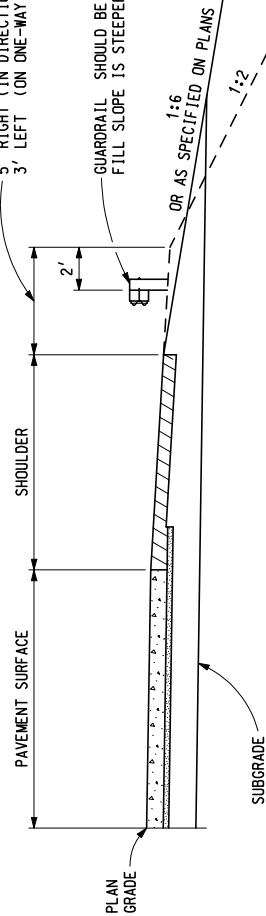


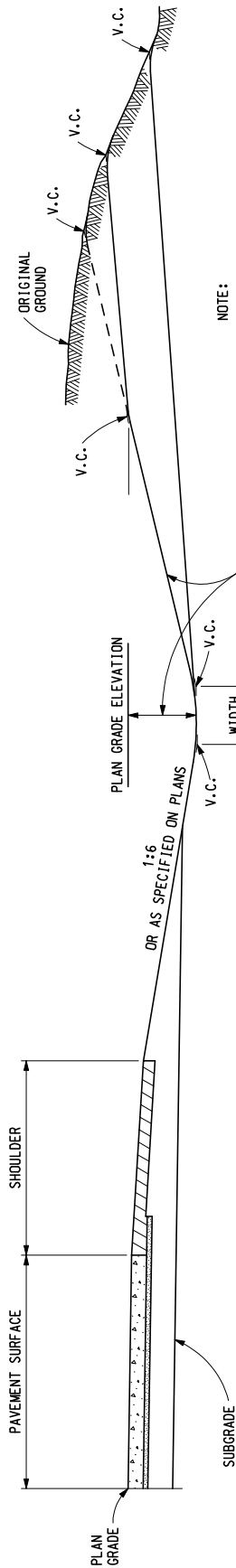
5' RIGHT (IN DIRECTION OF TRAFFIC)  
3' LEFT (ON ONE-WAY ROADWAYS)

GUARDRAIL SHOULD BE PLACED WHEN  
FILL SLOPE IS STEEPER THAN 1:3



ROUND BOTTOM DITCH WIDTH, ELEVATION AND  
BACKSLOPE AS SPECIFIED ON PLANS.  
(TO APPLY AT TOE OF FILL SLOPES WHERE  
CALLED FOR ON PLANS)

**FILL SECTION**

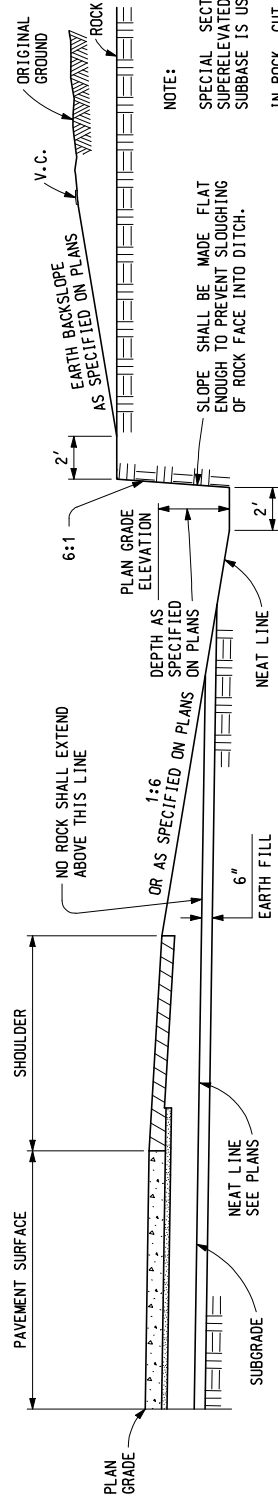


NOTE:

ADDITIONAL BORROW MAY BE OBTAINED BY  
MOVING THE DITCH OUT OR BY INCREASING THE  
DITCH WIDTH AS DIRECTED BY THE ENGINEER

ROUND BOTTOM DITCH WIDTH,  
ELEVATION AND BACKSLOPE  
AS SPECIFIED ON PLANS.

