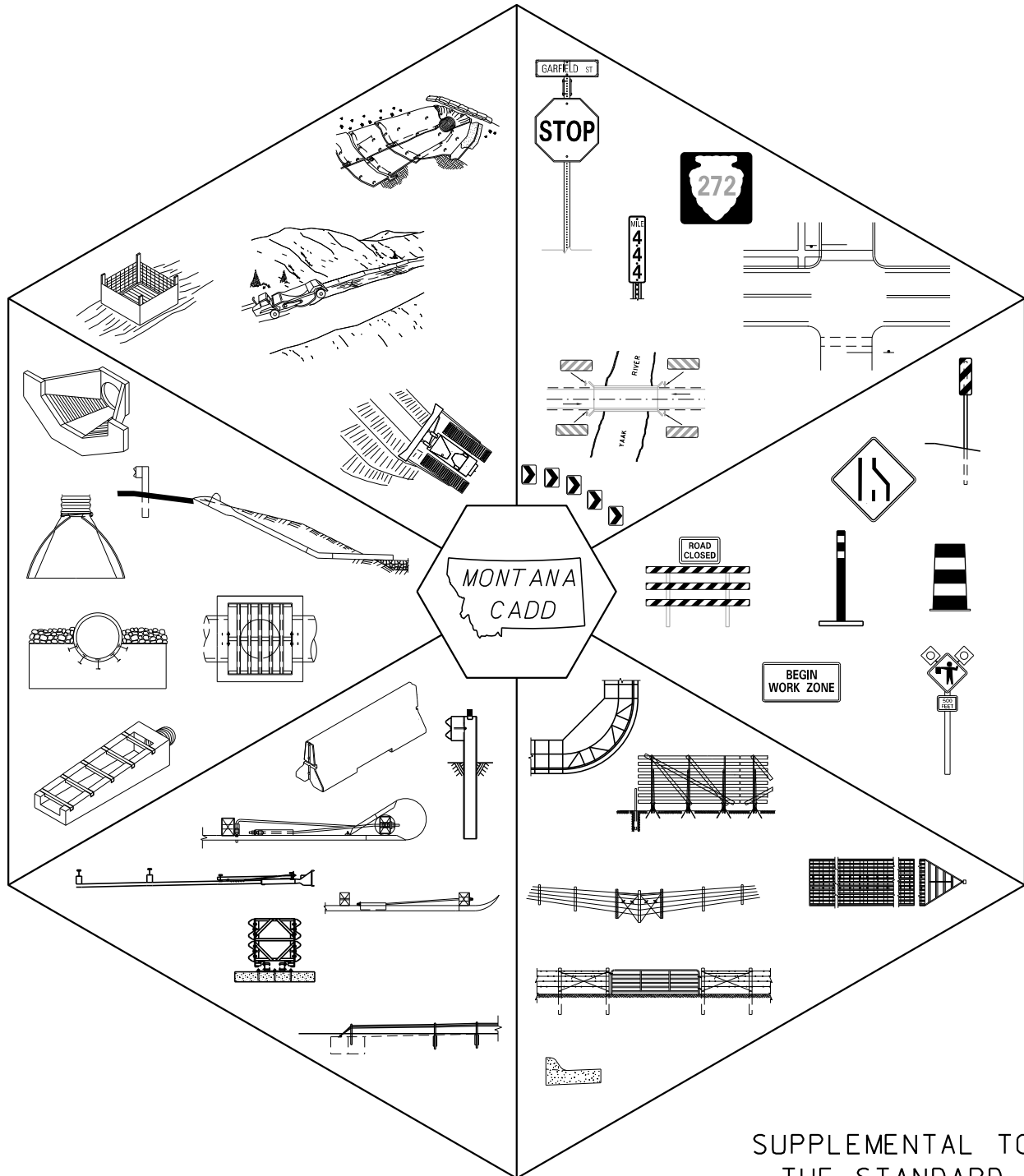


DETAILED DRAWINGS

SUPPLEMENT TO
2005 ENGLISH EDITION
EFFECTIVE: DECEMBER 2011



DETAILED DRAWINGS

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EFFECTIVE: MAY 2011**

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&	AND	CONC.	CONCRETE
@	AT	COND. (TEL.)	CONDUIT (SPECIFY TYPE)
		CONN.	CONNECTION
		CONST.	CONSTRUCTION
A. A. D. T.	ANNUAL AVERAGE DAILY TRAFFIC	CONST. PMT.	CONSTRUCTION PERMIT
AASHTO	AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS	COR.	CORNER
AB.	ABRUPT	CORR.	CORRECTED OR CORRUGATION
A. C.	ALUMINUM CAP OR ASPHALT CEMENT	COV.	COVER
ADD. EXC.	ADDITIONAL EXCAVATION	C. P.	CATCH POINT
ADJ.	ADJUSTED	CR.	CRUSHED OR CREEK
A. D. T.	AVERAGE DAILY TRAFFIC	CRS.	COURSE
AGC	ASSOCIATED GENERAL CONTRACTORS OF AMERICA	C. S. OR CS	CURVE TO SPIRAL
AGG.	AGGREGATE	C. S. F. OR CSF	COMBINATION SCALE FACTOR
AH.	AHEAD	C. S. P. OR CSP	CORRUGATED STEEL PIPE
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE	C. S. P. A OR CSPA	CORRUGATED STEEL PIPE ARCH
APP.	APPROACH	CT.	COURT
APPL.	APPLICATION	C. T. B. OR CTB	CEMENT TREATED BASE
APPROX.	APPROXIMATE	CTR.	CENTER
ARTBA	AMERICAN ROAD AND TRANSPORTATION BUILDERS ASSOCIATION	C. T. S. OR CTS	CRUSHED TOP SURFACING
ASPH.	ASPHALT	CULV.	CULVERT
ASTM	AMERICAN SOCIETY FOR TESTING & MATERIALS	C. Y.	CUBIC YARD
AVE.	AVENUE		
AVG.	AVERAGE	D	DEGREE OF CURVATURE OR DISTRIBUTION OF TRAFFIC
AWS	AMERICAN WELDING SOCIETY	DBL.	DOUBLE
AZ.	AZIMUTH	D _c	DEGREE OF CURVATURE (WITH SPIRALS)
		D. D.	DOWN DRAIN
BAL.	BALANCE	DE	DIFFERENCE IN ELEVATION
BBL. OR BBLs.	BARREL OR BARRELS	DEFL.	DEFLECTION
B. C.	BRASS CAP	DESC.	DESCRIPTION
B. C. R.	BEGIN CURB RETURN	DEST.	DESTROYED
B. E. OR BE	BRIDGE END	DET.	DETOUR OR DETAIL
BEG.	BEGIN	DETC.	DETECTOR
BIT.	BITUMINOUS OR BITUMEN	D. H.	DRILL HOLE
BK.	BACK OR BANK	D. H. V.	DESIGN HOURLY VOLUME
BLDG.	BUILDING	D. I.	DROP INLET
BLK.	BLOCK	DIA.	DIAMETER
B. L. M. OR BLM	U. S. BUREAU OF LAND MANAGEMENT	DIST.	DISTANCE OR DISTRICT
BLVD.	BOULEVARD	DN.	DOWN
B. M.	BENCH MARK	DP.	DEEP
BNDRY.	BOUNDARY	DR.	DRAIN OR DRIVE
BOT.	BOTTOM	DT.	DITCH
BR.	BRIDGE	DTL.	DETAIL OR DETAILED
B. R.	BASE OF RAIL	DWG.	DRAWING
BRG.	BEARING	DY.	DAYLIGHT
B. S. OR BS	BACKSIGHT		
B. S. T.	BITUMINOUS SURFACE TREATMENT	E	EAST OR EXTERNAL DISTANCE
B. W. FE.	BARBED WIRE FENCE	EASE. OR ESMT.	EASEMENT
		E. B. OR EB	EASTBOUND
C	CUT	E. C. R.	END CURB RETURN
C/A	CONTROL OF ACCESS	E. D. M. OR EDM	ELECTRONIC DISTANCE MEASUREMENT OR MEASURER
C. A. C. OR CAC	CRUSHED AGGREGATE COURSE	E. G.	EDGE OF GUTTER
CALC.	CALCULATED	ELEV. OR EL.	ELEVATION
C. A. P. OR CAP	CORRUGATED ALUMINUM PIPE	ELONG.	ELONGATED
CATV	CABLE TV	ELY.	EASTERLY
CB.	CURB	EMB.	EMBANKMENT
C. B.	CATCH BASIN	EMUL.	EMULSIFIED
C. B. W.	CONCRETE BLOCK WALL	E. O.	EDGE OF OIL
C. C.	CLOSING CORNER	E. P.	EDGE OF PAVEMENT
CDTN.	CONDITION	EQ.	EQUATION
CEM.	CEMENT	E _s	EXTERNAL DISTANCE (WITH SPIRALS)
C&G	CURB & GUTTER	E. S.	EDGE OF SHOULDER
CH.	CHANNEL OR CHAIN	E. T. W. OR ETW	EDGE OF TRAVELED WAY
CH. CH.	CHANNEL CHANGE	EW.	END WALL
CHD.	CHORD	EX.	EXISTING
CHIS. "x"	CHISELED CROSS	EXC.	EXCAVATION
C. I.	CURB INLET	EXT.	EXTENSION
CIR.	CIRCLE	EXWY.	EXPRESSWAY
CL.	CLASS OR CLEARANCE		
CL-4F, 5F	CHAIN LINK FENCE (W/ HEIGHT - ENGLISH)		
CL-1.2F, 1.5F	CHAIN LINK FENCE (W/ HEIGHT - METRIC)		
C/L OR ☿	CENTERLINE		
C. M. P. OR CMP	CORRUGATED METAL PIPE		
C. N.	CONCRETE NAIL		
CO.	COUNTY OR COMPANY		
C. O.	CLEAN OUT		
COMP.	COMPACTION		

DETAILED DRAWING


REFERENCE	DWG. NO.
STANDARD SPEC.	101-05
SECTION 101	

ABBREVIATIONS

EFFECTIVE: FEBRUARY 2005

F	FILL
F. A.	FEDERAL AID
F. C.	FLOOD CONTROL
FD.	FOUND
FDN.	FOUNDATION
FE.	FENCE
FERT.	FERTILIZER
F.E.T.S. OR FETS	FLARED END TERMINAL SECTION
F.G. OR FG	FINISHED GRADE OR FRONT OF GUTTER
F.G.S.	FINISHED GRADE STAKE
F.H.	FIRE HYDRANT
FHWA	FEDERAL HIGHWAY ADMINISTRATION
FIN.	FINISH
FL.	FLUSH
F.L. OR FL	FLOW LINE
F.O. OR FO	FIBER OPTIC CABLE
F.P.	FENCE POST
FR. OR FR	FRONTAGE
FR. RD.	FRONTAGE ROAD
F.S. OR FS	FORESIGHT
FT.	FOOT OR FEET
FTG.	FOOTING
FUT.	FUTURE
FWY.	FREEWAY
g	GRAM
G	GRADING
GA.	GAGE
GAL.	GALLON
GALV.	GALVANIZED
GAR.	GARAGE
GEOD.	GEODETIC
G.L.	GAS LINE
G.L.O.	GENERAL LAND OFFICE
G.P.S. OR GPS	GLOBAL POSITIONING SYSTEM
GR.	GRADE
G.R.	GUARDRAIL
GRD	GRID
GRND.	GROUND
GR.SEP.	GRADE SEPARATION
G.S.	GRAVEL SURFACING
G.S.P. OR GSP	GALVANIZED STEEL PIPE
GTR.	GUTTER
G.V.	GAS VALVE
ha	HECTARE
HDWL.	HEADWALL
HG.	HEADGATE
H.I. OR HI	HEIGHT OF INSTRUMENT
HO.	HOUSE
HOR.	HORIZONTAL
H.P.	HINGE POINT
HT.	HEIGHT
H&T	HUB & TACK
H.W.	HIGH WATER
HWY.	HIGHWAY
I	INTERSTATE
I.C.	INCIDENTAL CONSTRUCTION
I.D.	INSIDE DIAMETER
I.E.	INVERT ELEVATION
IN.	INCH
INC.	INCORPORATED OR INCREMENT
INCL.	INCLUDED
INSTR.	INSTRUMENT
INT.	INTERSECTION
INTCH.	INTERCHANGE
INV.	INVERT
I.P.	IRON PIN
IRR.	IRRIGATION
I.R.T.S. OR IRTS	INTERSECTING ROADWAY TERMINAL SECTION
JCT.	JUNCTION
J.P.	JOINT USE POLE

kg	KILOGRAM
km	KILOMETER
L	LENGTH OF CURVE, LITER OR ANGLE IRON
LB.	POUND
L _c	LENGTH OF CIRCULAR CURVE
L.C.	LONG CHORD
L.D.	LOOP DETECTOR
LENG.	LENGTH OR LENGTHEN
L.F.	LINEAR FOOT
LN.	LANE
L _s	LENGTH OF SPIRAL
L.S.	LAND SURVEYOR
LT.	LEFT
m	METER
m ²	SQUARE METER
m ³	CUBIC METER
mm	MILLIMETER
mm ²	SQUARE MILLIMETER
MATL.	MATERIAL
MAX.	MAXIMUM
M.C. OR MC	MEDIUM CURING
MDT	MONTANA DEPARTMENT OF TRANSPORTATION
MEAS.	MEASURED
MED.	MEDIAN
MH.	MANHOLE
MIN.	MINIMUM, MINERAL OR MINUTE
MISC.	MISCELLANEOUS
MKR.	MARKER
M.L.	MAINLINE
MNCPL.	MUNICIPAL
M.O.	MID ORDINATE
MON.	MONUMENT
M.P.C. OR MPC	MID-POINT OF CURVE
MUTCD	MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES
M.Y.	MILE YARD
N	NORTH
N.B. OR NB	NORTHBOUND
N.C.	NORMAL CROWN
N.E.	NORTHEAST
N.G. OR NG	NATURAL GAS
N.G.S. OR NGS	NATIONAL GEODETIC SURVEY
NL.	NAIL
NLY.	NORTHERLY
NO. OR #	NUMBER
N.W.	NORTHWEST
N.W.EL.	NORMAL WATER ELEVATION
O. OR O/S	OFFSET
O.C.	ON CENTERS OR OVERHEAD CROSSING
O.D.	OUTSIDE DIAMETER
O.G.	OLD GROUND OR ORIGINAL GROUND
OH.	OVERHANG OR OVERHEAD
O' PASS	OVERPASS
P	POWER CABLE, PIPE OR PRIMARY
P. OR PG.	PAGE
PAVT.	PAVEMENT
P.B.	PULL BOX
P.C. OR PC	POINT OF CURVE (BEGINNING)
P.C.C. OR PCC	POINT OF COMPOUND CURVE OR PORTLAND CEMENT CONCRETE
P.C.S.	PROJECT CONTROL SYSTEM
P.E. OR PE	PRELIMINARY ENGINEERING OR PROFESSIONAL ENGINEER

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 101	DWG. NO. 101-06
ABBREVIATIONS	
EFFECTIVE: FEBRUARY 2005	
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PEN.	PENETRATION	SLOT.DR.	SLOTTED DRAIN
PERF.	PERFORATED	SLP. STK.	SLOPE STAKE
P. I. OR PI	POINT OF INTERSECTION	SLY.	SOUTHERLY
PL.	PLACE, PLATE OR PLANT	S. P.	STAND PIPE OR STATE PLANE
P. L.	PROPERTY LINE	SPEC. PROV.	SPECIAL PROVISION
PLAS.	PLASTIC	S. P. H. P.	STEEL PIPE, HIGH PRESSURE
P. M.	PRINCIPAL MERIDIAN OR PUNCH MARK	SPK.	SPIKE
P. M. B.	PLANT MIX BASE	SO.	SQUARE
P. M. P.	PERFORATED METAL PIPE	S. S. OR SS	EMULSIFIED ASPHALT
P. M. S. OR PMS	PLANT MIX SURFACING	S. S. P. P.	STRUCTURAL STEEL PLATE PIPE
PMT.	PERMIT	OR SSPP	
P. O. C. OR POC	POINT ON CURVE	S. S. P. P. A.	STRUCTURAL STEEL PLATE PIPE ARCH
P. O. L. OR POL	POINT ON LINE	OR SSPPA	
P. O. S. OR POS	POINT ON SPIRAL	S. S. P. P. A. C.	STRUCTURAL STEEL PLATE PIPE ARCH
P. O. S. T. OR POST	POINT ON SEMI-TANGENT	OR SSPPAC	CULVERT
P. O. T. OR POT	POINT ON TANGENT	S. T. OR ST	SPIRAL TO TANGENT
P. O. V. C. OR POVC	POINT ON VERTICAL CURVE	ST.	STREET
P. P. OR PP	POWER POLE	STA.	STATION
PP.	PAGES	STD.	STANDARD
PREST.	PRESTRESSED	STD. SPEC.	STANDARD SPECIFICATIONS
PRIM.	PRIMARY	STK.	STAKED OR STAKE
PROC.	PROCESSING	STL.	STEEL
PROJ.	PROJECT OR PROJECTED	STM.	STORM DRAIN
PROT.	PROTECT, PROTECTOR OR PROTECTION	STPD.	STAMPED
P. T. OR PT	POINT OF TANGENT (END OF CURVE)	STR.	STRUCTURE OR STRAIGHT
PT.	POINT	SUBD.	SUBDIVISION
P. T. W. OR PTW	PRESENT TRAVELED WAY	SURF.	SURFACE OR SURFACING
PVC. OR PVC	POLYVINYL CHLORIDE	SURV.	SURVEY
PVT.	PRIVATE	S. W.	SOUTHWEST OR SIDEWALK
PWR. OR PWR	POWER (LINES)	S. Y.	SQUARE YARD
Q	PEAK DISCHARGE (WATER)	†	METRIC TON
QTY.	QUANTITY	T	TOWNSHIP, TANGENT LENGTH OR PERCENT TRUCKS
R	RANGE, RADIUS OR RISE	TAN.	TANGENT
R. A. C. E. T. OR RACET	ROAD APPROACH CULVERT END TREATMENT	T. B. C. OR TBC	TOP BACK OF CURB
R. A. P. OR RAP	RECYCLED ASPHALT PAVEMENT	T. B. M.	TEMPORARY BENCH MARK
R _c	SPIRAL CURVE RADIUS	TBR.	TIMBER
R. C OR RC	RAPID CURING	TEL. OR TEL	TELEPHONE
R. C. B. OR RCB	REINFORCED CONCRETE BOX	TEL. C.	TELEPHONE CABLE
R. C. P. OR RCP	REINFORCED CONCRETE PIPE	TELG.	TELEGRAPH
R. C. P. A. OR RCPA	REINFORCED CONCRETE PIPE ARCH	TEL. P.	TELEPHONE POLE
RD.	ROAD	TEMP.	TEMPERATURE OR TEMPORARY
RDL.	RADIAL	THK.	THICKNESS
RDWY.	ROADWAY	TK.	TACK
REC.	RECORD	TOPOG.	TOPOGRAPHIC
REF.	REFERENCE	T. P. OR TP	TURNING POINT
REINF.	REINFORCEMENT	TR.	TRACT
RET. W.	RETAINING WALL	TRANS.	TRANSMISSION LINE OR TRANSITION
RIV.	RIVER	TRAV.	TRAVERSE
R. M.	REFERENCE MONUMENT	TRIA.	TRIANGULATION
R. P. OR RP	REFERENCE POINT, POST OR RADIUS POINT	T _s	LENGTH OF TANGENT (CURVE WITH SPIRALS)
R. R.	RAILROAD	T. S. OR TS	TANGENT TO SPIRAL
RT.	RIGHT OR ROUTE	T. T. OR TT	TRANSMISSION TOWER
RTE.	ROUTE	TYP.	TYPICAL
R/W	RIGHT OF WAY	U	UNIT
RY.	RAILWAY	U. G.	UNDERGROUND
S	RATE OF FULL SUPERELEVATION, SLOPE IN FT. PER FT., SPAN, SOUTH OR SECONDARY	UNCL.	UNCLASSIFIED
SA.	SATELLITE (FOR TRAVERSE USE)	U' PASS	UNDERPASS
SAN. SEW.	SANITARY SEWER	U. S. C. & G. S.	U. S. COAST & GEODETIC SURVEY
S. B. OR SB	SOUTHBOUND	U. S. C. E.	U. S. CORPS OF ENGINEERS
S. C. OR SC	SPIRAL TO CURVE OR SLOW CURING	U. S. F. S.	U. S. FOREST SERVICE
SCH.	SCHEDULE	U. S. G. S.	U. S. GEOLOGICAL SURVEY
SDWK.	SIDEWALK	U. S. P. L. S.	U. S. PUBLIC LAND SURVEY
S. E.	SOUTHEAST	V	DESIGN SPEED OR VELOCITY
SEC.	SECTION, SECOND OR SECONDARY	V. A. B. M.	VERTICAL ANGLE BENCH MARK
SEL.	SELECT		
S. G. , SG OR SUBGR.	SUBGRADE		
SHLD. OR SH.	SHOULDER		
SHT.	SHEET		
SING.	SINGLE		
SIP.	SIPHON		
S. L. D.	SEA LEVEL DATUM		


DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 101	DWG. NO. 101-07
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ABBREVIATIONS

EFFECTIVE: FEBRUARY 2005

V. C. OR VC	VERTICAL CURVE
V. C. CORR.	VERTICAL CURVE OFFSET CORRECTION
V. C. M.	VERTICAL CONTROL MONUMENT
V. C. P.	VITRIFIED CLAY PIPE
VEH.	VEHICULAR
VERT. OR VT.	VERTICAL
VIT.	VITRIFIED
V. P.	VENT PIPE
V. P. C. OR VPC	VERTICAL POINT OF CURVE
V. P. I. OR VPI	VERTICAL POINT OF INTERSECTION
V. P. T. OR VPT	VERTICAL POINT OF TANGENCY
W	WEST
W/	WITH
W. B. OR WB	WESTBOUND
W. C.	WITNESS CORNER
W. L.	WATER LINE
WLY.	WESTERLY
W/O	WITHOUT
W. P.	WING POINT
W. S.	WATER SERVICE OR WARPED OR VARIABLE SLOPE
WT.	WEIGHT
W. T.	WATER TABLE
W. V.	WATER VALVE
W. W.	WING WALL OR WOVEN WIRE
YD	YARD
YD ²	SQUARE YARD
YD ³	CUBIC YARD
XING.	CROSSING
XSEC.	CROSS SECTION

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	101-08
SECTION 101	
ABBREVIATIONS	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	

TITLE SHEET

	PRIMARY ROAD **
	PRIMITIVE ROAD
	PROPOSED ROAD
	GRADED ROAD
	BLADED ROAD
	PRIMITIVE ROAD
	GRAVELED ROAD (CADD *)
	PAVED ROAD
	FEDERAL AID ROUTING (ON EXISTING ROAD)
	FEDERAL AID ROUTING (NON-EXISTING ROAD)
	INTERCHANGE
	STRUCTURE
	FREE FERRY
	TOLL FERRY
	HIGHWAY TUNNEL
	PASS
	RAILROAD
	RESERVATION LINE
	STATE & NATIONAL LINE
	COUNTY LINE
	TOWNSHIP & SECTION LINE
	INTERSTATE
	U. S. HIGHWAY
	STATE HIGHWAY (CADD *)
	CITY OR TOWN
	AIR FIELD
	DAM
	BUILDING OR HOUSE
	BRIDGE

** PRIMARY ROADS ARE 0.08" WIDE. ALL OTHERS ARE 0.05" WIDE.

PROFILE

	FLOWLINE AT ϕ CULVERT
	FLOWLINE AT ϕ IRRIGATION SYPHON
	FLOWLINE AT ϕ CONCRETE BOX CULVERT

CROSS SECTIONS

	POWER POLE (NO. OF WIRES AND VOLTAGE)
	TELEPHONE POLE (NO. OF WIRES)
	TELEGRAPH POLE (NO. OF WIRES)
	GUY POLE
	GUY AND ANCHOR

PLAN

	STATE & NATIONAL LINE
	COUNTY LINE
	CITY OR TOWN BOUNDARIES
	TOWNSHIP LINE
	SECTION LINE (SHOWING CORNER SOLID IF FOUND - OPEN IF NOT FOUND)
	CLOSING CORNER
	MEANDER CORNER
	OWNERSHIP TIE
	PROPERTY CORNER
	EXISTING R/W MONUMENT
	NEW R/W MONUMENT
	PROPERTY LINE
	SECTION LINE
	EXISTING ACCESS
	FULL ACCESS CONTROL
	LIMITED CONTROL
	EXISTING RIGHT-OF-WAY
	HIGHWAY RIGHT-OF-WAY
	RAILROAD RIGHT-OF-WAY
	BASE OR SURVEY LINE
	ϕ OF STAKED LINE WHEN A PROJECTION IS MADE
	RAILROAD
	TRAVELED WAY
	LEVEE OR DIKE (CADD *)
	RETAINING WALL (CADD *)
	PROPOSED RETAINING WALL (CADD *)
	RIPRAP
	GEOTEXTILE PATTERN
	CONCRETE SIDEWALK
	CONCRETE CURB
	EXISTING FENCE
	PROPOSED FENCE
	SNOW FENCE
	PROPOSED SNOW FENCE
	PROPOSED GUARDRAIL
	EXISTING CONCRETE MEDIAN RAIL
	SMALL DRAINAGE
	LARGE DRAINAGE
	RESERVOIR WITH DAM
	LAKE
	MARSH, SWAMP (CADD *)

PLAN

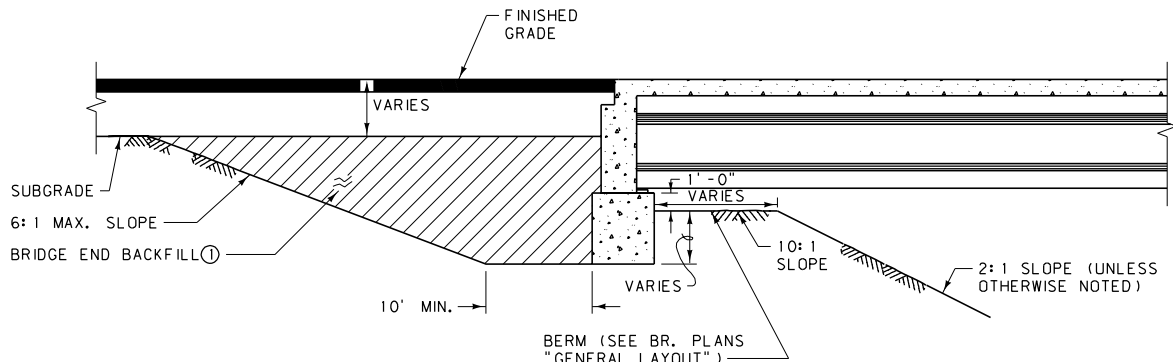
	BLUFFS OR CLIFFS
	WATER'S EDGE
	DEPRESSION
	DEPRESSION OBSCURE
	DITCH BLOCK
	EXISTING DITCH OR FLOW LINE
	PROPOSED DITCH
	FLOW LINE UP HILL
	CULVERT WITH HEADWALL (IN PLACE)
	CULVERT WITHOUT HEADWALL (IN PLACE)
	PROPOSED CULVERT
	EXISTING DROP OR MEDIAN INLET
	PROPOSED DROP OR MEDIAN INLET
	WATER VALVE BOX
	MANHOLE (LABEL AS TO TYPE OR SERVICE)
	PROPOSED MANHOLE
	FIRE HYDRANT
	WATER WELL WELL (CADD *)
	EXISTING CATCH BASIN
	PROPOSED CATCH BASIN
	CONDUIT & WIRING
	POWER CABLE
	EXISTING UNDERGROUND POWER (CADD *)
	EXISTING OVERHEAD POWER (CADD *)
	TELEPHONE OR TELEGRAPH CABLE
	EXISTING UNDERGROUND TELEPHONE (CADD *)
	EXISTING OVERHEAD TELEPHONE (CADD *)
	WATER LINE
	EXISTING WATER LINE (CADD *)
	STORM SEWER
	EXISTING STORM DRAIN (CADD *)
	PROPOSED STORM DRAIN (CADD *)
	SANITARY SEWER
	EXISTING SANITARY SEWER (CADD *)
	PROPOSED SANITARY SEWER (CADD *)
	NATURAL GAS LINE
	EXISTING NATURAL GAS LINE (CADD *)
	GASOLINE OR OIL LINE
	EXISTING GAS PIPE LINE (CADD *)
	EXISTING OIL PIPE LINE (CADD *)
	EXISTING UNDERGROUND FIBER CABLE (CADD *)
	EXISTING UNDERGROUND TV CABLE (CADD *)
	EXISTING UNDERGROUND MISSILE CABLE (CADD *)

PLAN

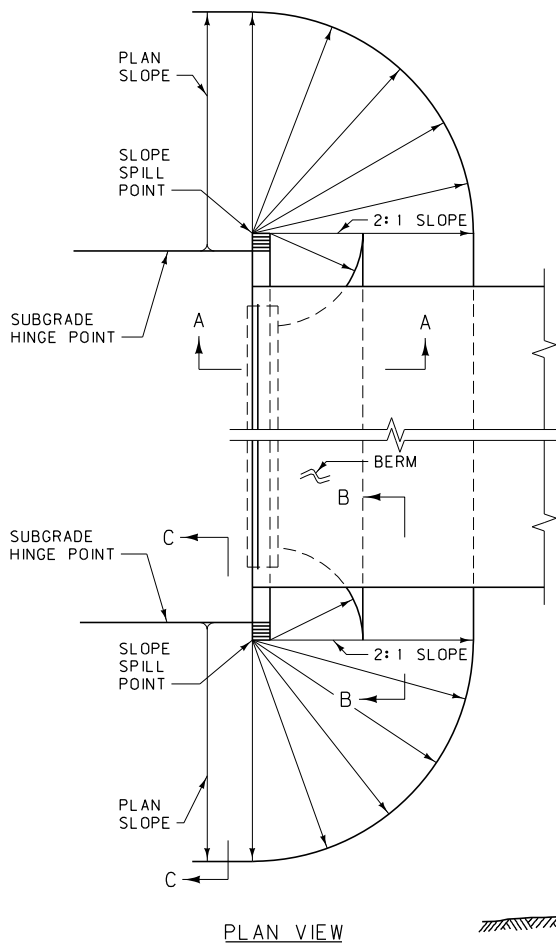
	SINGLE POST SIGN
	MULTIPLE POST SIGN
	TELEGRAPH POLE
	TELEPHONE POLE
	TELEPHONE PEDESTAL
	POWER POLE
	POWER PEDESTAL
	TROLLEY POLE
	LIGHT POLE
	GUY POLE
	GUY WIRE & ANCHOR
	TRANSMISSION TOWER
	GAS VALVE
	OIL OR GAS WELL
	TANKS
	TREE OR BUSH
	TREE LINE
	HEDGE LINE
	MAILBOX
	EXISTING APPROACH
	PROPOSED APPROACH
	EXISTING CATTLE GUARD
	PROPOSED CATTLE GUARD
	GRAVEL PIT
	SCALES
	MILE POST
	PROJECT MARKER
	STATION MARKER
	CENTERLINE
	DEFLECTION ANGLE
	DEFLECTION ANGLE (CIRCULAR CURVE WITH SPIRALS)
	DEFLECTION ANGLE OF ONE SPIRAL
	NORTH ARROW
	GATE

* SYMBOLOGY USED ON CADD DRAFTED PLANS

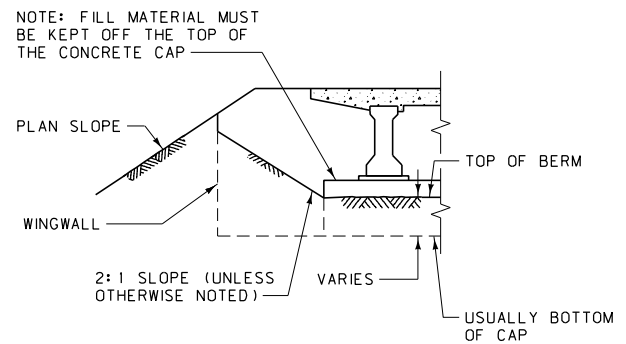
DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 101	DWG. NO. 101-10
SYMBOLS	
EFFECTIVE: FEBRUARY 2005	
	MONTANA DEPARTMENT OF TRANSPORTATION



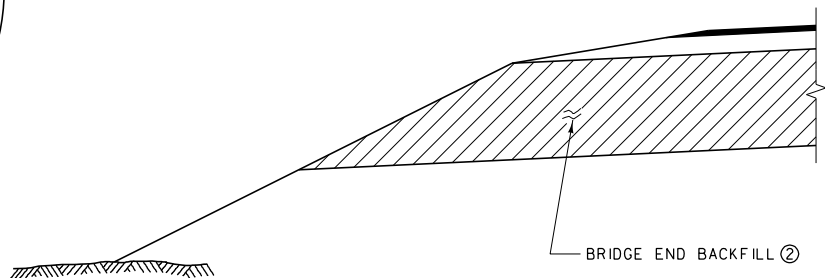
SECTION A-A



PLAN VIEW




SECTION B-B

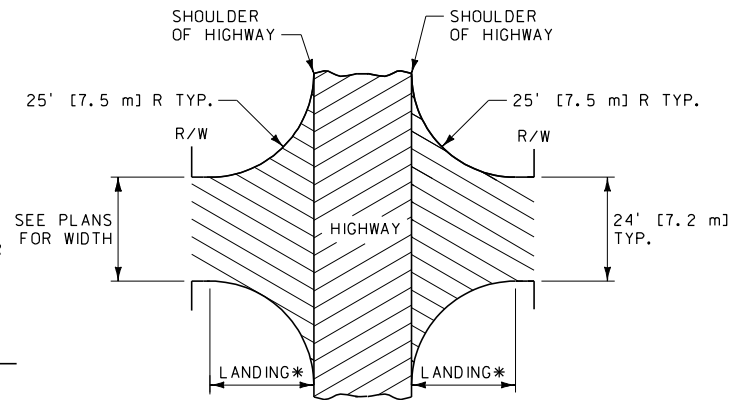
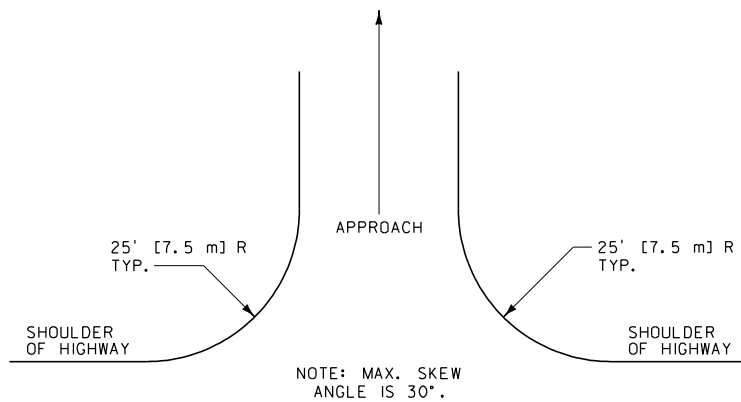


SECTION C-C

- NOTES:
- ① DO NOT PLACE THE BRIDGE END BACKFILL UNTIL AFTER THE BACKWALL AND DECK SLAB ARE COMPLETED. PLACE ALL MATERIAL IN 6" LAYERS AND COMPACT IN ACCORDANCE WITH SECTION 203.03.3 OF THE STANDARD SPECIFICATIONS.
 - ② WHEN THE BRIDGE END BACKFILL DOES NOT DAYLIGHT AT AN EMBANKMENT SLOPE TO PROVIDE DRAINAGE, EXTEND THE BRIDGE END BACKFILL 3 FEET BEYOND THE WINGWALL AND DAYLIGHT TO THE SLOPE FACING THE SPANNED CHANNEL.

