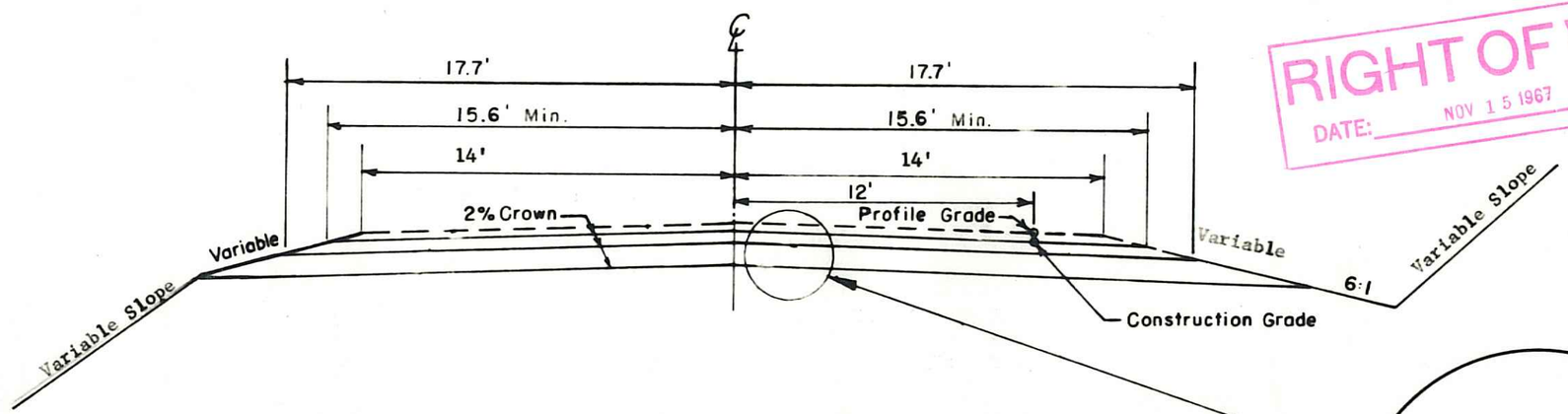
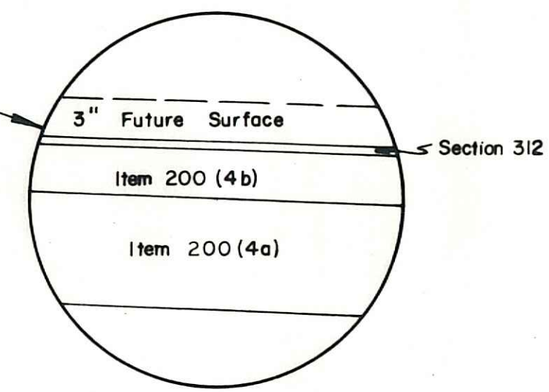
U. S DEPT. OF COMMERCE BUREAU OF PUBLIC ROADS					
STATE	FOREST	ROUTE NO.	SECTION	SHEET NO.	TOTAL SHEET
MONT.	Deerlodge	16	2(1)	3	

TYPICAL BASE SECTION

STA. 25+75.34 TO STA. 180+80





Item 200 (4a) Crushed Aggregate Base, Grading C
See Table Below for Compacted Depth.

Item 200 (4b) Crushed Aggregate Base, Grading E, 4"
Compacted Depth.

Bituminous Preservative Treatment,
SECTION 312, shoulder to shoulder.

NOTE: Where necessary for the purpose of facilitating traffic, any aggregate base or bituminous surfacing shall be constructed part width at a time. (Ref. Second Paragraph Art. 7.5. F. P. 61).

TABLE OF THICKNESS-BASE MATERIAL

STATION	TO STATION	COMPACTED THICKNESS 200(4a)	COMPACTED THICKNESS 200(4b)
25+75.34	72+00	8"	4"
72+00	133+00	14"	4"
133+00	180+80	8"	4"
All Approach Roads		8"	4"

Placed in layers not exceeding 5" compacted depth.

NOTE: Crushed aggregate base shall be mixed in a CENTRAL PLANT to optimum moisture prior to placing on the road, as provided in Article 200-3.5 of the special provisions.
NO DIRECT PAYMENT will be made for water used for processing or maintenance.

U.S. DEPARTMENT OF COMMERCE
BUREAU OF PUBLIC ROADS
REGION 8

SCALE _____ DATE _____

U. S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION BUREAU OF PUBLIC ROADS					
STATE	FOREST	ROUTE NO	SECTION	SHEET NO	TOTAL SHEET
MONT.	DEERLODGE	16	2(1)	4	

SUMMARY

ITEM NUMBERS →		102(1)		105A(2)			100(3)	591(1)
BALANCE POINTS STATION TO STATION		UNCLASSIFIED EXCAVATION CU. YDS.		HAUL YD. MI.		SHEET NO.	CLEARING & GRUBBING ACRES	SEEDING, FERTILIZING & MULCHING UNITS
20+00	50+43	5,888		1,030		6	5.3	182.37
50+43	64+08	10,307		1,718		7	8.6	310.86
64+08	100+08	47,221		16,313		8	9.6	338.05
100+08	114+51	12,446		1,751		9	7.5	219.36
114+51	121+53	5,567		289		10	8.4	298.34
121+53	144+93	16,458		2,416		11	3.5	129.36
144+93	150+33	6,107		258				
150+33	157+68	5,639		461				
157+68	169+52	6,531		662				
169+52	187+00	6,689		1,077				
Slope Protection X-Haul				2,525				
TOTALS		122,853		28,500		TOTALS	42.9	1,478.34

STANDARD PLAN 60-15.4
MAY 15, 1967

DRAINAGE SUMMARY

THE CULVERT LENGTHS SHOWN HEREON ARE APPROXIMATE. THE CONTRACTOR SHALL NOT ORDER CULVERT PIPE UNTIL THE ACTUAL LENGTHS OF THE VARIOUS GAGES ARE FURNISHED HIM BY THE ENGINEER.

✱ DENOTES FACTORY ELONGATED.

ANY CULVERT WITH A PORTION REQUIRING ELONGATED PIPE SHALL BE ELONGATED IN ITS ENTIRE LENGTH.

U. S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS

STATE	FOREST	ROUTE NO.	SECTION	SHEET NO.	TOTAL SHEETS
MONTANA	DEERLODGE	16	2(1)	5	

ACCEPTABLE ALTERNATE CULVERT PIPE
(ACCEPTABLE ALTERNATES IDENTIFIED BY CHECK MARK, GAGE, OR CLASS DESIGNATION)

① PLAIN, ASPHALT DIPPED, OR ASPHALT DIPPED AND PAVED AS REQUIRED BY BID ITEM.

STATION	DESIGNED COVER		GALVANIZED CORRUGATED METAL PIPE							END SECTIONS TYPE I					END SECTIONS TYPE II					① STEEL 3"x1" CORRUGATIONS	① ALUMINUM	CONCRETE				BEVELED ENDS (METAL PIPE)	STRUTTING OR TIES	REMARKS
		DIAM.		18"	24"	30"	36"	42"			18"	24"	30"			36"	42"												
		GAGE		16	16	16	16	16			16	16	14			16	16												
		ITEM NO.		453(1a)	453(1b)	453(1c)	453(1d)	453(1e)			460(4a)	460(4b)	460(4c)			460(5a)	460(5b)					EQUIVALENT DIAMETER	REINFORCED (CLASS)	IMPERFECT TRENCH	NON-REINFORCED			
26+60	1			52							2										16	18	III		X			Road Approach Right
34+40	2				52							2									16	24	III					
38+77	3				36							2																Ext. 12' Lt.& 24' Rt.
42+50	3				54							2									16	24	III					
46+38	3				28							2																Ext. 8' Lt. & 20' Rt.
50+50	2				58							2									16	24	III					Road Approach Right
55+50	3						68									2				16	16	36	III					
73+46	4				74							2									16	24	III					
79+80	3			56							2										16	18	III		X			Road Approach Left
80+80	3				86							2									16	24	III					
85+47	2				54							2									16	24	III					
90+52	3					80							2								16	30	III					
96+15	3					56							2								16	30	III					
101+51	3				58							2									16	24	III					
105+50	3				56							2									16	24	III					
109+50	3					86							2								16	30	III					
115+50	5				74							2									16	24	III					
123+45	3					70							2								16	30	III					
130+00	2				70							2									16	24	III					
140+80	2				70							2									16	24	III					
144+00	3				80							2									16	24	III					
149+57	2				54							2									16	24	III					
152+40	3							66									2			16	14	42	III					
155+82	6				78							2									16	24	III					
160+33	5				76							2									16	24	III					
164+01	2				64							2									16	24	III					
165+41	1			48																	16	18	III		X			Encase 4" water main
167+31	2				60							2									16	24	III					
175+81	2				72							2									16	24	III					
183+35	2					38																						Ext. 18' Lt. & 20'Rt.
TOTAL				156	1,254	330	68	66			4	40	8			2	2											

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
Bureau of Public Roads

STATE	FOREST	ROUTE NO	SECTION	SHEET NO	TOTAL SHEETS
MONT.	DEER-LODGE	16	2(1)		

GALVANIZED BEAM TYPE GUARDRAIL AND FLARE

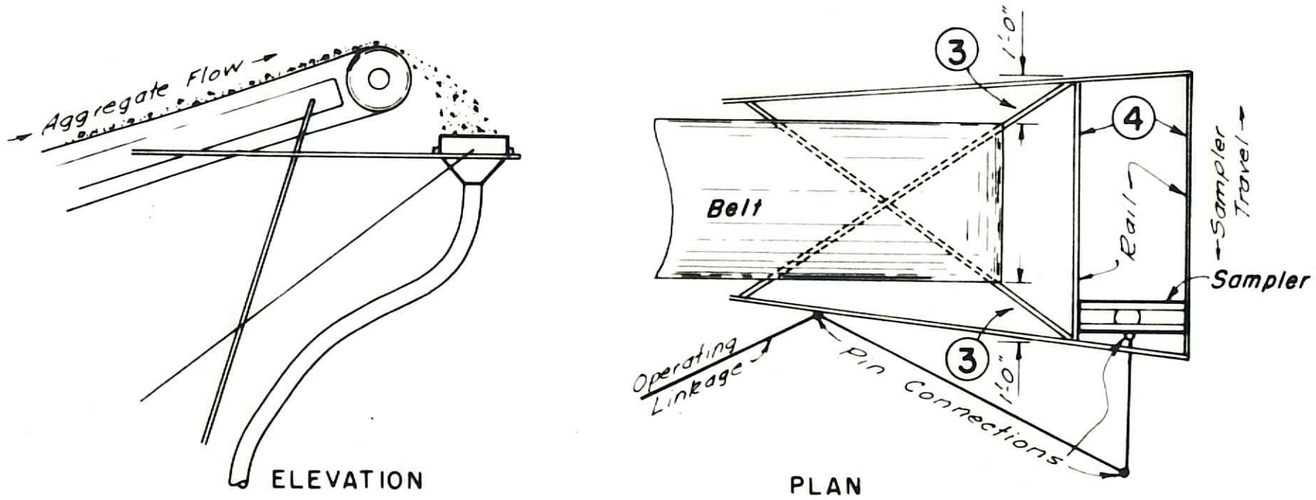
STATION TO STATION		ITEM 583(2)		ITEM 583(3)		REMARKS
		LT.	RT.	LT.	RT.	
63+10	64+60	100	*60	50	0	*(Including 25' factory bent to 20' Radius for Appr. Rd. Rt.)
65+40	66+90	100	100	50	50	West Fork Rock Creek Bridge
TOTAL		200	160	100	50	
GRAND TOTAL		360		150		

L. FROST

U. S. DEPT. OF COMMERCE BUREAU OF PUBLIC ROADS					
STATE	FOREST	ROUTE NO.	SECTION	SHEET NO.	TOTAL SHEETS
Mont	Deer Lodge	16	2 (1)		

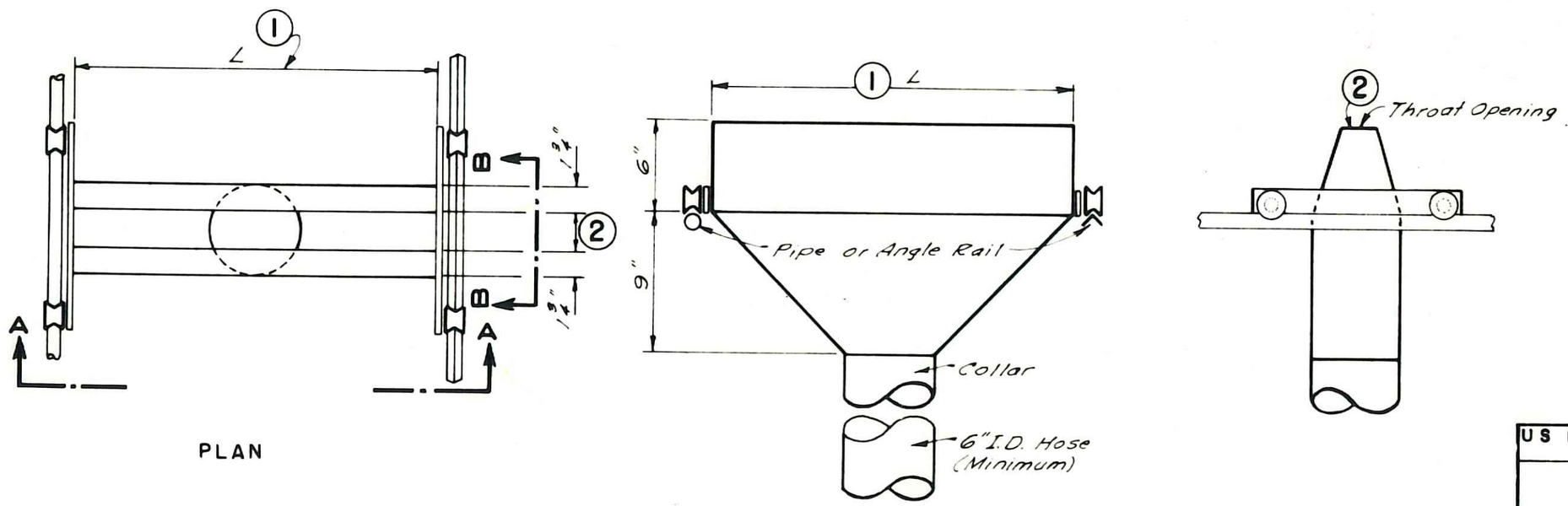
NOTE:

See Article 6.3 of the Special Provisions for mandatory features.



ELEVATION PLAN

GENERAL LAYOUT



PLAN SECTION A-A SECTION B-B

SAMPLER DETAILS

U S DEPARTMENT OF COMMERCE BUREAU OF PUBLIC ROADS	
AGGREGATE SAMPLING DEVICE	
DATE AUGUST 1965	SHEET 1 OF 1
SCALE NONE	DRWG. No. 339

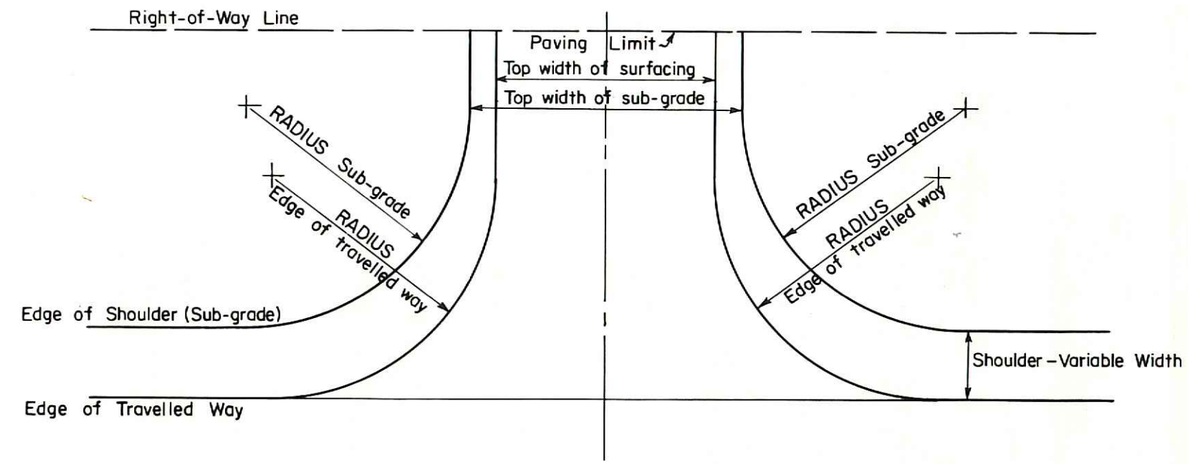
THE WIDTHS FOR THE APPROACHES SHALL BE THE FOLLOWING:

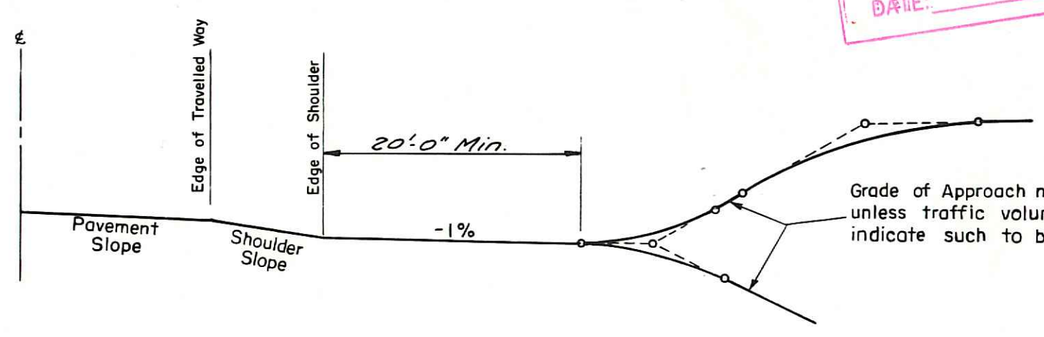
	SPECIFIED WIDTH Top Width of Surfacing	SPECIFIED WIDTH Top Width of Sub-Grade	RADIUS Edge of Travelled Way	RADIUS Sub-Grade
TYPE A	12'	24'	20'	20'
TYPE B	16'	28'	20'	20'
TYPE C	20'	32'	20'	20'
TYPE D	24'	36'	25'	25'

APPROACHES TO PUBLIC ROADS (COUNTY, STATE AND MUNICIPALITIES), AND PUBLIC OR PRIVATE ROADS USED FOR COMMERCIAL PURPOSES SHALL BE FINISHED WITH THE SAME TREATMENT AS SHOWN FOR THE ADJACENT ROADBED.

OTHER APPROACHES SHALL BE FINISHED WITH UNTREATED BASE TO THE SAME THICKNESS AS SHOWN FOR THE ADJACENT ROADBED. THE WEARING SURFACE SHALL BE OF THE SAME TYPE AND THICKNESS AS SHOWN FOR THE ADJACENT ROADBED, BUT NOT TO EXCEED 1-1/2 INCHES.

SIDE SLOPE RATIO AND DEGREE OF FINISH OF APPROACHES SHALL BE COMPATIBLE WITH ADJACENT ROADWAY CONSTRUCTION.





APPROVED

FEDERAL PROJECTS ENGINEER

U. S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS
REGION EIGHT PORTLAND OREGON

STANDARD
ROAD APPROACHES
MONTANA FOREST HIGHWAY PROJECTS

DATE: AUGUST 1967

DRAWING NO. 60-7.5

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION BUREAU OF PUBLIC ROADS					
STATE	FOREST	ROUTE NO	SECTION	SHEET NO	TOTAL SHEETS
Mont	Deerlodge	16	2(1)	2	

GRADE DEFINITIONS

PROFILE GRADE: The ultimate finished grade

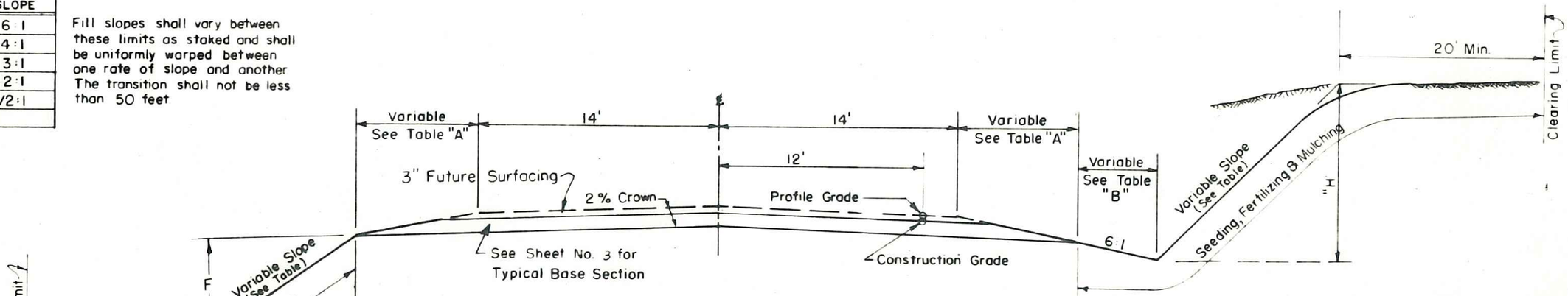
CONSTRUCTION GRADE: Any grade less than the ultimate finished grade to which the project is being constructed.

TYPICAL GRADING SECTION

GRADING & BASE	MILES
BRIDGE	MILES
TOTAL	2.933 MILES

FILL SLOPE TABLE	
"F"	SLOPE
0'-5'	6:1
5'-10'	4:1
10'-15'	3:1
15'-20'	2:1
Over 20'	1½:1

Fill slopes shall vary between these limits as staked and shall be uniformly warped between one rate of slope and another. The transition shall not be less than 50 feet



+ For exceptions See Article 100-4.1 of the special Provisions.

Rounding of slopes shall be in accordance with Specifications. See Std Drwg No 60-11 for details.

NOTE: Grade shall be carried 12 feet from centerline on tangents and inside of curves.

CUT SLOPE TABLE EXCEPT IN SOLID ROCK	
"H"	SLOPE
0' To 5'	5:1
5' To 10'	4:1
10' To 15'	3:1
15' To 20'	2:1
Over 20'	1½:1

Or Flatter

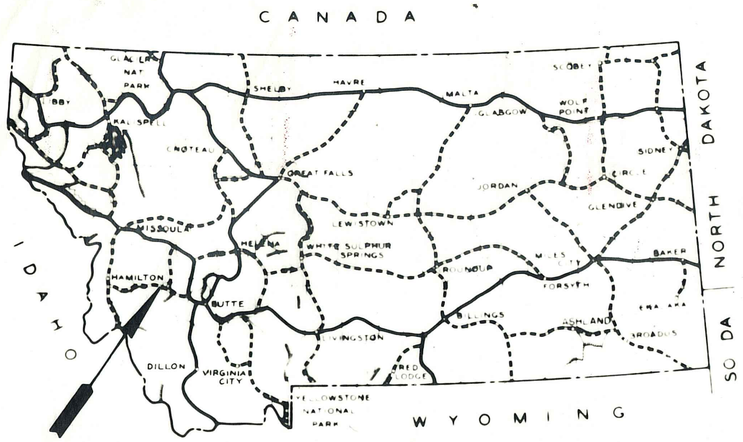
TABLE "A"		
Station to Station		Width
25+75.34	72+00	8'
72+00	133+00	* 11'
133+00	180+80	8'

TABLE "B"		
Station to Station		Width
25+75.34	72+00	7'
72+00	133+00	4'
133+00	180+00	7'

* On Fill Slopes steeper than 3:1 where guardrail is used, reduce 11' width to 9'.

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS

REGION	8	STATE	Montana
PROJECT	16-2(1)		
SHEET	1	OF	2 SHEETS



KEY MAP MONTANA

PLANS FOR PROPOSED
MONTANA FOREST HIGHWAY PROJECT 16-2(1)
SKALKAHO HIGHWAY

LENGTH 2.933 MILES

CLASS I

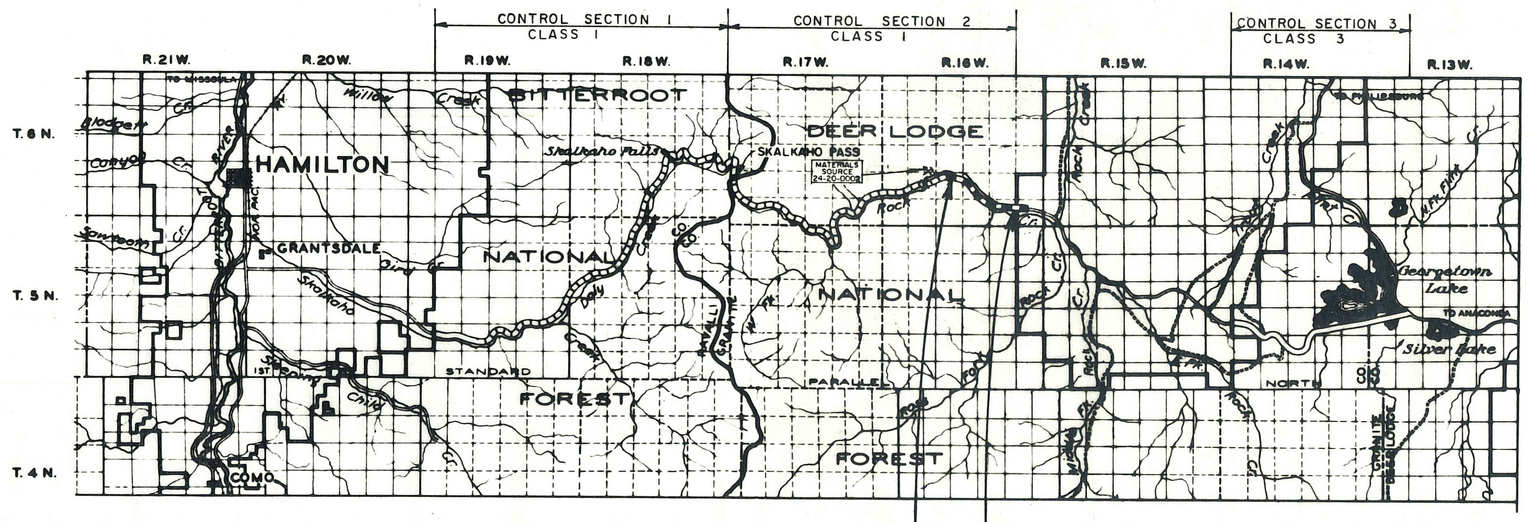
DEERLODGE NATIONAL FOREST

GRANITE COUNTY

RIGHT OF WAY COPY
DATE: NOV 15 1967

INDEX TO SHEETS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	TYPICAL GRADING SECTION
3	TYPICAL BASE SECTION
4	SUMMARY
5	DRAINAGE SUMMARY
6-11	PLAN-PROFILE STA 25+75.34 TO 180+80
	DRWG. NOS.
	WEST FORK ROCK CREEK BRIDGE
	BEAM GUARDRAIL TABLE
	MATERIALS SOURCE NO 24-20-0002
	SIGN ERECTION DETAILS
	DRWG NO. 339 AGGREGATE SAMPLING DEVICE
	STD. DRWG. NO. 15-1.5 GENERAL CULVERT DETAILS
	" " " 15-2.15 CORRUGATED METAL CULVERTS
	" " " 15-3.4 CONCRETE CULVERT PIPE
	" " " 15-6 CONCRETE END SECTIONS
	" " " 15-8.7 METAL END SECTIONS
	" " " 34-2.5 BEAM GUARDRAIL
	" " " 35-22.4 GUIDE POST
	" " " 60-3.3 R/W MONUMENTS & MAINTENANCE MARKERS
	" " " 60-7.5 ROAD APPROACHES
	" " " 60-11 ROUNDING DETAILS
	" " " 60-16 RANDOM FILL



Note

All references in these plans to
U.S. DEPARTMENT OF COMMERCE
BUREAU OF PUBLIC ROADS

Shall mean:
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS

SCALE OF MILES
0 1 2 3 4 5 6 7 8 9 10

LEGEND
APPROX RTE ESTAB RTE GRADED BASE BIT SURF PAVED

Description of Project

Improvement Grading, Base and Bridge

Roadbed Width 31.2' At Construction Grade
Surface
Type Code 3210
Width
Bridges

Design Classification

A.D.T.	1964 - 61
A.D.T.	1984 - 170
D.H.V.	40
D	55%
T	9%
V	60 M.P.H.

