEGORY</b>	<b>DRAWING DESCRIPTION</b>
TRENCH-01	C	TRENCH MODES	BURIED PIPE IN EXCAVATOR TRENCH
TRENCH-03	A	TRENCH MODES	BURIED PIPE IN ROCK TRENCH
ROW-01	B	RIGHT-OF-WAY MODES	NORTH SLOPE (WINTER)
ROW-02	E	RIGHT-OF-WAY MODES	WINTER
ROW-03	D	RIGHT-OF-WAY MODES	SUMMER
ROW-04	B	RIGHT-OF-WAY MODES	CROSS SLOPES - NORTH SLOPE (WINTER)
ROW-05	E	RIGHT-OF-WAY MODES	CROSS SLOPES (WINTER)
ROW-06	C	RIGHT-OF-WAY MODES	POINT THOMSON GAS TRANSMISSION PIPELINE (WINTER)
ROW-21	C	RIGHT-OF-WAY MODES	ADDITIONAL TEMPORARY WORKSPACE 1/2
ROW-22	C	RIGHT-OF-WAY MODES	ADDITIONAL TEMPORARY WORKSPACE 2/2
ROAD-01	E	ROAD CROSSINGS	ROAD CROSSINGS - ARTERIAL/COLLECTOR ROADS
ROAD-02	E	ROAD CROSSINGS	ROAD CROSSINGS - LOCAL ROADS
ROAD-03	C	ROAD CROSSINGS	TRAILS & DRIVEWAYS
FP-01	D	FOREIGN PIPELINE AND UTILITY CROSSINGS	FOREIGN PIPELINES
UT-01	C	FOREIGN PIPELINE AND UTILITY CROSSINGS	BURIED UTILITY
UT-02	C	FOREIGN PIPELINE AND UTILITY CROSSINGS	ABOVE GROUND UTILITY
WB-01	C	WATERBODY CROSSINGS	MAJOR/INTERMEDIATE - TRENCHED
WB-02	C	WATERBODY CROSSINGS	MAJOR/INTERMEDIATE - HDD
WB-03A	C	WATERBODY CROSSINGS	MAJOR/INTERMEDIATE - UNSUPPORTED PIPE BRIDGE
WB-03B	C	WATERBODY CROSSINGS	MAJOR/INTERMEDIATE - SIMPLY SUPPORTED SPAN BRIDGE
WB-03C	A	WATERBODY CROSSINGS	MAJOR/INTERMEDIATE - CABLE SUPPORTED SPAN
BC-01	C	BUOYANCY CONTROL	CONCRETE COATING
BC-02	C	BUOYANCY CONTROL	SADDLE BAGS
BC-03	C	BUOYANCY CONTROL	BOLT ON RIVER WEIGHTS
BC-04	C	BUOYANCY CONTROL	SCREW ANCHORS
BC-05	C	BUOYANCY CONTROL	CONCRETE SET ON WEIGHTS
CC-01	C	CORROSION CONTROL	COATINGS

**ALASKA PIPELINE PROJECT  
APPENDIX 1E  
TYPICAL DRAWINGS INDEX  
PRELIMINARY DRAFT FERC APPLICATION**

<b>TYPICAL DRAWING NUMBER</b>	<b>REV.</b>	<b>DRAWING CATEGORY</b>	<b>DRAWING DESCRIPTION</b>
CC-02	C	CATHODIC PROTECTION	TYPICAL DEEP VERTICAL ANODE BED
CC-03	C	CATHODIC PROTECTION	TYPICAL HORIZONTAL ANODE BED
FC-01	C	FRACTURE CONTROL	TYPICAL FRACTURE CONTROL METHOD
ACC-01	C	TYPICAL ACCESS ROADS	TYPICAL PERMANENT ACCESS ROAD SECTION
ACC-03	C	TYPICAL ACCESS ROADS	TYPICAL TEMPORARY ICE/SNOW ACCESS ROAD SECTION
ACC-05	C	TYPICAL ACCESS ROADS	TYPICAL TEMPORARY SHOOFLY ROADS PLAN/SECTION
ACC-06	C	TYPICAL ACCESS ROADS	TYPICAL TEMPORARY GRANULAR ACCESS ROAD OFF HIGHWAY
FAC-05	C	PIPELINE FACILITIES	TYPICAL MAINLINE BLOCK VALVE PLOT PLAN
FAC-08A	C	PIPELINE FACILITIES	TYPICAL DELIVERY POINT TAKE-OFF PLOT PLAN
CONST-02	D	CONSTRUCTION TYPICALS	HORIZONTAL BORING/DRILLING ROADS
CONST-03	D	CONSTRUCTION TYPICALS	OPEN-CUT ROADS
CONST-04	E	CONSTRUCTION TYPICALS	WATERBODIES – MAJOR/INTERMEDIATE - OPEN-CUT
CONST-05	E	CONSTRUCTION TYPICALS	WATERBODIES – MINOR - OPEN-CUT
CONST-06	E	CONSTRUCTION TYPICALS	WATERBODIES - ISOLATED OPEN CUT - DAM AND PUMP
CONST-07	E	CONSTRUCTION TYPICALS	WATERBODIES - ISOLATED OPEN CUT - DAM AND FLUME
CONST-08	E	CONSTRUCTION TYPICALS	WATERBODIES - ISOLATED OPEN CUT - DAM AND DIVERT
CONST-09	C	CONSTRUCTION TYPICALS	WATERBODIES - HORIZONTAL DIRECTIONAL DRILL
CONST-10	E	CONSTRUCTION TYPICALS	WATERBODIES - HORIZONTAL BORE
CONST-11	C	CONSTRUCTION TYPICALS	EQUIPMENT CROSSING - FORD
CONST-12	C	CONSTRUCTION TYPICALS	EQUIPMENT CROSSING - MAT BRIDGE
CONST-13	C	CONSTRUCTION TYPICALS	EQUIPMENT CROSSING - MAT ROCK/CULVERT BRIDGE
CONST-14	C	CONSTRUCTION TYPICALS	EQUIPMENT CROSSING - ROCK/CULVERT BRIDGE
CONST-15	C	CONSTRUCTION TYPICALS	EQUIPMENT CROSSING - ICE BRIDGE
CONST-16	C	CONSTRUCTION TYPICALS	EQUIPMENT CROSSING - CLEAN SNOW FILL
CONST-17	C	CONSTRUCTION TYPICALS	EQUIPMENT CROSSING - LOG FILL
CONST-20	D	CONSTRUCTION TYPICALS	HELIPADS
CONST-22A	C	CONSTRUCTION TYPICALS	1500 PERSON CAMP - 20 ACRES

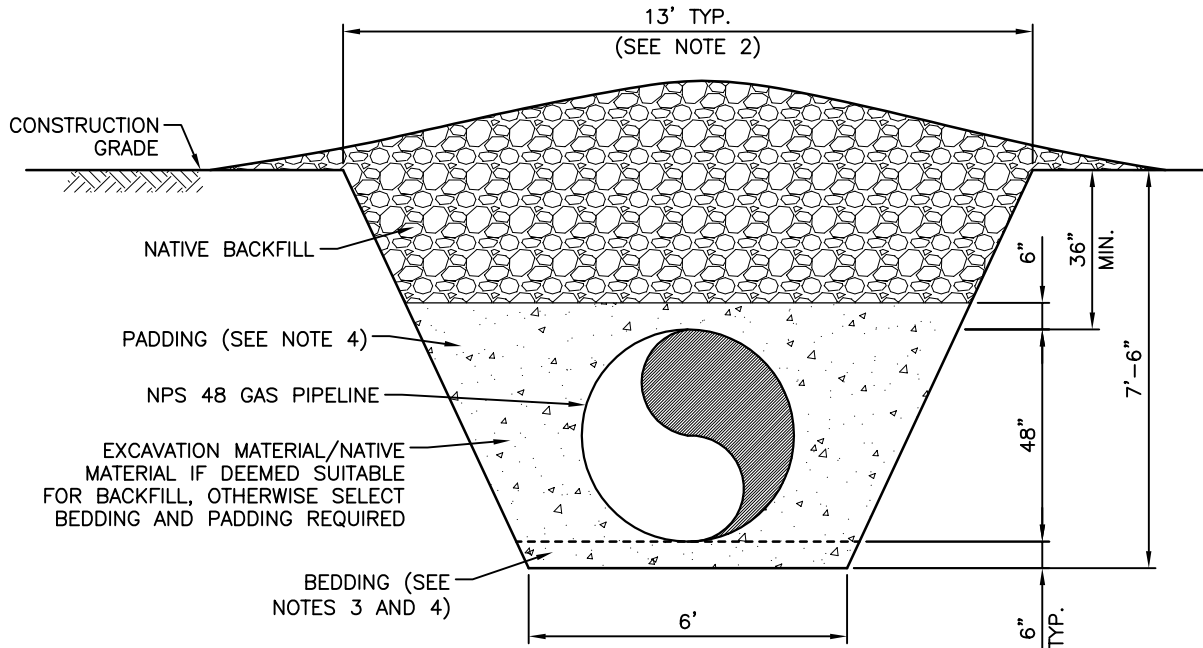
**ALASKA PIPELINE PROJECT  
APPENDIX 1E  
TYPICAL DRAWINGS INDEX  
PRELIMINARY DRAFT FERC APPLICATION**

<b>TYPICAL DRAWING NUMBER</b>	<b>REV.</b>	<b>DRAWING CATEGORY</b>	<b>DRAWING DESCRIPTION</b>
CONST-22B	C	CONSTRUCTION TYPICALS	750 PERSON CAMP - 10 ACRES
CONST-22C	C	CONSTRUCTION TYPICALS	500 PERSON CAMP - 8 ACRES
CONST-22D	C	CONSTRUCTION TYPICALS	150 PERSON CAMP - 3 ACRES
CONST-22E	C	CONSTRUCTION TYPICALS	50 PERSON CAMP - 2 ACRES
CONST-23A	C	CONSTRUCTION TYPICALS	PIPE STORAGE/CAMP/ CONTRACTOR YARD - OPTION 1 - 50 ACRES
CONST-23B	C	CONSTRUCTION TYPICALS	PIPE STORAGE/CAMP/ CONTRACTOR YARD - OPTION 2 - 50 ACRES
CONST-23C	C	CONSTRUCTION TYPICALS	PIPE STORAGE/CAMP/ CONTRACTOR YARD - OPTION 3 - 50 ACRES
CONST-23D	B	CONSTRUCTION TYPICALS	STAND ALONE PIPE STORAGE YARD - 20 ACRES
CONST-24	C	CONSTRUCTION TYPICALS	STAND ALONE CONTRACTOR YARD - 8 ACRES
CONST-28	C	CONSTRUCTION TYPICALS	CONSTRUCTION ON STEEP LONGITUDINAL SLOPES
CONST-33	C	CONSTRUCTION TYPICALS	TYPICAL WATER DISCHARGE SITE
CONST-34	C	CONSTRUCTION TYPICALS	HYDROSTATIC TEST POINT
FAULT-01	C	FAULT CROSSINGS	CONCEPTUAL "ZEE" FAULT CROSSING DESIGN - STRIKE-SLIP FAULTS
FAULT-02	C	FAULT CROSSINGS	CONCEPTUAL "U" FAULT CROSSING DESIGN - STRIKE- SLIP FAULTS
FAULT-03	C	FAULT CROSSINGS	CONCEPTUAL "ZEE" FAULT CROSSING DESIGN - REVERSE OR THRUST FAULTS

**ALASKA PIPELINE PROJECT  
APPENDIX 1E  
TYPICAL DRAWINGS  
PRELIMINARY DRAFT FERC APPLICATION**

**GENERAL NOTES:**

1. DRAWINGS ARE CONCEPTUAL IN NATURE BASED ON CURRENT AVAILABLE INFORMATION.
2. SITE SPECIFIC DRAWINGS WILL BE DEVELOPED FOR MANY OF THE TYPICAL SITUATIONS SHOWN.
3. DRAWINGS WILL BE UPDATED AS ENGINEERING PROGRESSES. ADDITIONAL DRAWINGS WILL BE GENERATED AND OBSOLETE DRAWINGS WILL BE DELETED.
4. TRENCH MODES AND RIGHT-OF-WAY MODES ARE HIGHLY DEPENDANT ON THE FINAL PIPELINE ROUTE AND CENTERLINE AND WILL BE UPDATED AS ROUTING PROGRESSES.



#### NOTES:

1. MINIMUM DEPTH OF COVER SHOWN FOR TYPICAL CLASS 1, 2 OR 3 LOCATIONS. ADDITIONAL DEPTH MAY BE REQUIRED FOR CROSSINGS, AREAS REQUIRING BUOYANCY CONTROL, AREAS WITH FROST HEAVE POTENTIAL AND OTHER AREAS AS IDENTIFIED SUCH AS ROAD ENCROACHMENTS.
2. DITCH WALLS WILL BE AS VERTICAL AS SOIL CONDITIONS ALLOW.
3. BEDDING ONLY REQUIRED IF NATIVE DITCH MATERIAL IS NOT SUITABLE, OTHERWISE PIPE CAN REST ON NATIVE SOIL DITCH BOTTOM.
4. NATIVE MATERIAL EXCAVATED FROM DITCH MAY BE USED FOR BEDDING AND PADDING IF SUITABLE.

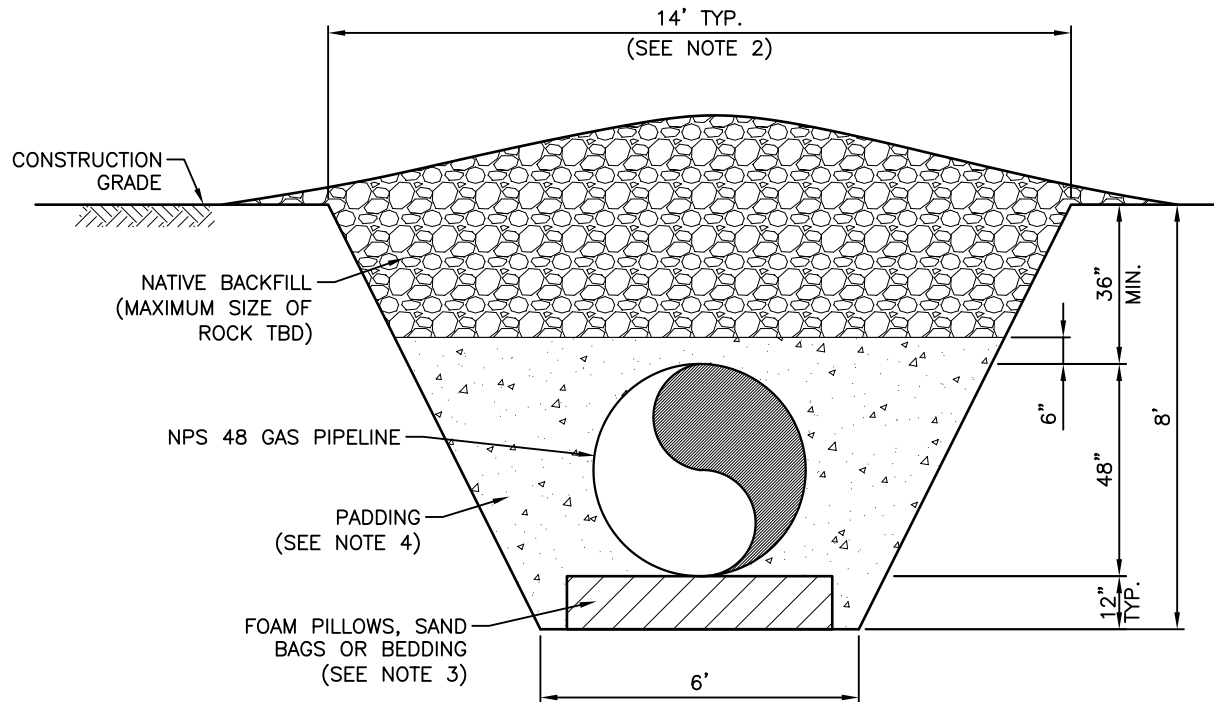
PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION

## Appendix 1E TRENCH-01

### Alaska Pipeline Project

Trench Modes – Buried Pipe In Excavator Trench

Rev.  
C



#### NOTES:

1. MINIMUM DEPTH OF COVER SHOWN FOR TYPICAL CLASS 1, 2 AND 3 LOCATIONS BASED ON ALTERNATIVE MAXIMUM ALLOWABLE OPERATING PRESSURE CRITERIA. ADDITIONAL DEPTH MAY BE REQUIRED FOR CROSSINGS, AREAS REQUIRING BUOYANCY CONTROL, AND OTHER AREAS AS IDENTIFIED SUCH AS ROAD ENCROACHMENTS.
2. DITCH WALLS WILL BE AS VERTICAL AS BEDROCK CONDITIONS ALLOW.
3. FOAM PILLOWS, SAND BAGS OR IMPORT SAND BEDDING REQUIRED TO SUPPORT PIPE.
4. IMPORT SAND PADDING REQUIRED.

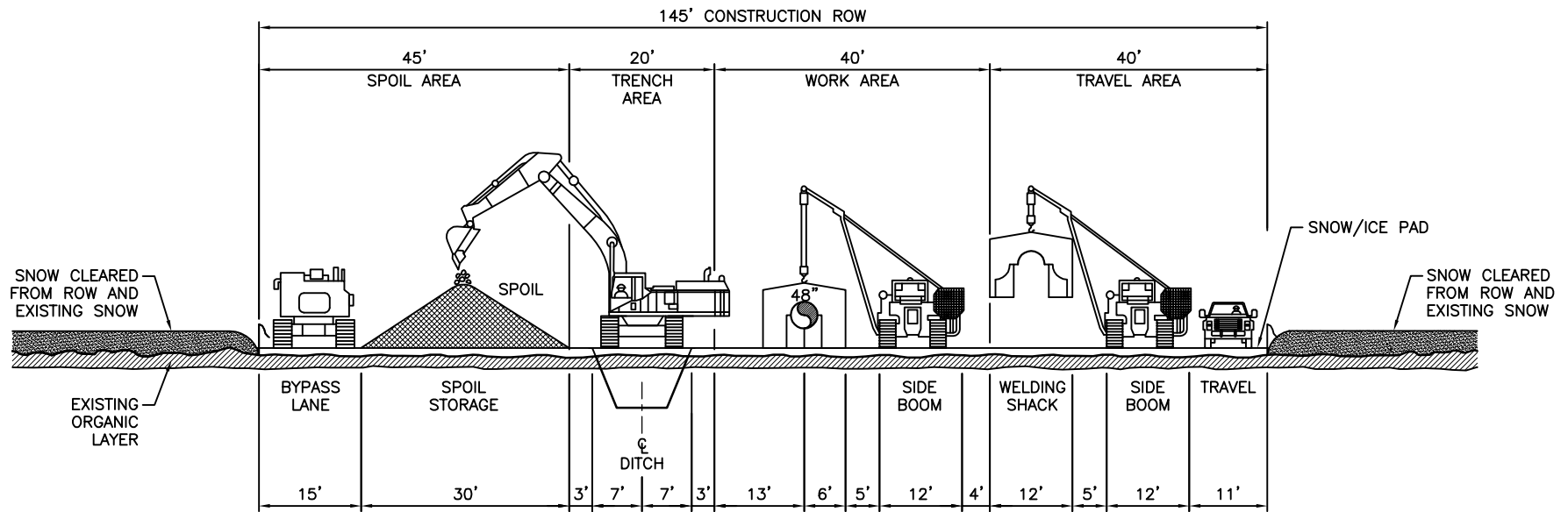
PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION

## Appendix 1E TRENCH-03

### Alaska Pipeline Project

Trench Modes – Buried Pipe In Rock Trench

Rev.  
A



PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION

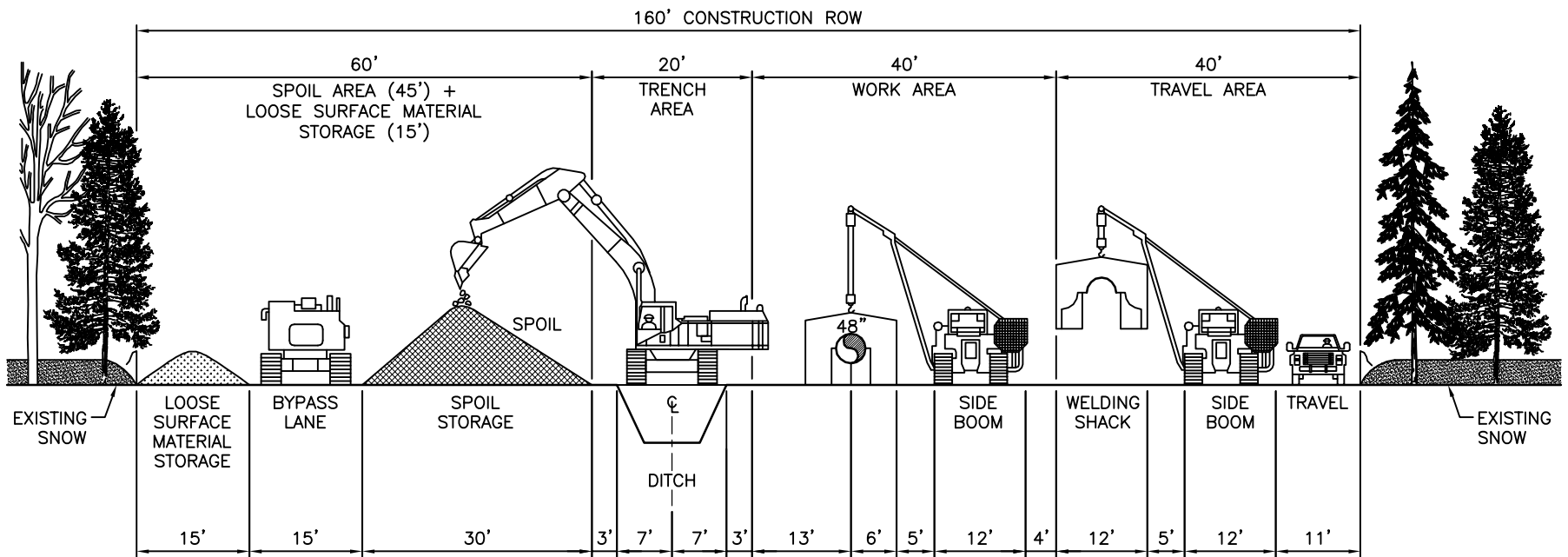
## Appendix 1E ROW-01

### Alaska Pipeline Project

Right-of-Way Modes – North Slope (Winter)

Rev.  
B





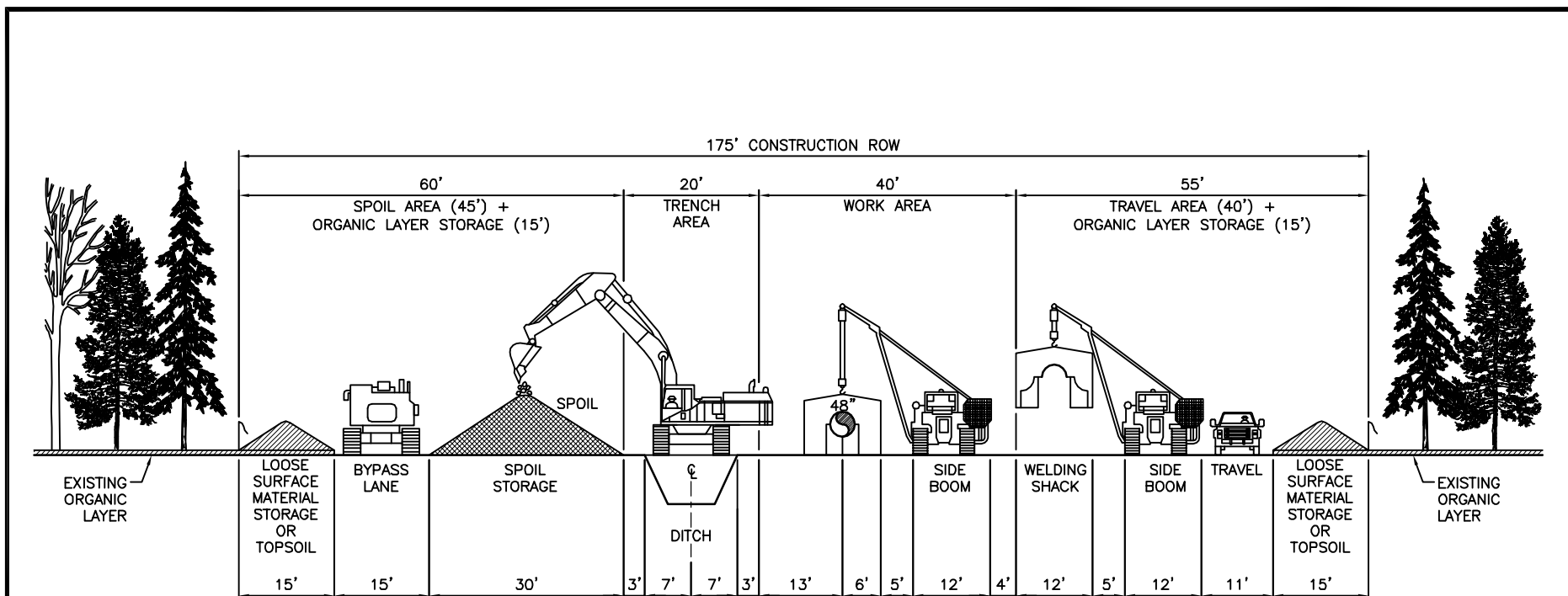
**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

## Appendix 1E ROW-02

### Alaska Pipeline Project

Right-of-Way Modes – Winter

Rev.  
E



**NOTE:**

1. FULL WIDTH TOPSOIL LAYER STRIPPING ON SOME AGRICULTURAL LANDS ONLY (WIDTH SHOWN BASED ON 6" OF STRIPPING).

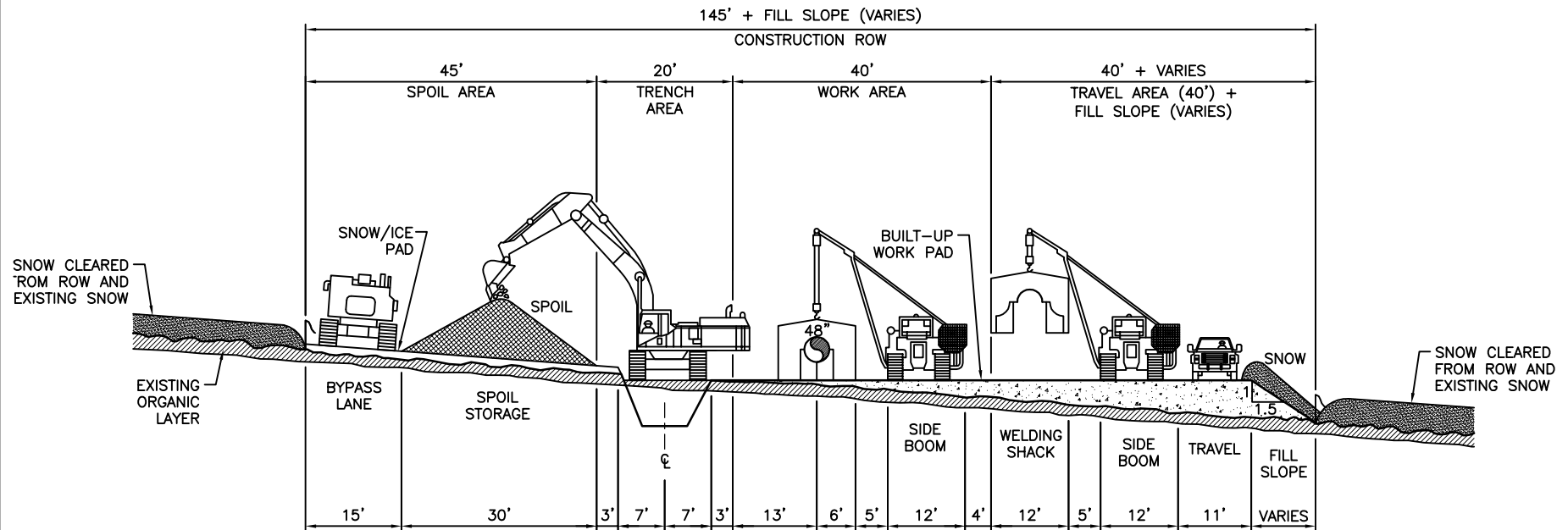
**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

## Appendix 1E ROW-03

### Alaska Pipeline Project

Right-of-Way Modes – Summer

Rev.  
D



**NOTES:**

1. GEOTEXTILE AND GEOGRID REINFORCEMENT MAY BE PLACED AT BASE OF BUILT-UP WORK PAD TO REDUCE DISTURBANCE OF THE TUNDRA PERMAFROST.
2. NOMINAL CONFIGURATION FOR MAXIMUM OF 10% CROSS SLOPE.