**CUT - OFF OR SIDE BORROW SECTION**



NOTE:

SPECIAL SECTIONS ARE NECESSARY ON  
SUPERELEVATED CURVES AND WHERE DEEP  
SUBBASE IS USED.

SLOPE SHALL BE MADE FLAT  
ENOUGH TO PREVENT SLOUGHING  
OF ROCK FACE INTO DITCH.

IN ROCK CUT SECTIONS, THE NEED FOR  
A CONCRETE BARRIER OR OTHER TYPE OF  
PROTECTION SHOULD BE EVALUATED.

**ROCK CUT SECTION**

NOTE:

ROCK EXCAVATION WILL BE PAID FOR  
TO THE NEAT LINE SHOWN.



*Brandon D. Orr*  
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DEPARTMENT DIRECTOR  
Gloria J. Jeff

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

**GRADING CROSS-SECTIONS**

PREPARED BY  
DESIGN  
SUPPORT AREA

*Calvin Roberts*  
ENGINEER OF MAINTENANCE

*James D. Culp*  
ENGINEER OF TRAFFIC AND SAFETY

DRAWN BY: B.L.T.  
CHECKED BY: W.K.P.

*James D. Culp*  
ENGINEER OF TRAFFIC AND SAFETY

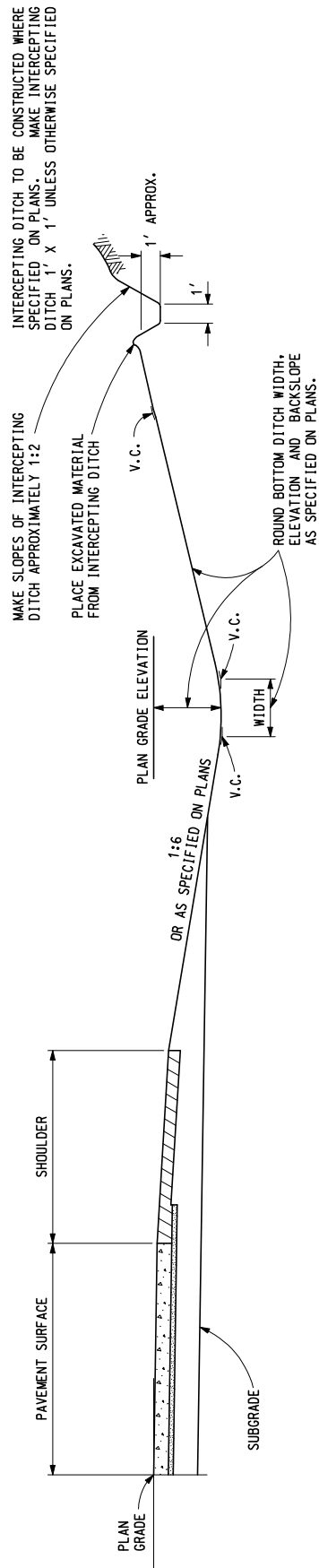
*John P. ...*  
ENGINEER OF DEVELOPMENT

11-14-2003  
F.H.W.A. APPROVAL

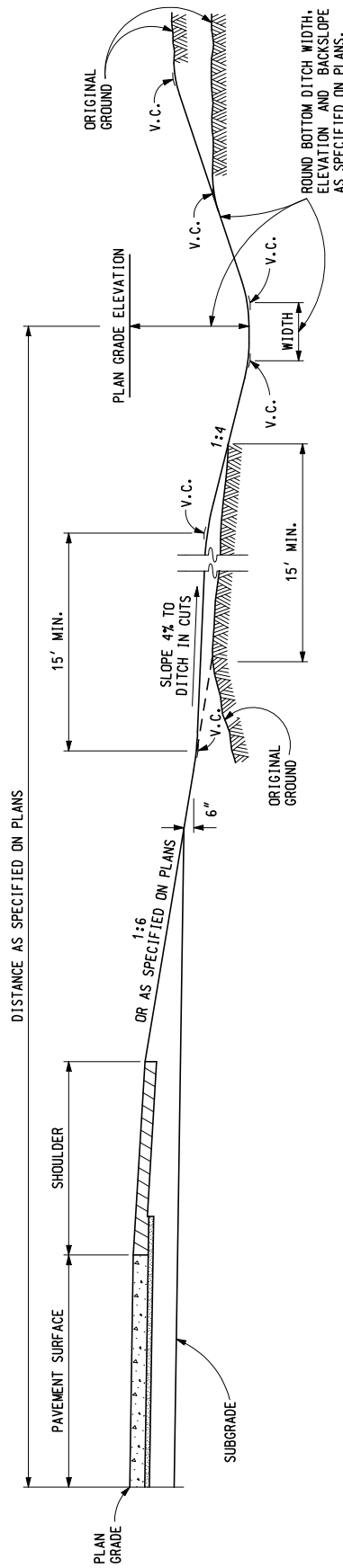
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PLAN DATE