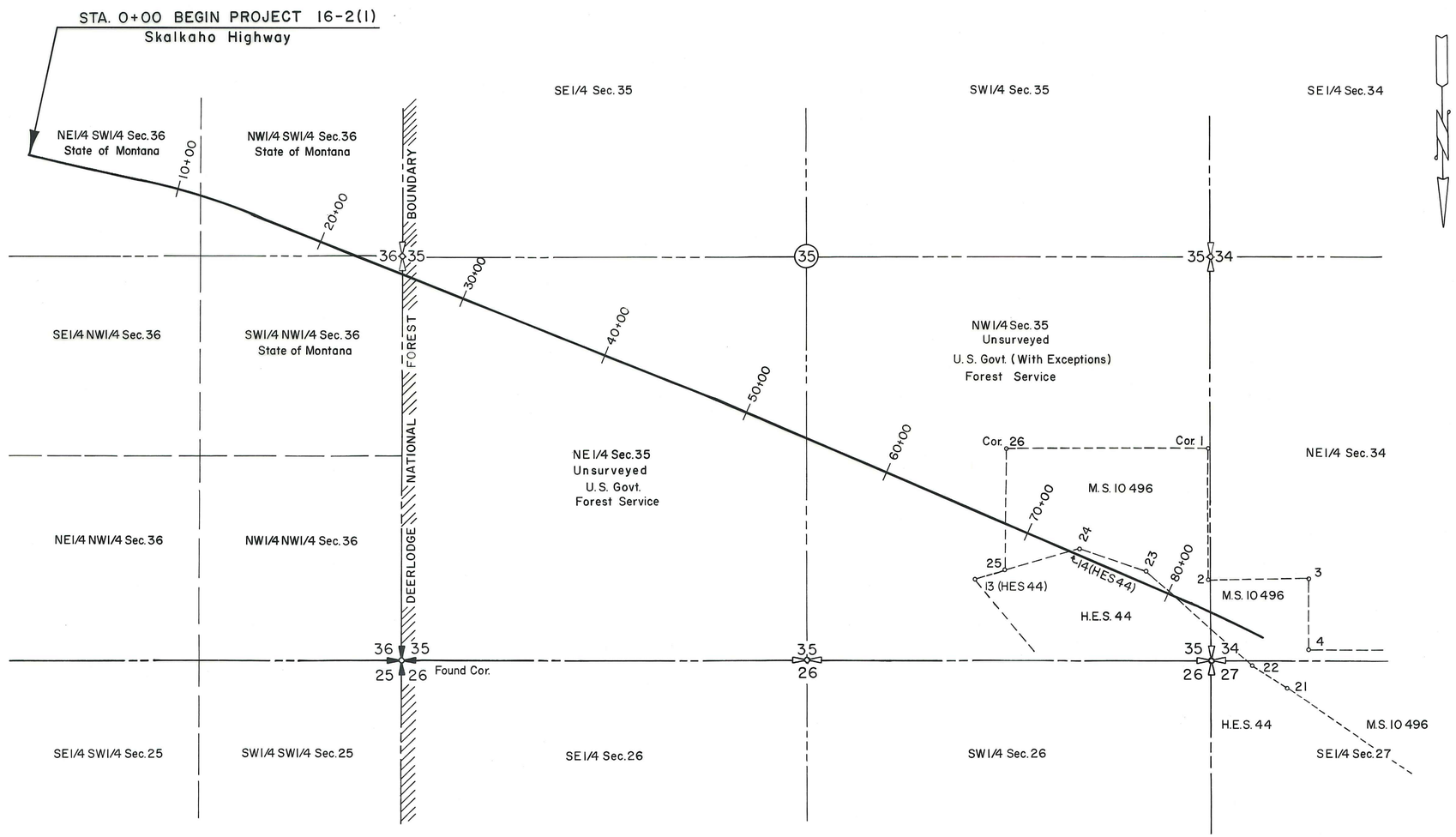
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS
REGION NO. 8

Approved

_____ Date _____
FOR REGIONAL ADMINISTRATOR

STATE			
Mont.	Deerlodge	16	2(1)

Mont Hiway Pkg - F-161(7)
Skalkaho Hiway



T6N R16W MPM

SCALE
0' 400' 800' 1200' 1600' 2000'

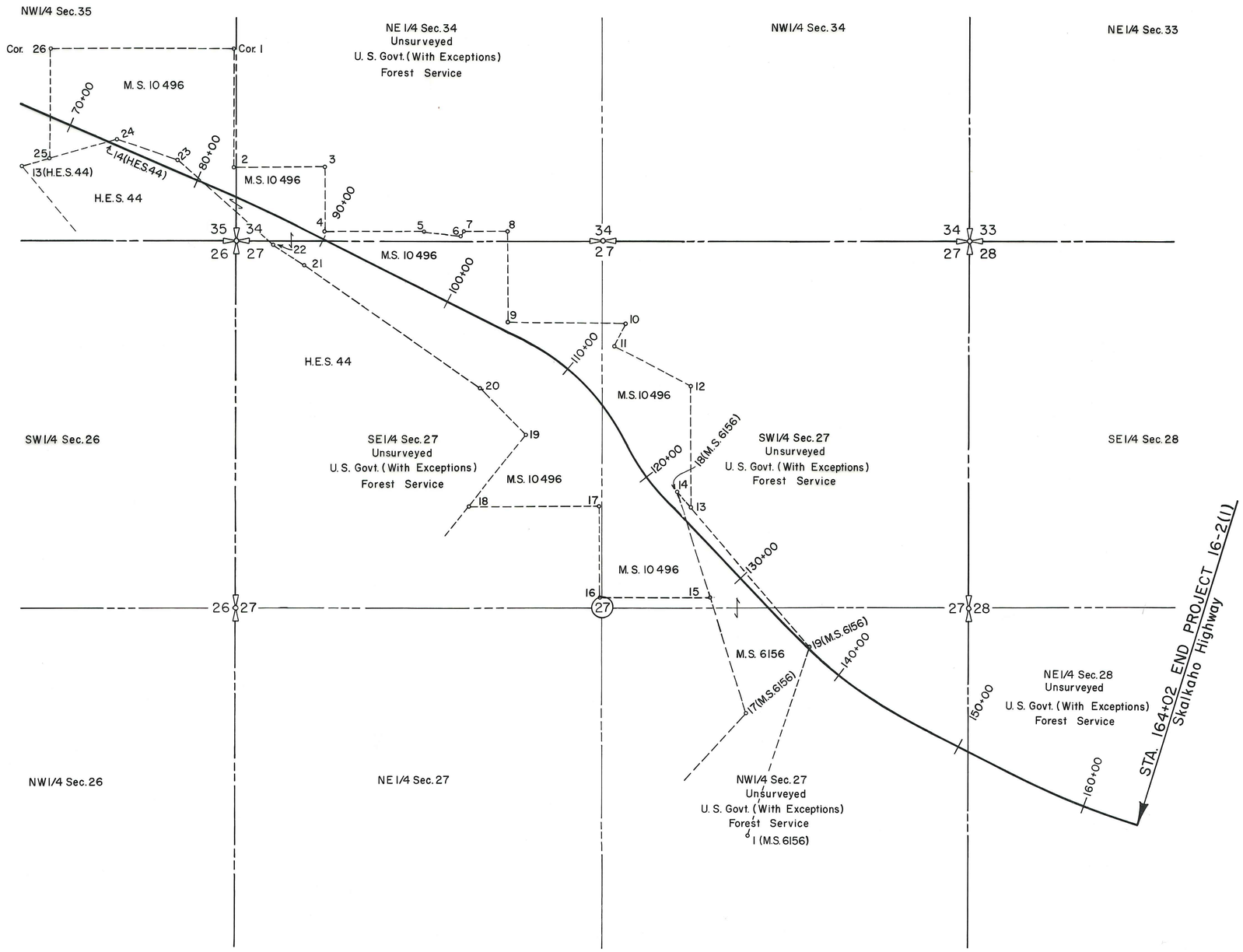
VICINITY AND TOTAL PARCEL DETAIL MAP

SHEET 1 OF 2

C.L.

STATE	
Mont. Deerlodge 16	2(1)

Mont Hiway R/W F-161-(7)
Skalkaho Hiway



M.S. 6156
Star Placer
Joe & Nellie Castello
Phillipsburg, Montana

M.S. 10496
Agemite Placer
Joe & Nellie Castello
Phillipsburg, Montana

H. E.S. 44
R.R. Richtmyer
Phillipsburg, Montana

T6N R16W MPM

SCALE
0' 400' 800' 1200' 1600' 2000'

VICINITY AND TOTAL PARCEL DETAIL MAP

SHEET 2 OF 2

C.L.

U. S. DEPT. OF COMMERCE BUREAU OF PUBLIC ROADS					
STATE	FOREST	ROUTE NO.	SECTION	SHEET NO.	TOTAL SHEETS
Mont	Deerlodge	16	2(1)	6	

THE ALIGNMENT AND GRADE AS HEREON SHOWN ARE SUBJECT TO ADJUSTMENT

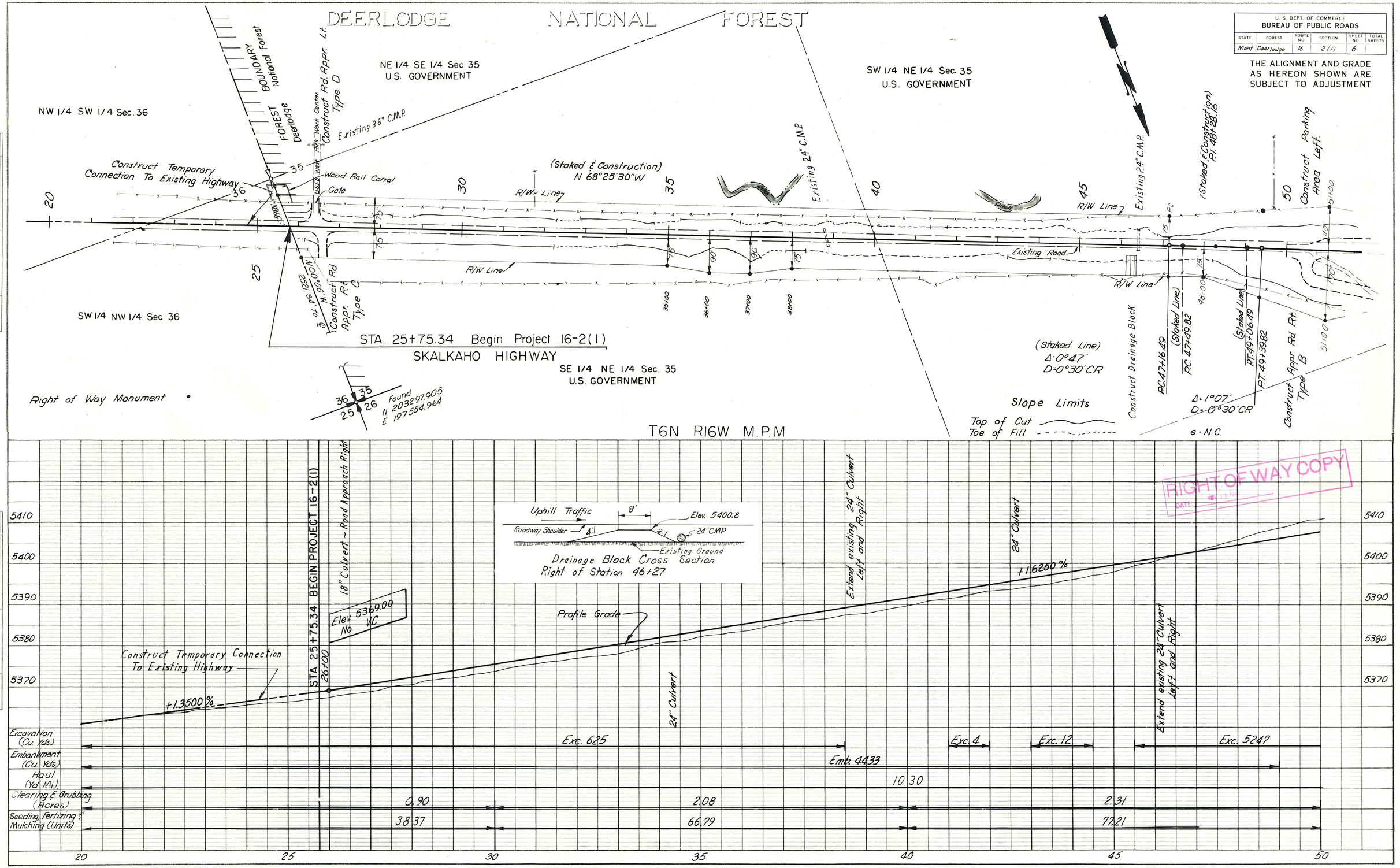


PLATE I PLAN - PROFILE B P R STANDARD
EUGENE DIETZGEN CO. CHICAGO - NEW YORK

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U. S. DEPT. OF COMMERCE BUREAU OF PUBLIC ROADS					
STATE	FOREST	ROUTE NO.	SECTION	SHEET NO.	TOTAL SHEETS
Mont.	Deerlodge	16	2(1)	7	

THE ALIGNMENT AND GRADE AS HEREON SHOWN ARE SUBJECT TO ADJUSTMENT

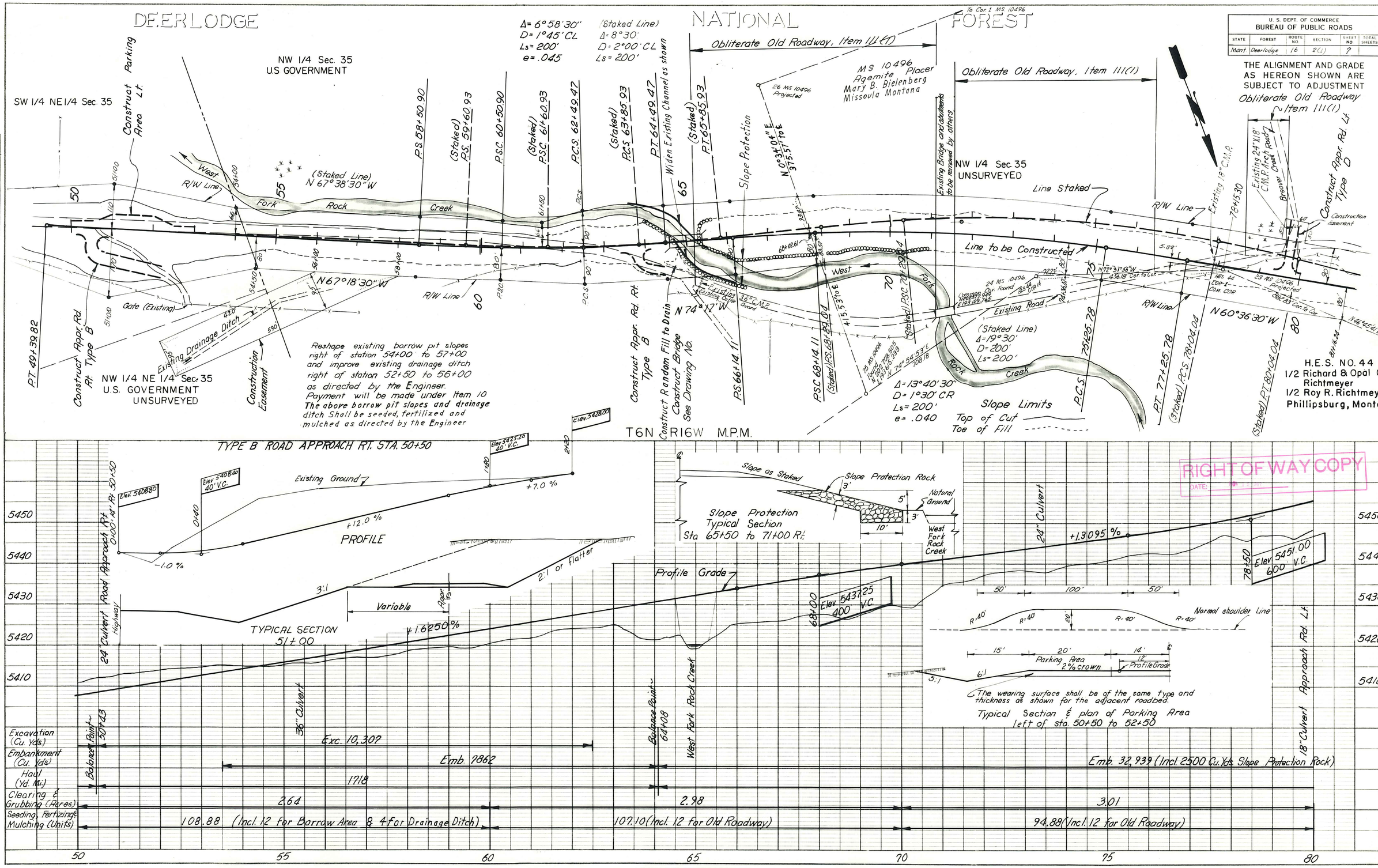

PLATE I PLAN - PROFILE & P R STANDARD
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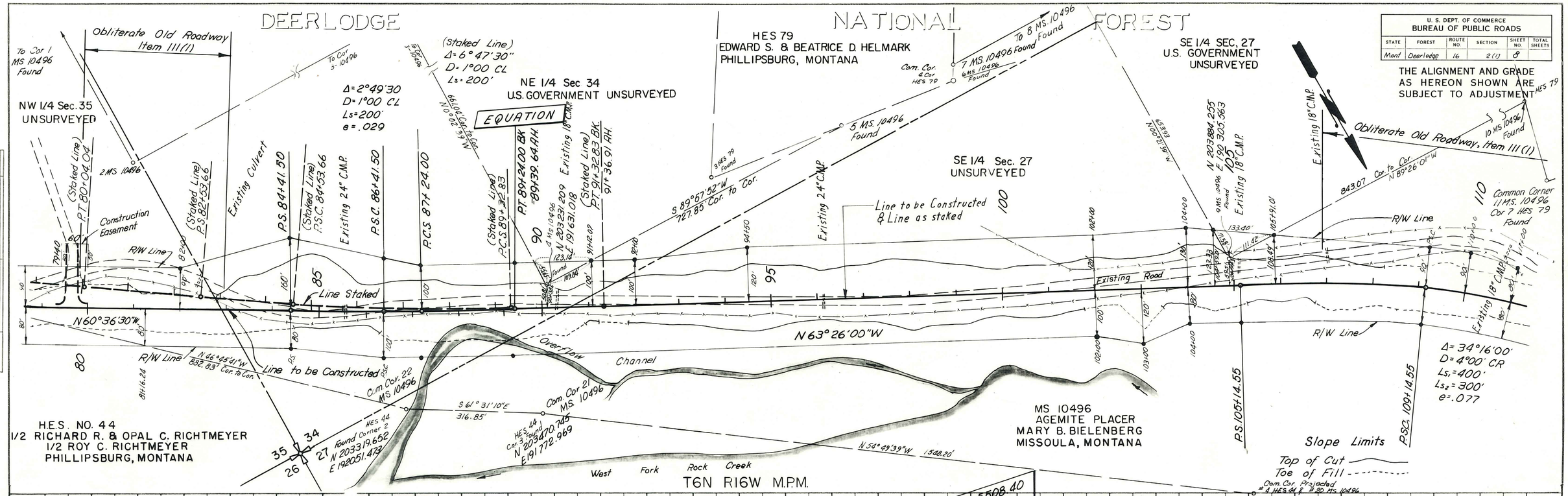
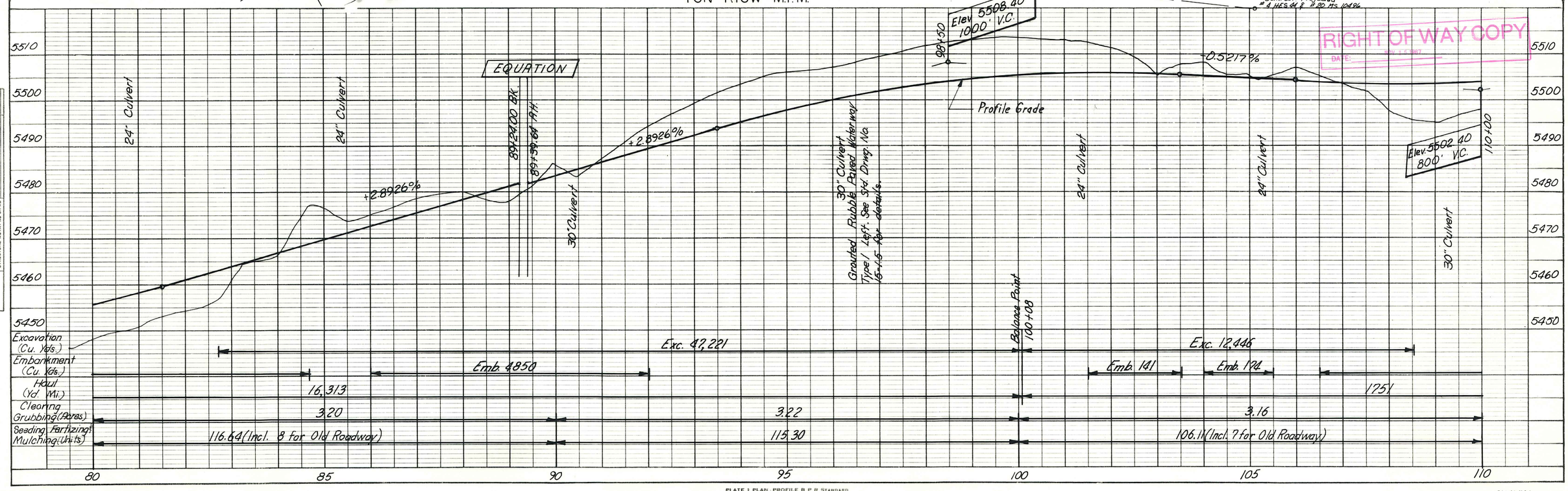
U. S. DEPT. OF COMMERCE BUREAU OF PUBLIC ROADS					
STATE	FOREST	ROUTE NO.	SECTION	SHEET NO.	TOTAL SHEETS
Mont	Deerlodge	16	2(1)	8	

THE ALIGNMENT AND GRADE AS HEREON SHOWN ARE SUBJECT TO ADJUSTMENT





RIGHT OF WAY COPY
DATE: NOV 17 1987

PLAN — SURVEYED, PLOTTED, A.I. OR WAY CHECKED, NOTE BOOK, NO., BY, DATE

PROFILE — SURVEYED, PLOTTED, GRADES CHECKED, B.M. NOTED, STRUCTURE NOTATNS CH'KD, NOTE BOOK, NO., BY, DATE

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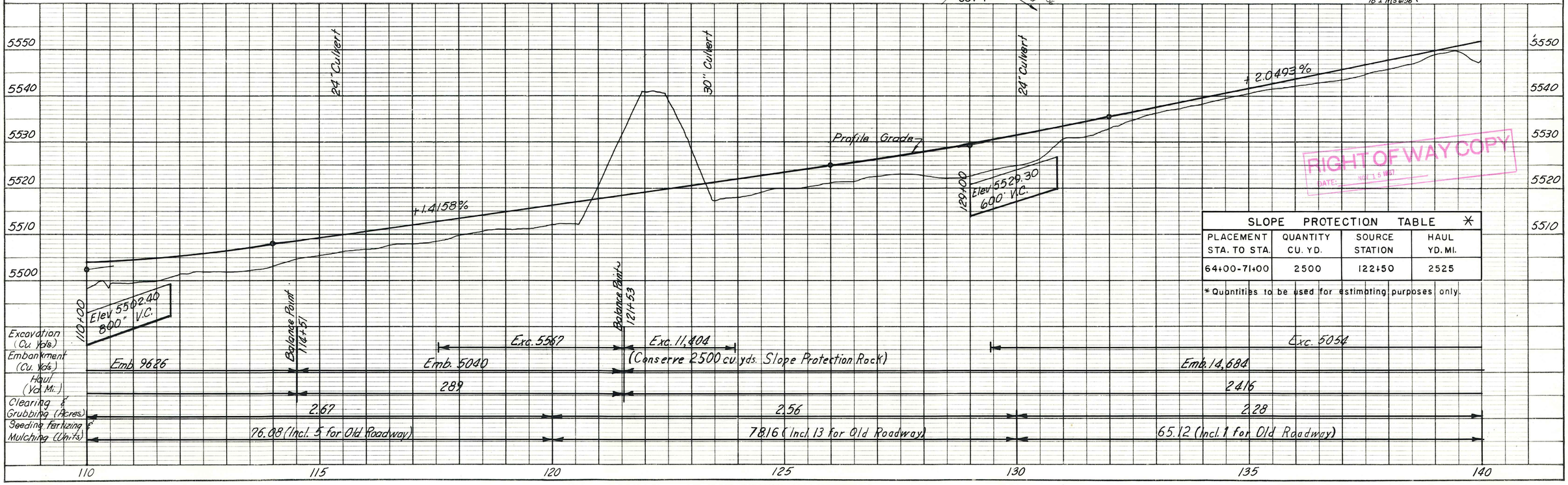
PLATE 1 PLAN - PROFILE & P R STANDARD
EUGENE DIETZGEN CO. CHICAGO - NEW YORK

Printed in U.S.A. On ABEWRIGHT Tracing Cloth

U. S. DEPT. OF COMMERCE BUREAU OF PUBLIC ROADS					
STATE	FOREST	ROUTE NO.	SECTION	SHEET NO.	TOTAL SHEETS
Mont	Deerlodge	16	2(1)	9	

THE ALIGNMENT AND GRADE AS HEREON SHOWN ARE SUBJECT TO ADJUSTMENT



RIGHT OF WAY COPY
DATE: JUL 15 1967

SLOPE PROTECTION TABLE *			
PLACEMENT STA. TO STA.	QUANTITY CU. YD.	SOURCE STATION	HAUL YD. MI.
64+00-71+00	2500	122+50	2525

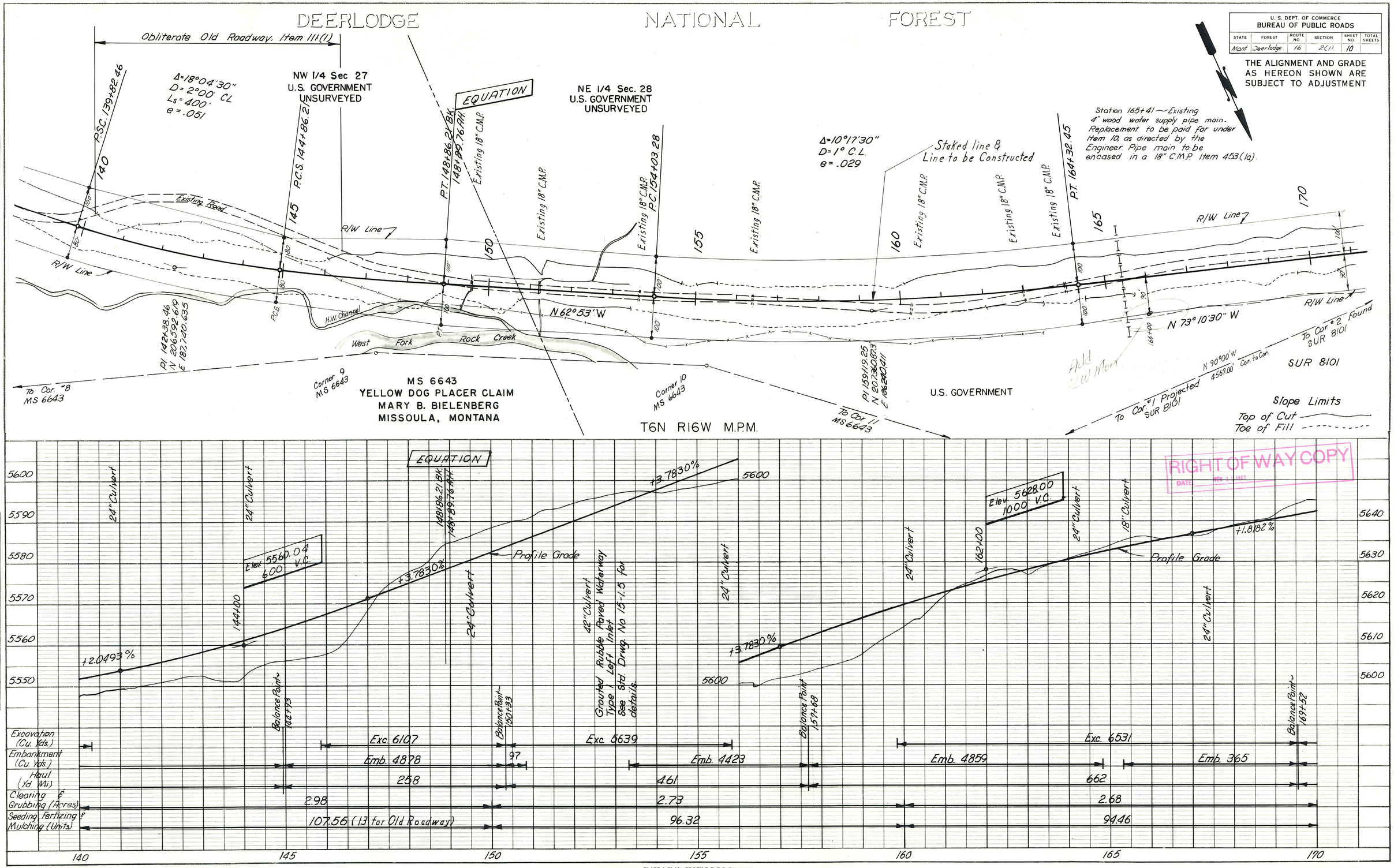
* Quantities to be used for estimating purposes only.