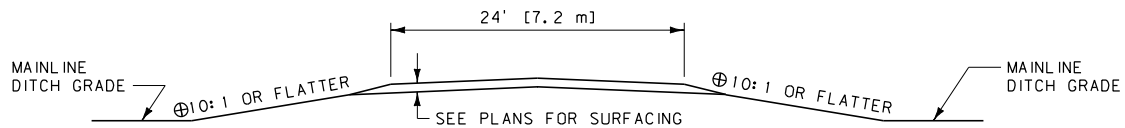
DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	203-00
SECTION 203	
ROADWAY EMBANKMENT AT BRIDGE END	
EFFECTIVE: FEBRUARY 2005	
-- REVISED --	
January 2008	
 MONTANA DEPARTMENT OF TRANSPORTATION	

-- REVISED --
January 2008



* 25.0' [7.5 m] MIN. FOR PRIVATE OR FIELD APP.
75.0' [25.0 m] MIN. FOR COUNTY AND MAIN ROADS.

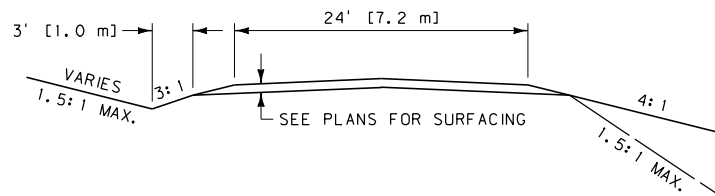
LANDING GRADE (-3% DESIRABLE,
+3% ALLOWABLE).



TYPICAL SECTION WITHIN CLEAR ZONE

USE A PIPE AS NECESSARY FOR DRAINAGE.
INSTALL CULVERTS OUTSIDE THE CLEAR
ZONE OR PROVIDE END TREATMENT.

⊕ PROVIDE 6:1 SLOPES
AT A MINIMUM.



TYPICAL SECTION BEYOND CLEAR ZONE

BACK SLOPES **	
0' - 5' [0.0 m - 1.5 m]	4:1
5' - 10' [1.5 m - 3.0 m]	2:1
OVER 10' [3.0 m]	1.5:1

FILL SLOPES **	
0' - 10' [0.0 m - 3.0 m]	4:1
10' - 20' [3.0 m - 6.0 m]	2:1
OVER 20' [6.0 m]	1.5:1

NOTES:


① APPROACH GRADE BEYOND LANDING IS NOT TO EXCEED 10% UNLESS TRAFFIC VOLUMES AND COST INDICATE SUCH TO BE JUSTIFIABLE.

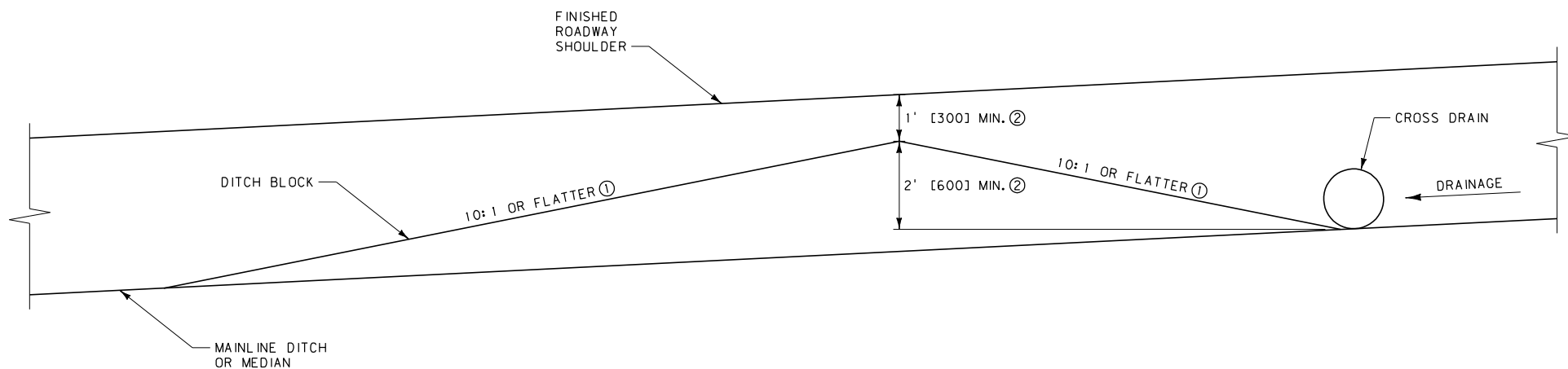
② CONSTRUCT APPROACHES TO FIT LOCAL CONDITIONS.

③ SECURE WRITTEN PERMISSION FROM LANDOWNER FOR WORK BEYOND THE RIGHT-OF-WAY.

** CRITERIA SHOWN ARE FOR PRIVATE AND FARM FIELD APPROACHES. FOR COUNTY AND MAIN ROADS USE ESTABLISHED STANDARDS FOR APPLICABLE FUNCTIONAL CLASS.

UNITS SHOWN IN BRACKETS [] ARE
METRIC AND ARE IN MILLIMETERS (mm)
UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 203	DWG. NO. 203-05
APPROACHES	
--REVISED-- MAY 2011	EFFECTIVE: FEBRUARY 2005
 MONTANA DEPARTMENT OF TRANSPORTATION	



NOTES:

- ① CONSTRUCT DITCH BLOCKS TO FIT LOCAL CONDITIONS. WHEN CONDITIONS DO NOT ALLOW 10:1 SLOPES, USE 6:1 SLOPES.
- ② HEIGHTS SHOWN ARE MINIMUMS. SET HEIGHT OF DITCH BLOCKS BASED ON AMOUNT OF ANTICIPATED DRAINAGE.


UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	203-20
SECTION 203	

DITCH BLOCKS

--REVISED--	EFFECTIVE: FEBRUARY 2005
MAY 2011	
 MONTANA DEPARTMENT OF TRANSPORTATION	

SCHEDULE OF BEST MANAGEMENT PRACTICES (BMPs)		
NAME	DESCRIPTION	DTL. DWG. NO. (208-###)
GENERAL BMP's		
IO	INLET/OUTLET PROTECTION	1A
WP	WATERWAY PROTECTION	1B
WR	WATER RESOURCE PROTECTION	1C
TEMPORARY SOIL STABILIZATION BMPs (SS)		
SS-2	PRESERVATION OF EXISTING VEGETATION	02
SS-3	HYDRAULIC MULCH	04
SS-4	TEMPORARY SEEDING	06
SS-5	SOIL BINDERS	08
SS-6	STRAW MULCH	10
SS-7	EROSION CONT. BLANKETS/MATS, PLASTIC COVERS & GEOTEXTILES	12A & 12B
SS-8	WOOD MULCH	14
SS-9	EARTH DIKES/DRAINAGE SWALES & LINED DITCHES	16
SS-10	OUTLET PROTECTION/VELOCITY DISSIPATION DEVICES	18
SS-11	SLOPE DRAINS	20
SS-12	SLOPE ROUGHENING	22
SS-13	TERRACED SLOPES	24
SS-14	VEGETATED BUFFER	26
SS-15	EROSION SEEDING	28
TEMPORARY SEDIMENT CONTROL BMPs (SC)		
SC-1	SILT FENCE	30
SC-2	DESILTING BASIN	32A & 32B
SC-3	SEDIMENT TRAP	34
SC-4	CHECK DAMS	36
SC-5	FIBER ROLLS	38
SC-6	GRAVEL BAG BERM	40
SC-8	SAND BAG BARRIERS	42
SC-9	STRAW BALE BARRIERS	44
SC-10	STORM DRAIN INLET PROTECTION	46A & 46B
SC-11	DUGOUT DITCH BASIN	48
WIND EROSION CONTROL BMPs (WE)		
WE-1	WIND EROSION CONTROL	50
SNOW ACCUMULATION & SNOW MELT BMPs (SN)		
SN-2	SNOW ACCUMULATION MANAGEMENT	52
SN-3	FREEZE REDUCTION	54
TRACKING CONTROL BMPs (TC)		
TC-1	STABILIZED CONSTRUCTION ENTRANCE/EXIT	56
TC-3	ENTRANCE/OUTLET TIRE WASH	58
NON-STORM WATER MANAGEMENT BMPs (NS)		
NS-4	TEMPORARY STREAM CROSSINGS	60

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-00
SCHEDULE OF BEST MANAGEMENT PRACTICES	
EFFECTIVE: APRIL 2006	
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SYMBOL:

1/0

INLET/OUTLET PROTECTION:

INLET/OUTLET PROTECTION (I/O) ARE STRUCTURES ASSOCIATED WITH SEDIMENT REMOVAL AT INLETS AND SEDIMENT REMOVAL AT PIPE OUTLETS. THE PURPOSE OF THIS BMP IS TO ALLOW STORM WATERS OF INTERMITTENT DRAINAGES TO FLOW THROUGH DISTURBED AREAS WITH MINIMAL IMPACT DURING STORM EVENTS AND TO KEEP SEDIMENT FROM LEAVING MDT PROPERTY.

INLET/OUTLET PROTECTION IS USED AT CULVERT INSTALLATIONS THAT DISCHARGE DIRECTLY INTO A WATER RESOURCE OR CULTURAL AND HISTORICAL RESOURCE ADJACENT TO THE RIGHT-OF-WAY LINE. DO NOT USE INLET/OUTLET PROTECTION ON STOCK UNDERPASSES OR APPROACH CULVERTS.

APPROPRIATE BMP FEATURES INCLUDE OUTLET PROTECTION/VELOCITY DISSIPATION DEVICES, SILT FENCE, DESILTING BASIN, SEDIMENT TRAP, CHECK DAMS, FIBER ROLLS, GRAVEL BAG BERM, SAND BAG BARRIER, STRAW BALE BARRIER AND STORM DRAIN INLET PROTECTION. THIS BMP LIST IS NOT COMPREHENSIVE AND DOES NOT SUPERSEDE MDT STANDARD SPECIFICATIONS OR MANDATES AND REQUIREMENTS SPECIFIED BY OTHER AUTHORIZED STATE AND FEDERAL AGENCIES.

INTERMITTENT/EPHEMERAL FLOW
AND CONSTRUCTION SEASON
TERMINATION/WINTER SUSPENSION

**CULVERT INSTALLATION
WITH INTERMITTENT FLOW**

INSTALL PROTECTION NEAR OR
AT WATER'S EDGE TO PREVENT
SEDIMENT FROM ENTERING WATER

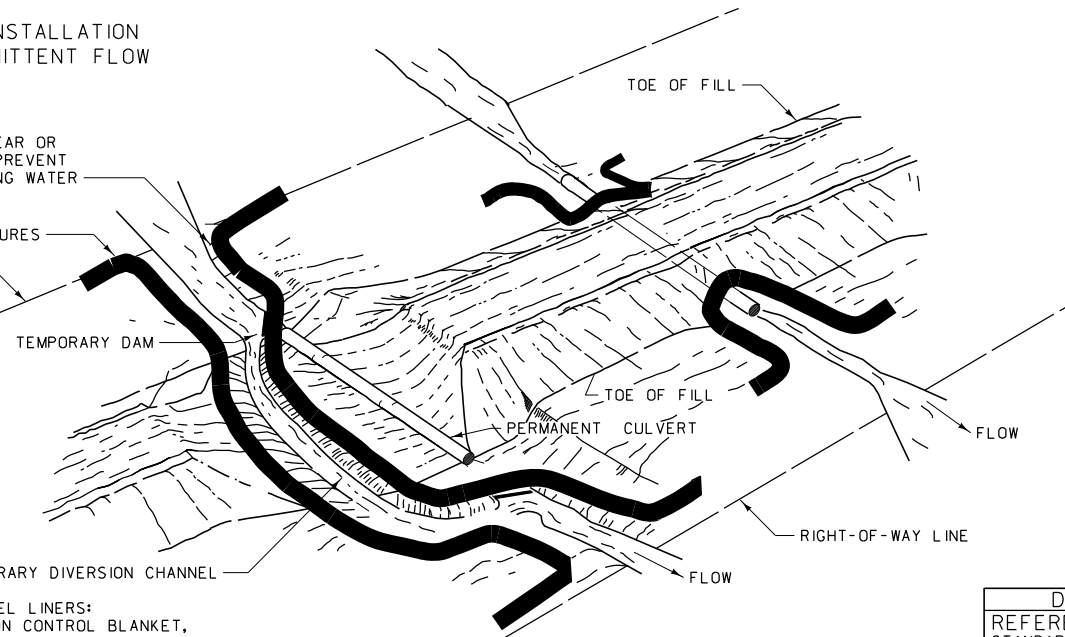
SEE ABOVE LIST FOR
APPROPRIATE BMP FEATURES


RIGHT-OF-WAY LINE

TEMPORARY DAM

TEMPORARY DIVERSION CHANNEL

CHANNEL LINERS:
EROSION CONTROL BLANKET,
ROCK, GEOTEXTILE FABRIC



DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-1A
INLET/OUTLET PROTECTION	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	

SYMBOL:



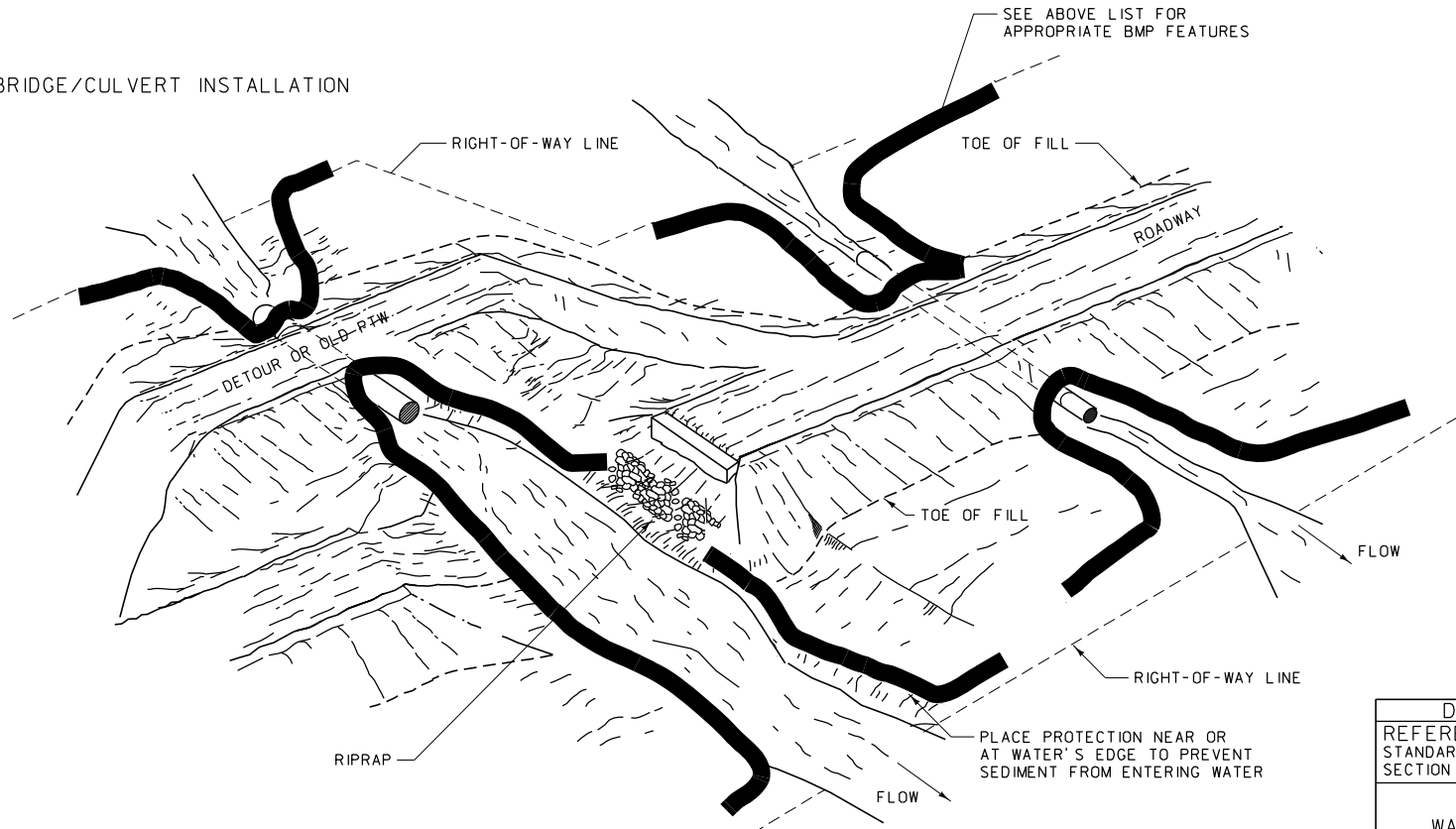
WATERWAY PROTECTION:


WATERWAY PROTECTION (WP) IS AN EROSION CONTROL FOR CONSTRUCTION ACTIVITIES CROSSING WATER RESOURCES. WATERWAY PROTECTION APPLIES TO PERENNIAL STREAM CROSSINGS, WETLANDS, CHANNEL CHANGES, STREAM BANK DISTURBANCES, IRRIGATION SYSTEMS OR OTHER IMPACTS TO WATER RESOURCES FROM BRIDGE CONSTRUCTION OR CULVERT INSTALLATIONS.

APPROPRIATE BMP FEATURES INCLUDE EROSION CONTROL BLANKETS/MATS, SLOPE ROUGHENING, VEGETATIVE BUFFER STRIP, SILT FENCE, CHECK DAMS, FIBER ROLLS, GRAVEL BAG BERM, SAND BAG BARRIER, AND STRAW BALE BARRIER. THIS BMP LIST IS NOT COMPREHENSIVE AND DOES NOT SUPERSEDE MDT STANDARD SPECIFICATIONS OR MANDATES AND REQUIREMENTS SPECIFIED BY OTHER AUTHORIZED STATE AND FEDERAL AGENCIES.

PERENNIAL STREAM CROSSING

BRIDGE/CULVERT INSTALLATION



DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	208-1B
SECTION 208	
WATERWAY PROTECTION	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	

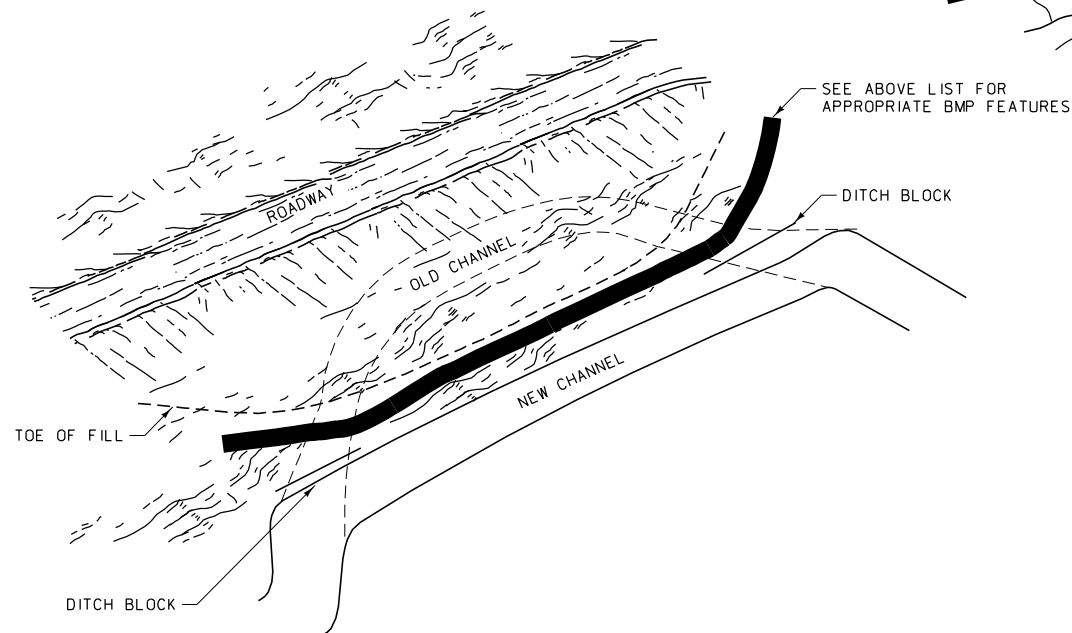
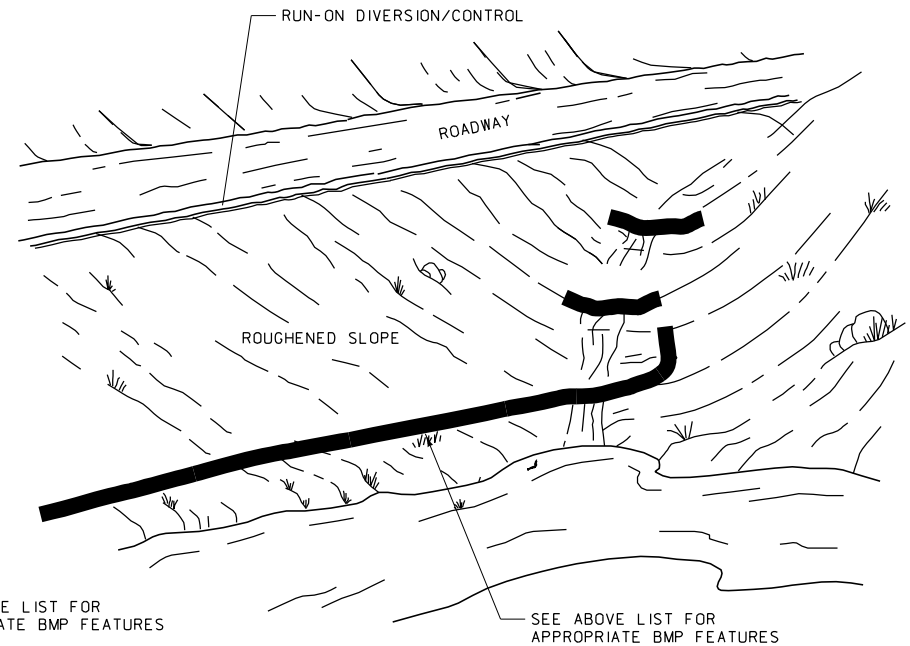
SYMBOL:


WR

WATER RESOURCE PROTECTION:

WATER RESOURCE PROTECTION (WR) IS EROSION CONTROL FOR CONSTRUCTION ACTIVITIES ADJACENT TO WATER RESOURCES. WATER RESOURCE PROTECTION APPLIES TO PERENNIAL STREAMS, WETLANDS, CHANNEL CHANGES, STREAM BANK DISTURBANCES, IRRIGATION SYSTEMS OR OTHER IMPACTS TO WATER RESOURCES FROM ROAD CONSTRUCTION. IT CAN BE USED FOR CRITICAL RESOURCES. THE DESIGNER DENOTES "CRITICAL RESOURCE" ON THE PLANS AND PUTS WATER RESOURCE PROTECTION WITH IT.

APPROPRIATE BMP FEATURES INCLUDE EROSION CONTROL BLANKETS/MATS, SLOPE ROUGHENING, VEGETATIVE BUFFER STRIP, SILT FENCE, CHECK DAMS, FIBER ROLLS, GRAVEL BAG BERM, SAND BAG BARRIER, AND STRAW BALE BARRIER. THIS BMP LIST IS NOT COMPREHENSIVE AND DOES NOT SUPERSEDE MDT STANDARD SPECIFICATIONS OR MANDATES AND REQUIREMENTS SPECIFIED BY OTHER AUTHORIZED STATE AND FEDERAL AGENCIES.



DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	208-1C
SECTION 208	
WATER RESOURCE PROTECTION	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION serving you with pride	

SYMBOL: ——— PEV ———

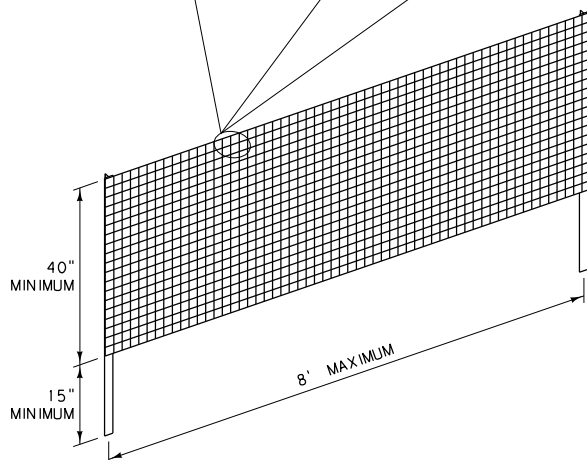
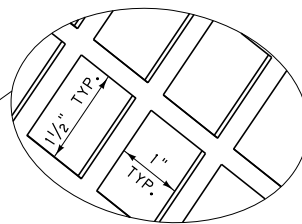
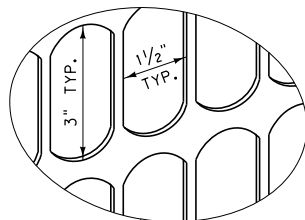
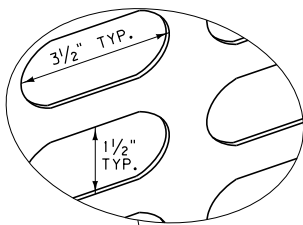
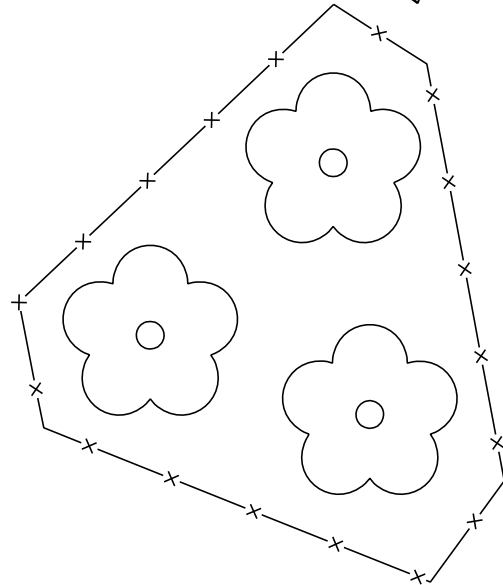
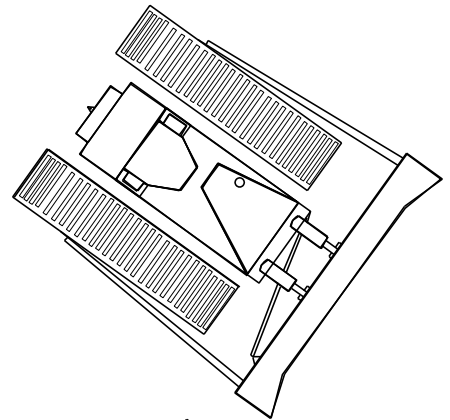
PRESERVATION OF EXISTING VEGETATION SS-2:


PRESERVATION OF EXISTING VEGETATION IS THE IDENTIFICATION AND PROTECTION OF DESIRABLE VEGETATION THAT PROVIDES EROSION AND SEDIMENT CONTROL BENEFITS. PROVIDE PRESERVATION OF EXISTING VEGETATION PRIOR TO COMMENCEMENT OF CLEARING AND GRUBBING OPERATIONS OR OTHER SOIL DISTURBING ACTIVITIES. MARK THE AREA AS DESIGNATED ON THE CONSTRUCTION PLANS USING TEMPORARY FENCING MADE OF ORANGE POLYPROPYLENE THAT IS STABILIZED AGAINST ULTRAVIOLET LIGHT. AFFIX FENCING TO METAL "T" POST USING 11 GAGE WIRE. PLACE FENCING AN ADEQUATE DISTANCE FROM TREES AND BUSHES TO PREVENT ROOT AND IRRIGATION SYSTEM DAMAGE.

UPON WRITTEN APPROVAL BY THE ENGINEER, THE CONTRACTOR MAY BE ALLOWED TO FLAG OR VERBALLY DESIGNATE AREAS OF EXISTING VEGETATIVE PRESERVATION.

PRESERVATION OF EXISTING VEGETATION MAY BE USED IN CONJUNCTION WITH VEGETATIVE BUFFER (SS-14), WIND EROSION CONTROL (WE-1) AND SNOW ACCUMULATION (SN-1).

FOLLOW CLEAR ZONE REQUIREMENTS FOR ALL FENCING PLACED WITHIN THE CLEAR ZONES.



DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	208-02
SECTION 208	
PRESERVATION OF EXISTING VEGETATION (SS-2)	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	

SYMBOL: ———— HM ————

HYDRAULIC MULCH SS-3:

HYDRAULIC MULCH CONSISTS OF APPLYING A MIXTURE OF SMALL PIECES OF CELLULOSE FIBERS WHICH CAN BE MADE FROM SHREDDED WOOD FIBERS OR RECYCLED PAPER AND A STABILIZING EMULSION AND TACKIFIER (SUBJECT TO ENGINEER'S DISCRETION) USING HYDRO-MULCHING EQUIPMENT. HYDRAULIC MULCH IS APPLIED TO DISTURBED AREAS REQUIRING TEMPORARY PROTECTION UNTIL PERMANENT VEGETATION IS ESTABLISHED OR DISTURBED AREAS THAT MUST BE RE-DISTURBED FOLLOWING AN EXTENDED PERIOD OF INACTIVITY.

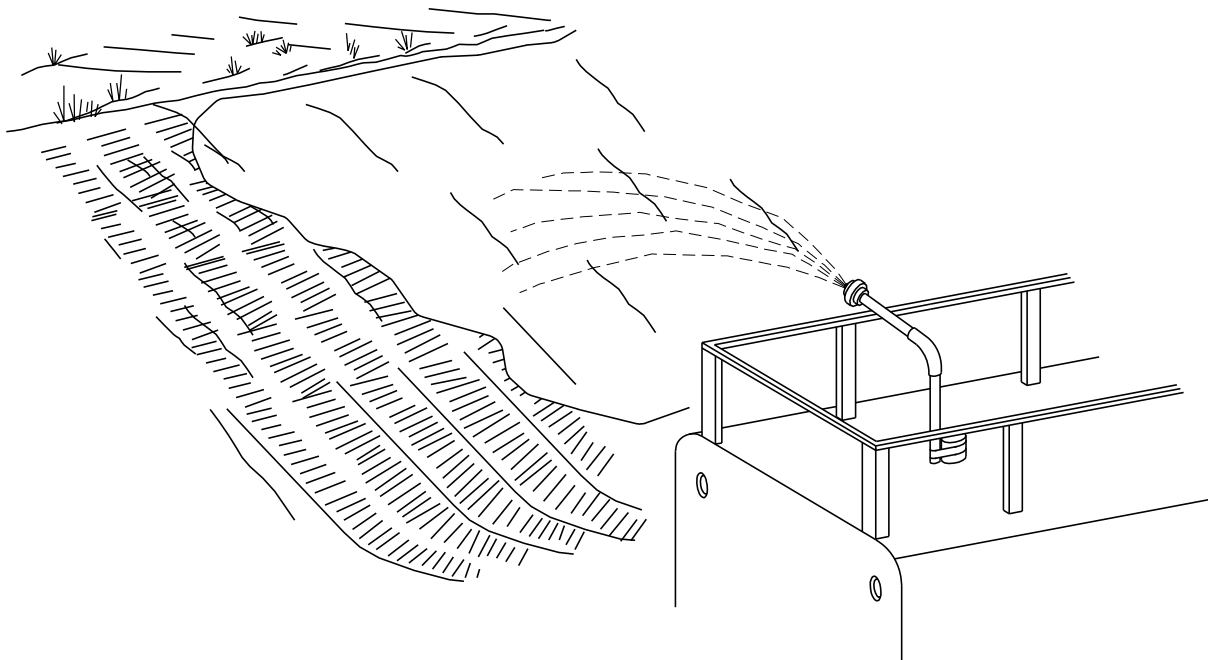
APPLY HYDRAULIC MULCH A MINIMUM OF 24 HOURS PRIOR TO A STORM EVENT TO ALLOW FOR ADEQUATE DRYING.

HYDRAULIC MULCH SELECTION MUST MEET MDT SPECIFICATIONS AND BE APPROVED BY THE ENGINEER PRIOR TO PLACEMENT. ROUGHEN EXISTING EMBANKMENT FOLLOWING GUIDELINES SPECIFIED IN BMP SS-12. WHEN EITHER TEMPORARY SEEDING OR PERMANENT SEEDING IS COMBINED WITH THE HYDRAULIC MULCH BMP, COMPLETE SEEDING OPERATIONS PRIOR TO HYDRAULIC MULCHING OPERATIONS. REFER TO BMPs SS-4 AND SS-5 FOR SEEDING REQUIREMENTS. REMOVE ANY OVER SPRAY FROM ROADWAYS OR SIDEWALKS IMMEDIATELY FOLLOWING APPLICATION.

REAPPLY HYDRAULIC MULCH TO ANY DISTURBED AREAS FOLLOWING A RAIN EVENT OR RESULTING FROM CONSTRUCTION ACTIVITIES.


RECYCLED PAPER MULCH SHOULD CONTAIN 100% POST CONSUMED PAPER.

REFER TO BMP SS-5 (SOIL BINDER) FOR TACKIFIER REQUIREMENTS. ADD ENVIRONMENTALLY SAFE GREEN DYE AS A VISUAL AID DURING APPLICATION.



HYDRAULIC MULCH		
PRODUCT	MATERIAL	APPLICATION RATE *
PAPER-BASED HYDRAULIC MULCH	PAPER	1000 LB./ACRE (MIN)
WOOD-BASED HYDRAULIC MULCH	WOOD OR WOOD & PAPER	1000 LB./ACRE (MIN)

* APPLICATION RATES VARY WITH SLOPE & MUST
BE APPROVED BY THE ENGINEER

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-04
HYDRAULIC MULCH (SS-3)	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	

SYMBOL: ——— TS ———

TEMPORARY SEEDING SS-4:

TEMPORARY SEEDING IS THE ESTABLISHMENT OF A TEMPORARY VEGETATIVE COVER BY SEEDING WITH CEREAL BARLEY. USE TEMPORARY SEEDING ON AREAS 3:1 OR FLATTER THAT WILL BE EXPOSED FOR LONGER THAN 14 DAYS AND THAT WILL UNDERGO FURTHER DISTURBANCE, EXCLUDE ROCK SLOPES THAT CANNOT BE EXCAVATED BY RIPPING.

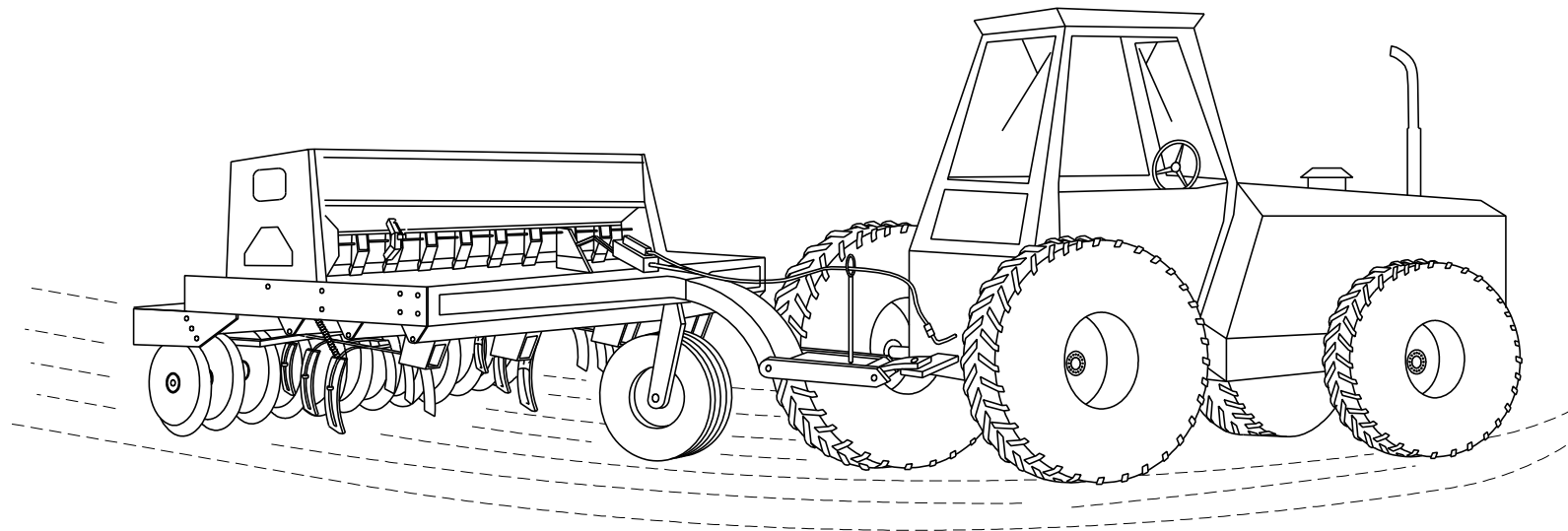
SEEDING DATES AND APPLICATION RATES ARE AS FOLLOWS:

APR. 1 TO JUN. 30: CEREAL BARLEY AT 12 LB./ACRE
JUL. 1 TO AUG. 31: TEMPORARY SEEDING NOT RECOMMENDED
SEP. 1 TO NOV. 15: CEREAL BARLEY AT 12 LB./ACRE


DO NOT TEMPORARY SEED FROM SEP. 1 TO NOV. 15 IF THE AREA IS TO BE PERMANENTLY SEEDED THAT FALL.

CONTACT THE MDT AGRONOMIST, THROUGH THE ENGINEER, PRIOR TO USING SUBSTITUTIONS OR PLACING TEMPORARY SEEDING OUTSIDE THESE DATES. DRILL SEED SLOPES OF 3:1 OR FLATTER. FOR SLOPES STEEPER THAN 3:1, REFER TO EROSION SEEDING.

ANY TEMPORARY SEEDING EFFORTS THAT DO NOT PROVIDE ADEQUATE COVER MUST BE RE SEEDED AS REQUIRED BY THE ENGINEER.



SLOPES 3:1 OR FLATTER

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	208-06
SECTION 208	
TEMPORARY SEEDING (SS-4)	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	

SYMBOL: ———— SB ————

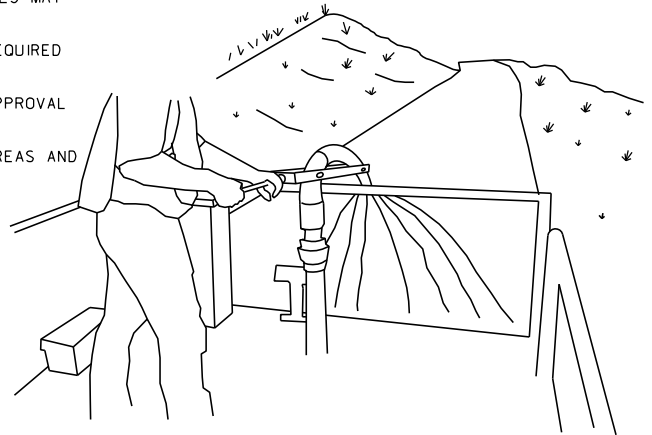
SOIL BINDERS SS-5:

SOIL BINDERS CONSIST OF APPLYING AND MAINTAINING POLYMERIC OR LIGNIN SULFONATE SOIL STABILIZERS OR EMULSIONS. SOIL BINDERS ARE MATERIALS APPLIED TO THE SOIL SURFACE TO TEMPORARILY PREVENT WATER-INDUCED EROSION OF EXPOSED SOILS ON CONSTRUCTION SITES. SOIL BINDERS TYPICALLY ALSO PROVIDE DUST, WIND AND SOIL STABILIZATION BENEFITS. BECAUSE SOIL BINDERS CAN OFTEN BE INCORPORATED INTO THE WORK, THEY MAY BE A GOOD CHOICE FOR AREAS WHERE GRADING ACTIVITIES MAY SOON RESUME.


DUE TO THE TEMPORARY NATURE OF SOIL BINDERS, REAPPLICATION MAY BE REQUIRED OVER AREAS WITH PEDESTRIAN AND VEHICLE TRAFFIC.

SOIL BINDER TYPE AND APPLICATION PROCEDURES REQUIRE THE ENGINEER'S APPROVAL PRIOR TO PLACEMENT. APPLY PER MANUFACTURES SPECIFICATIONS.

REAPPLY SOIL BINDERS, AS SPECIFIED BY THE ENGINEER, IN HIGH TRAFFIC AREAS AND FOLLOWING RAIN EVENTS TO ENSURE AN ADEQUATELY MAINTAINED SURFACE.



PROPERTIES OF SOIL BINDERS FOR EROSION CONTROL				
CHEMICALS	COPOLYMER	LIGNIN SULFONATE	PSYLLIUM	GUAR
COMMENTS	FORMS SEMIPERMEABLE TRANSPARENT CRUST. RESISTS ULTRAVIOLET RADIATION & MOISTURE INDUCED BREAKDOWN.	PAPER INDUSTRY WASTE PRODUCT. ACTS AS DISPERSING AGENT. BEST IN DRY CLIMATES. CAN BE SLIPPERY.	EFFECTIVE ON DRY, HARD SOILS. FORMS A CRUST.	EFFECTIVE ON DRY, HARD SOILS. FORMS A CRUST.
RELATIVE COST	HIGH	MODERATE	LOW	LOW
ENVIRONMENTAL HAZARD	LOW	LOW	LOW	LOW
PENETRATION	MODERATE	MODERATE	HIGH	HIGH
EVAPORATION	MODERATE	MODERATE	MODERATE	MODERATE
LEACHING RESISTANCE	LOW	HIGH	HIGH	HIGH
ABRASION RESISTANCE	HIGH	LOW	MODERATE	MODERATE
LONGEVITY	1 TO 2 YEARS	6 MONTHS TO 1 YEAR	3 TO 6 MONTHS	3 TO 6 MONTHS
MINIMUM CURING TIME BEFORE RAIN	24 HOURS	24 HOURS	24 HOURS	24 HOURS
COMPATIBILITY WITH EXISTING VEGETATION	GOOD	POOR	POOR	POOR
MODE OF DEGRADATION	CHEMICALLY DEGRADABLE	BIOLOGICALLY/PHYSICALLY/CHEMICALLY	BIOLOGICALLY DEGRADABLE	BIOLOGICALLY DEGRADABLE
LABOR INTENSIVE	NO	NO	NO	NO
SPECIALIZED APPL. EQUIPMENT	YES	YES	YES	YES
LIQUID/POWDER	LIQUID	POWDER	POWDER	POWDER
SURFACE CRUSTING	YES	YES, BUT DISSOLVED ON REWETTING	YES, BUT DISSOLVED ON REWETTING	YES, BUT DISSOLVED ON REWETTING
CLEAN-UP	SOLVENTS	SOLVENTS	WATER	WATER
EROSION CONTROL APPLICATION RATE	APPLY 85-105 GAL./ACRE	APPLY 600-700 GAL./ACRE	APPLY 150 LB./ACRE WITH 500-2000 LB./ACRE FIBER MULCH	APPLY 100-200 LB./ACRE WITH 500-2000 LB./ACRE FIBER MULCH
DUST CONTROL APPLICATION RATE	APPLY 30-55 GAL./ACRE	LOOSEN SURFACE 1-2 INCHES. NEED 4-8% FINES. APPLY 50-200 GAL./ACRE	APPLY 150 LB./ACRE	APPLY 40-60 LB./ACRE

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-08
SOIL BINDERS (SS-5)	
EFFECTIVE: FEBRUARY 2005	
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SYMBOL: ——— SM ———

STRAW MULCH SS-6:

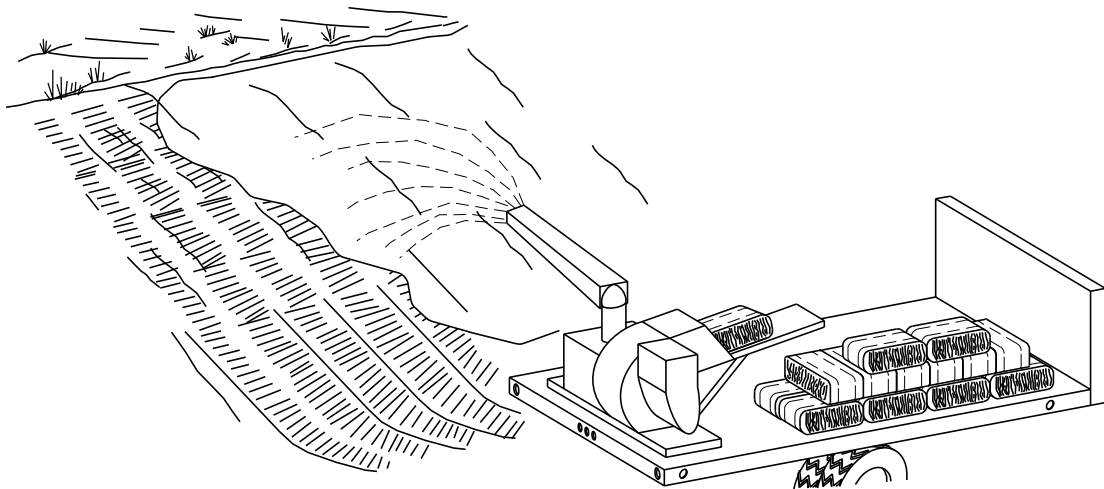
STRAW MULCH CONSISTS OF PLACING A UNIFORM LAYER OF STRAW AND ANCHORING IT INTO THE SOIL WITH A STUDDED ROLLER OR DISK OR BINDING THE STRAW TOGETHER WITH AN ENGINEER APPROVED TACKIFIER.

USE STRAW MULCH FOR SOIL STABILIZATION AS A TEMPORARY SURFACE COVER ON DISTURBED AREAS UNTIL SOILS CAN BE PREPARED OR RE-VEGETATION/PERMANENT VEGETATION IS ESTABLISHED. STRAW MULCH IS COMMONLY USED IN COMBINATION WITH TEMPORARY SEEDING, BMPs SS-4 & SS-15, AND/OR PERMANENT SEEDING TO ENHANCE PLANT ESTABLISHMENT.

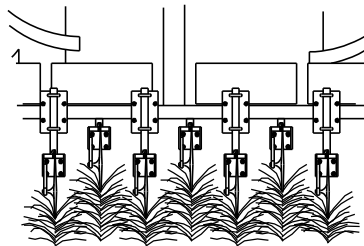
ALL STRAW MULCH IS REQUIRED TO BE CERTIFIED WEED FREE AND DERIVED FROM WHEAT, BARLEY OR RICE. ENGINEERS APPROVAL IS REQUIRED PRIOR TO ANY PLACEMENT OF STRAW MULCH.

STRAW MULCH CAN BE APPLIED BY HAND OR BLOWN UNDER LOW WIND CONDITIONS. OBTAIN ENGINEERS APPROVAL FOR PLACEMENT METHODS PRIOR TO PLACEMENT. EVENLY DISTRIBUTE STRAW MULCH AT A MINIMUM LOOSE RATE OF 4000 LB./ACRE. IMMEDIATELY FOLLOWING PLACEMENT, CRIMP OR APPLY TACKIFIERS TO RETAIN MULCH. CRIMP USING DISKS OR A PUNCH-TYPE ROLLER. IF TACKIFIERS ARE USED, FOLLOW GUIDELINES PROVIDED IN BMP SS-5. WHEN EITHER TEMPORARY OR PERMANENT SEEDING IS COMBINED WITH THE STRAW MULCH BMP, COMPLETE SEEDING OPERATIONS PRIOR TO STRAW MULCH PLACEMENT. REFER TO BMPs SS-4 AND SS-15 FOR SEEDING GUIDELINES.


REAPPLICATION OF STRAW MULCH AND TACKIFIER MAY BE REQUIRED BY THE ENGINEER TO MAINTAIN EFFECTIVE SOIL STABILIZATION OVER DISTURBED AREAS AND SLOPES.



STRAW BLOWER



STRAW CRIMPING

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	208-10
SECTION 208	
STRAW MULCH (SS-6)	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	

SYMBOL: ———— EC ————

EROSION CONTROL BLANKETS/MATS, PLASTIC COVERS, & GEOTEXTILES SS-7:

EROSION CONTROL BLANKETS/MATS, PLASTIC COVERS, & PERMANENT EROSION CONTROL GEOTEXTILES ARE USED TO STABILIZE DISTURBED SOIL AREAS AND PROTECT SOILS FROM EROSION BY WIND AND WATER. THESE PRODUCTS CAN BE USED ON STEEP SLOPES, SLOPES WITH HIGH EROSION HAZARDS, SLOPES WHERE MULCHES CAN NOT BE ANCHORED, UNPROTECTED CHANNELS AND HIGH FLOW CHANNELS.

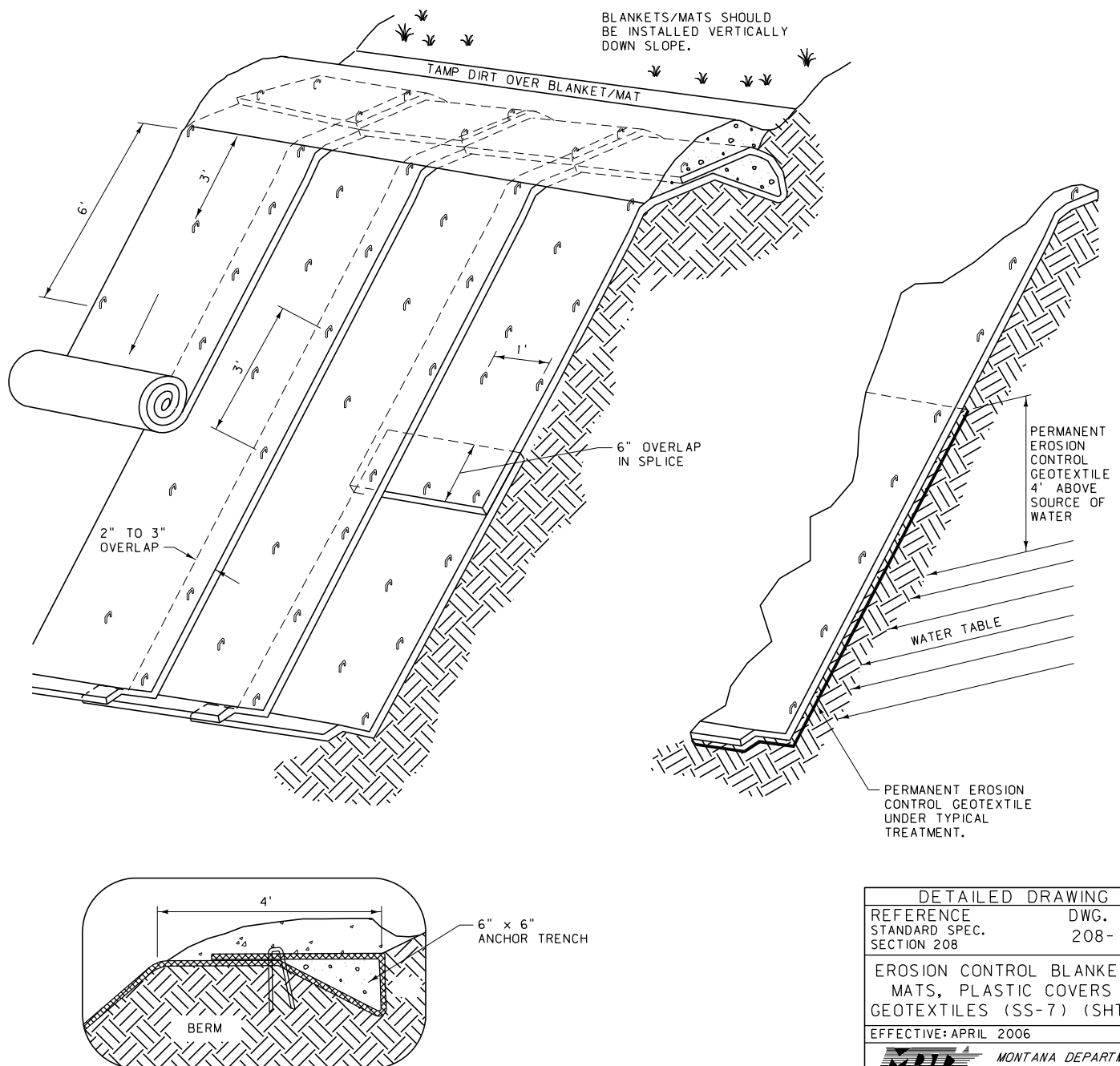
INSTALL EROSION CONTROL BLANKETS/MATS IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS AND MDT STANDARD SPECIFICATIONS SECTION 610.


INSTALL PERMANENT EROSION CONTROL GEOTEXTILE IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS AND MDT STANDARD SPECIFICATIONS SECTION 622.

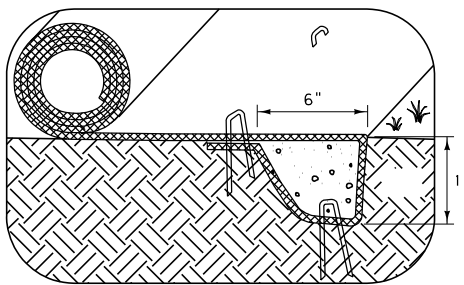
PROVIDE EROSION CONTROL BLANKETS/MATS MEETING MDT STANDARD SPECIFICATIONS SECTION 713.12.

PROVIDE PERMANENT EROSION CONTROL GEOTEXTILE MEETING MDT STANDARD SPECIFICATIONS SECTION 716.

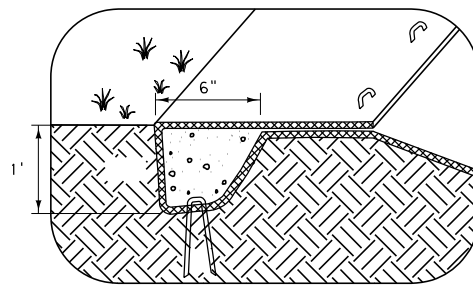
LIMIT USE OF PLASTIC COVERS TO COVERING STOCKPILES, OR VERY SMALL GRADED AREAS FOR SHORT PERIODS OF TIME (SUCH AS THROUGH ONE IMMINENT STORM EVENT) UNTIL ALTERNATIVE MEASURES MAY BE INSTALLED. PLASTIC COVERS ARE REQUIRED TO BE POLYETHYLENE SHEETING HAVING A MINIMUM THICKNESS OF 6 mil. ANCHOR PLASTIC COVERS WITH SANDBAGS PLACED NO MORE THAN 10 FT. APART AND BY KEYING INTO THE TOP OF SLOPE TO PREVENT INFILTRATION OF SURFACE WATERS UNDER THE PLASTIC. TAPE OR WEIGHT DOWN THE ENTIRE LENGTH OF ALL SEAMS WITH AT LEAST A 1 FT. TO 2 FT. OVERLAP.



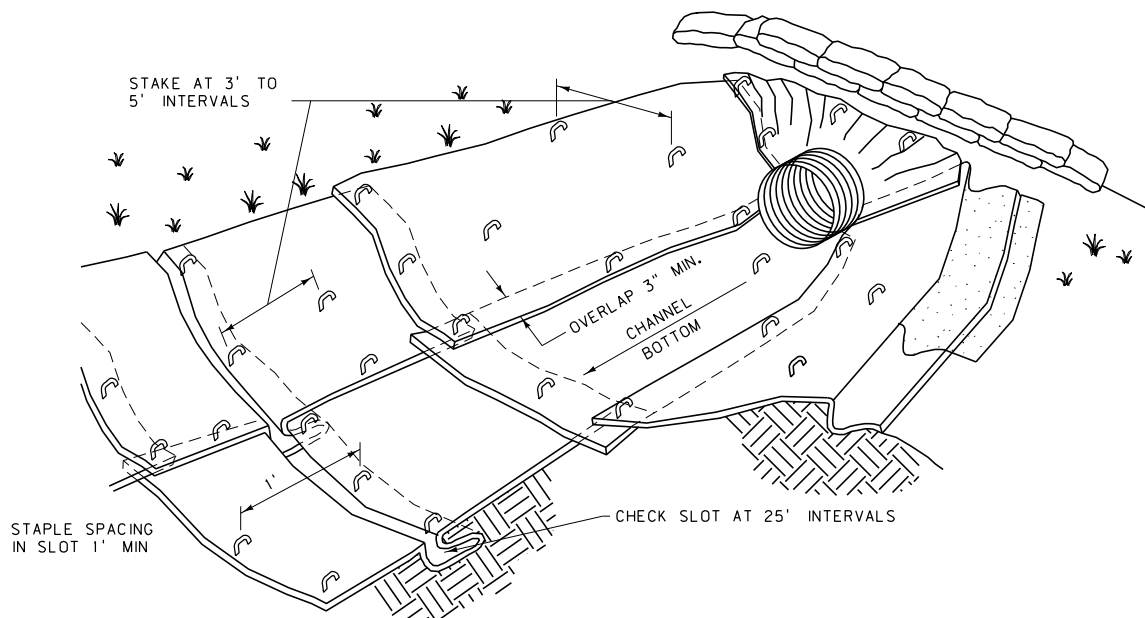
DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	208-12A
SECTION 208	
EROSION CONTROL BLANKETS/ MATS, PLASTIC COVERS & GEOTEXTILES (SS-7) (SHT 1)	
EFFECTIVE: APRIL 2006	
 MONTANA DEPARTMENT OF TRANSPORTATION	



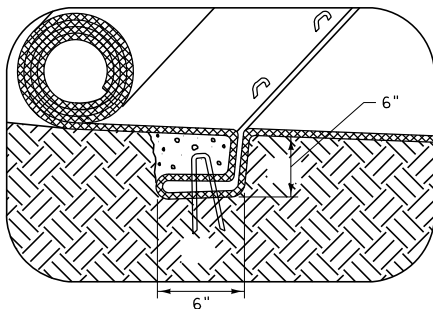
INITIAL CHANNEL ANCHOR TRENCH



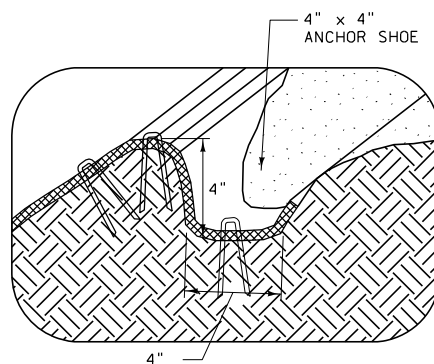
TERMINAL SLOPE & CHANNEL ANCHOR TRENCH




TYPICAL CHANNEL DETAIL - ISOMETRIC VIEW



INTERMITTENT CHECK SLOT



LONGITUDINAL ANCHOR TRENCH

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	208-12B
SECTION 208	
EROSION CONT. BLANKETS/ MATS, PLASTIC COVERS & GEOTEXTILES (SS-7) (SHT 2)	
EFFECTIVE: APRIL 2006	
 MONTANA DEPARTMENT OF TRANSPORTATION	

SYMBOL: ——— WM ———

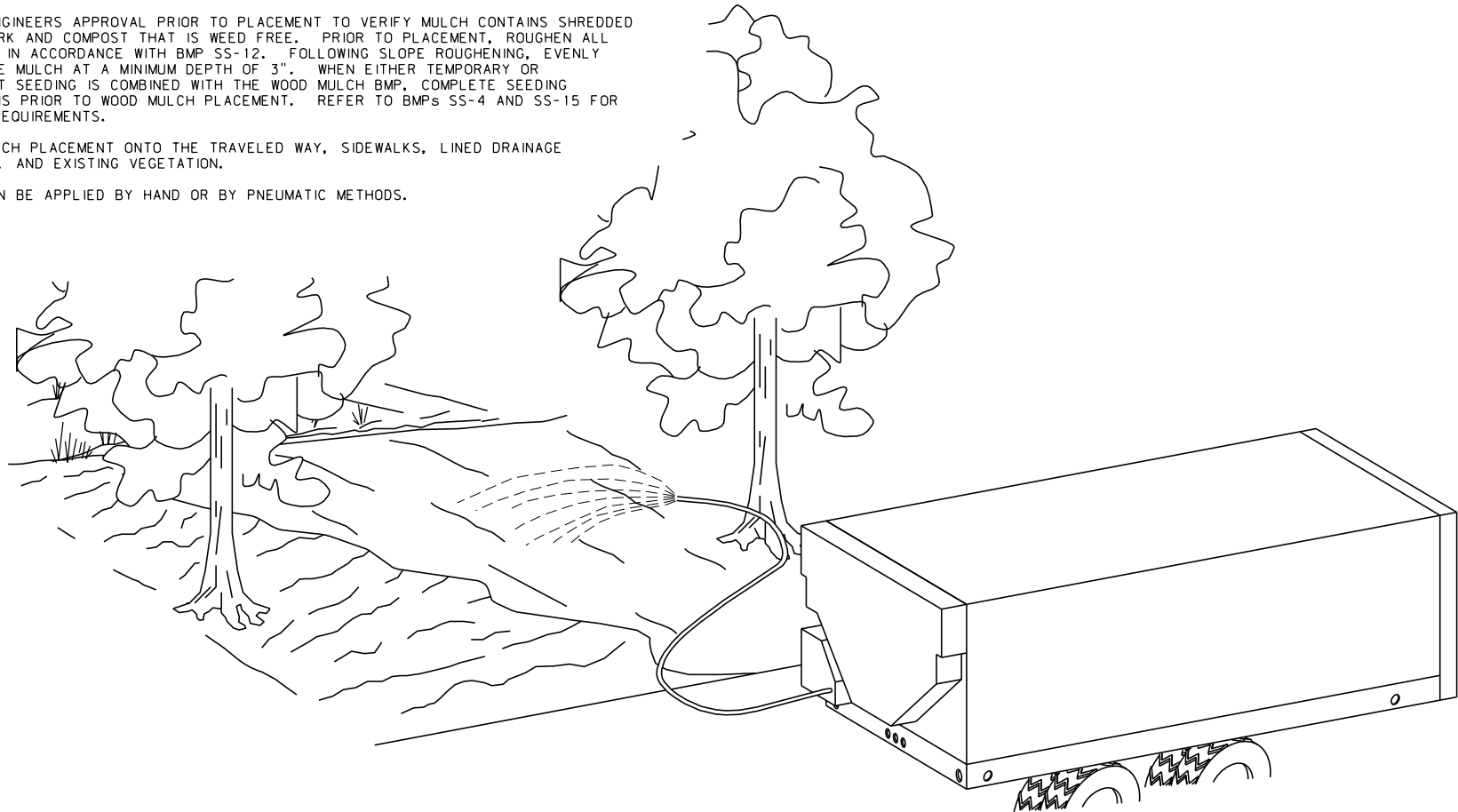
WOOD MULCH SS-8:


WOOD MULCHING CONSISTS OF APPLYING A MIXTURE OF SHREDDED WOOD MULCH, BARK, OR COMPOST. WOOD MULCH IS MOSTLY APPLICABLE TO LANDSCAPE PROJECTS. WOOD MULCHING REDUCES EROSION BY PROTECTING BARE SOIL RAINFALL IMPACT, INCREASING INFILTRATION, AND REDUCING RUNOFF. DO NOT USE WOOD MULCH WHERE CONCENTRATED RUNOFF FLOWS MAY EXIST.