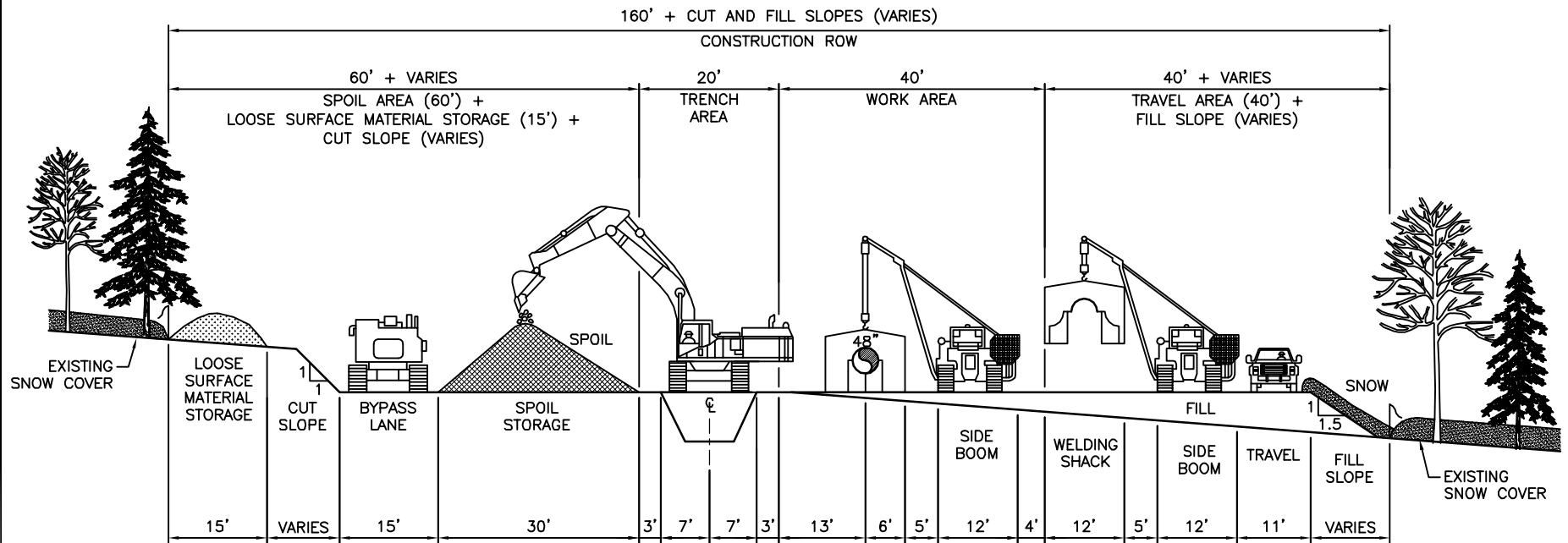
**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

## Appendix 1E ROW-04

### Alaska Pipeline Project

Right-of-Way Modes – Cross Slopes – North Slope (Winter)

Rev.  
B



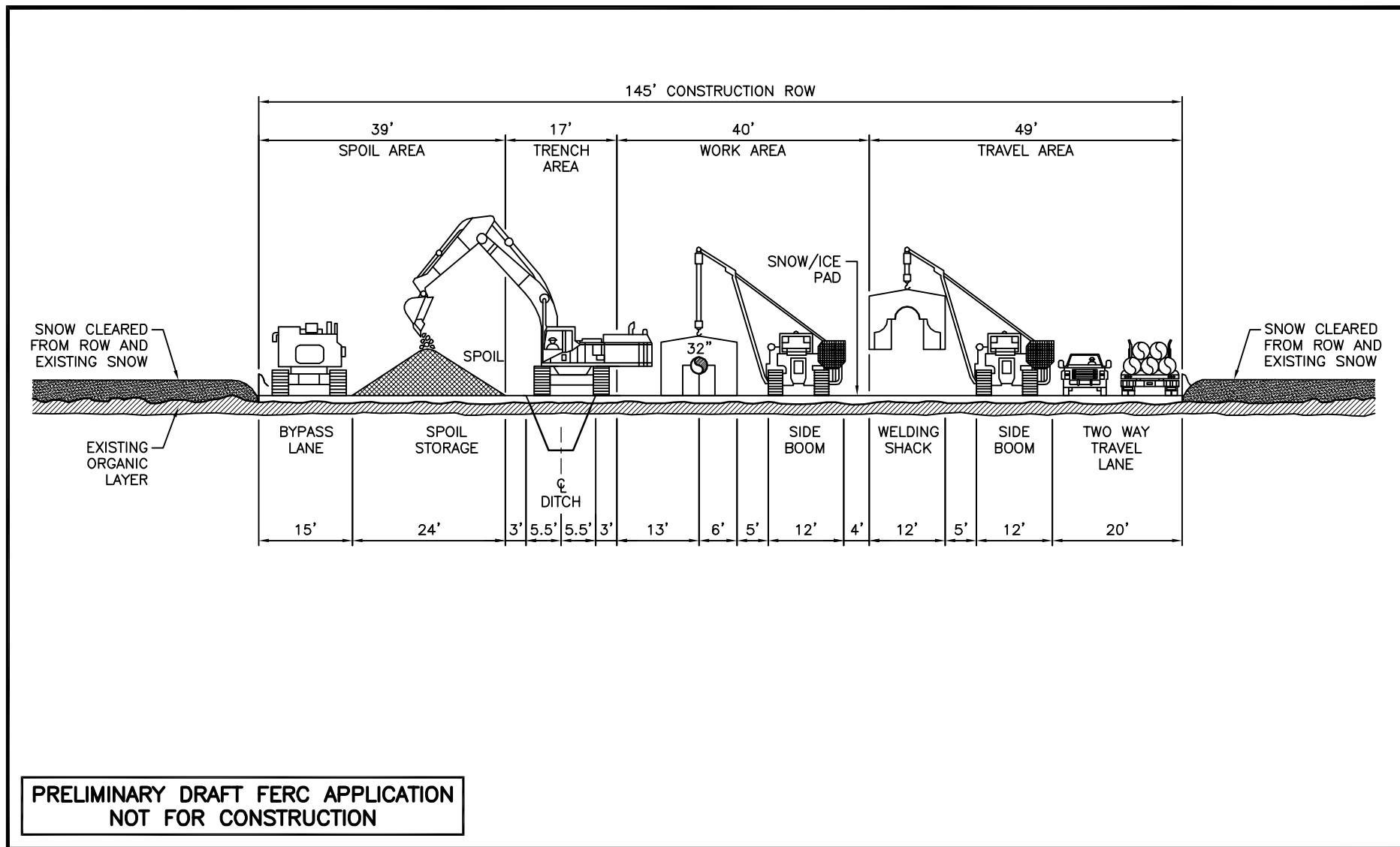
PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION

## Appendix 1E ROW-05

### Alaska Pipeline Project

Right-of-Way Modes – Cross Slopes (Winter)

Rev.  
E

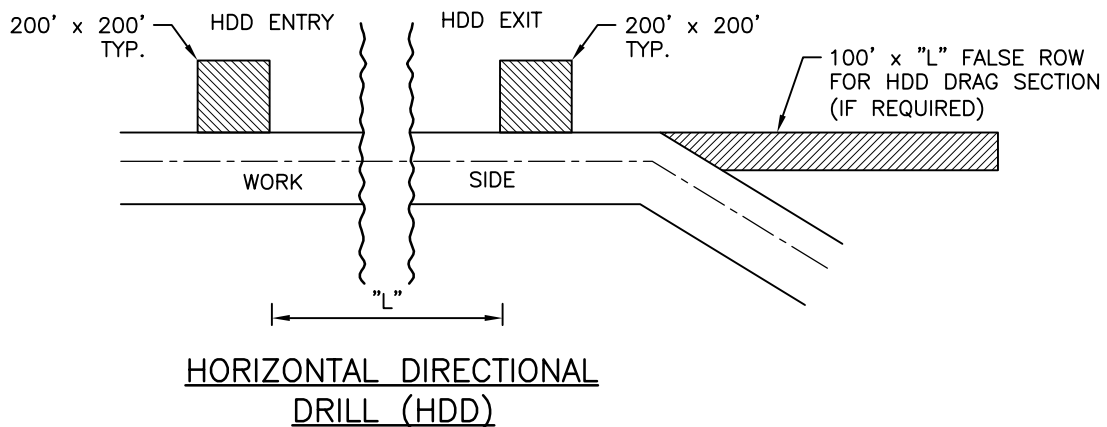
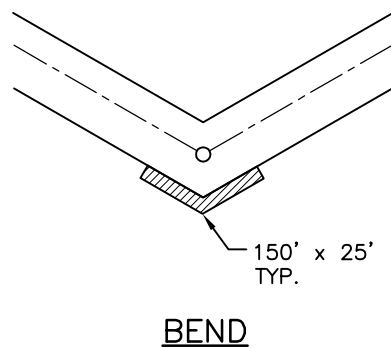
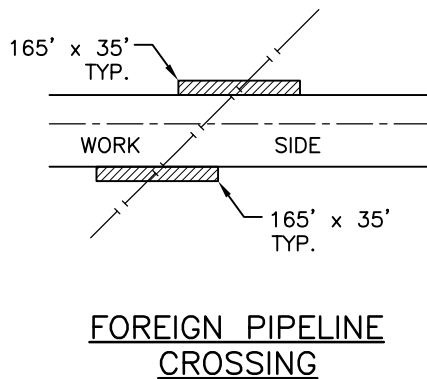
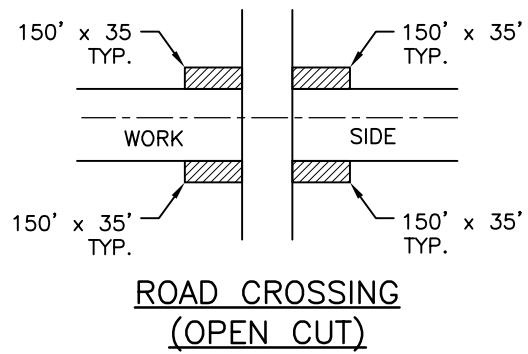
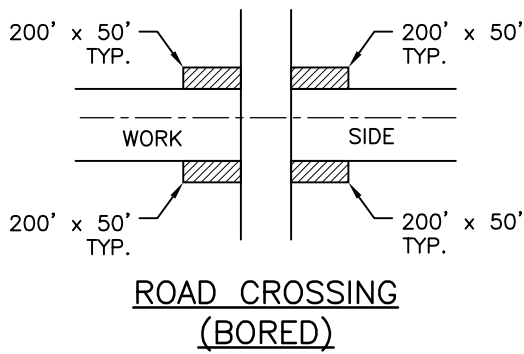


## Appendix 1E ROW-06

### Alaska Pipeline Project

Right-of-Way Modes – Point Thomson Gas Transmission Pipeline (Winter)

Rev.  
C



----- PROPOSED GAS PIPELINE

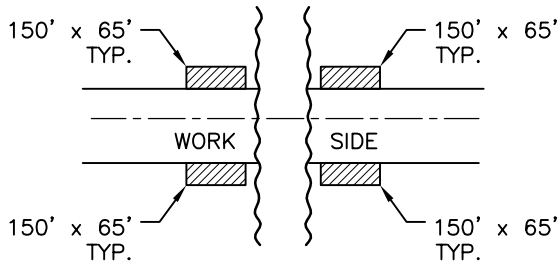
----- CONSTRUCTION ROW BOUNDARY

**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

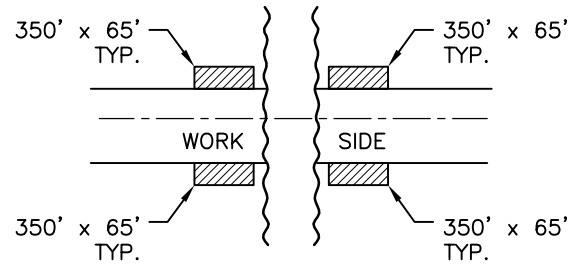
## Appendix 1E ROW-21 Alaska Pipeline Project

Right-of-Way Modes - Additional Temporary Workspace 1/2

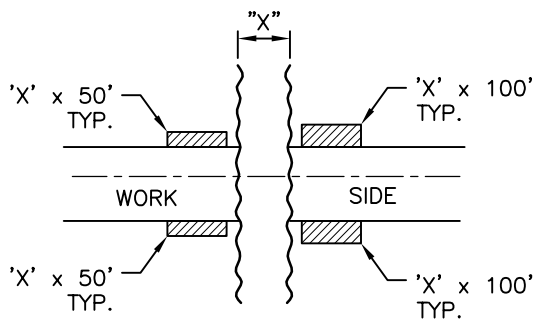
Rev.  
C



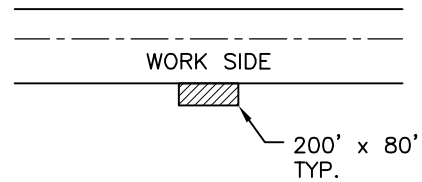
WATERCOURSE  
CROSSING <50' WIDE



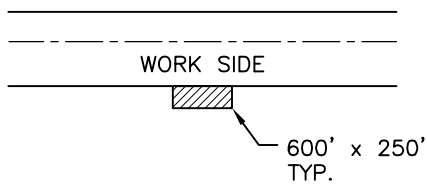
WATERCOURSE  
CROSSING >50' WIDE



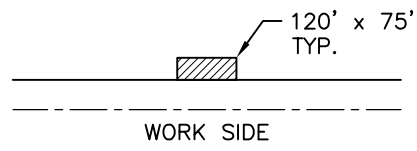
WETLAND CROSSING



TURN AROUND



BEGINNING/END OF SPREAD



TIMBER DECK

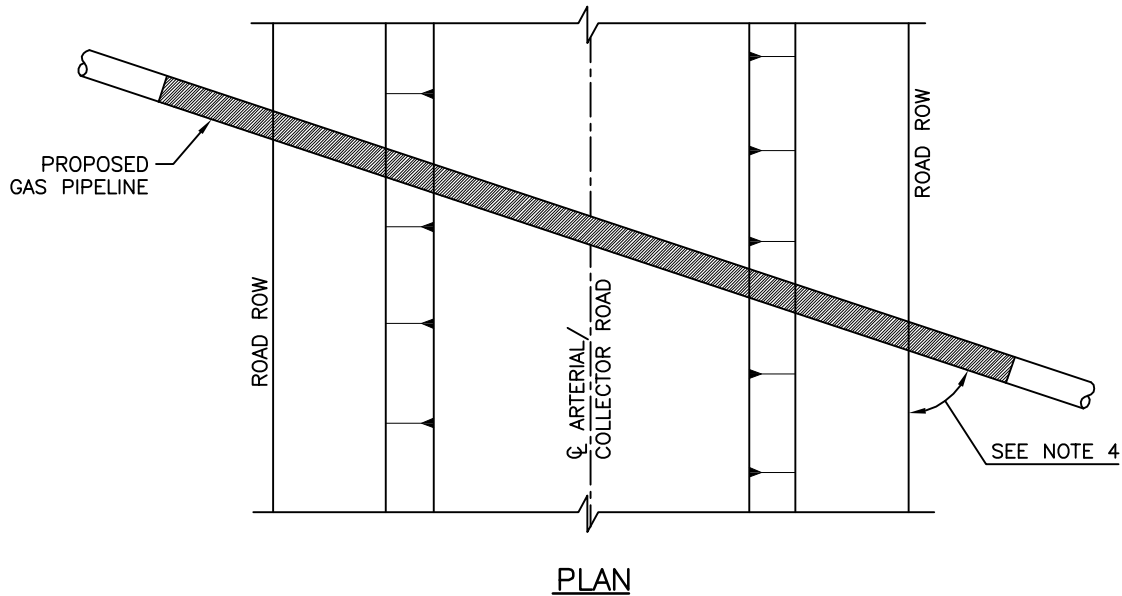
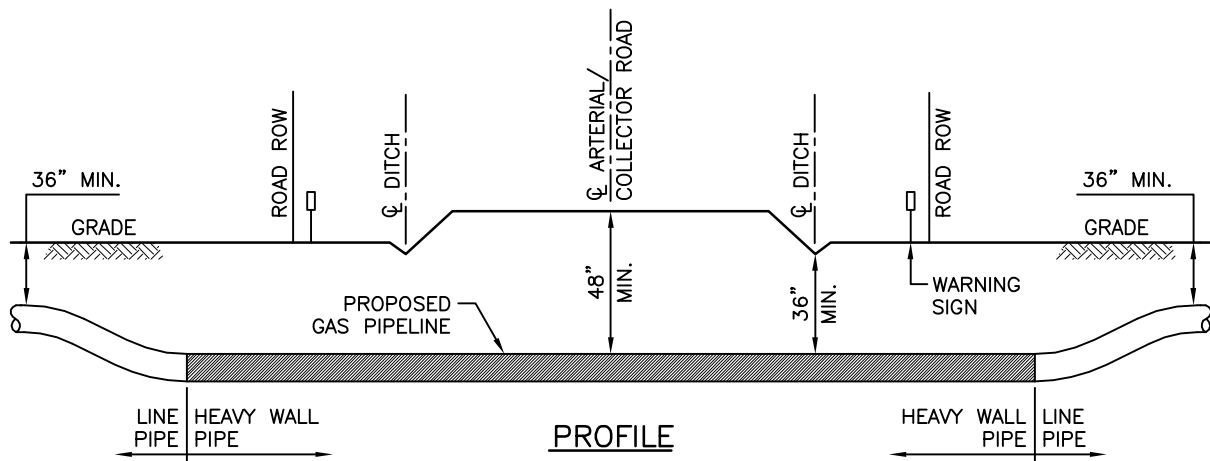
**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

----- PROPOSED GAS PIPELINE  
————— CONSTRUCTION ROW BOUNDARY

## Appendix 1E ROW-22 Alaska Pipeline Project

Right-of-Way Modes – Additional Temporary Workspace 2/2

Rev.  
C



#### NOTES:

1. WARNING SIGNS TO BE INSTALLED ON EACH SIDE OF ROAD ROW.
2. MINIMUM DEPTHS OF COVER SHOWN, CROSSING AGREEMENTS MAY DICTATE ADDITIONAL DEPTH.
3. CROSSING ANGLE TO BE AS CLOSE AS POSSIBLE TO 90° OR AS SPECIFIED IN THE CROSSING AGREEMENT.

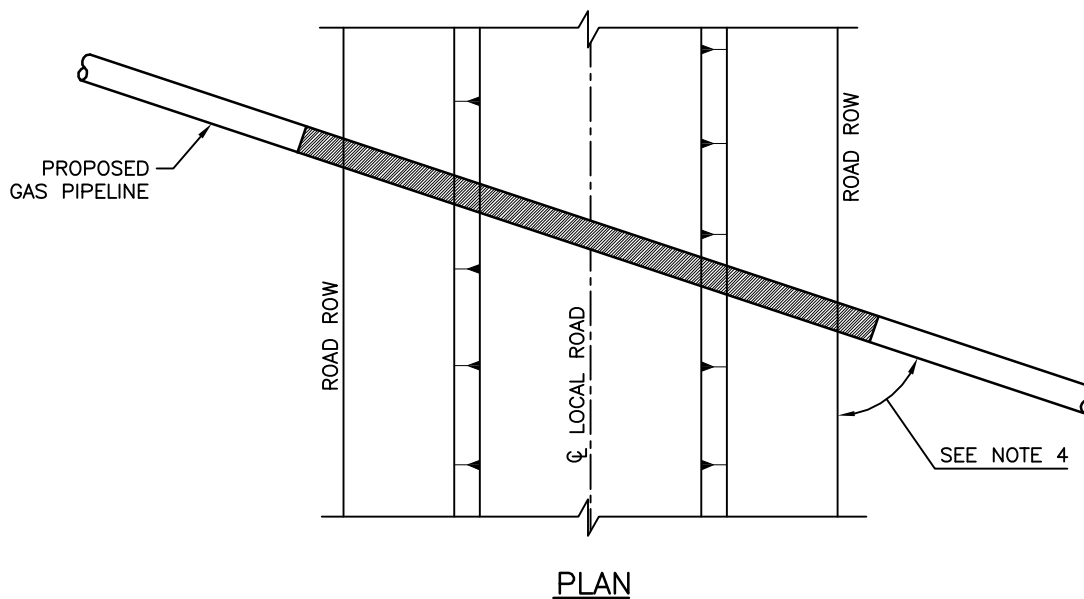
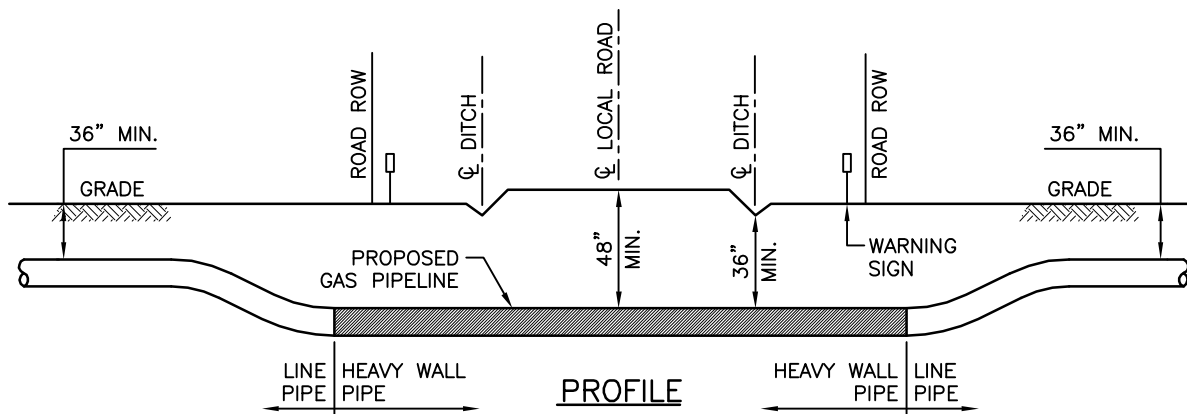
**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

## Appendix 1E ROAD-01 Alaska Pipeline Project

Road Crossings – Arterial Highways/Collector Roads

Rev.  
E





**NOTES:**

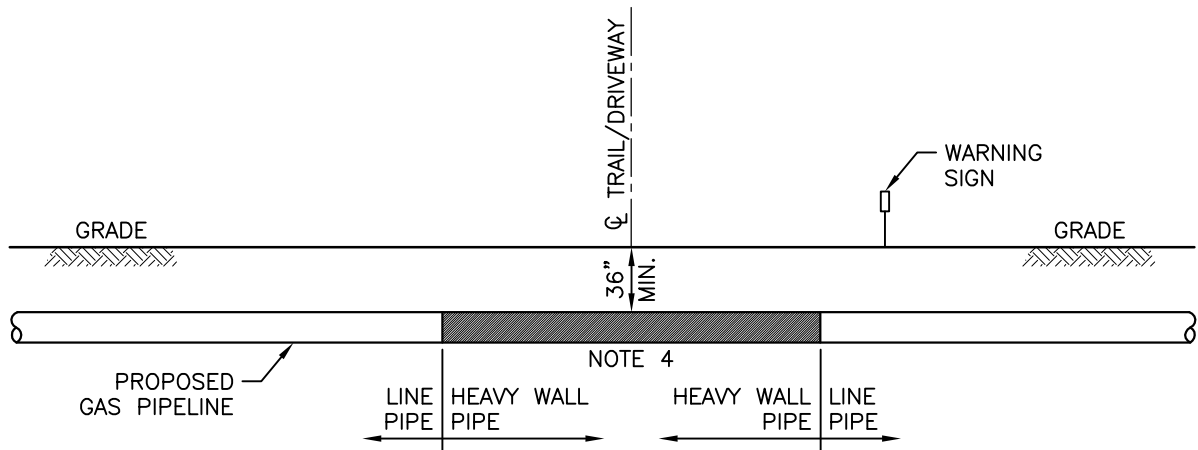
1. WARNING SIGNS TO BE INSTALLED ON EACH SIDE OF ROAD ROW.
2. MINIMUM DEPTHS OF COVER SHOWN, CROSSING AGREEMENTS MAY DICTATE ADDITIONAL DEPTH.
3. CROSSING ANGLE TO BE AS CLOSE AS POSSIBLE TO 90° OR AS SPECIFIED IN THE CROSSING AGREEMENT.

**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

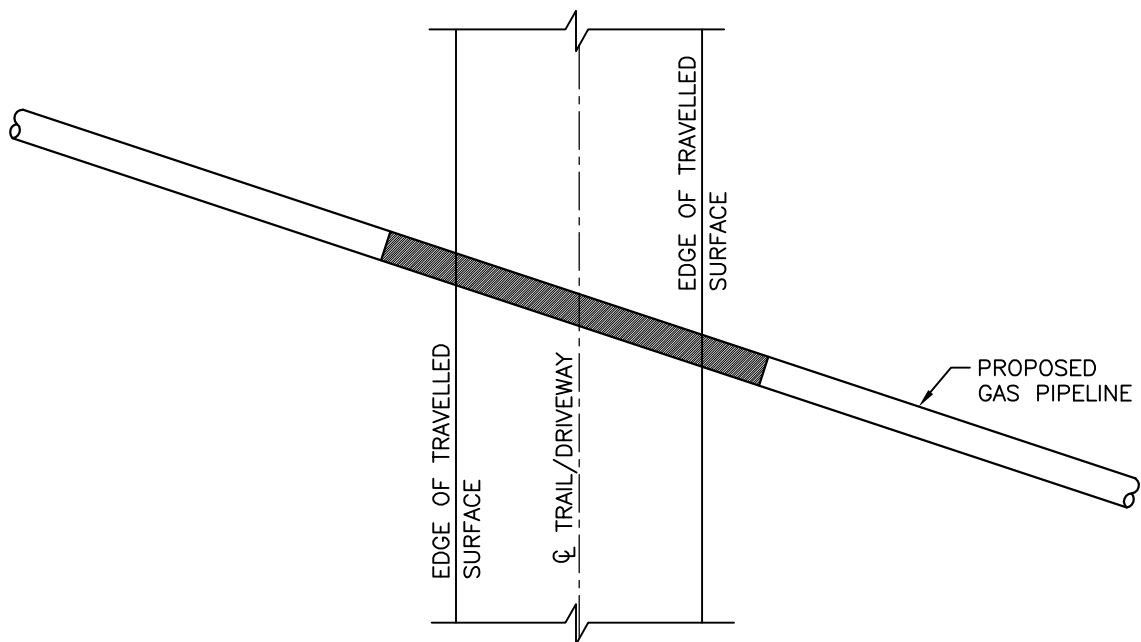
**Appendix 1E ROAD-02  
Alaska Pipeline Project**

Road Crossings – Local Roads

Rev.  
E



### PROFILE



### PLAN

#### NOTES:

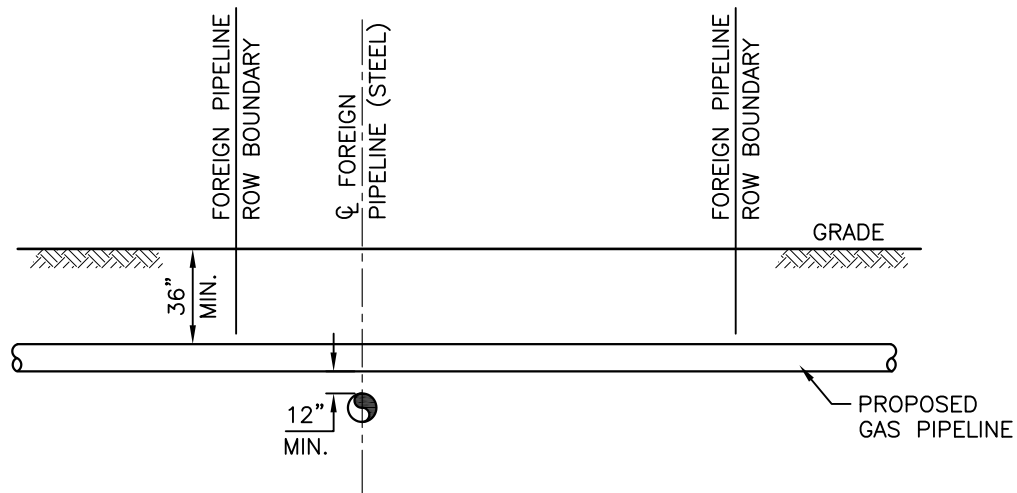
1. BENDS SHALL NOT BE PERMITTED UNDER TRAVELLED SURFACE.
2. WARNING SIGN TO BE INSTALLED ON ONE SIDE OF TRAIL/DRIVEWAY.
3. MINIMUM DEPTH OF COVER SHOWN, CROSSING AGREEMENT MAY DICTATE ADDITIONAL DEPTH.
4. TYPICALLY ONE JOINT OF HEAVY WALL PIPE INSTALLED AT TRAILS/DRIVEWAYS.

**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

## Appendix 1E ROAD-03 Alaska Pipeline Project

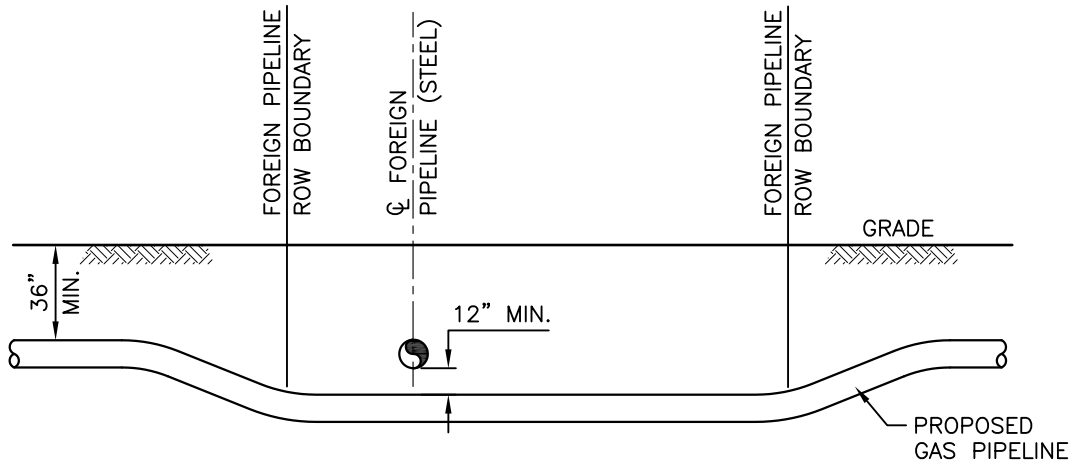
Road Crossings – Trails And Driveways

Rev.  
C



**DETAIL "A"**

NEW PIPELINE IS PLACED OVER  
EXISTING FOREIGN PIPELINE



**DETAIL "B"**

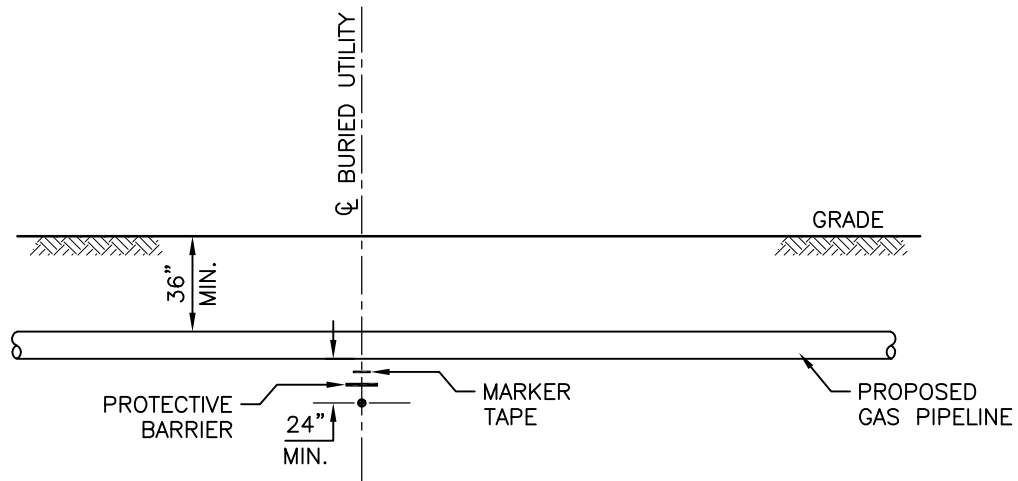
NEW PIPELINE IS PLACED UNDER  
EXISTING FOREIGN PIPELINE

**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

## Appendix 1E FP-01 Alaska Pipeline Project

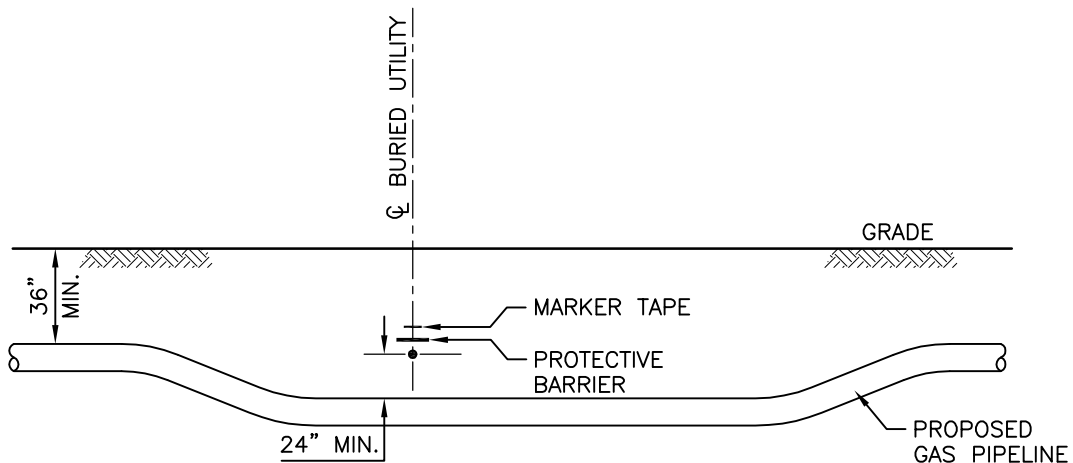
Foreign Pipeline And Utility Crossings – Foreign Pipelines

Rev.  
D



### DETAIL "A"

NEW PIPELINE IS PLACED OVER  
EXISTING BURIED UTILITY



### DETAIL "B"

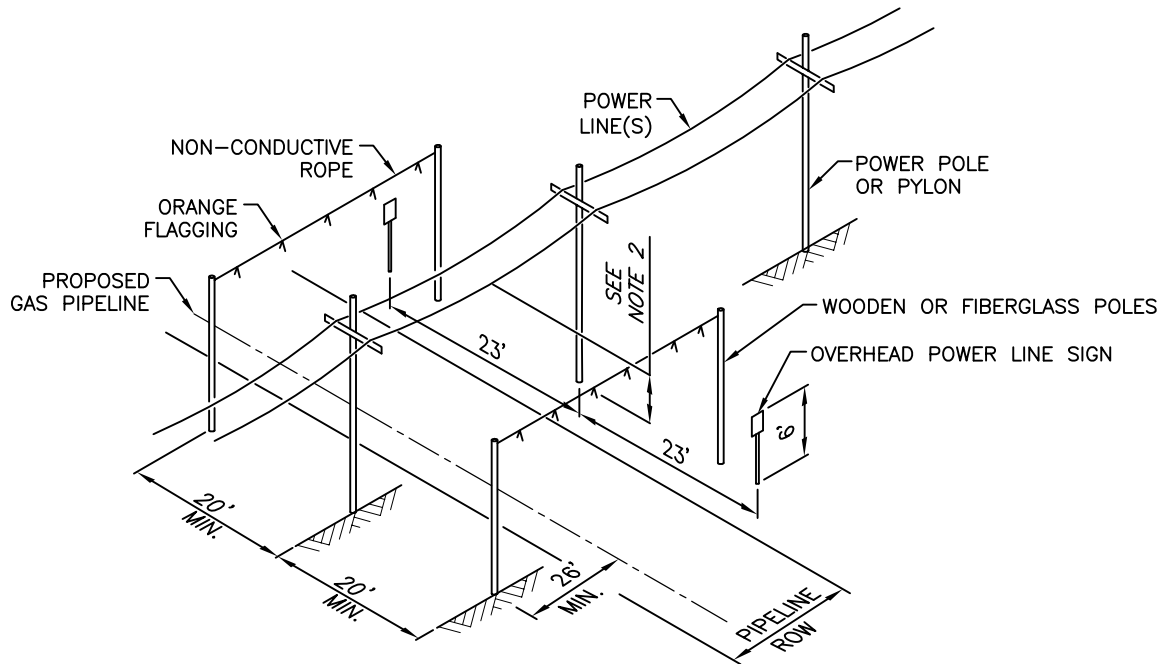
NEW PIPELINE IS PLACED UNDER  
EXISTING BURIED UTILITY

PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION

## Appendix 1E UT-01 Alaska Pipeline Project

Foreign Pipeline And Utility Crossings – Buried Utility

Rev.  
C



MINIMUM SAFE LIMITS OF APPROACH DISTANCES FOR PERSONS AND EQUIPMENT	
OPERATING VOLTAGE OF OVERHEAD POWER LINE BETWEEN CONDUCTORS	DISTANCE
0 – 750 V (INSULATED OR POLYETHYLENE COVERED CONDUCTORS – NOTE 4)	12"
ABOVE 750 V (INSULATED CONDUCTORS – NOTES 4,5)	40"
0 – 40 000 V	10'
69 000 – 72 000 V	11'–6"
138 000 – 144 000 V	13'
230 000 – 240 000 V	16'–6"
500 000 V	23'

#### NOTES:

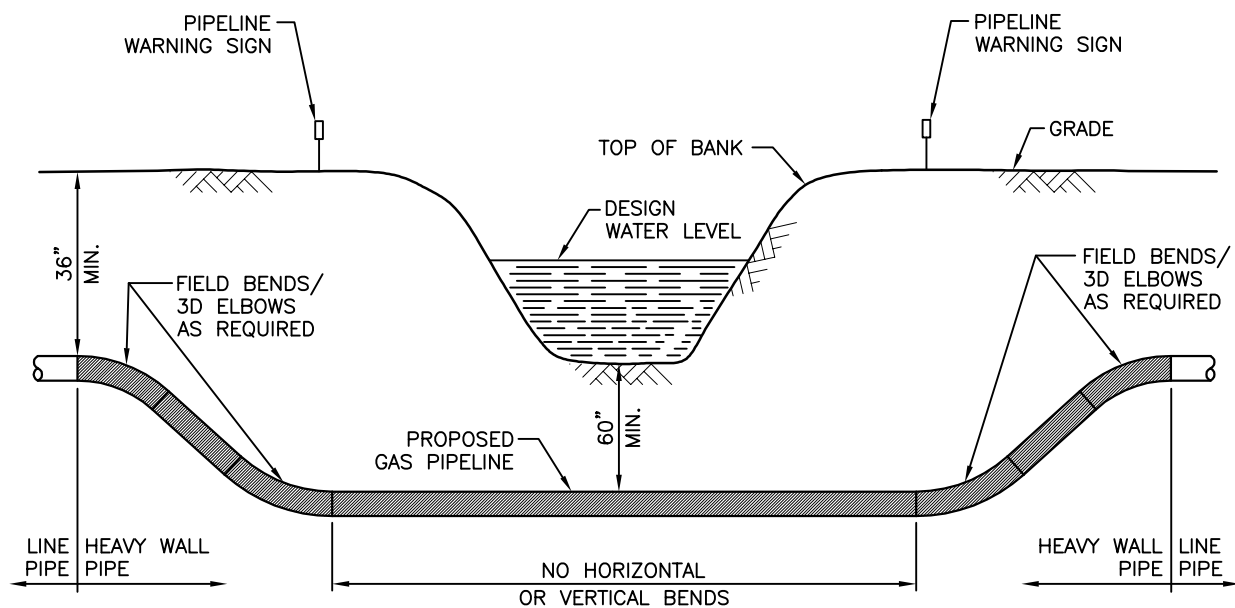
1. OVERHEAD POWER LINE SIGNS, SHALL BE PLACED APPROXIMATELY 23' ON EITHER SIDE OF THE OVERHEAD POWER LINES IN PLAIN VIEW OF THOSE TRAVELLING IN EITHER DIRECTION UNDER THE LINES.
2. THE ABOVE CLEARANCES APPLY IN ALL DIRECTIONS, VERTICAL OR HORIZONTAL.
3. ALL POLES, SIGNS, FLAGGING, ETC. TO BE REMOVED FROM CROSSING SITE AFTER CLEAN-UP.
4. A MINIMUM OF 26' HORIZONTAL SEPARATION SHALL BE MAINTAINED FROM ALL POLES AND STRUCTURES ASSOCIATED WITH AN OVERHEAD POWERLINE UNLESS OTHERWISE SPECIFIED BY THE FOREIGN LINE OWNER IN WRITING, GREATER DISTANCES MAY BE IMPOSED.
5. CONDUCTORS MUST BE INSULATED OR COVERED THROUGHOUT THEIR ENTIRE LENGTH TO COMPLY WITH THESE GROUPS.
6. CONDUCTORS MUST BE MANUFACTURED TO RATED AND TESTED INSULATION LEVELS.