**R-105-D**

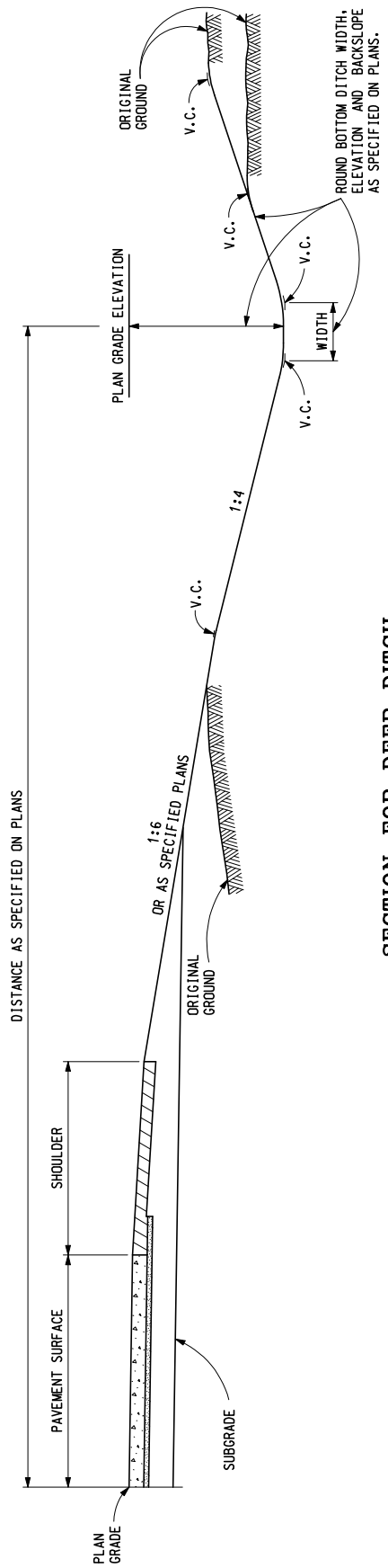
SHEET  
1 OF 6



**ROUND BOTTOM DITCH SECTION**



**BERM OR SWAMP DITCH SECTION**

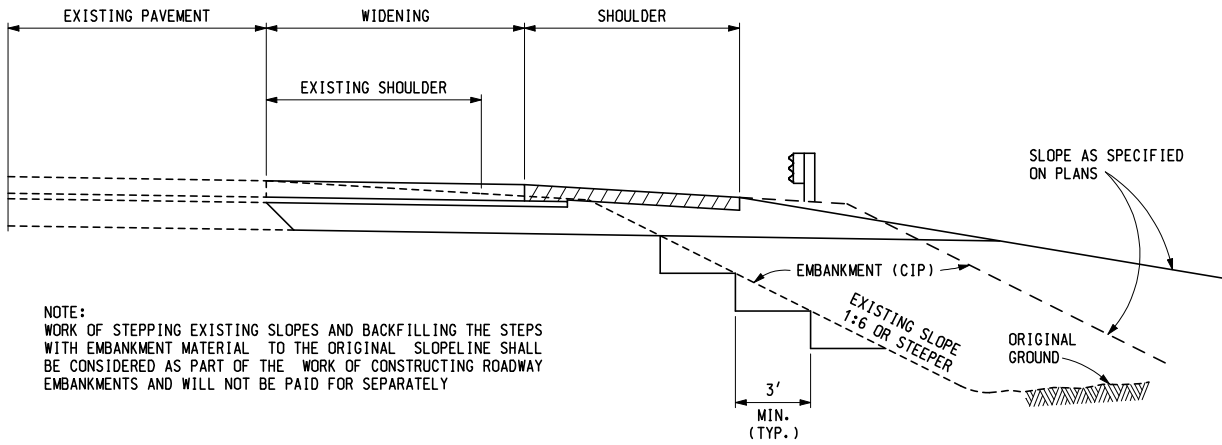


**SECTION FOR DEEP DITCH**

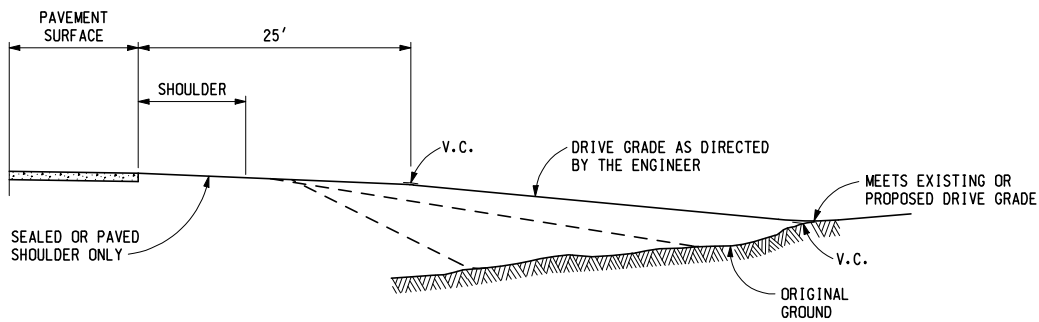
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**GRADING CROSS-SECTIONS**