OBTAIN ENGINEERS APPROVAL PRIOR TO PLACEMENT TO VERIFY MULCH CONTAINS SHREDDED WOOD, BARK AND COMPOST THAT IS WEED FREE. PRIOR TO PLACEMENT, ROUGHEN ALL SURFACES IN ACCORDANCE WITH BMP SS-12. FOLLOWING SLOPE ROUGHENING, EVENLY DISTRIBUTE MULCH AT A MINIMUM DEPTH OF 3". WHEN EITHER TEMPORARY OR PERMANENT SEEDING IS COMBINED WITH THE WOOD MULCH BMP, COMPLETE SEEDING OPERATIONS PRIOR TO WOOD MULCH PLACEMENT. REFER TO BMPs SS-4 AND SS-15 FOR SEEDING REQUIREMENTS.

AVOID MULCH PLACEMENT ONTO THE TRAVELED WAY, SIDEWALKS, LINED DRAINAGE CHANNELS, AND EXISTING VEGETATION.

MULCH CAN BE APPLIED BY HAND OR BY PNEUMATIC METHODS.



DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	208-14
SECTION 208	
WOOD MULCH (SS-8)	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	

SYMBOL: ——— ED ———

EARTH DIKES/DRAINAGE SWALES & LINED DITCHES SS-9:

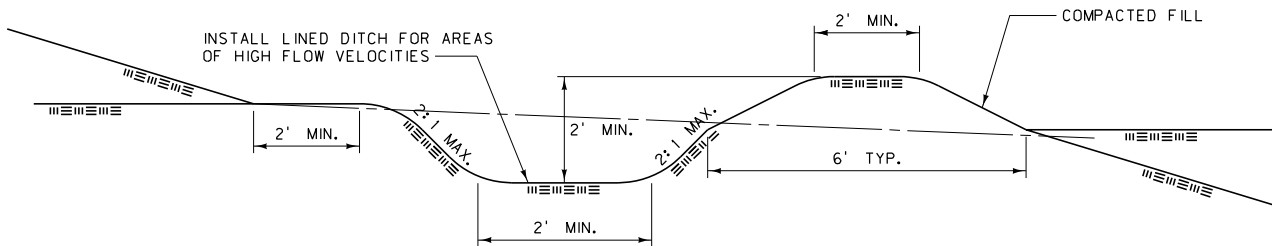
EARTH DIKES, DRAINAGE SWALES AND LINED DITCHES ARE STRUCTURES THAT INTERCEPT, DIVERT, AND CONVEY SURFACE RUN-OFF, GENERALLY SHEET FLOW, TO PREVENT EROSION. THESE DEVICES MAY BE IMPLEMENTED ON A PROJECT-BY-PROJECT BASIS WITH OTHER BMPs WHEN DETERMINED NECESSARY AND FEASIBLE BY THE ENGINEER. DIKES, SWALES AND DITCHES ARE CONVEYANCE MEASURES AND ARE NOT INTENDED TO TRAP SEDIMENT. SEDIMENT CONTROL BMPs CAN BE USED IN CONJUNCTION WITH THESE CONVEYANCE DEVICES.

WHEN POSSIBLE, INSTALL AND UTILIZE DIKES, SWALES AND DITCHES EARLY IN THE CONSTRUCTION PHASE. CONSTRUCT SWALES ALONG THE TOP AND BOTTOM OF CUT AND FILL SLOPES, AS SPECIFIED IN THE PLANS OR AS DESIGNATED BY THE ENGINEER. "V" BOTTOM DITCHES CAN BE USED FOR SWALE CONSTRUCTION FOLLOWING ENGINEERS APPROVAL. USE SEDIMENT CONTROL DEVICES FOR RUNOFF THAT IS DIVERTED FROM DISTURBED AREAS. CONVEY FLOWS FROM UNDISTURBED AREAS INTO A STABILIZED AREA AT NON-EROSIVE VELOCITIES. DO NOT PLACE DIKES, SWALES, AND DITCHES IN A MANNER THAT ALLOWS HIGHWAY RUNOFF TO ENTER ONTO OTHER PROPERTY'S RIGHT-OF-WAY.

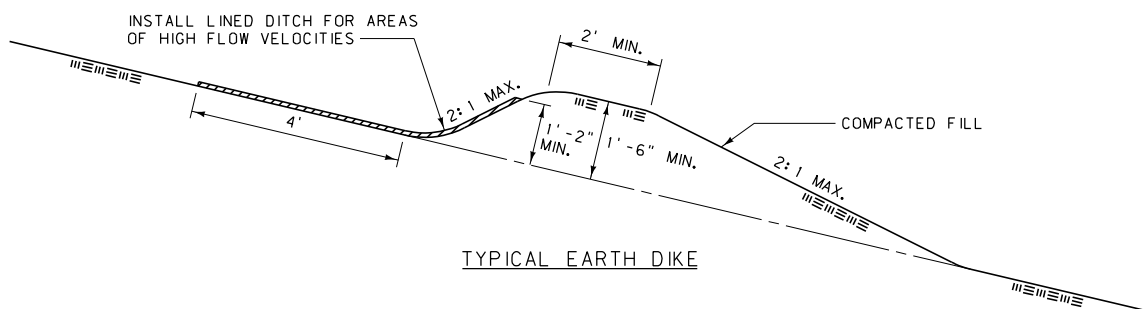
USE LINED DITCHES FOR AREAS OF HIGH FLOW VELOCITIES FOLLOWING THE GUIDELINES SPECIFIED IN SS-7 (EROSION CONTROL BLANKETS/MATS, PLASTIC COVERS & GEOTEXTILES) AND/OR SS-11 (SLOPE DRAINS). SEED ALL UNLINED PORTIONS OF DITCHES, DIKES AND SWALES THAT WILL BE IN USE FOR MORE THEN 14 DAYS IN ACCORDANCE WITH SS-15 (EROSION SEEDING)

INSPECT DIKES, SWALES, AND DITCHES AFTER RAINFALL EVENTS. REMOVE DEBRIS AND SEDIMENT, AND REPAIR LININGS AND EMBANKMENTS AS NEEDED OR AS SPECIFIED BY THE ENGINEER.

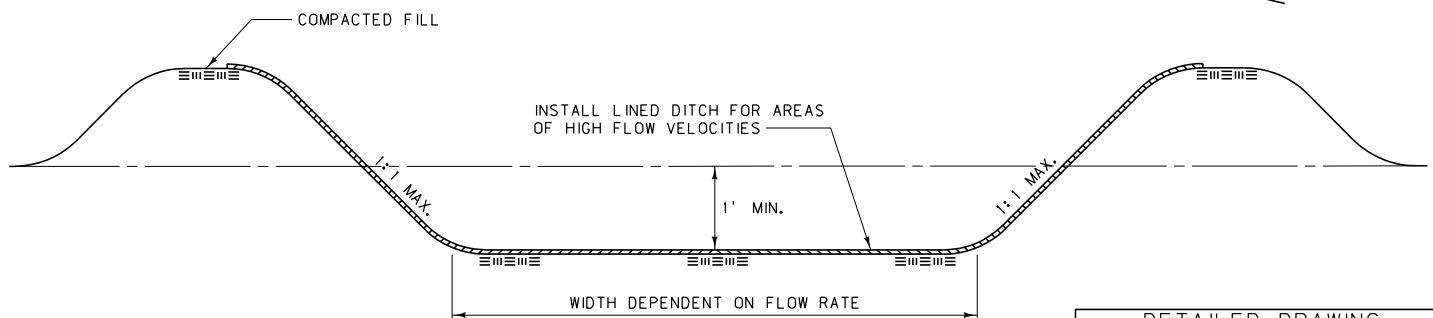
REMOVAL ALL DIKES, SWALES AND LINED DITCHES FROM THE CLEAR ZONES EXPEDIENTLY UPON COMPLETION OF CONSTRUCTION ACTIVITIES.




TYPICAL DRAINAGE SWALE




TYPICAL EARTH DIKE



TYPICAL TRAPEZOIDAL DITCH

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	208-16
SECTION 208	
EARTH DIKES/DRAINAGE SWALES & LINED DITCHES (SS-9)	
EFFECTIVE: APRIL 2006	
 MONTANA DEPARTMENT OF TRANSPORTATION	

SYMBOL: 

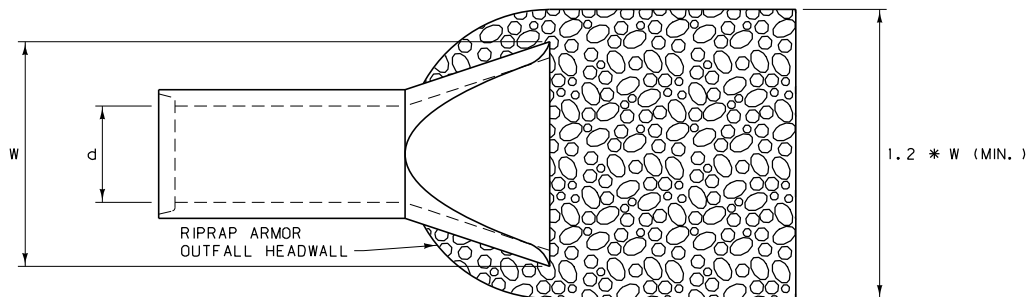
OUTLET PROTECTION/VELOCITY DISSIPATION DEVICES SS-10:

OUTLET PROTECTION AND VELOCITY DISSIPATION DEVICES ARE PLACED AT PIPE OUTLETS TO PREVENT SCOUR AND REDUCE THE VELOCITY AND/OR ENERGY OF EXITING STORM WATER FLOWS. THESE DEVICES CAN BE USED AT THE OUTLETS OF PIPES, DRAINS, CULVERTS, SLOPE DRAINS, DIVERSION DITCHES, SWALES, CONDUITS OR CHANNELS AND SHOULD BE IMPLEMENTED ON A PROJECT-BY-PROJECT BASIS WITH OTHER BMPs WHEN DETERMINED NECESSARY BY THE ENGINEER.

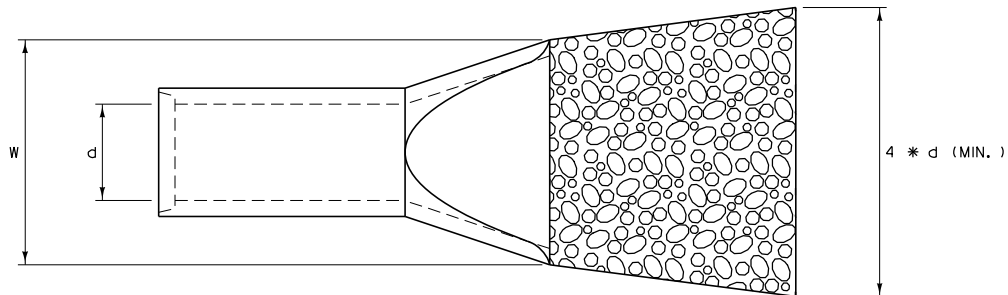
FOLLOW GUIDELINES BELOW FOR SIZING OUTLET PROTECTION AND VELOCITY DISSIPATION DEVICES. FOLLOWING ENGINEER'S APPROVAL, OTHER MATERIALS MAY BE SUBSTITUTED FOR RIPRAP. PERMANENT EROSION CONTROL GEOTEXTILE PLACEMENT MAY BE ELIMINATED FOLLOWING ENGINEER'S APPROVAL. PLACE TYPE 1 OR TYPE 2 BANK PROTECTION AT PIPE OUTLET. FOR PIPE DIAMETERS LARGER THAN 24" AND/OR HIGH FLOWS, THE APPLICATION IS NOT CONSIDERED TEMPORARY AND A MONTANA REGISTERED ENGINEER'S DESIGN IS REQUIRED.

INSTALL PERMANENT EROSION CONTROL GEOTEXTILE IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS AND MDT STANDARD SPECIFICATIONS SECTION 622.

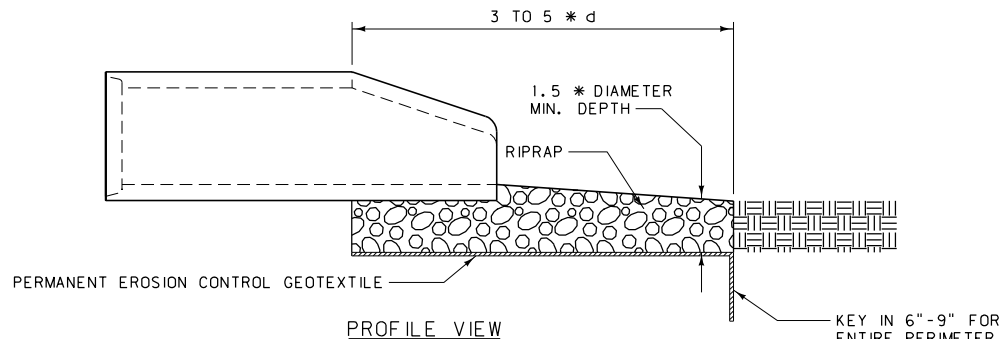
PROVIDE PERMANENT EROSION CONTROL GEOTEXTILE MEETING MDT STANDARD SPECIFICATIONS SECTION 716.




PLAN VIEW - CHANNELIZED FLOW
(OUTFALL TO CHANNEL OR DITCH)



PLAN VIEW - UNCHANNELIZED FLOW
(OUTFALL TO UNCONFINED SURFACE-OVERLAND FLOW)



DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-18
OUTLET PROTECTION/VELOCITY DISSIPATION DEVICES (SS-10)	
EFFECTIVE: APRIL 2006	
 MONTANA DEPARTMENT OF TRANSPORTATION serving you with pride	

SYMBOL: ——— TSD ———

SLOPE DRAINS SS-11

A SLOPE DRAIN IS A PIPE OR LINED CHANNEL USED TO INTERCEPT AND CONVEY SURFACE RUNOFF OR GROUNDWATER INTO A STABILIZED WATERCOURSE, TRAPPING DEVICE, OR STABILIZED AREA. THIS DEVICE MAY BE USED AT CONSTRUCTION SITES WHERE SLOPES MAY BE ERODED BY SURFACE RUNOFF.

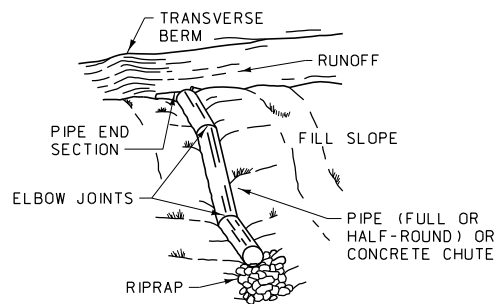
DO NOT EXCEED A DRAINAGE AREA OF 10 ACRES PER SLOPE DRAIN PIPE. FOR AREAS LARGER THAN 10 ACRES USE ROCK LINED CHANNELS. DO NOT PLACE SLOPE DRAINS ON SLOPES THAT EXCEED 2:1 SLOPES. INCORPORATE BMP SS-9 (EARTH DIKES/DRAINAGE SWALES & LINED DITCHES) TO AID IN FLOW DIVERSION.

INSTALL SLOPE DRAINS AS FOLLOWS:

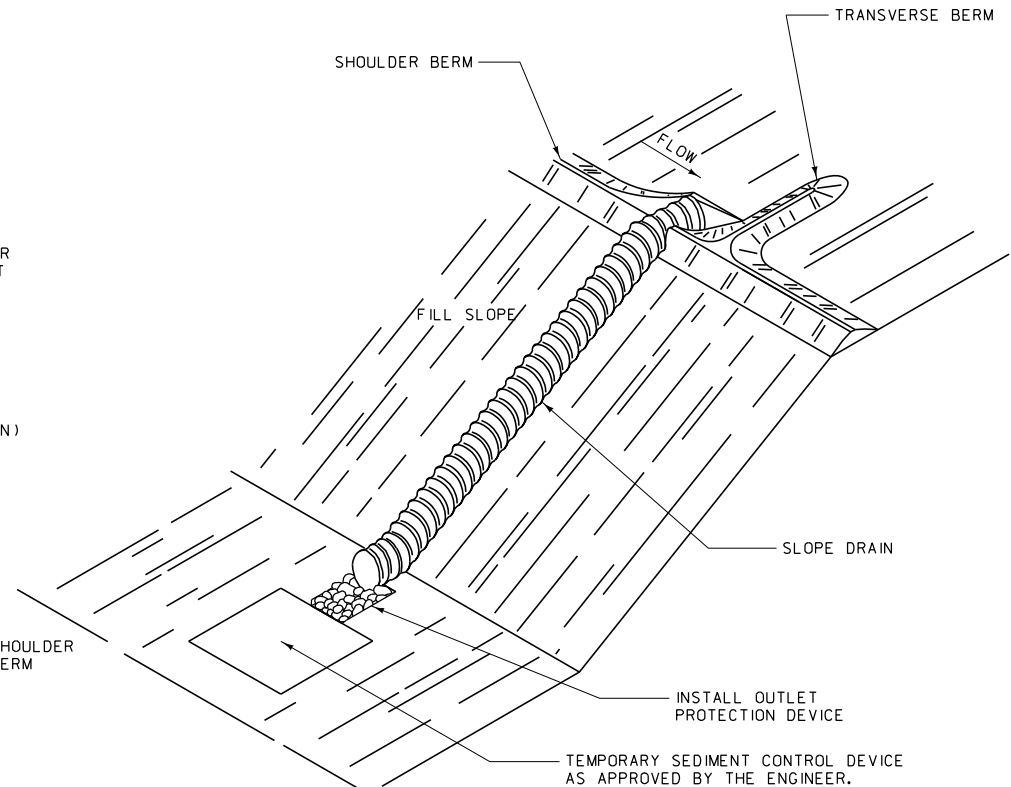
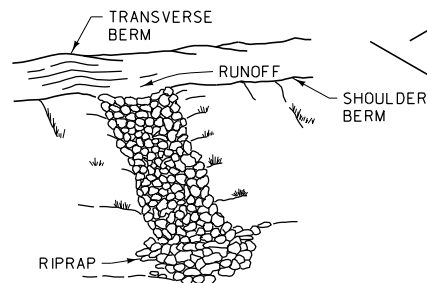
- INSTALL DRAINS PERPENDICULAR TO SLOPE
- COMPACT SOIL AROUND INLET, OUTLET AND LENGTH OF STRUCTURE
- SECURELY ANCHOR SLOPE DRAINS INTO SOIL
- ENSURE CONNECTIONS ARE WATER TIGHT
- PROTECT INLET AND OUTLET WITH BMP SS-10 (OUTLET PROTECTION & VELOCITY DISSIPATION)

ALL MATERIALS REQUIRE ENGINEER'S APPROVAL PRIOR TO PLACEMENT.

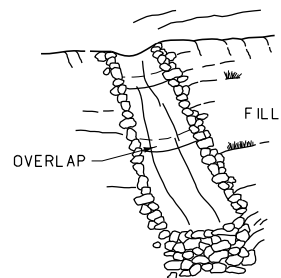
PIPE SLOPE DRAIN



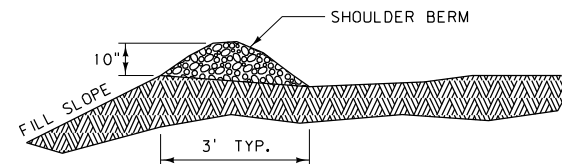
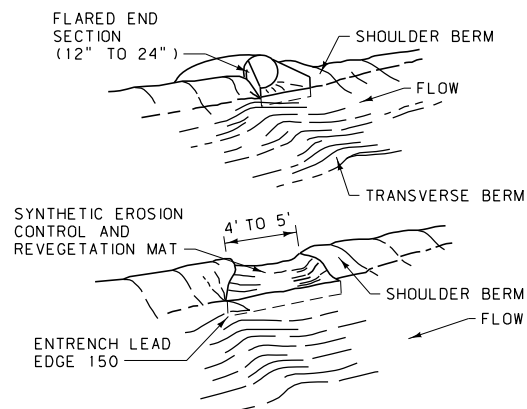
RIPRAP SLOPE DRAIN




DITCH LINER: SYNTHETIC EROSION CONTROL AND REVEGETATION MAT



SLOPE DRAIN INLETS



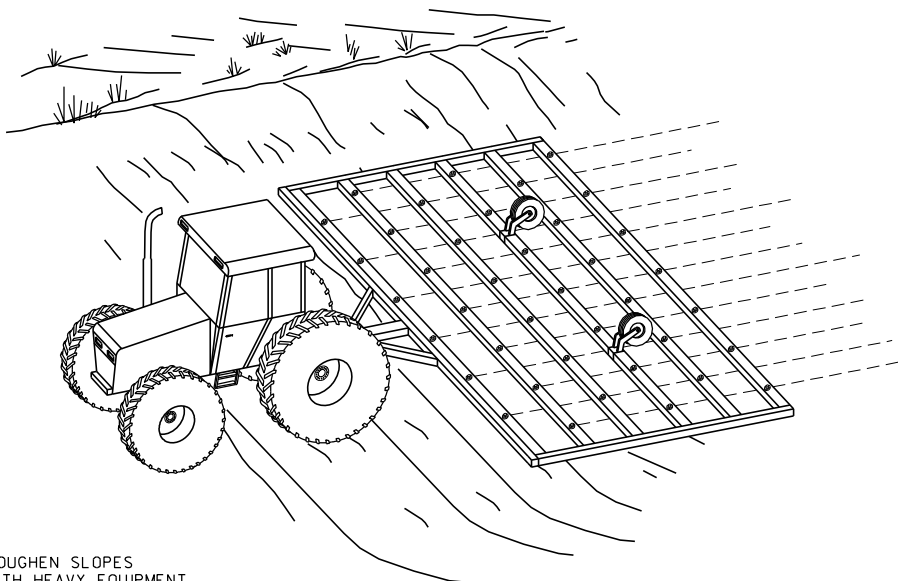
DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-20
SLOPE DRAINS (SS-11)	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION serving you with pride	

SYMBOL: _____ SR _____

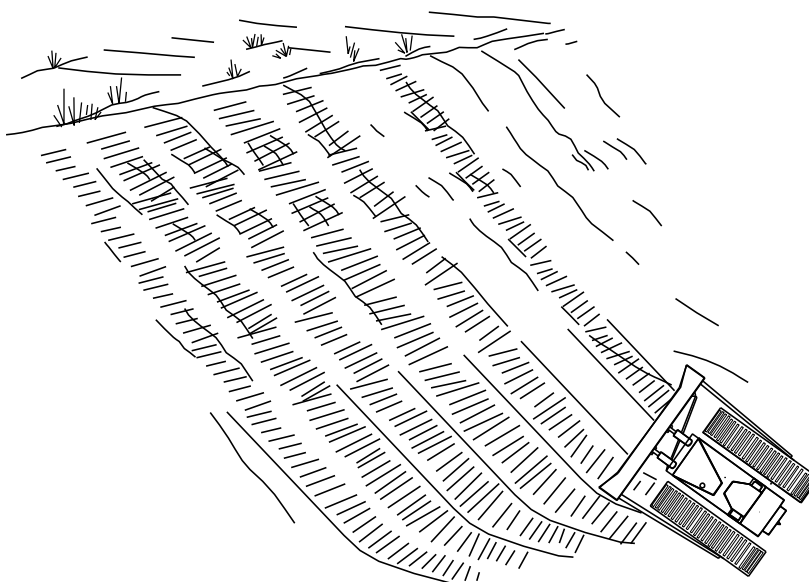
SLOPE ROUGHENING SS-12:


SLOPE ROUGHENING IS A VERY ROUGH SOIL SURFACE ON SLOPES RESULTING FROM CONSTRUCTION ACTIVITIES OR THE SYSTEMATIC ROUGHENING USING HEAVY EQUIPMENT TO CREATE RIDGES OR FURROWS PERPENDICULAR TO THE SLOPE. THE RIDGES OR FURROWS ARE TO BE EQUAL TO OR GREATER THAN 2" IN HEIGHT AND NO FURTHER THAN TWICE THE HEIGHT OF THE RIDGE OR FURROW APART. SLOPE ROUGHENING IS A GOOD FIRST LINE OF DEFENSE TO CONTROL EROSION AND SEDIMENT RUNOFF. DEGREE OF SLOPE ROUGHENING IS DEPENDENT ON THE GRADES AND PROXIMITY TO WATER RESOURCES.

ALL SLOPES STEEPER THAN 3:1 AND GREATER THAN 5 VERTICAL FEET REQUIRE SLOPE ROUGHENING, EXCLUDING ROCK SLOPES THAT CANNOT BE EXCAVATED BY RIPPING. ROUGHEN DISTURBED SLOPES OR LEAVE IN A ROUGHENED CONDITION. APPROPRIATE SUPPLEMENTS INCLUDE SOIL STABILIZATION BMPs SUCH AS TEMPORARY SEEDING OR EROSION SEEDING. WHEN FILL SLOPES ARE WITHIN 50 FT. OF SURFACE WATER, EARTH DIKES/DRAINAGE SWALES & LINED DITCHES (SS-9) AND/OR A SEDIMENT CONTROL BMP ARE REQUIRED.



ROUGHEN SLOPES
WITH HEAVY EQUIPMENT
OR LEAVE IN ROUGHENED
CONDITION



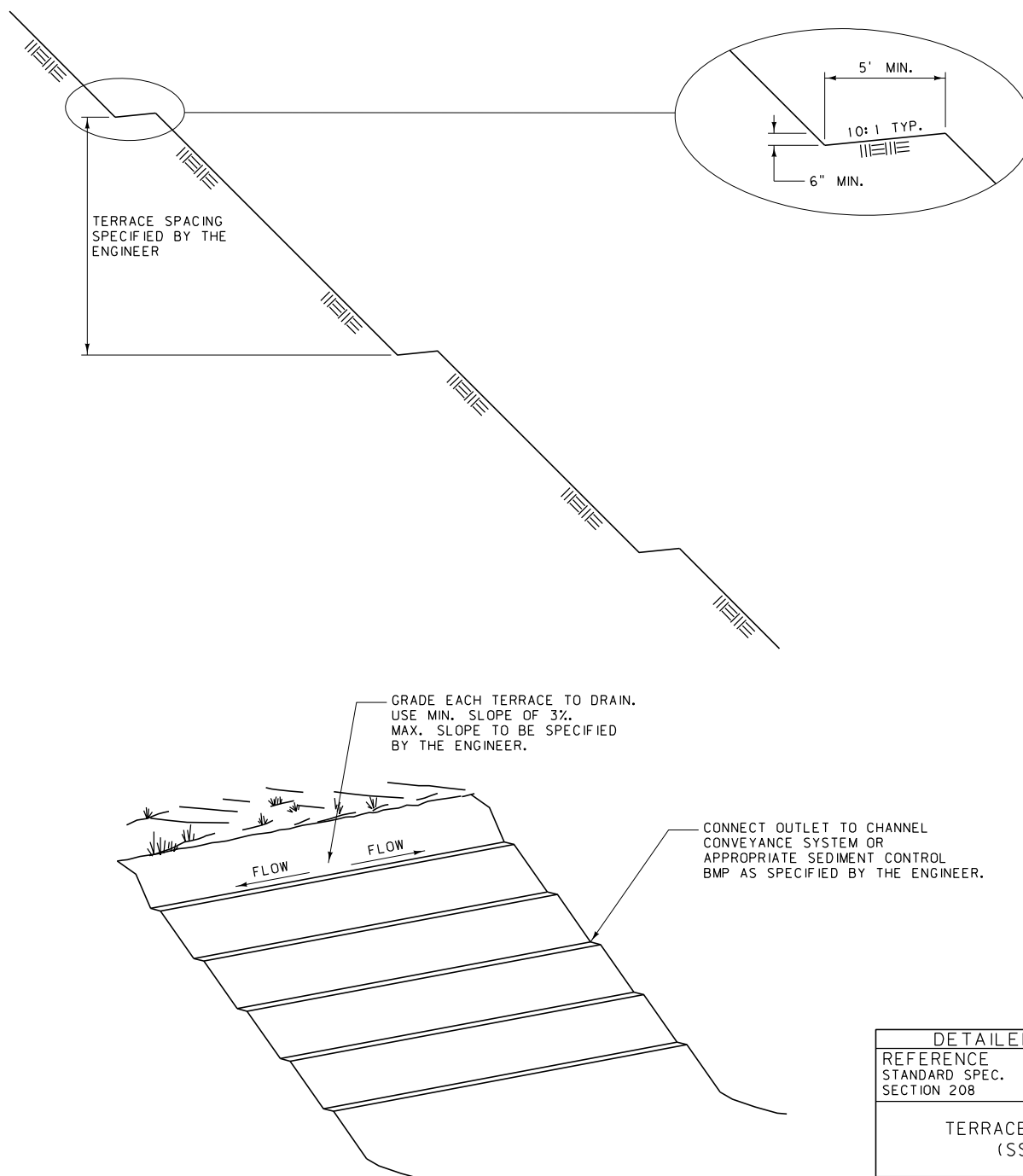
DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	208-22
SECTION 208	
SLOPE ROUGHENING (SS-12)	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	


SYMBOL: ———— GT ————

TERRACED SLOPES SS-13:

TERRACED SLOPES ARE MADE OF EITHER EARTHEN EMBANKMENTS OR RIDGE AND CHANNEL SYSTEMS THAT ARE PROPORTIONALLY SPACED AND ARE CONSTRUCTED WITH AN ADEQUATE GRADE. TERRACES REDUCE DAMAGE FROM EROSION BY COLLECTING AND REDISTRIBUTING SURFACE RUNOFF TO STABLE OUTLETS AT SLOWER VELOCITIES AND BY INCREASING THE DISTANCE OF OVERLAND RUNOFF FLOW. THIS BMP IS USUALLY LIMITED TO USE ON LONG STEEP SLOPES WITH A WATER EROSION PROBLEM, OR WHERE IT IS ANTICIPATED THAT WATER EROSION WILL BE A PROBLEM. TERRACED SLOPES ARE NOT APPROPRIATE FOR USE ON SANDY, STONY, OR SHALLOW SOILS.