**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

## Appendix 1E UT-02 Alaska Pipeline Project

Foreign Pipeline And Utility Crossings – Above Ground Utility

Rev.  
C



PROFILE

NOTES:

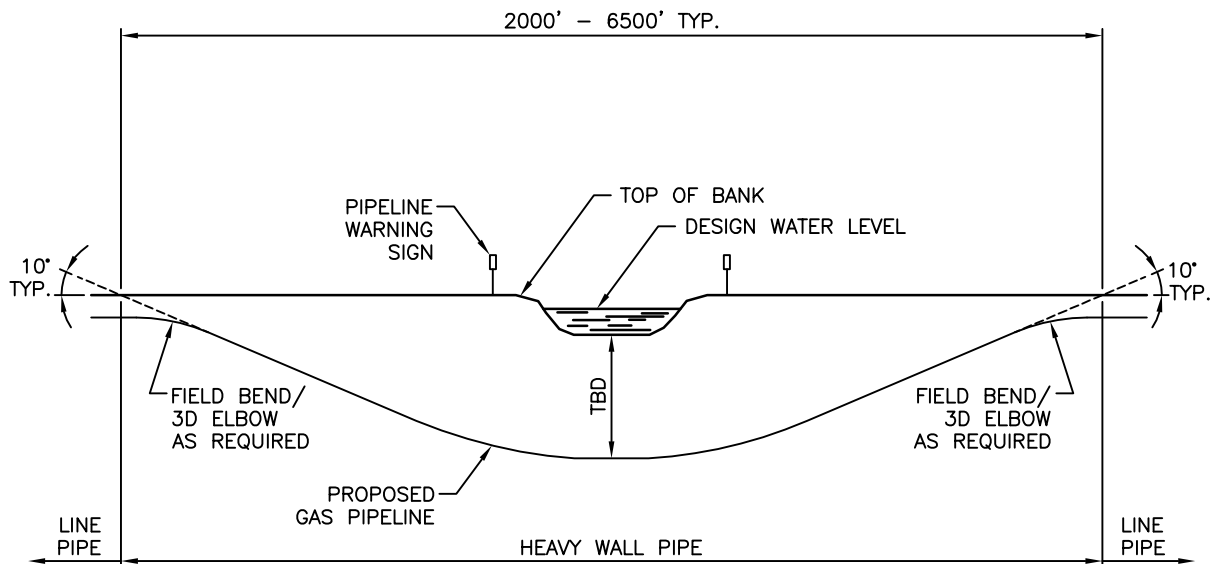
1. CROSSING SHALL BE CONSTRUCTED IN ACCORDANCE WITH APPROVED METHOD(S) FROM AUTHORITIES HAVING JURISDICTION.
2. EROSION CONTROL DESIGN SHALL BE IMPLEMENTED AS PER THE SEDIMENT AND EROSION CONTROL PLAN.
3. INSTALL APPROVED AND APPROPRIATE VEHICLE CROSSING AS REQUIRED.
4. ALL MAJOR AND INTERMEDIATE WATERBODY CROSSINGS WILL HAVE A DETAILED SITE SPECIFIC CROSSING DRAWING INCLUDING RECLAMATION PLANS. PROFILE SHOWN IS FOR ILLUSTRATIVE PURPOSES ONLY. MINIMUM DEPTH OF COVER WILL ALSO BE SITE SPECIFIC.

**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

**Appendix 1E WB-01  
Alaska Pipeline Project**

Waterbody Crossings – Major/Intermediate – Trenched

Rev.  
C



### PROFILE

#### NOTES:

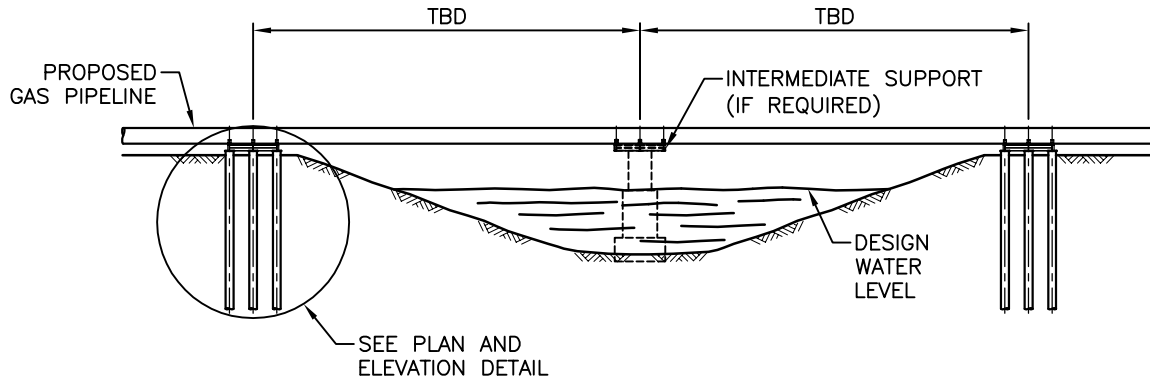
1. OBTAIN GEOTECHNICAL DATA, PRIOR TO INITIATING DRILLING. DRILLING MAY NOT BE FEASIBLE IN SOME MATERIALS SUCH AS UNCONSOLIDATED GRAVELS.
2. PREPARE A DRILLING MUD RELEASE CONTINGENCY PLAN.
3. SET UP DRILLING EQUIPMENT BACK FROM THE EDGE OF THE WATERCOURSE; DO NOT CLEAR WITHIN THE VEGETATED BUFFER ZONE EXCEPT ALONG THE WORK SIDE, IF TEMPORARY VEHICLE CROSSING IS INSTALLED.
4. MONITOR WATERCOURSE AND SURROUNDING AREA ALONG THE DRILL PATH FOR AN INADVERTENT MUD RELEASE.
5. ENSURE THAT ONLY BENONITE BASED DRILLING MUD IS USED. DO NOT ALLOW THE USE OF ANY ADDITIVES TO THE DRILLING MUD WITHOUT THE APPROVAL OF PROPER REGULATORY AUTHORITIES.
6. EXCAVATE SUMPS AT THE DRILL ENTRY AND ANTICIPATED EXIT POINTS TO CONTAIN THE DRILLING MUD.
7. DISPOSE DRILLING MUD IN ACCORDANCE WITH THE APPROPRIATE REGULATORY AUTHORITY REQUIREMENTS.
8. ALL HDD INSTALLATIONS WILL HAVE A DETAILED SITE SPECIFIC CROSSING DRAWING.

**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

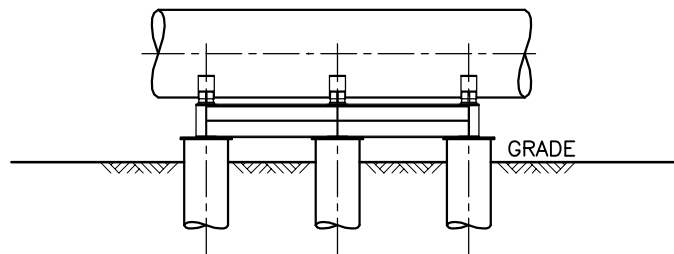
## **Appendix 1E WB-02 Alaska Pipeline Project**

Waterbody Crossings – Major/Intermediate – HDD

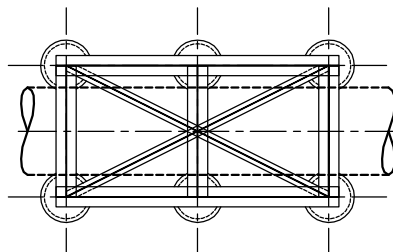
Rev.  
C



ELEVATION



ELEVATION



PLAN

NOTES:

1. CONCEPTUAL DESIGN FOR ILLUSTRATIVE PURPOSES ONLY.
2. EXPANSION LOOP MAY BE REQUIRED AT ONE END OF UNSUPPORTED SPAN.

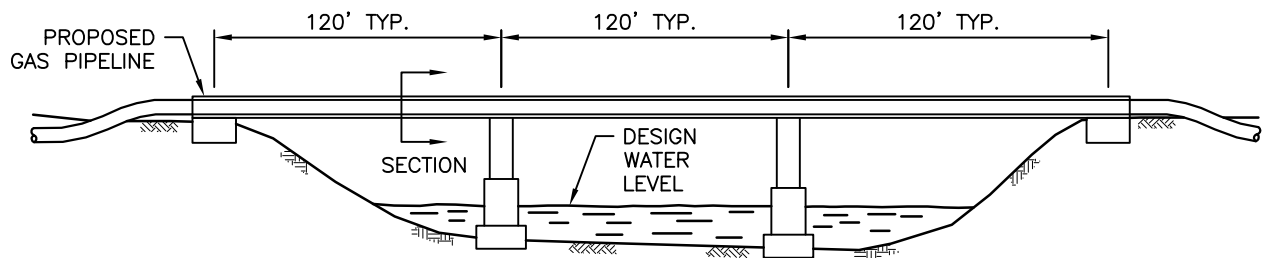
**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

**Appendix 1E WB-03A  
Alaska Pipeline Project**

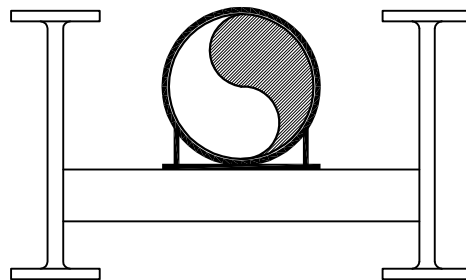
Waterbody Crossings – Major/Intermediate–Unsupported Span Bridge

Rev.  
C





ELEVATION



SECTION

NOTE:

1. CONCEPTUAL DESIGN FOR ILLUSTRATIVE PURPOSES ONLY.

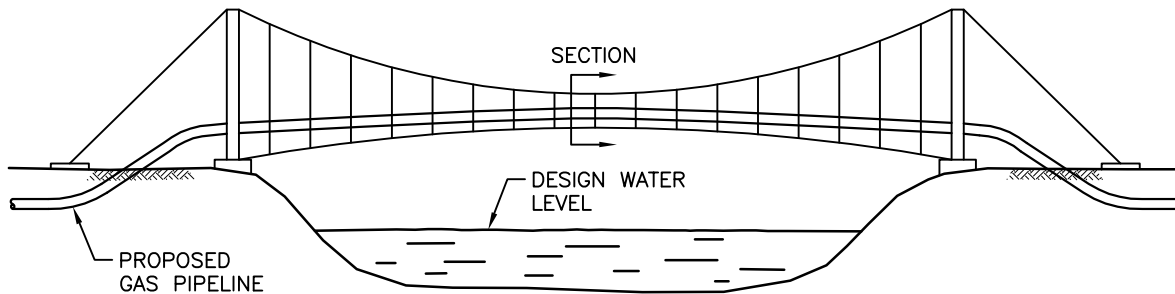
PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION

## Appendix 1E WB-03B

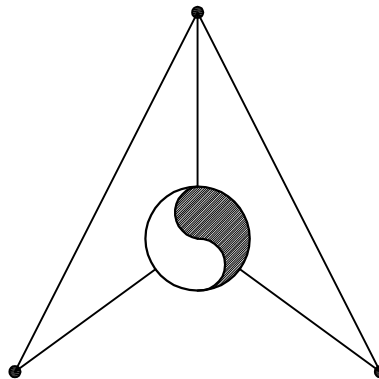
### Alaska Pipeline Project

Waterbody Crossings – Major/Intermediate–Simply Supported Span Bridge

Rev.  
C



ELEVATION



SECTION

NOTE:

1. CONCEPTUAL DESIGN FOR ILLUSTRATIVE PURPOSES ONLY.

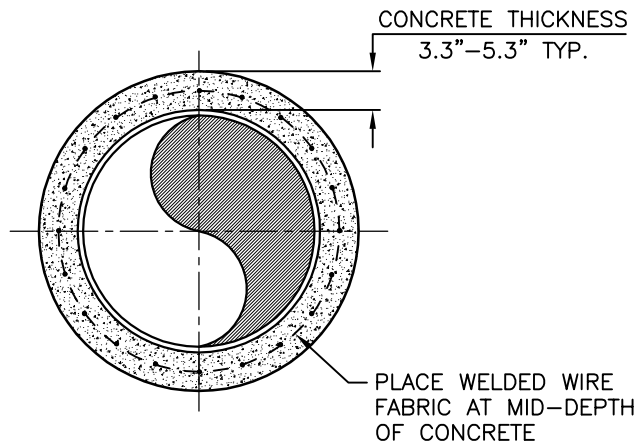
PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION

## Appendix 1E WB-03C

### Alaska Pipeline Project

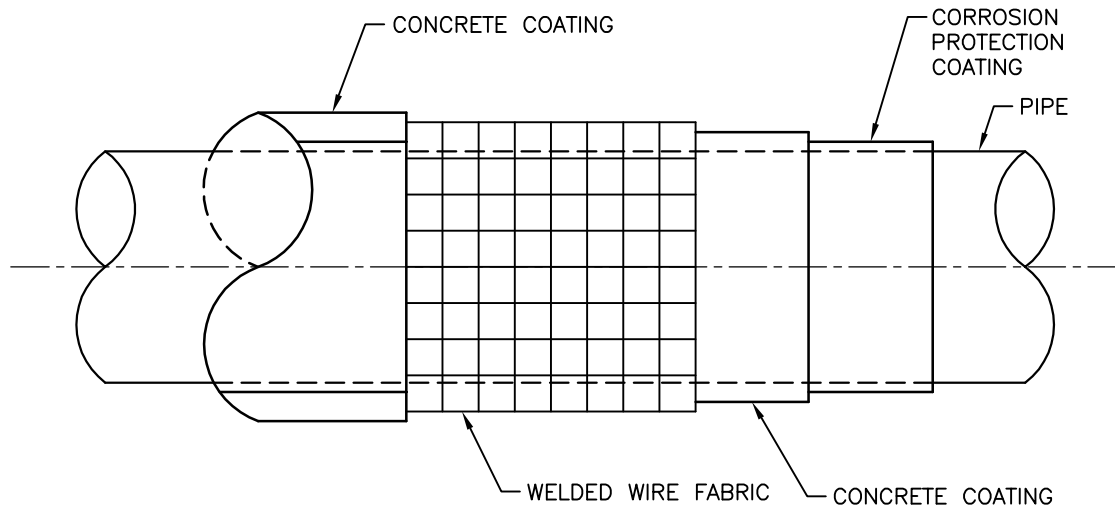
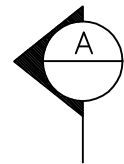
Waterbody Crossings – Major/Intermediate – Cable Supported Span

Rev.  
A

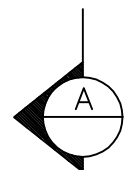


SECTION

A



ELEVATION

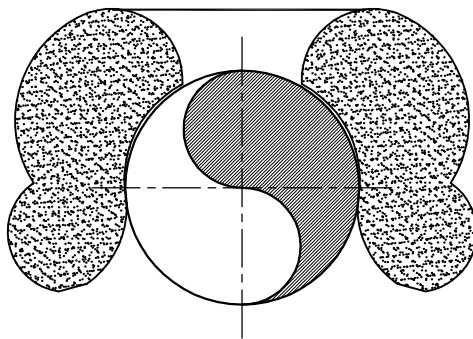


PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION

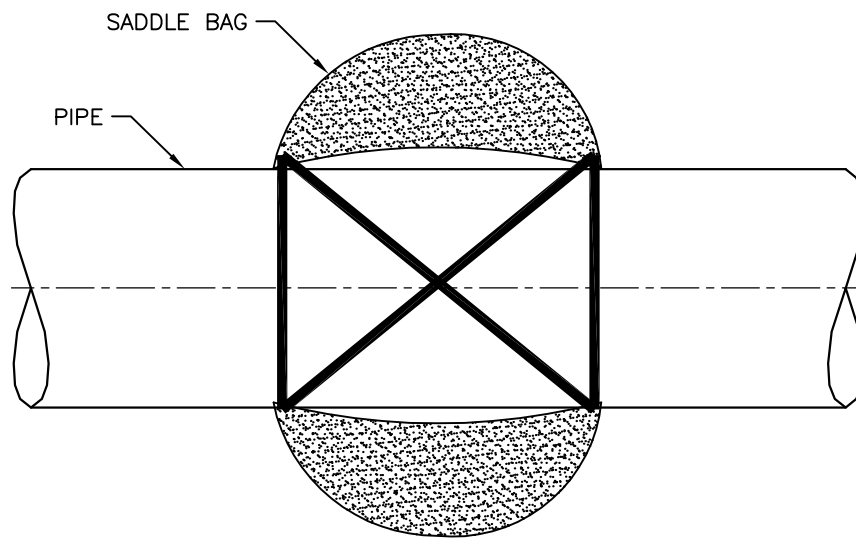
## Appendix 1E BC-01 Alaska Pipeline Project

Buoyancy Control – Concrete Coating

Rev.  
C



SECTION



PLAN

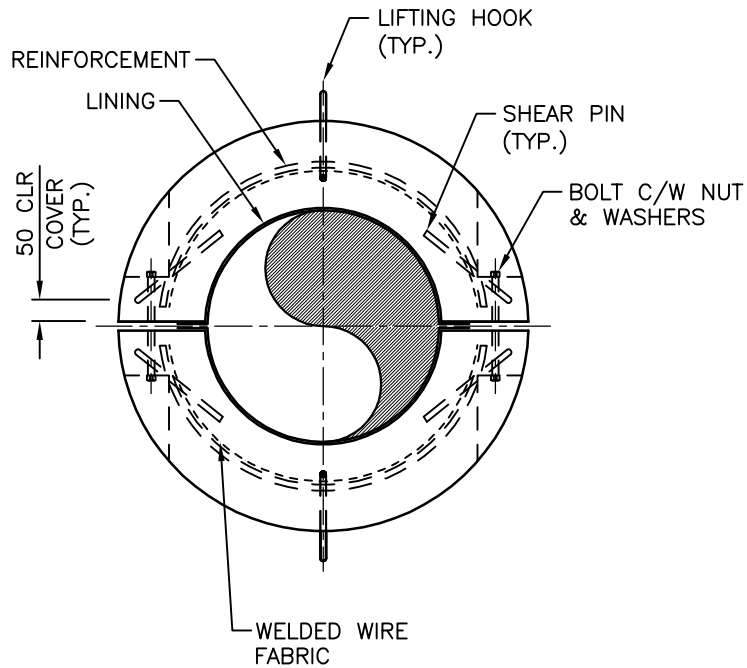
PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION

## Appendix 1E BC-02

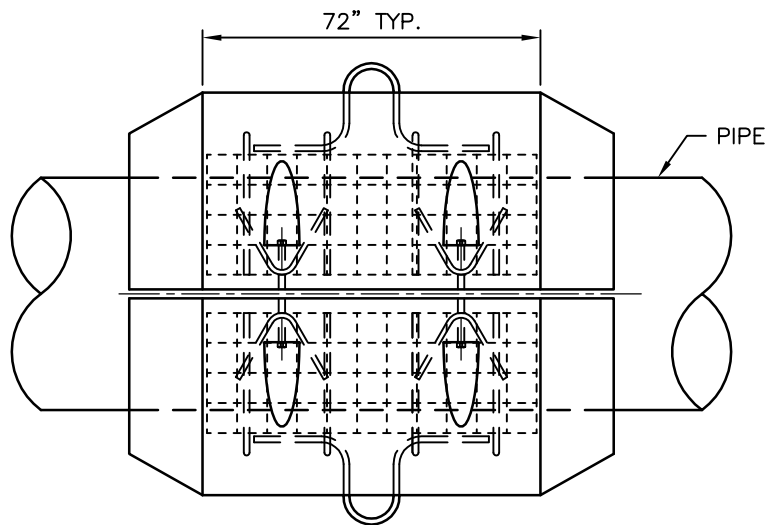
### Alaska Pipeline Project

Buoyancy Control – Saddle Bags

Rev.  
C



SECTION



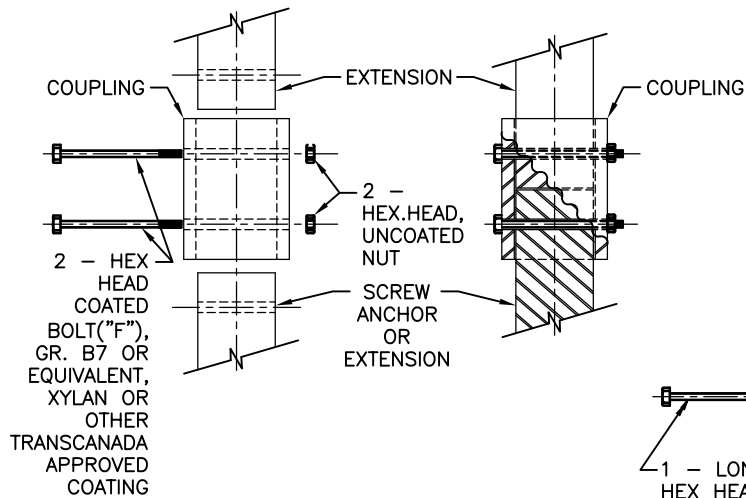
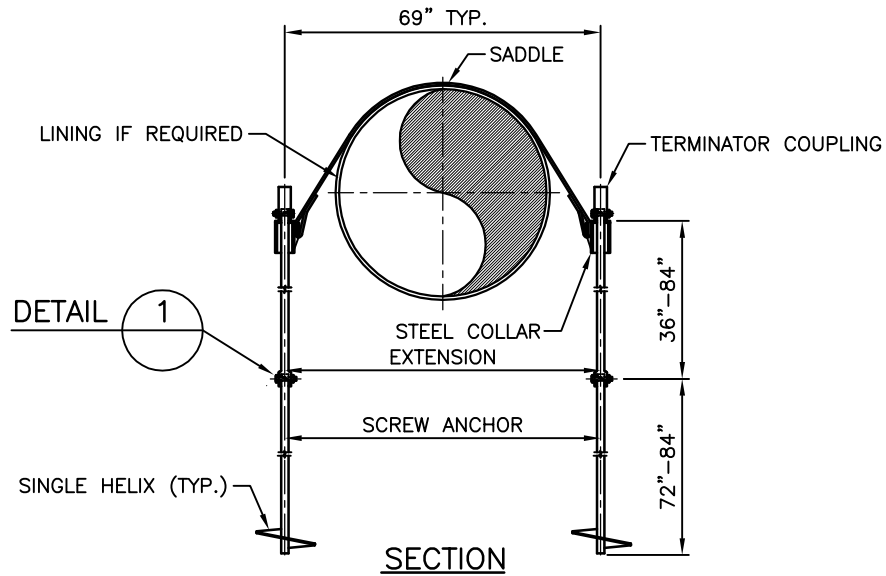
ELEVATION

PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION

## Appendix 1E BC-03 Alaska Pipeline Project

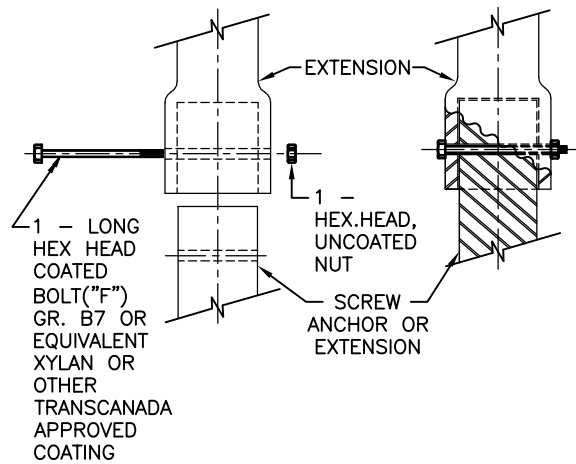
Buoyancy Control – Bolt-on River Weights

Rev.  
C



CONNECTION DETAIL 1

OPTION A



CONNECTION DETAIL 1

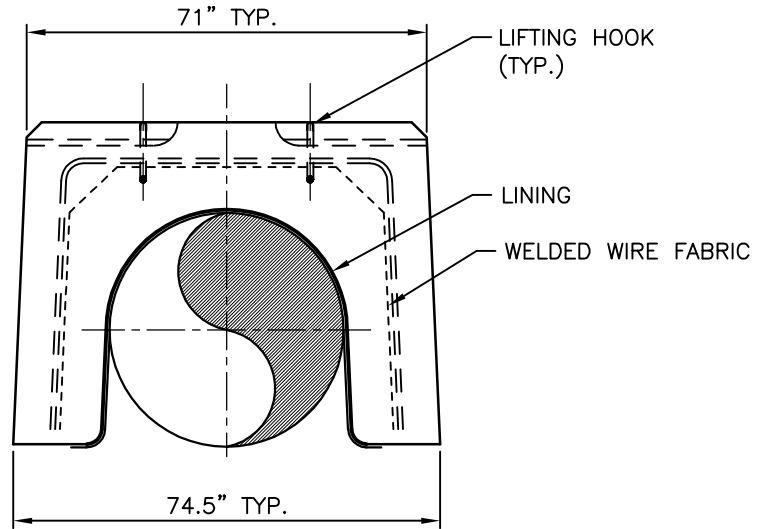
OPTION B

PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION

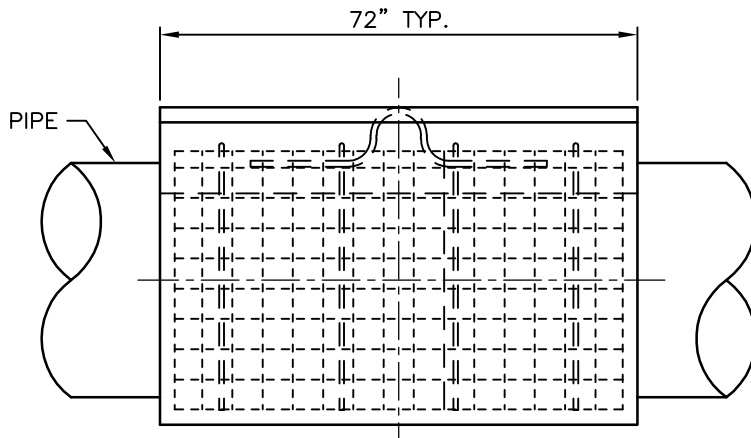
## Appendix 1E BC-04 Alaska Pipeline Project

Buoyancy Control - Screw Anchors

Rev.  
C



SECTION



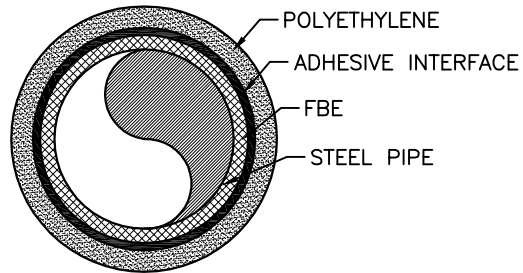
ELEVATION

PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION

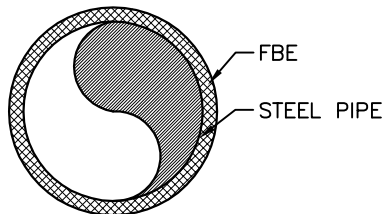
## Appendix 1E BC-05 Alaska Pipeline Project

Buoyancy Control – Set-on Weights

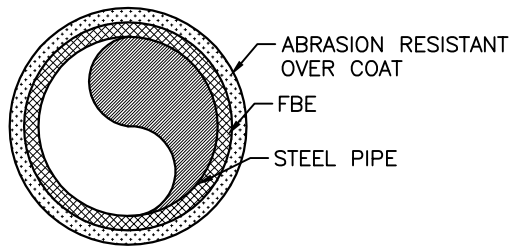
Rev.  
C



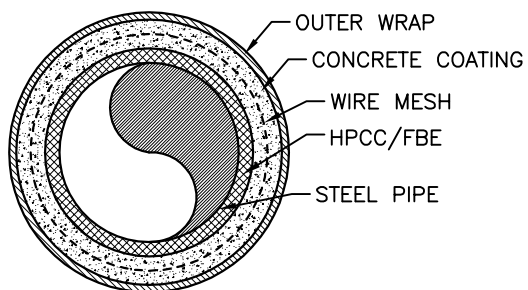
HIGH PERFORMANCE COMPOSITE  
COATING (HPCC)



FUSION BONDED EPOXY (FBE)