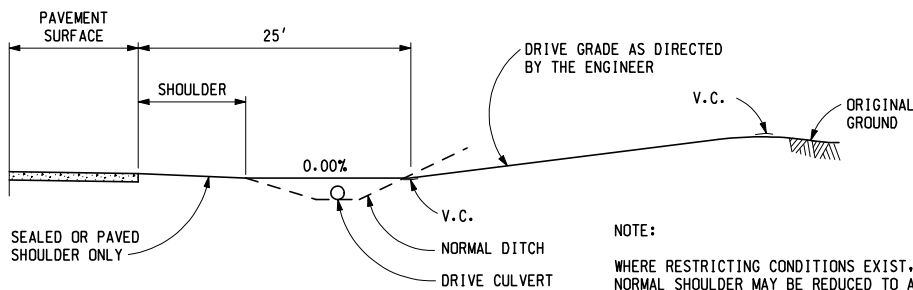
11-14-2003 F.H.W.A. APPROVAL	6-19-2002 PLAN DATE	R-105-D	SHEET 2 OF 6
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**ADDING EMBANKMENT TO EXISTING SLOPES**



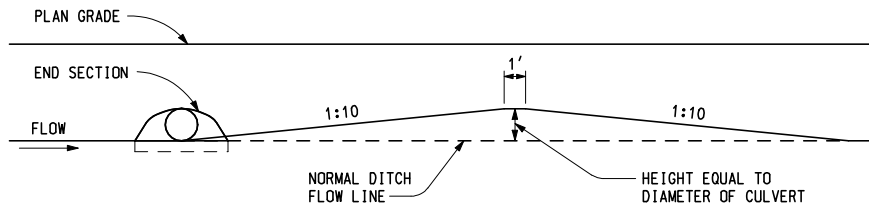
**GRADING OF DRIVES IN FILL SECTIONS**



NOTE:

WHERE RESTRICTING CONDITIONS EXIST, THE FLAT AREA DISTANCE OUTSIDE THE NORMAL SHOULDER MAY BE REDUCED TO A MINIMUM OF 4' VERTICAL CURVE. IN ALL CASES THE NORMAL FULL WIDTH SHOULDER SHALL BE MAINTAINED AND THE FLAT AREA SHOULD BE MAXIMIZED.

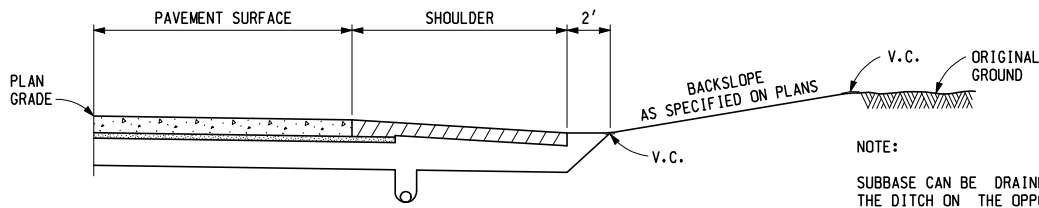
**GRADING OF DRIVES IN CUT SECTIONS**



**DIKE IN DITCH SECTION**

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BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

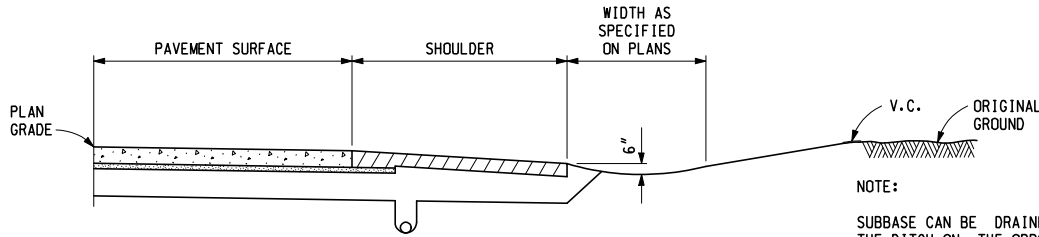
**GRADING CROSS-SECTIONS**



NOTE:

SUBBASE CAN BE DRAINED WITH UNDER DRAIN OR ONE-WAY TO THE DITCH ON THE OPPOSITE SIDE. SHORT SECTIONS CAN BE DRAINED LONGITUDINALLY. SEE STANDARD PLAN R-80-SERIES.