DESIGN TERRACED SLOPES WITH ADEQUATE AND APPROPRIATE OUTLETS. ENGINEER'S APPROVAL IS REQUIRED PRIOR TO MODIFICATIONS OF SPECIFIED TERRACED SLOPES.



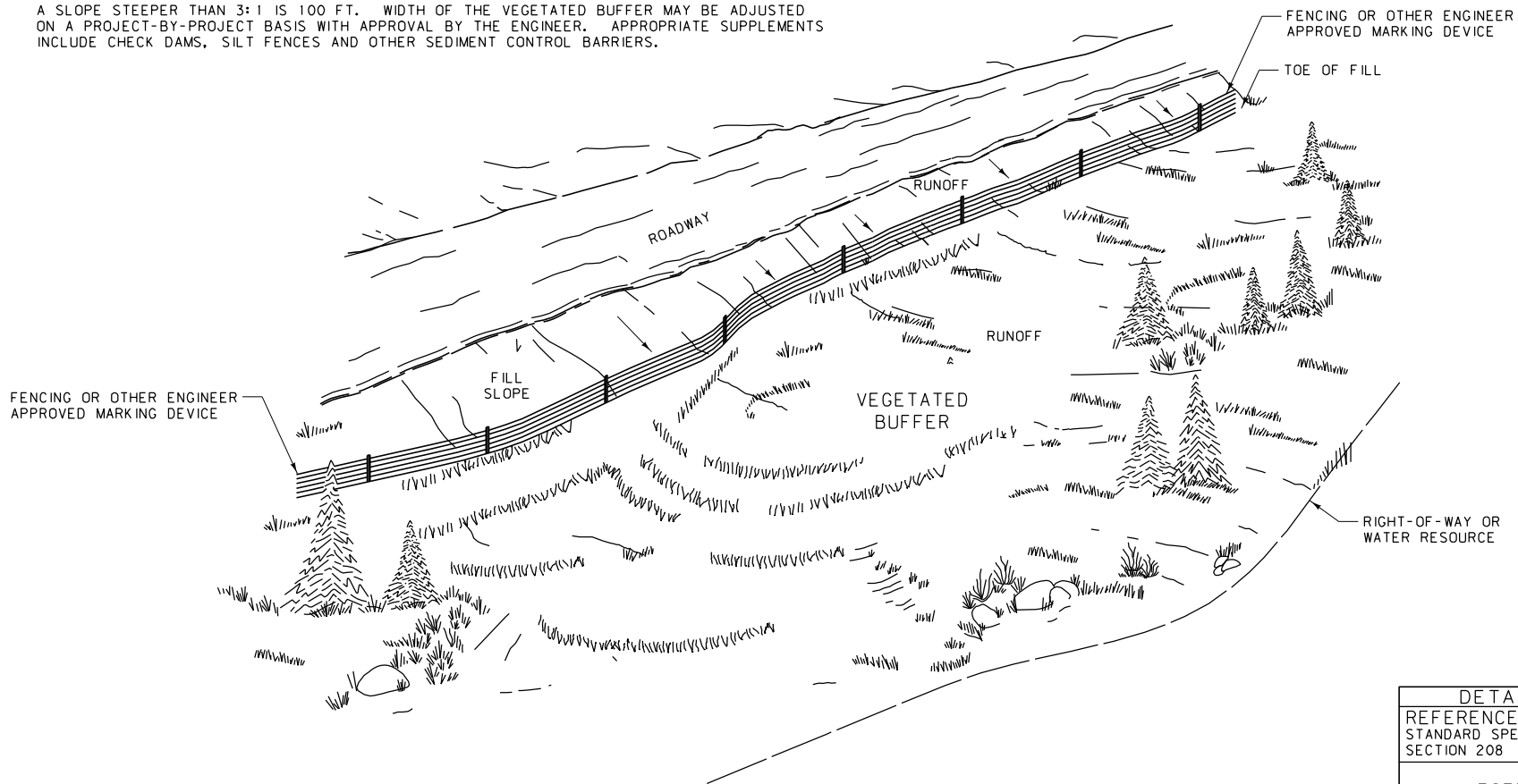
DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	208-24
SECTION 208	
TERRACED SLOPES (SS-13)	
EFFECTIVE: FEBRUARY 2005	
 serving you with pride	MONTANA DEPARTMENT OF TRANSPORTATION


SYMBOL: ——— VBS ———

VEGETATED BUFFER SS-14:

VEGETATED BUFFER IS AN UNDISTURBED AREA OR STRIP OF ESTABLISHED VEGETATION. A VEGETATED BUFFER PROVIDES A LIVING SEDIMENT FILTER TO REDUCE RUNOFF VELOCITIES AND ALLOW CAPTURE AND SETTLING OF COARSE-GRAINED SEDIMENT. VEGETATED BUFFERS REDUCE OR PREVENT SEDIMENTATION FROM LEAVING THE RIGHT-OF-WAY.

IDENTIFY EXISTING VEGETATED BUFFERS BEFORE CONSTRUCTION OCCURS AND MARK AREA PER SS-2 (PRESERVATION OF EXISTING VEGETATION) OR WITH SC-1 (SILT FENCE). ESTABLISHED VEGETATED BUFFERS SHOULD INCLUDE GRASSES AND SHRUBS. IRRIGATION, FERTILIZATION AND WEED AND PEST CONTROL MAY BE REQUIRED IN ORDER TO ESTABLISH AND MAINTAIN AN EFFECTIVE VEGETATED BUFFER. KEEP EQUIPMENT AND FILL MATERIAL OFF OF VEGETATED BUFFERS. ALWAYS CONSIDER VEGETATED BUFFER BUFFERS WHEN WATER RESOURCES ARE ADJACENT TO OR NEAR DISTURBANCES AND REQUIRE PROTECTION. THE MINIMUM WIDTH REQUIREMENT FOR A WELL-ESTABLISHED VEGETATED BUFFER WITH A SLOPE OF 3:1 OR FLATTER IS 50 FT. THE MINIMUM WIDTH REQUIREMENT FOR A WELL-ESTABLISHED VEGETATED BUFFER WITH A SLOPE STEEPER THAN 3:1 IS 100 FT. WIDTH OF THE VEGETATED BUFFER MAY BE ADJUSTED ON A PROJECT-BY-PROJECT BASIS WITH APPROVAL BY THE ENGINEER. APPROPRIATE SUPPLEMENTS INCLUDE CHECK DAMS, SILT FENCES AND OTHER SEDIMENT CONTROL BARRIERS.



DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-26
VEGETATED BUFFER (SS-14)	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	

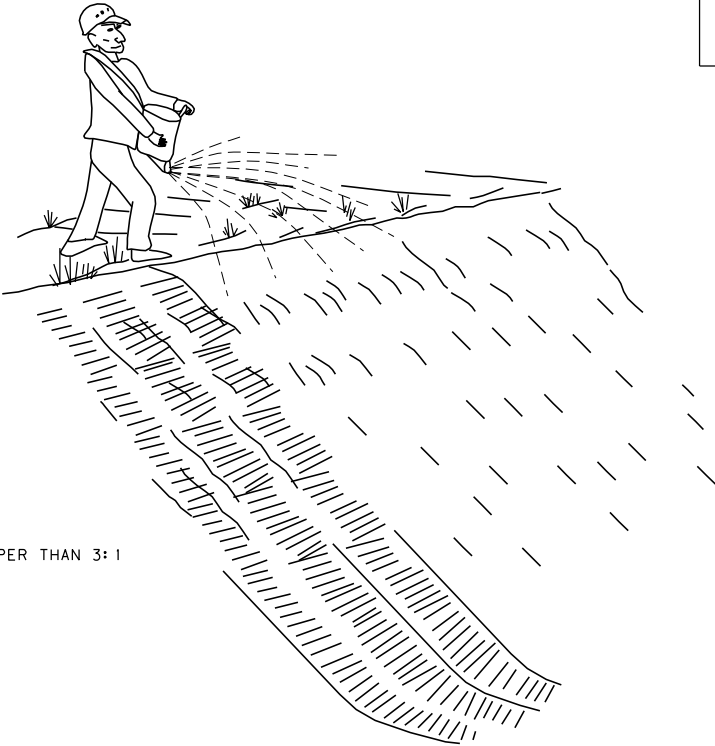
SYMBOL: _____ ES _____

EROSION SEEDING BMP SS-15:


EROSION SEEDING IS THE IMMEDIATE SEEDING OF FRESHLY EXPOSED SLOPES. USE EROSION SEEDING ON CUT AND FILL SLOPES STEEPER THAN 3:1 THAT ARE NOT SUBJECT TO FURTHER DISTURBANCE. EXCLUDE ROCK SLOPES THAT CANNOT BE EXCAVATED BY RIPPING. SEEDING DOES NOT REPLACE OR SUBSTITUTE FOR FINAL SEEDING ACTIVITIES SPECIFIED IN THE SEEDING SPECIAL PROVISION.

SEED COMPLETED SECTIONS DAILY, REGARDLESS OF THE TIME OF YEAR. ACCOMPLISH SEEDING BY MANUAL BROADCASTING WITH A SHOULDER-HARNESSED SPREADER SEEDER WITH NO MULCH OR FERTILIZER APPLIED. TRACK AREAS FOLLOWING SEEDING IN ACCORDANCE TO BMP SS-12, SLOPE ROUGHENING. HYDROSEEDING MAY ONLY BE USED AS APPROVED BY THE MDT AGRONOMIST, THROUGH THE ENGINEER. STORE THE RECOMMENDED SEED MIX ON-SITE PRIOR TO INITIATION OF SLOPE EXCAVATION. IF ONE OR MORE SPECIES IS UNAVAILABLE, CONTACT THE MDT AGRONOMIST, THROUGH THE ENGINEER, FOR THE SUBSTITUTE. ROCK AREAS THAT CANNOT BE RIPPED WILL BE EVALUATED ON A PROJECT-BY-PROJECT BASIS FOR THE NEED OF EROSION SEEDING. THESE AREAS WILL RECEIVE EROSION SEEDING FOLLOWING THE ENGINEER'S APPROVAL. THE SEED MIX AND RATE OF APPLICATION ARE AS FOLLOWS:

SLOPES STEEPER THAN 3:1



DISTRICT	SPECIES	LB. /ACRE PLS
1 (MISSOULA)	CANADA WILD RYE	3
	SECAR BLUEBUNCH WHEATGRASS	5
	CRITANA THICKSPIKE WHEATGRASS	5
	COVAR SHEEP FESCUE	2
	CEREAL BARLEY	5
2, 3, 5 (BUTTE, GREAT FALLS, BILLINGS)	CANADA WILD RYE	3
	SECAR BLUEBUNCH WHEATGRASS	5
	SODAR STREAMBANK WHEATGRASS	5
	COVAR SHEEP FESCUE	2
	CEREAL BARLEY	5
4 (GLENDALE)	CANADA WILD RYE	3
	SECAR BLUEBUNCH WHEATGRASS	5
	ROSANA WESTERN WHEATGRASS	5
	LODORM GREEN NEEDLEGRASS	3
	CEREAL BARLEY	5

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	208-28
SECTION 208	
EROSION SEEDING (SS-15)	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	

SYMBOL: ——— SF ———

SILT FENCE SC-1:

SILT FENCE IS A SINGLE OR SERIES OF FILTER FABRIC SEDIMENT BARRIER STRETCHED AND ATTACHED TO SUPPORTING POSTS. THE FENCE BOTTOM IS ENTRENCHED.

SILT FENCES ARE USED FOR SHEET FLOWS TO ASSIST IN SEDIMENT CONTROL BY RETAINING SOME OF THE ERODED SOIL PARTICLES AND SLOWING THE RUNOFF VELOCITY TO ALLOW PARTICLE SETTLING. APPLICATIONS INCLUDE WATER RESOURCE PROTECTION, INLET PROTECTION, BANK PROTECTION, AND TOE OF SLOPE PROTECTION. INSTALL SILT FENCES PRIOR TO DISTURBING AREAS REQUIRING THIS BMP OR AS SLOPE GRADES ARE ACHIEVED. MAXIMUM CUT OR FILL SLOPE FOR A SILT FENCE IS 2:1. FOLLOW MDT STANDARD SPECIFICATION 622 FOR SILT FENCE INSTALLATION.

PROVIDE SILT FENCE MEETING MDT STANDARD SPECIFICATIONS SECTION 716.

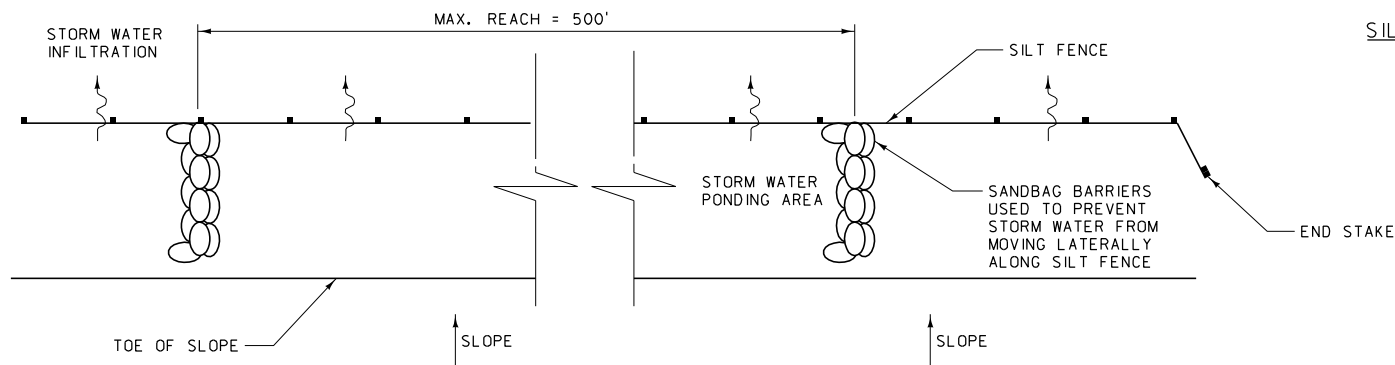
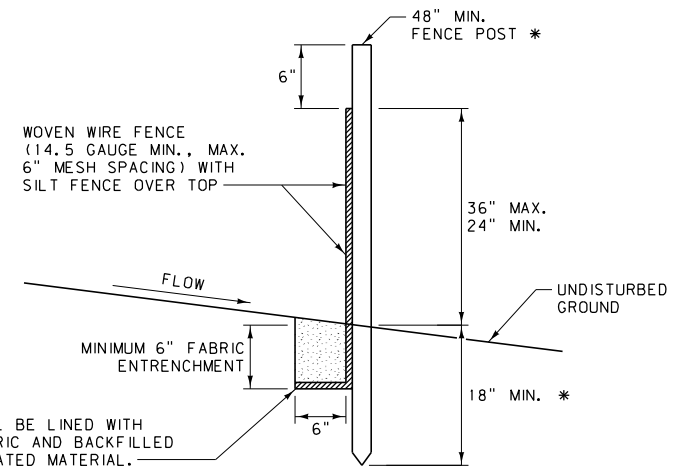
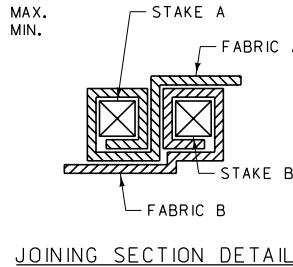
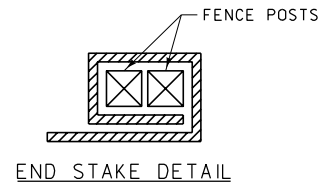
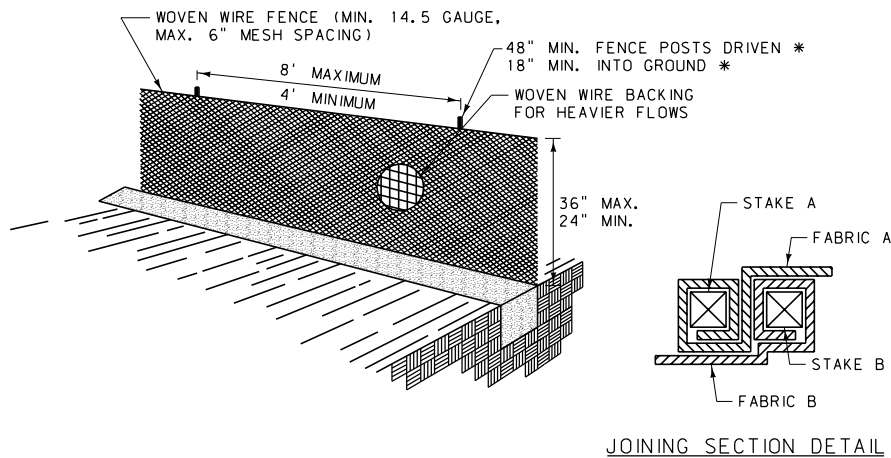
THERE ARE TWO TYPE OF SILT FENCE INSTALLATIONS:

- UNSTABILIZED - SILT FENCE SUPPORTED WITH EITHER WOOD OR METAL FENCE POSTS.
- STABILIZED - SILT FENCE SUPPORTED WITH METAL POSTS AND WITH WOVEN WIRE BACKING.


ENTRENCHMENT - THE INITIAL SILT FENCE INSTALLATION REQUIRES ONLY THE VERTICAL ENTRENCHMENT COMPONENT UNLESS THE ENGINEER DETERMINES BOTH VERTICAL AND HORIZONTAL ENTRENCHMENT COMPONENTS ARE NECESSARY. IF THE FENCE REQUIRES REPLACEMENT DUE TO FAILURE FROM PULLOUT OR UNDERCUTTING, THE SUBSEQUENT INSTALLATION WILL INCLUDE BOTH VERTICAL AND HORIZONTAL ENTRENCHMENT COMPONENTS.

SILT FENCES ARE USED BETWEEN THE EDGE OF CONSTRUCTION DISTURBANCE AND A WATER RESOURCE, AND AT A CRITICAL RESOURCE OR RIGHT-OF-WAY LINE THAT IS ADJACENT TO CONSTRUCTION ACTIVITY. POSITION THE BARRIER TO PREVENT SEDIMENT FROM ENTERING DRAINAGES. DO NOT PLACE THE BARRIER ACROSS LIVE STREAMS. WOVEN WIRE BACKING IS NECESSARY WHEN DEALING WITH HEAVIER FLOW VELOCITIES AND SEDIMENT OR AS A ROCK BARRIER. REMOVE SEDIMENT FROM BEHIND THE FENCE WHEN IT ACCUMULATES TO ONE-THIRD THE ORIGINAL HEIGHT. EITHER GRADE AND SEED OR REMOVE THE SEDIMENT DEPOSITS PRIOR TO REMOVAL OF THE FENCE. DISTANCES BETWEEN SILT FENCE WHEN USED FOR SEDIMENT RETENTION ARE AS FOLLOWS:

- FROM 2% TO 3% PLACE SILT FENCE AT 500 FT. SPACING
- FROM 3% TO 4% PLACE SILT FENCE AT 300 FT. SPACING
- FROM 4% + PLACE SILT FENCE AT 150 FT. SPACING



* FOR CLEAR ZONE APPLICATIONS USE MAX. POST LENGTH OF 60" WITH A MAX. BURIAL DEPTH OF 18".

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-30
SILT FENCE (SC-1)	
EFFECTIVE: APRIL 2006	
 MONTANA DEPARTMENT OF TRANSPORTATION <i>serving you with pride</i>	

SYMBOL: ——— DB ———

DESILTING BASIN SC-2:

A DESILTING BASIN IS A TEMPORARY BASIN FORMED BY EXCAVATION AND/OR CONSTRUCTING AN EMBANKMENT SO THAT SEDIMENT-LADEN RUNOFF IS TEMPORARILY DETAINED UNDER SLOW FLOWING CONDITIONS, ALLOWING SEDIMENT TO SETTLE OUT BEFORE THE RUNOFF IS DISCHARGED.

USE DESILTING BASINS FOR DISTURBED AREAS BETWEEN 5 ACRES AND 10 ACRES WHERE SEDIMENT-LADEN WATER MAY ENTER THE DRAINAGE SYSTEM OR WATERCOURSE.

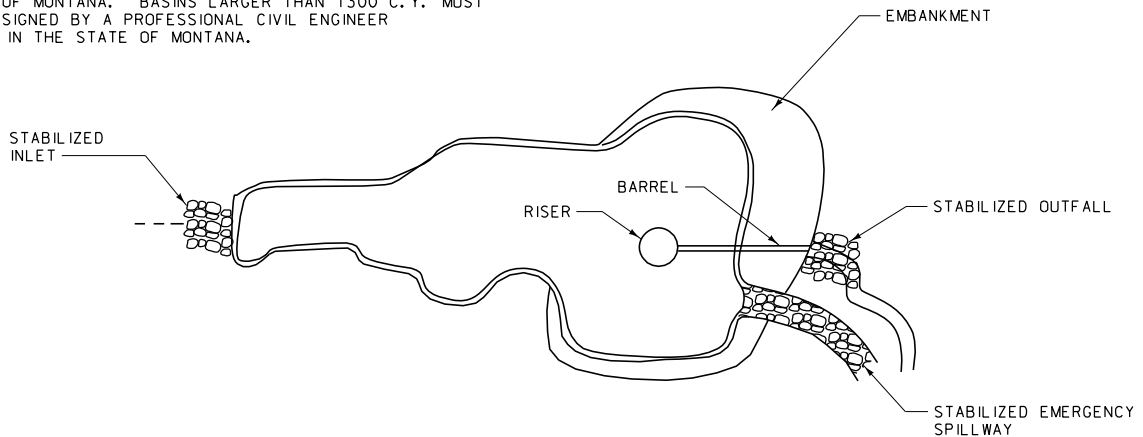
DO NOT USE DESILTING BASINS FOR DRAINAGE AREAS GREATER THAN 75 ACRES AND DO NOT LOCATE BASINS WITHIN LIVE STREAMS.

SIZE DESILTING BASINS SUCH THAT THERE IS 50 C.Y. PER ACRE OF CONTRIBUTING AREA. LENGTH MUST BE EQUAL OR LARGER THAN TWICE THE WIDTH. DEPTH MUST BE BETWEEN 3 FT. AND 5 FT. ANY BASIN MEETING THE DEFINITION OF A "HIGH HAZARD DAM" MUST BE DESIGNED BY A PROFESSIONAL CIVIL ENGINEER REGISTERED IN THE STATE OF MONTANA. BASINS LARGER THAN 1300 C.Y. MUST ALSO BE DESIGNED BY A PROFESSIONAL CIVIL ENGINEER REGISTERED IN THE STATE OF MONTANA.

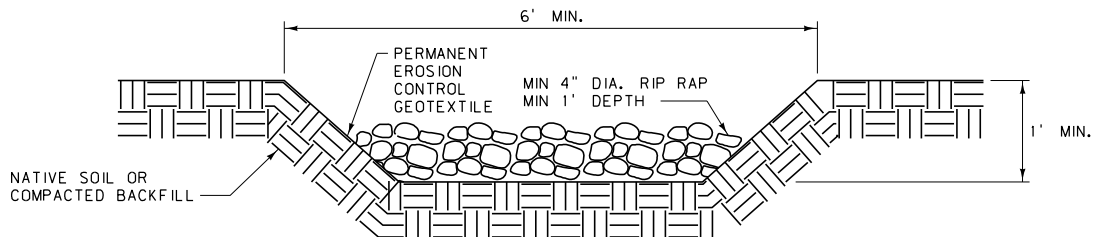
PLACE ROCK, VEGETATION, PERMANENT EROSION CONTROL GEOTEXTILE OR BLANKETS TO PROTECT THE BASIN INLET AND SLOPES AGAINST EROSION. SURROUND DESILTING BASINS WITH CHAIN LINK FENCE WHEN DESIGNED IN RESIDENTIAL/COMMERCIAL AREAS OR AS DIRECTED BY THE ENGINEER.

INSTALL PERMANENT EROSION CONTROL GEOTEXTILE IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS AND MDT STANDARD SPECIFICATIONS SECTION 622.

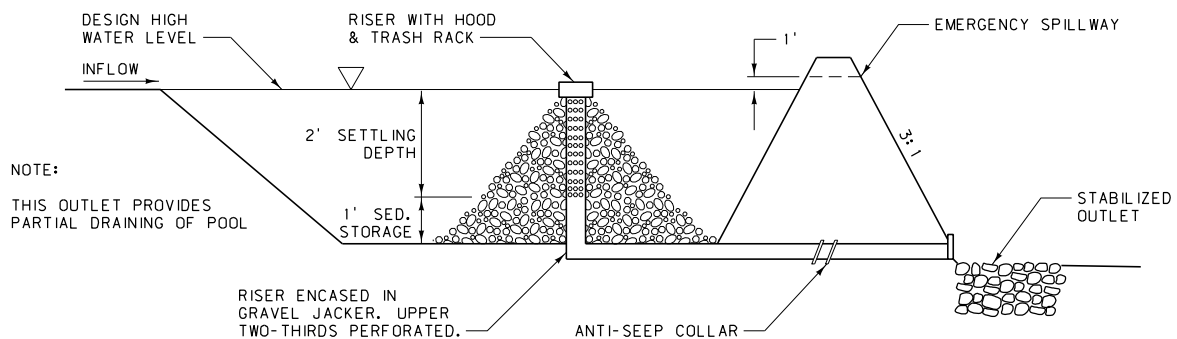
PROVIDE PERMANENT EROSION CONTROL GEOTEXTILE MEETING MDT STANDARD SPECIFICATIONS SECTION 716.




TYPICAL DESILTING BASIN - TOP VIEW

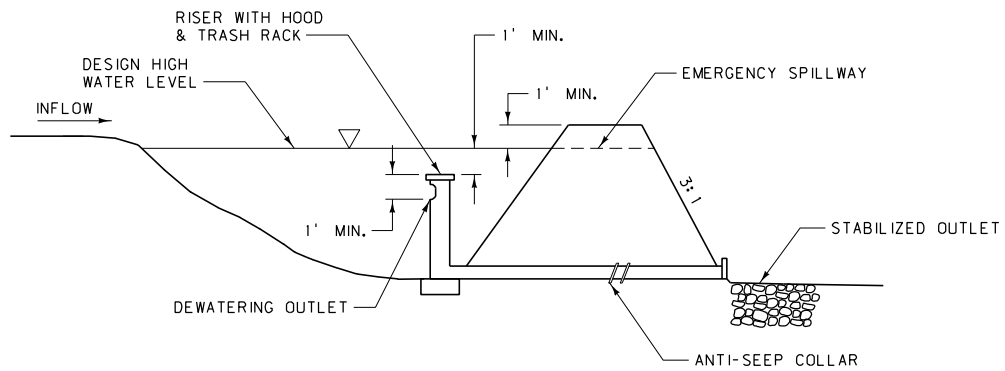


TYPICAL DESILTING BASIN - EMERGENCY SPILLWAY CROSS SECTION



TYPICAL DESILTING BASIN - OUTLET #1

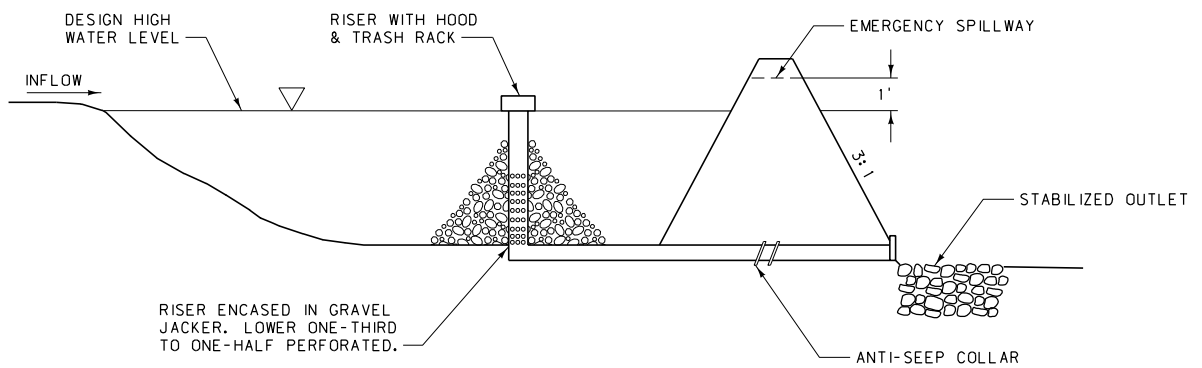
DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-32A
DESILTING BASIN (SC-2) (SHEET 1)	
EFFECTIVE: APRIL 2006	
 MONTANA DEPARTMENT OF TRANSPORTATION serving you with pride	



NOTE:

THIS OUTLET PROVIDES NO
DRAINING OF PERMANANT POOL


TYPICAL DESILTING BASIN - OUTLET #2



NOTE:

THIS OUTLET PROVIDES
COMPLETE DRAINING OF POOL

TYPICAL DESILTING BASIN - OUTLET #3

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	208-32B
SECTION 208	
DESILTING BASIN (SC-2) (SHEET 2)	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	

SYMBOL: ———— ST ————

SEDIMENT TRAP SC-3:

A SEDIMENT TRAP IS A TEMPORARY BASIN WITH A CONTROLLED RELEASE STRUCTURE, FORMED BY EXCAVATING OR CONSTRUCTION OF AN EARTHEN EMBANKMENT ACROSS A WATERWAY OR LOW DRAINAGE AREA.

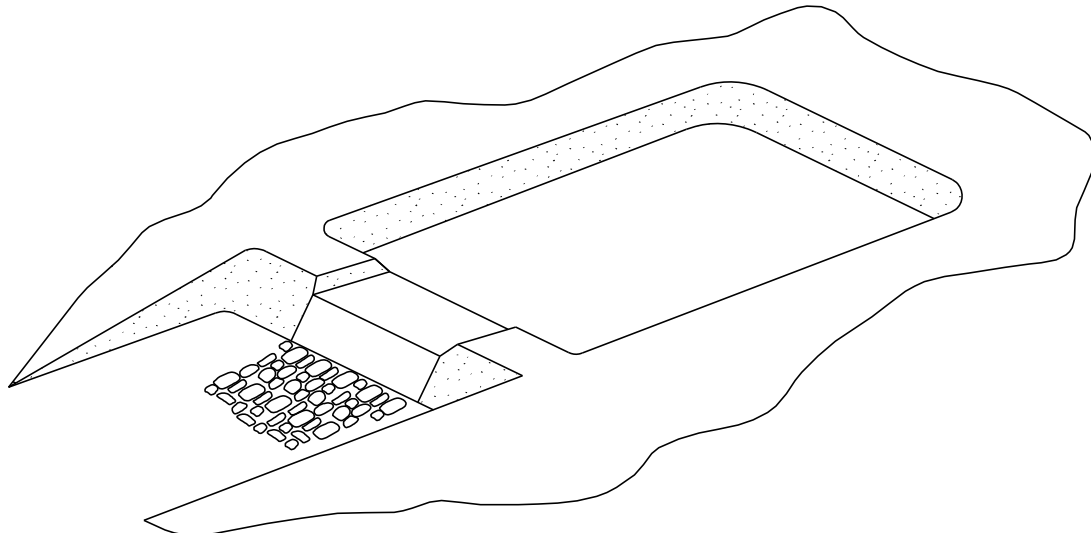
USE SEDIMENT TRAPS WHEN DISTURBED AREAS ARE LESS THAN 5 ACRES. THIS BMP CAN BE USED TO PROVIDE ADDITIONAL PROTECTION FOR A WATER BODY OR FOR REDUCING SEDIMENT BEFORE IT ENTERS A DRAINAGE SYSTEM.