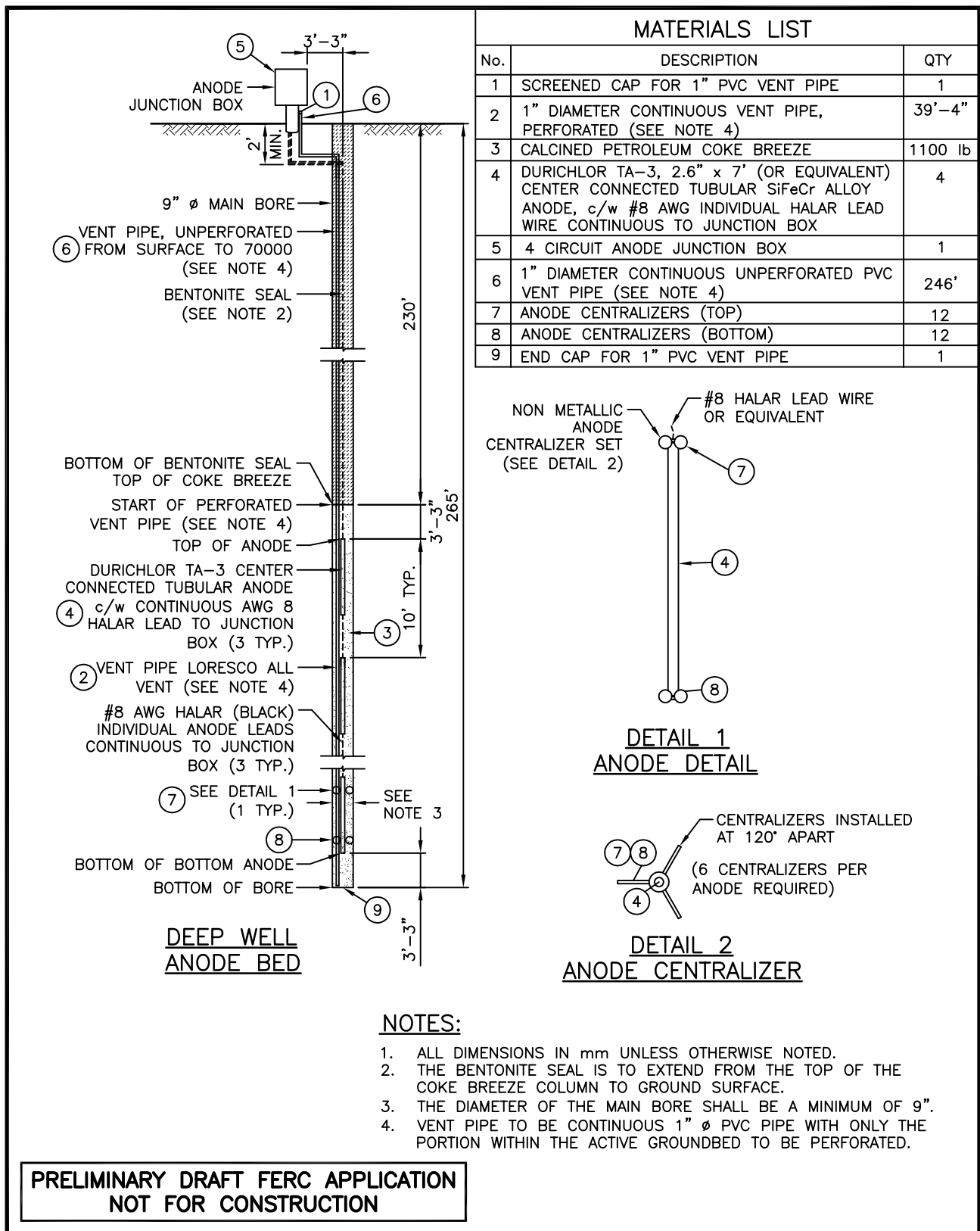
ABRASION COATED FBE



CONCRETE ROCK PROTECTION

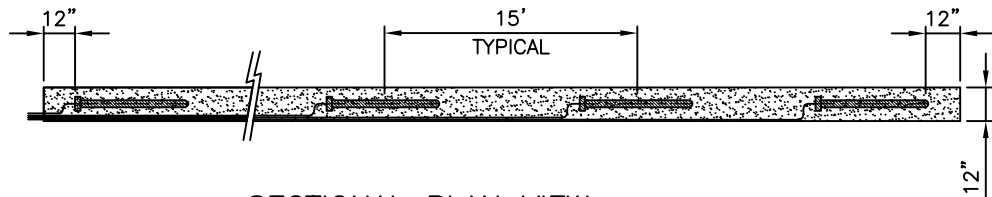
PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION



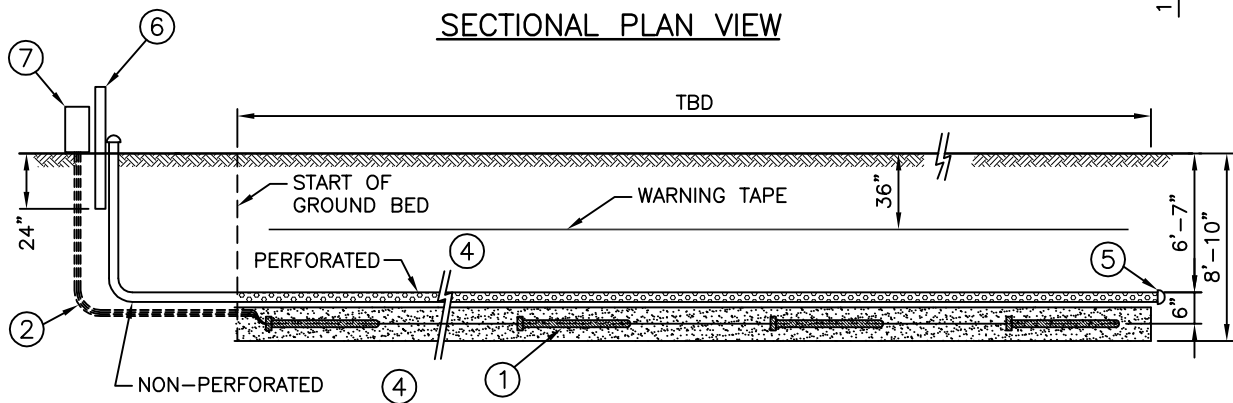


## MATERIAL LIST

No.	DESCRIPTION	QTY
1	2" x 60" SiFeCr. ANODES	TO SUIT
2	#8 HMWPE (BLACK) ANODE LEADS	TO SUIT
3	55 lb BAGS OF CALCINED PETROLEUM COKE BREEZE	TO SUIT
4	4.5" WEEPING TILE	TO SUIT
5	4.5" CAP FOR WEEPING TILE	2
6	4.5" x 4.5" x 5' TREATED CEDAR POST	1
7	B2 WIRING PEDESTAL	1



SECTIONAL PLAN VIEW



SECTIONAL ELEVATION VIEW

### GENERAL INSTALLATION PROCEDURE:

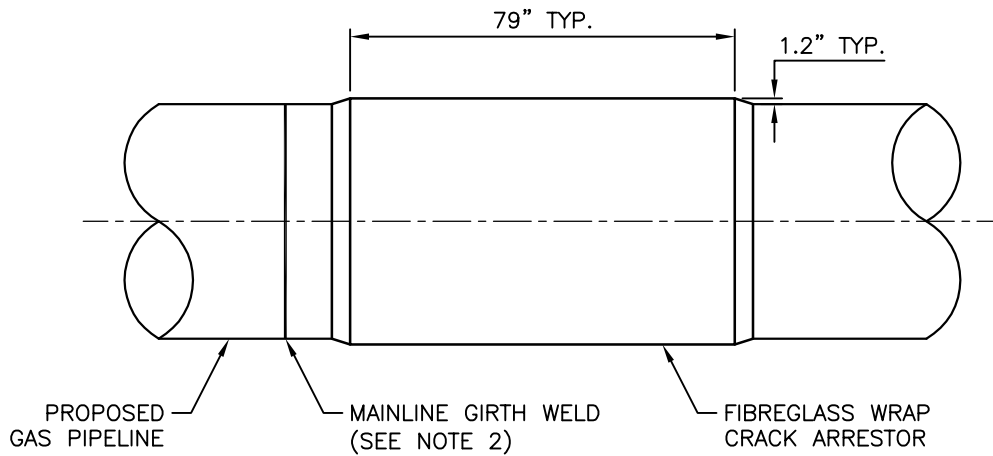
1. EXCAVATE A TRENCH.
2. POUR A 4" BED OF COKE BREEZE EVENLY ALONG THE TRENCH AND TAMP TO COMPACT.
3. PLACE ANODES AT THE NOTED SPACING IN THE CENTRE OF THE COKE BREEZE BED.
4. POUR COKE BREEZE BACKFILL OVER THE ANODES TO ACHIEVE A TRENCH COVER 4" ABOVE THE ANODES AND TAMP TO COMPACT.
5. PLACE THE WEEPING TILE SYSTEM IN THE TRENCH ABOVE THE COKE BREEZE.
6. BACKFILL TO 36" BELOW GRADE BY USING NATIVE BACKFILL, FREE OF LARGE ROCKS OR FROZEN CLODS AND TAMP TO COMPACT EVERY 12" LIFT.
7. LAY WARNING TAPE AS SHOWN.
8. BACKFILL AND TAMP TO EVEN GRADE.

**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

## Appendix 1E CC-03 Alaska Pipeline Project

Cathodic Protection – Typical Horizontal Anode Bed

Rev.  
C



**NOTES:**

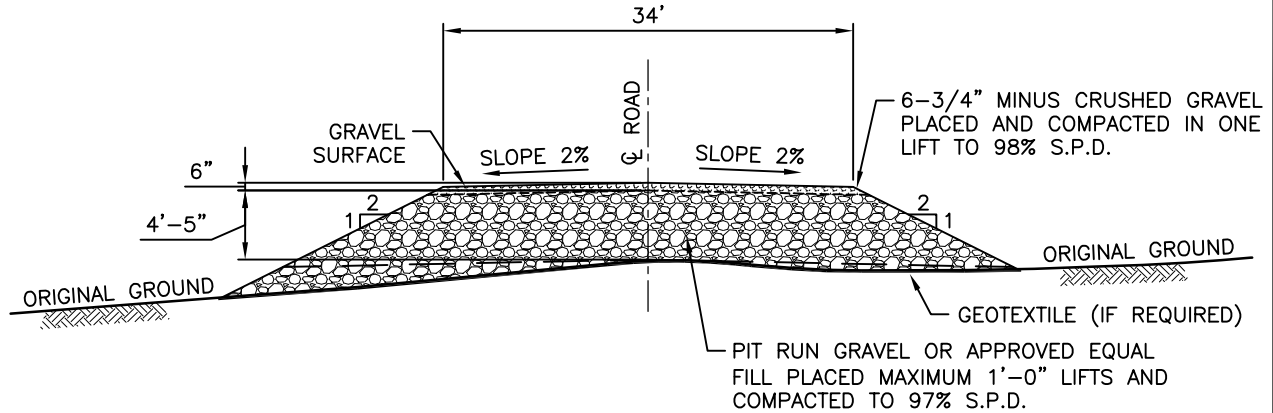
1. FIBREGLASS WRAP CRACK ARRESTORS INSTALLED ON TOP OF EXTERNAL COATING AT THE COATING MILL OR OTHER SUITABLE LOCATIONS.
2. CRACK ARRESTORS SHALL BE INSTALLED AT PIPE ENDS WITH SUFFICIENT CLEARANCE NOT TO INTERFERE WITH THE WELDING OR NDE PROCESS.
3. CRACK ARRESTORS TO BE INSTALLED AT NOMINAL TBD INTERVALS.

**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

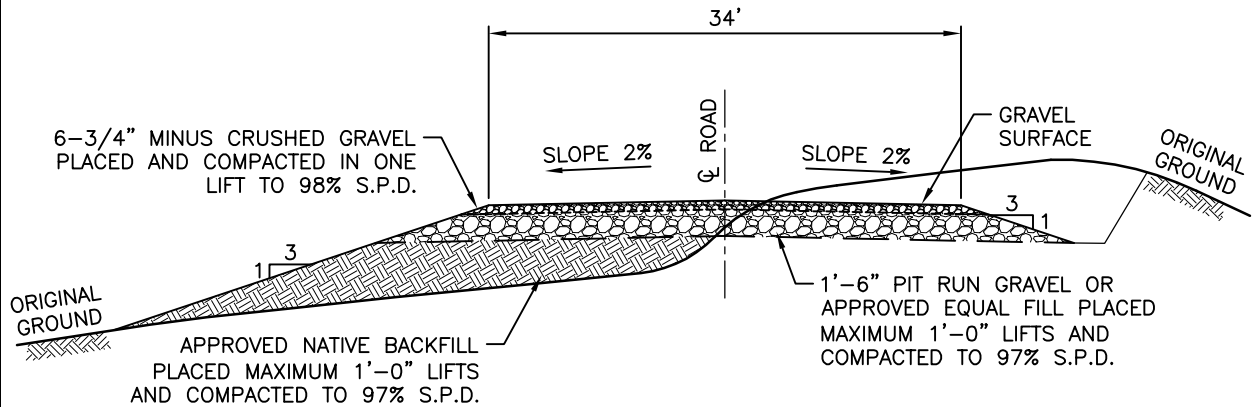
**Appendix 1E FC-01  
Alaska Pipeline Project**

Fracture Control – Typical Fracture Control Method

Rev.  
C



TYPICAL CROSS – SECTION ALL WEATHER ROAD FOR PERMAFROST AREA



TYPICAL CROSS-SECTION ALL WEATHER ROAD FOR NON-PERMAFROST AREA

DESIGN STANDARDS

CLASS III ALL WEATHER ROAD

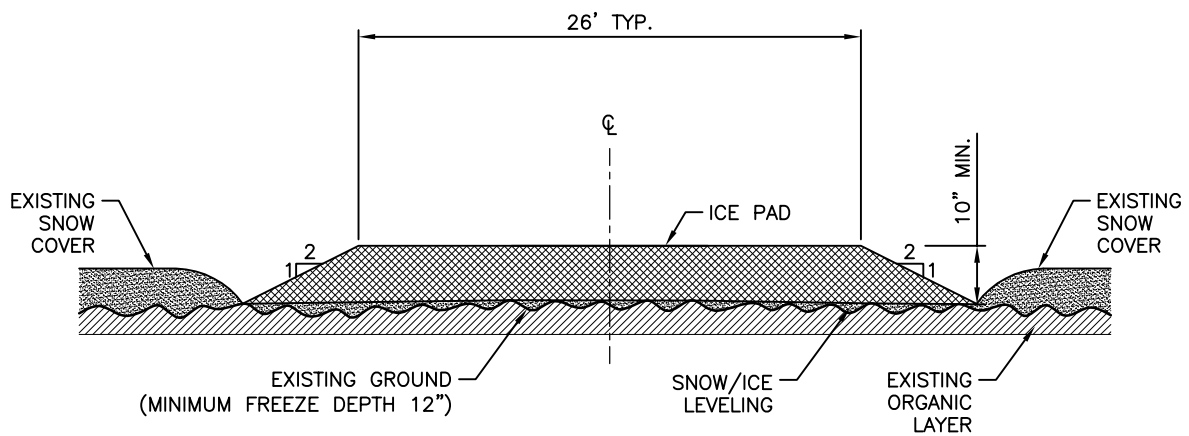
1. MAXIMUM GRADE : SUSTAINED – 6%  
PITCH – 8%
2. MAXIMUM RIGHT-OF-WAY WIDTH TBD.
3. TYPICAL SUBGRADE HEIGHT ON PERMAFROST : 5', NON PERMAFROST : 2'.
4. DESIGN SPEED TBD.

**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

**Appendix 1E ACC-01  
Alaska Pipeline Project**

Access Roads – Typical Permanent Road Sections

Rev.  
C



### SECTION

#### NOTE:

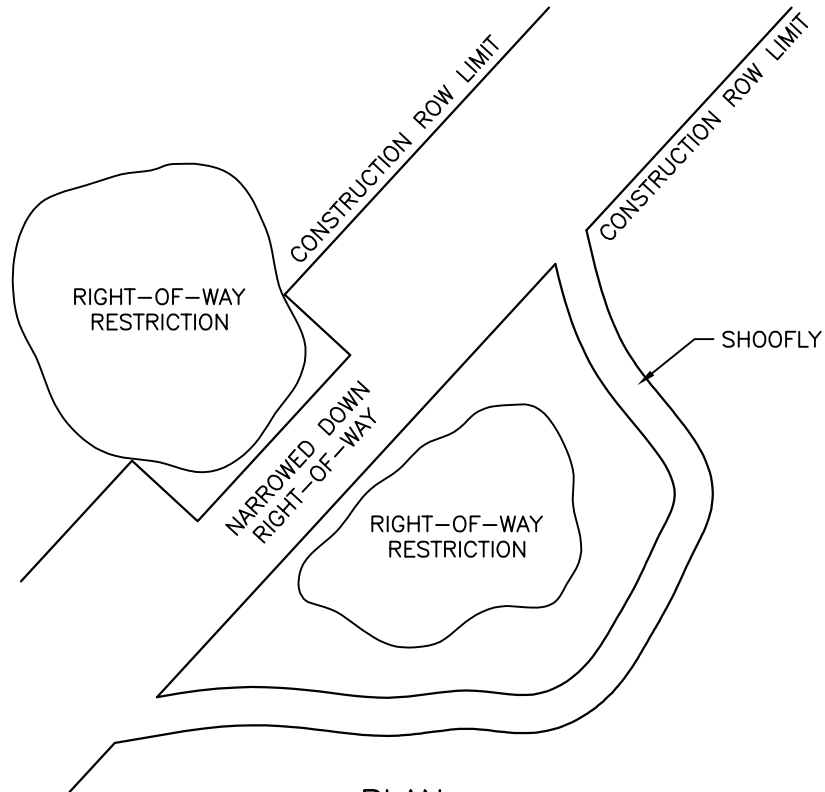
1. SNOW/ICE ROADS ARE ONLY SUITABLE FOR USE DURING WINTER CONDITIONS. TRAVEL WILL BE RESTRICTED DURING CERTAIN DATES (TBD).

**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

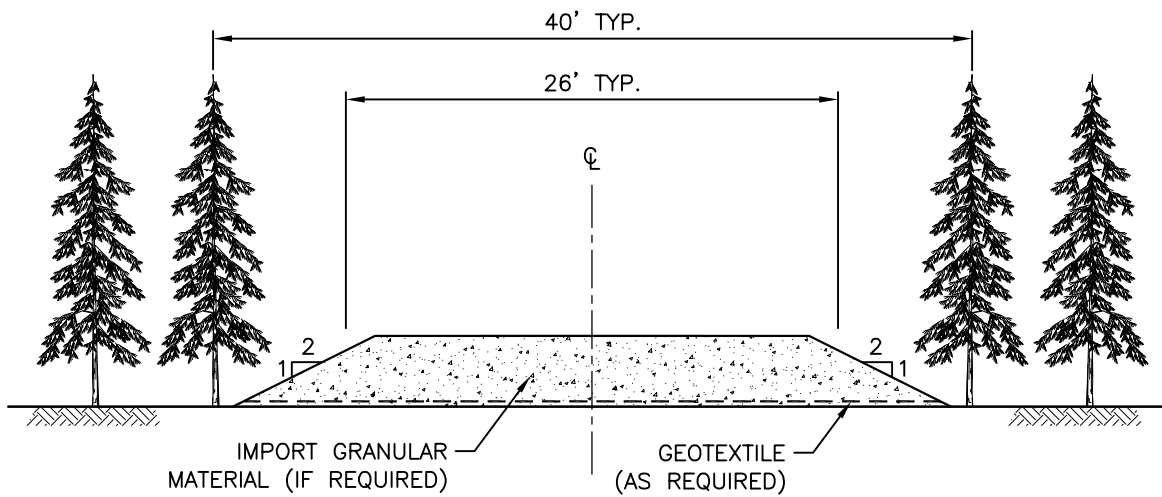
## **Appendix 1E ACC-03 Alaska Pipeline Project**

Access Roads – Typical Temporary Snow/Ice Road Section

Rev.  
C



PLAN



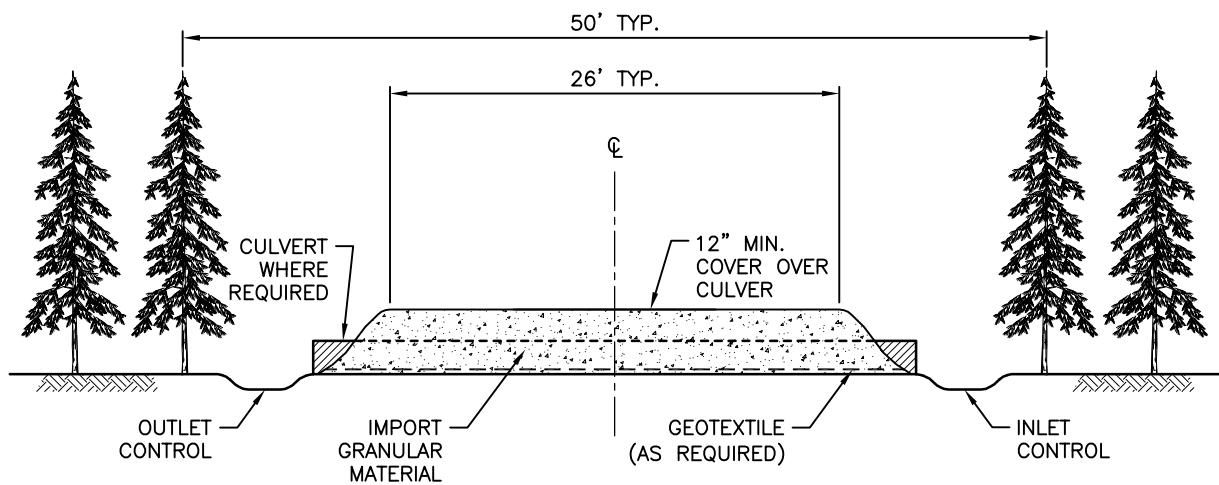
SECTION

PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION

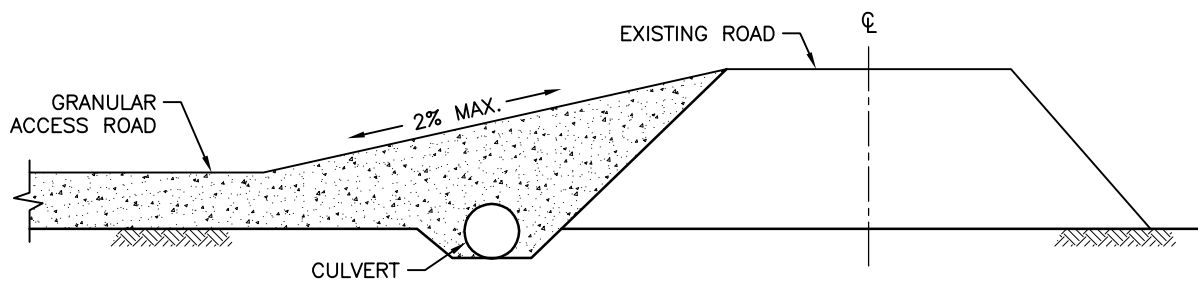
## Appendix 1E ACC-05 Alaska Pipeline Project

Access Roads – Typical Temporary Shoofly Road Plan/Section

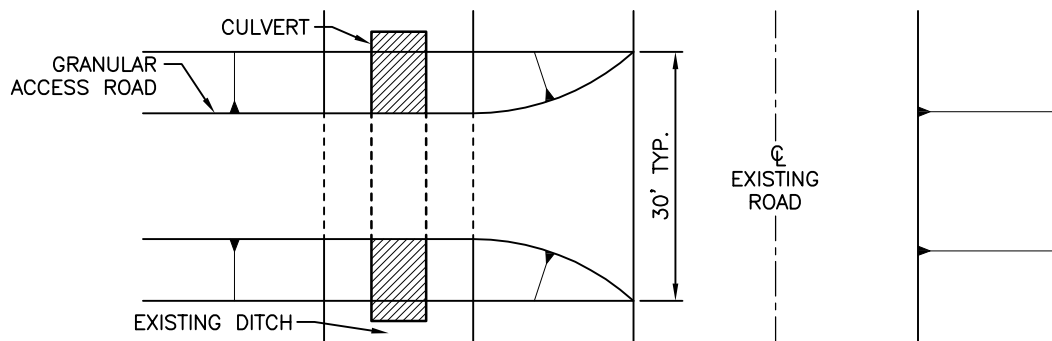
Rev.  
C



SECTION



PROFILE – EXISTING ROAD RAMP



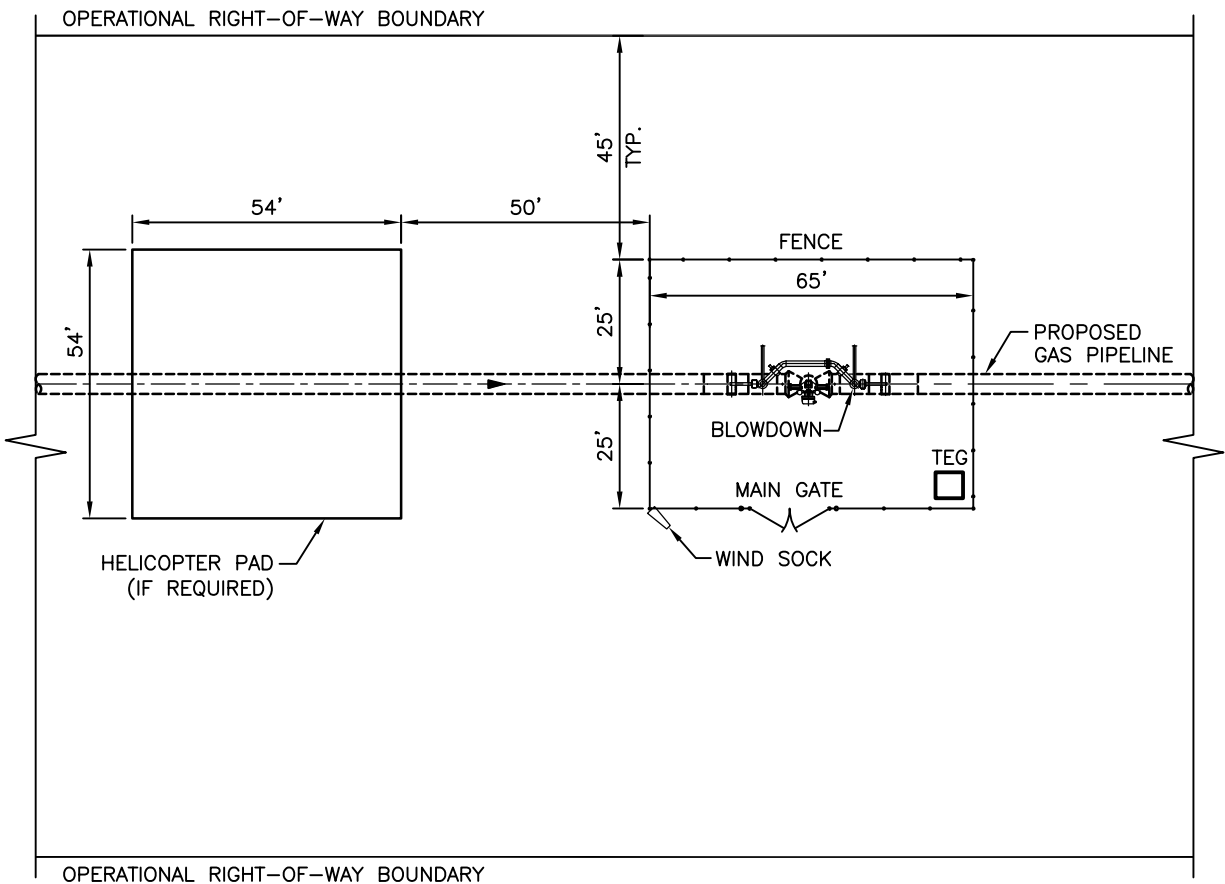
PLAN – EXISTING ROAD PLAN

**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

## Appendix 1E ACC-06 Alaska Pipeline Project

Access Roads – Typical Temporary Granular Road Off Highway

Rev.  
C



PLAN

NOTES:

1. A HELICOPTER PAD WILL BE PROVIDED FOR REMOTE BLOCK VALVE LOCATIONS WITH NO ACCESS.
2. TEG UNIT WILL BE PROVIDED FOR CATHODIC PROTECTION WHERE CONVENTIONAL POWER IS NOT AVAILABLE.

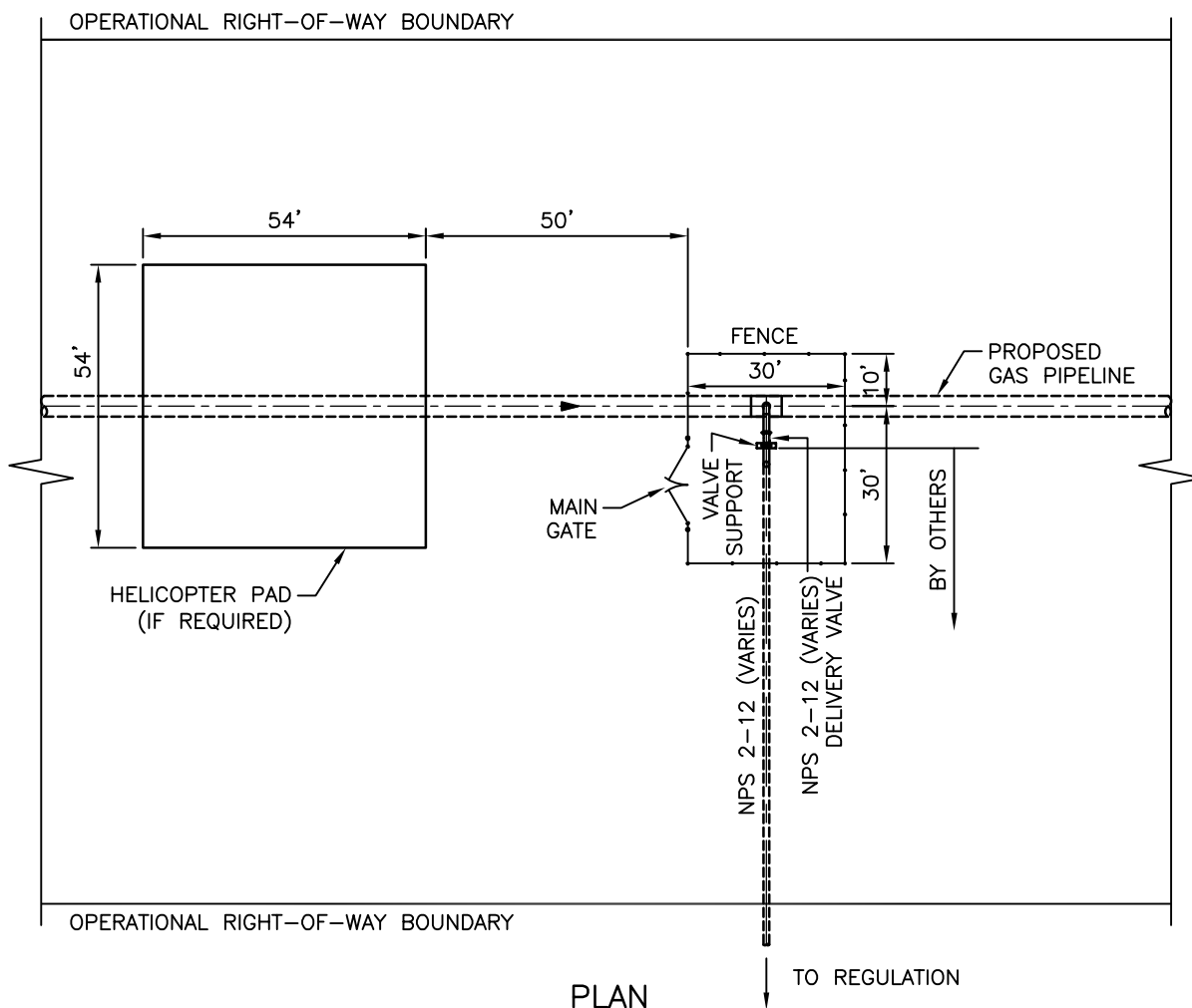
**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

**Appendix 1E FAC-05  
Alaska Pipeline Project**

Pipeline Facilities – Typical Mainline Block Valve Plot Plan

Rev.  
C





NOTE:

1. A HELICOPTER PAD WILL BE PROVIDED FOR REMOTE DELIVERY POINT TAKE-OFFS WITH NO ACCESS.

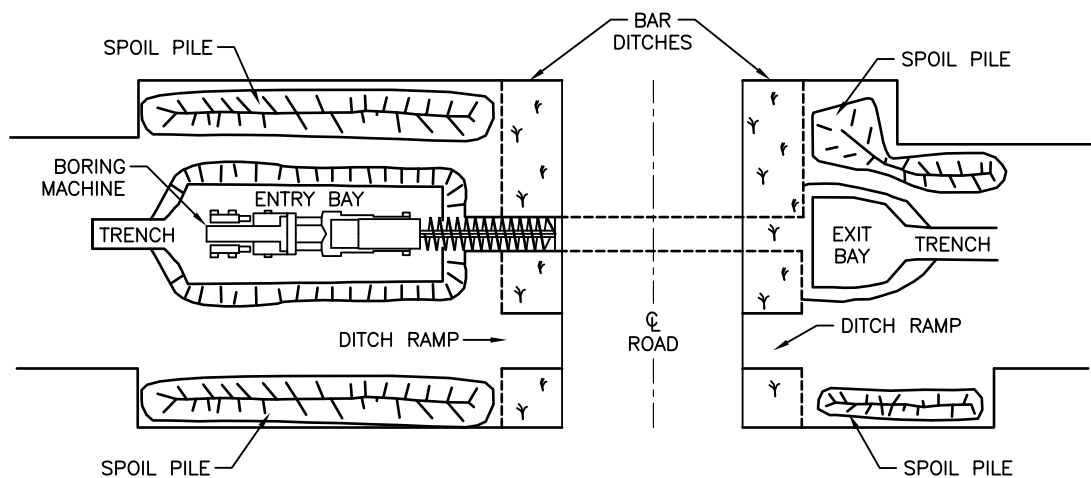
PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION

## Appendix 1E FAC-08A

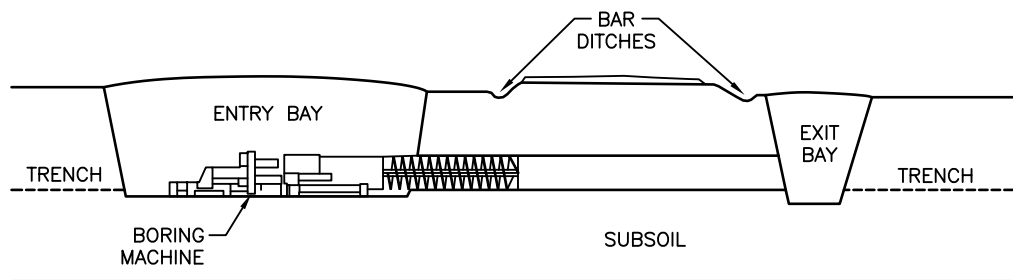
### Alaska Pipeline Project

Pipeline Facilities – Typical Delivery Point Take-Off Plot Plan

Rev.  
C



PLAN VIEW



PROFILE

NOTES:

1. ACQUIRE AND MARK ADDITIONAL TEMPORARY WORKSPACE.
2. EXCAVATE ENTRY AND EXIT BAYS.
3. AFTER COMPLETION OF PIPE TIE-INS, BACKFILL AND COMPACT IN LIFTS TO MINIMIZE SUBSIDENCE AND THE NEED FOR A CROWN OVER THE EXCAVATION.
4. REMOVE DITCH RAMPS.
5. FOR UNSTABLE SOIL, PROVIDE SHORING AS REQUIRED.