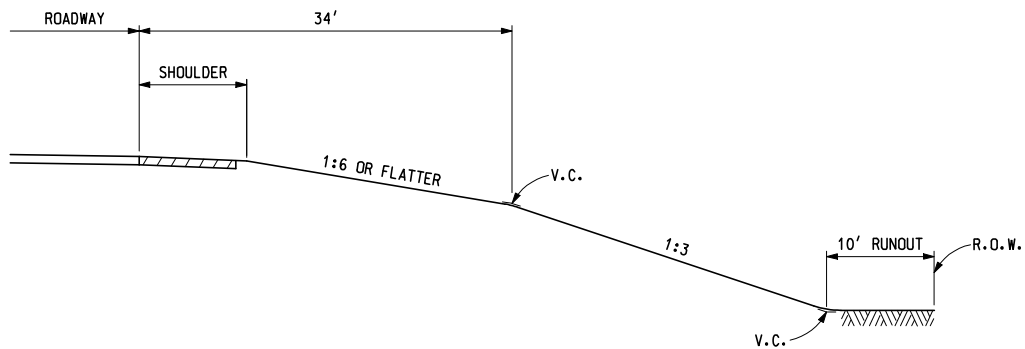
**NO DITCH SECTION**



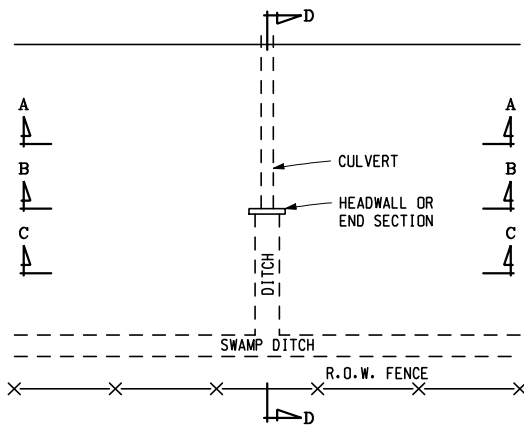
NOTE:

SUBBASE CAN BE DRAINED WITH UNDER DRAIN OR ONE-WAY TO THE DITCH ON THE OPPOSITE SIDE. SHORT SECTIONS CAN BE DRAINED LONGITUDINALLY. SEE STANDARD PLAN R-80-SERIES.

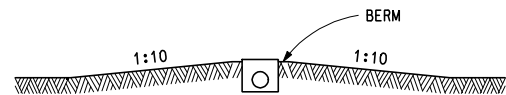
**VALLEY DITCH SECTION**



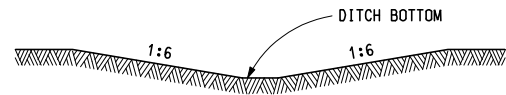
**BARN ROOF FILL SECTION**  
(TO APPLY ON TANGENT SECTIONS ONLY)