PLAN: SURVEYED, PLOTTED, ALIGNMENT CHECKED, RT. OF WAY CHECKED, NOTE BOOK, NO., BY, DATE

PROFILE: SURVEYED, PLOTTED, GRADES CHECKED, B.M. NOTED, STRUCTURE NOTATIONS CH'KD, NOTE BOOK, NO., BY, DATE

U. S. DEPT. OF COMMERCE BUREAU OF PUBLIC ROADS					
STATE	FOREST	ROUTE NO.	SECTION	SHEET NO.	TOTAL SHEETS
Mont.	Deerlodge	16	2(1)	10	

THE ALIGNMENT AND GRADE AS HEREON SHOWN ARE SUBJECT TO ADJUSTMENT

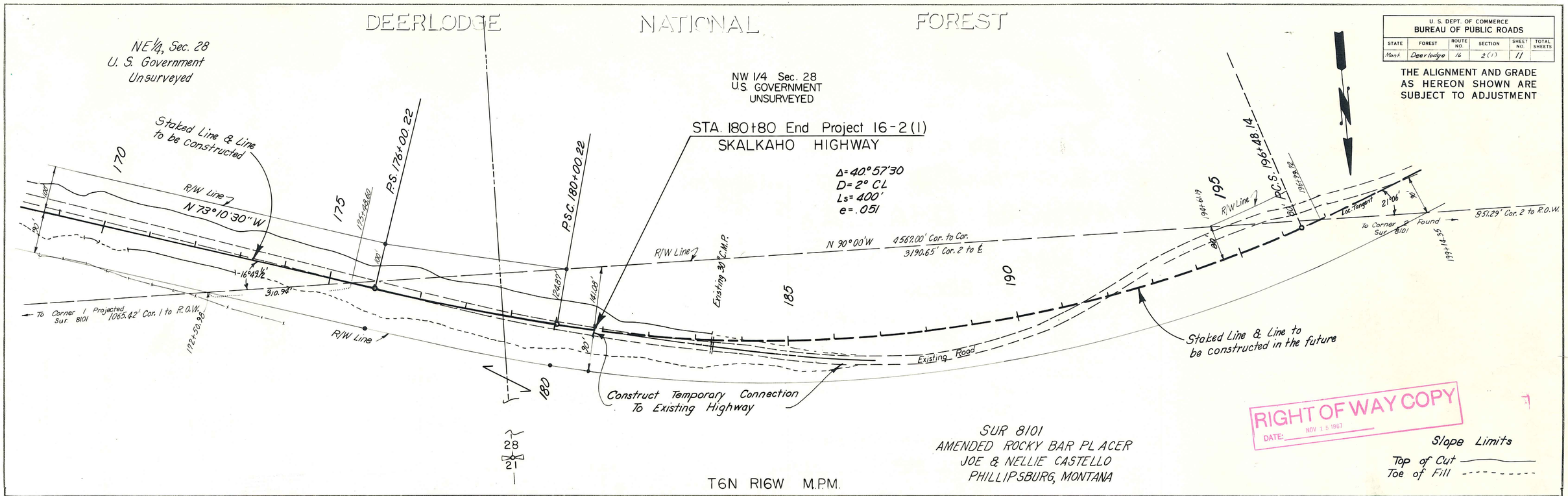


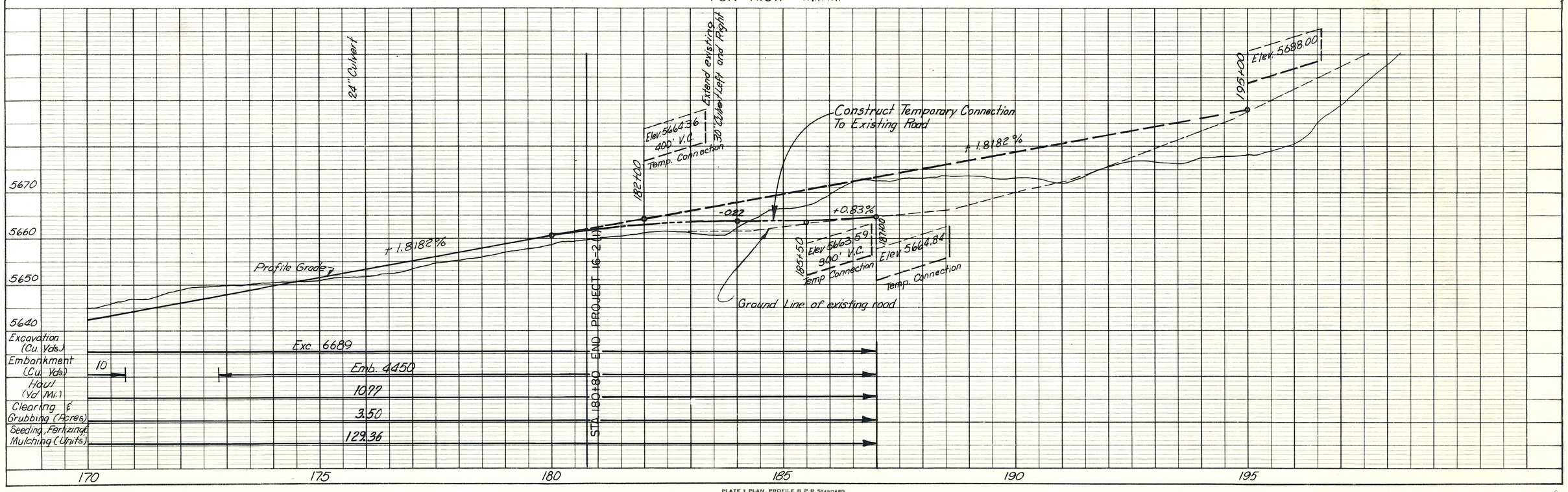
PLAN — SURVEYED / PLOTTED / ALIGNMENT CHECKED / RT OF WAY CHECKED / NOTE BOOK / NO. / BY / DATE

PROFILE — SURVEYED / PLOTTED / GRADES CHECKED / B.M. NOTED / STRUCTURE NOTE NO. CHKD / NOTE BOOK / NO. / BY / DATE

U. S. DEPT. OF COMMERCE BUREAU OF PUBLIC ROADS					
STATE	FOREST	ROUTE NO.	SECTION	SHEET NO.	TOTAL SHEETS
Mont	Deerlodge	16	2(1)	11	

THE ALIGNMENT AND GRADE AS HEREON SHOWN ARE SUBJECT TO ADJUSTMENT

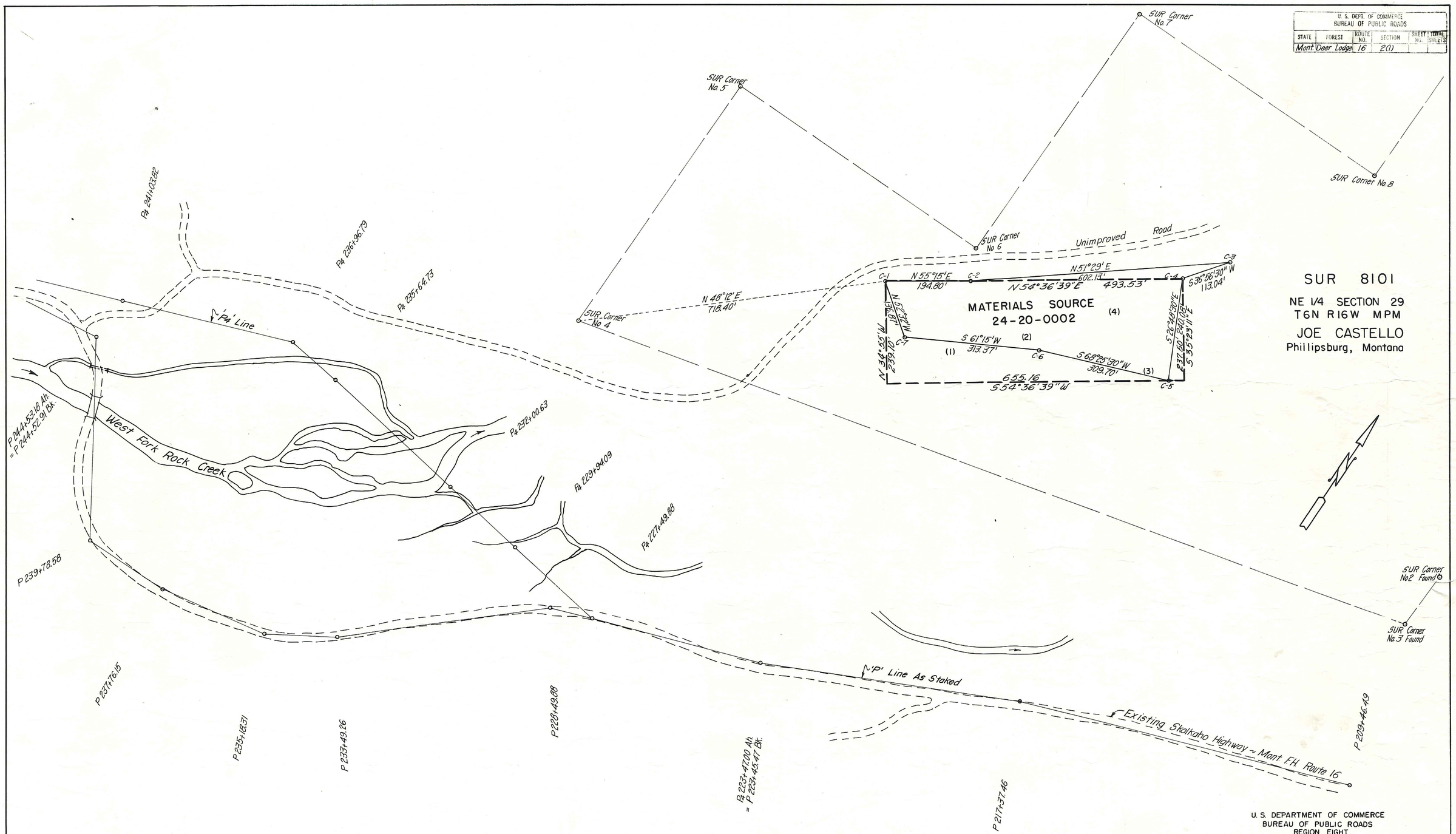




PLAN — NOTE BOOK NO. — SURVEYED — PLOTTED — GRADES CHECKED — B.M. & TIES CHECKED — STRUCTURE NOTATIONS CH'KD — BY — DATE

PROFILE — NOTE BOOK NO. — SURVEYED — PLOTTED — GRADES CHECKED — B.M. & TIES CHECKED — STRUCTURE NOTATIONS CH'KD — BY — DATE

U. S. DEPT. OF COMMERCE BUREAU OF PUBLIC ROADS					
STATE	FOREST	ROUTE NO.	SECTION	SHEET NO.	TOTAL SHEETS
Mont.	Deer Lodge	16	2(1)		



SUR 8101

NE 1/4 SECTION 29
T6N R16W MPM

JOE CASTELLO
Phillipsburg, Montana

LEGEND
(3) LOCATION OF TEST HOLE

SCALE IN FEET
0 200 400 600 800

U. S. DEPARTMENT OF COMMERCE
BUREAU OF PUBLIC ROADS
REGION EIGHT

MATERIALS SOURCE 24-20-0002

SKALKAHO HIGHWAY
MONTANA F.H. PROJECT 16-2(1)

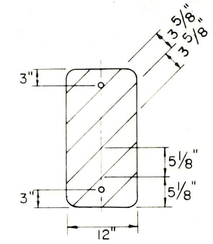
SCALE: AS SHOWN DATE: DECEMBER 1966

Station	Quantity	Rt or Lt.	Sign No.	Panel Size	Letter Size	Mounting Height	Length of Post	Guide Post Design "D"
26+25	1	Lt.	R1-1	30"x30"	10C	5'-0"	11'-6"	2
30+00	1	Lt.	W8-3	30"x30"	5D	5'-0"	11'-6"	
64+60	1	Rt.	X1-1	12"x36"	–	2'-0"	8'-0"	
65+40	1	Lt.	X1-1	12"x36"	–	2'-0"	8'-0"	
79+65	1	Lt.	R1-1	30"x30"	10C	5'-0"	11'-6"	2
137+80	1	Rt.	R1-1	30"x30"	10C	5'-0"	11'-6"	2
170+00	1	Rt.	W8-3	30"x30"	10C	5'-0"	11'-6"	
175+00	1	Rt.	W5-1	30"x30"	10C	5'-0"	11'-6"	

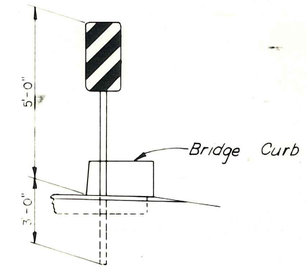
NOTE:

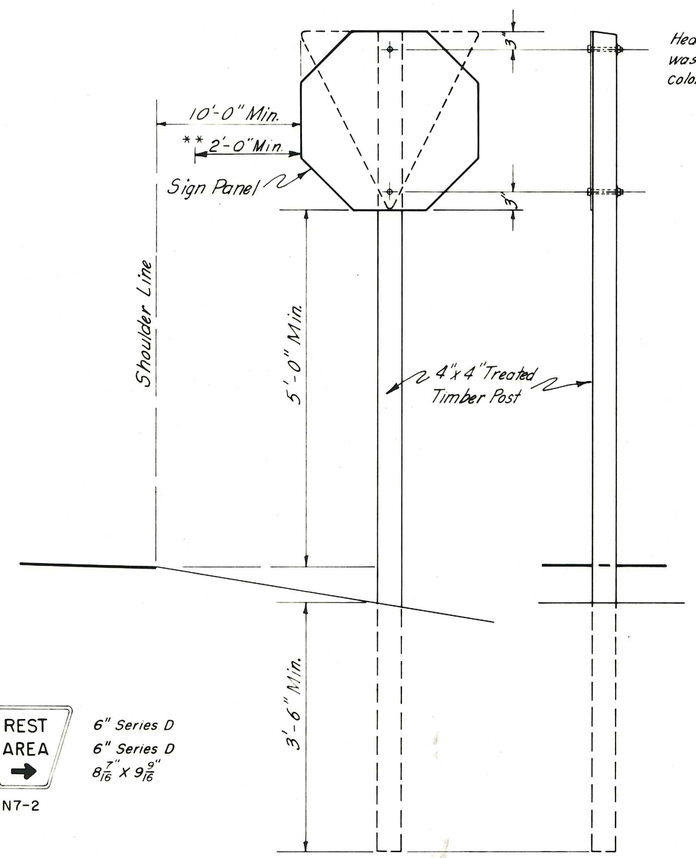
Stripes shall be Black and Reflectorized White

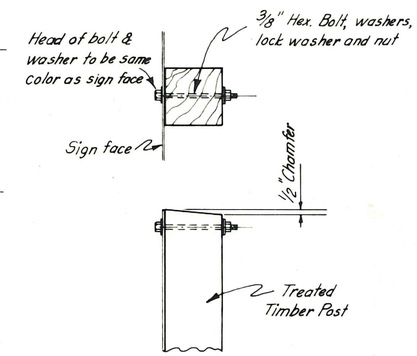
Panels shall be mounted on steel 'U' posts, 2 lbs/ft, with inside edge flush with face of curb.



TYPE X1-1 SIGN

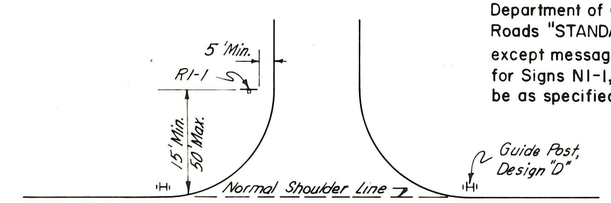




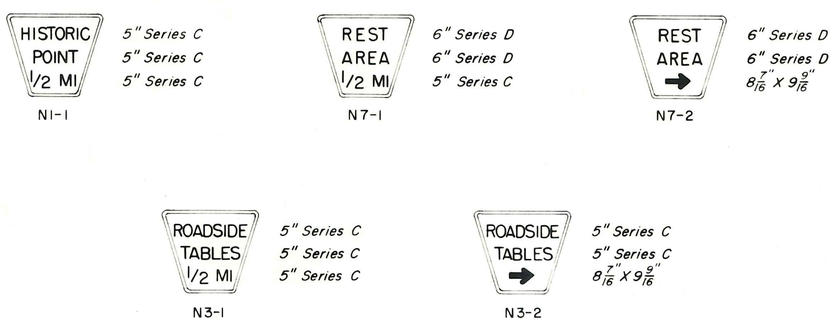


SIGN FASTENING DETAILS

The contractor shall not order signs until the proper distance and direction at Arrow has been furnished by the Engineer.



TYPICAL APPROACH ROAD SIGNING



NOTES: N1-1 thru N3-2
The above signs shall be 36"X18"X30"(LXL'XH). They shall have Interstate Green legend on a reflectorized white background, 3/8" margins, 5/8" borders, and 1 1/2" corner radii. N7-2 and N3-2 may be left or right.

TYPICAL ERECTION
REGULATORY & WARNING SIGNS

** When sign is installed behind guardrail, edge of sign may be 2'-0" min. from face of rail.

NOTES

1. Panel material shall be sheet aluminum alloy conforming to Aluminum Association alloy designation 6061-T6. The thickness of the sheet material shall be 0.080 inch.
2. All bolts, nuts and washers shall be aluminum, stainless steel or cadmium plated steel.
3. All bolt holes drilled in wood shall be 3/8" in diameter. All bolt holes drilled in metal shall be 7/16" in diameter. Vertical hole centers shall be 24".
4. Treated timber posts shall be of construction grade Douglas Fir, Western Hemlock or Western Larch, S4S, pressure treated with 5% solution of pentachlorophenol in accordance with Section 430, Standard Specifications for Construction of Roads and Bridges, FP-61.
5. Word messages, shapes and colors of the sign panels shall conform to the standards set forth in the "Manual on Uniform Traffic Control Devices for Streets and Highways" as published by the Department of Commerce. The Bureau of Public Roads "STANDARD ALPHABET" shall be used, except messages, shapes and colors of sign panels for Signs N1-1, N3-1, N3-2, N7-1 & N7-2 shall be as specified on the plans.

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS
REGION EIGHT PORTLAND, OREGON

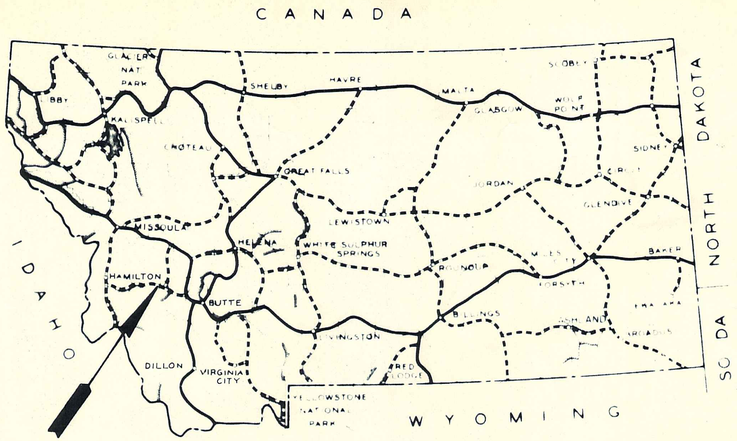
SIGN ERECTION DETAILS

FOR MONTANA PROJECTS

SCALE NONE

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS

REGION 8	STATE Montana		
PROJECT 16-2(1)			
SHEET 1	OF 2	SHEETS	



KEY MAP MONTANA

PLANS FOR PROPOSED
MONTANA FOREST HIGHWAY PROJECT 16-2(1)
SKALKAHO HIGHWAY

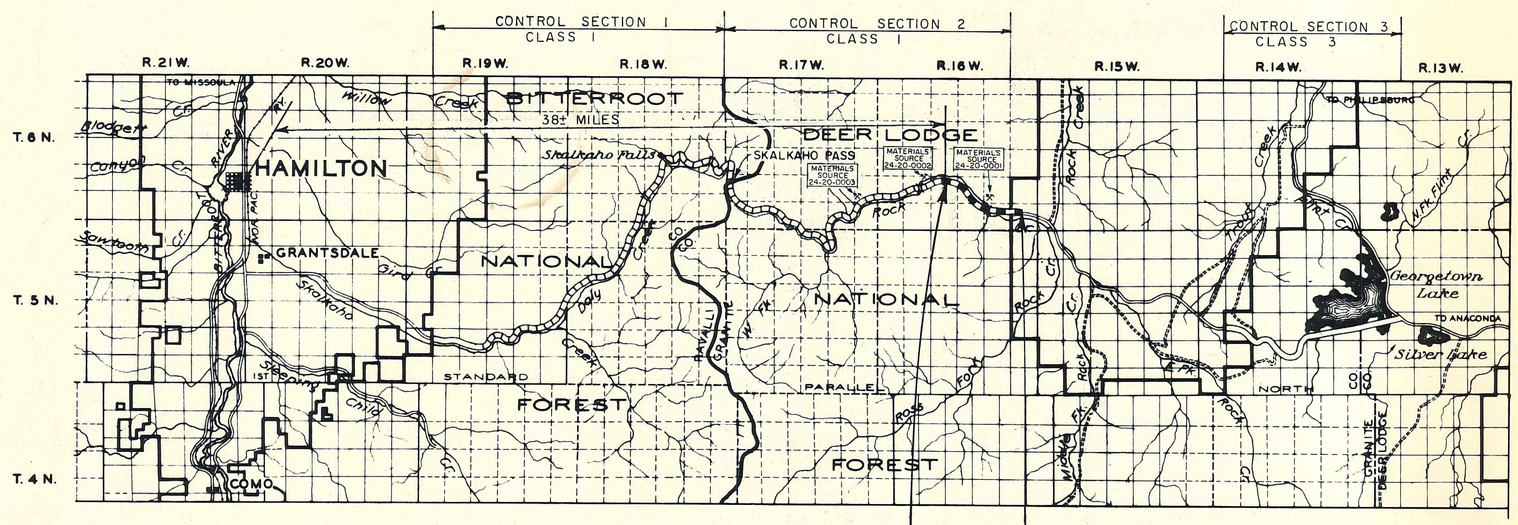
LENGTH 3.102 MILES

CLASS 1

DEERLODGE NATIONAL FOREST
GRANITE COUNTY

INDEX TO SHEETS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	TYPICAL SECTION
3	ROUNDING DETAILS
4	TYPICAL BASE SECTION
5	SUMMARY
6-7	DRAINAGE SUMMARY
8-13	PLAN-PROFILE STA. 0+00 TO STA. 164+02
14-	DRWGS. NO. WEST FORK ROCK CREEK BRIDGE
	BEAM GUARDRAIL TABLE
	MATERIALS SOURCE NO. 24-20-0001
	MATERIALS SOURCE NO. 24-20-0002
	SIGN ERECTION DETAILS
	DRWG. NO. 339 AGGREGATE SAMPLING DEVICE
	STD. DRWG. NO. 15-1.5 GENERAL CULVERT DETAILS
	" " " 15-2.15 CORRUGATED METAL PIPE
	" " " 15-3.4 CONCRETE PIPE DETAILS
	" " " 15-4.7 STRUCTURAL PLATE PIPE
	" " " 15-8.5 END SECTIONS
	" " " 25-2A.1 CATTLE GUARDS - SUBSTRUCTURE
	" " " 25-2B.1 CATTLE GUARDS - SUPERSTRUCTURE
	" " " 34-2.4 BEAM GUARDRAIL
	" " " 35-22.4 GUIDE POSTS
	" " " 60-3.3 R/W MONUMENTS & MAINT. MARKERS
	" " " 60-7.4 ROAD APPROACHES
	" " " 60-16 RANDOM FILL



Note

All references in these plans to
U.S. DEPARTMENT OF COMMERCE
BUREAU OF PUBLIC ROADS

Shall mean:
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS

SCALE OF MILES
0 1 2 3 4 5 6 7 8 9 10

LEGEND
APPROX RTE ESTAB RTE GRADED BASE BIT SURF PAVED

Description of Project

Improvement Grading, Base and Bridge

Roadbed Width 30' At Construction Grade
Surface
Type Code 3210
Width
Bridges

Design Classification

A.D.T.	1964 - 61
A.D.T.	1984 - 170
D.H.V.	40
D	55%
T	9%
V	60 M.P.H.

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS
REGION NO. 8

Approved

Date _____

FOR INTERIM REGIONAL FEDERAL HIGHWAY ADMINISTRATOR

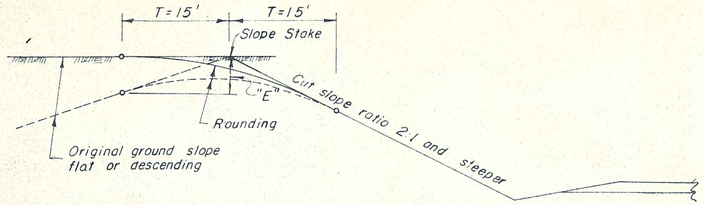
PRELIMINARY COPY
DATE: JUN 26 1967

U.S. DEPT. OF COMMERCE
BUREAU OF PUBLIC ROADS

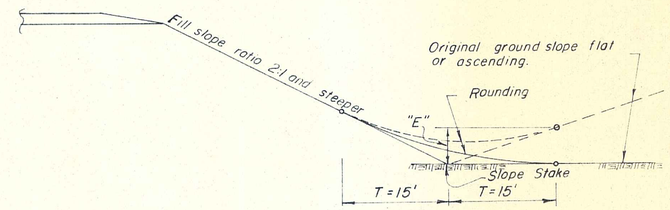
STATE	FOREST	ROUTE NO.	SECTION	SHEET	TOTAL SHEETS
Mont.	Deerlodge	16	2(1)		

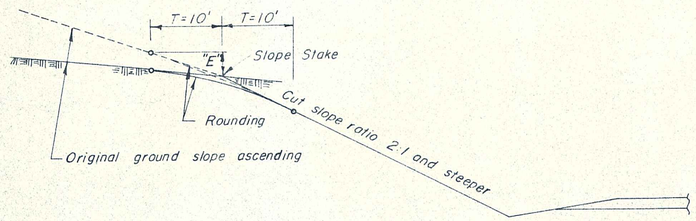
TYPICAL ROUNDING OF CUT AND FILL SLOPES

as provided in Section 102-3.8 of the Standard Specifications for construction of Roads and Bridges (FP-61).

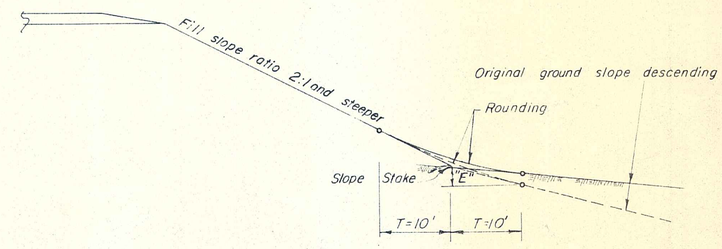


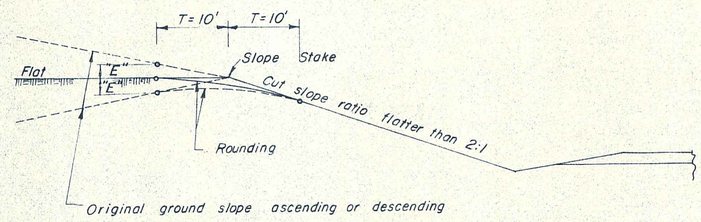
M2 - C/F SLOPES 2:1 & STEEPER (T=15')						
Vert. Dist. "E"	Descending Ground - Cuts Ascending Ground - Fills					
	M2 = M/2 (ft.)					
(ft.)	3/4:1	1:1	1¼:1	1½:1	1¾:1	2:1
Flat	5.0	3.8	3.0	2.5	2.2	1.9
2.0	5.5	4.3	3.5	3.0	2.7	2.4
4.0	6.0	4.8	4.0	3.5	3.2	2.9
6.0	6.5	5.3	4.5	4.0	3.7	3.4
8.0	7.0	5.8	5.0	4.5	4.2	3.9
10.0	7.5	6.3	5.5	5.0	4.7	4.4
12.0	8.0	6.8	6.0	5.5	5.2	4.9
14.0	8.5	7.3	6.5	6.0	5.7	5.4
16.0	9.0	7.8	7.0	6.5	6.2	5.9

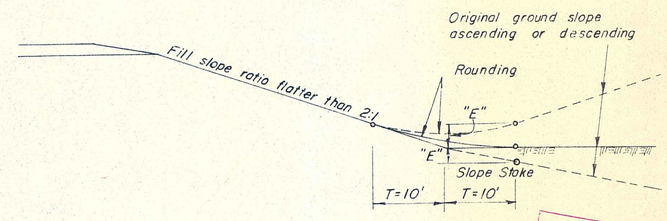




M2 - C/F SLOPES 2:1 & STEEPER (T=10')						
Vert. Dist. "E"	Ascending Ground - Cuts Descending Ground - Fills					
	M2 = M/2 (ft.)					
(ft.)	3/4:1	1:1	1¼:1	1½:1	1¾:1	2:1
0.1	3.4	2.5	2.0	1.7	1.4	1.3
2.0	2.9	2.0	1.5	1.2	0.9	0.8
4.0	2.4	1.5	1.0	0.7	0.4	0.3
6.0	1.9	1.0	0.5	0.2	0.0	0.0
8.0	1.4	0.5	0.0	0.0		
10.0	0.9	0.0				
12.0	0.4					
14.0	0.0					

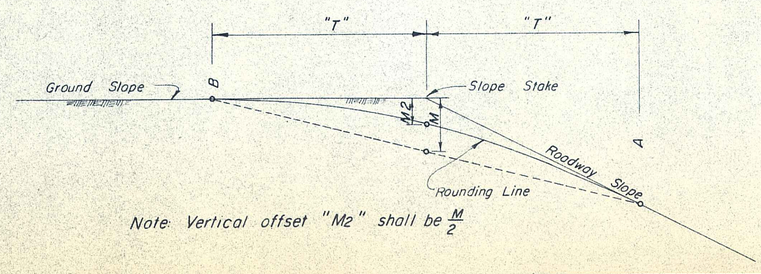






M2 FOR CUT OR FILL SLOPES FLATTER THAN 2:1 (T=10')												
Vert. Dist. "E"	Ascending Ground - Cuts Descending Ground - Fills						Descending Ground - Cuts Ascending Ground - Fills					
	M2 = M/2 (ft)						M2 = M/2 (ft)					
(ft.)	2½:1	3:1	3½:1	4:1	5:1	6:1	2½:1	3:1	3½:1	4:1	5:1	6:1
Flat	1.0	0.8	0.7	0.6	0.5	0.4	1.0	0.8	0.7	0.6	0.5	0.4
1.0	0.8	0.6	0.5	0.4	0.3	0.2	1.3	1.1	1.0	0.9	0.8	0.7
2.0	0.5	0.3	0.2	0.1	0.0	0.0	1.5	1.3	1.2	1.1	1.0	0.9
3.0	0.3	0.0	0.0	0.0			1.8	1.6	1.5	1.4	1.3	1.2
4.0	0.0						2.0	1.8	1.7	1.6	1.5	1.4
5.0							2.3	2.1	2.0	1.9	1.8	1.7
6.0							2.5	2.3	2.2	2.1	2.0	1.9
7.0							2.8	2.6	2.5	2.4	2.3	2.2
8.0							3.0	2.8	2.7	2.6	2.5	2.4
9.0							3.3	3.1	3.0	2.9	2.8	2.7
10.0							3.5	3.3	3.2	3.1	3.0	2.9

VERTICAL Offsets from roadway and ground slopes to rounding line for cuts and fills



Note: Vertical offset "M2" shall be $\frac{M}{2}$

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS
REGION EIGHT PORTLAND, OREGON

STANDARD

ROUNDING DETAILS

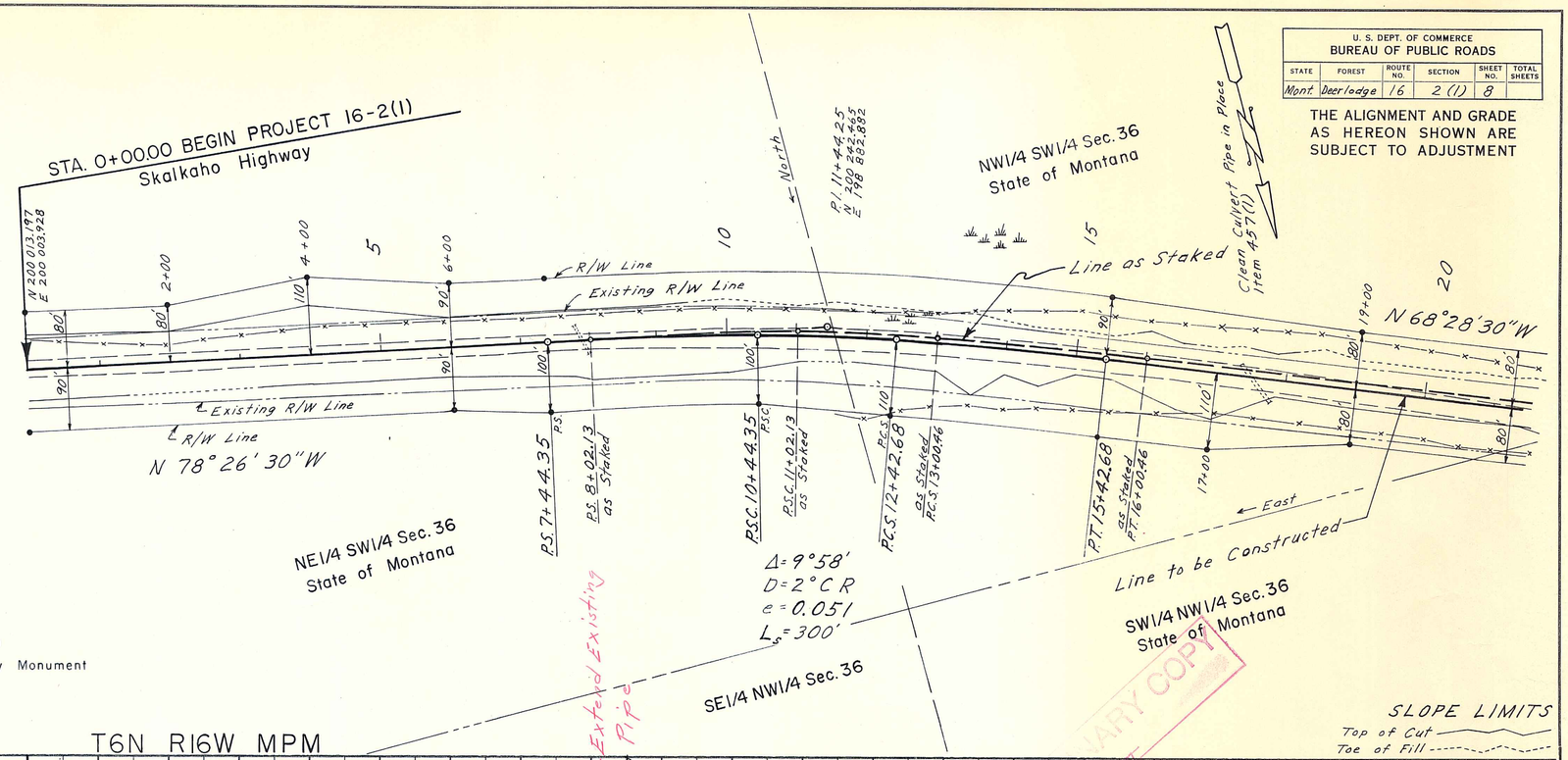
SCALE NONE DATE MAY, 1967

DRAWING NO.