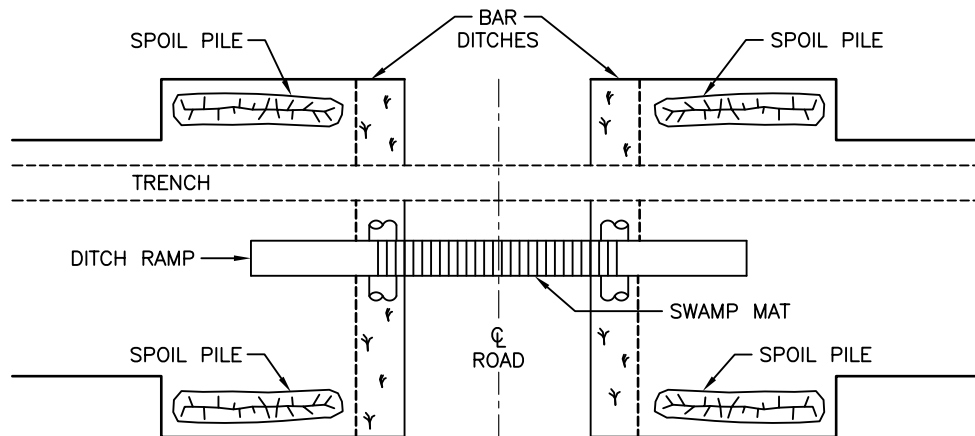
**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

## Appendix 1E CONST-02

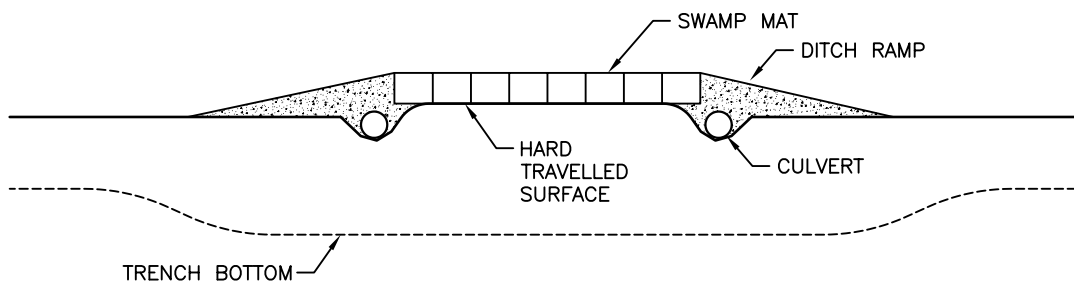
### Alaska Pipeline Project

Construction Typicals – Horizontal Boring/Drilling Roads

Rev.  
D



PLAN VIEW



PROFILE

NOTES:

1. SWAMP MATS MAY BE REQUIRED ACROSS ROAD TO PROTECT HARD TRAVELLED SURFACE FROM EQUIPMENT, DURING INSTALLATION.
2. OPEN-CUT ROAD CROSSING TO BE CARRIED OUT AS QUICKLY AS POSSIBLE.
3. PROPER SIGNAGE AND ROAD CLOSURE REQUIRED BEFORE COMMENCING TRENCHING.
4. TRENCH SPOIL TO BE REPLACED IN 6" LIFTS AND COMPACTED TO 95% OF THE MAXIMUM PROCTOR DRY DENSITY.
5. ORIGINAL HARD TRAVELLED SURFACE TO BE RESTORED TO ORIGINAL CONDITION FOLLOWING COMPLETION OF CROSSING INSTALLATION.

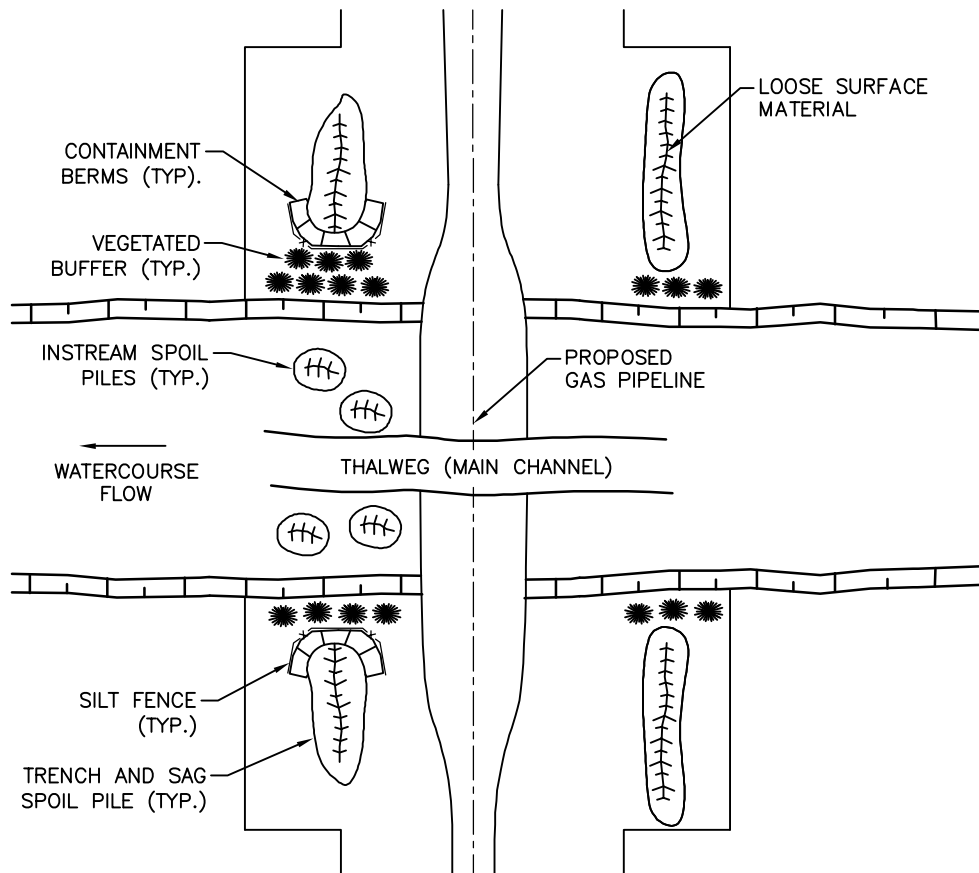
**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

## Appendix 1E CONST-03

### Alaska Pipeline Project

Construction Typicals – Open-Cut Roads

Rev.  
D



PLAN VIEW

NOTES:

1. CLEAR VEGETATION FROM EXCAVATION AND MATERIALS STORAGE AREAS, LEAVING A VEGETATED BUFFER BACK FROM THE BANK ON THE STORAGE AND WORK SIDES OF THE ROW. CLEAR VEGETATION FROM THE WORK SIDE ONLY IF A VEHICLE CROSSING IS REQUIRED.
2. GRUB ROOTS, AND SALVAGE LOOSE SURFACE MATERIAL FROM GRADED AND EXCAVATED AREAS AND STORE SEPARATELY OUT OF THE WAY OF CROSSING ACTIVITIES.
3. CONSTRUCT SPOIL CONTAINMENT BERMS AND INSTALL SEDIMENT CONTROL FEATURES (e.g. SILT FENCE, STRAW BALES) DOWNSLOPE OF PROPOSED SPOIL STORAGE AREAS.
4. THE INSTREAM PIPE SECTION SHALL BE CONSTRUCTED AND TESTED PRIOR TO INSTREAM ACTIVITY.
5. ANY EQUIPMENT WORKING INSTREAM MUST BE CLEAN, IN GOOD WORKING CONDITION AND CONTAIN ENVIRONMENTALLY FRIENDLY HYDRAULIC AND LUBRICATING FLUIDS.
6. EXCAVATE BELLHOLE THROUGH WATERCOURSE AND STOCKPILE SPOIL INSTREAM, IN DISCRETE PILES ADJACENT TO THE EXCAVATION DOWNSTREAM OF THE CROSSING. SPOIL SHOULD NOT BE STOCKPILED IN THE MAIN CHANNEL (THALWEG). THE INSTREAM SPOIL PILES MUST NOT BLOCK MORE THAN 2/3 OF THE CHANNEL WIDTH.
7. EXCAVATE SAGS ON BOTH SIDES OF WATERCOURSE AND STOCKPILE WET SPOIL BEHIND THE SPOIL CONTAINMENT BERMS. INSTALL PIPE SECTION, BACKFILL EXCAVATION AND RE-ESTABLISH WATERCOURSE BED AND BANKS.

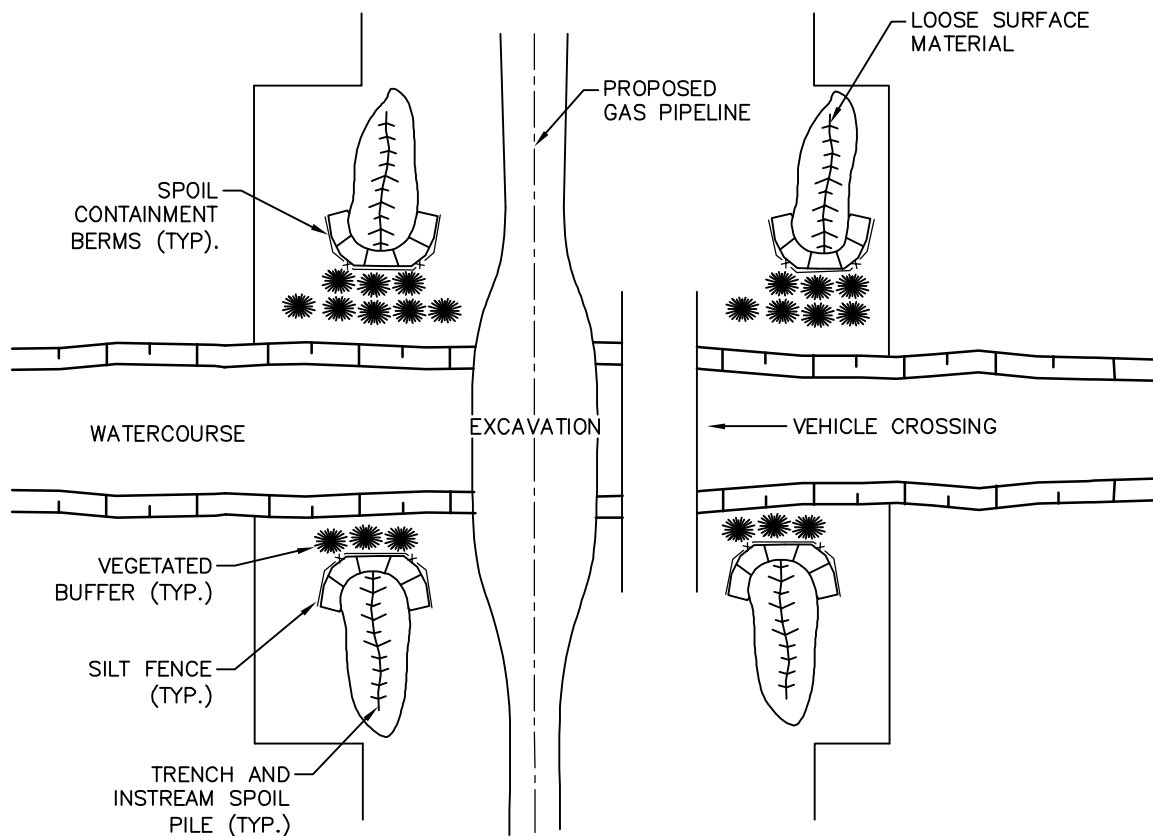
**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

## Appendix 1E CONST-04

### Alaska Pipeline Project

Construction Typicals – Waterbodies – Major/Intermediate Open-Cut

Rev.  
E



PLAN VIEW

NOTES:

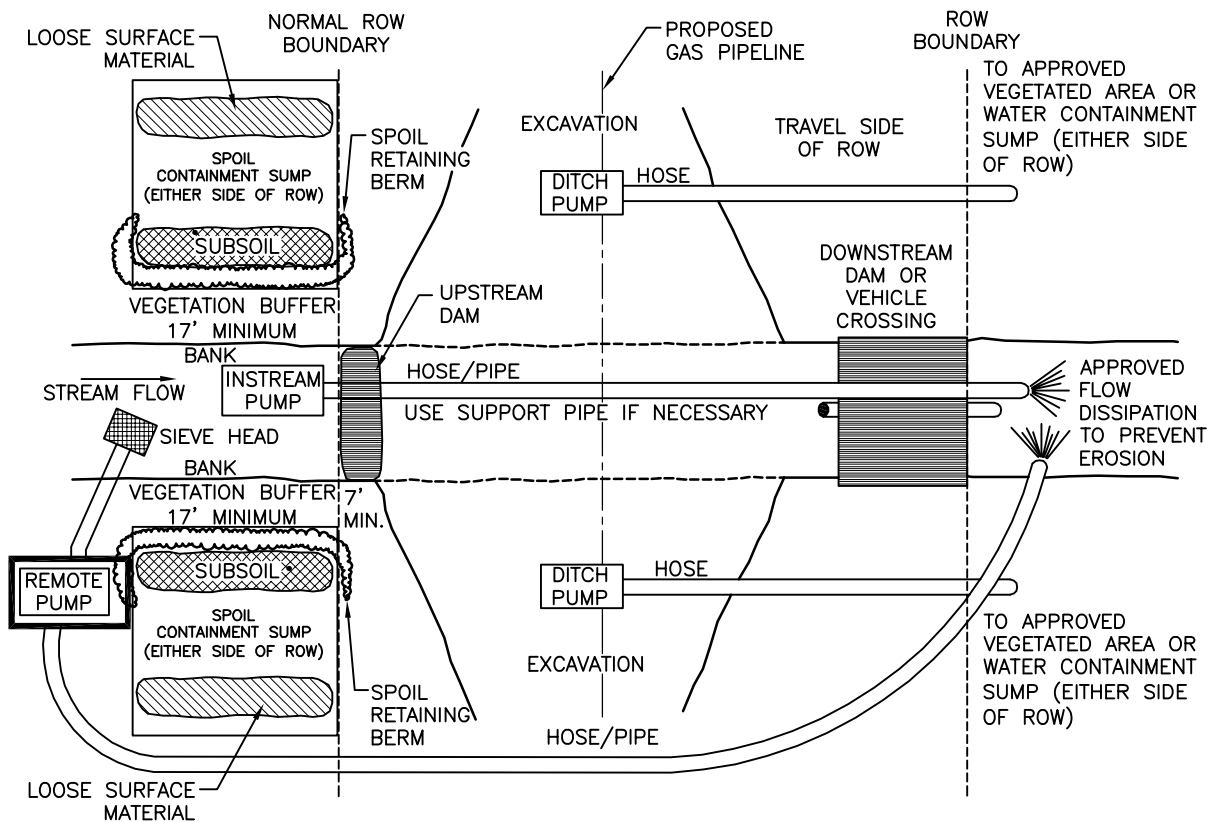
1. CLEAR VEGETATION FROM WORK SPACE AND MATERIAL STORAGE AREAS, LEAVING A VEGETATED BUFFER BACK FROM THE BANK ON THE STORAGE SIDE OF THE ROW.
2. GRUB ROOTS, SALVAGE LOOSE SURFACE MATERIAL FROM GRADED AND EXCAVATED AREAS AND STORE THEM SEPARATELY OUT OF THE WAY OF CROSSING ACTIVITIES.
3. CONSTRUCT SPOIL CONTAINMENT BERMS AND INSTALL SEDIMENT CONTROL FEATURE (e.g. SILT FENCE, STRAW BALES) DOWNSLOPE OF PROPOSED SPOIL STORAGE AREAS.
4. THE INSTREAM PIPE SECTION SHALL BE CONSTRUCTED AND TESTED PRIOR TO INSTREAM ACTIVITY.
5. TO REDUCE THE NEED FOR EQUIPMENT WORKING INSTREAM, LOCATE BACKHOES ON BOTH BANKS OF THE WATERCOURSE DURING EXCAVATION.
6. EXCAVATE THE CROSSING AND STORE WET SPOIL BEHIND THE SPOIL CONTAINMENT BERMS. INSTALL PIPE SECTION, BACKFILL EXCAVATION AND RE-ESTABLISH WATERCOURSE BED AND BANKS.

**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

**Appendix 1E CONST-05  
Alaska Pipeline Project**

Construction Typicals – Waterbodies – Minor Open-Cut

Rev.  
E



DAM AND PUMP BY INSTREAM PUMPING ACROSS EXCAVATION OR BY REMOTE PUMPING AROUND EXCAVATION

#### NOTES:

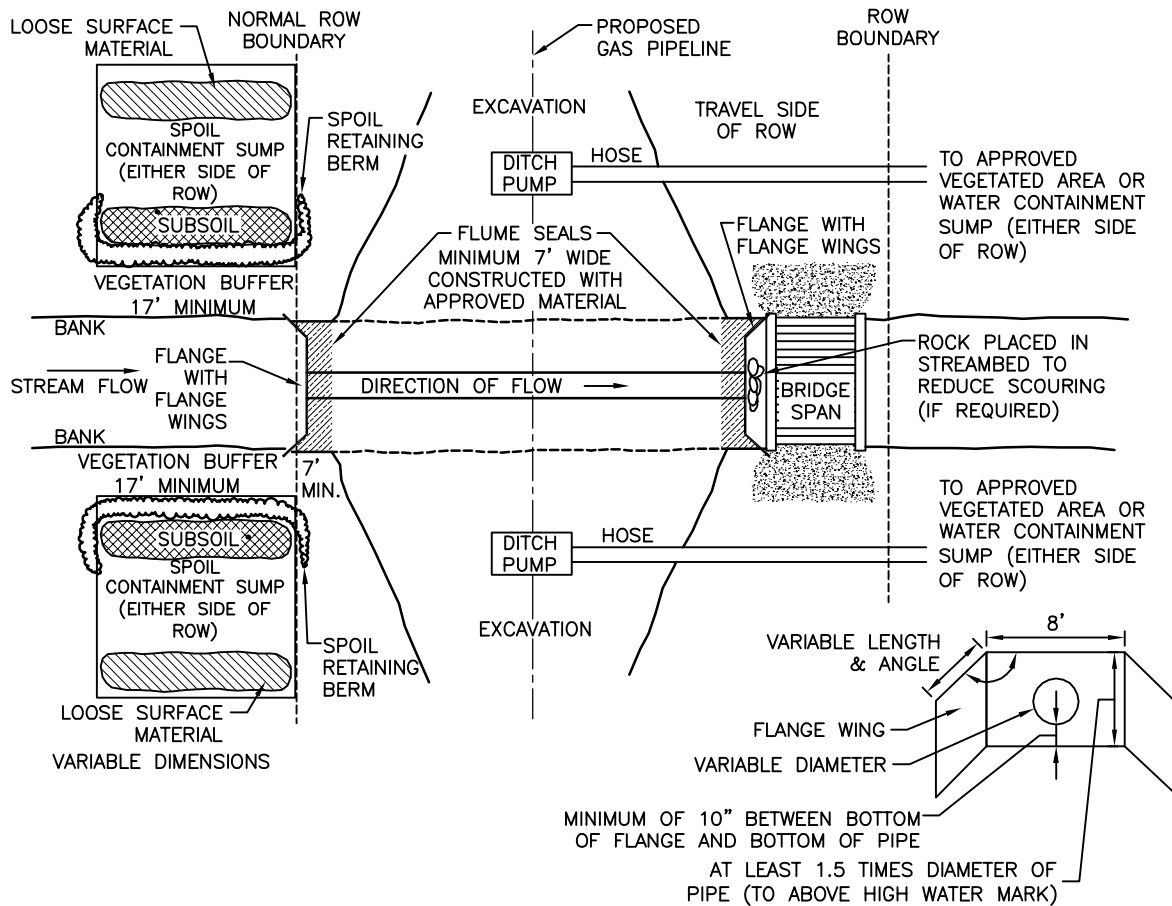
1. INSTALL THE VEHICLE CROSSING ON THE WORK SIDE EDGE OF THE ROW TO ALLOW FOR A WIDE EXCAVATION.
2. STOCKPILE ALL REQUIRED MATERIALS AND EQUIPMENT ON THE SITE PRIOR TO BEGINNING INSTREAM WORK.
3. PERFORM THE BANK GRADE AND PREPARE SPOIL CONTAINMENT SUMPS AS CIRCUMSTANCES DICTATE.
4. COMPLETE WELDING, COATING, AND WEIGHTING OF THE RIVER PIPE SECTION.
5. BEGIN THE OPERATION IN THE EARLY MORNING TO ALLOW FOR SAME DAY INSTALLATION IF POSSIBLE.
6. INSTALL PUMPS AND CHECK OPERATION TO EQUALIZE FLOW.
7. CONSTRUCT THE SPOIL SIDE DAM USING SPECIFIED DAMMING TECHNIQUES. DAM SHOULD BE CONSTRUCTED ON THE SPOIL SIDE EDGE OF THE ROW TO ALLOW FOR A WIDE EXCAVATION.
8. PLUG THE VEHICLE CROSSING CULVERT OR CONSTRUCT THE DOWNSTREAM DAM USING SPECIFIED DAMMING TECHNIQUES. WHERE A BRIDGE IS USED THE DAM SHOULD BE CONSTRUCTED AS CLOSE TO THE SPOIL SIDE OF THE BRIDGE AS POSSIBLE TO ALLOW FOR A WIDE EXCAVATION.
9. EXCAVATE TRENCH AS RAPIDLY AS POSSIBLE AND INSTALL PIPE.
10. BACKFILL THE STREAM CHANNEL FIRST PUSHING THE SILTED WATER BACK INTO THE BANK EXCAVATIONS. PUMP OR DRAIN THE BANK EXCAVATIONS WHILE PROGRESSIVELY BACKFILLING FROM THE STREAM CHANNEL OUTWARD. CONSTRUCT WATER CONTAINMENT SUMPS IF NECESSARY.
11. RESTORE BED AND BANKS OF THE STREAM CHANNEL, REMOVE THE DOWNSTREAM DAM OR VEHICLE CROSSING PLUG, REMOVE UPSTREAM DAM OR VEHICLE CROSSING PLUG AND REMOVE BYPASS PUMPS.

**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

## Appendix 1E CONST-06 Alaska Pipeline Project

Construction Typicals - Waterbodies - Isolated Open-Cut - Dam and Pump

Rev.  
E



**FRONT VIEW OF FLUME FACE (UPSTREAM)**

**NOTES:**

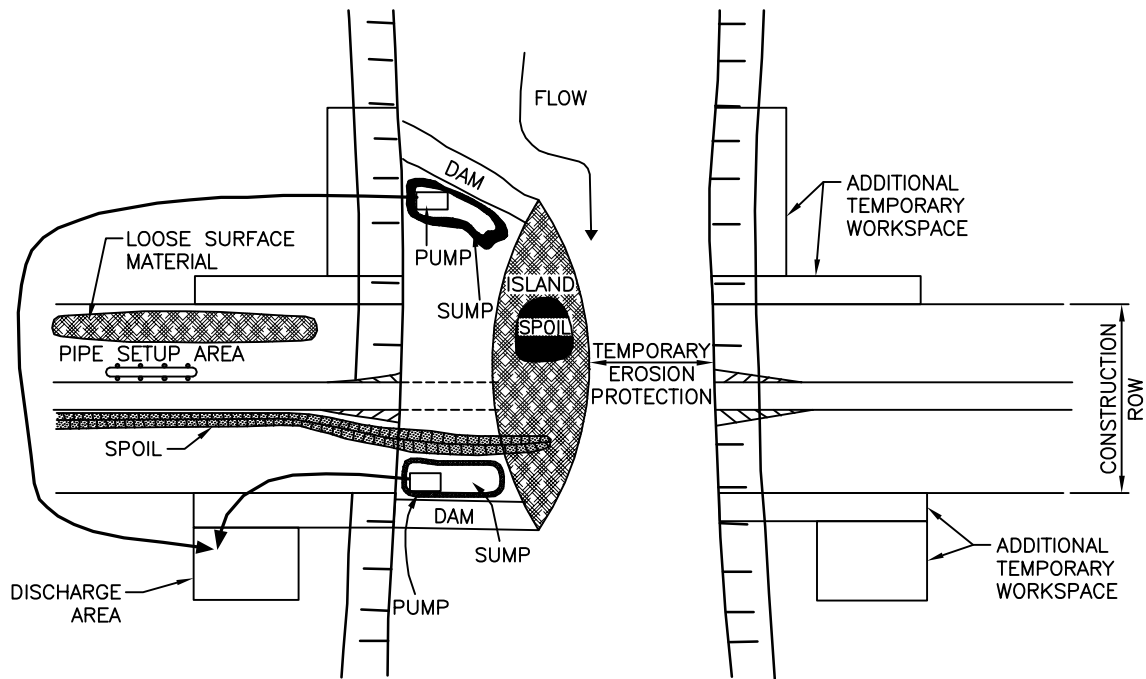
1. INSTALL THE VEHICLE CROSSING ON THE WORK SIDE EDGE OF THE ROW TO ALLOW FOR A WIDE EXCAVATION.
2. GRADE THE BANKS OF THE WATER CROSSING AND PREPARE THE SPOIL CONTAINMENT AREAS.
3. CONSTRUCT THE FLUME WITH CORRECT FLANGES AND FLANGE WINGS, AS PER THE SPECIFICATIONS.
4. STOCKPILE ALL REQUIRED MATERIALS PRIOR TO BEGINNING INSTREAM WORK.
5. COMPLETE CONSTRUCTION OF PIPE SECTION.
6. INSTALL THE FLUME IN THE STREAM CHANNEL USING SEALING TECHNIQUES. DEWATER THE AREA BETWEEN THE FLANGE WINGS.
7. BEGINNING IN THE EARLY MORNING, EXCAVATE THE TRENCH AS QUICKLY AS POSSIBLE PLACING SPOIL OUT OF THE STREAM CHANNEL. CREATE SPOIL CONTAINMENT SUMPS IF NECESSARY TO KEEP SPOIL FROM FLOWING BACK INTO THE STREAM CHANNEL.
8. PUMP EXCAVATION AS REQUIRED TO PREVENT DOWNSTREAM FLOW OF SILTED WATER. DIRECT THE PUMPED WATER INTO VEGETATED AREAS WELL BACK FROM THE WATER COURSE. CONSTRUCT WATER CONTAINMENT SUMPS.
9. INSTALL PIPE.
10. BACKFILL THE STREAM CHANNEL FIRST, SQUEEZING THE SILTED WATER INTO THE BANK EXCAVATIONS. PUMP OR DRAIN THE BANK EXCAVATIONS WHILE PROGRESSIVELY BACKFILLING FROM THE STREAM CHANNEL OUTWARD AND COMPLETE BACKFILL.
11. RE-ESTABLISH THE BED AND BANKS OF THE STREAM CHANNEL, REMOVE THE DOWNSTREAM SEAL MATERIALS, REMOVE UPSTREAM SEAL MATERIALS AND REMOVE THE FLUME.

**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

**Appendix 1E CONST-07  
Alaska Pipeline Project**

Construction Typicals – Waterbodies – Isolated Open-Cut – Dam and Flume

Rev.  
E



PLAN VIEW

NOTES:

1. IF THERE IS A HIGH VELOCITY STREAMFLOW, INSTALL DEFLECTION BARRIER (e.g., MEDIAN BARRIERS) TO PERMIT CONSTRUCTION OF DAM OUTSIDE FULL STREAMFLOW.
2. CONSTRUCT DAM FROM LOCAL MATERIALS, SANDBAGS, AQUADAMS, SHEET PILING, MEDIAN BARRIERS, GRAVEL OR OTHER APPROPRIATE MATERIAL TO EXTEND OVER HALFWAY ACROSS THE WATERCOURSE.
3. INSTALL IMPERMEABLE BARRIER WITHIN DAM.
4. INSTALL RIPRAP ON UPSTREAM SIDE TO PROTECT THE DAM FROM EROSION IF DAM IS CONSTRUCTED OF LOOSE MATERIAL.
5. SPOIL STORAGE SHALL BE ABOVE THE HIGH WATER MARK OR PROTECTED BY EROSION CONTROL MEASURES TO ENSURE THAT, WHEN THE WATER LEVEL RISES AFTER ALL FLOW HAS BEEN CHANNELIZED INTO ONE CHANNEL, SPOIL IS NOT WASHED AWAY.
6. INSTALL SUMPS TO COLLECT SEEPAGE AND THEN PUMP TO DEWATERING AREA.
7. ENSURE DISCHARGE AREA CAN HANDLE THE VOLUME OF WATER AND SILT PUMPED TO SHORE.
8. COMPLETE TRENCHING, LOWERING IN AND BACKFILLING.
9. REMOVE DAM, RECONSTRUCT BANK.
10. REPEAT PROCESS FOR OTHER CHANNEL.
11. TEMPORARY DIVERSION ALSO MAY BE MADE THROUGH ABANDONED CHANNELS AS LONG AS STEPS ARE TAKEN TO MINIMIZE A FLUSH OF SEDIMENT ONCE THE WATERCOURSE IS REDIRECTED THROUGH THE "NEW" CHANNEL.
12. TEMPORARY DIVERSION THROUGH A CHANNEL EXCAVATED INTO A FLOOD PLAIN IS POSSIBLE IF LINED OR PASSED THROUGH A FLEXIBLE CONDUIT TO PREVENT EXCESSIVE EROSION ALONG THE "NEW" CHANNEL.