SEDIMENT BASINS ARE NOT APPROPRIATE FOR DRAINAGE AREAS LARGER THAN 5 ACRES AND ONLY REMOVE LARGE TO MEDIUM SIZED PARTICLES. DO NOT USE SEDIMENT TRAPS IN LIVE STREAMS.

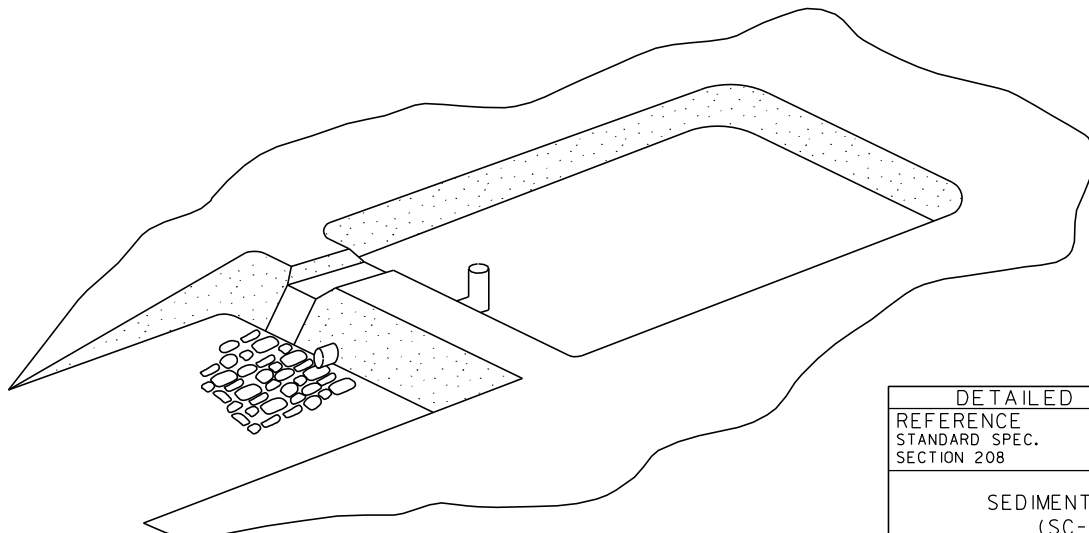
A MINIMUM SETTLING ZONE OF 70 C.Y. PER ACRE AND A MINIMUM SEDIMENT ZONE OF 35 C.Y. PER ACRE IS REQUIRED FOR EACH SEDIMENT TRAP. ANY TRAP MEETING THE DEFINITION OF A "HIGH HAZARD DAM" MUST BE DESIGNED BY A PROFESSIONAL CIVIL ENGINEER LICENSED IN THE STATE OF MONTANA. ALL TRAPS LARGER THAN 1300 C.Y. REQUIRE A DESIGN BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF MONTANA.

PLACE ROCK, VEGETATION, GEOTEXTILE OR BLANKETS TO PROTECT THE TRAP'S INLET, OUTLET AND SLOPES AGAINST EROSION. ENCLOSE THE SEDIMENT TRAP WITH CHAIN LINK FENCE WHEN PLACED IN RESIDENTIAL/COMMERCIAL AREAS OR AS DIRECTED BY THE ENGINEER.


REFER TO BMP SC-2 FOR RISER PIPE CONFIGURATIONS AND OVERFLOW SPILLWAY DESIGNS.



TYPICAL SEDIMENT TRAP WITH SPILLWAY TYPE OUTFALL



TYPICAL SEDIMENT TRAP WITH RISER PIPE TYPE OUTFALL

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	208-34
SECTION 208	
SEDIMENT TRAP (SC-3)	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	

SYMBOL: ———— CD ————

CHECK DAMS SC-4:

A CHECK DAM IS A SMALL DEVICE CONSTRUCTED OF GRAVEL, SANDBAGS, OR FIBER ROLLS, PLACED ACROSS A NATURAL OR MAN-MADE CHANNEL OR DRAINAGE DITCH. CHECK DAMS REDUCE SCOUR AND CHANNEL EROSION BY REDUCING FLOW VELOCITIES AND ENCOURAGING SEDIMENT DROP-OUT.

CHECK DAMS MAY BE INSTALLED IN SMALL CHANNELS WITH DRAINAGE AREAS OF 10 ACRES OR LESS AND/OR STEEP CHANNELS WHERE STORM WATER RUNOFF VELOCITIES EXCEED 5 FT./S. THE MAXIMUM HEIGHT FOR CHECK DAMS WITHIN THE CLEAR ZONE IS 6".

CHECK DAMS CANNOT BE USED IN LIVE STREAMS OR FOR DRAINAGE AREAS LARGER THAN 10 ACRES. IN ADDITION, CHECK DAMS CANNOT BE CONSTRUCTED FROM SILT FENCE.

PLACE CHECK DAMS AT A DISTANCE THAT WILL ALLOW SMALL POOLS TO BE FORMED BEHIND EACH DAM. INSTALL THE FIRST CHECK DAM APPROXIMATELY 15 FT. FROM THE OUTFALL DEVICE. PLACE MULTIPLE CHECK DAMS SUCH THAT BACKWATER FROM THE DOWNSTREAM DAM WILL REACH THE TOE OF THE UPSTREAM DAM. ROCK MAY BE PLACED BY HAND OR BY MECHANICAL METHOD TO ACHIEVE COMPLETE DITCH OR SWALE COVERAGE.

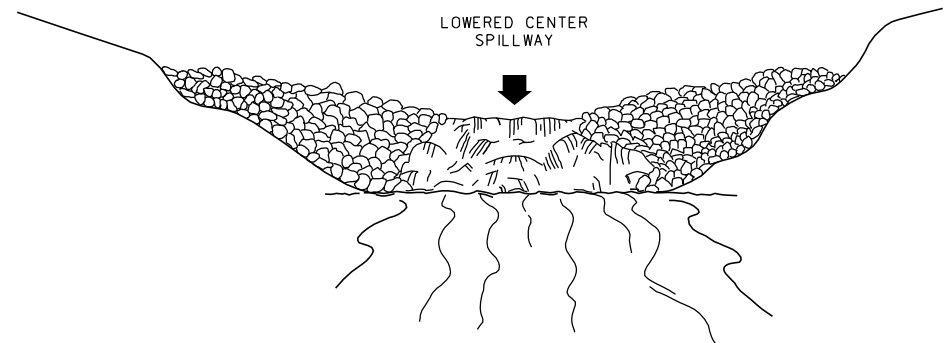
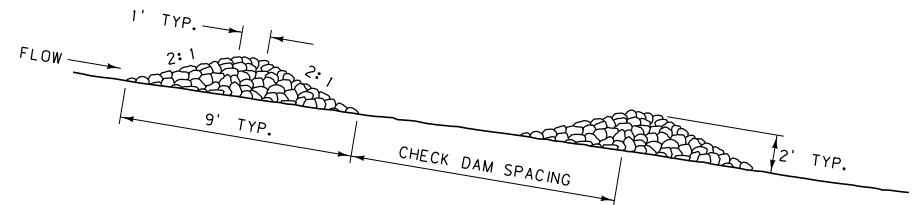
CHECK DAMS CONSTRUCTED FROM GRAVEL MUST BE 100% PASSING THE 2" SCREEN AND 10% MAXIMUM PASSING THE NO. 4 SIEVE. DAM MATERIAL MAY BE PITRUN OR CRUSHED AGGREGATE. REFER TO BMPs SC-5 AND SC-8 FOR USE OF FIBER ROLLS AND SAND BAGS AS CHECK DAMS.


REMOVE SEDIMENT FROM BEHIND THE DAM WHEN IT ACCUMULATES TO ONE-HALF THE ORIGINAL HEIGHT UNLESS ITS DRAINAGE AREA HAS BEEN STABILIZED.

DISTANCES BETWEEN CHECK DAMS ARE AS FOLLOWS:

- FROM 1% TO 3% PLACE CHECK DAMS AT 300 FT. SPACING
- FROM 3% TO 4% PLACE CHECK DAMS AT 200 FT. SPACING
- FROM 4% + PLACE CHECK DAMS AT 100 FT. SPACING

CHECK DAM SPACING MAY BE ADJUSTED ON A PROJECT-BY-PROJECT BASIS BY THE ENGINEER. DO NOT USE CHECK DAMS ON 1-2% GRADES UNLESS DETERMINED NECESSARY BY THE ENGINEER.



DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	208-36
SECTION 208	
CHECK DAMS (SC-4)	
EFFECTIVE: APRIL 2006	
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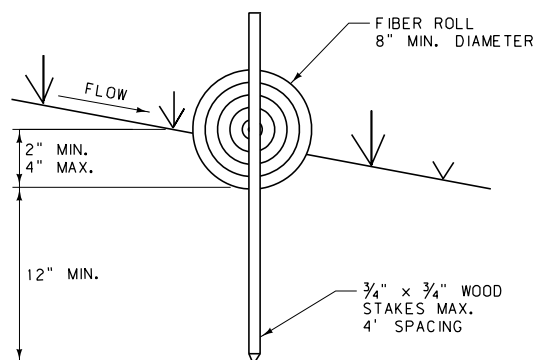
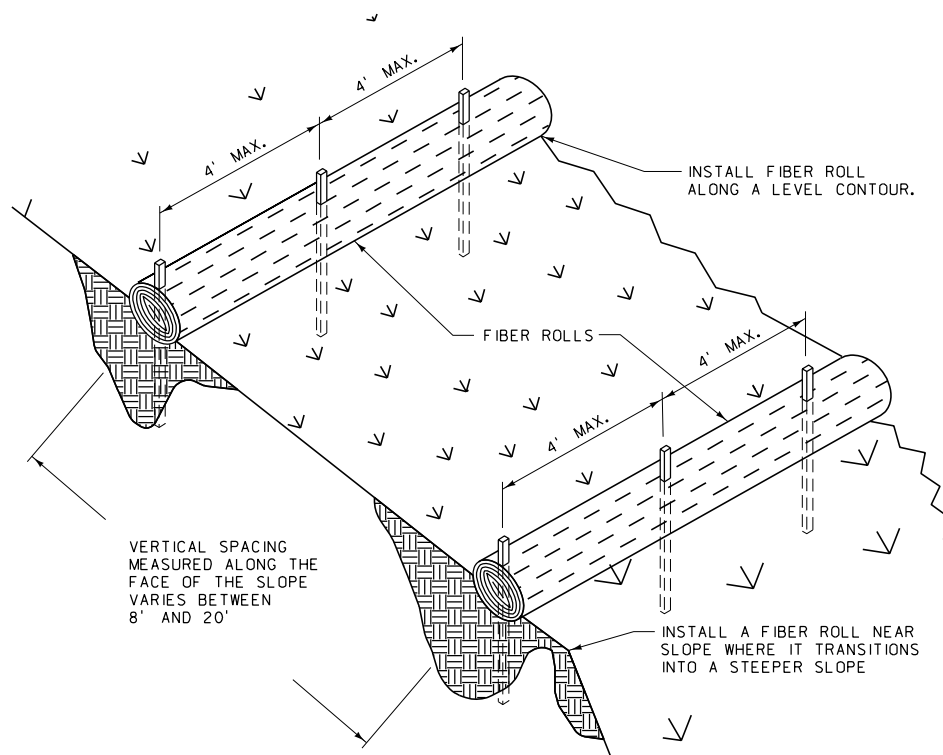
SYMBOL: ———— FR ————


FIBER ROLLS SC-5:

A FIBER ROLL CONSISTS OF EROSION CONTROL BLANKET MATERIAL THAT IS PREFABRICATED, OR ROLLED AND BOUND IN THE FIELD INTO A TIGHT TUBULAR ROLL AND PLACED ON THE FACE OF SLOPES AT REGULAR INTERVALS TO INTERCEPT RUNOFF, REDUCE ITS FLOW VELOCITY, RELEASE THE RUNOFF AS SHEET FLOW, AND PROVIDE SOME REMOVAL OF SEDIMENT FROM THE RUNOFF.

FIBER ROLLS MAY BE USED ALONG THE TOP, FACE, AND AT GRADE BREAKS OF EXPOSED AND ERODIBLE SLOPES TO SHORTEN SLOPE LENGTH AND SPREAD RUNOFF AS SHEET FLOW. ROLLS MAY BE USED AS CHECK DAMS IF APPROVED BY THE ENGINEER. FOR USE AS CHECK DAMS, PLACE FIBER ROLLS AT 50 FT. MAXIMUM SPACING OR AS APPROVED BY THE ENGINEER.

ALTHOUGH FIBER ROLLS PROVIDE SOME SEDIMENT REMOVAL, FIBER ROLLS ARE NOT TO BE USED IN PLACE OF A LINEAR SEDIMENT BARRIER (I.E., SILT FENCE, SANDBAG BARRIER, OR STRAW BALE BARRIER).



DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-38
FIBER ROLLS (SC-5)	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	

SYMBOL: ——— GBB ———

GRAVEL BAG BERM SC-6:

A GRAVEL BAG BERM CONSISTS OF A SINGLE ROW OF GRAVEL BAGS THAT ARE INSTALLED END-TO-END TO FORM A BARRIER ACROSS A SLOPE TO INTERCEPT RUNOFF, REDUCE RUNOFF VELOCITY, RELEASE RUNOFF AS SHEET FLOW, AND PROVIDE SOME SEDIMENT REMOVAL. GRAVEL BAG BERMS CAN BE USED ALONG THE FACE AND AT GRADE BREAKS OF EXPOSED AND ERODIBLE SLOPES TO SHORTEN SLOPE LENGTHS AND SPREAD RUNOFF AS SHEET FLOW.

THESE DEVICES ARE NOT TO BE USED IN PLACE OF A LINEAR SEDIMENT BARRIER (I.E., SILT FENCE, SANDBAG BARRIERS, OR STRAW BALE BARRIERS).

USE WOVEN POLYPROPYLENE, POLYETHYLENE, OR POLYAMIDE FABRIC OR BURLAP MATERIAL FOR BAGS. BAG MATERIAL IS REQUIRED TO HAVE A MINIMUM UNIT WEIGHT OF 0.25 LB./S.Y. MULLEN BURST STRENGTH EXCEEDING 300 PSI AND AN ULTRAVIOLET STABILIZATION EXCEEDING 70%.

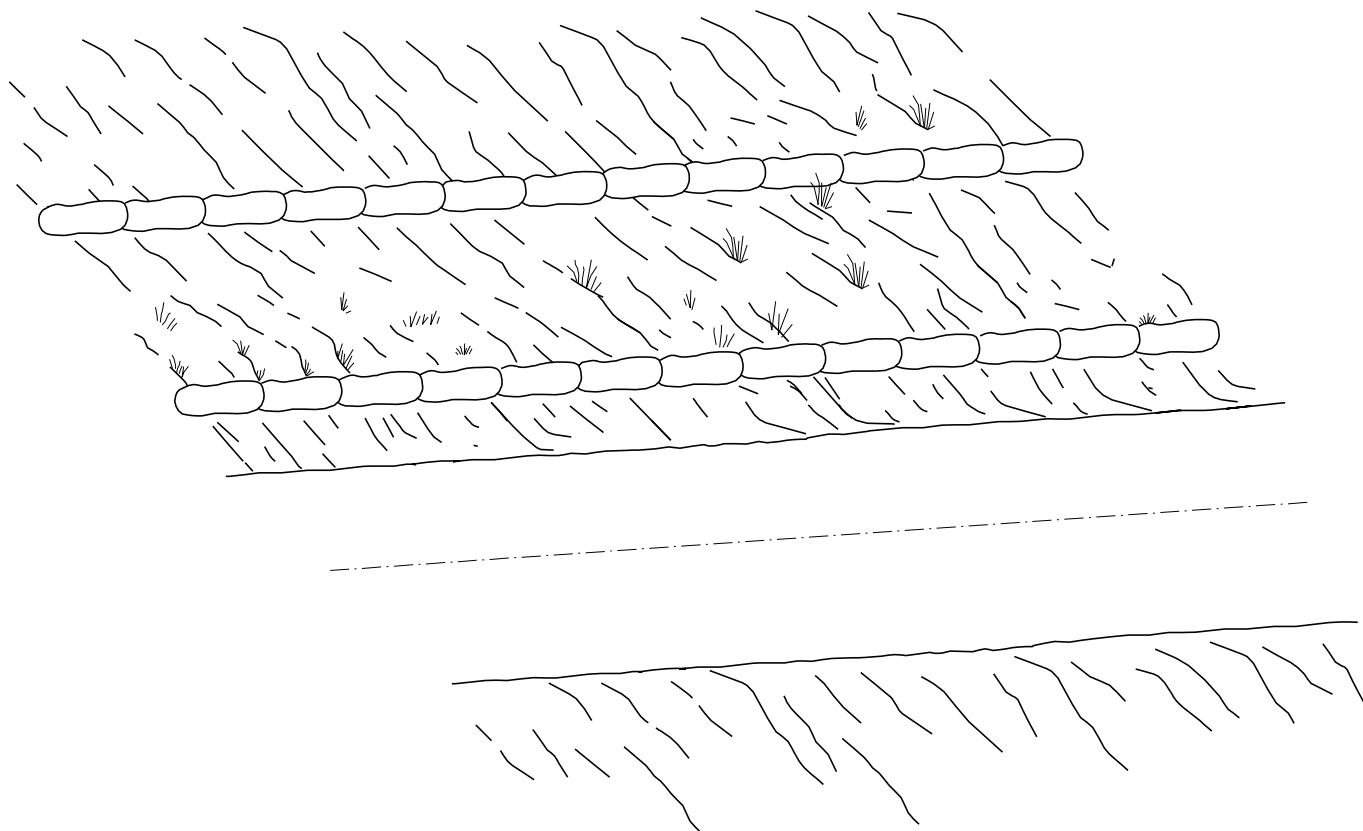
USE GRAVEL BAGS HAVING A LENGTH OF 1'-6", WIDTH OF 12", THICKNESS OF 3", AND A MASS OF APPROXIMATELY 35 LB. ALTERNATIVE BAG SIZES REQUIRE ENGINEERS APPROVAL PRIOR TO USE.


FILL GRAVEL BAGS APPROXIMATELY 75% FULL WITH GRAVEL CONSISTING OF 100% PASSING THE $\frac{3}{4}$ " SCREEN AND 10% MAXIMUM PASSING THE NO. 4 SIEVE. FILL MATERIAL MAY BE PITRUN OR CRUSHED AGGREGATE. FILL MATERIAL IS SUBJECT TO APPROVAL BY THE ENGINEER.

TIGHTLY PLACE GRAVEL BAGS TO MINIMIZE GAPS BETWEEN BAGS. BAGS MAY BE STAGGERED ON A PROJECT-BY PROJECT BASIS AS APPROVED BY THE ENGINEER.

PLACE GRAVEL BAG BERMS AT 8 FT. TO 20 FT. SPACING ALONG THE SLOPE. FOR ABNORMALLY STEEP OR SHALLOW SLOPES FOLLOW ENGINEERS GUIDELINES.

ALL BAGS PLACED WITHIN THE CLEAR ZONE REQUIRE MEASURES TO PROTECT GRAVEL FROM FREEZING. ALL FREEZE REDUCTION METHODS REQUIRE ENGINEERS APPROVAL PRIOR TO IMPLEMENTATION.



DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-40
GRAVEL BAG BERM (SC-6)	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	

SYMBOL: ——— SAND-B ———

SAND BAG BARRIERS SC-8:

A SANDBAG BARRIER IS A TEMPORARY LINEAR SEDIMENTATION BARRIER CONSISTING OF STACKED SANDBAGS, DESIGNED TO INTERCEPT AND SLOW THE FLOW OF SEDIMENT-LADEN SHEET FLOW RUNOFF. SANDBAGS CAN ALSO BE USED WHERE FLOWS ARE MODERATELY CONCENTRATED, SUCH AS DITCHES, SWALES, AND STORM DRAIN INLETS TO DIVERT AND/OR DETAIN FLOWS.

LIMIT THE USE OF SANDBAG BARRIERS TO DRAINAGE AREAS OF 5 ACRES OR SMALLER. DUE TO THE BAG MATERIAL, SANDBAG BARRIERS HAVE A TENDENCY TO FAIL OVER LONG-TERM PROJECTS.

USE WOVEN POLYPROPYLENE, POLYETHYLENE, OR POLYAMIDE FABRIC OR BURLAP MATERIAL FOR BAGS. BAG MATERIAL IS REQUIRED TO HAVE A MINIMUM UNIT WEIGHT OF 0.25 LB./S.Y., A MULLEN BURST STRENGTH EXCEEDING 300 PSI AND AN ULTRAVIOLET STABILIZATION EXCEEDING 70%.

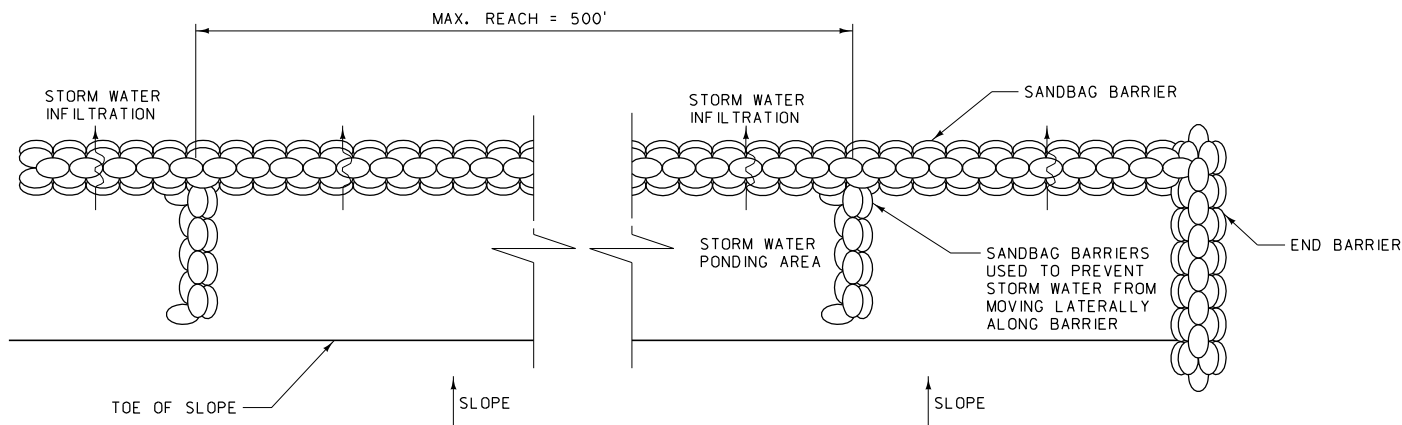
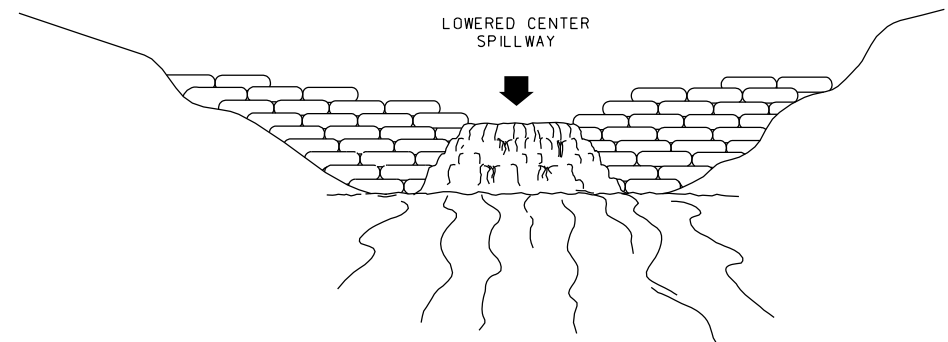
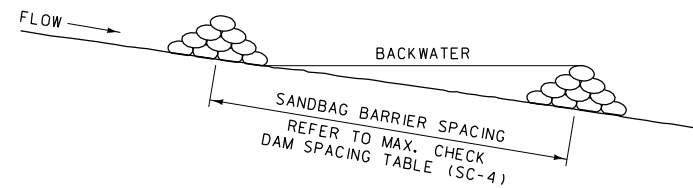
USE SANDBAGS HAVING A LENGTH OF 1'-6", WIDTH OF 12", THICKNESS OF 3", AND A MASS OF APPROXIMATELY 35 LB. ALTERNATIVE BAG SIZES MAY REQUIRE ENGINEER'S APPROVAL PRIOR TO USE.


FILL SANDBAGS WITH SAND CONSISTING OF 100% PASSING THE NO. 4 SIEVE, 50% PASSING THE NO. 10 SIEVE, AND 20% MAXIMUM PASSING THE NO. 200 SIEVE. FILL MATERIAL IS SUBJECT TO APPROVAL BY THE ENGINEER.

WHEN INSTALLING SANDBAG BARRIERS AS LINEAR CONTROL, PLACE BAGS ALONG A LEVEL CONTOUR. UPON ENDING THE SANDBAG RUN, PLACE THE LAST BAGS TO ANGLE UP THE SLOPE SO THAT FLOWS DO NOT ESCAPE AROUND THE END.

WHEN SANDBAG BARRIERS ARE PLACED IN CONCENTRATED FLOWS, STACK SANDBAGS TO HEIGHT USING A PYRAMID APPROACH WITH THE UPPER SANDBAGS OVERLAPPING THE LOWER ROW. THIS APPLICATION MAY NOT BE USED WITHIN THE CLEAR ZONE UNLESS OVERALL HEIGHT IS 6" OR LESS.

ALL BAGS PLACED WITHIN THE CLEAR ZONE REQUIRE MEASURES TO PROTECT SAND FROM FREEZING. ALL FREEZE REDUCTION METHODS REQUIRE ENGINEERS APPROVAL PRIOR TO IMPLEMENTATION.



DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-42
SAND BAG BARRIERS (SC-8)	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION serving you with pride	

SYMBOL: ———— STRAW-B ————

STRAW BALE BARRIERS SC-9:

STRAW BALE BARRIERS ARE A SEDIMENT BARRIER CONSISTING OF ENTRENCHED, OVERLAPPING AND ANCHORED STRAW BALES THAT REDUCE RUNOFF VELOCITIES AND RETAIN SEDIMENT. DO NOT USE STRAW BALE BARRIERS INSIDE THE CLEAR ZONE. STRAW BALES MUST BE CERTIFIED WEED-FREE.

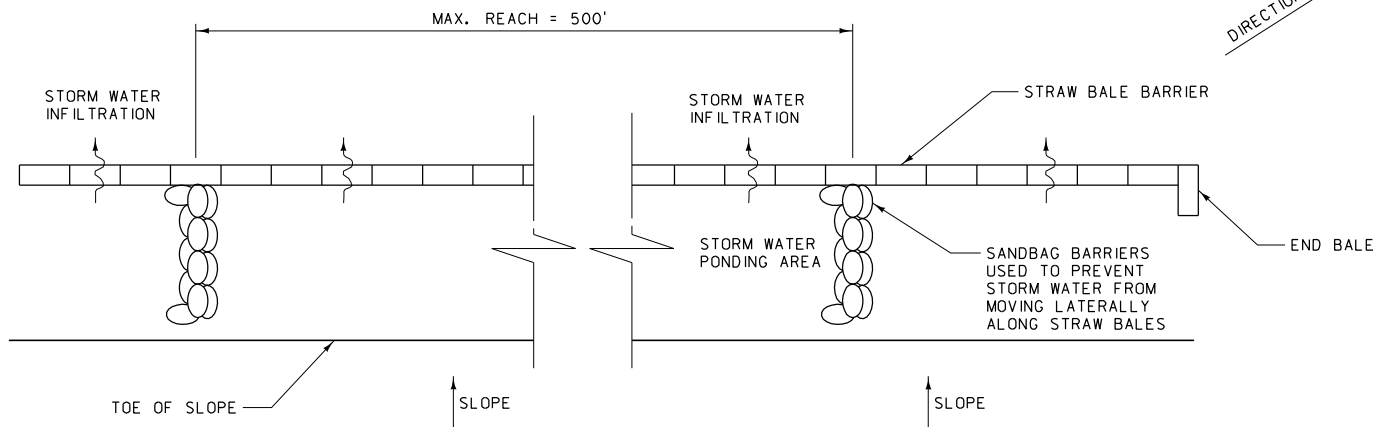
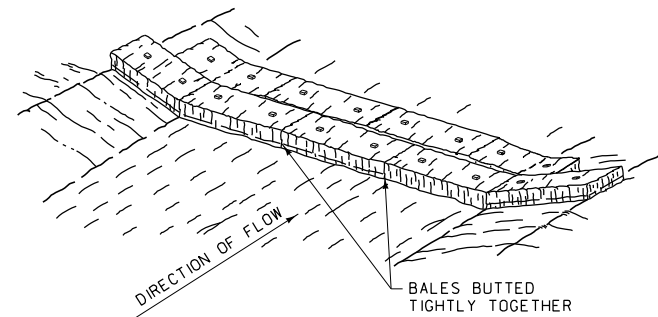
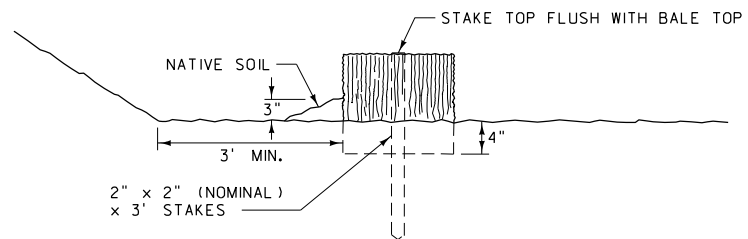
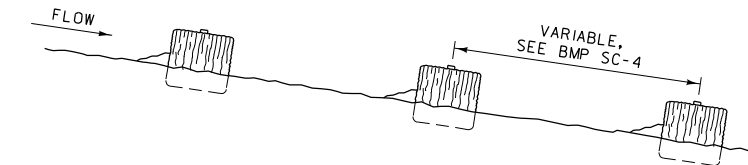
STRAW BALE BARRIERS ARE USED FOR SHEET OR CONCENTRATED FLOWS TO REDUCE RUNOFF VELOCITY, PROMOTE SEDIMENT RETENTION AND ALLOW SETTLING. DO NOT USE STRAW BALES IN HIGH FLOWS SUCH AS CHANNELS OR LIVE STREAMS. IN ADDITION, STRAW BALES CAN NOT BE USED ON SURFACE WHICH DO NOT ALLOW FOR ENTRENCHMENT.


MINIMUM STRAW BALES SIZE REQUIREMENTS ARE A WIDTH OF 1'-2", HEIGHT OF 1'-6", LENGTH OF 3 FT. AND A MASS OF 50 LB. USE STEEL WIRE (16 GAGE MIN.), NYLON OR POLYPROPYLENE STRING (1/16" MIN. DIAMETER) TO BIND BALES. MINIMUM BREAKING STRENGTH OF BINDING MATERIAL IS 80 LB. USE 2" BY 2" (NOMINAL) BY 3 FT. LONG WOODEN STAKES. DO NOT USE METAL STAKES.

INSTALL STRAW BALES ALONG A LEVEL CONTOUR, WITH THE LAST BALE TURNED UP SLOPE. PLACE BALES IN A 4" DEEP TRENCH, TIGHTLY ABUT ADJACENT BALES, AND STAKE USING A MINIMUM OF TWO STAKES PER BALE. IF SLOPES EXCEED 10:1 THE LENGTH OF SLOPE UP STREAM OF THE BARRIER MUST BE LESS THAN 50 FT. OFFSET BALES AT LEAST 3 FT. FROM THE TOE OF SLOPES. IF SITE CONDITIONS DO NOT ALLOW FOR OFFSET, BALES MAY BE PLACED AT TOE.

FOLLOW GUIDELINES IN BMP SC-4 IF BALES ARE USED AS CHECK DAMS.

REPAIR OR REPLACE DAMAGED, UNDER-CUT OR END RUN BALES. REMOVE SEDIMENT BUILDUP FROM BALES ONCE IT REACHES A HEIGHT OF 1/3 THE BALE HEIGHT.



DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-44
STRAW BALE BARRIERS (SC-9)	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	

SYMBOL:

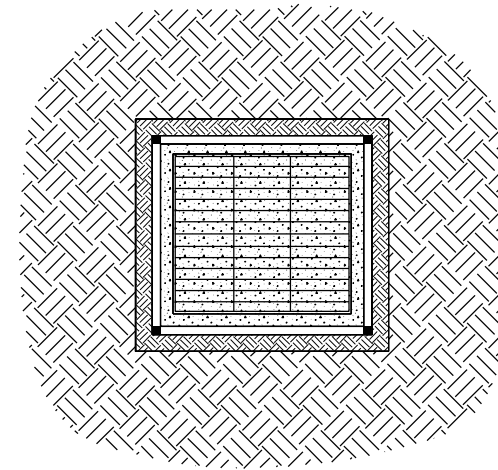


STORM DRAIN INLET PROTECTION SC-10:

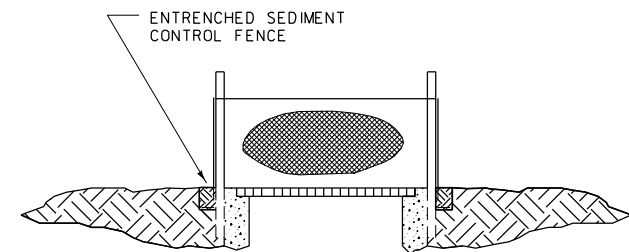
STORM DRAIN INLET PROTECTION IS USED AT STORM DRAIN INLETS THAT ARE SUBJECT TO RUNOFF FROM CONSTRUCTION ACTIVITIES. THESE DEVICES DRAIN AND/OR FILTER SEDIMENT-LADEN RUNOFF AND ALLOW SEDIMENT TO SETTLE PRIOR TO DISCHARGE OF STORM WATER INTO STORM WATER DRAINAGE SYSTEMS OR WATERCOURSES.

USE STORM DRAIN INLET PROTECTION WHEN PONDING WILL NOT ENCRDACH INTO HIGHWAY AND FOR DRAINAGE AREAS OF 1 ACRE OR LESS. FOR FLOWS LESS THEN 0.5 CFS SILT FENCE OR STRAW BALES MAY BE USED. WHEN FLOWS EXCEED 0.5 CFS USE SANDBAG BARRIERS OR GRAVEL CHECK DAMS. FOLLOW SILT FENCE (SC-1), STRAW BALE BARRIERS (SC-9), SANDBAG BARRIERS (SC-8) AND CHECK DAMS (SC-4) FOR INSTALLATION REQUIREMENTS FOR EACH TYPE OF MATERIAL.

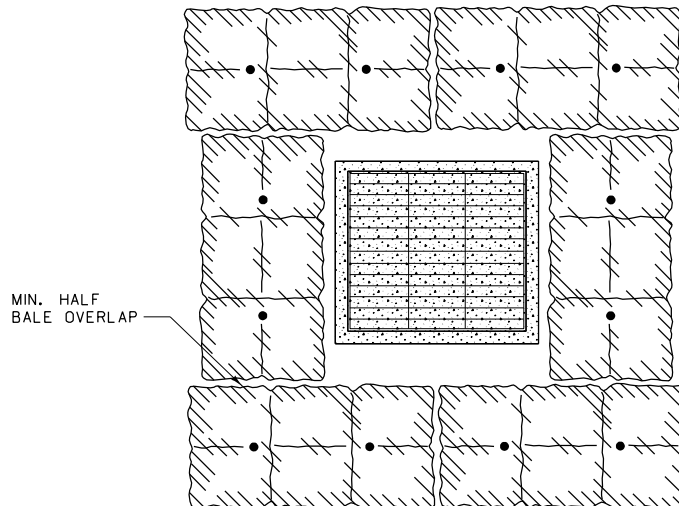
STRAW BALES, SAND BAGS, AND GRAVEL BERMS MAY BE USED WITHIN THE CLEAR ZONE UPON ENGINEERS APPROVAL. EXPEDITENTLY REMOVE ALL STRAW BALES, SAND BAGS, AND GRAVEL BERMS FROM THE CLEAR ZONE UPON COMPLETION OF CONSTRUCTION ACTIVITIES.



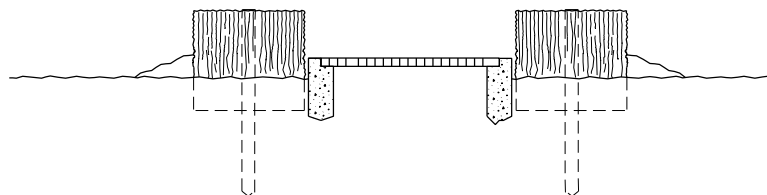
SILT FENCE - PLAN VIEW



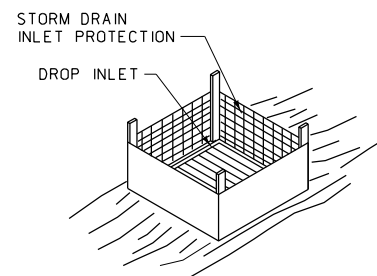
SILT FENCE - PROFILE VIEW




STRAW BALE BARRIER - PLAN VIEW

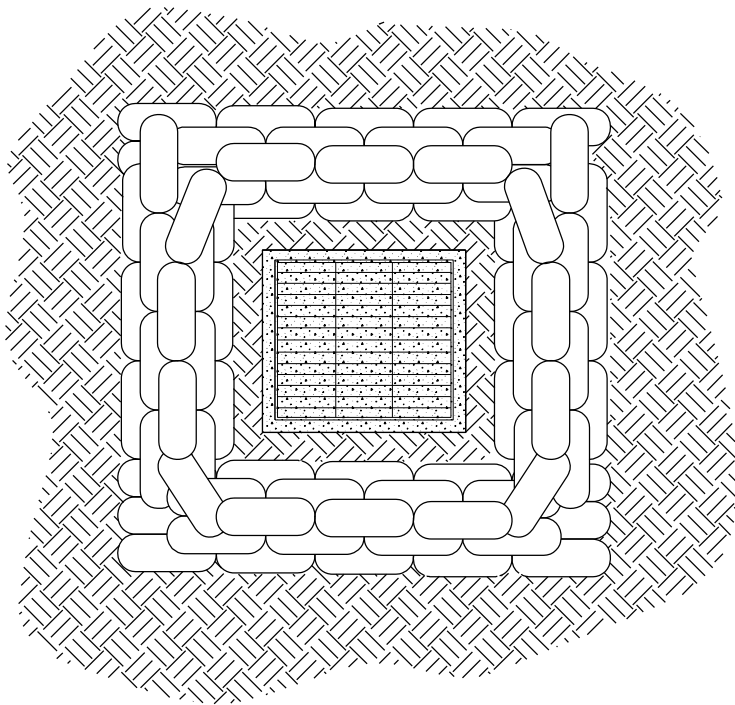


STRAW BALE BARRIER - PROFILE VIEW

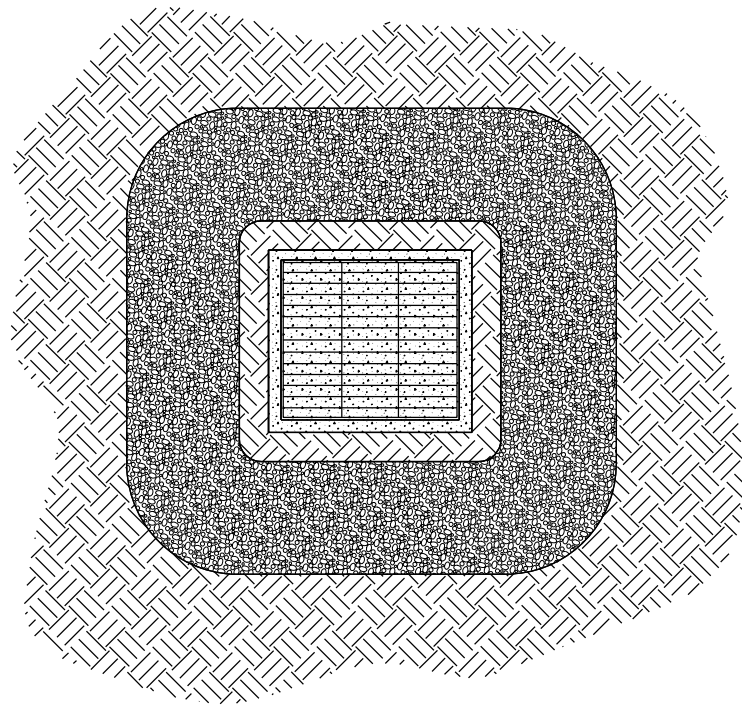


EXAMPLE ISOMETRIC VIEW

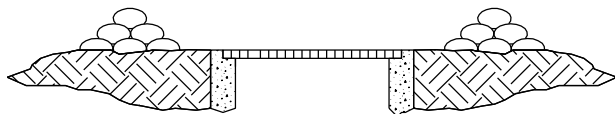
DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-46A
STORM DRAIN INLET PROTECTION (SC-10) (SHEET 1)	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	



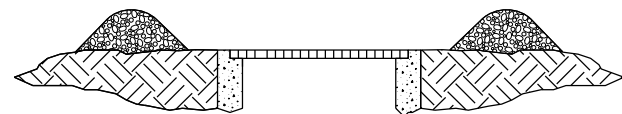
SANDBAG BARRIER - PLAN VIEW




GRAVEL CHECK DAM - PLAN VIEW



SANDBAG BARRIER - PROFILE VIEW



GRAVEL CHECK DAM - PROFILE VIEW

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	208-46B
SECTION 208	
STORM DRAIN INLET PROTECTION (SC-10) (SHEET 2)	
EFFECTIVE: FEBRUARY 2005	
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SYMBOL: ——— DDB ———

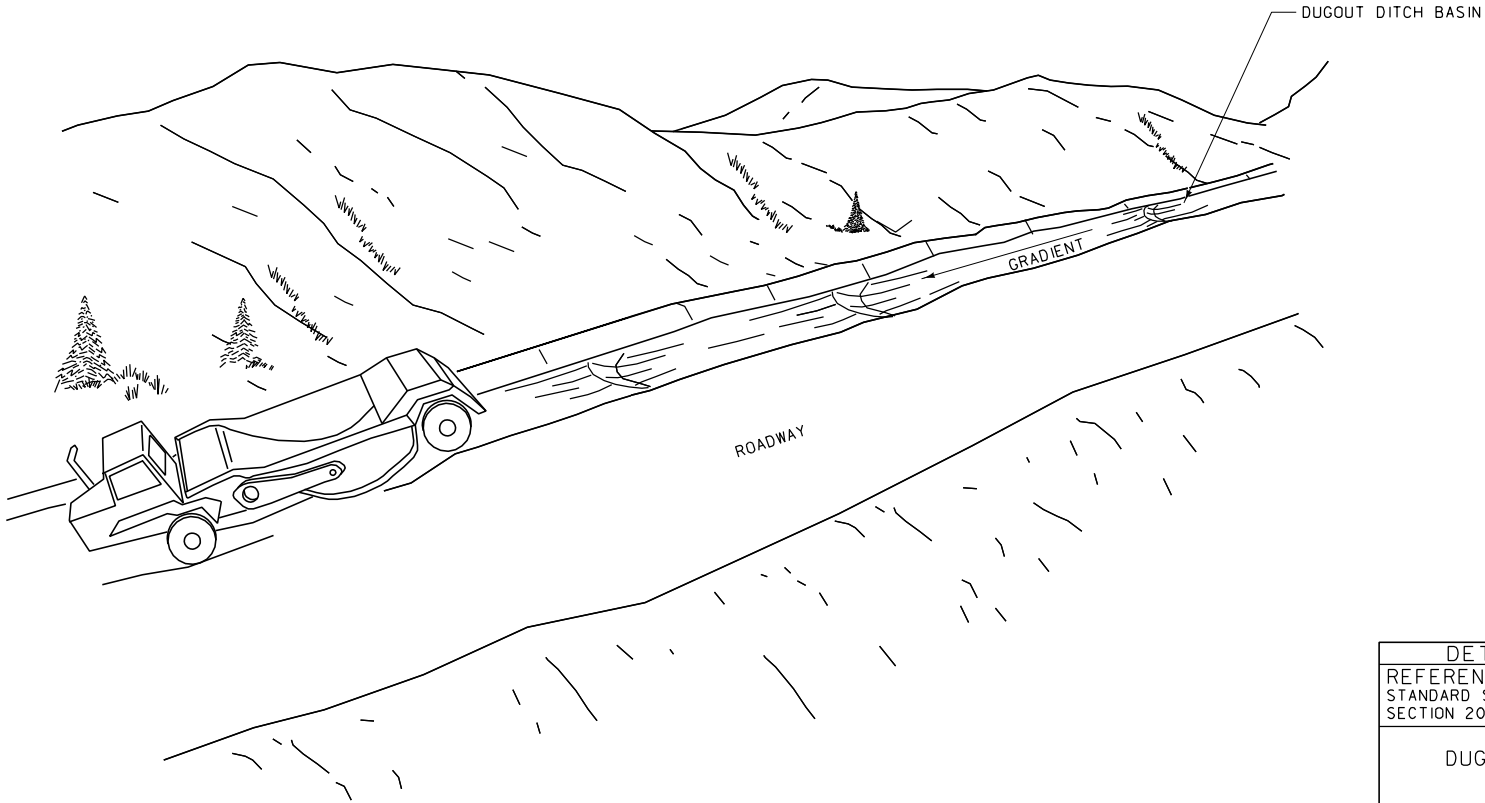
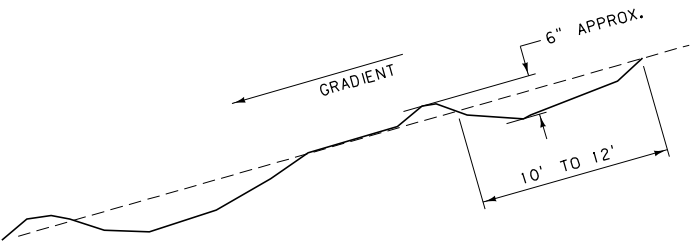
DUGOUT DITCH BASIN SC-11:


DUGOUT DITCH BASINS CONSIST OF ONE OR A SERIES OF SMALL DUGOUT BASINS USED FOR CONCENTRATED FLOWS TO REDUCE RUNOFF VELOCITY, PROMOTE SEDIMENT RETENTION AND ALLOW SETTLING. THE MAXIMUM HEIGHT FOR DUGOUT DITCH BASINS USED INSIDE THE CLEAR ZONE IS 6".

DUGOUT DITCH BASINS ARE USED FOR LONGITUDINAL SLOPE STEEPNESS (GRADE) SEDIMENT RETENTION. APPLICATIONS INCLUDE DITCH SEDIMENT TRAPS, INTERCEPTOR DITCHES AND TOE OF SLOPE PROTECTION. USE IS DEPENDENT ON SOIL TYPE. DISTANCES BETWEEN DUGOUT DITCH BASINS ARE AS FOLLOWS:

- FROM 2% TO 3% PLACE DUGOUT DITCH BASINS AT 300 FT. SPACING
- FROM 3% TO 4% PLACE DUGOUT DITCH BASINS AT 150 FT. SPACING
- FROM 4% + PLACE DUGOUT DITCH BASINS AT 50 FT. SPACING

DUGOUT DITCH BASIN SPACING CAN BE ADJUSTED ON A PROJECT-BY-PROJECT BASIS FOLLOWING ENGINEERS APPROVAL.



DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	208-48
SECTION 208	
DUGOUT DITCH BASIN (SC-11)	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	

WIND EROSION CONTROL WE-1:

WIND EROSION CONTROL CONSISTS OF APPLYING WATER OR OTHER DUST SUPPRESSANTS, ROUGHENING SURFACES OR INSTALLING WIND BARRIERS TO PREVENT WIND EROSION BY PROTECTING SOIL SURFACES OR BY REDUCING WIND VELOCITIES.

WATER SPRAYING:

APPLY BY MEANS OF PRESSURE-TYPE DISTRIBUTORS OR PIPELINES EQUIPPED WITH A SPRAY SYSTEM OR HOSES AND NOZZLES THAT MAY ENSURE EVEN DISTRIBUTION. DO NOT USE EXCESSIVE AMOUNTS OF WATER FOR DUST SUPPRESSION THAT MAY CAUSE SOILS TO BECOME SATURATED AND CREATE OTHER PROBLEMS SUCH AS EXCESS RUNOFF, MUD/DIRT TRACKING OR ICING IN THE WINTER MONTHS. EQUIP ALL DISTRIBUTION SYSTEMS WITH A POSITIVE MEANS OF SHUTOFF. UNLESS WATER IS APPLIED BY MEANS OF PIPELINES, AT LEAST ONE MOBILE IS REQUIRED TO BE AVAILABLE AT ALL TIMES ON THE CONSTRUCTION SITE TO APPLY WATER OR DUST SUPPRESSANTS. IF RECLAIMED WASTEWATER IS USED, THE SOURCES AND DISCHARGE MUST MEET MONTANA DEQ WATER RECLAMATION CRITERIA. DO NOT USE NON-POTABLE WATER IN TANKS OR DRAIN PIPES THAT MAY BE USED TO CONVEY POTABLE WATER. DO NOT CONNECT BETWEEN POTABLE AND NON-POTABLE SUPPLIES. MARK ALL NON-POTABLE TANKS, PIPES AND OTHER CONVEYANCES AS "NON-POTABLE WATER - DO NOT DRINK".

DUST SUPPRESSANTS:

MATERIALS APPLIED AS TEMPORARY SOIL STABILIZERS AND SOIL BINDERS MAY ALSO PROVIDE WIND EROSION CONTROL BENEFITS. APPLY THESE MATERIALS PER MANUFACTURE'S SPECIFICATIONS IN ACCORDANCE WITH ALL FEDERAL, STATE AND LOCAL REGULATIONS. SEE SS-5 SOIL BINDERS.

CALCIUM CHLORIDE OR OTHER DUST SUPPRESSANTS USED ON ROADWAYS THAT ARE NOT LISTED IN SS-5 MUST MEET MDT SPECIFICATIONS AND/OR BE APPROVED BY THE ENGINEER PRIOR TO USE.

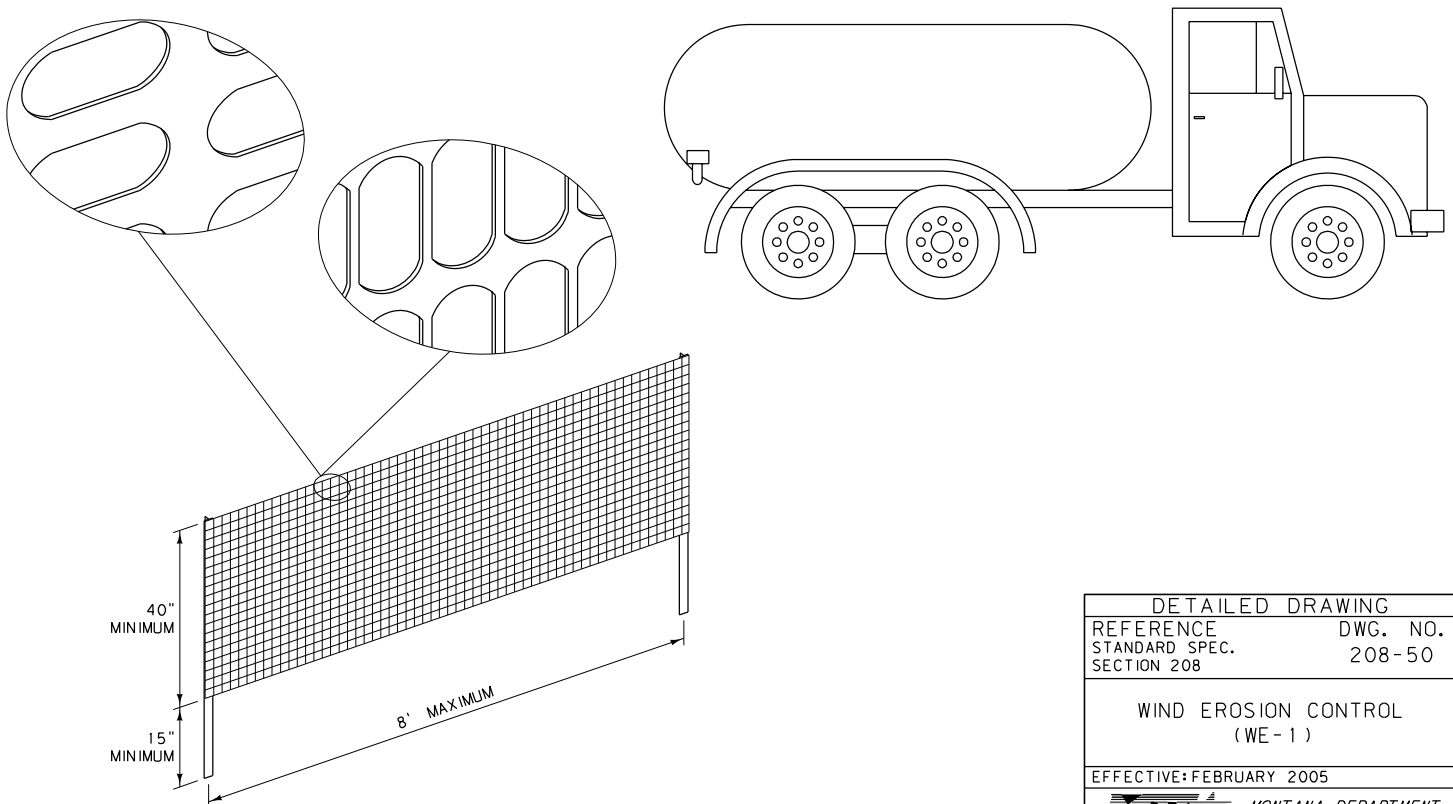
SLOPE ROUGHENING:


REFER TO SLOPE ROUGHENING TECHNIQUES DISCUSSED IN SS-12 SLOPE ROUGHENING.

WIND BARRIERS:

WIND BARRIERS PROVIDE AN AREA OF REDUCED WIND VELOCITY WHICH ALLOWS SETTLING OF LARGE SEDIMENT PARTICLES. MAXIMUM REDUCTION OF WIND VELOCITIES OCCUR IMMEDIATELY DOWNWIND OF THE WIND BARRIER, GRADUALLY DECREASING FURTHER DOWNWIND.

USE TEMPORARY WIND FENCING AS WIND BARRIERS ON CONSTRUCTION SITES. BOARD FENCING, EARTHEN BANKS, STRAW ROWS, ROCK WALLS, OR OTHER TEMPORARY WIND BARRIERS MAY BE UTILIZED AS APPROVED BY THE ENGINEER. WIND FENCING CAUSES WIND VELOCITY TO SLOW DOWN FOR APPROXIMATELY 40-50 TIMES THE FENCE HEIGHT, HOWEVER THE WIND FENCING IS ONLY EFFECTIVE FOR WIND BREAKING FOR APPROXIMATELY 10-25 TIMES THE HEIGHT OF THE FENCE. WIND FENCE IS REQUIRED TO BE A PREFABRICATED COMMERCIAL PRODUCT MADE OF WOVEN POLYETHYLENE AND ULTRAVIOLET RESISTANT MATERIAL WITH A POROSITY OF 50% MINIMUM. WIND FENCING IS MOST PROTECTIVE IN A DIRECTION THAT IS PERPENDICULAR TO THE WIND DIRECTION. FOR WIND PROTECTION OF STOCKPILES, PLACE WIND FENCING APPROXIMATELY 3 PILE HEIGHTS UPWIND OF THE STOCKPILE BASE.



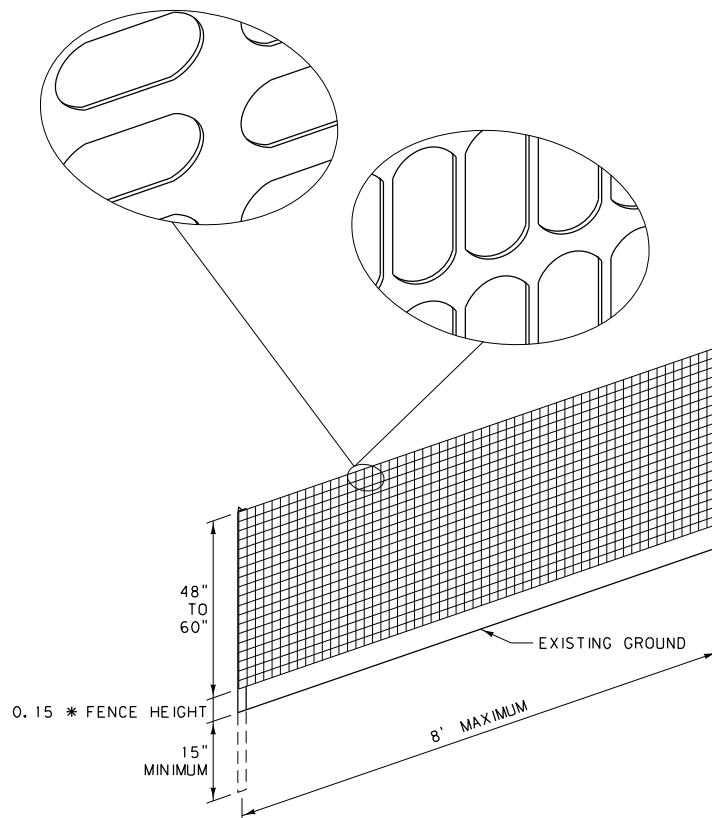
DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	208-50
SECTION 208	
WIND EROSION CONTROL (WE-1)	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	


SNOW ACCUMULATION MANAGEMENT (SN-2):

SNOW ACCUMULATION BARRIERS PROVIDE AN AREA OF REDUCED WIND VELOCITY WHICH ALLOWS SETTLING OF SNOW. MAXIMUM REDUCTION OF WIND VELOCITIES OCCUR IMMEDIATELY DOWNWIND OF THE SNOW BARRIER, GRADUALLY DECREASING FURTHER DOWNWIND.

SNOW FENCING IS ONLY EFFECTIVE FOR DRIFT CONTROL FOR APPROXIMATELY 15-20 TIMES THE HEIGHT OF THE FENCE. SNOW FENCE IS REQUIRED TO BE A PREFABRICATED COMMERCIAL PRODUCT MADE OF WOVEN POLYETHYLENE AND ULTRAVIOLET RESISTANT MATERIAL WITH A POROSITY OF 40-60%. SNOW FENCING IS MOST PROTECTIVE IN A DIRECTION THAT IS PERPENDICULAR TO THE WIND DIRECTION. SEVERAL PARALLEL FENCES CAN BE USED IN AREAS OF HIGH SNOW ACCUMULATION OR HIGH WIND CONDITIONS. SECURE FENCING TO APPROVED POSTS WITH FOLLOWING MANUFACTURE RECOMMENDATIONS.

MAINTAIN SNOW FENCING AS NEEDED OR AS SPECIFIED BY THE ENGINEER. REMOVE SNOW ACCUMULATIONS FROM FENCING ONCE LEVELS HAVE REACHED THE BOTTOM OF THE FENCE.

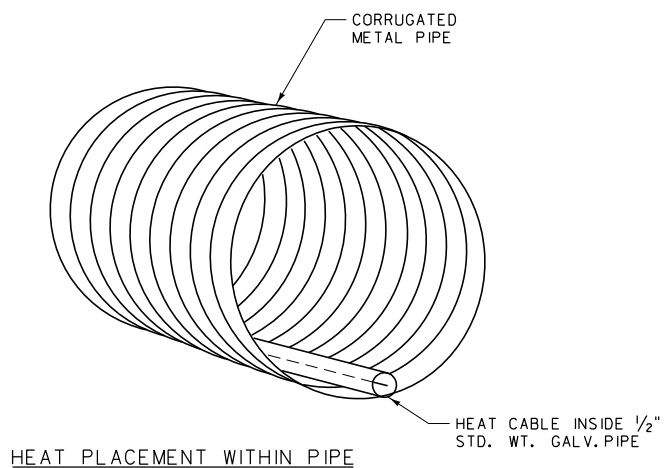
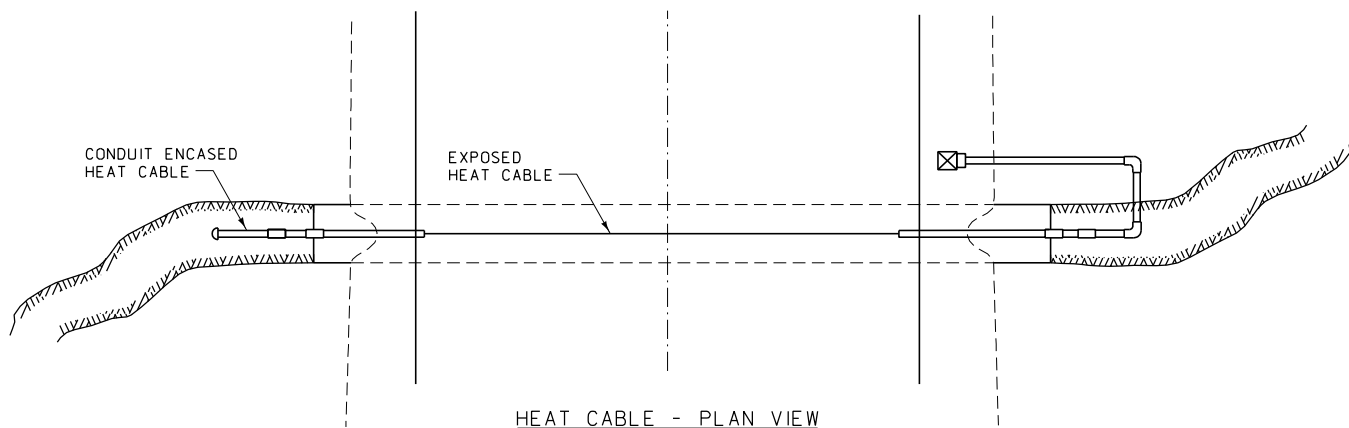
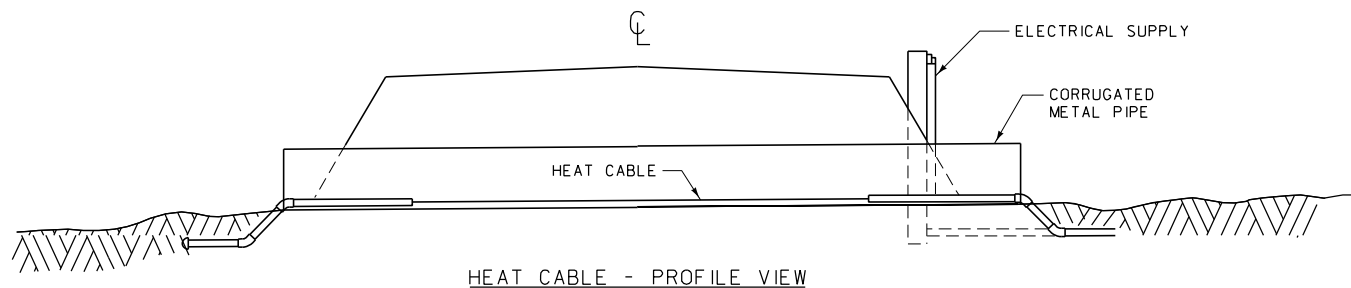



DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	208-52
SECTION 208	
SNOW ACCUMULATION MANAGEMENT (SN-2)	
EFFECTIVE: FEBRUARY 2005	
 <i>serving you with pride</i>	MONTANA DEPARTMENT OF TRANSPORTATION

FREEZE REDUCTION SN-3:

FREEZE REDUCTION BMPS ARE USED TO ENSURE THAT CRITICAL CULVERTS DO NOT FREEZE DURING THE WINTER MONTHS. USE HEAT TRACE IN CULVERTS TO PREVENT FREEZING. IN ENGINEER APPROVED CONDITIONS A DOUBLE CULVERT SYSTEM MAY BE USED. WITH THIS SYSTEM IF ONE CULVERT FREEZES A SECOND, HIGHER OR LOWER, CULVERT WILL CONTAIN RUNOFF.