U. S. DEPT. OF COMMERCE BUREAU OF PUBLIC ROADS					
STATE	FOREST	ROUTE NO.	SECTION	SHEET NO.	TOTAL SHEETS
Mont.	Deerlodge	16	2 (1)	8	

THE ALIGNMENT AND GRADE AS HEREON SHOWN ARE SUBJECT TO ADJUSTMENT

PLAN		BY	DATE
NOTE BOOK	SURVEYED		
	PLOTTED	G. Rice	1-1-62
	ALIGNMENT CHECKED	G. L. Bowen	5-1-62
	RT. OF WAY CHECKED		
NO.	Draftsman	C. Larson	6-1-62



Ditch Blocks	
Station	Side
20+97	Rt.
26+00	Rt.
30+50	Rt.
35+50	Rt.
38+77	Rt.
42+50	Rt.
46+38	Rt.
58+50	Rt.
109+50	Lt.

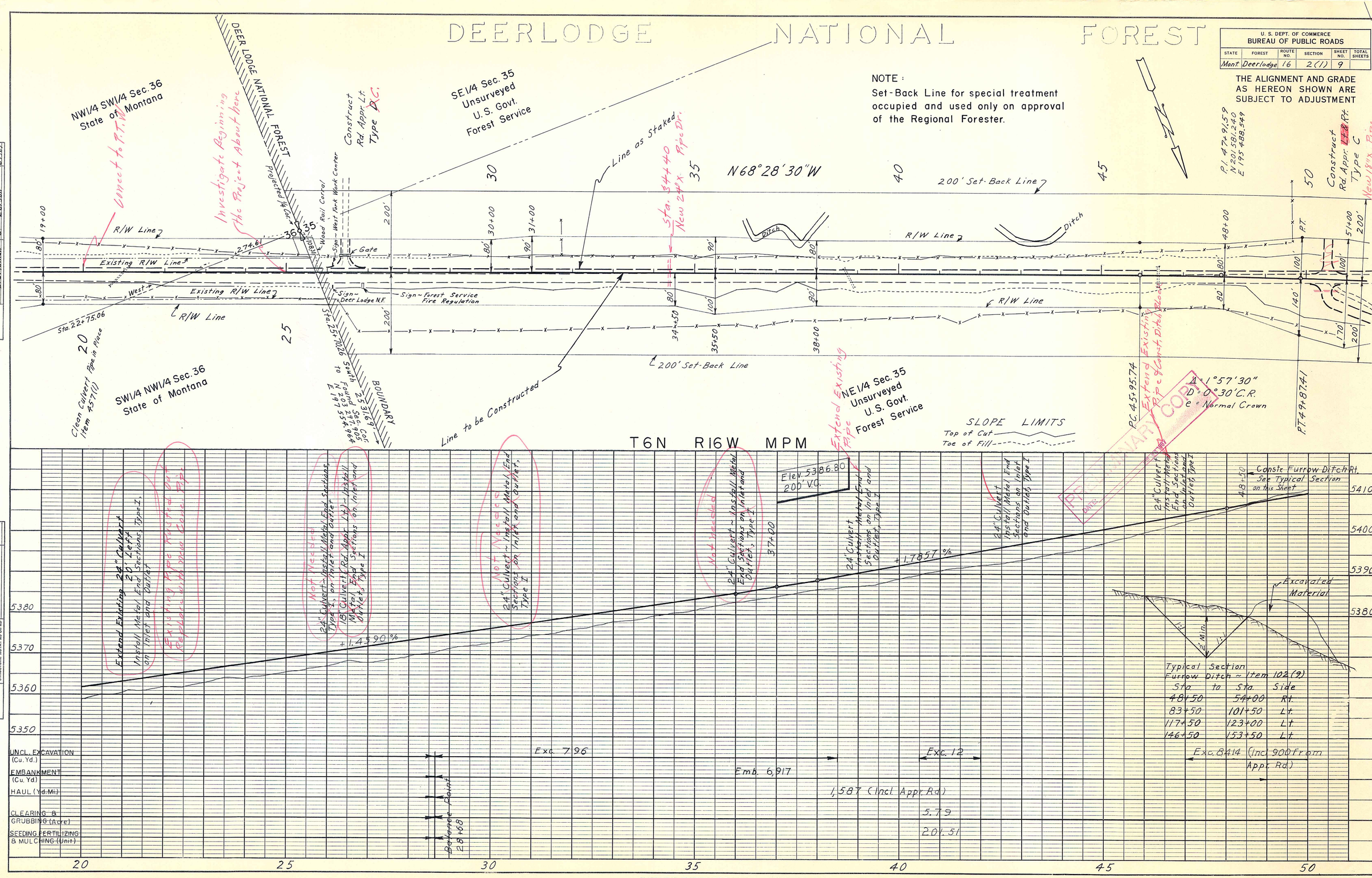
PROFILE		BY	DATE
NOTE BOOK	SURVEYED		
	PLOTTED		
	GRADES CHECKED		
	B.M. & TIES		
NO.	STRUCTURE NOTATNS CH'KD		

UNCL. EXCAVATION (Cu. Yd.)	Exc. 6,784
EMBANKMENT (Cu. Yd.)	Emb. 5,164
HAUL (Yd. Mi)	1,415
CLEARING & GRUBBING (Acre)	6.78
SEEDING, FERTILIZING & MULCHING (Unit)	218.41

U. S. DEPT. OF COMMERCE BUREAU OF PUBLIC ROADS					
STATE	FOREST	ROUTE NO.	SECTION	SHEET NO.	TOTAL SHEETS
Mont	Deerlodge	16	2(1)	9	

THE ALIGNMENT AND GRADE AS HEREON SHOWN ARE SUBJECT TO ADJUSTMENT

NOTE:
Set-Back Line for special treatment occupied and used only on approval of the Regional Forester.

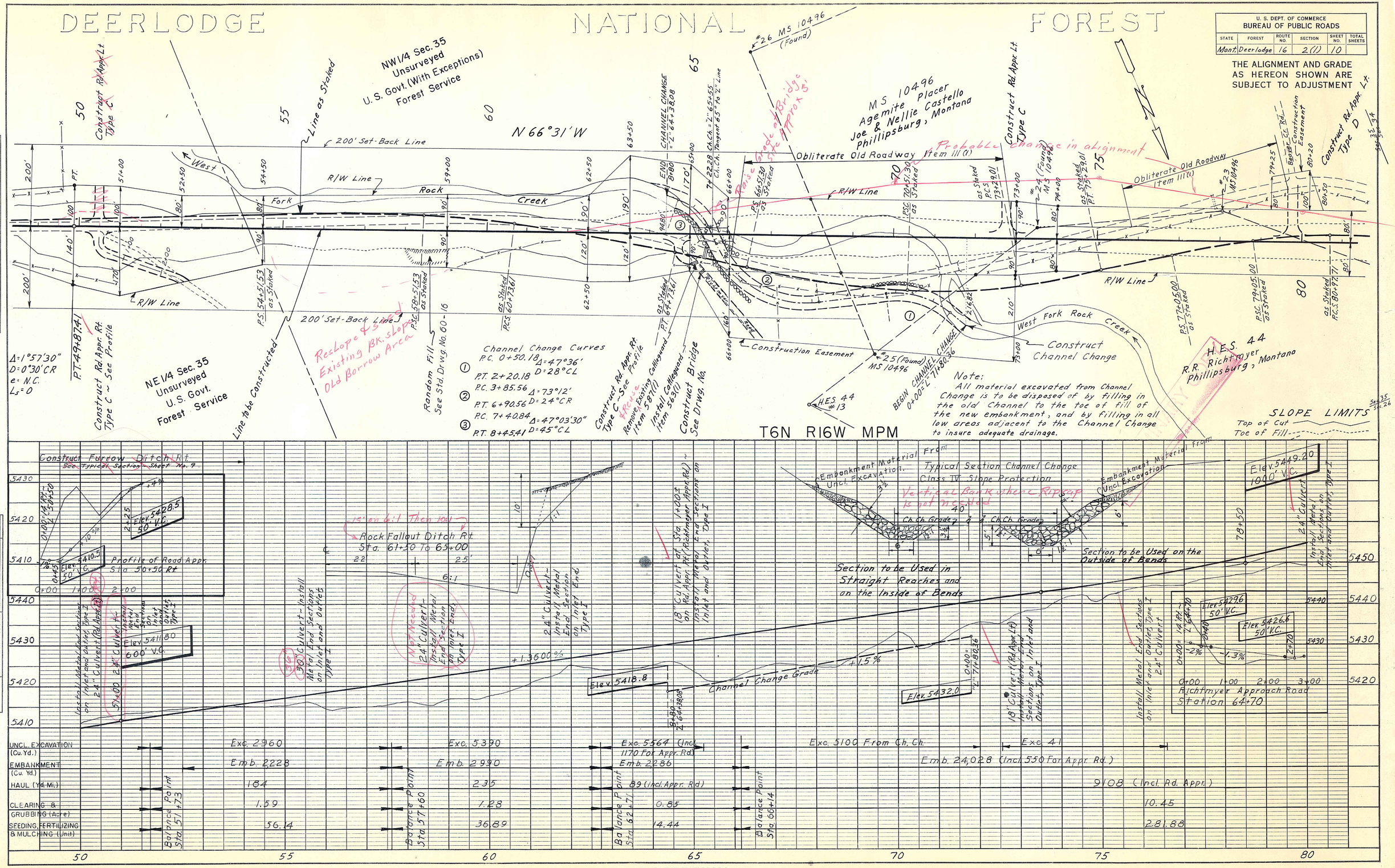


PLAN		BY	DATE
NOTE BOOK	SURVEYED	G. Rice	1.9.6
	PLOTTED	G. C. Bowen	5.1.62
	ALIGNMENT CHECKED		
	RT OF WAY PLOTTED		
NO.		C. Larson	6.1.1962

PROFILE		BY	DATE
NOTE BOOK	SURVEYED		
	PLOTTED		
	GRADES CHECKED		
	BRIDGE NOTES		
NO.	STRUCTURE NOTATNS CK'KD		

U. S. DEPT. OF COMMERCE BUREAU OF PUBLIC ROADS					
STATE	FOREST	ROUTE NO.	SECTION	SHEET NO.	TOTAL SHEETS
Mont.	Deerlodge	16	2(1)	10	

THE ALIGNMENT AND GRADE AS HEREON SHOWN ARE SUBJECT TO ADJUSTMENT



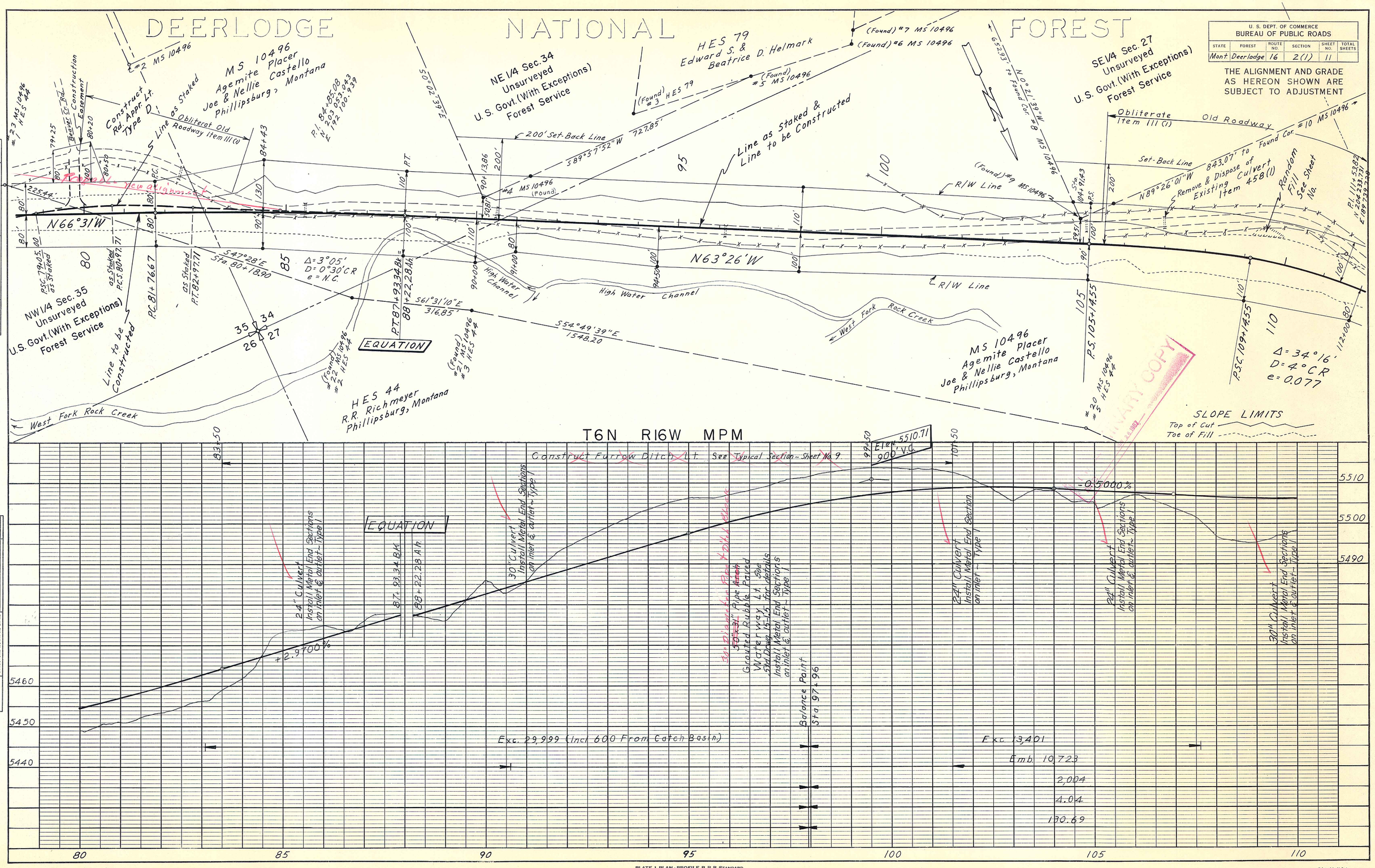
PLAN — NOTE BOOK NO. — SURVEYED — PLOTTED — GRADES CHECKED — BRIDGE NO. — RIGHT OF WAY CHECKED — STRUCTURE NOTATNS CH'KD — BY — DATE

PROFILE — NOTE BOOK NO. — SURVEYED — PLOTTED — GRADES CHECKED — BRIDGE NO. — RIGHT OF WAY CHECKED — STRUCTURE NOTATNS CH'KD — BY — DATE

Printed in U.S.A. On ARKWRIGHT Tracing Cloth

U. S. DEPT. OF COMMERCE BUREAU OF PUBLIC ROADS					
STATE	FOREST	ROUTE NO.	SECTION	SHEET NO.	TOTAL SHEETS
Mont	Deerlodge	16	2(1)	11	

THE ALIGNMENT AND GRADE AS HEREON SHOWN ARE SUBJECT TO ADJUSTMENT

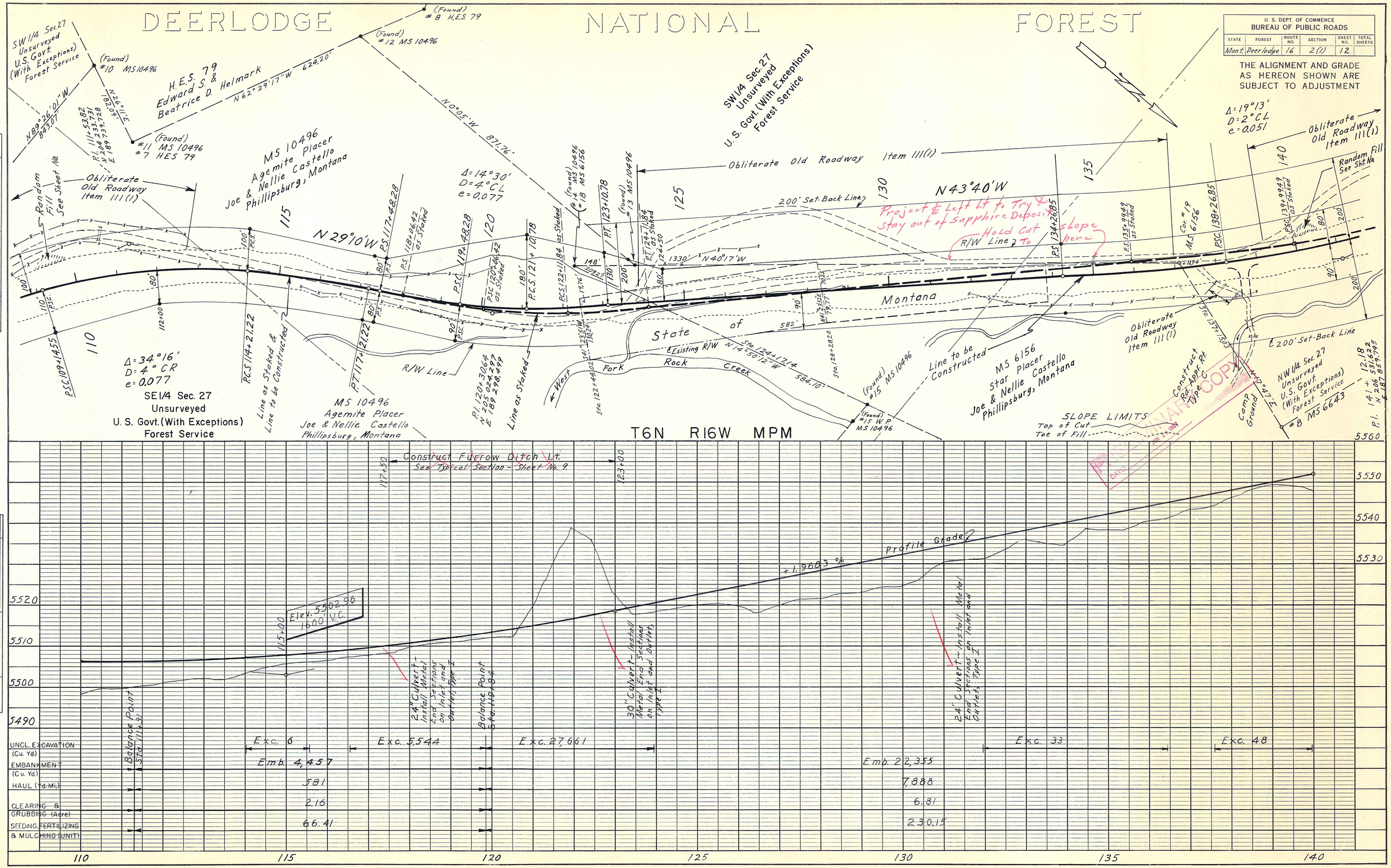


PLAN		BY	DATE
SURVEYED		G. Rice	1962
PLOTTED		G. C. Baxter	5-1962
ALIGNMENT CHECKED			
RT. OF WAY CHECKED			
NOTE BOOK			
NO.		Drafting Room	C. Larson

PROFILE		BY	DATE
SURVEYED			
PLOTTED			
GRADES CHECKED			
B.M.s. NOTED			
STRUCTURE NOTATNS CH'KD			
NOTE BOOK			
NO.			

U. S. DEPT. OF COMMERCE BUREAU OF PUBLIC ROADS					
STATE	FOREST	ROUTE NO.	SECTION	SHEET NO.	TOTAL SHEETS
Mont.	Deerlodge	16	2(1)	12	

THE ALIGNMENT AND GRADE AS HEREON SHOWN ARE SUBJECT TO ADJUSTMENT

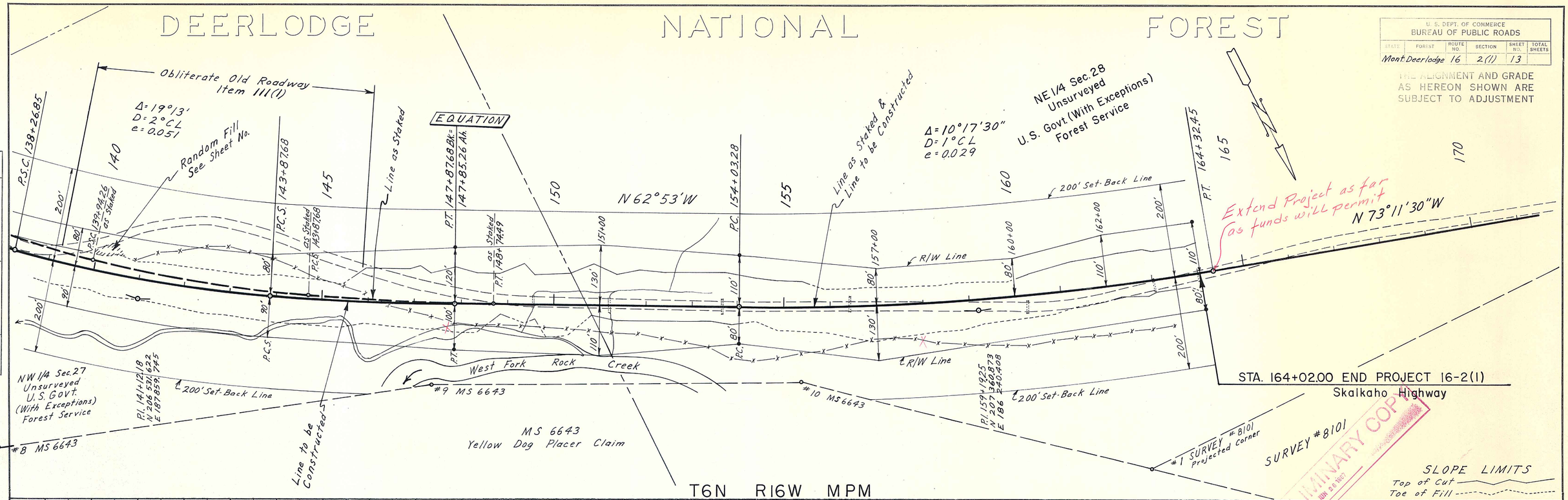


PLAN		BY	DATE
SURVEYED			
PLOTTED		G. Baker	12-62
ALIGNMENT CHECKED		G.C. Baker	5-1962
RT. OF WAY CHECKED			
NOTE BOOK			
NO.	Grandman	C. Larson	6-1962

PROFILE		BY	DATE
SURVEYED			
PLOTTED			
GRADES CHECKED			
B.M.s NOTED			
STRUCTURE ROTATKS CHKD			
NOTE BOOK			
NO.			

U. S. DEPT. OF COMMERCE BUREAU OF PUBLIC ROADS					
STATE	FOREST	ROUTE NO.	SECTION	SHEET NO.	TOTAL SHEETS
Mont.	Deerlodge	16	2(1)	13	

THE ALIGNMENT AND GRADE AS HEREON SHOWN ARE SUBJECT TO ADJUSTMENT



PLAN		BY	DATE
NOTE BOOK	SURVEYED	G. Rice	1962
	PLOTTED	G. C. Bowen	5-1962
	ALIGNMENT CHECKED		
	RT. OF WAY CHECKED		
NO.	Drafting	G. Larson	6-1962

PROFILE		BY	DATE
NOTE BOOK	SURVEYED		
	PLOTTED		
	GRADES CHECKED		
	BRIDGE		
NO.	STRUCTURE NOTATIONS CH'KD		

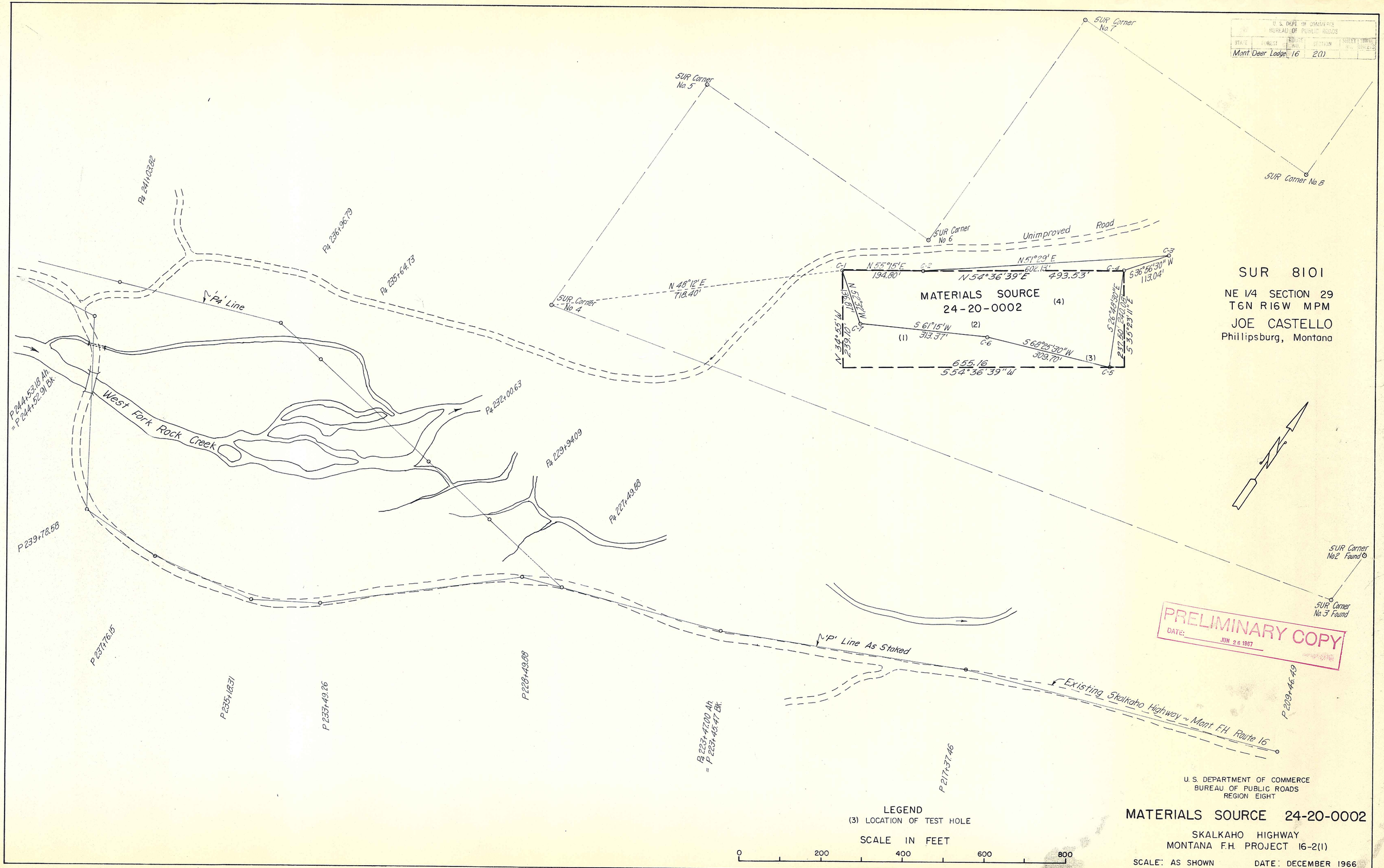
PRELIMINARY COPY

Printed in U.S.A. On ARKWRIGHT Tracing Cloth

PLATE 1 PLAN - PROFILE B P R STANDARD
EUGENE DIETZGEN CO. CHICAGO - NEW YORK

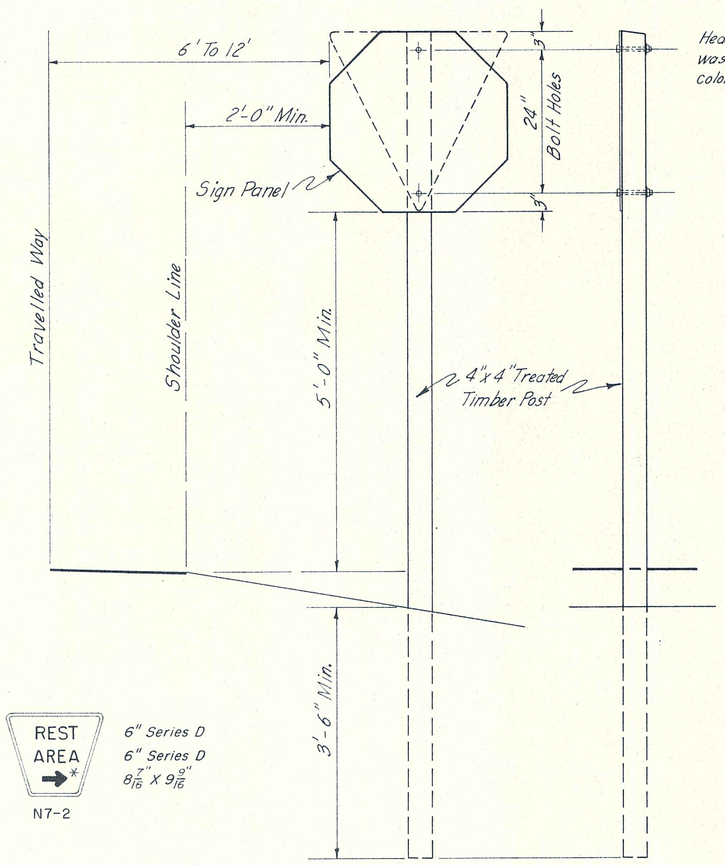
Printed in U.S.A. On ARKWRIGHT Tracing Cloth

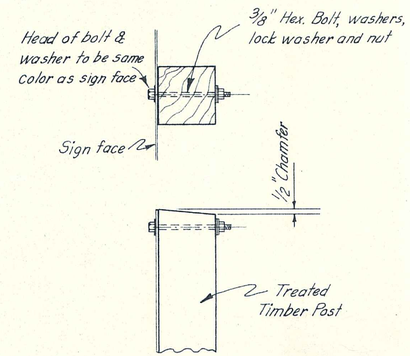
U. S. DEPT. OF COMMERCE BUREAU OF PUBLIC ROADS					
STATE	FOREST	ROUTE NO.	SECTION	SHEET NO.	TOTAL SHEETS
Mont	Deer Lodge	16	2(1)		



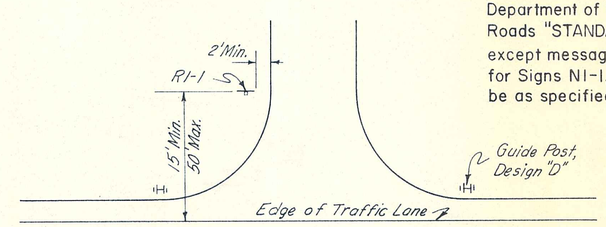
STATE	FOREST	ROUTE NO.	SECTION	SHEET NO.	TOTAL SHEETS
Mont.	Deerlodge	16	2(1)		

Station	Quantity	Rt. or Lt.	Sign No.	Panel Size	Letter Size	Mounting Height	Length of Post	Guide Post Design "D"
5+00	1	Lt.	W5-1	30"X 30"	5 D	5'0"	11'6"	
26+50	1	Lt.	R1-1	30"X 30"	10 C	5'0"	11'6"	2
79+85	1	Lt.	R1-1	30"X 30"	10 C	5'0"	11'6"	2
138+60	1	Rt.	R1-1	30"X 30"	10 C	5'0"	11'6"	2
159+00	1	Rt.	W5-1	30"X 30"	5 D	5'0"	11'6"	





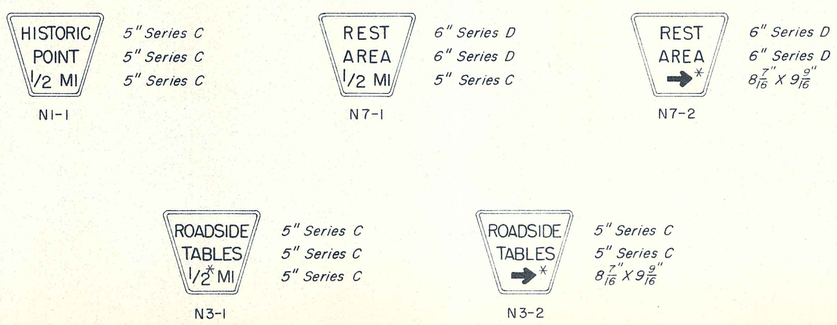
SIGN FASTENING DETAILS



TYPICAL APPROACH ROAD SIGNING

NOTES

1. Panel material shall be sheet aluminum alloy conforming to Aluminum Association alloy designation 6061-T6. The thickness of the sheet material shall be 0.080 inch.
2. All bolts, nuts and washers shall be aluminum, stainless steel or cadmium plated steel.
3. All bolt holes drilled in wood shall be 3/8" in diameter. All bolt holes drilled in metal shall be 7/16" in diameter. Vertical hole centers shall be 24".
4. Treated timber posts shall be of construction grade Douglas Fir, Western Hemlock or Western Larch, S4S, pressure treated with 5% solution of pentachlorophenol in accordance with Section 430, Standard Specifications for Construction of Roads and Bridges, FP-61.
5. Word messages, shapes and colors of the sign panels shall conform to the standards set forth in the "Manual on Uniform Traffic Control Devices for Streets and Highways" as published by the Department of Commerce. The Bureau of Public Roads "STANDARD ALPHABET" shall be used, except messages, shapes and colors of sign panels for Signs N1-1, N3-1, N3-2, N7-1 & N7-2 shall be as specified on the plans.