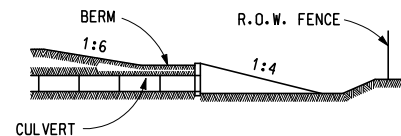
SECTION A - A



SECTION B - B



SECTION C - C

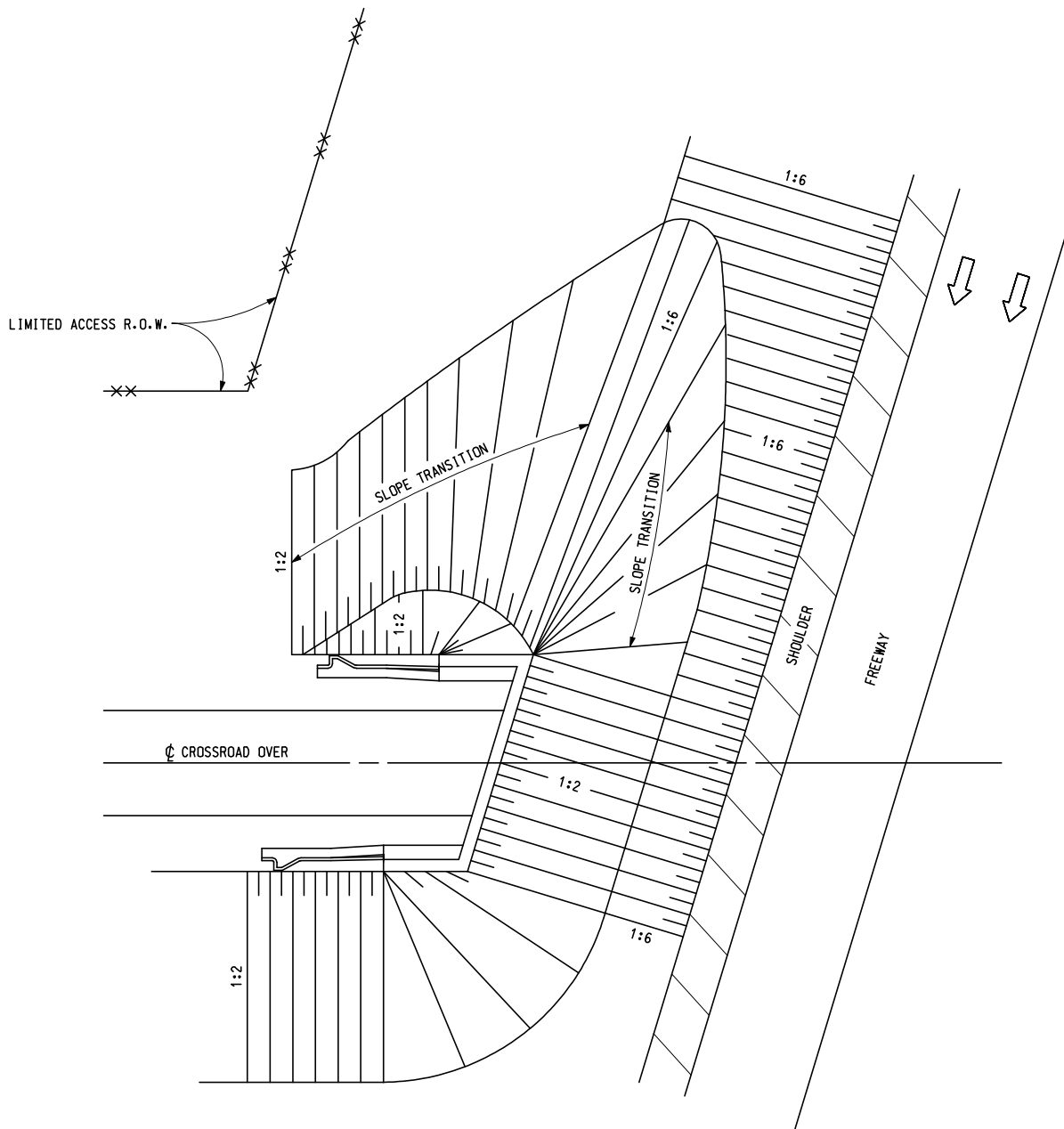


SECTION D - D

**OUTLET CULVERT IN BERM OR SWAMP DITCH SECTION**

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**GRADING CROSS-SECTIONS**



**NOTE:**

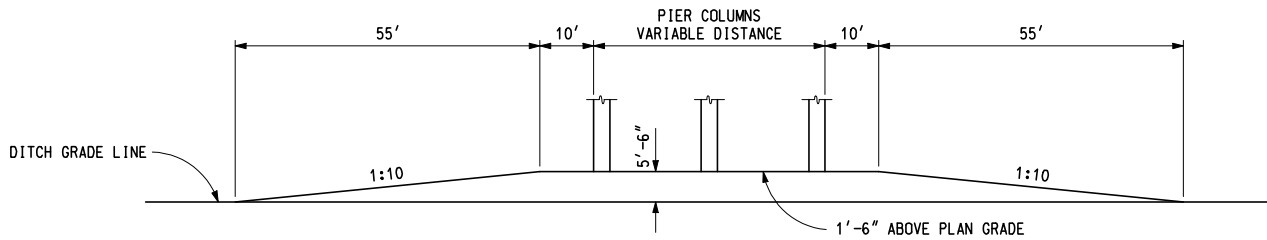
THE 1:6 SLOPE FACING FREEWAY TRAFFIC SHOULD BE USED ON ALL NEW CONSTRUCTION UNLESS THE DISTANCE FROM THE EDGE OF THE NEAREST FREEWAY THROUGH LANE TO THE TOE OF THE 1:2 SLOPE UNDER THE BRIDGE EXCEEDS THE CLEAR ZONE.