**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

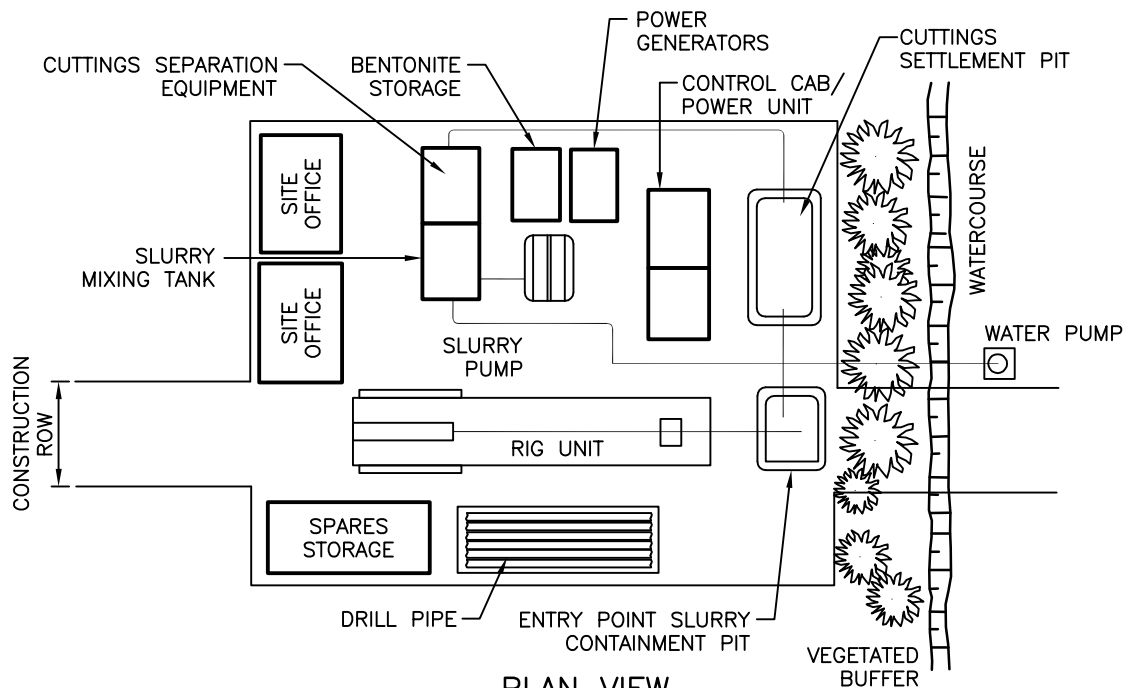
## Appendix 1E CONST-08

### Alaska Pipeline Project

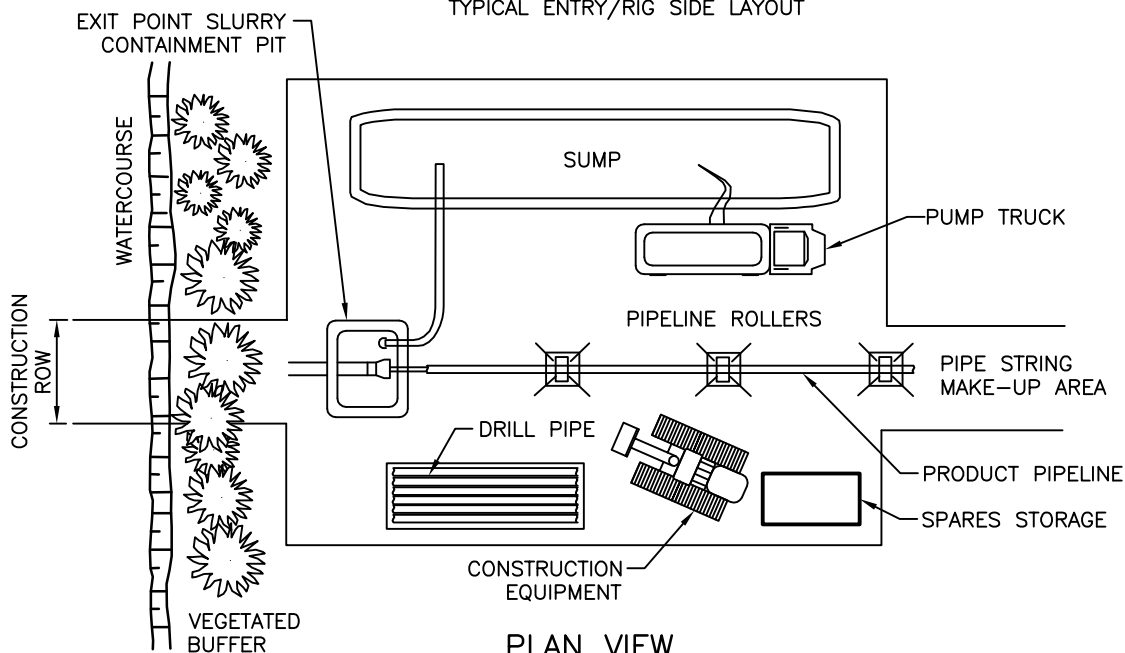
Construction Typicals – Waterbodies – Isolated Open-Cut – Dam and Divert

Rev.  
E





**PLAN VIEW**  
TYPICAL ENTRY/RIG SIDE LAYOUT



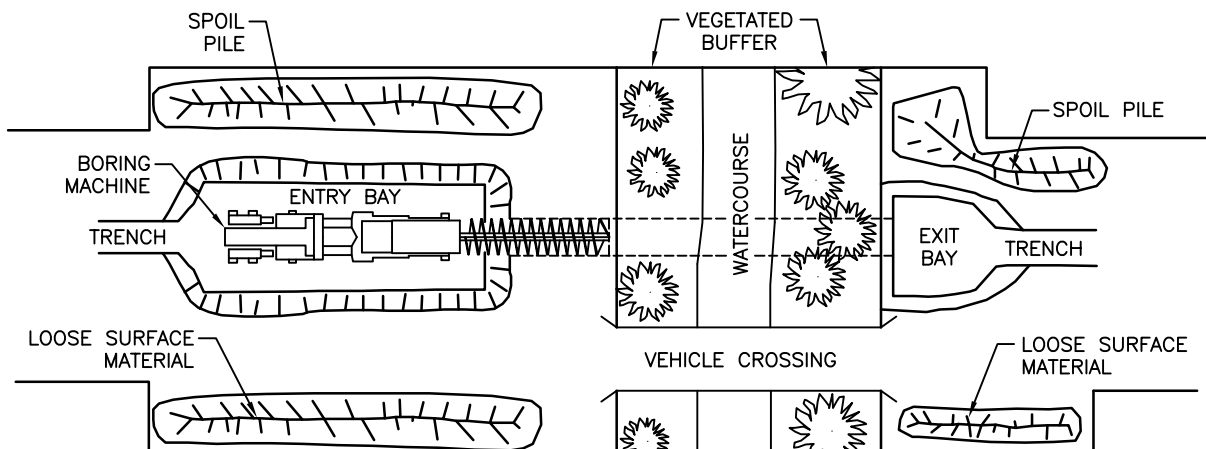
**PLAN VIEW**  
TYPICAL EXIT/PIPE SIDE LAYOUT

**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

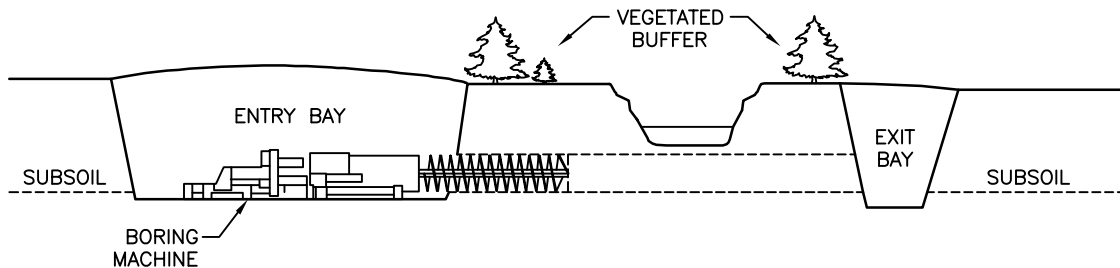
## Appendix 1E CONST-09 Alaska Pipeline Project

Construction Typicals – Waterbodies – Horizontal Directional Drill

Rev.  
C



PLAN VIEW



PROFILE

NOTES:

1. ACQUIRE AND MARK ADDITIONAL TEMPORARY WORKSPACE.
2. SET UP EQUIPMENT BACK FROM THE EDGE OF THE WATERCOURSE; DO NOT CLEAR WITHIN BUFFER ZONE EXCEPT ALONG THE WORK SIDE, IF TEMPORARY VEHICLE CROSSING IS INSTALLED.
3. EXCAVATE ENTRY AND EXIT BAYS. STORE SPOIL ON OPPOSITE SIDE OF LOOSE SURFACE MATERIAL OR ADJACENT TO TOPSOIL MAINTAINING ADEQUATE SEPARATION. FOR UNSTABLE SOIL, PROVIDE SHORING AS REQUIRED.
4. COMPLETE BORING AND TIE-IN TO MAINLINE.
5. PUMP BOTH BAYS DRY IF SEEPAGE BECOMES A PROBLEM. DEWATER ONTO STABLE, WELL VEGETATED LAND, AWAY FROM THE WATERCOURSE.
6. BACKFILL AND COMPACT IN LIFTS.

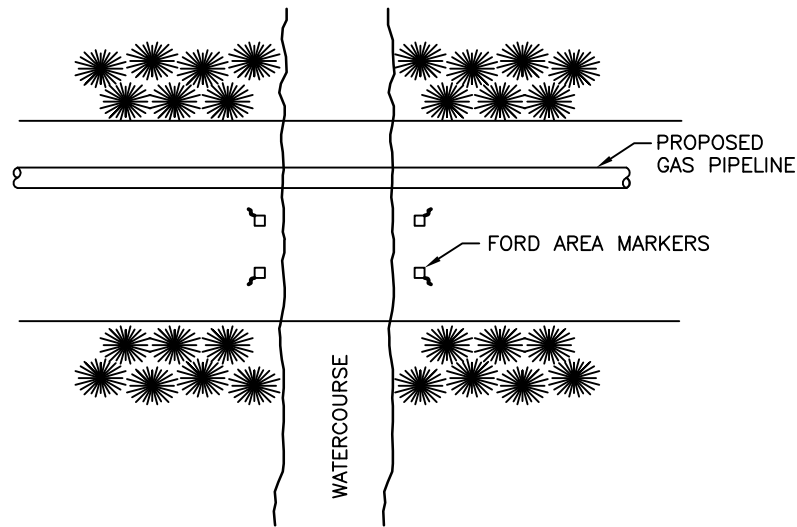
**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

## Appendix 1E CONST-10

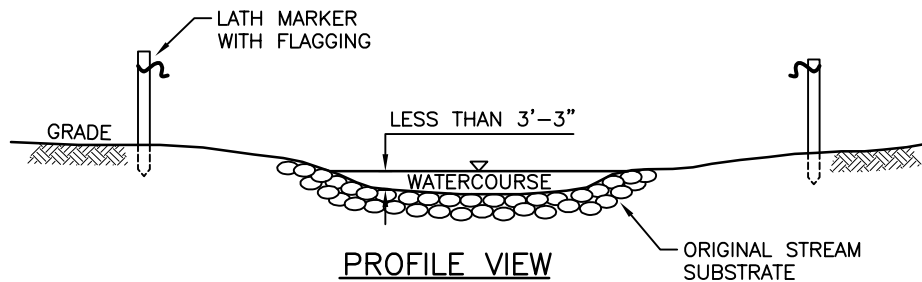
### Alaska Pipeline Project

Construction Typicals – Waterbodies – Horizontal Bore

Rev.  
E



PLAN VIEW



PROFILE VIEW

NOTES:

1. USE FORDS TO PROVIDE VEHICULAR ACCESS ACROSS RELATIVELY SHALLOW (LESS THAN 3'-3") AND NARROW WATERCOURSES WITH GRANULAR BEDS AND STABLE BANKS. WHERE WATER DEPTH, STREAMBED COMPOSITION OR BANK SLOPES COULD POSE TRAFFICABILITY PROBLEMS FOR RUBBER TIRED VEHICLES, LIMIT FORD TRAFFIC TO VEHICLES AND EQUIPMENT WITH TRACKS.
2. DO NOT USE FORD DURING FISH SPAWNING, INCUBATION OR MIGRATION PERIODS.
3. MINIMIZE GRADING IN PROXIMITY TO WATERCOURSE. GRADE AND GRUB ONLY ALONG THE TRENCHLINE AND AN AREA IMMEDIATELY ADJACENT TO THE TRENCHLINE. PULL DIRT AND DEBRIS AWAY FROM WATERCOURSE, IF BANKS REQUIRE SLOPING.
4. MINIMIZE USE OF FORD.
5. STABILIZE BANKS AND APPROACHES WITH GRANULAR BLANKET UNDERLAIN BY A GEOTEXTILE, IF WARRANTED.
6. MARK BOUNDARIES OF FORD ON BOTH SIDES OF CROSSING TO CONFINE ALL VEHICLE TRAFFIC TO FORD.
7. RESTORE AND STABILIZE BEDS AND BANKS TO ORIGINAL CONTOUR WHEN FORD IS NOT LONGER NEEDED. GRANULAR BLANKET NEED NOT BE REMOVED IF IT IS NOT A BARRIER TO FISH DURING LOW FLOW CONDITIONS.

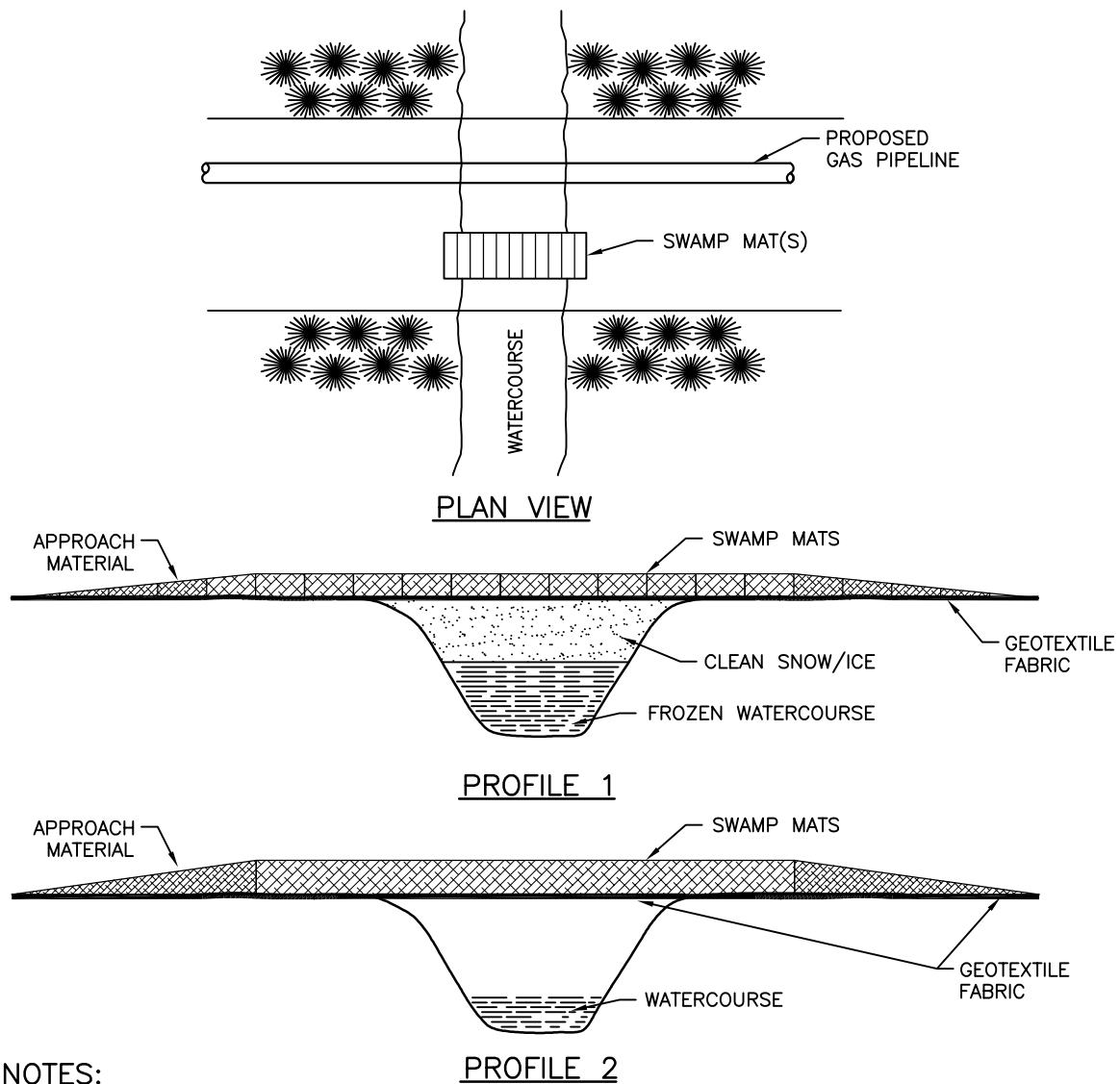
**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

## Appendix 1E CONST-11

### Alaska Pipeline Project

Construction Typicals – Equipment Crossing – Ford

Rev.  
C



**NOTES:**

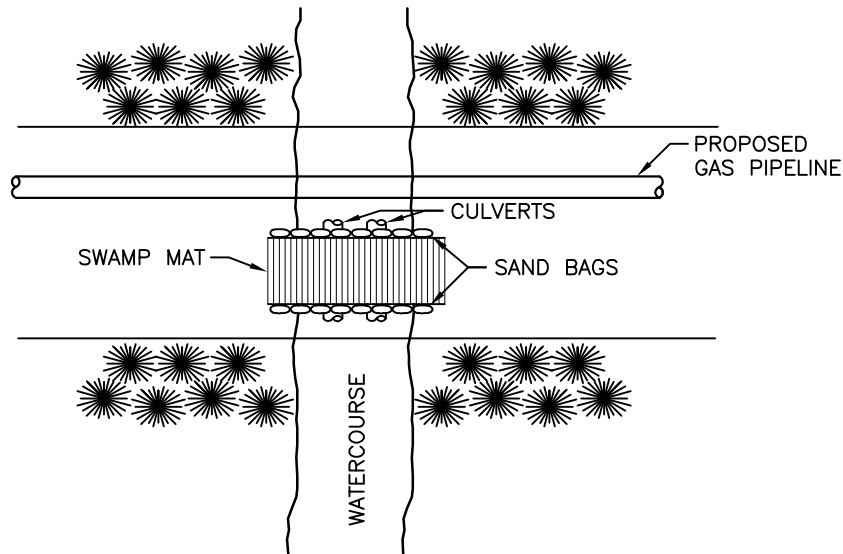
1. USE SWAMP MATS TO PROVIDE VEHICULAR ACCESS ACROSS WATERCOURSES IN BOTH FROZEN AND UN-FROZEN CONDITIONS.
2. FOR WATERCOURSES FROZEN TO THE BOTTOM, GEOTEXTILE FABRIC IS PLACED OVER EXISTING SNOW/ICE SURFACE PRIOR TO PLACEMENT OF THE SWAMP MATS. ALTERNATIVELY, CLEAN SNOW OR ICE CAN BE USED TO FILL THE CHANNEL PRIOR TO PLACEMENT OF THE GEOTEXTILE FABRIC AND SWAMP MATS (PROFILE 1).
3. FOR NARROW WATERCOURSES WITH STABLE BANKS, GEOTEXTILE FABRIC IS DRAPED ACROSS THE CHANNEL PRIOR TO PLACEMENT OF THE SWAMP MATS (PROFILE 2).

**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

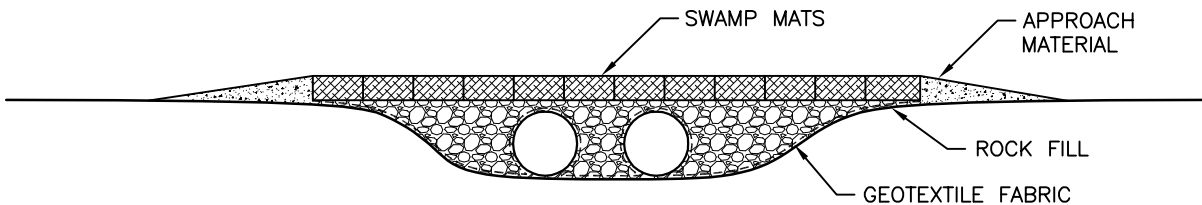
**Appendix 1E CONST-12  
Alaska Pipeline Project**

Construction Typicals – Equipment Crossing – Mat Bridge

Rev.  
C



PLAN VIEW



PROFILE VIEW

**NOTES:**

1. TO PROTECT THE STREAM BED, A GEOTEXTILE LINER SHALL BE LAID DOWN ON THE BED AND BANKS AFTER INSTALLING THE CULVERT BUT BEFORE PLACING ANY RAMP MATERIAL. GEOTEXTILE SHALL BE WIDE ENOUGH TO FOLD BACK INTO THE EDGE OF THE RAMP AT THE UPSTREAM AND DOWNSTREAM ENDS OF THE RAMP AND PREVENT ANY FILL FROM FALLING INTO THE STREAM. THE SIDES OF THE RAMP SHALL BE ARMoured TO PROTECT IT FROM EROSION DURING HIGH STREAMFLOWS.
2. CULVERTS SHALL BE INSTALLED AS PER COMPANY'S REQUEST AND BE OF SUFFICIENT SIZE AND NUMBER TO HANDLE A ONE IN TWENTY YEAR STREAM FLOW. CULVERTS SHALL ALSO BE OF SUFFICIENT WALL THICKNESS AND GRADE TO HANDLE HEAVY LOADS.
3. RAMPS SHALL BE OF SUFFICIENT DEPTH TO PREVENT COLLAPSE OF THE CULVERT.
4. RAMPS SHALL BE CONSTRUCTED FROM COMPANY APPROVED LOCAL MINERAL SUBSOIL FREE OF ORGANICS OR OTHER DELETERIOUS MATERIAL.
5. ALL MATERIALS REQ'D SHALL BE SUPPLIED BY CONTRACTOR.

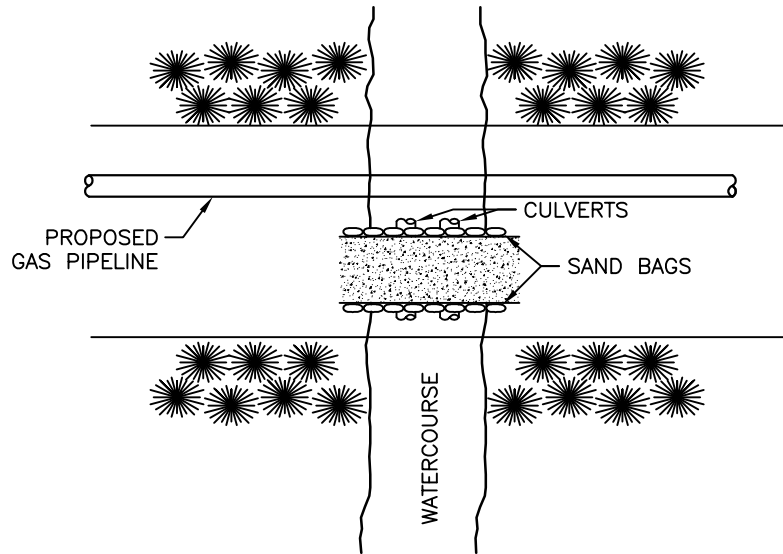
**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

## Appendix 1E CONST-13

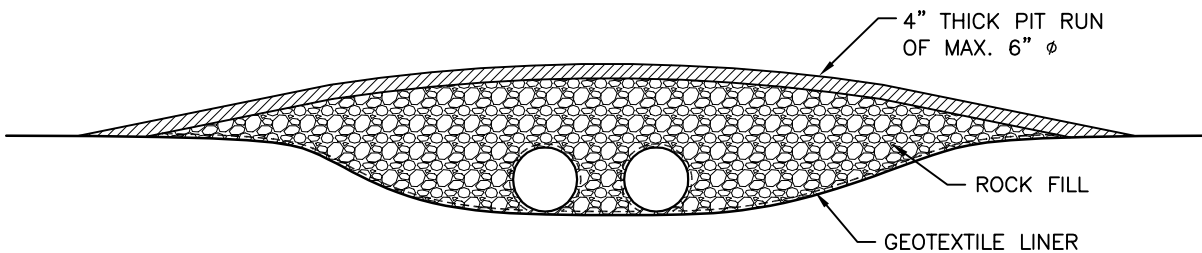
### Alaska Pipeline Project

Construction Typicals - Equipment Crossing - Mat Rock/Culvert Bridge

Rev.  
C



PLAN VIEW



PROFILE VIEW

NOTES:

1. TO PROTECT THE STREAM BED, A GEOTEXTILE LINER SHALL BE LAID DOWN ON THE BED AND BANKS AFTER INSTALLING THE CULVERT BUT BEFORE PLACING ANY RAMP MATERIAL. GEOTEXTILE SHALL BE WIDE ENOUGH TO FOLD BACK INTO THE EDGE OF THE RAMP AT THE UPSTREAM AND DOWNSTREAM ENDS OF THE RAMP AND PREVENT ANY FILL FROM FALLING INTO THE STREAM. THE SIDES OF THE RAMP SHALL BE ARMoured TO PROTECT IT FROM EROSION DURING HIGH STREAMFLOWS.
2. CULVERTS SHALL BE INSTALLED AS PER COMPANY'S REQUEST AND BE OF SUFFICIENT SIZE AND NUMBER TO HANDLE A ONE IN TWENTY YEAR STREAM FLOW. CULVERTS SHALL ALSO BE OF SUFFICIENT WALL THICKNESS AND GRADE TO HANDLE HEAVY LOADS.
3. RAMPS SHALL BE OF SUFFICIENT DEPTH TO PREVENT COLLAPSE OF THE CULVERT.
4. RAMPS SHALL BE CONSTRUCTED FROM COMPANY APPROVED LOCAL MINERAL SUBSOIL FREE OF ORGANICS OR OTHER DELETERIOUS MATERIAL.
5. ALL MATERIALS REQ'D SHALL BE SUPPLIED BY CONTRACTOR.
6. TOP COURSE OF 1" ROAD CRUSH MAY BE ADDED AT COMPANY'S REQUEST.

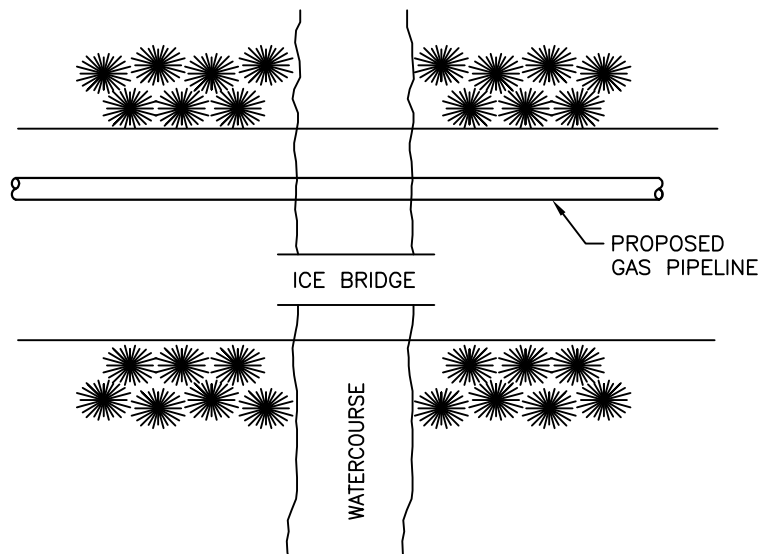
**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

## Appendix 1E CONST-14

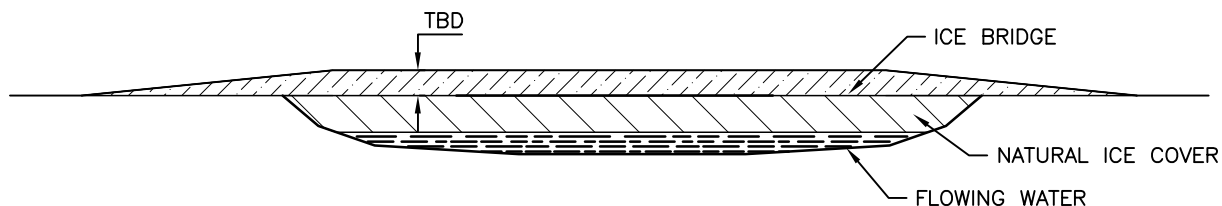
### Alaska Pipeline Project

Construction Typicals - Equipment Crossing - Rock/Culvert Bridge

Rev.  
C



PLAN VIEW



PROFILE VIEW

NOTES:

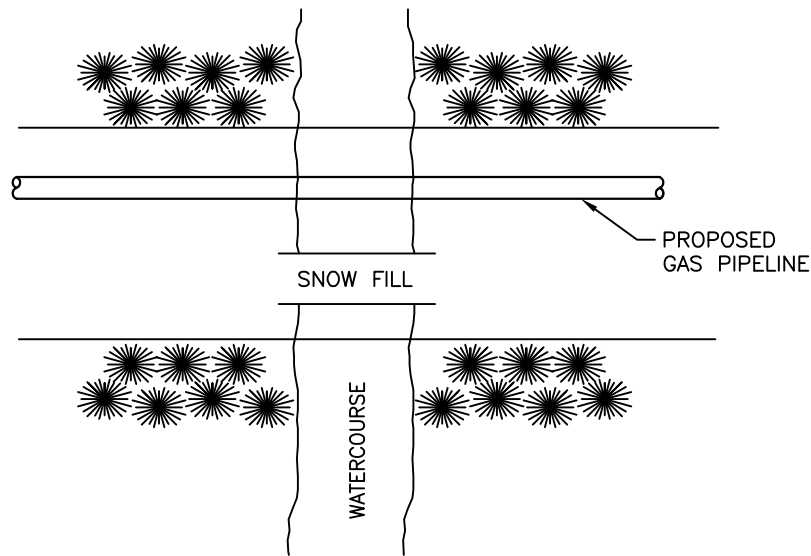
1. USE ICE BRIDGES TO PROVIDE VEHICULAR ACCESS ACROSS FLOWING WATERCOURSES WITH SIGNIFICANT NATURAL ICE COVER.
2. WATER FROM WATERCOURSES (OR HAULED TO SITE, IF NECESSARY) IS PUMPED ONTO THE PROPOSED ICE BRIDGE TO INCREASE THE LOAD-BEARING CAPACITY FOR HEAVY EQUIPMENT USE.
3. MONITOR ICE BRIDGE INTEGRITY DURING CONSTRUCTION ACTIVITIES, FLOOD AS REQUIRED TO MAINTAIN LOAD-BEARING CAPACITY.
4. PRIOR TO SPRING BREAK-UP AND TO MINIMIZE ICE JAMS AND POTENTIAL FLOODING, THE ICE BRIDGE IS CLEANED OF DEBRIS AND NOTCHED AT SEVERAL LOCATIONS.

**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

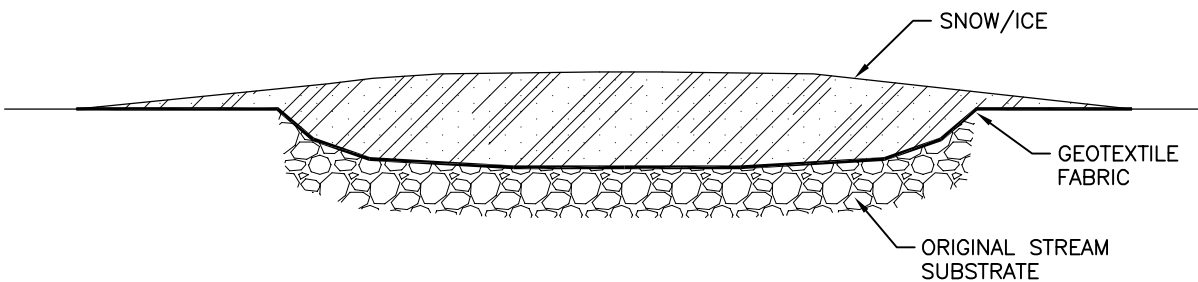
**Appendix 1E CONST-15  
Alaska Pipeline Project**

Construction Typicals – Equipment Crossing – Ice Bridge

Rev.  
C



PLAN VIEW



PROFILE VIEW

NOTES:

1. DURING FROZEN CONDITIONS, USE SNOW FILLS TO PROVIDE VEHICULAR ACCESS ACROSS WATERCOURSES WITH LITTLE OR NO FLOW.
2. CLEAN SNOW FROM ADJACENT AREAS IS PUSHED ONTO THE CROSSING LOCATION TO PROVIDE A LEVEL SURFACE FOR EQUIPMENT. IF THE SUPPLY OF CLEAN SNOW IS INADEQUATE, SNOW CAN BE PROVIDED BY SNOWMAKING MACHINES OR HAULED FROM NEARBY AREAS, SUCH AS LAKES.
3. PRIOR TO SPRING BREAK-UP AND TO MINIMIZE POTENTIAL FLOODING, THE SNOW FILL IS CLEARED OF DEBRIS AND V-NOTCHED.
4. GEOTEXTILE FABRIC TO BE PLACED ACROSS WATERBODY BEFORE SNOW FILL, AND REMOVED THE FOLLOWING SPRING.