TYPICAL ERECTION
REGULATORY & WARNING SIGNS

NOTES: N1-1 thru N3-2
The above signs shall be 36"X18"X30"(LXL'XH). They shall have Interstate Green legend on a reflectorized white background, 3/8 margins, 5/8 borders, and 1 1/2 corner radii. N7-2 and N3-2 may be left or right.

*Variations noted in table above

PRELIMINARY COPY
DATE: JUN 26 1967

APPROVED

FOR FEDERAL PROJECTS ENGINEER

U. S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS
REGION EIGHT PORTLAND, OREGON

STANDARD

SIGN ERECTION DETAILS

FOR MONTANA PROJECTS

SCALE: NONE DATE: MAY, 1967

DRAWING NO.

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION BUREAU OF PUBLIC ROADS					
STATE	FOREST	ROUTE NO.	SECTION	SHEET NO.	TOTAL SHEETS
Mont.	Deerlodge	16	2(1)	2	

GRADE DEFINITIONS

PROFILE GRADE: The ultimate finished grade.

CONSTRUCTION GRADE: Any grade less than the ultimate finished grade to which the project is being constructed.

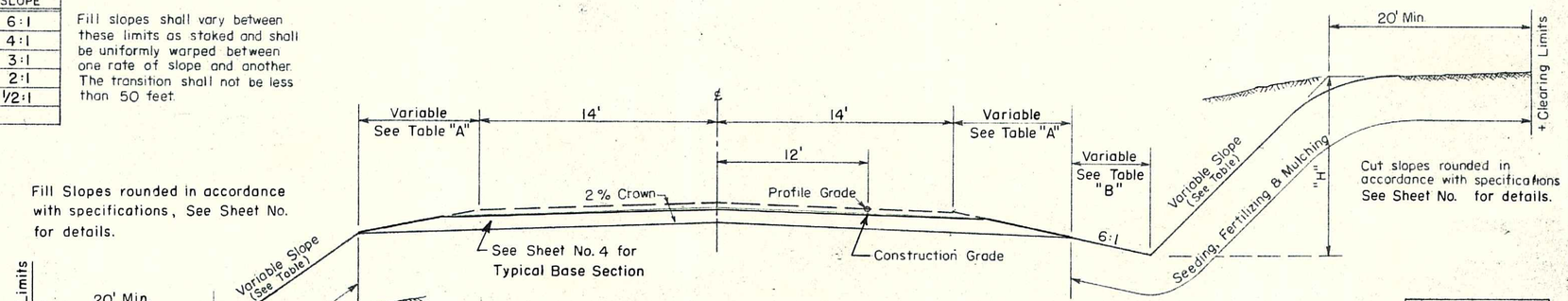
TYPICAL SECTION

GRADING & BASE	[illegible]	MILES
BRIDGE	[illegible]	MILES
TOTAL	3.102	MILES

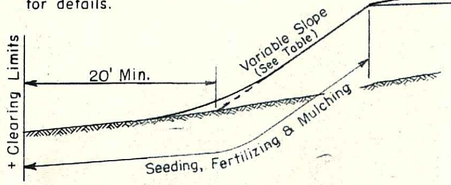
Waiting for bridge length.

FILL SLOPE TABLE	
HEIGHT	SLOPE
0'-5'	6:1
5'-10'	4:1
10'-15'	3:1
15'-20'	2:1
Over 20'	1½:1

Fill slopes shall vary between these limits as staked and shall be uniformly warped between one rate of slope and another. The transition shall not be less than 50 feet.



Fill Slopes rounded in accordance with specifications, See Sheet No. for details.



+ For exceptions See Article 100-4.1 of the special Provisions.

+ A minimum of 40 feet shall be cleared on either side of the centerline where right-of-way widths will permit

NOTE: Grade shall be carried 12 feet from centerline on tangents and inside of curves.

CUT SLOPE TABLE EXCEPT IN SOLID ROCK	
"H"	SLOPE
0' To 5'	5:1
5' To 10'	4:1
10' To 15'	3:1
15' To 20'	2:1
Over 20' Or Flatter	1½:1

TABLE "A"		
Station	to Station	Width
0+00	24+00	11'
24+00	72+00	8'
72+00	133+00	* 11'
133+00	164+02	8'

TABLE "B"		
Station	to Station	Width
0+00	24+00	10'
24+00	61+50	13'
61+50	65+00	25'
65+00	72+00	7'
72+00	133+00	4'
133+00	145+50	7'
145+50	156+50	13'
156+50	164+02	7'

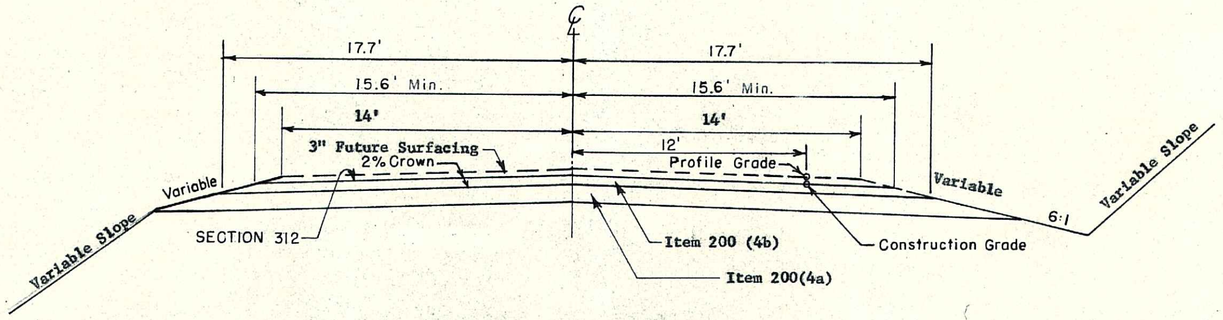
* On Fill Slopes steeper than 3:1 where guardrail is used, reduce 11' width to 9'.

PRELIMINARY COPY
DATE: [illegible] 1967

U. S. DEPT. OF COMMERCE BUREAU OF PUBLIC ROADS					
STATE	FOREST	ROUTE NO.	SECTION	SHEET NO.	TOTAL SHEET
MONT.	Deerlodge	16	2(1)		

TYPICAL BASE SECTION

STA. 0+00 TO STA. 164+02



Item 200 (4a) Crushed Aggregate Base, Grading C
See Table Below for Compacted Depth.

Item 200 (4b) Crushed Aggregate Base, Grading E, 4"
Compacted Depth.

PRELIMINARY COPY
DATE: JUN 28 1967

Bituminous Preservative Treatment,
SECTION 312, shoulder to shoulder.

NOTE: Where necessary for the purpose of facilitating traffic, any aggregate base or bituminous surfacing shall be constructed part width at a time. (Ref. Second Paragraph Art. 7.5. F. P. 61).

TABLE OF THICKNESS-BASE MATERIAL

STATION TO STATION	COMPACTED THICKNESS 200(4a)	COMPACTED THICKNESS 200(4b)
0+00 – 24+00	14"	4"
24+00 – 72+00	8"	4"
72+00 – 133+00	14"	4"
133+00 – 164+02	8"	4"
All Approach Roads	8"	4"

Placed in layers not exceeding 5" compacted depth.

NOTE: Crushed aggregate base shall be mixed in a CENTRAL PLANT to optimum moisture prior to placing on the road, as provided in Article 200-3.5 of the special provisions. NO DIRECT PAYMENT will be made for water used for processing or maintenance.

U.S. DEPARTMENT OF COMMERCE
BUREAU OF PUBLIC ROADS
REGION 8

SCALE _____ DATE _____

U S DEPT OF COMMERCE
BUREAU OF PUBLIC ROADS

STATE	FOREST	ROUTE NO	SECTION	SHEET NO	TOTAL SHEET
MONT.	DEERLODGE	16	2(1)		

SUMMARY

ITEM NUMBERS →		102(1)	105A(2)	100(3)	591(1)	REMARKS
BALANCE POINTS STATION TO	STATION	UNCLASSIFIED EXCAVATION CU. YDS.	HAUL YD. MI.	CLEARING & GRUBBING ACRES	SEEDING, FERTILIZING & MULCHING UNITS	
0+00	28+68	6,784	1,415	6.78	218.41	
28+68	51+73	9,222	1,587	5.79	201.51	Includes 900 cu. yds. excavation from approach road.
51+73	57+60	2,960	184	1.59	56.14	
57+60	62+71	5,390	235	1.28	36.89	
62+71	66+14	5,564	89	0.85	14.44	Includes 1,170 Cu.Yds. excavation for approach road.
66+14	97+96	35,140	9,108	10.45	281.88	Includes 5,100 Cu.Yds excavation for ch. ch., 600 Cu.Yds. excavation for catch basin.
97+96	111+31	13,401	2,004	4.04	130.69	
111+31	119+84	5,550	581	2.16	66.41	
119+84	146+30	27,952	7,888	6.81	230.15	
146+30	148+15	2,339	18	0.84	24.35	
148+15	159+28	11,419	1,203	3.22	122.06	
159+28	164+02	2,354	92	1.23	47.84	
TOTALS		128,075	24,404	45.04	1,430.77	

PRELIMINARY COPY
DATE: JUN 28 1967

U S DEPARTMENT OF COMMERCE
BUREAU OF PUBLIC ROADS
REGION 8

SCALE _____ DATE _____

STANDARD PLAN 60-15.4
MAY 15, 1967

DRAINAGE SUMMARY

THE CULVERT LENGTHS SHOWN HEREON ARE APPROXIMATE. THE CONTRACTOR SHALL NOT ORDER CULVERT PIPE UNTIL THE ACTUAL LENGTHS OF THE VARIOUS GAGES ARE FURNISHED HIM BY THE ENGINEER.

✱ DENOTES FACTORY ELONGATED.

ANY CULVERT WITH A PORTION REQUIRING ELONGATED PIPE SHALL BE ELONGATED IN ITS ENTIRE LENGTH.

U. S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS

STATE	FOREST	ROUTE NO.	SECTION	SHEET NO.	TOTAL SHEETS
MONT.	DEERLODGE	16	2(1)		

ACCEPTABLE ALTERNATE CULVERT PIPE
(ACCEPTABLE ALTERNATES IDENTIFIED BY CHECK MARK, GAGE, OR CLASS DESIGNATION)

① PLAIN, ASPHALT DIPPED, OR ASPHALT DIPPED AND PAVED AS REQUIRED BY BID ITEM.

STATION	DESIGNED COVER		GALVANIZED CORRUGATED METAL PIPE						GALVANIZED CORRUGATED METAL PIPE-ARCH			END SECTION FOR PIPE-ARCH		END SECTIONS TYPE I			END SECTIONS TYPE II		① STEEL 3"x1" CORRUGATIONS	① ALUMINUM	CONCRETE				BEVELED ENDS (METAL PIPE)	STRUTTING OR TIES	REMARKS
		DIAM.	18"	24"	30"	36"	42"		50" x 31"			50" x 31"		18"	24"	30"	36"	42"										
		GAGE	16	16	16	16	16		14			14		16	16	16	16	16										
		ITEM NO.	453(1a)	453(1b)	453(1c)	453(1d)	453(1e)		454(1)			460(9)		460(4a)	460(4b)	460(4c)	460(5a)	460(5b)			EQUIVALENT DIAMETER	REINFORCED (CLASS)	IMPERFECT TRENCH	NON-REINFORCED				
8+01	3					58											2		16 gage	16 gage								
17+36	4					26											1		16 gage									Ext. Exist. pipe Lt.
20+97	3			20											2													Ext. Exist. pipe Lt.
26+00	2			70											2					16 gage	24"	III						
26+50	2		50											2						16 gage	18"	III		X				Road Approach Left
30+50	2			56											2					16 gage	24"	III						
35+50	2			56											2					16 gage	24"	III						
38+77	3			74											2					16 gage	24"	III						
42+50	3			76											2					16 gage	24"	III						
46+38	3			78											2					16 gage	24"	III						
50+50	2			40											2					16 gage	24"	III						Road Approach Left
51+00	4			60											2					16 gage	24"	III						
55+50	5				86											2				16 gage	30"	III						
58+50	5			100											1					16 gage	24"	III						End Section on Inlet
61+42	4			96											1					16 gage	24"	III						End Section on Inlet
64+70	2		46											2						16 gage	18"	III		X				Road Approach Right
72+85	3		50											2						16 gage	18"	III		X				Road Approach Left
76+40	3			60											2					16 gage	24"	III						
79+90	3			90											2					16 gage	24"	III						
85+47	4			70											2					16 gage	24"	III						
90+52	3				60											2				16 gage	30"	III						
96+15	3								56			2								14 gage	36"	III						
101+51	3			78											1					16 gage	24"	III						End Section on Inlet
105+50	3			64											2					16 gage	24"	III						
109+50	3				86											2				16 gage	30"	III						
118+05	8			60											2					16 gage	24"	III						
123+45	8				82											2				16 gage	30"	III						
131+44	2			58											2					16 gage	24"	III						
140+39	7				70											2				16 gage	30"	III						
145+91	3			70											2					16 gage	24"	III						
149+57	2			72											2					16 gage	24"	III						
TOTAL			146	1348	384	84	0		56			2		6	37	10	4	0										

STANDARD PLAN 60-15.4
MAY 15, 1967

DRAINAGE SUMMARY

THE CULVERT LENGTHS SHOWN HEREON ARE APPROXIMATE. THE CONTRACTOR SHALL NOT ORDER CULVERT PIPE UNTIL THE ACTUAL LENGTHS OF THE VARIOUS GAGES ARE FURNISHED HIM BY THE ENGINEER.

✱ DENOTES FACTORY ELONGATED.

ANY CULVERT WITH A PORTION REQUIRING ELONGATED PIPE SHALL BE ELONGATED IN ITS ENTIRE LENGTH.

U. S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS

STATE	FOREST	ROUTE NO.	SECTION	SHEET NO.	TOTAL SHEETS
MONT.	DEERLODGE	16	2(1)		

ACCEPTABLE ALTERNATE CULVERT PIPE
(ACCEPTABLE ALTERNATES IDENTIFIED BY CHECK MARK, GAGE, OR CLASS DESIGNATION)

① PLAIN, ASPHALT DIPPED, OR ASPHALT DIPPED AND PAVED AS REQUIRED BY BID ITEM.

STATION	DESIGNED COVER		GALVANIZED CORRUGATED METAL PIPE						GALVANIZED CORRUGATED METAL PIPE-ARCH	END SECTION FOR PIPE-ARCH	END SECTIONS TYPE I			END SECTIONS TYPE II		① STEEL 3"x1" CORRUGATIONS	① ALUMINUM	CONCRETE				BEVELED ENDS (METAL PIPE)	STRUTTING OR TIES	REMARKS
		DIAM.	18"	24"	30"	36"	42"		50" x 31"	50" x 31"	18"	24"	30"	36"	42"			EQUIVALENT DIAMETER	REINFORCED (CLASS)	IMPERFECT TRENCH	NON-REINFORCED			
		GAGE	16	16	16	16	16		14	14	16	16	16	16	16									
		ITEM NO.	453(1a)	453(1b)	453(1c)	453(1d)	453(1e)		454(1)	460(9)	460(4a)	460(4b)	460(4c)	460(5a)	460(5b)									
BroughtForward			146	1348	384	84	0		56	2	6	37	10	4	0									
152+40	3						64								2	16 gage	14 gage							
155+82	6			78								2					16 gage	24"	III					
160+33	5			66								2					16 gage	24"	III					
164+01	2			64								2					16 gage	24"	III					
TOTAL			146	1556	384	84	64		56	2	6	43	10	4	2									

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JUN 21 1967
DATE:

6

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
Bureau of Public Roads

STATE	FOREST	ROUTE NO	SECTION	SHEET NO	TOTAL SHEETS
MONT.	DEER-LODGE	16	2(1)		

GALVANIZED BEAM TYPE GUARDRAIL AND FLARE

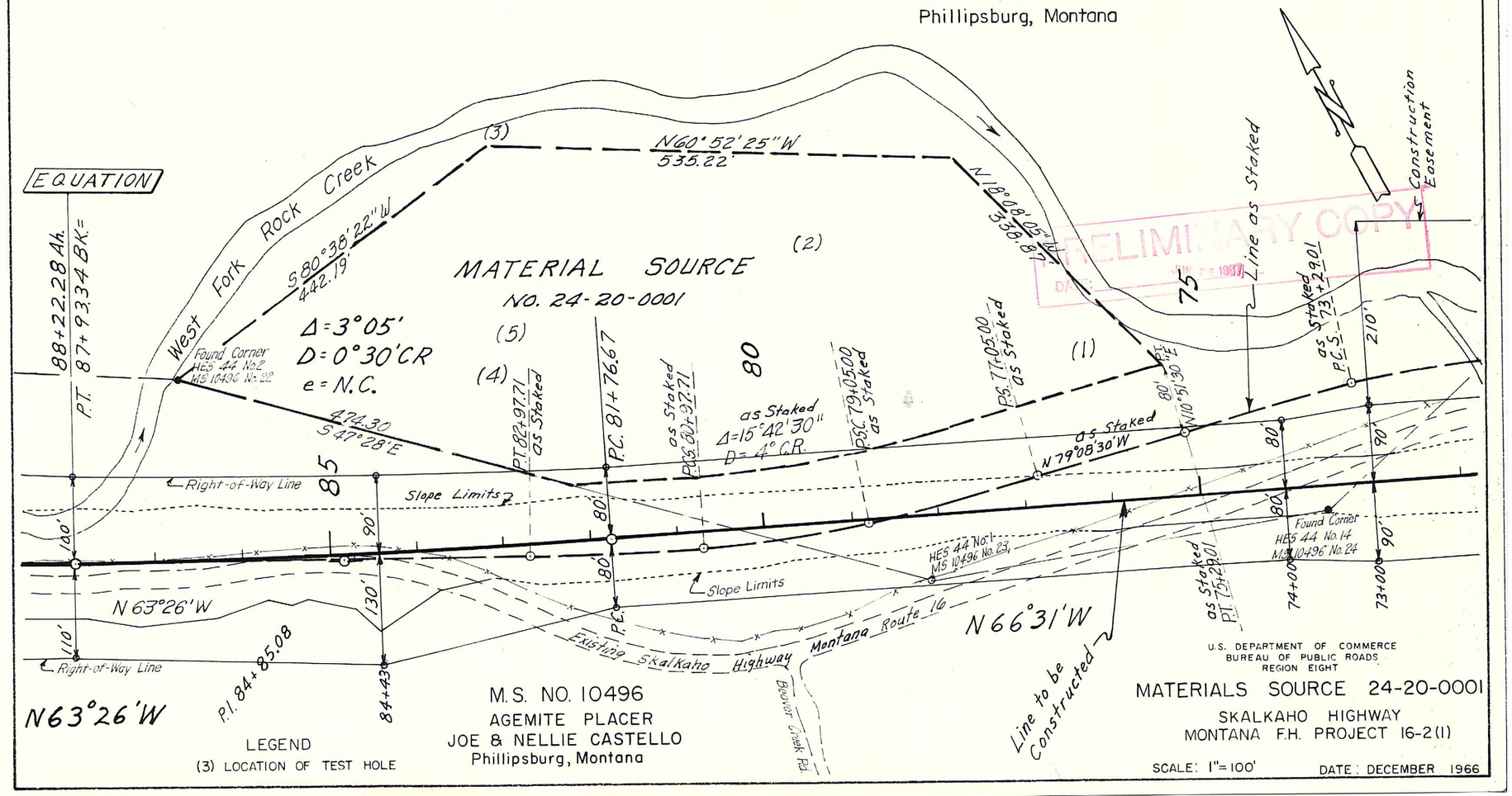
STATION TO STATION		ITEM 583(2)		ITEM 583(3)		REMARKS
		LT.	RT.	LT.	RT.	
63+65	65+15	100	* 50	50	0	*(Including 25' factory bent to 20' Radius for Appr. Rd. Rt.)
66+00	67+50	100	100	50	50	West Fork Rock Creek Bridge
TOTAL		200	150	100	50	
GRAND TOTAL		350		150		

PRELIMINARY COPY
DATE JUN 26 1967

L. FROST

H.E.S. NO. 44
NW 1/4 Section 35
T. 6 N. R. 16 W. M.P.M.
R. R. RICHTMYER
Phillipsburg, Montana

Mont. Deerlodge 16 2(1)



LEGEND
(3) LOCATION OF TEST HOLE

M.S. NO. 10496
AGEMITE PLACER
JOE & NELLIE CASTELLO
Phillipsburg, Montana

U.S. DEPARTMENT OF COMMERCE
BUREAU OF PUBLIC ROADS
REGION EIGHT

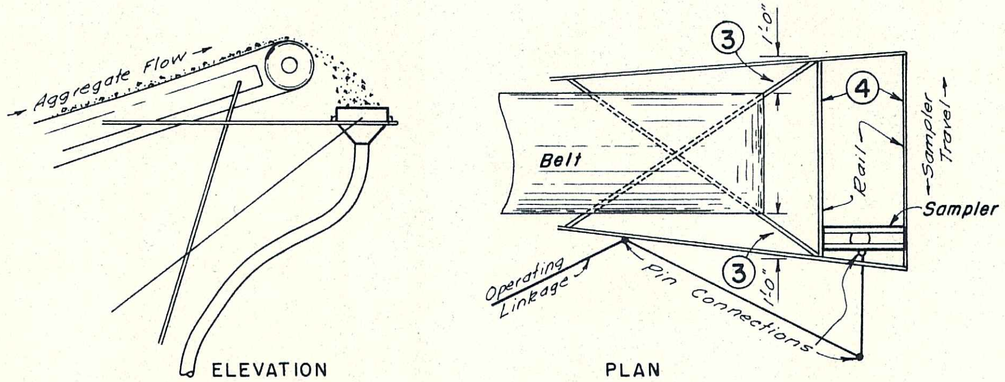
MATERIALS SOURCE 24-20-0001
SKALKAHO HIGHWAY
MONTANA F.H. PROJECT 16-2(1)

SCALE: 1"=100' DATE: DECEMBER 1966

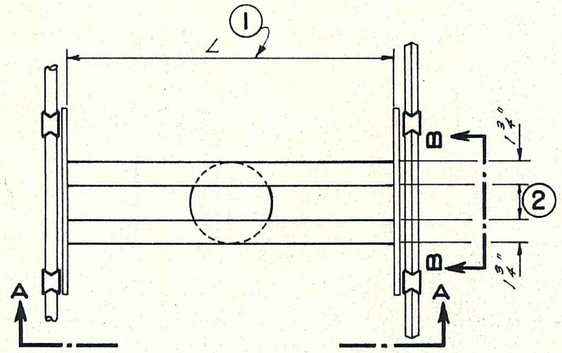
U. S. DEPT. OF COMMERCE BUREAU OF PUBLIC ROADS					
STATE	FOREST	ROUTE NO.	SECTION	SHEET NO.	TOTAL SHEETS
Mont	Deerlodge	16	2 (1)	14	

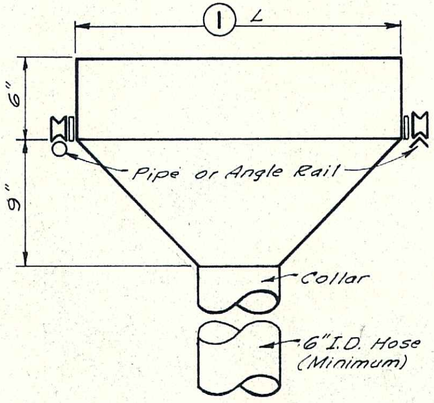
NOTE:

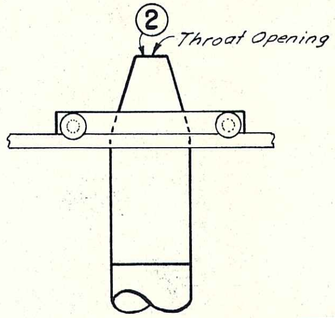
See Article 6.3 of the Special Provisions for mandatory features.



GENERAL LAYOUT

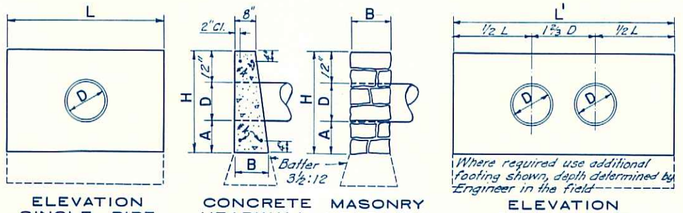






SAMPLER DETAILS

US DEPARTMENT OF COMMERCE BUREAU OF PUBLIC ROADS	
AGGREGATE SAMPLING DEVICE	
DATE AUGUST 1965	SHEET 1 OF 1
SCALE NONE	DRWG. No. 339



ELEVATION SINGLE PIPE — CONCRETE HEADWALL — MASONRY HEADWALL — ELEVATION DOUBLE PIPE

Concrete Headwalls - Concrete Class "A", Cement Type I or II. Chamfer all exposed corners ¾". 4-#4 bars

Masonry Headwalls - Mortar 1:3 Rocks on top of wall to be exposed, not plastered. Section 410, Cement Rubble Masonry for Forest Roads, Class B Masonry for Parks.

DATA AND QUANTITIES FOR TWO HEADWALLS

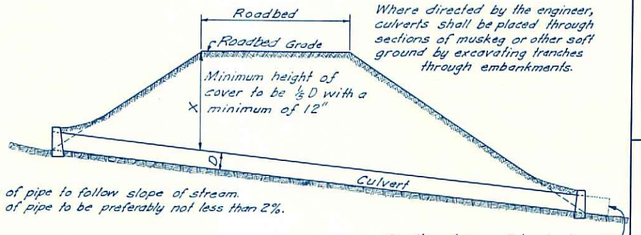
DESIGN			CONCRETE							MASONRY				
			SINGLE PIPE				DOUBLE PIPE			SINGLE PIPE			DOUBLE PIPE	
D	A	H	B	L	CONC. CU.YD.	STEEL LBS.	L'	CONC. CU.YD.	STEEL LBS.	B	L	MAS. CU. YD.	L'	MASONRY CU. YD.
12"	1'-0"	3'-0"	1'-0"	4'-0"	0.69	27	5'-8"	0.95	39	1'-2"	3'-8"	0.88	5'-4"	*1.25
15"	1'-0"	3'-3"	1'-1"	5'-0"	0.98	34	7'-1"	1.33	48	1'-4"	4'-4"	1.27	6'-5"	*1.82
18"	1'-0"	3'-6"	1'-2"	6'-0"	1.31	41	8'-6"	1.78	58	1'-6"	5'-0"	1.75	7'-6"	*2.53
24"	1'-4"	4'-4"	1'-5"	8'-0"	2.43	54	11'-4"	3.31	77	1'-10"	6'-4"	3.30	9'-8"	4.83
30"	1'-8"	5'-2"	1'-9"	10'-0"	4.21	68	14'-2"	5.72	96	2'-2"	7'-8"	5.54	11'-10"	8.23
36"	2'-0"	6'-0"	2'-0"	12'-0"	6.42	82	17'-0"	8.68	116	2'-6"	9'-0"	8.69	14'-0"	12.93

FOR PIPE SEE F.P. 61.

*Net quantity. For pay quantities, holes not deducted. See F.P.-61, Section 410.

Headwalls in all cases to be placed parallel to ℄ of roadway

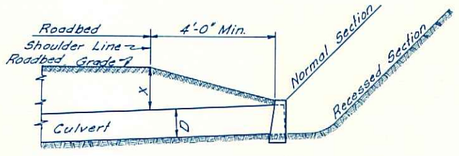
HEADWALLS FOR PIPE CULVERTS 12" TO 36" DIAMETER



Where directed by the engineer, culverts shall be placed through sections of muskeg or other soft ground by excavating tranches through embankments.

As alternate on outlet end, pipe may extend as shown and wall omitted. Protect bed and slopes with riprap or paving where necessary.