**GRADING DETAILS FOR FLATTENING LONG SLOPE AT BRIDGE APPROACH FILLS FACING ONCOMING TRAFFIC**

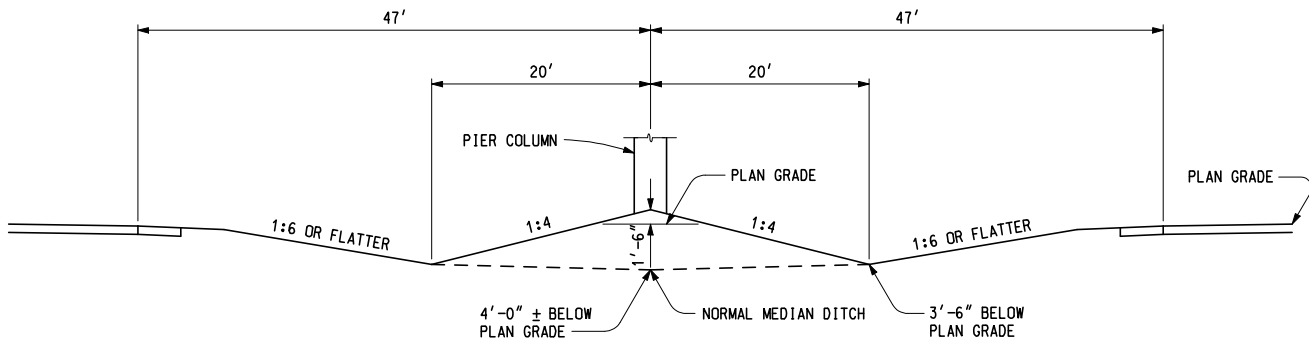
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**GRADING CROSS-SECTIONS**

11-14-2003 F.H.W.A. APPROVAL	6-19-2002 PLAN DATE	R-105-D	SHEET 5 OF 6
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LONGITUDINAL SECTION ALONG MEDIAN



TRANSVERSE SECTION AT STRUCTURES

TYPICAL GRADING DETAILS AROUND PIERS FOR MEDIANS 94' OR WIDER

NOTES:

THIS STANDARD APPLIES PRINCIPALLY FOR VARIOUS DITCH TYPES AND FOR THE ROUNDING OF SLOPES. THE SUBGRADE WILL BE SPECIFIED ON THE PLANS. SLOPES OTHER THAN THOSE SPECIFIED ON THIS PLAN MAY BE USED WHEN THEY ARE SPECIFIED ON THE PROJECT PLANS. IN THE EVENT OF A DISCREPANCY BETWEEN THIS PLAN AND THE PROJECT PLANS, THE PROJECT PLANS WILL GOVERN.

SEE CURRENT STANDARD PLAN R-107-SERIES FOR SUPERELEVATED SECTIONS.

DITCHES SHOULD ALWAYS BE DEEP ENOUGH TO GRAVITY DRAIN THE SUBBASE, WHERE SUBBASE IS USED.

THE SUBGRADE SHOULD BE SLOPED TO DRAIN TO THE OUTSIDE DITCH IF THE MEDIAN ON DUAL ROADWAYS IS OF INSUFFICIENT WIDTH TO ALLOW DITCHES DEEP ENOUGH TO DRAIN THE SUBBASE.

THE TOP OF BACKSLOPES AND THE BOTTOM OF FILL SLOPES SHALL BE ROUNDED WITH VERTICAL CURVES AS FOLLOWS, PROVIDED TREES OR OTHER RESTRICTIONS DO NOT INTERFERE:

1. USE 4' VERTICAL CURVE ON CUTS OR FILLS LESS THAN 4'.
2. USE 8' TO A MAXIMUM 16' VERTICAL CURVE ON CUTS OR FILLS 4' TO 16'.
3. USE A MAXIMUM 16' VERTICAL CURVE ON CUTS OR FILLS GREATER THAN 16'.

ALL TRANSITIONS IN LENGTH OF VERTICAL CURVES SHALL BE GRADUAL AND GRADED TO PRESENT A UNIFORM AND ATTRACTIVE APPEARANCE.

WHEN 1:6 OR FLATTER SLOPES CANNOT BE CONSTRUCTED WITHIN THE EXISTING R.O.W., THE BARN ROOF FILL SECTION MAY BE USED TO ELIMINATE THE NEED FOR ADDITIONAL R.O.W.. THEY WILL BE USED ONLY WHERE SPECIFIED ON THE PLANS.

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

GRADING CROSS-SECTIONS

11-14-2003  
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6-19-2002  
PLAN DATE

R-105-D

SHEET  
6 OF 6