**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

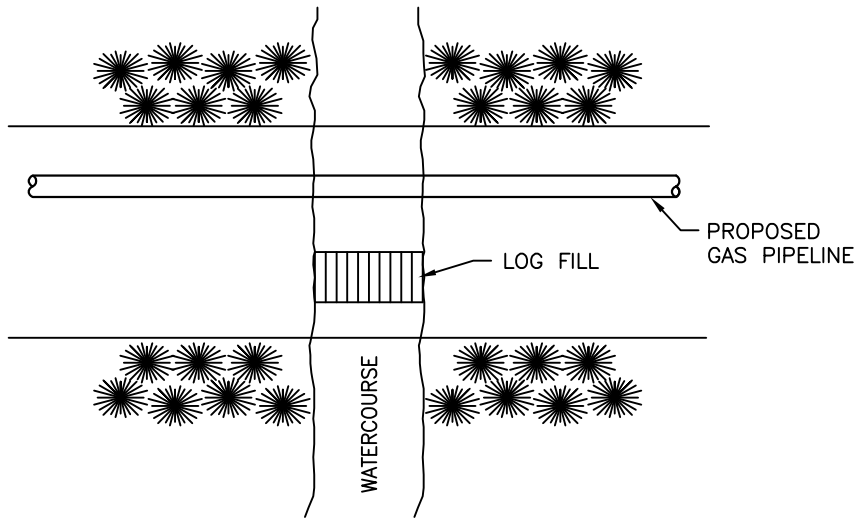
## Appendix 1E CONST-16

### Alaska Pipeline Project

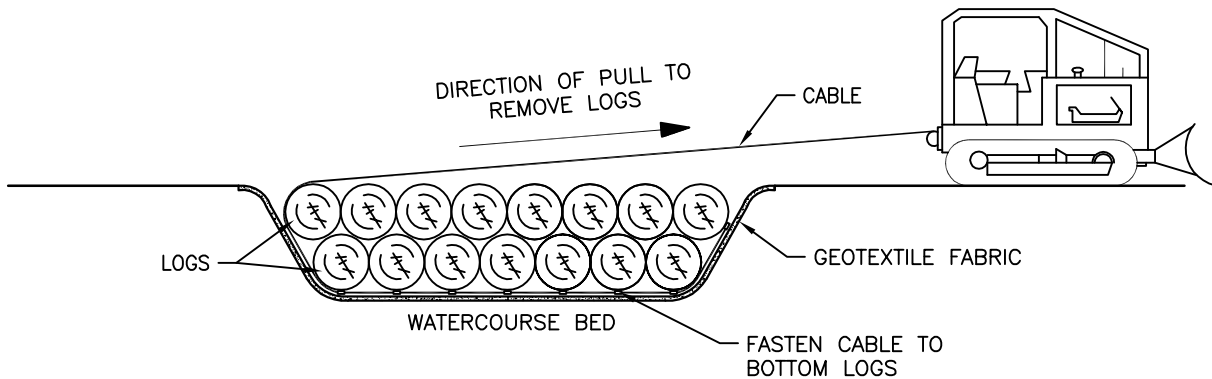
Construction Typicals – Equipment Crossing – Clean Snow Fill

Rev.  
C





PLAN VIEW



PROFILE

NOTES:

1. USE LOG FILL TO PROVIDE VEHICULAR ACCESS ACROSS SMALL WATERCOURSES WITH LITTLE OR NO FLOW.
2. USE NON-MERCHANTABLE TIMBER FOR THE LOG FILL. MERCHANTABLE TIMBER CAN BE USED IF THE APPROPRIATE REGULATORY AUTHORITY HAS GRANTED A WAIVER.
3. THE LOGS ARE BUNDLED WITH CABLE TO FACILITATE EASY REMOVAL AND PLACED ONTO GEOTEXTILE FABRIC IN THE CHANNEL. THE GEOTEXTILE FABRIC IS THEN WRAPPED AROUND THE LOG FILL.
4. APPROVED MATERIAL (e.g. RIG MAT, SNOW, SOIL) IS PLACED OVER THE LOG FILL TO PROVIDE A STABLE DRIVING SURFACE.
5. REMOVE CROSSING AT COMPLETION OF CONSTRUCTION OR PRIOR TO SPRING BREAK-UP.
6. ENSURE WATERCOURSE IS CLEARED OF DEBRIS OR SOIL THAT MAY HAVE BEEN DEPOSITED DURING CONSTRUCTION ACTIVITIES.

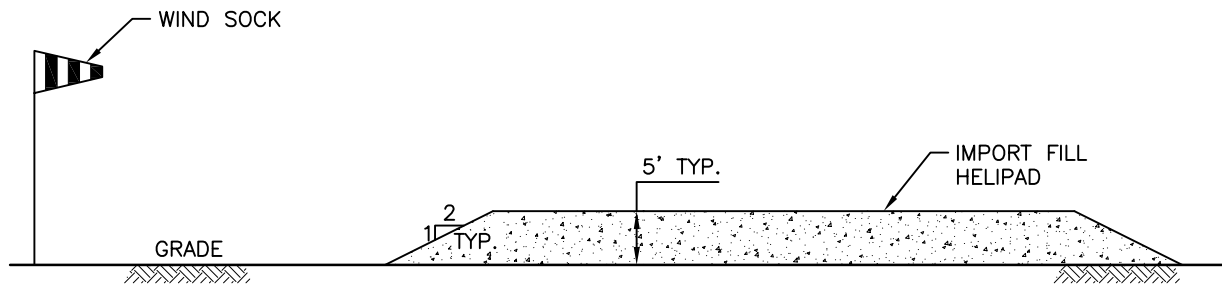
**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

## Appendix 1E CONST-17

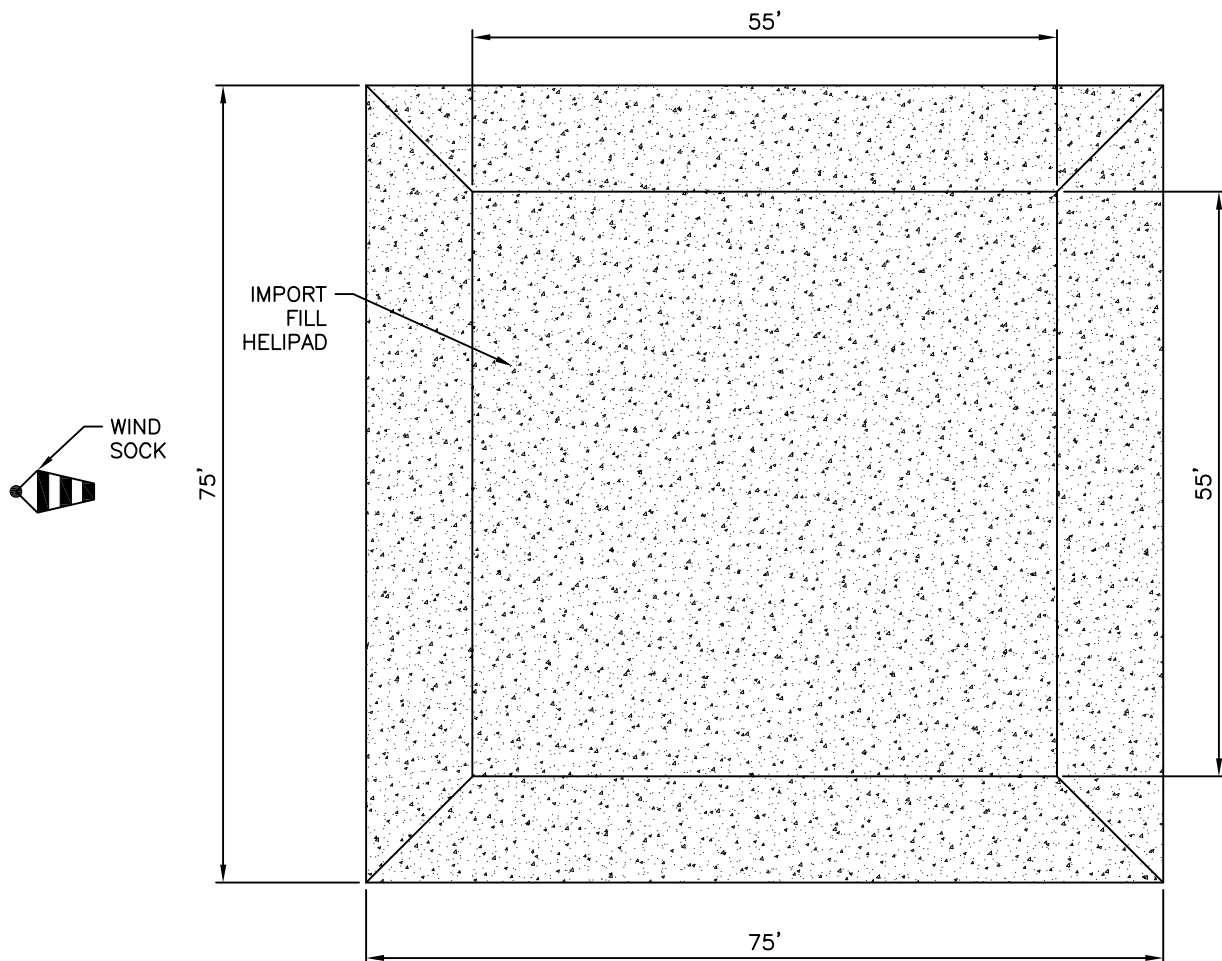
### Alaska Pipeline Project

Construction Typicals – Equipment Crossing – Log Fill

Rev.  
C



PROFILE



PLAN

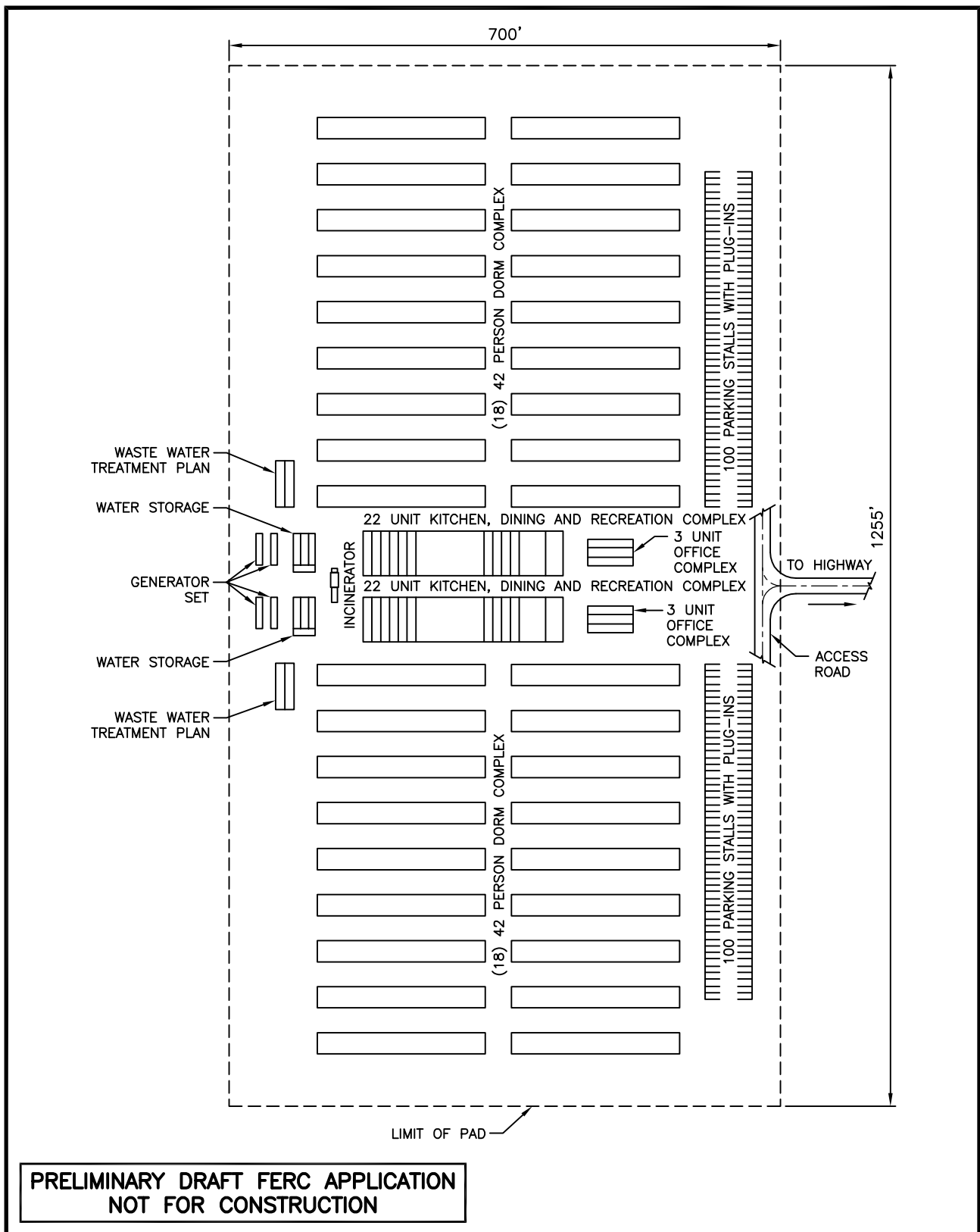
PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION

## Appendix 1E CONST-20

### Alaska Pipeline Project

Construction Typicals – Helipads

Rev.  
D

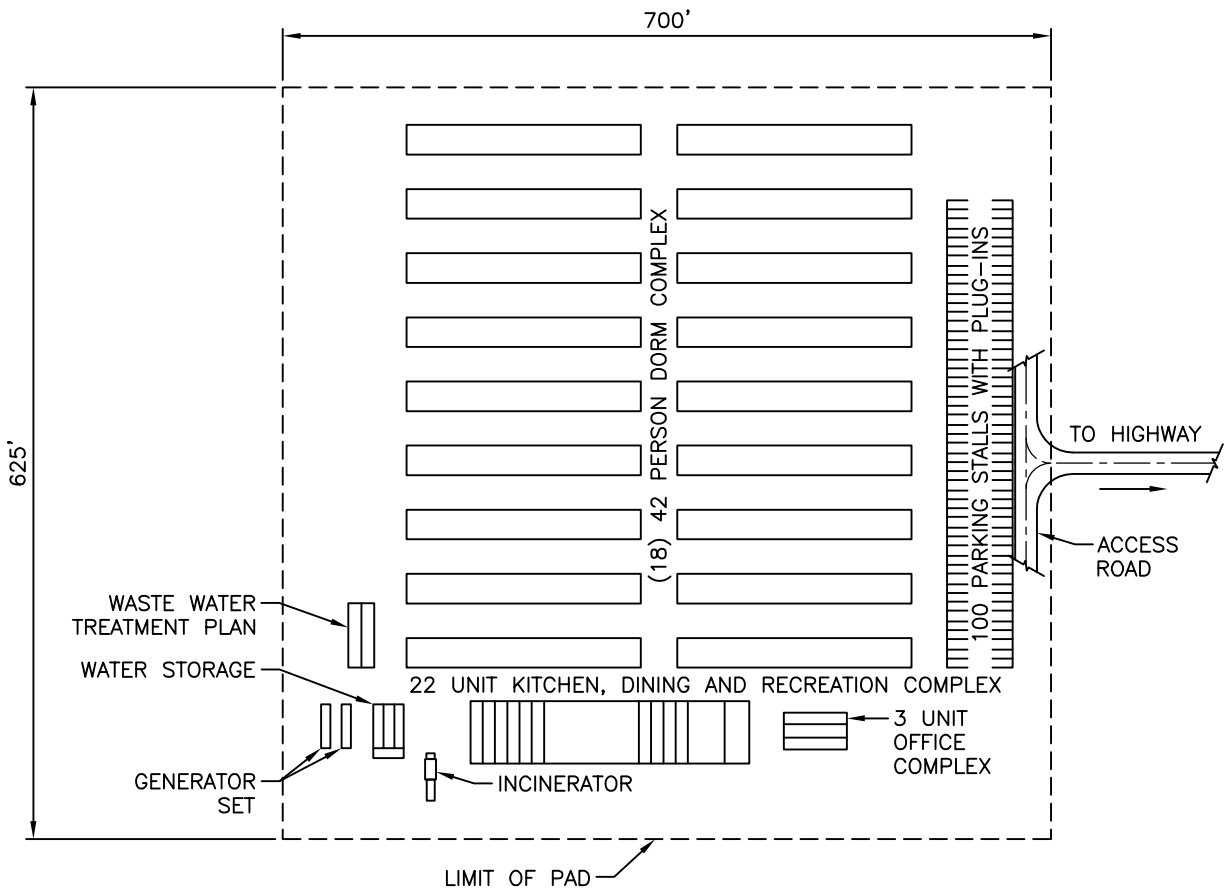


## Appendix 1E CONST-22A

### Alaska Pipeline Project

Construction Typicals - 1500 Person Camp - 20 Acres

Rev.  
C



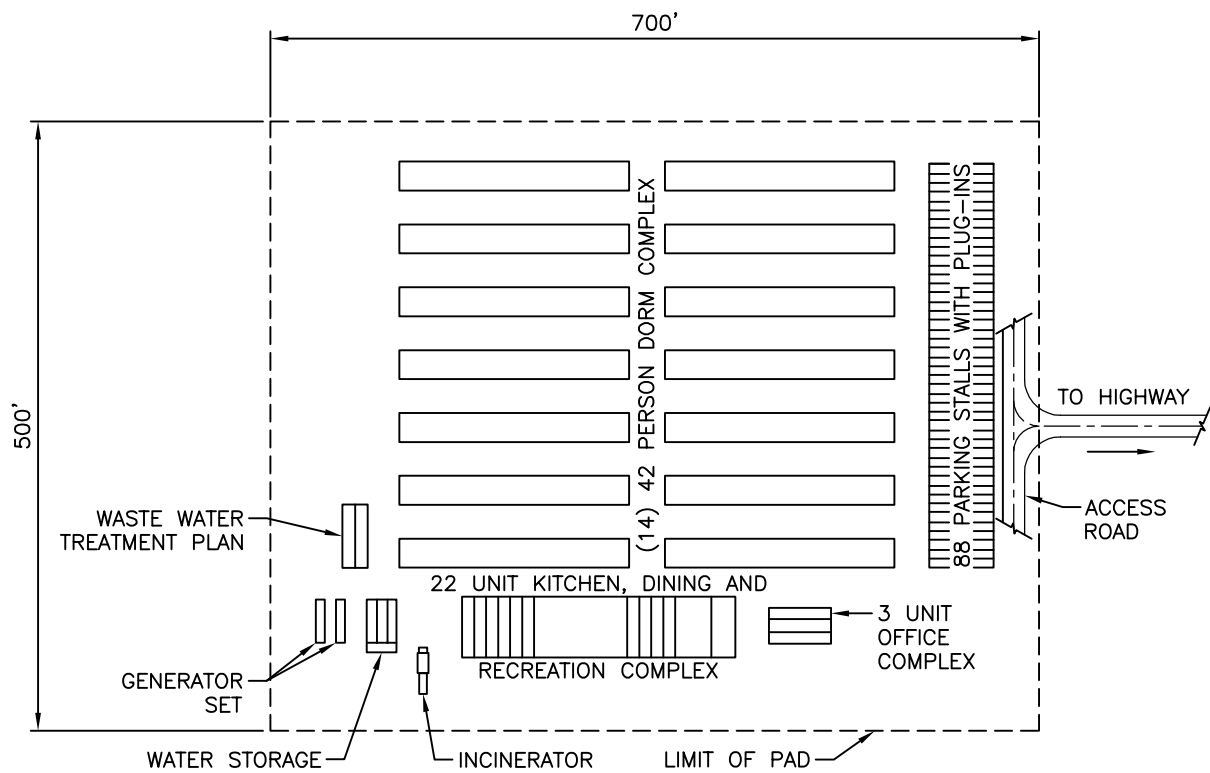
PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION

## Appendix 1E CONST-22B

### Alaska Pipeline Project

Construction Typicals - 750 Person Camp - 10 Acres

Rev.  
C



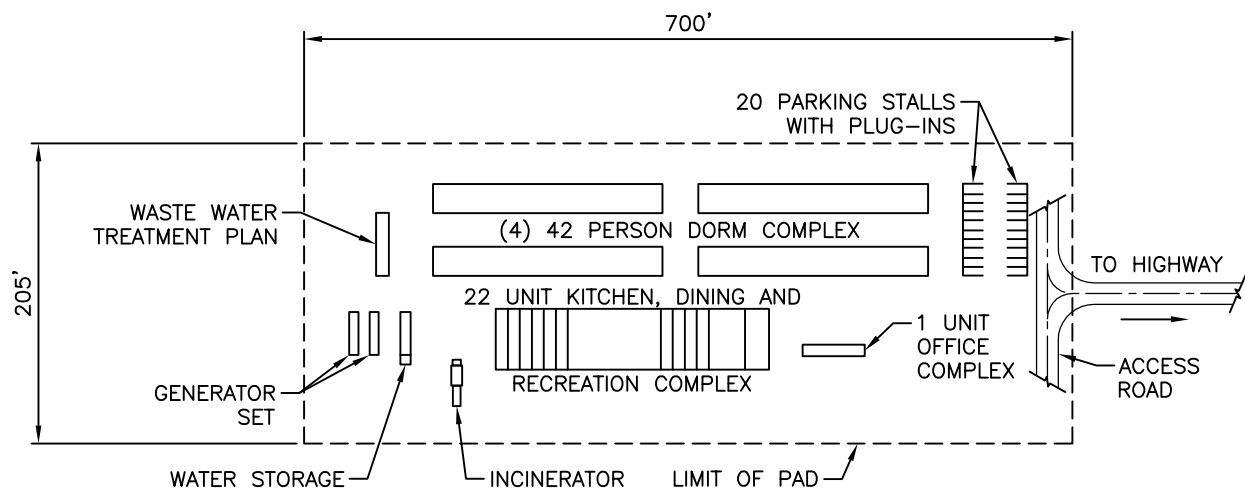
PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION

## Appendix 1E CONST-22C

### Alaska Pipeline Project

Construction Typicals - 500 Person Camp - 8 Acres

Rev.  
C



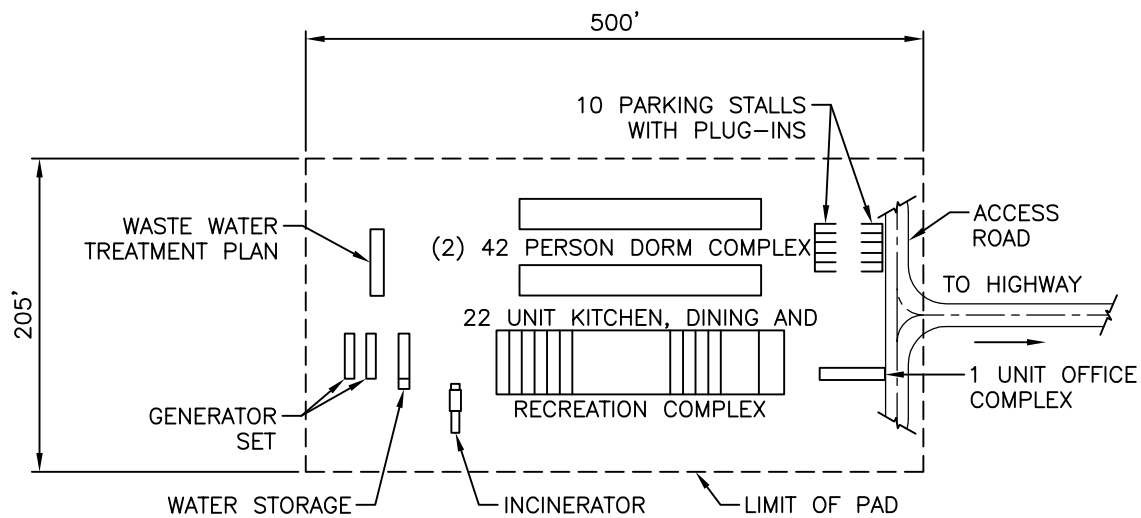
PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION

## Appendix 1E CONST-22D

### Alaska Pipeline Project

Construction Typicals - 150 Person Camp - 3 Acres

Rev.  
C



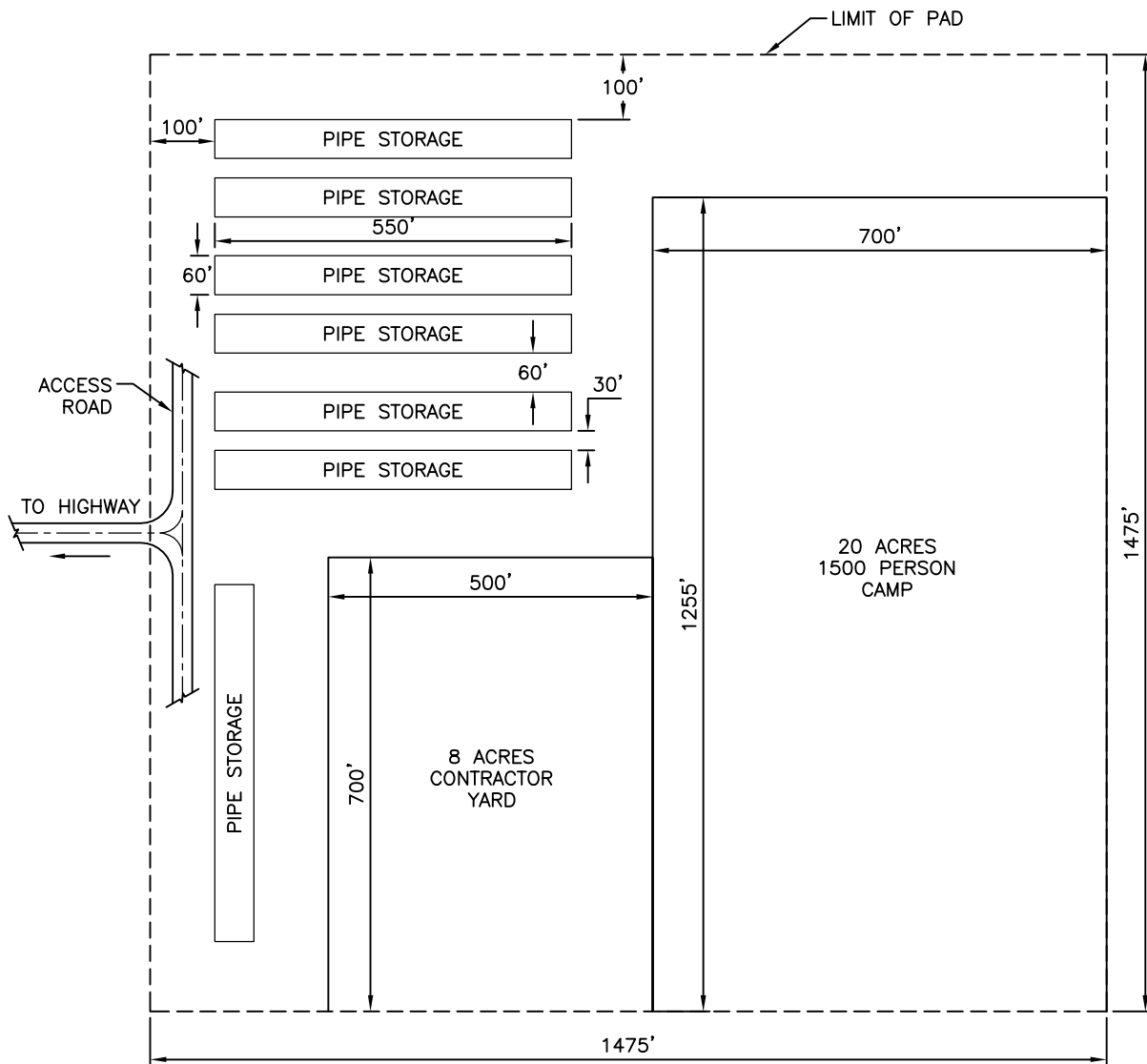
PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION

## Appendix 1E CONST-22E

### Alaska Pipeline Project

Construction Typical - 50 Person Camp - 2 Acres

Rev.  
C



50 ACRES TOTAL

PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION

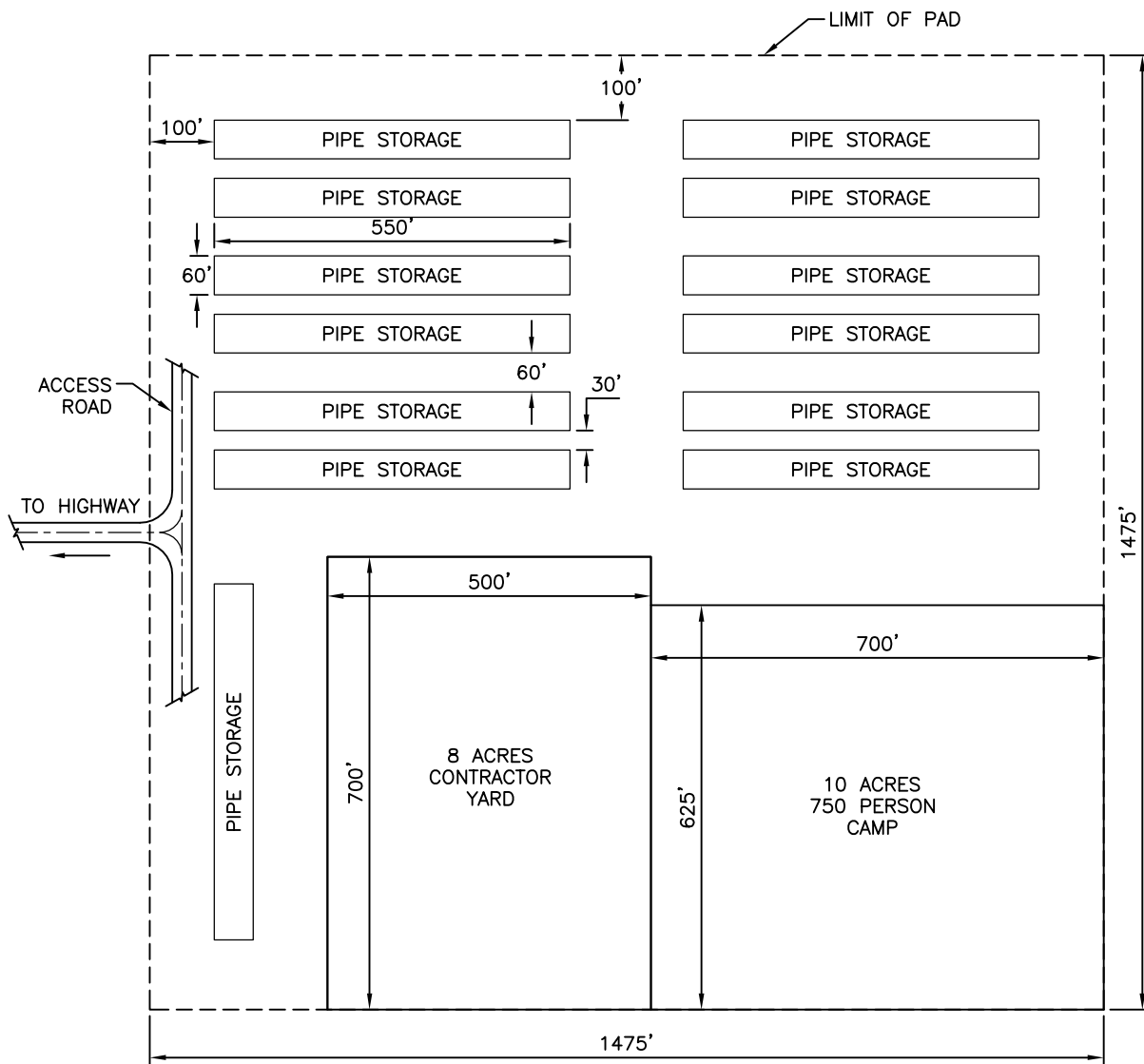
## Appendix 1E CONST-23A

### Alaska Pipeline Project

Construction Typicals - Pipe Storage/Camp/Contractor Yard - Option 1

Rev.  
C





50 ACRES TOTAL

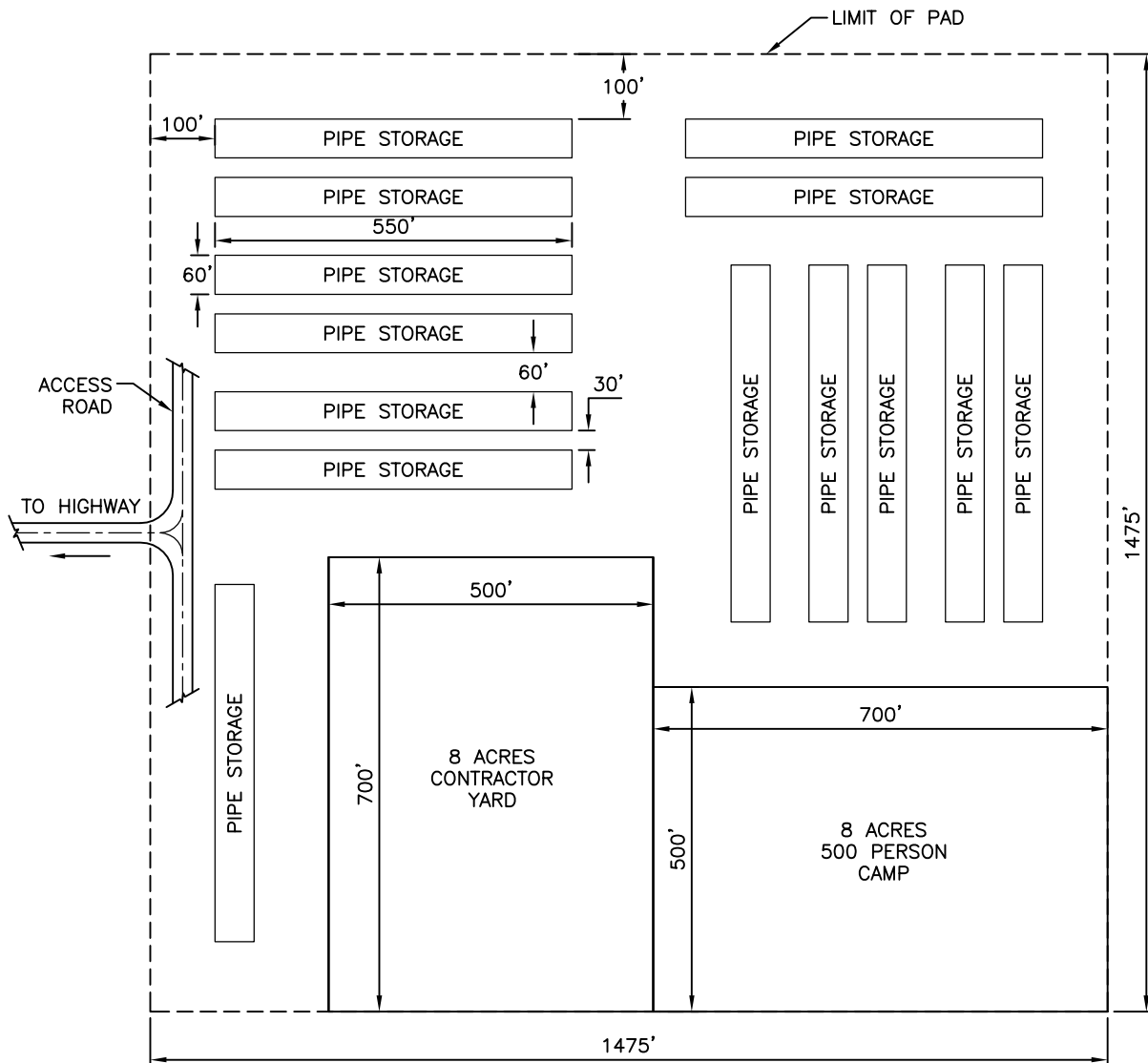
PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION

## Appendix 1E CONST-23B

### Alaska Pipeline Project

Construction Typicals - Pipe Storage/Camp/Contractor Yard - Option 2

Rev.  
C



50 ACRES TOTAL

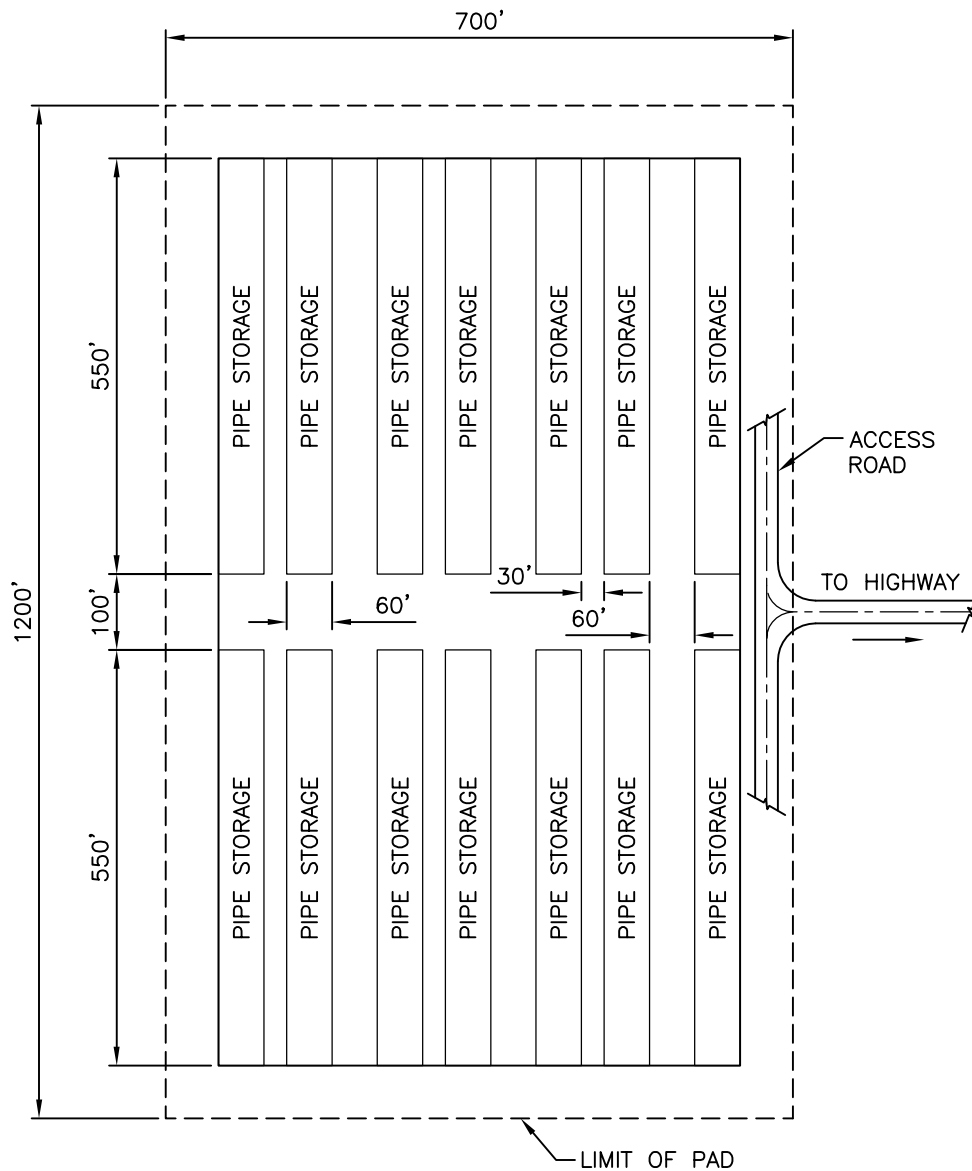
PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION

## Appendix 1E CONST-23C

### Alaska Pipeline Project

Construction Typicals - Pipe Storage/Camp/Contractor Yard - Option 3

Rev.  
C



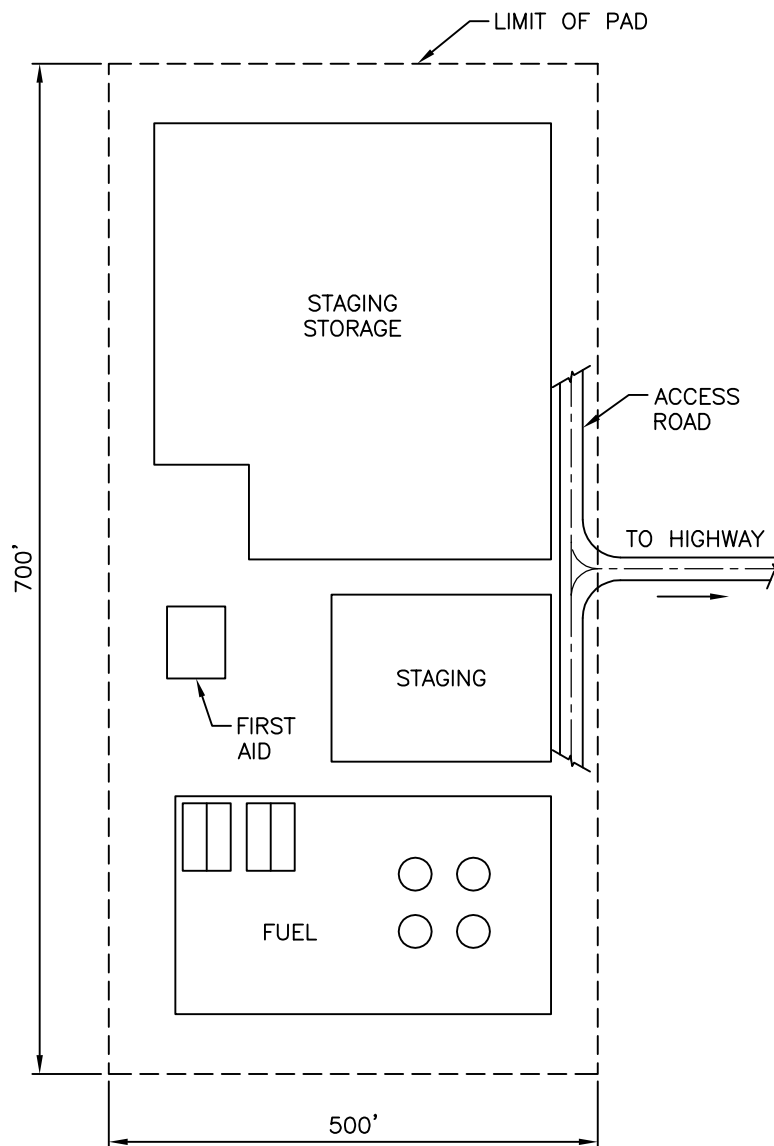
PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION

## Appendix 1E CONST-23D

### Alaska Pipeline Project

Construction Typicals – Stand Alone Pipe Storage Yard – 20 Acres

Rev.  
B

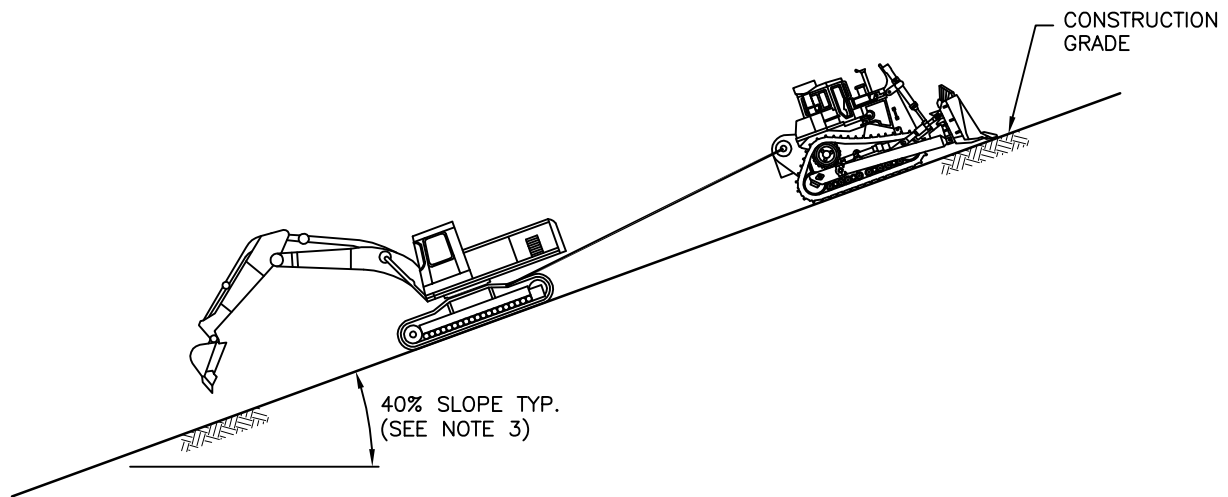


PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION

## Appendix 1E CONST-24 Alaska Pipeline Project

Construction Typicals - Stand Alone Contractor Yard - 8 Acres

Rev.  
C



**NOTES:**

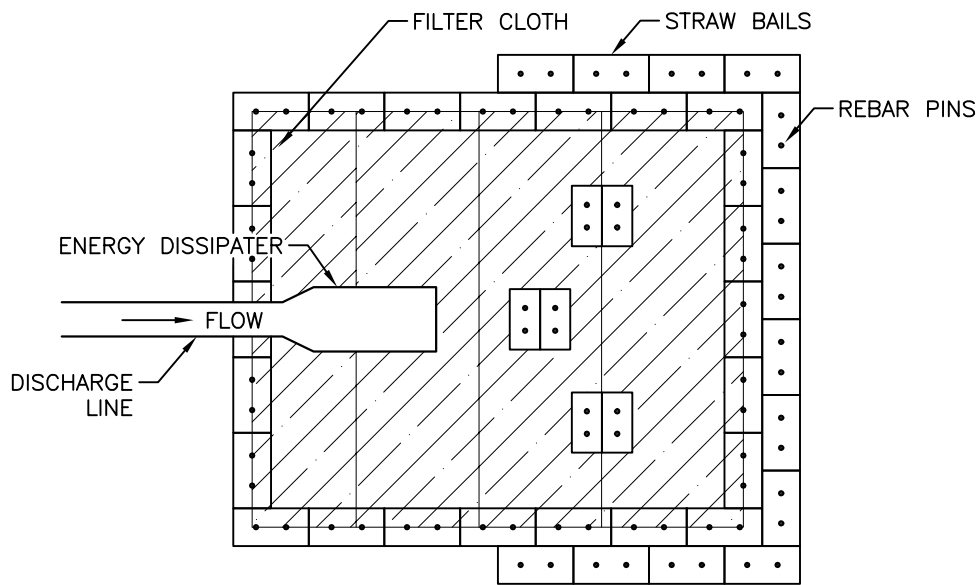
1. WINCHES MAY BE REQUIRED FOR MOVING EQUIPMENT AND MATERIAL, AND DURING CONSTRUCTION ON STEEP LONGITUDINAL SLOPES.
2. WINCHES WITH EITHER BE FIXED WINCHES OR TRACKED EQUIPMENT WITH WINCHES.
3. WINCHES WILL TYPICALLY BE REQUIRED FOR SLOPES OF 40% (22') AND UP.

**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

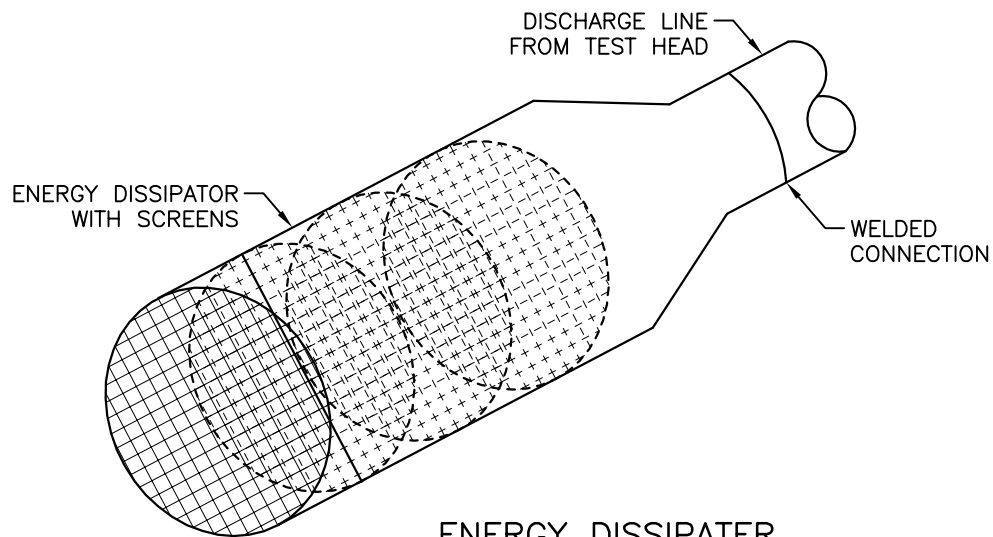
**Appendix 1E CONST-28  
Alaska Pipeline Project**

Construction Typicals – Construction on Steep Longitudinal Slopes

Rev.  
C



PLAN



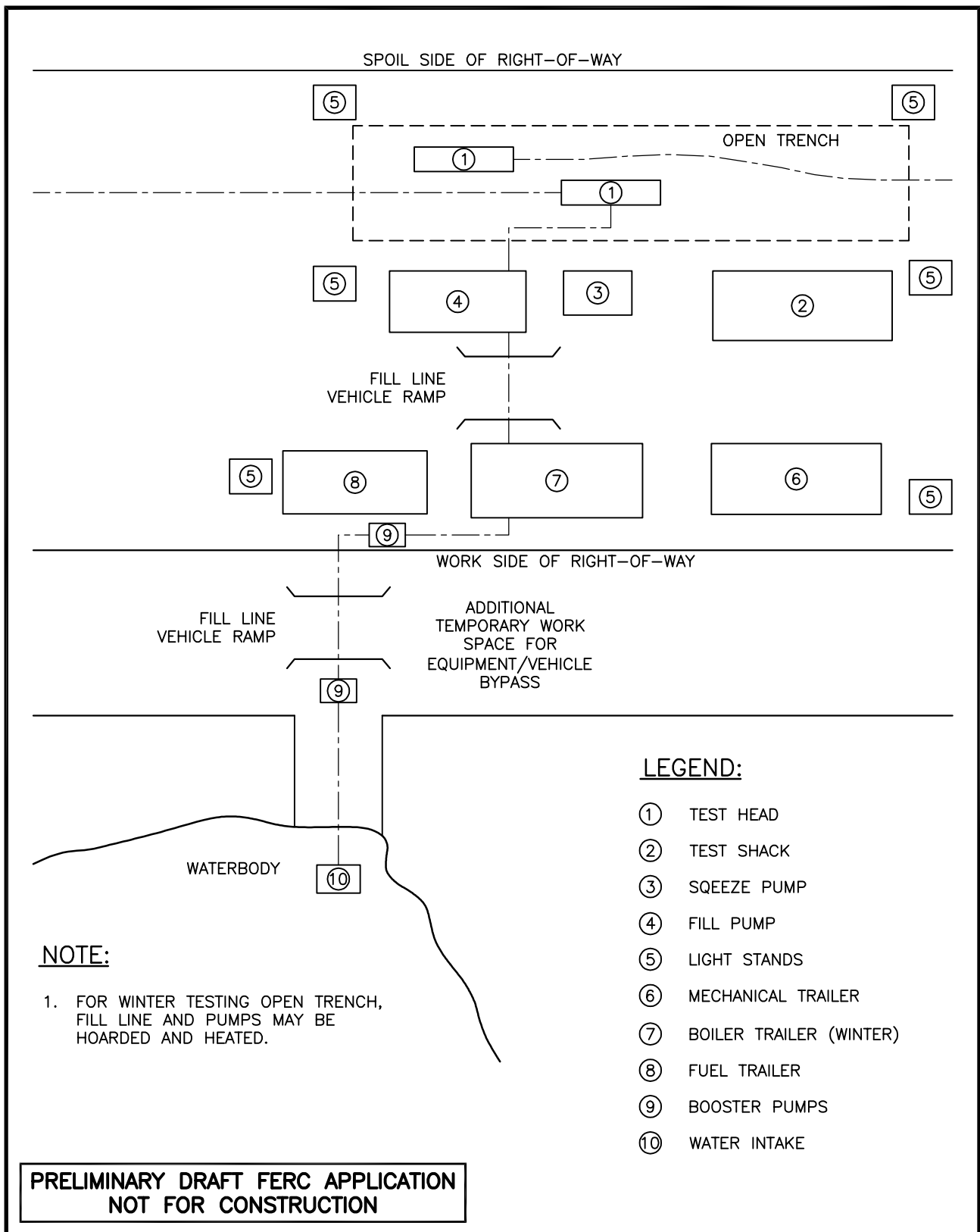
ENERGY DISSIPATER

PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION

## Appendix 1E CONST-33 Alaska Pipeline Project

Construction Typicals – Typical Water Discharge Site

Rev.  
C

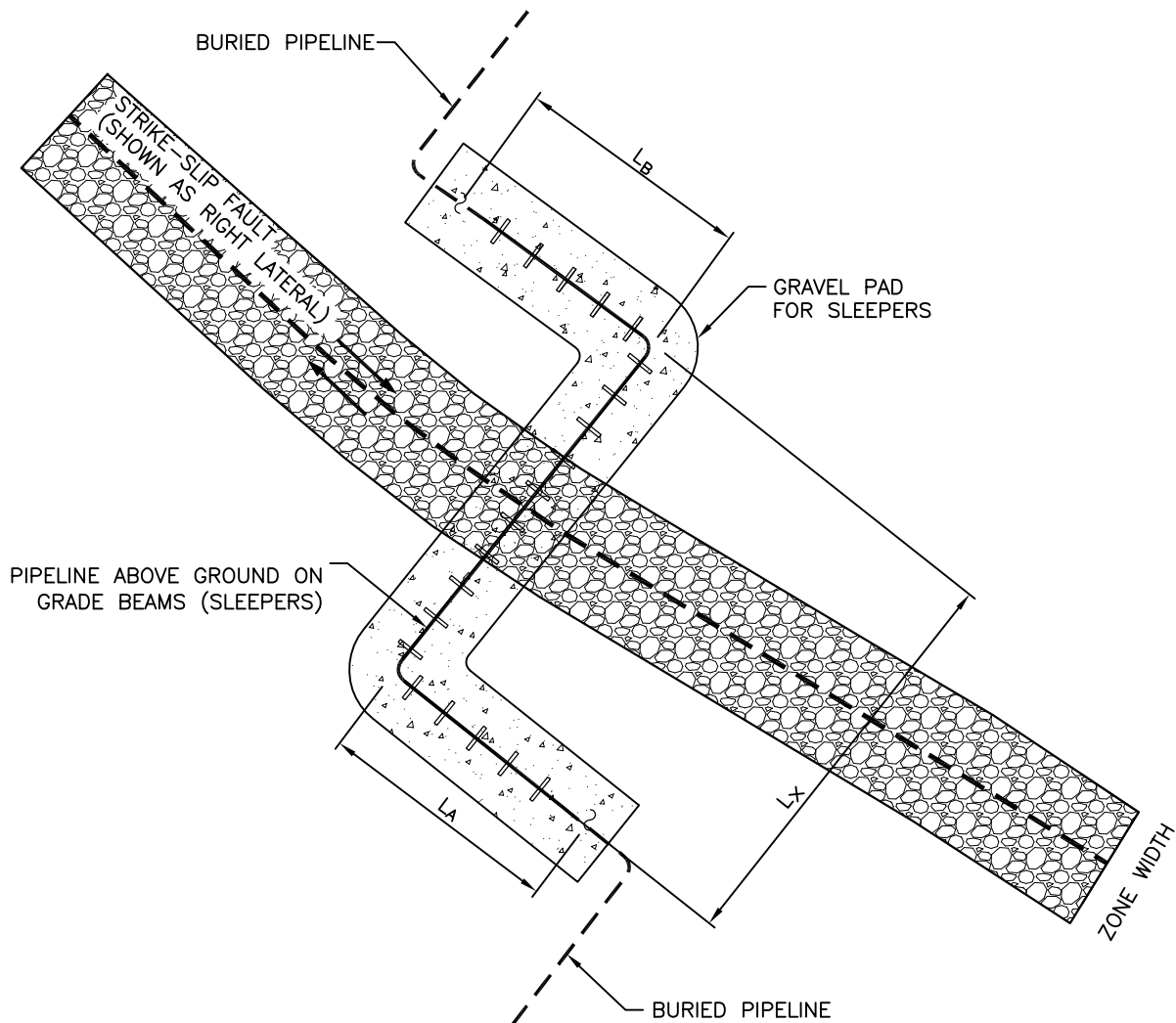


## Appendix 1E CONST-34

### Alaska Pipeline Project

Construction Typicals – Hydrostatic Test Point

Rev.  
C



#### NOTES:

1. "ZEE" CONFIGURATION MAY BE OPPOSITE HAND.
2. DESIGN PARAMETERS TO BE DETERMINED ON A SITE SPECIFIC BASIS INCLUDE:
  - TRANSITION LEGS,  $L_A$  AND  $L_B$
  - CROSSING LEG,  $L_X$
  - SLEEPER SPACING
  - SLEEPER BEAM LENGTH
  - PIPE SHOE LENGTH
  - TYPE AND THICKNESS OF GRANULAR PAD TO SUPPORT SLEEPERS

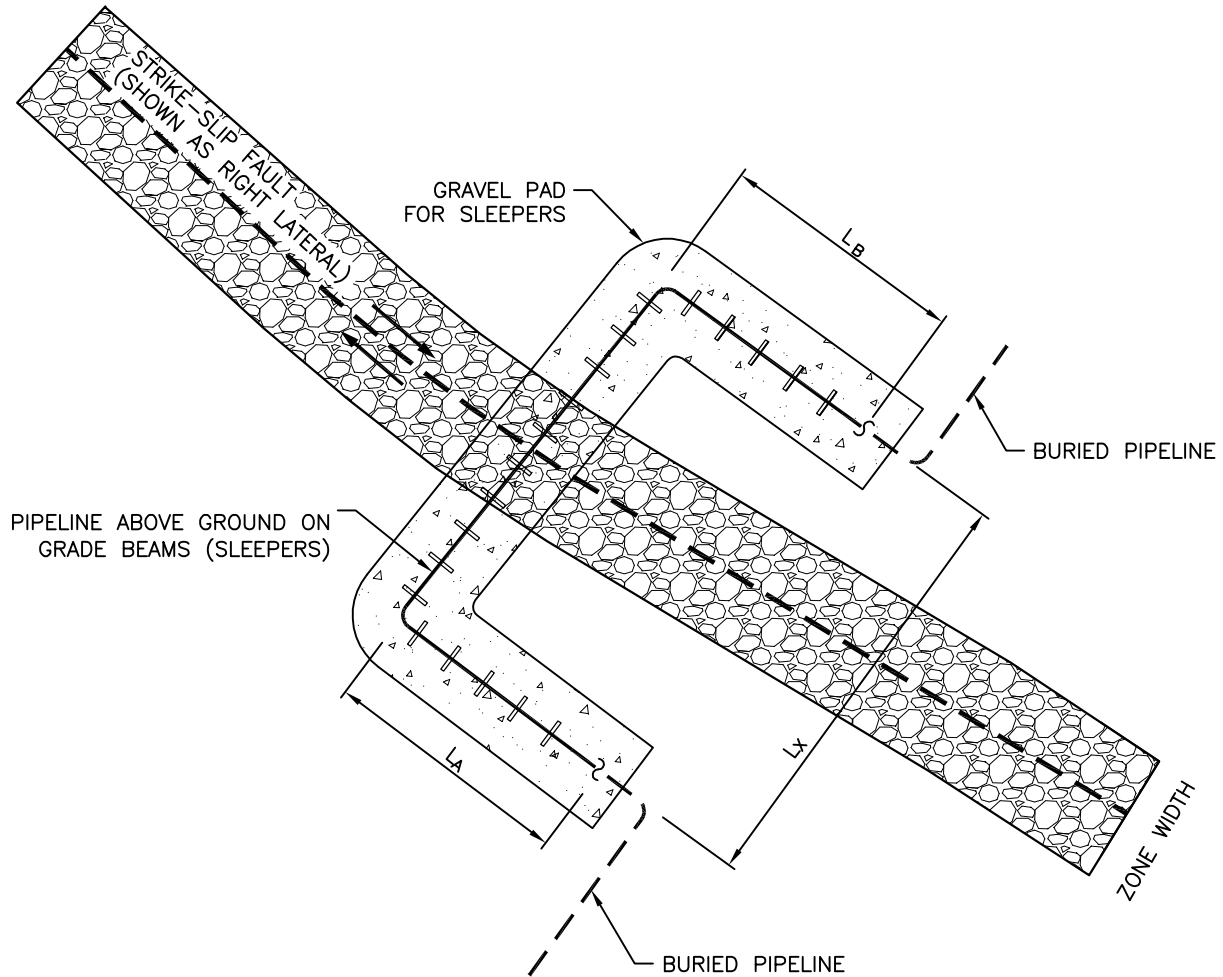
**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

## Appendix 1E FAULT-01 Alaska Pipeline Project

Conceptual "Zee" Fault Crossing Design – Strike-Slip Faults

Rev.  
C





#### NOTES:

1. "U" CONFIGURATION MAY BE OPPOSITE HAND.
2. DESIGN PARAMETERS TO BE DETERMINED ON A SITE SPECIFIC BASIS INCLUDE:
  - TRANSITION LEGS,  $L_A$  AND  $L_B$
  - CROSSING LEG,  $L_x$
  - SLEEPER SPACING
  - SLEEPER BEAM LENGTH
  - PIPE SHOE LENGTH
  - TYPE AND THICKNESS OF GRANULAR PAD TO SUPPORT SLEEPERS

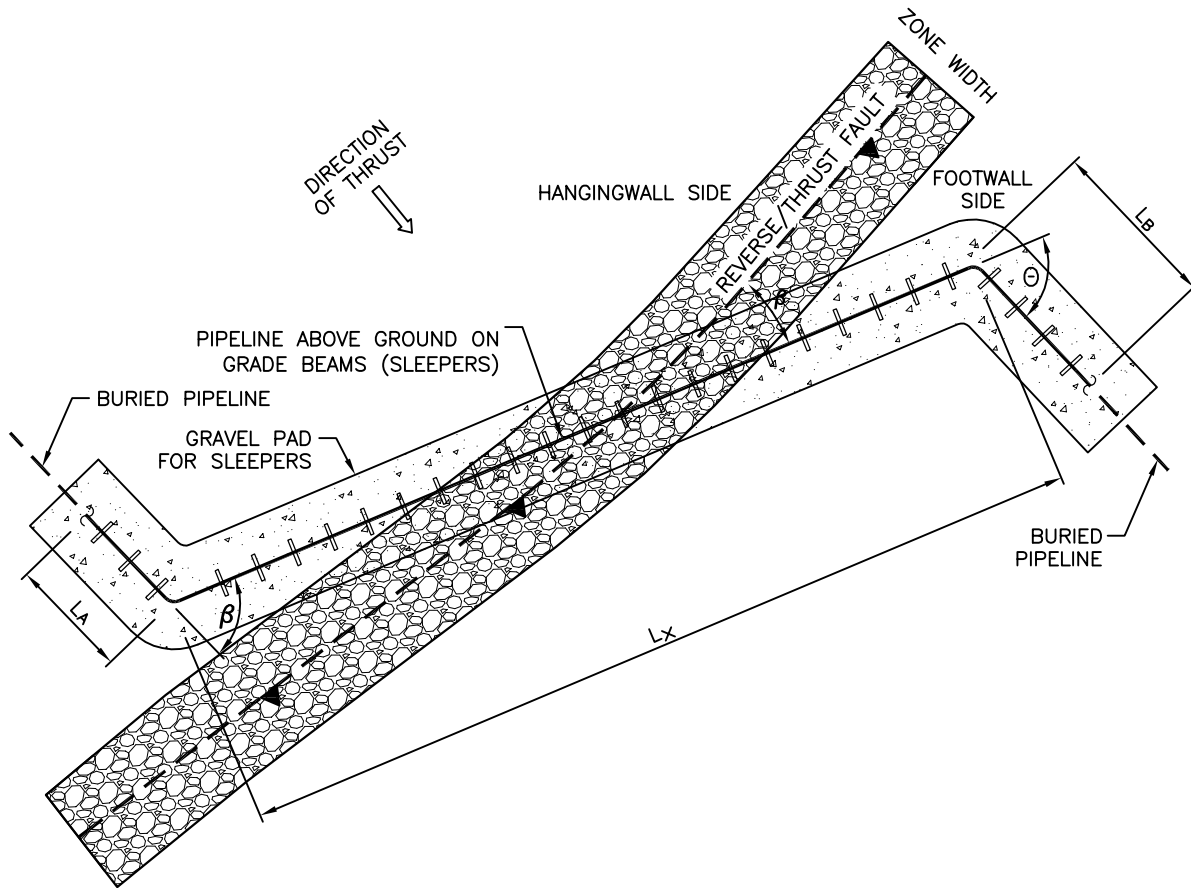
PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION

## Appendix 1E FAULT-02

### Alaska Pipeline Project

Conceptual "U" Fault Crossing Design – Strike-Slip Faults

Rev.  
C



**NOTES:**

1. "ZEE" CONFIGURATION MAY BE OPPOSITE HAND.
2. DESIGN PARAMETERS TO BE DETERMINED ON A SITE SPECIFIC BASIS INCLUDE:
  - TRANSITION LEGS,  $L_A$  AND  $L_B$
  - CROSSING LEG,  $L_x$
  - SLEEPER SPACING
  - SLEEPER BEAM LENGTH
  - PIPE SHOE LENGTH
  - TYPE AND THICKNESS OF GRANULAR PAD TO SUPPORT SLEEPERS
  - INTERSECTION ANGLE,  $\beta$
  - BEND ANGLE,  $\theta$

**PRELIMINARY DRAFT FERC APPLICATION  
NOT FOR CONSTRUCTION**

## Appendix 1E FAULT-03

### Alaska Pipeline Project

Conceptual "Zee" Fault Crossing Design – Reverse or Thrust Faults

Rev.  
C