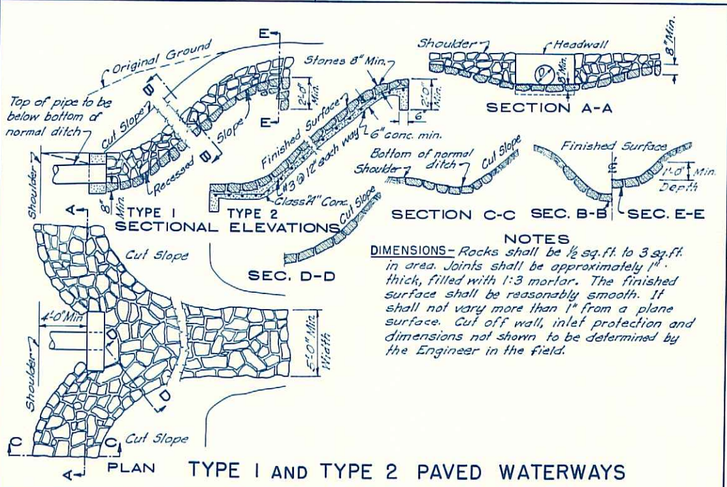
FILL SECTION



CUT SECTION

ALL HEADWALLS TO BE PLACED PARALLEL TO ℄ ROADWAY

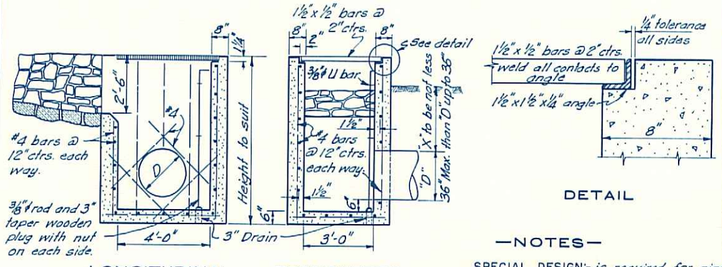
MINIMUM REQUIREMENTS FOR LOCATION OF HEADWALLS



NOTES

DIMENSIONS - Rocks shall be ½ sq.ft. to 3 sq.ft. in area. Joints shall be approximately 1" thick, filled with 1:3 mortar. The finished surface shall be reasonably smooth. It shall not vary more than 1" from a plane surface. Cut off wall, inlet protection and dimensions not shown to be determined by the Engineer in the field.

TYPE 1 AND TYPE 2 PAVED WATERWAYS



—NOTES—

SPECIAL DESIGN:- is required for pipe culverts exceeding 36" in diameter.

CONCRETE:- Class "A" mixed with Type I or Type II Portland cement.

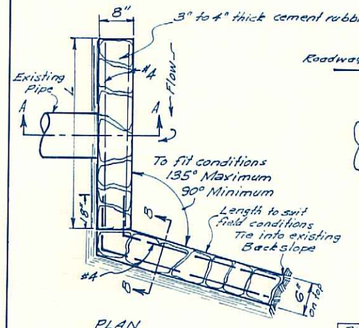
GRATING:- Paid for as reinforcement steel Item 407(1).

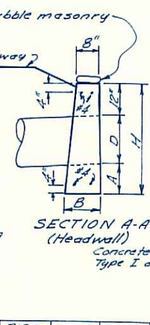
REINFORCING STEEL:- Deformed, Intermediate grade steel. All bars shall be 1½" from face of concrete as shown. For heights exceeding 6 feet, a duplicate mat of steel shall be included for the outside face.

OPENINGS:- may be placed on side or end as required.

PAINT:- Grating cover, two coats of red lead and one coat of gray. Paint shall conform to Section 420 of the Standard Specifications FP-61.

DROP INLETS—CATCH BASINS—SYPHONS

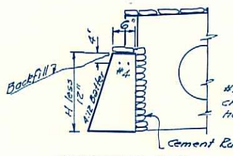




All headwalls to be placed parallel to centerline of roadway.

Concrete: Class "A", cement Type I or II low alkali.

PIPE SIZE	A	B	D	H	L
18"	1'-0"	1'-2"	18"	3'-6"	6'-0"
24	1'-4"	1'-5"	24"	4'-4"	8'-0"
36"	2'-0"	2'-0"	36"	6'-0"	12'-0"



SECTION B-B (Check Dam)

CONCRETE HEADWALL with CHECK DAM

PRELIMINARY COPY
DATE: JUN 26 1967

Drawn by M. D. Replogle
Traced by M. D. R.
Checked by

U. S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS
REGION EIGHT PORTLAND, OREGON

STANDARD

GENERAL CULVERT DETAILS

APRIL 1967

Scale as Shown

APPROVED: R. E. Farlet
FOR FEDERAL PROJECTS ENGINEER

15-1.5

NOTE ~ OREGON-WASHINGTON PROJECTS
Minimum Culvert requirements for Road Approaches:
For fills up to 20 feet – 12" diameter – 16 gage.
For fills over 20 feet as determined from tables below.

FILL HEIGHT and GAGE TABLES
H-20 LIVE LOAD

ROUND PIPES

2 2/3" x 7/16" CORRUGATIONS

PIPE DIAMETER (INCHES)	MINIMUM COVER (INCHES)	STEEL GAGES 16		14		12		10		8		ALUMINUM GAGES 16		14		12		10		8	
		MAXIMUM FILL HEIGHT ABOVE TOP OF PIPE IN FEET																			
		C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E
18	12	47	–	55	–	70	–	–	–	–	–	28	–	31	–	36	–	42	–	49	–
24	12	30	–	33	–	40	–	48	–	–	–	22	–	23	–	25	–	28	–	31	–
30	12	24	34	25	36	29	47	33	49	37	52	19	–	20	–	21	31	22	33	24	34
36	12	21	28	22	30	24	39	26	41	28	43	16	–	16	–	19	25	20	27	21	28
42	12	19	31	20	38	21	43	23	46	24	48			18	25	19	35	19	38	20	40
48	12	18	27	19	37	20	40	21	42	22	44					18	24	18	31	19	38
54	12			18	33	19	38	20	39	21	41					17	–	18	21	18	27
60	12					18	34	19	38	20	40							16	–	18	20
66	12					18	25	18	35	19	38							12	–	15	–
72	12							18	25	18	31									12	–
78	12									18	25										
84	12									18	20										

3" x 1" CORRUGATIONS

PIPE DIAMETER (INCHES)	MINIMUM COVER (INCHES)	STEEL GAGES 16		14		12		10		8	
		MAXIMUM FILL HEIGHT ABOVE TOP OF PIPE IN FEET									
		C	E	C	E	C	E	C	E	C	E
36	12	34	43	38	58	48	92	56	106	63	118
42	12	28	38	30	50	37	74	42	84	48	91
48	12	24	32	27	44	30	60	34	68	38	76
54	12	22	29	24	39	26	52	29	58	32	64
60	12	21	25	22	35	24	48	26	52	28	56
66	12	20	23	20	32	22	44	23	46	25	50
72	12	19	22	20	29	21	42	22	44	23	46
78	12	18	20	19	27	20	40	21	42	22	44
84	12			19	25	19	38	20	40	21	42
90	12			18	23	19	37	19	38	20	40
96	12					18	35	19	38	20	39
102	24					18	33	19	36	19	37
108	24					18	31	19	34	19	35
114	24							18	32	19	33
120	24							18	30	19	32

COLUMNS "C" are CIRCULAR PIPES.
COLUMNS "E" have a 5 Percent ELONGATION of the VERTICAL AXIS.

TABLE OF ALUMINUM SHEET GAGES

GAGE	THICKNESS
16	0.060"
14	0.075"
12	0.105"
10	0.135"
8	0.164"

Culvert ties shall be placed in pipes, to prevent distortion during placing of fill, as shown in the table below. Ties may be omitted in that portion of the pipe where the height of fill cover is less than that requiring ties.
When backfill is a non-compressive granular material, culvert ties may be omitted for any height of fill.

PIPE-ARCH CULVERTS

2 2/3" x 7/16" CORRUGATIONS

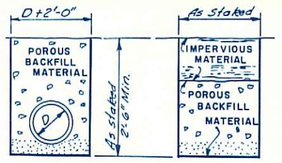
CULVERT SIZE SPAN	RISE	STEEL MINIMUM COVER (INCHES)	STEEL MINIMUM GAGE	STEEL MAXIMUM COVER IN FEET	ALUMINUM MINIMUM COVER (INCHES)	ALUMINUM MINIMUM GAGE	ALUMINUM MAXIMUM COVER IN FEET
18	11	18	16	15	18	16	15
22	13	18	16	15	18	16	15
25	16	18	16	15	18	16	15
29	18	18	16	15	18	16	15
36	22	18	16	14	18	16	14
43	27	18	16	13	18	14	13
50	31	18	14	12	18	12	12
58	36	18	12	12	18	10	12
65	40	18	12	12	18	10	12
72	44	18	10	12	18	10	12
76	52	18	10	12			
83	57	18	10	12			

3" x 1" CORRUGATIONS

CULVERT SIZE SPAN	RISE	STEEL MINIMUM COVER (INCHES)	STEEL MINIMUM GAGE	STEEL MAXIMUM COVER IN FEET
73	55	18	16	15
81	59	18	14	15
87	63	18	14	15
95	67	18	12	15
103	71	24	12	15
112	75	24	12	15
117	79	24	12	15
128	83	24	10	14

ACCEPTABLE PIPE-ARCH ALTERNATES

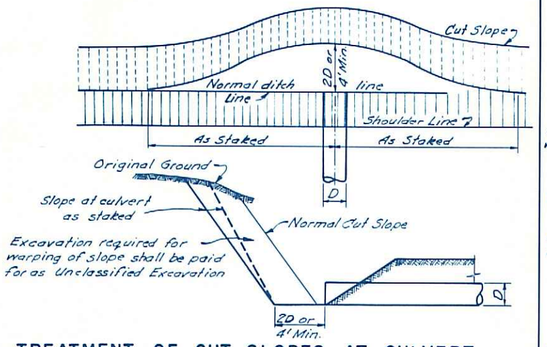
STEEL STND. CORRUGATIONS	STEEL 3" x 1"	ALUMINUM STND. CORRUGATIONS
72 x 44	73 x 55	72 x 44
76 x 52	81 x 59	—
83 x 57	87 x 63	—



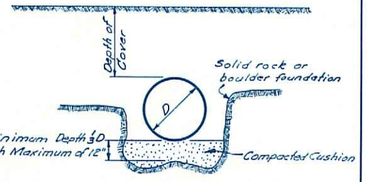
PIPE UNDERDRAIN — BLIND DRAIN

NOTE: POROUS BACKFILL MATERIAL FOR BEDDING and BACKFILLING SHALL CONFORM TO THE REQUIREMENTS OF ARTICLE 820-2.2 of the STANDARD SPECIFICATIONS FP-61.

UNDERDRAINS



TREATMENT OF CUT SLOPES AT CULVERT INLETS



Use earth cushion if material can be placed in the dry. If excavation is wet, use granular material.

Maintain a minimum depth of cushion, as shown in the sketch above, between high points of rocks and/or boulders and bottom of culvert.

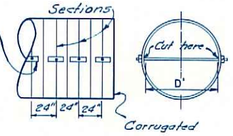
BEDDING OF CULVERTS IN SOLID ROCK OR BOULDER FOUNDATION

TABLE OF CULVERT TIES

PIPE DIAMETER (INCHES)	48	54	60	72	78	84
HEIGHT OF COVER (FEET)	30	25	20	15	10	10

TIES ARE REQUIRED WHEN HEIGHT OF COVER EQUALS OR EXCEEDS AMOUNT SHOWN

3" x 4" x 18" fir or pine block. Wrought washers on rods Holes in blocks ⅛" oversize.

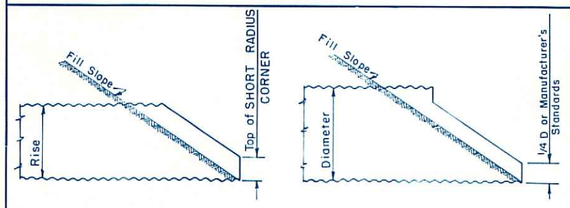


DIMENSIONS OF TIE RODS
ALL DIMENSIONS ARE INCHES

DIA. PIPE	DIA. ROD	LENGTH ROD	THREAD ENDS	D'
48	5/8	56	4 1/2	45 1/2
54	5/8	62	4 1/2	51 1/2
60	3/4	68	6	57
72	3/4	80	6	68 1/2
78	3/4	86	6	74
84	3/4	92	6	80

Unless ordered otherwise, ties shall remain in place at least one month after placing the embankment. See Special Provisions for method of paying for ties.

DETAILS OF CULVERT TIES



PIPE-ARCH

STEP-BEVEL when Rise equals 40 inches or larger.

ROUND PIPES

STEP-BEVEL when Diameter equals 48 inches or larger.

Bevel of pipe to be on 1½:1 Slope unless otherwise shown on the plans or called for by the Special Provisions.

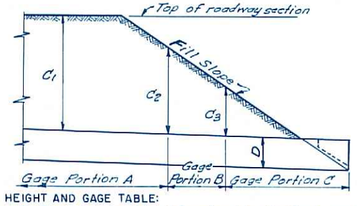
The ends of culverts shall not be cut on a skew.

END TREATMENT OF CULVERTS

ROUND PIPE DIAMETER "D"	"F" MINIMUM	PIPE-ARCHES SPAN	"F" MINIMUM
UP TO 24"	12"	UP TO 24"	12"
24" TO 72"	1/2 D "	24" TO 108"	1/3 S "
72" TO 180"	36" "	108" TO 189"	36" "

When a culvert is subjected to heavy loads from construction equipment, it may be necessary to maintain a temporary additional cover. The amount of cover, placement and subsequent removal to plan grade is the responsibility of the contractor and will not be paid for by the government.
Minimum cover for the various types of metal pipe is shown in the gage tables above.

MINIMUM SPACING



USING FILL HEIGHT AND GAGE TABLE:
Portion A- Gage required is determined by depth of cover C_1
Portion B- Gage required is determined by depth of cover C_2
Portion C- Gage required is determined by depth of cover C_3
Normally, the length of any selected gage shall not be less than 20'-0"

METHOD OF STEPPING GAGES

COUPLING BANDS

CULVERT SIZE	CORRUGATED STND. ANNULAR WIDTH	STND. ANNULAR No. of BOLTS	HELICAL WIDTH	HELICAL No. of BOLTS	3" x 1" WIDTH	3" x 1" No. of BOLTS	FLAT-DIMPLED WIDTH	FLAT-DIMPLED No. of BOLTS	FLAT-DIMPLED No. of Rows of DIMPLES
UNDER 18"	7	2	7	2	–	–	12	2	2
18" TO 60"	12	3*	12	3*	14	3*	12	3*	2
OVER 60"	24	5	24	5	24	5	24	5	4

* For bands with "Punch-out" type connections, 2 bolts are permissible for each lap.

Data in this block does not apply to pipes furnished under AASHO Spec. M-136.

Bands shall lap 1/2 width onto each section of pipe and must fully encircle the joint forming a nearly watertight connection.

ALL BOLTS – 1/2"ø GALV.

GENERAL NOTES

CULVERT EXTENSIONS:

REMOVE EXISTING HEADWALLS AND MAKE STANDARD CONNECTION AS REQUIRED BETWEEN NEW AND OLD PIPE, IN ACCORDANCE WITH STANDARD SPECIFICATION FP-61. THE DAMAGED OR CORRODED ENDS OF EXISTING GALVANIZED CORRUGATED METAL PIPE TO BE EXTENDED SHALL BE REMOVED. IF THE DAMAGED END IS FLAME CUT, THE SPELTER WHICH HAS BEEN BURNED BY THE FLAME CUTTING SHALL BE WIRE BRUSHED TO CLEAN METAL, AND THE AREA PAINTED WITH TWO COATS OF A PAINT FOR REPAIR OF GALVANIZED SURFACES COMPLYING WITH MILITARY SPECIFICATION MIL-P-21035, HIGH ZINC DUST CONTENT. IF THE DAMAGED END OF A BITUMINOUS COATED PIPE IS FLAME CUT, THE CUT END SHALL BE WIRE BRUSHED TO CLEAN THE METAL, AND THE AREA GIVEN ONE HEAVY COAT OF AN APPROVED ASPHALT PAINT.

UNLESS OTHERWISE PROVIDED FOR, THE COST OF REMOVING THE HEADWALLS SHALL BE INCLUDED IN THE PRICE BID FOR "EXCAVATION FOR STRUCTURES."

MATERIAL: IDENTIFICATION

NO CULVERTS WILL BE ACCEPTED UNLESS THE METAL IS CLEARLY IDENTIFIED ON THE OUTSIDE OF EACH SECTION, SHOWING:

1) NAME OF SHEET MANUFACTURER
2) NAME OF BRAND AND KIND OF BASE METAL
3) GAGE NUMBER OR SHEET THICKNESS

AND FOR GALVANIZED PIPE THESE ADDITIONAL ITEMS:

4) WEIGHT OF SPELTER COATING
5) IDENTIFICATION SYMBOLS SHOWING HEAT NUMBERS

WHEN TWO OR MORE DIFFERENT GAGES OF A BITUMINOUS COATED OR ASBESTOS BONDED PIPE OF THE SAME DIAMETER ARE REQUIRED, PIPE OF EACH GAGE SHALL BE CLEARLY MARKED FOR FIELD IDENTIFICATION.

TREATMENT OF FLAME CUT ENDS OR OTHER DAMAGED SPELTER:

GALVANIZED PIPE: SAME AS DETAILED UNDER "CULVERT EXTENSIONS" ABOVE.

BITUMINOUS COATED ASBESTOS PIPE: THE DAMAGED END SHALL BE WIRE BRUSHED TO CLEAN METAL AND THE AREA GIVEN ONE HEAVY COAT OF AN APPROVED ASPHALT PAINT.

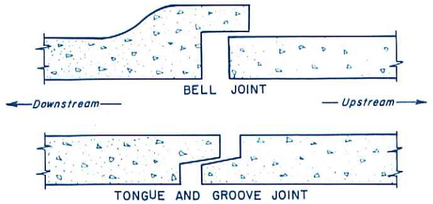
DESIGNED
DRAWN M. D. Replogle
TRACED
CHECKED

APPROVED:
FOR FEDERAL PROJECTS ENGINEER

U. S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS
REGION EIGHT PORTLAND, OREGON

STANDARD
DETAILS CORRUGATED METAL PIPE

DATE MAY 1967 SCALE None
SHEET OF SHEETS DRAWING NO. 15-2.15



Pipe laying shall begin at the downstream end of the culvert with the bell or groove ends facing upstream. See Article 450-3.2 of the Standard Specifications FP-61.

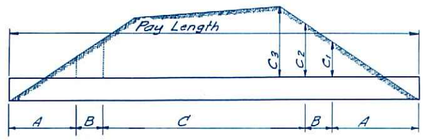
CONSTRUCTION JOINTS

SELECTION TABLE
CLASSES OF
REINFORCED CONCRETE PIPE

C (COVER IN FEET)	ORDINARY EMBANKMENT	IMPERFECT TRENCH
LESS THAN 2	III	–
2-10	II	–
11-15	III	–
16-20	IV	II *
21-25	IV	II *
26-30	V	III *
31-35	–	III
36-40	–	IV
41-45	–	IV
46-50	–	IV
51-60	–	V
61-70	–	V
70=MAXIMUM		

* Acceptable alternates in lieu of Classes IV & V under ordinary embankment. Table is based on Class "C" Bedding.

Extra Strength non-reinforced concrete culvert pipe, with ordinary embankment, is an acceptable alternate in 12" and 18" diameters where Cover, "C", is 15 feet or less.

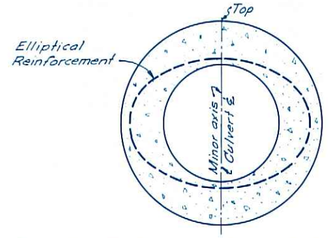


Portions A-Class required as determined by fill cover C1
Portions B-Class required as determined by fill cover C2
Portion C-Class required as determined by fill cover C3
The Class of pipe is selected from table above corresponding to the method of installation.

METHOD OF DETERMINING CLASSES OF CONCRETE PIPE

The class of pipe and method of placement, as shown on the Culvert Pipe Summary Sheet, is based on the maximum cover of fill. The class of pipe toward the ends of the culvert may be changed, as indicated in the above sketch, with the approval of the engineer. Except non-reinforced culvert pipe shall not be used in any installation where reinforced concrete culvert pipe is required.

DESIGNED
DRAWN M. D. Replogle
TRACED
CHECKED



Concrete culvert pipe may be manufactured with either two mats of circular reinforcement or one mat of reinforcement elliptically shaped as in the above sketch.

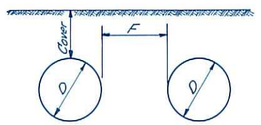
MARKING REINFORCED CONCRETE PIPE

The following information shall be clearly marked on each section of pipe.

(a) Pipe class and type of wall (A, B or C)
(b) Date of manufacture
(c) Name or trade-mark of manufacturer
(d) One end of each elliptically reinforced section shall clearly indicate the top or bottom of section.

Elliptically reinforced pipe shall be laid with the marks designating the "top" or "bottom" of the pipe not more than 5 degrees from a vertical plane through the longitudinal axis of the pipe.

SECTION
REINFORCED CONCRETE PIPE



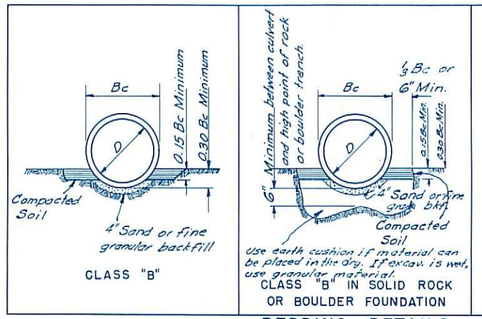
"F" to be ½D or 3'-0" whichever is less, but with 12" minimum. Minimum cover to be ½D with a minimum of 1.75 feet.

The minimum cover noted above is for normal highway loading. When pipes are subjected to heavy loads from construction equipment, it may be necessary to temporarily place additional cover of ½D.

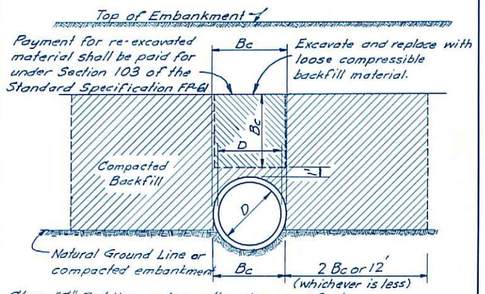
When such additional cover is required, the placing and subsequent removal to plan grade, will be the responsibility of the contractor and will not be paid for by the government.

The additional cover as noted above is not a contract requirement and is optional with the contractor.

MINIMUM SPACING & COVER

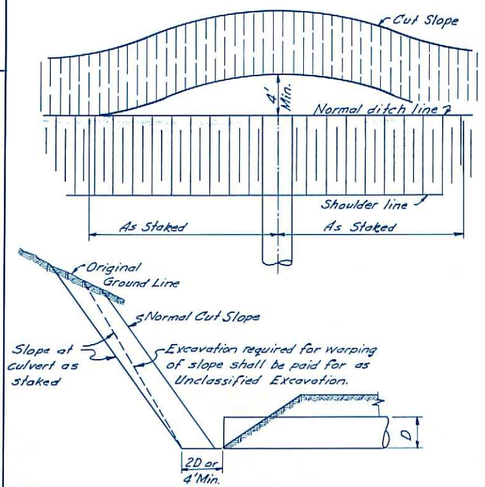


BEDDING DETAILS



Class "C" Bedding unless otherwise specified.

IMPERFECT TRENCH METHOD



TREATMENT OF CUT SLOPES AT CULVERT INLETS

GENERAL NOTES

Non-reinforced concrete pipe shall comply with AASHO Specification M-86 for Extra Strength pipe. Pipe complying with the dimensional requirements of AASHO Specification M-170, Class III, but without the reinforcing steel, may be used providing it will meet the strength requirements of AASHO Specification M-86 for Extra Strength pipe.

Bedding for culverts shall be Class "C" unless otherwise specified on the plans or in the special provisions.

APPROVED: O. E. Jarlet
FOR FEDERAL PROJECTS ENGINEER

U. S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS
REGION EIGHT PORTLAND, OREGON

STANDARD
DETAILS
CONCRETE
CULVERT PIPE

DATE APRIL 1967 SCALE NONE
SHEET 1 OF 1 SHEETS DRAWING NO. 15-3.4

FILL HEIGHT AND GAGE TABLE
ROUND PIPES
H-20 LOADING

DIA. PIPE	MIN. COVER *	GAGES - 4 BOLTS PER FOOT							1-GAGE - 8 BOLTS/FOOT
		12	10	8	7	5	3	1	
INCHES	INCHES	MAXIMUM FILL HEIGHT ABOVE TOP OF PIPE IN FEET							
60	12	42	62	81	93	112	132	144	220
72	12	35	51	67	77	93	108	118	181
84	12	30	44	57	66	75	80	86	145
96	12	26	38	50	58	63	66	70	124
108	24	23	34	45	51	53	56	59	112
120	24	21	31	40	46	48	50	52	104
132	24	19	28	36	42	45	46	48	98
144	24	17	25	33	38	42	42	44	92
156	24	16	23	31	35	40	41	42	85
168	24	15	22	28	33	38	40	41	78
180	24	14	20	27	31	37	38	40	73
192	24	—	18	25	29	35	38	39	68
204	36	—	18	23	27	32	37	38	65
216	36			21	23	27	31	35	62
228	36			18	18	23	26	30	57
240	36				18	18	23	26	55
252	36					18	20	23	52

STRUT SPACING FOR ROUND PIPE

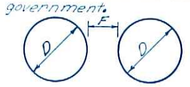
Pipe Diam in Inches	Size of Strut	FILL HEIGHT ABOVE TOP OF PIPE IN FEET								
		15	20	30	40	50	60	70	80	90
		STRUT SPACING FT.								
60	4x4			4.5	3.5	3.0				
	4x6			6.0	5.0	4.0	3.5			
	6x6						5.5	4.5	4.0	3.5
	6x8							6.0	5.0	4.0
72	4x4		5.5	3.5						
	4x6		6.0	5.5	4.0	3.5				
	6x6				6.0	5.0	4.0	3.5		
	6x8						5.5	5.0	4.0	3.5
84	4x4		4.5	3.0						
	4x6		6.0	4.5	3.5					
	6x6				5.0	4.0	3.5			
	6x8					5.5	4.5	4.0	3.5	
	8x8							5.5	5.0	4.0
96	4x4		3.5							
	4x6		5.5	4.0						
	6x6			6.0	4.5	3.5				
	6x8				6.0	5.0	4.5	3.5	3.0	
	8x8						5.5	5.0	4.5	3.5
108	4x6		4.5	3.0						
	6x6		6.0	5.0	4.0	3.0				
	6x8				5.5	4.5	4.0	3.5		
	8x8						5.0	4.5	4.0	3.0

Poles of equivalent end area may be used in lieu of the sawn timber strut.

For culverts within the heavy lines in the FILL HEIGHT and GAGE TABLE, *struts are required when installed in compressive backfill material (i.e. clay, silt, etc.) Refer to* "METHOD of DETERMINING WHEN STRUTTING IS REQUIRED" and "STRUT SPACING FOR ROUND PIPE." *When backfill is a non-compressive granular material, as indicated in the cross-hatched diagram, struts may be omitted for any fill height.*

For culverts 120 inch diameter and greater and for all culvert installations where the depth of cover is 100 feet or more, a non-compressive granular material (i.e. graded rock, gravel, sand, etc.) shall be placed in accordance with the cross-hatched diagram.

* NOTE: *The minimum cover shown in the tables is for normal highway loading. When pipes are subjected to heavy loads from construction equipment, it may be necessary to temporarily place additional cover of ½ D. When such additional cover is required, the placing and subsequent removal to plan grade, will be the responsibility of the contractor and will not be paid for by the government.*



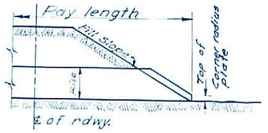
"F" DISTANCE
60" to 72" = ½ D Minimum
72" to 180" = 3'-0" Minimum

MINIMUM SPACING — MULTIPLE PIPES

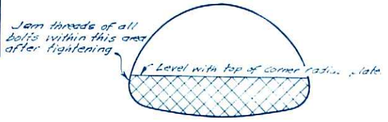
FILL HEIGHT AND GAGE TABLE
PIPE-ARCH CULVERTS
H-20 LOADING

PIPE DIMENSIONS SPAN	x RISE	CORNER RADIUS PLATE INCHES	MINIMUM COVER * INCHES	MINIMUM GAGE	MAXIMUM FILL ABOVE TOP OF PIPE (FEET)
6'-1"	4'-7"	18	18	12	15
7-0	5-1	18	18	12	15
7-11	5-7	18	18	12	15
8-2	5-9	18	24	12	15
9-6	6-5	18	24	12	15
10-11	7-1	18	24	12	13
11-5	7-3	18	24	12	12
12-10	8-4	18	24	12	11
14-1	8-9	18	24	12	11
15-4	9-3	18	24	10	10
15-10	9-10	18	24	10	9
16-7	10-1	18	36	10	8
13-3	9-4	31	24	12	15
14-2	9-10	31	24	12	15
15-4	10-4	31	24	10	15
16-3	10-10	31	36	10	15
17-2	11-4	31	36	10	15
18-1	11-10	31	36	8	14
19-3	12-4	31	36	8	13
19-11	12-10	31	36	8	13
20'-7"	13'-2"	31	36	7	12

Ends of pipe to be step-beveled to 1½:1 slope unless otherwise shown on the plans or called for by special provisions.



Pipe order lengths to be multiples of two feet. Pay length of structural plate pipe arch culverts is from end to end at bottom measured along center line.

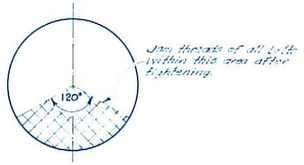


JAM BOLTS
DIAGRAM - PIPE-ARCH CULVERTS

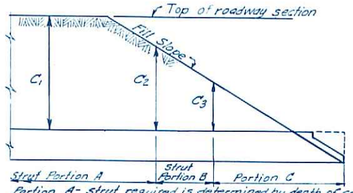
STRUCTURAL PLATE PIPE-ARCH DETAILS

METHOD OF STEPPING GAGES

Portion A - Gage required is determined by depth of cover C_1
Portion B - Gage required is determined by depth of cover C_2
Portion C - Gage required is determined by depth of cover C_3
Normally the length of any selected gage shall not be less than 20'-0"



JAM BOLTS
DIAGRAM - PIPE CULVERTS



Portion A - Strut required is determined by depth of cover C_1
Portion B - Strut required is determined by depth of cover C_2
Portion C - Strut required is determined by depth of cover C_3
No strutting required if C_3 is equal to or less than that shown in table of strut spacing. Any of the several alternate struts will be accepted.

METHOD OF DETERMINING WHEN STRUTTING IS REQUIRED

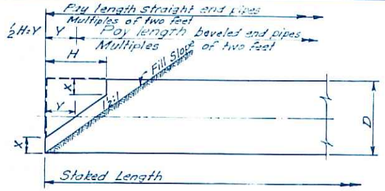
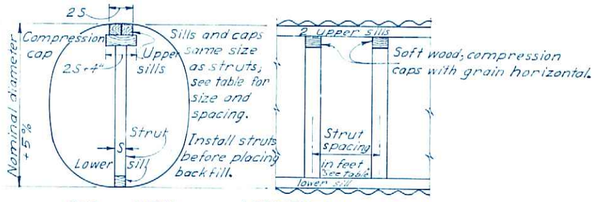


DIAGRAM OF PAY LENGTHS

TABLE of STEP BEVELS-1½:1 Fill Slope			
D IN INCHES	X	Y	NOTES
60	0.5	3.0	*Staked Length - 2½ Order Length. Order Length = Pay Length. Adjust Order Length to nearest 2 ft. increment.*
66	0.8	3.0	
72	1.0	3.0	
84	1.5	3.0	
96	1.4	3.9	
108	1.8	4.1	
120	2.4	3.9	*Dimensions shown are approximate and may be adjusted to suit fabricators standards.*
132	1.5	6.0	
144	2.0	6.0	
156	2.5	6.0	
168	2.4	6.9	
180	3.5	6.0	

STEP BEVEL DETAILS

Strut length to produce tight fit to maintain the 5% deformation.



END VIEW LONGITUDINAL SECTION

STRUTTING

STRUCTURAL PLATE PIPE DETAILS

GENERAL NOTES

BOLTING: ALL CONNECTING BOLTS SHALL BE DRAWN UP WITH TORQUE WRENCHES TO A TORQUE OF NOT LESS THAN 150 FOOT POUNDS AND NOT OVER 200 FOOT POUNDS. JAM THREADS IN BOTTOM PLATE BOLTS, AS INDICATED IN THE DIAGRAMS, AFTER BOLTS HAVE BEEN DRAWN UP TO THE SPECIFIED TORQUE.

BEDDING AND BACKFILL: FOR BEDDING AND BACKFILL OF CULVERTS, SEE ARTICLE 103-3.7 IN THE STANDARD SPECIFICATIONS FP-61.

ROUND PIPES: ALL PIPES SHALL BE FURNISHED FACTORY DEFORMED TO 5% OUT OF ROUND AND THE LONG DIAMETER TO BE PLACED VERTICALLY.

WHEN STRUTS ARE NEEDED, THEY SHALL BE LEFT IN PLACE UNTIL THE FILL HAS TAKEN THE INITIAL SETTLEMENT AND SUCH ADDITIONAL TIME AS THE ENGINEER MAY DEEM NECESSARY. IN CASE THE STRUTS ARE LEFT IN PLACE BEYOND COMPLETION DATE OF THE CONTRACT, THE CONTRACTOR SHALL BE RELIEVED OF THE RESPONSIBILITY FOR REMOVAL.

STRUTTING: SEE SPECIAL PROVISIONS FOR PAYMENT.

END TREATMENT OF CULVERTS: UNLESS OTHERWISE CALLED FOR ON THE PLANS OR THE DRAINAGE SUMMARY, THE FOLLOWING CRITERIA SHALL APPLY:

1) THE ENDS OF PIPE-ARCH CULVERTS SHALL BE STEP-BEVELED AS SHOWN IN THE INSET ABOVE; AND THE ENDS OF ROUND CULVERT PIPE SHALL BE STEP-BEVELED AS SHOWN IN THE DETAILS AT LEFT SHEET MARGIN.
2) THE ENDS OF STEP-BEVELED PIPE CULVERTS AND PIPE-ARCH CULVERTS LAID ON A SKEW SHALL NOT BE CUT ON A SKEW.

CULVERT PAY LENGTH: SEE INSET ABOVE AND NOTES UNDER STEP-BEVEL DETAILS AT LEFT SHEET MARGIN.

MARKING - IDENTIFICATION: EACH PLATE SHALL BE IDENTIFIED IN COMPLIANCE WITH AASHO SPECIFICATION M-167.

CULVERT GAGES: THE BOTTOM PLATES ARE TO BE ONE (1) GAGE HEAVIER THAN THE ABOVE TABULAR VALUES, BUT NOT HEAVIER THAN ONE (1) GAGE.

TREATMENT OF DAMAGED SPELTER: DAMAGE TO SPELTER CAUSED FROM FLAME CUTTING OR WELDING OF GALVANIZED METAL SHEETS DURING FABRICATION, OR OTHER DAMAGE TO SPELTER, SHALL BE REPAIRED AS FOLLOWS:

1) WIRE BRUSH TO CLEAN METAL
2) PAINT THE AREA WITH TWO COATS OF A PAINT FOR REPAIR OF GALVANIZED SURFACES COMPLYING WITH MILITARY SPECIFICATIONS MIL-P-21035, HIGH ZINC DUST CONTENT.

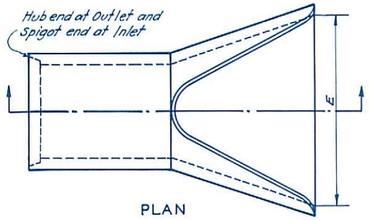
DESIGNED
DRAWN Wm. Koester
TRACED Wm Koester
CHECKED

APPROVED: R.E. Jarlet
FOR FEDERAL PROJECTS ENGINEER

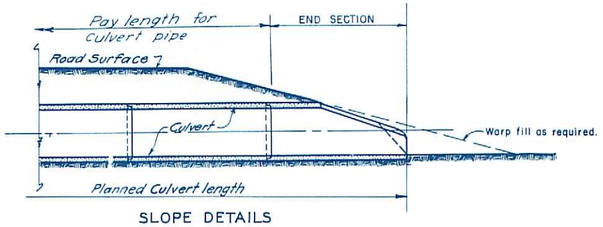
U. S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS
REGION EIGHT PORTLAND, OREGON

STANDARD
STRUCTURAL PLATE CULVERTS (STEEL)

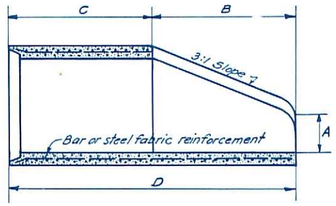
DATE MAY 1967 SCALE None
SHEET 1 OF 1 SHEETS DRAWING 15-4.7



PLAN

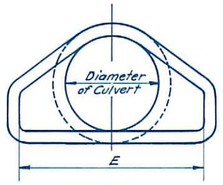


SLOPE DETAILS



SECTION X-X

Concrete to be manufacturer's standard, with a minimum 28 day strength of 3,000 psi.

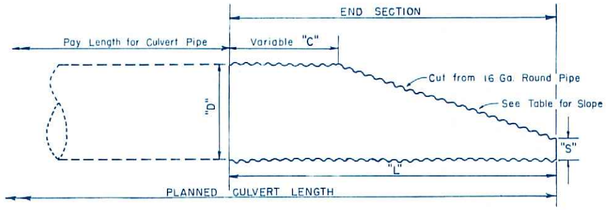


END VIEW

TYPE III					
END SECTION DIMENSIONS					
DIAM.	A	B	C	D	E
12"	4"	2'-0"	4'-0 7/16"	6'-0 7/16"	2'-0"
18"	9"	2'-3"	3'-10"	6'-1"	3'-0"
24"	9 1/2"	3'-7 1/2"	2'-6"	6'-1 1/2"	4'-0"
30"	1'-0"	4'-6"	1'-7 3/8"	6'-1 3/4"	5'-0"
36"	1'-3"	5'-3"	2'-10 3/8"	8'-1 3/8"	6'-0"
42"	1'-9"	5'-3"	2'-11"	8'-2"	6'-6"
48"	2'-0"	6'-0"	2'-2"	8'-2"	7'-0"
* 60"	2'-6"	5'-0"	3'-3"	8'-3"	8'-0"

*60" Special End Section is based on the slope of a wing 2:1.

END SECTION FOR PIPE CULVERTS - TYPE III
(REINFORCED CONCRETE - PREFABRICATED)

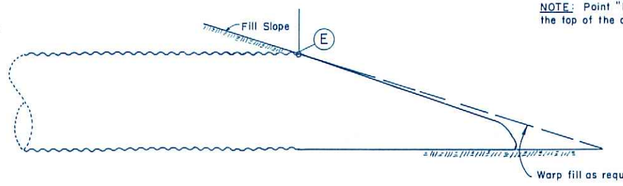


METAL END SECTION TYPE II

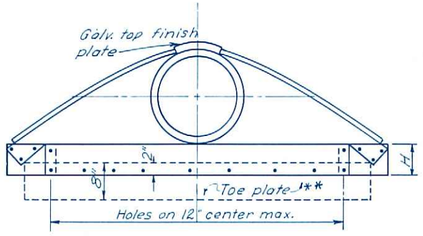
TYPE II				
END SECTION DIMENSIONS				
DIAMETER	DIM. "L"	DIM. "C"	DIM. "S"	SLOPE
18"	5'-3"	1'-9"	4"	3:1
24"	7'-0"	2'-0"	4"	3:1
30"	7'-9"	1'-3"	4"	3:1
36"	7'-6"	1'-3"	6"	2 1/2:1
42"	9'-1 1/2"	1'-7 1/2"	6"	2 1/2:1

NOTE: If the End Section is flame cut, damaged spelter shall be cleaned by wire brushing and given two,(2), heavy coats of High Zinc Dust type paint for repair of galvanized surfaces. This repair is not required when pipe is to be Bituminous Coated.

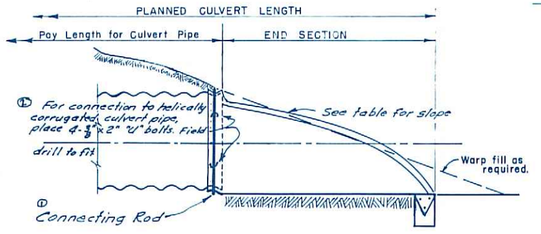
NOTE: Point "E" is the intersection of the fill slope with the top of the culvert.



TYPICAL INSTALLATION —— TYPES I, II, & III.



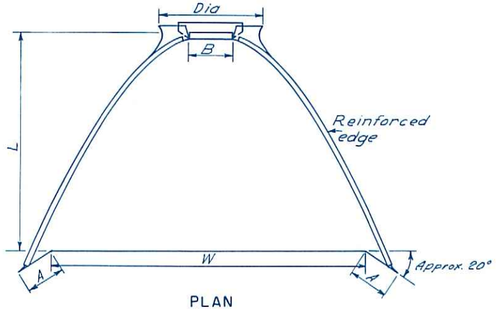
ELEVATION



TYPICAL CROSS-SECTION

① For alternate designs of connection, see General Notes.

② Not required if section of helically corrugated culvert pipe is welded to End Section for use of standard coupling bands.



PLAN

TYPE I							
METAL END SECTIONS							
PIPE DIAM	GA.	DIMENSIONS					APPROX. SLOPE
		A	B	H	L	W	
12"	16	6"	6"	6"	21"	24"	2 1/2
15"	16	7	8	6	26	30	2 1/2
18"	16	8	10	6	31	36	2 1/2
21"	16	9	12	6	36	42	2 1/2
24"	16	10	13	6	41	48	2 1/2
30"	14	12	16	8	51	60	2 1/2
36"	14	14	19	9	60	72	2 1/2
42"	12	16	22	11	69	84	2 1/2
48"	12	18	27	12	78	90	2 1/4
54	12	18	30	12	84	102	2
60	12	18	33	12	87	114	1 3/4
66	12	18	36	12	87	120	1 1/2
72	12	18	39	12	87	126	1 1/3
78	12	18	42	12	87	132	1 1/4
84	12	18	45	12	87	138	1 1/6

Toe plate, where needed, to be punched to match holes in skirt lip, 3/8" galv. bolts to be furnished. Length of toe plate is W+10" for 12" to 30" dia. pipe incl. and W+22" for 36" to 48" dia. pipe incl.

Skirt section for 12" to 24" dia. pipe incl. to be made in one piece.

Skirt section for 30" to 48" dia. pipe incl. may be made from two sheets joined by riveting or bolting on center line.

Connector Section, Corner Plate and Toe Plate to be the same gage as skirt and each to be galvanized.

**Use toe plate only when called for on plans.

METAL END SECTIONS - TYPE I

GENERAL NOTES

METAL PIPE: END SECTIONS TO BE CONNECTED WITH BOLTS, RIVETS, BANDS OR WELDING IN ACCORDANCE WITH THE MANUFACTURER'S STANDARDS. TYPE I END SECTIONS FOR ASBESTOS BONDED PIPE SHALL BE BITUMINOUS COATED, AND IF CALLED FOR IN THE BID SCHEDULE, SHALL BE PAVED. BITUMINOUS COATING AND PAVING SHALL COMPLY WITH THE COATING PROVISIONS OF SUB-ARTICLE 453-2.1(b) AND (c) OF THE STANDARD SPECIFICATIONS FP-61.

WHEN END SECTIONS CONNECT TO HELICALLY CORRUGATED PIPE, THE CONNECTION SHALL BE DESIGNED TO ENGAGE THE LAST CORRUGATION OR AS SHOWN IN THE TYPICAL CROSS SECTION.

TYPE: THE MATERIALS IN THE END SECTION SHALL CONFORM TO THE MATERIALS IN THE CONNECTING MAIN PIPE EXCEPT THAT METAL END SECTIONS MAY BE USED ON CONCRETE PIPE.

ALTERNATE DESIGN: UPON APPROVAL BY THE ENGINEER, VARIATIONS IN DESIGN AND DIMENSIONS WILL BE PERMITTED TO MEET MANUFACTURER'S STANDARDS.

U. S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS
REGION EIGHT PORTLAND, OREGON

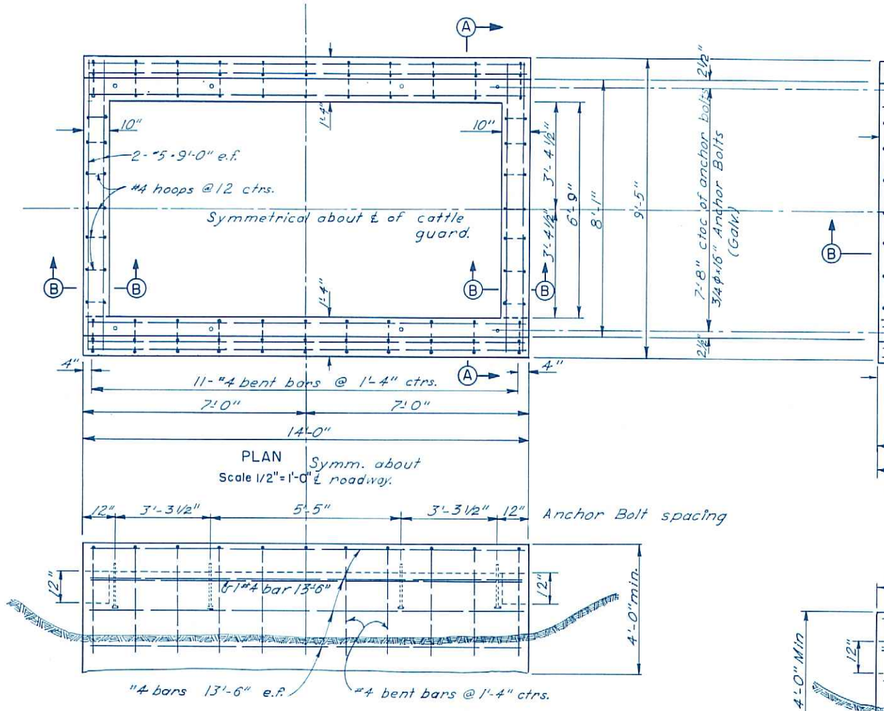
END SECTIONS

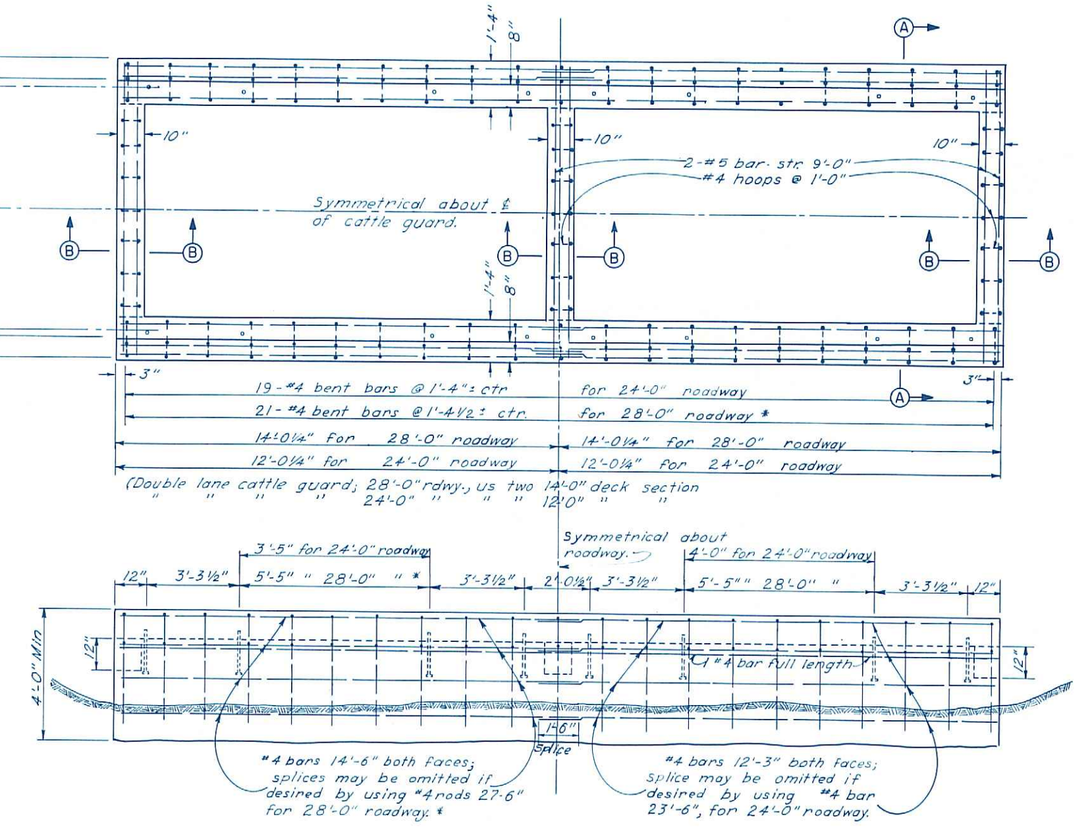
FOR PIPE CULVERTS

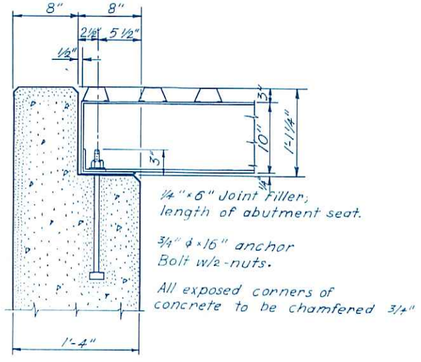
NO SCALE MAY 1967

APPROVED: R. E. Barlet
FOR FEDERAL PROJECTS ENGINEER

15-8.5







ANCHOR BOLT DETAIL
Scale 1 1/2"=1'-0"

REINFORCMENT STEEL					
		ROADWAY WIDTH			
		14'-0"	24'-0"	28'-0"	
SIZE	LENGTH	Nº REQ'D	Nº REQ'D	Nº REQ'D	SHAPE
#4	13'-6"	18	—	—	STRAIGHT
#4	14'-6"	—	—	36	"
#4	12'-3"	—	36	—	"
#4	8'-0"	22	38	42	BENT BAR
#5	9'-0"	8	12	12	STRAIGHT
4	3'-0"	14	21	21	HOOPS
TOTAL WEIGHTS		383.044	652.388	727.872	

NOTE:

*Drawing is detailed for a 28'-0" roadway. Splices in Nº 4 spacer bars shall be limited to one splice per run. For deck section see Drawing Nº 25-28.1

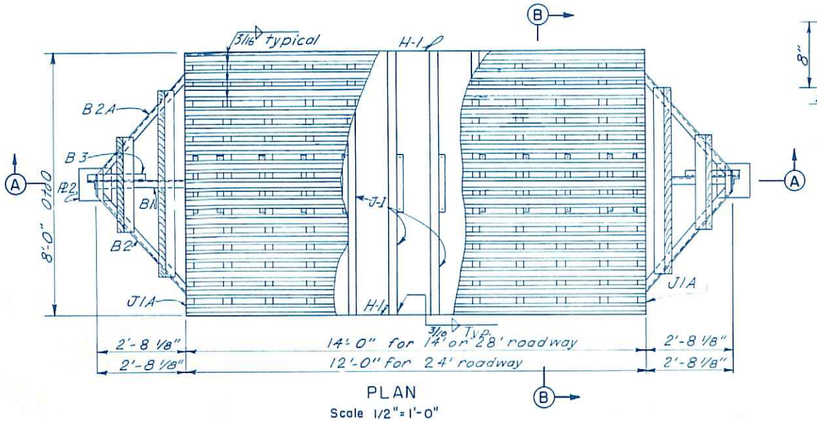
APPROVED
FOR FEDERAL PROJECTS ENGINEER

DESIGNED
DRAWN W.F. Koester
TRACED
CHECKED

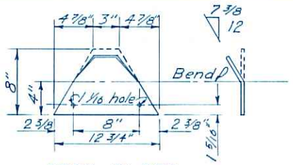
U. S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS
REGION EIGHT PORTLAND, OREGON

CONCRETE SUBSTRUCTURE
CATTLE GUARDS 14-24 AND 28
FOOT WIDTHS

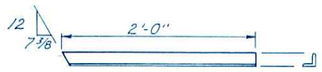
DATE JUNE 1967 SCALE AS SHOWN
SHEET 1 OF 2 SHEETS DRAWING NO. 25-2A.1



PLAN
Scale 1/2" = 1'-0"

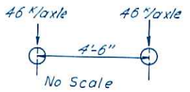


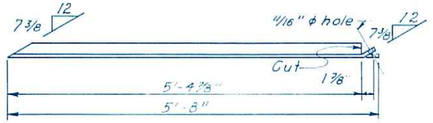
APEX PLATE
Make fr. 1/4" × 8" × 12 3/4" PL MK PL1



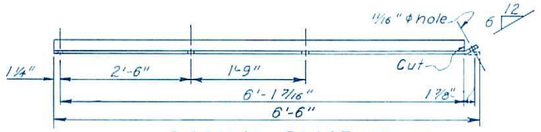
BRACE MK B3

U-80 LOADING



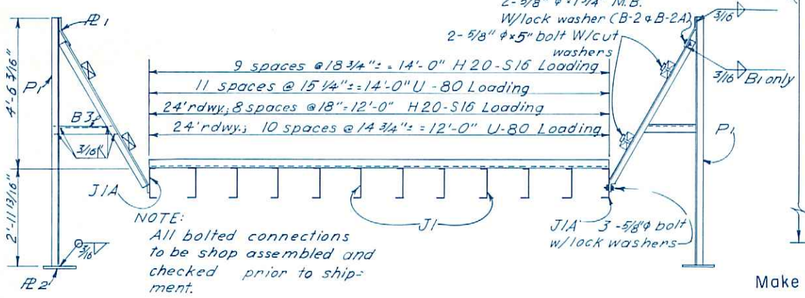


DIAGONAL BRACE MK B1



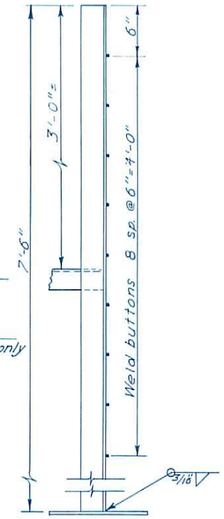
DIAGONAL BRACE MK B2
MK B2A opposite hand

NOTE:
All braces to made from 2 1/2 × 2 1/2 × 3/8 " ∠5.9 angle.

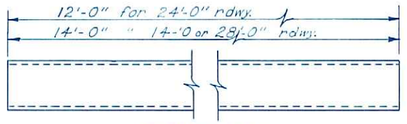


NOTE:
All bolted connections to be shop assembled and checked prior to shipment.

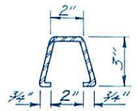
SECTION "A-A"
Scale 1/2" = 1'-0"



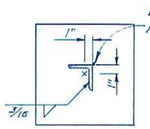
POST
Make fr. 3" × 3" × 3/8" ∠7.2 Angle MK P1



FORMED RAIL
Make fr. 3/16" PL MK F1

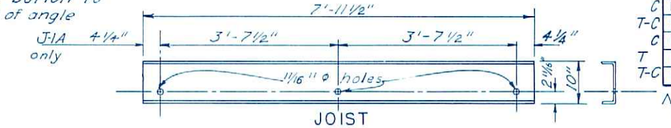


RAIL SECTION



Weld button to heel of angle

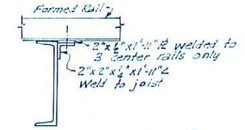
BASE PLATE
Make fr. 3/8" × 12" × 12" PL
MK. PL2



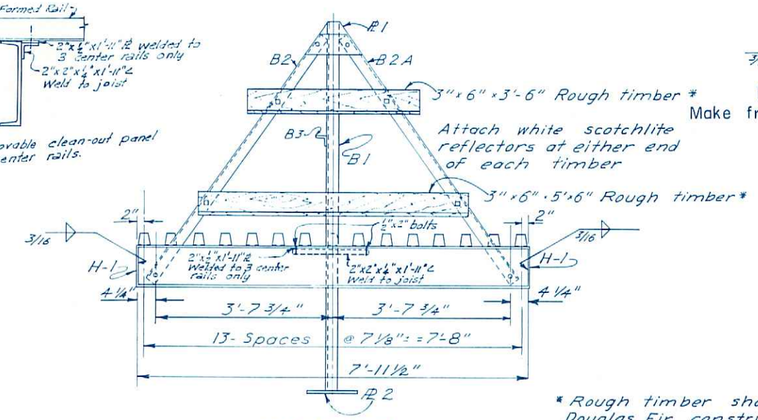
JOIST

For a 14'-0" or 28'-0" rdwy.
Make 8 Fr. 10" Channel 15.3# J-1 H20-S16 Loading
" 2 " " " " J-1A " & U-80 "
" 10" " " " J-1 U-80 "

For a 24'-0" rdwy. Using 2 12'-0 spans
Make 7 Fr. 10" Channel 15.3# J-1 H20-S16 Loading
" 2 " " " " J-1A " & U-80 "
" 9 " " " " J-1 U-80 "

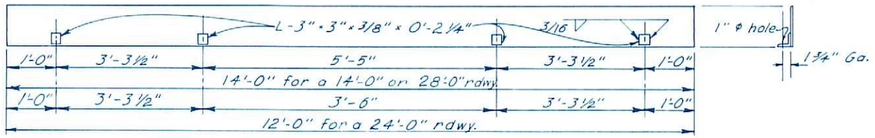


Removable clean-out panel 3 center rails.



SECTION "B-B"
Scale 1/2" = 1'-0"

* Rough timber shall be Douglas Fir construction grade W.C.L.I.B. Rule 15 paragraph 123 b.



HEADER
Make fr. 10" × 1/4" PL & 3" × 3" × 3/8" × 2 1/4" angle MK H1

GENERAL NOTES:

Design
For concrete substructure design see drawing 25-2A.1 For treated timber substructure design see drawing 25-3.

Specifications: Design-AASHO Standard Specs. for Hwy. Bridges 1953. Construction-Standard Specifications FP-61.

Loadings: H20-S16 & U-80 (U-80 is Forest Service designation) Unless the U-80 loading is specified, use H20-S16.

Concrete:
All concrete to be class "A."

Reinforcement Steel:
All bars to be deformed intermediate grade.

Structural Steel:
All structural steel shall conform to current A.S.T.M. A-7 spec.. All welding to conform to current specifications for "Welded Highway and Railway Bridges of the American Welding Society."

Paint:
All structural steel shall be given one shop coat of red lead paint after fabrication is completed. Two field coats of light gray paint in accordance with Section 420 of the Standard Specification FP-61 shall be applied.

Hardware:
All hardware shall be galvanized.

* Estimate based on 4'-0" minimum structure depth.

ESTIMATE

	ITEM	14' ROADWAY	24' ROADWAY	28' ROADWAY
T-C	STRUCTURAL EXC. *	30 cu. yd.	48 cu. yd.	55 cu. yd.
C	REINFORCEMENT STEEL	390 lbs	623 lbs.	730 lbs.
T-C	STRUCTURAL STEEL	3,155 lbs	5,400 lbs.	6,310 lbs.
C	CONCRETE, CLASS "A" *	8 cu. yd.	13 cu. yd.	14 cu. yd.
T	LUMBER	30 f. b. m.	30 f. b. m.	30 f. b. m.
T-C	HARDWARE	As required	As required	As required

NOTE:
"C" = Concrete structure.
"T" = Timber structure.

Pay Item:
The bid Item 563(1), "Cattle Guards" shall be one structure complete as shown hereon including structural excavation, connecting any existing fences and construction of a gate if required by the plans. A wire gate shall be used unless otherwise specified.

Alternate Designs:-
Alternate designs, if equivalent strength, general dimensions and fabricated from steel sections, will be acceptable upon written approval by the engineer.

U. S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS
REGION EIGHT PORTLAND, OREGON

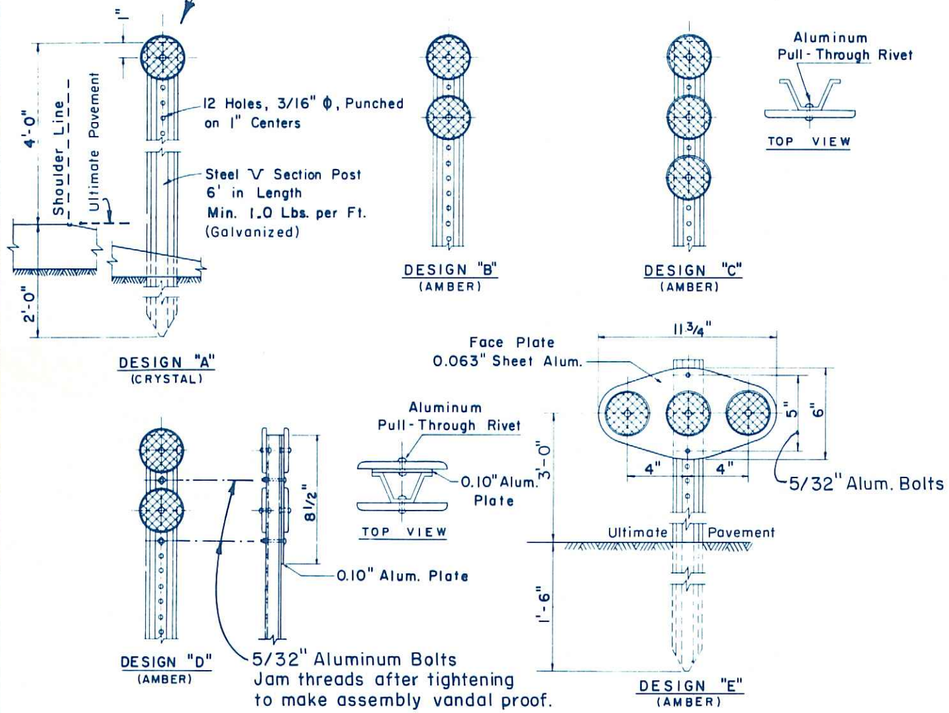
SUPERSTRUCTURE
CATTLE GUARDS 14-24 & 28
FOOT WIDTHS

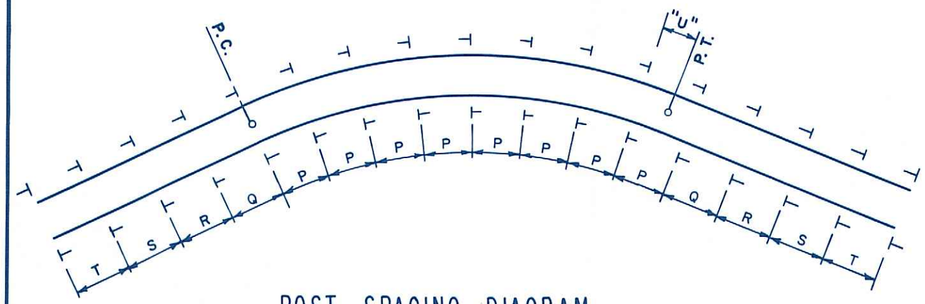
DATE JUNE 1967 SCALE As Shown
SHEET 2 OF 2 SHEETS DRAWING NO. 25-2B.1

DESIGNED
DRAWN William Koester
TRACED
CHECKED M.D. Replogle

DESIGN "F"

Install 0.10" x 6" Aluminum plate as shown for Design "D". Place one crystal reflector on each side of post. See notes on right for installation restrictions.





POST SPACING DIAGRAM
HORIZONTAL CURVES

NOTES

All reflectors shall be of "center mount" type.

Post type shall be as shown in Design "A" for all designs.

Posts shall be driven, using an approved metal driving cap, prior to installation of the reflectors.

Guide Posts shall be placed facing oncoming traffic, 2'-0" clear from edge of shoulder or face of curb, or as shown on the plans.

Post shall be installed behind guard rail posts where there is guard rail installed along the highway.

Unless otherwise specified, Design "A" Guide Posts shall be installed.

Where contract does not provide for the construction of the ultimate pavement, the thickness of base and pavement to be placed later shall be allowed for when establishing the elevation of the Guide Post reflectors.

At sharp hazardous right-hand curves on two-way roadways, Guide Post Design "F" may be placed on the left. All other Guide Posts shall be mono-directional.

IF DISTANCE "U" IS 20 FEET OR MORE, ADD ONE REGULAR SPACE AS SHOWN.

GUIDE POST SPACING ON HORIZONTAL CURVES

DEGREE OF CURVE	SPACE "P" ON CURVE	SPACING ON BOTH APPROACHES			
		Q	R	S	T
LESS THAN 2	264'	264'	NONE	NONE	NONE
2 or 3	100'	180'	264'	NONE	NONE
4 or 5	75'	150'	264'	NONE	NONE
6 or 7	60'	110'	180'	264'	NONE
8 or 9	50'	90'	150'	264'	NONE
10 to 17	40'	70'	120'	264'	NONE
18 to 25	30'	50'	90'	180'	264'
26 PLUS	20'	35'	60'	120'	264'

APPROVED:

R. E. Farbet
FOR FEDERAL PROJECTS ENGINEER

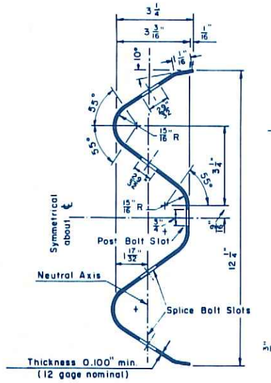
U. S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS
REGION EIGHT PORTLAND, OREGON

STANDARD
GUIDE POSTS
FOR MONTANA PROJECTS

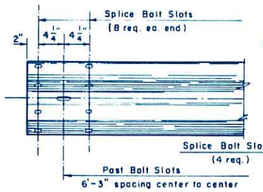
MAY 1967

35-22.4

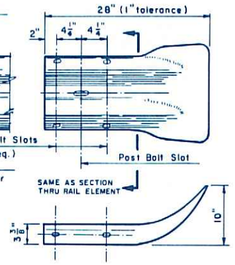
Design by State Highway Commission
Helena, Montana
Drawing No. 90-11 revised 2/1/63



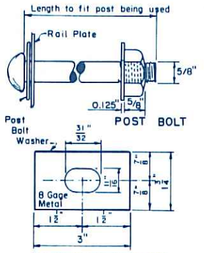
SECTION THRU RAIL ELEMENT



ELEVATION OF RAIL ELEMENT

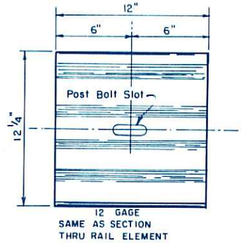


TERMINAL SECTION



POST BOLT

POST BOLT WASHER



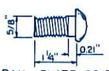
BACK-UP PLATE

At all posts, where guardrail is not spliced, a BACK-UP PLATE shall be placed between the Beam Guardrail and the Treated Timber Block.

NOTE: Point (B) is edge of paved shoulder.

POST BOLT SLOT

SPLICE BOLT SLOT

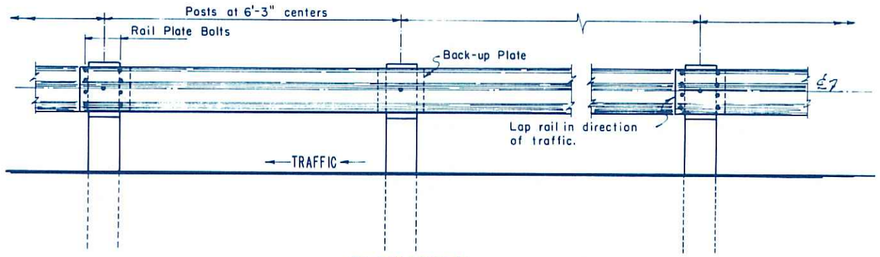


RAIL PLATE BOLT

RAIL MEMBERS
(GALVANIZED)

NOTE: If the rail element is on a curve of radius of 150 feet or less, the rail element shall be factory curved to the specified radius.

A screw head rail bolt without shoulder, but with the same general dimensions may be used in lieu of the rail bolt shown.



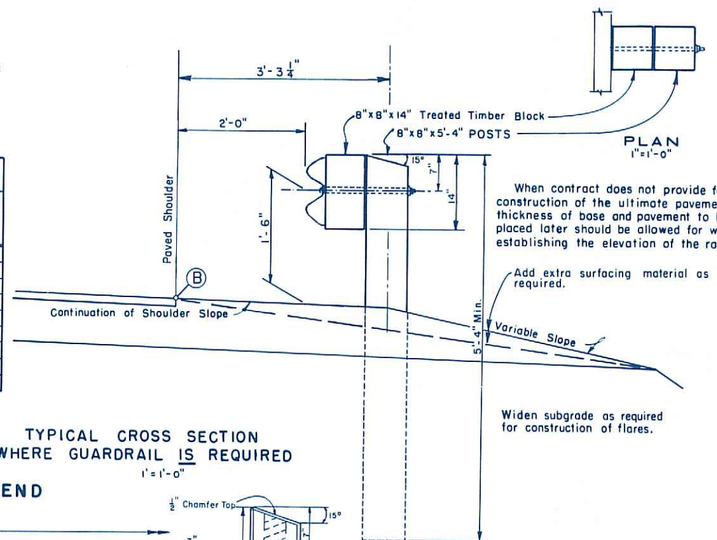
ELEVATION
3/4" = 1'-0"

TABLE A
FOR ALIGNMENT AT BRIDGE END

POST	W_1 in feet 1.00	2.00	3.00	4.00	5.00	6.00	7.00	X feet
	Y_1 in feet							
P_1	0	0	0	0	0	0	0	0
P_2	0.22	0.25	0.24	0.22	0.20	0.19	0.22	12.5
P_3	0.78	1.00	0.96	0.89	0.82	0.75	0.88	25
P_4	1.00	1.75	2.04	2.00	1.84	1.69	1.97	37.5
P_5		2.00	2.76	3.11	3.16	3.00	3.50	50
P_6			3.00	3.78	4.18	4.31	5.03	62.5
P_7				4.00	4.80	5.25	6.12	75
P_8					5.00	5.81	6.78	87.5
P_9						6.00	7.00	100

T_1 in feet					
37.5	50	62.5	75	87.5	100

Offsets W_1 and Y_1 are measured from face of bridge curb, projected, to face of rail.

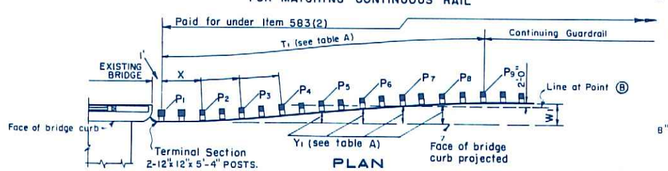


PLAN
1" = 1'-0"

When contract does not provide for the construction of the ultimate pavement, the thickness of base and pavement to be placed later should be allowed for when establishing the elevation of the rail.

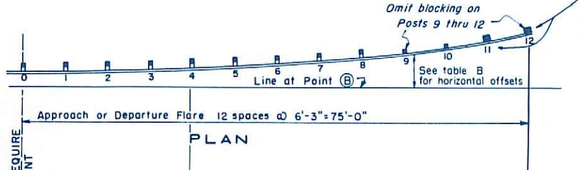
TYPICAL CROSS SECTION WHERE GUARDRAIL IS REQUIRED
1" = 1'-0"

ALIGNMENT AT BRIDGE END
FOR MATCHING CONTINUOUS RAIL



PLAN

All guardrail posts to be set vertically. Guardrail posts to be S4S Treated Timber or Concrete, 8"x8"x5'-4", except as noted.



PLAN

TABLE B
TABLE of HORIZONTAL OFFSETS

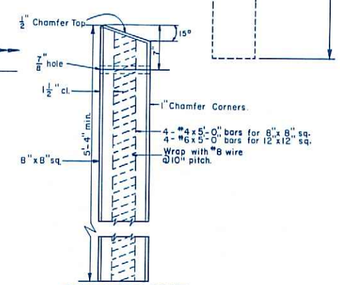
POST Nº	FLARE APPROACH	DEPARTURE
0	2.0'	2.0'
1	2.04	2.03
2	2.17	2.11
3	2.38	2.25
4	2.67	2.45
5	3.04	2.70
6	3.50	3.0
7	4.04	3.36
8	4.68	3.78
9	5.38	4.25
10	6.17	4.78
11	7.05	5.38
12	8.0'	6.0'

Offset is measured from line at point (B) to face of rail.

TABLE C
TABLE of HORIZONTAL OFFSETS—PORTION of TOTAL HORIZONTAL OFFSET

POST	OFFSET	POST	OFFSET	POST	OFFSET	POST	OFFSET	POST	OFFSET
0	0.0	5	0.04	10	0.17	15	0.39	20	0.69
1	0.0	6	0.06	11	0.21	16	0.44	21	0.77
2	0.01	7	0.09	12	0.25	17	0.50	22	0.84
3	0.02	8	0.11	13	0.29	18	0.56	23	0.92
4	0.03	9	0.14	14	0.34	19	0.63	24	1.0

Offset is measured from face of bridge curb, projected, to face of rail.



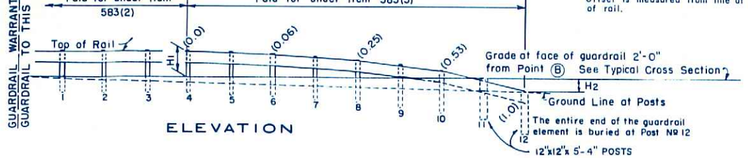
CONCRETE POST

Concrete or Timber posts may be used. However, all posts on any one particular project shall be of the same type and design.

GENERAL NOTES

ORDERING RAIL: RAIL ORDER LENGTHS WILL BE FURNISHED THE CONTRACTOR BY THE RESIDENT ENGINEER. RAIL PANEL LENGTHS 12'-6" OR 25'-0" CENTER TO CENTER OF POST MAY BE USED, EXCEPT THAT ON CURVES OF LESS THAN 300 FOOT RAIL RADIUS AND ON APPROACH AND DEPARTURE FLARES THE 12'-6" RAIL LENGTHS MUST BE USED.

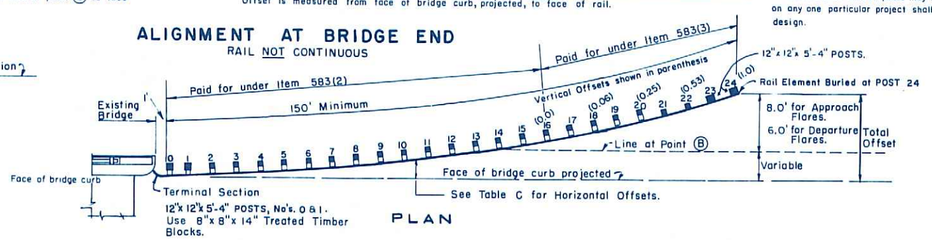
PAINTING: PAINTING OF RAIL OR POST IS NOT REQUIRED.



ELEVATION

The sum of H1 and H2 equals total vertical offset. The portion of the total vertical offset required to erect the guardrail as shown is indicated in parenthesis above posts 4, 6, 8, 10 and adjacent to 12.

ALIGNMENT AT BRIDGE END
RAIL NOT CONTINUOUS



PLAN

DESIGNED
DRAWN
TRACED
CHECKED

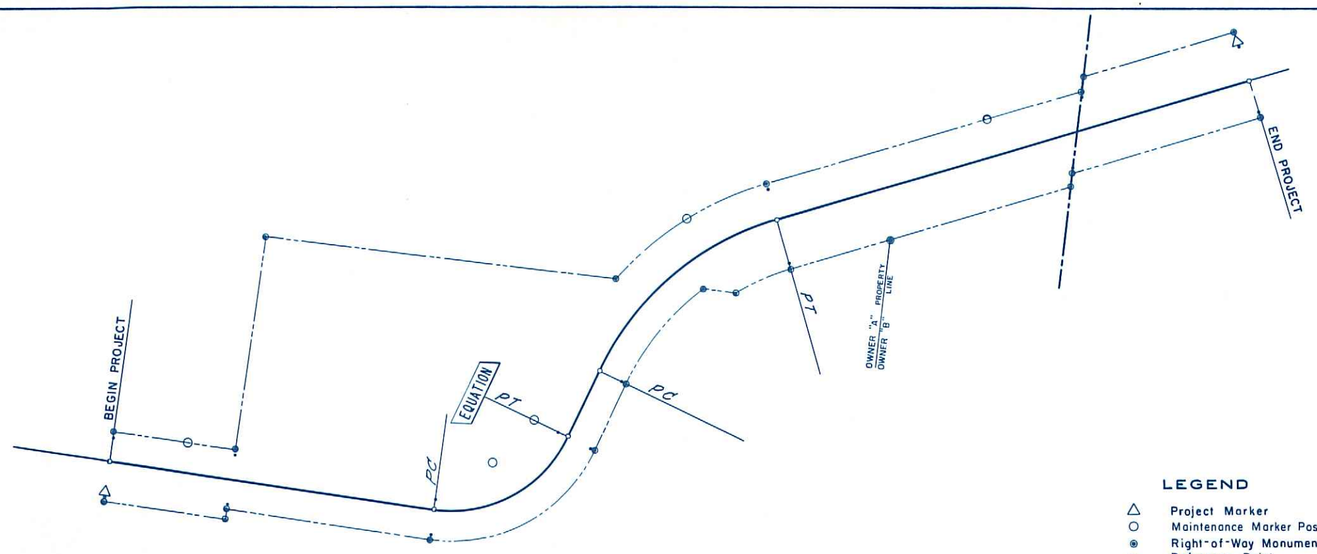
APPROACH and DEPARTURE FLARES

APPROVED: R E Tarbet
FOR FEDERAL PROJECTS ENGINEER

U. S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS
REGION EIGHT PORTLAND, OREGON

STANDARD
BEAM GUARDRAIL
FOR MONTANA PROJECTS

DATE APRIL 1967 SCALE None or As Noted
SHEET 1 OF 1 SHEETS DRAWING NO 34-2.4



TYPICAL PLAN

LEGEND

- △ Project Marker
- ○ Maintenance Marker Post
- ◉ Right-of-Way Monument
- • Reference Point
- Right-of-Way Line
- Principal Property Line
- Centerline - Roadway

GENERAL NOTES

GENERAL:

REFERENCE POINTS, PROJECT MARKERS, MAINTENANCE MARKER POSTS AND RIGHT-OF-WAY MONUMENTS SHALL BE SO PLACED THAT THEY WILL NOT BE DISTURBED BY MAINTENANCE OPERATIONS.

MATERIALS:

CONCRETE: ALL CONCRETE TO BE CLASS "A" AND SHALL BE GIVEN A RUBBED FINISH.

REINFORCEMENT STEEL: SHALL BE INTERMEDIATE GRADE.

ALUMINUM SHEET: ALUMINUM SHEETS CONFORMING TO ALUMINUM ASSOCIATION DESIGNATION 6061-T6 SHALL BE USED. THE THICKNESS OF ALUMINUM SHEET SHALL BE 0.080 INCHES.

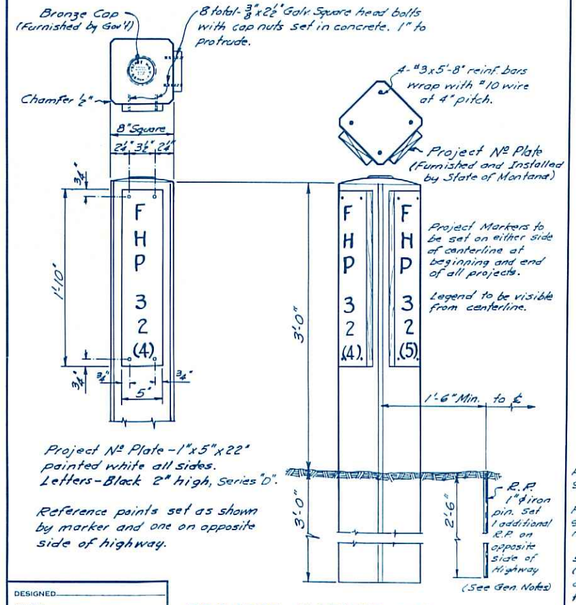
PLYWOOD: HIGH DENSITY DOUGLAS FIR PLYWOOD CONFORMING TO THE REQUIREMENTS AS SET FORTH IN "COMMERCIAL STANDARD CS45 FOR DOUGLAS FIR PLYWOOD" PUBLISHED BY THE U.S. DEPARTMENT OF COMMERCE SHALL BE USED. THE PLYWOOD SHALL BE B-B HIGH-DENSITY OVERLAY, 60/40 WITH AMBER OVERLAY ON BOTH SIDES AND OF 5/8 INCH THICKNESS.

REFERENCE POINTS:

REFERENCE POINTS ARE TO BE SET ON BOTH SIDES OF THE CENTERLINE OF THE HIGHWAY AT THE BEGINNING AND ENDING OF ALL PROJECTS, AT ALL PCs, PTs, ANGLE POINTS AND AT SUCH POINTS AS MAY BE DESIRABLE ON LONG TANGENTS. WHEN IT IS UNDESIRABLE TO USE CONCRETE STATION MONUMENTS (I.E. DUE TO INTERSECTING ROADWAY; LOT OR BLOCK LINES IN A TOWN) REFERENCE POINTS SHALL BE PLACED.

LETTERS:

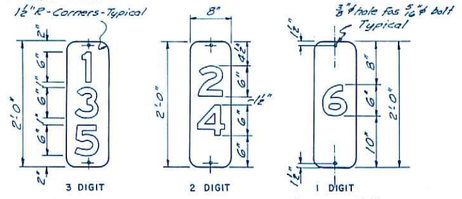
LETTERS, NUMERALS AND LEGENDS SHOWN ON THE PLAN AND INDICATED BY A SERIES "D" OR "E" SHALL CONFORM TO THE "STANDARD ALPHABETS FOR HIGHWAY SIGNS" PUBLISHED BY THE BUREAU OF PUBLIC ROADS, 1961. OTHER LETTERS, NUMERALS AND LEGENDS SHALL CONFORM TO SIZES INDICATED AND CURRENT CONSTRUCTION PRACTICES.



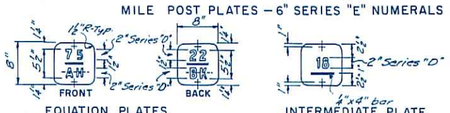
DESIGNED
DRAWN
TRACED
CHECKED

PROJECT MARKER and REFERENCE POINTS

Mile posts and supplemental plates will have white reflectorized legend (non-removable copy) on a green reflectorized background. Plates may be fabricated from aluminum sheet or high density plywood. (See General Notes.)



MILE POST PLATES - 6" SERIES "E" NUMERALS



EQUATION PLATES

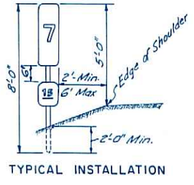
INTERMEDIATE PLATE

2" SERIES "D" LEGEND

When an equation is posted, a supplementary plate will be placed below the standard mile post giving the decimal of a mile to the nearest hundredth.

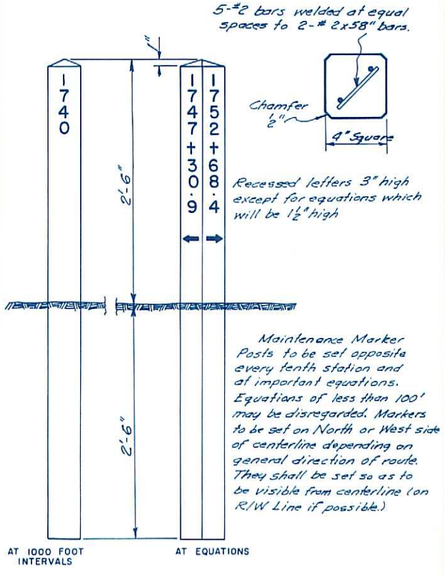
When an intermediate point is posted, a supplementary plate will be placed below the standard mile post giving the decimal of a mile at that point to the nearest hundredth.

Bolts shall be galvanized or cadmium plated steel or aluminum. Galvanized Steel "U" Posts (Nominal Weight 2 lbs. per foot) with 36-⅜" holes at 1" centers starting 1" below the top shall be furnished.

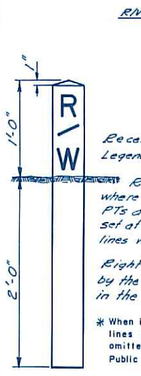


TYPICAL INSTALLATION

MILEPOSTS



MAINTENANCE MARKER POST



Recessed letters 3" high
Legend to face centerline.

Right-of-way Monuments will be set at all points where the width of the right-of-way changes, at PCs and PTs and angle points. In addition, monuments shall be set at intersections of section lines and any other property lines where ownership changes.*

Right-of-way Monuments are not to be ordered by the contractor until the actual number is verified in the field by the engineer.

* When it seems undesirable to use concrete monuments, as on block lines in some parts of a town, concrete monuments will be omitted and iron pipes or pins will be placed by Bureau of Public Roads forces.

RIGHT-OF-WAY MONUMENT

U. S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS
REGION EIGHT PORTLAND, OREGON

STANDARD
RIGHT-OF-WAY MONUMENTS, PROJECT & MAINTENANCE MARKERS, and REFERENCE POINTS
FOR MONTANA PROJECTS

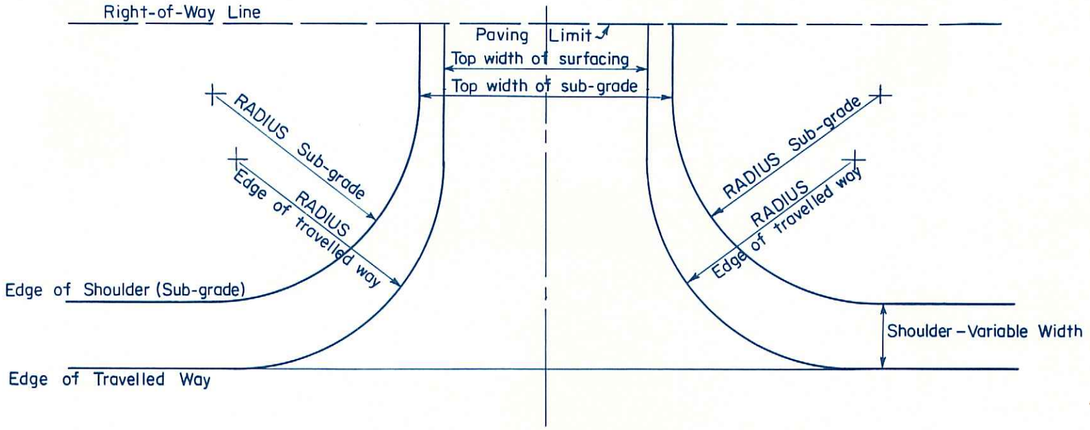
APPROVED: R E Jarlet
FOR FEDERAL PROJECTS ENGINEER

DATE MAY 1967 SCALE NONE

SHEET 1 OF 1 SHEETS DRAWING NO. 60-3.3

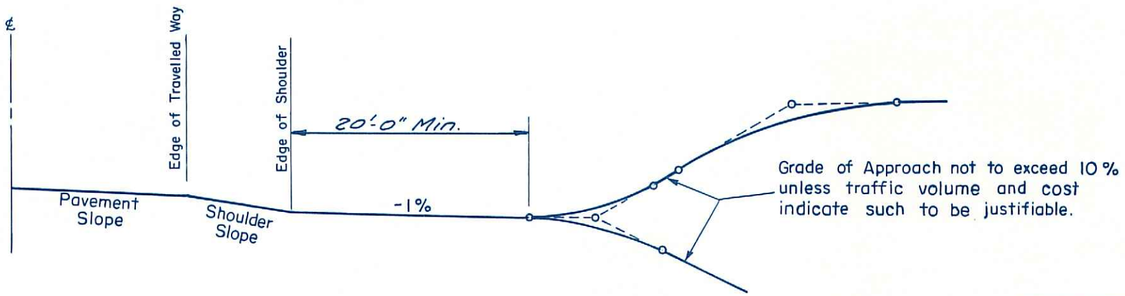
THE WIDTHS FOR THE APPROACHES SHALL BE THE FOLLOWING :

	SPECIFIED WIDTH Top Width of Surfacing	SPECIFIED WIDTH Top Width of Sub-Grade	RADIUS Edge of Travelled Way	RADIUS Sub-Grade
TYPE A	12'	24'	20'	20'
TYPE B	16'	28'	20'	20'
TYPE C	20'	32'	20'	20'
TYPE D	24'	36'	25'	25'



APPROACHES TO PUBLIC ROADS (COUNTY, STATE AND MUNICIPALITIES), AND PUBLIC OR PRIVATE ROADS USED FOR COMMERCIAL PURPOSES SHALL BE FINISHED WITH THE SAME TREATMENT AS SHOWN FOR THE ADJACENT ROADBED.

OTHER APPROACHES SHALL BE FINISHED WITH UNTREATED BASE TO THE SAME THICKNESS AS SHOWN FOR THE ADJACENT ROADBED. THE WEARING SURFACE SHALL BE OF THE SAME TYPE AND THICKNESS AS SHOWN FOR THE ADJACENT ROADBED, BUT NOT TO EXCEED 1-1/2 INCHES.



APPROVED

FEDERAL PROJECTS ENGINEER

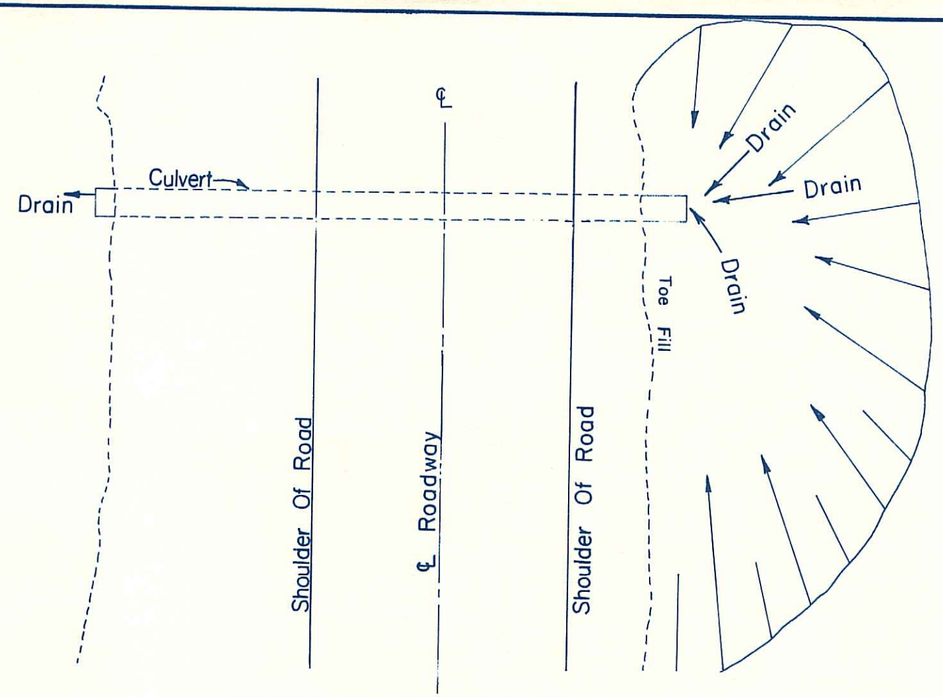
U. S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS
REGION EIGHT PORTLAND OREGON

STANDARD
ROAD APPROACHES
MONTANA FOREST HIGHWAY PROJECTS

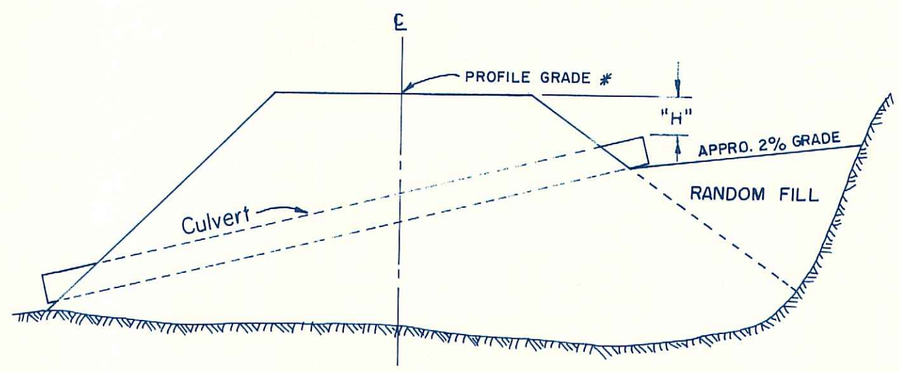
DATE: MAY 1967

DRAWING NO 60-7.4

U. S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION BUREAU OF PUBLIC ROADS					
STATE	FOREST	ROUTE NO.	SECTION	SHEET NO.	TOTAL SHEET



PLAN OF RANDOM FILL



TYPICAL SECTION FOR RANDOM FILL

Including Method Of Culvert Installation

* Profile Grade is the Ultimate Finished Grade.

TABLE FOR PLACEMENT OF PIPE INLET IN RANDOM FILL AREA

MINIMUM "H"	PIPE SIZE
2.8'	18"
3.0'	24"
3.3'	30"
3.5'	36"
3.8'	42"
4.0'	48"
4.3'	54"
4.5'	60"
4.8'	66"
5.0'	72"

APPROVED

R. E. Farhest

FOR FEDERAL PROJECTS ENGINEER

U. S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS REGION NO. 8

TYPICAL SECTION FOR RANDOM FILL

DATE: MAY 12, 1967 SCALE: NONE

SHEET 1 OF 1 SHEETS DRWG. NO. 60-16