ALL ELECTRICAL WORK TO BE COMPLETED BY A LICENSED ELECTRICIAN IN ACCORDANCE WITH NATIONAL ELECTRICAL CODES AND MDT STANDARD SPECIFICATIONS. HEAT CABLE IS INTENDED FOR CONTINUOUS OPERATION IN THE WINTER AND CAN NOT BE USED TO THAW FROZEN CULVERTS.



DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	208-54
SECTION 208	
FREEZE REDUCTION (SN-3)	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	

SYMBOL:

SCEE

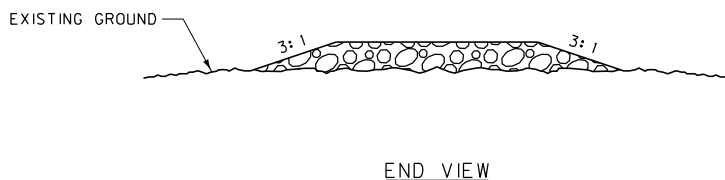
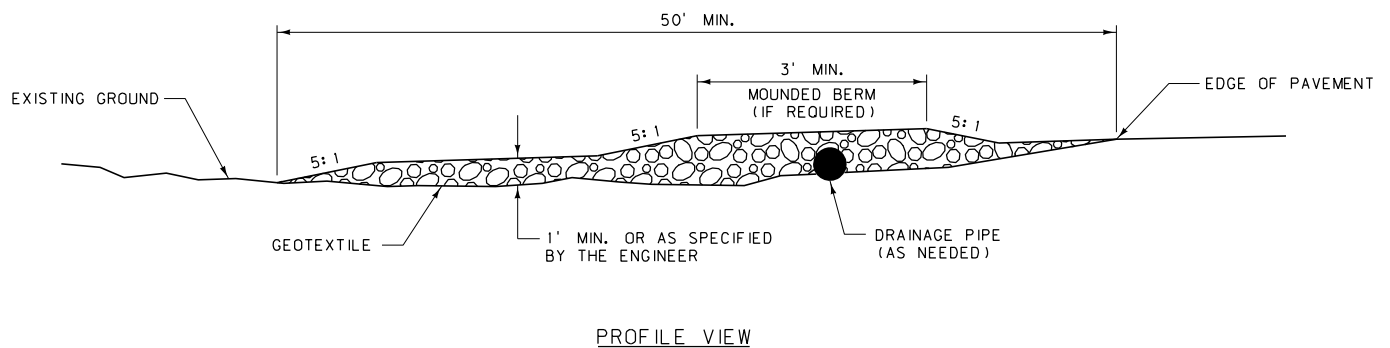
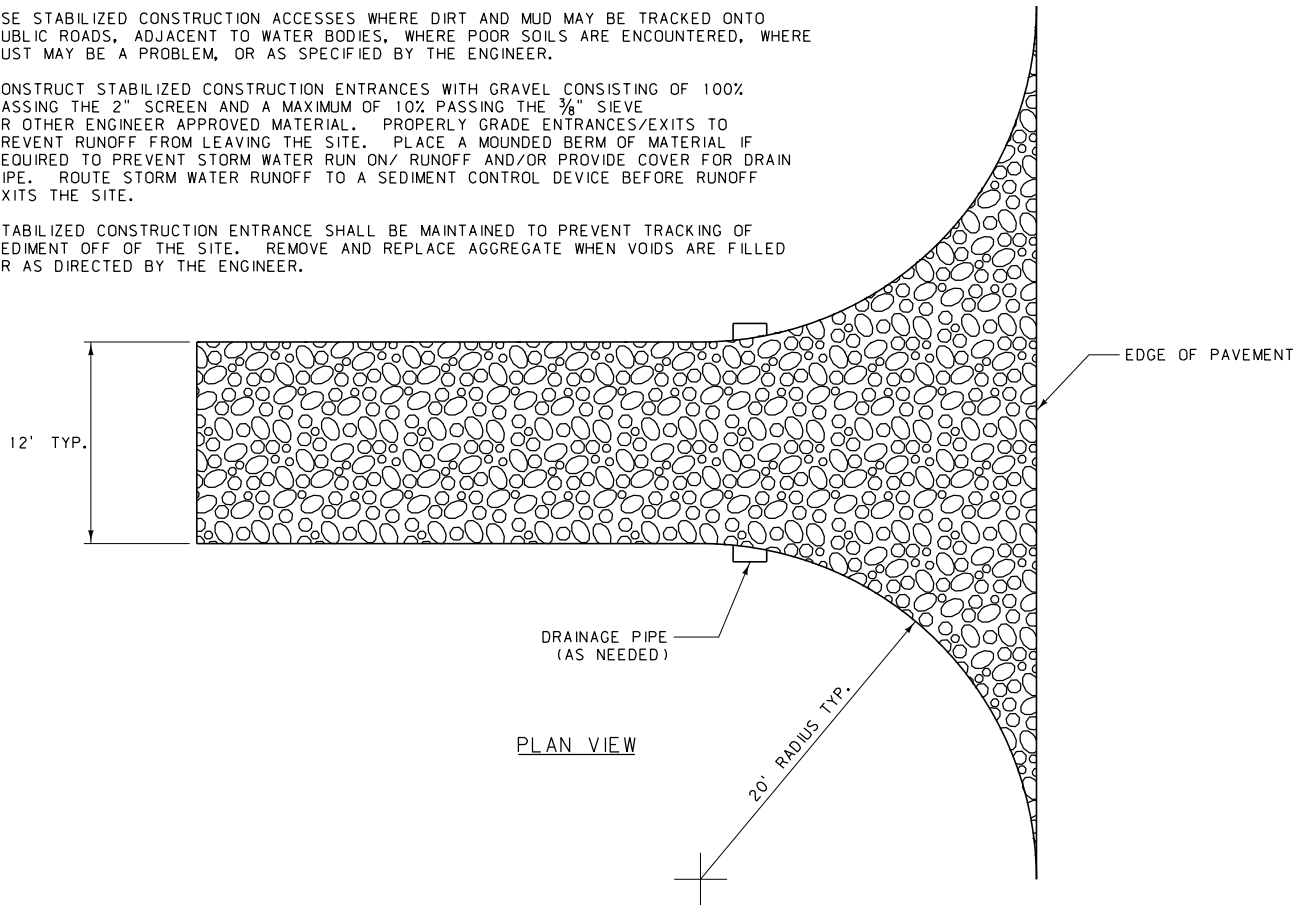
STABILIZED CONSTRUCTION ENTRANCE/EXIT TC-1:


A STABILIZED CONSTRUCTION ACCESS IS A DEFINED POINT OF ENTRANCE/EXIT TO A CONSTRUCTION SITE THAT IS STABILIZED TO REDUCE THE TRACKING OF MUD AND DIRT ONTO PUBLIC ROADS BY CONSTRUCTION VEHICLES.

USE STABILIZED CONSTRUCTION ACCESSES WHERE DIRT AND MUD MAY BE TRACKED ONTO PUBLIC ROADS, ADJACENT TO WATER BODIES, WHERE POOR SOILS ARE ENCOUNTERED, WHERE DUST MAY BE A PROBLEM, OR AS SPECIFIED BY THE ENGINEER.

CONSTRUCT STABILIZED CONSTRUCTION ENTRANCES WITH GRAVEL CONSISTING OF 100% PASSING THE 2" SCREEN AND A MAXIMUM OF 10% PASSING THE 3/8" SIEVE OR OTHER ENGINEER APPROVED MATERIAL. PROPERLY GRADE ENTRANCES/EXITS TO PREVENT RUNOFF FROM LEAVING THE SITE. PLACE A MOUNDED BERM OF MATERIAL IF REQUIRED TO PREVENT STORM WATER RUN ON/ RUNOFF AND/OR PROVIDE COVER FOR DRAIN PIPE. ROUTE STORM WATER RUNOFF TO A SEDIMENT CONTROL DEVICE BEFORE RUNOFF EXITS THE SITE.

STABILIZED CONSTRUCTION ENTRANCE SHALL BE MAINTAINED TO PREVENT TRACKING OF SEDIMENT OFF OF THE SITE. REMOVE AND REPLACE AGGREGATE WHEN VOIDS ARE FILLED OR AS DIRECTED BY THE ENGINEER.



DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	208-56
SECTION 208	
STABILIZED CONSTRUCTION ENTRANCE/EXIT (TC-1)	
EFFECTIVE: FEBRUARY 2005	
	MONTANA DEPARTMENT OF TRANSPORTATION

SYMBOL:



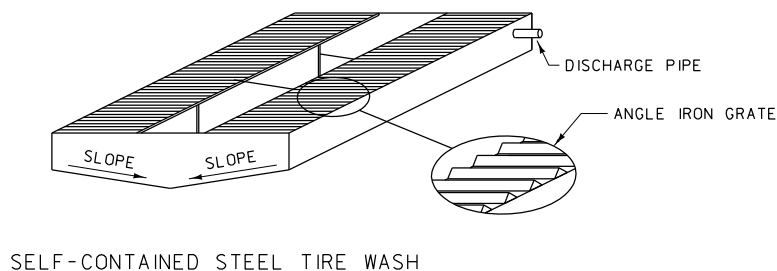
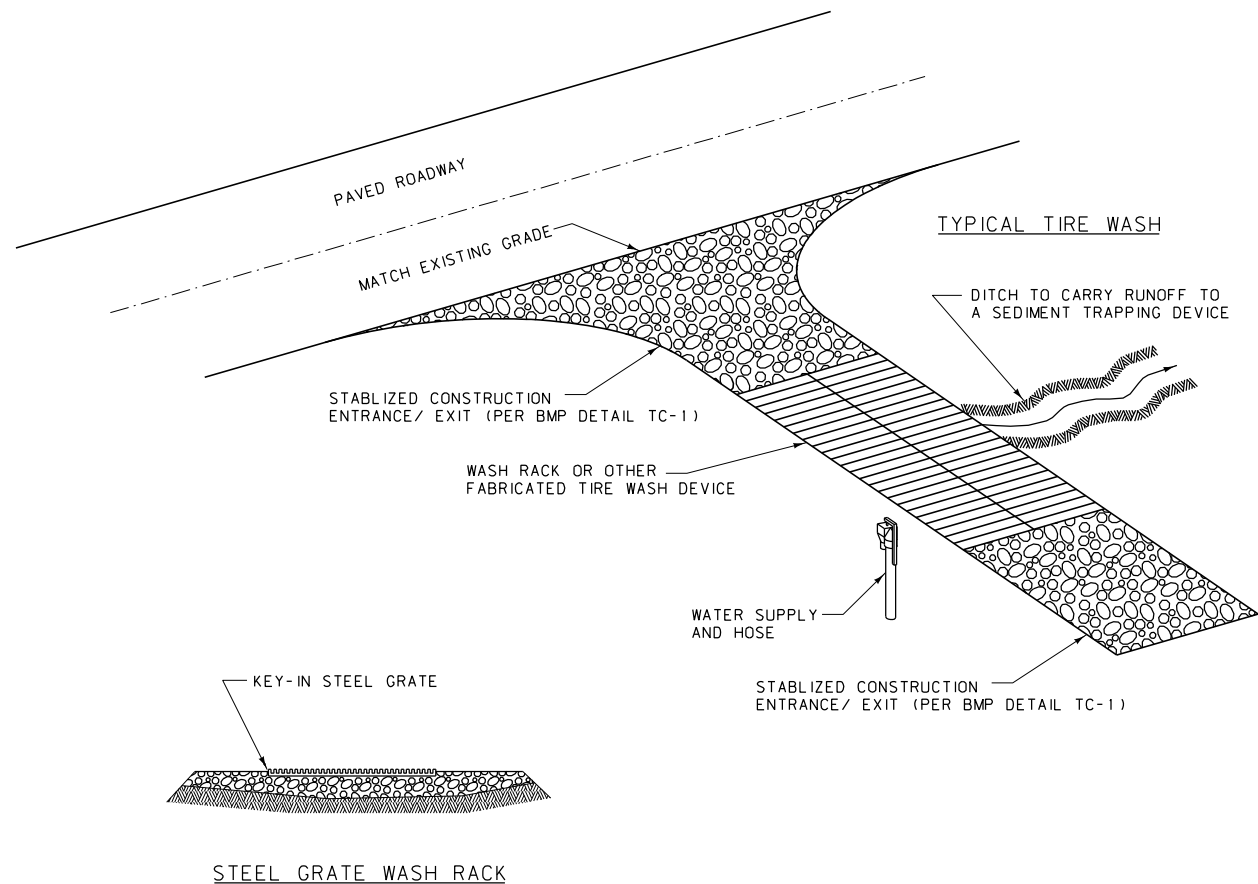
ENTRANCE/EXIT TIRE WASH TC-3:


A TIRE WASH IS AN AREA LOCATED AT A STABILIZED CONSTRUCTION ACCESS POINT WHERE PRESSURIZED WATER IS USED TO REMOVE SEDIMENT FROM TIRES AND UNDERCARRIAGE, AND TO PREVENT SEDIMENT FROM BEING TRANSPORTED ONTO PUBLIC ROADWAYS.

TIRE WASHES ARE MEANT TO BE USED ON A PROJECT-BY-PROJECT BASIS AND REQUIRES APPROVAL BY THE ENGINEER. THESE DEVICES REQUIRE A SUPPLY OF WASH WATER AND MAY REQUIRE A TURNOUT OR DOUBLE WIDE ACCESS.

FOLLOW BMP TC-1 FOR STABILIZED CONSTRUCTION ENTRANCES/EXITS. PROVIDE WASH RACK SUITABLE FOR SUPPORTING TRAFFIC LOADS. DIRECT WASH WATER FROM THE RACK, THROUGH A DRAINAGE DITCH, TO A SEDIMENT TRAP DEVICE. ENGINEERS APPROVAL IS REQUIRED PRIOR TO CONSTRUCTION.

TIRE WASH DEVICES OTHER THAN THOSE SHOWN MAY BE USED AS APPROVED BY THE ENGINEER.



DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	208-58
SECTION 208	
ENTRANCE/EXIT TIRE WASH (TC-3)	
EFFECTIVE: APRIL 2006	
 <i>serving you with pride</i>	MONTANA DEPARTMENT OF TRANSPORTATION

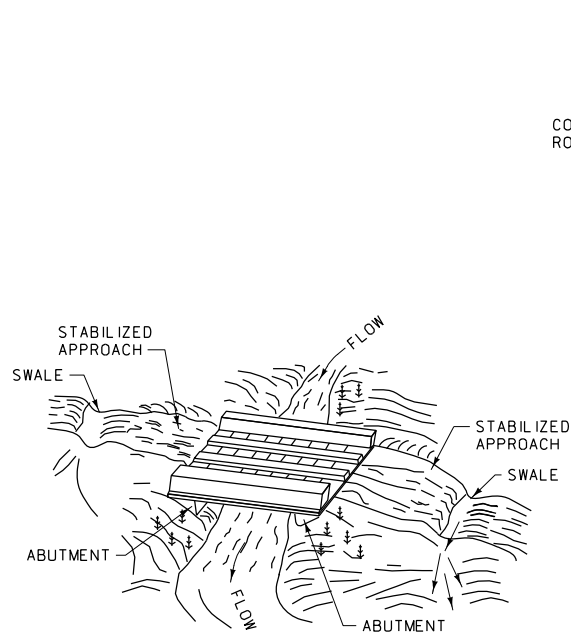
TEMPORARY STREAM CROSSINGS NS-4:

A TEMPORARY STREAM CROSSING IS A STRUCTURE PLACED ACROSS A WATERWAY THAT ALLOWS VEHICLES AND/OR HEAVY EQUIPMENT TO CROSS THE WATERWAY DURING CONSTRUCTION. THE STREAM CROSSINGS PROTECT THE STREAM BANKS AND CHANNELS FROM DAMAGE CAUSED BY VEHICLE MOVEMENT WHICH RELEASES SEDIMENT.

TEMPORARY STREAM CROSSINGS CAN CONSIST OF BRIDGES, CULVERTS OR FORDS. FOLLOW STREAM CROSSING GUIDELINES PROVIDED IN THE MDT/FWP TASK FORCE RECOMMENDATIONS REPORT. TEMPORARY STREAM CROSSINGS REQUIRE THE ACQUISITION OF SPECIAL PERMITS.

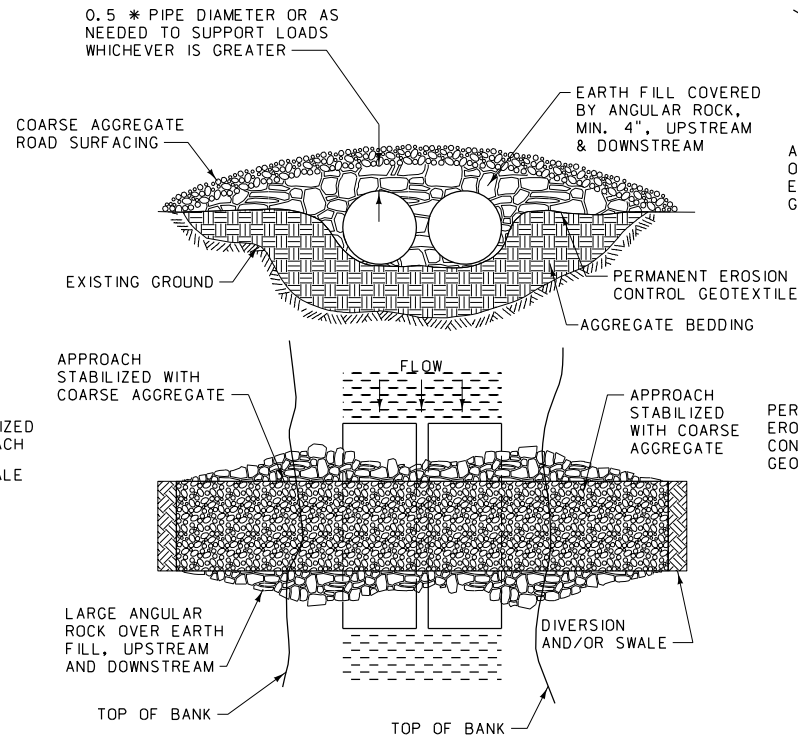
INSTALL PERMANENT EROSION CONTROL GEOTEXTILE IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS AND MDT STANDARD SPECIFICATIONS SECTION 622.

PROVIDE PERMANENT EROSION CONTROL GEOTEXTILE MEETING MDT STANDARD SPECIFICATIONS SECTION 716.

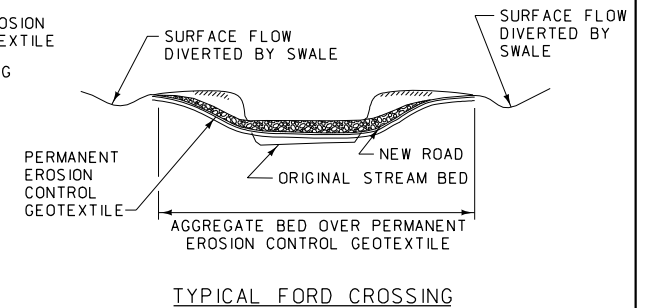
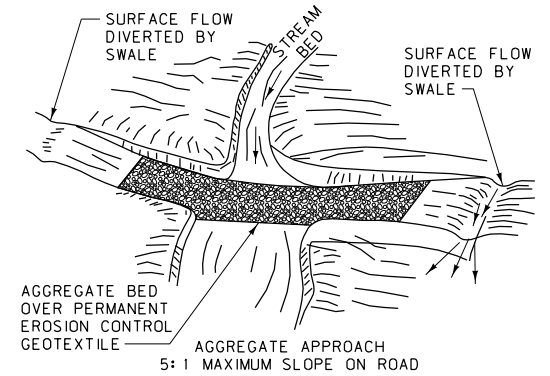


NOTE:
SURFACE FLOW OF ROAD DIVERTED BY SWALE AND/OR DIKE


TYPICAL BRIDGE CROSSING

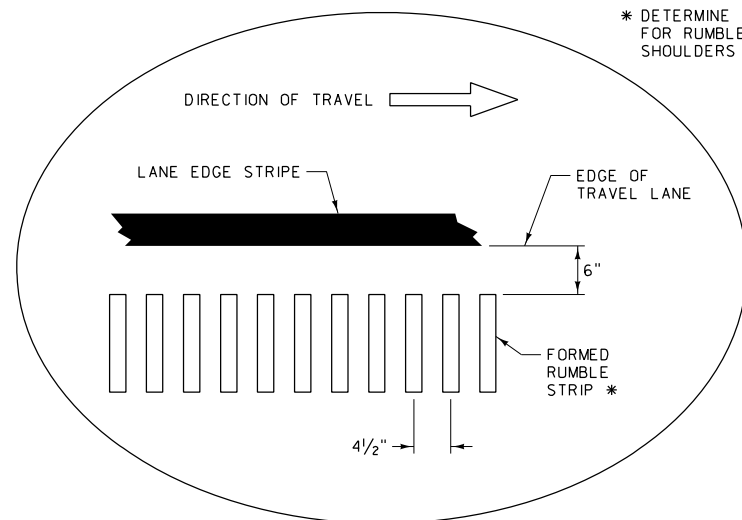


TYPICAL CULVERT CROSSING

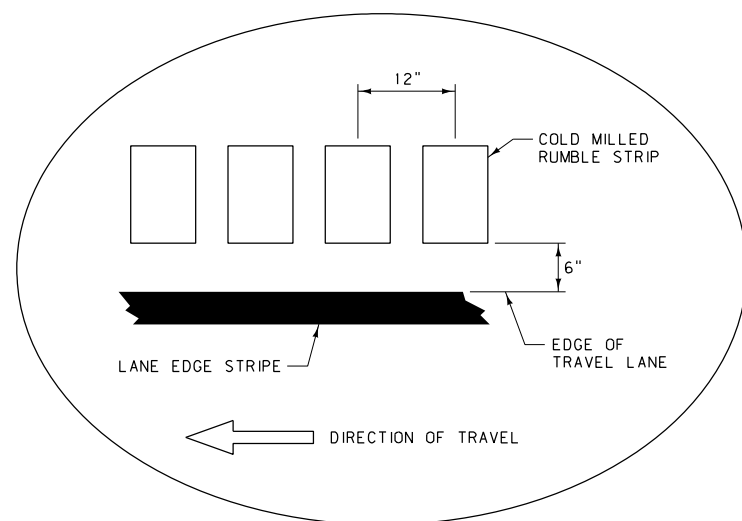


TYPICAL FORD CROSSING

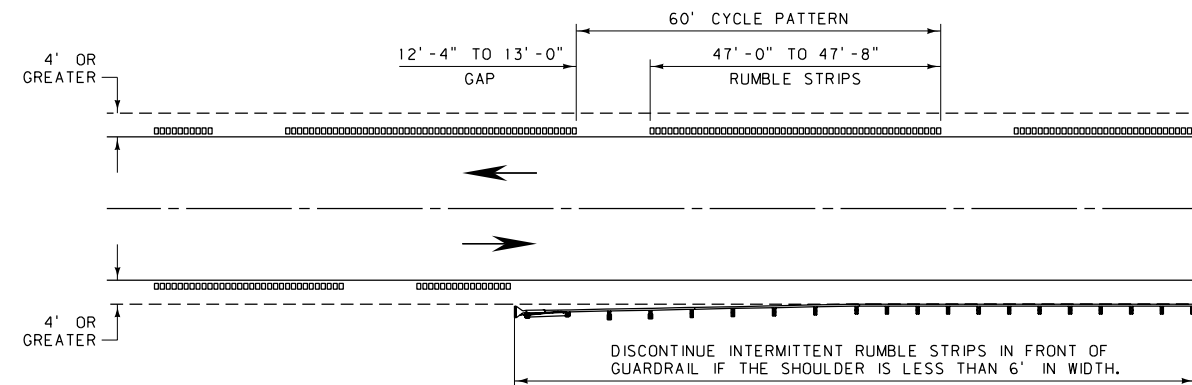
DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 208	DWG. NO. 208-60
TEMPORARY STREAM CROSSINGS (NS-4)	
EFFECTIVE: APRIL 2006	
 MONTANA DEPARTMENT OF TRANSPORTATION	



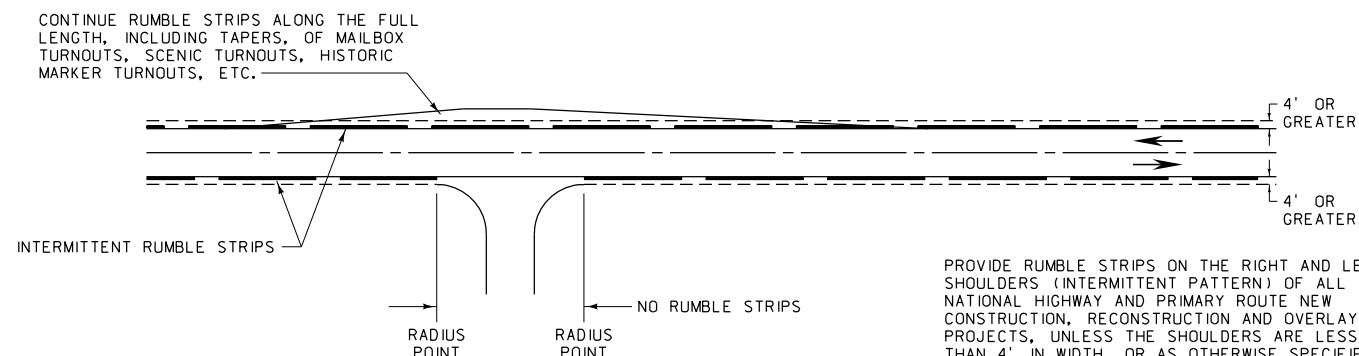
TYPICAL SHOULDER INSTALLATION
(CONCRETE PAVEMENT)



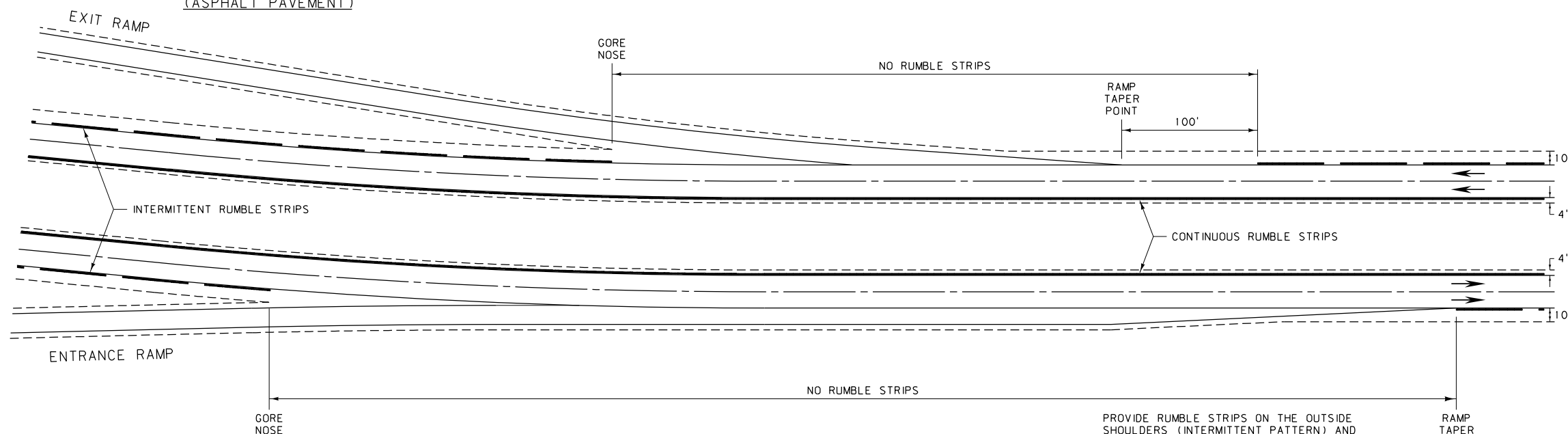
TYPICAL SHOULDER INSTALLATION
(ASPHALT PAVEMENT)



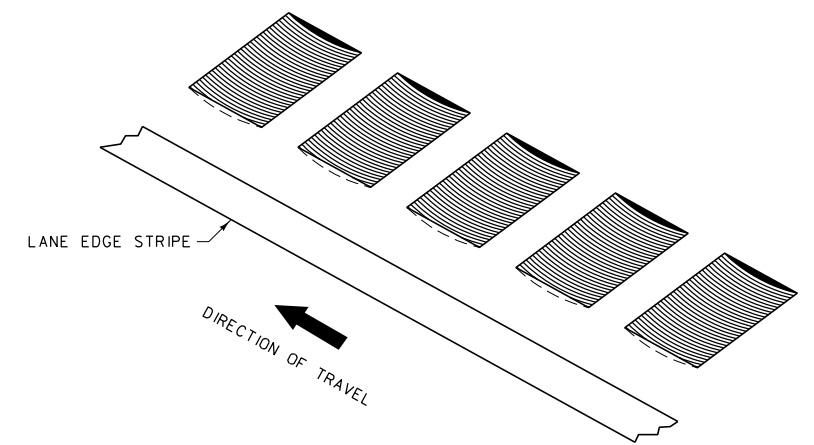
INTERMITTENT RUMBLE STRIP SPACING



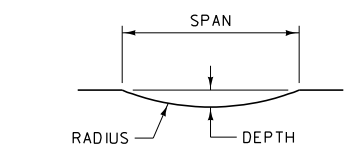
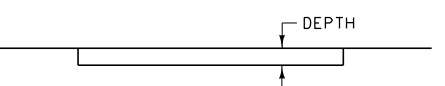
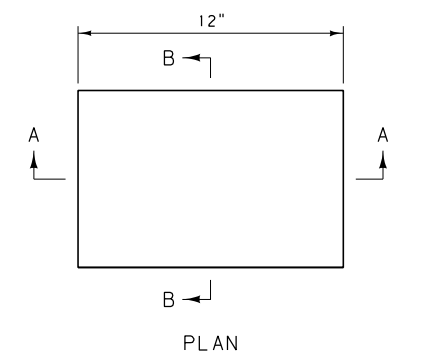
NATIONAL HIGHWAY ROUTE OR
PRIMARY ROUTE APPLICATION



INTERSTATE APPLICATION



ISOMETRIC VIEW




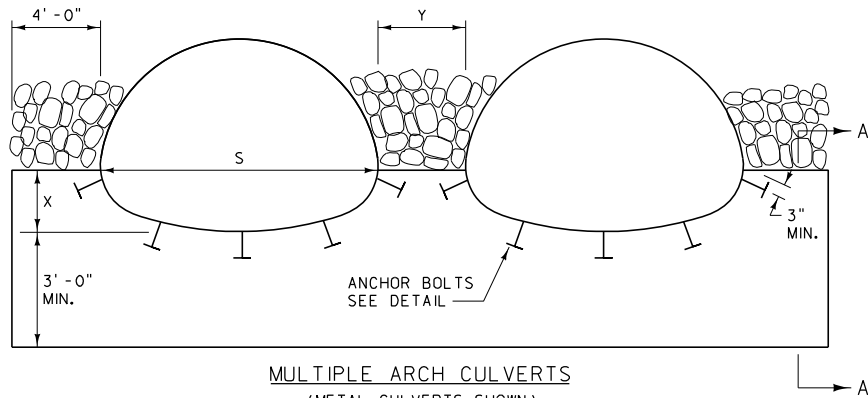
	DEPTH	RADIUS	SPAN
CONCRETE	1"	1"	2"
ASPHALT	1/2" TO 3/4"	12" MAX.	6 7/8" TO 8 3/8"

RUMBLE STRIP DETAIL

NOTE:

DO NOT INSTALL RUMBLE STRIPS OVER CONCRETE BRIDGE DECKS OR WHERE OBSTACLES, SUCH AS CONCRETE BARRIER RAIL, PREVENT PROPER PLACEMENT.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 401	DWG. NO. 401-02
SHOULDER RUMBLE STRIPS	
EFFECTIVE: FEBRUARY 2005	
 serving you with pride	MONTANA DEPARTMENT OF TRANSPORTATION

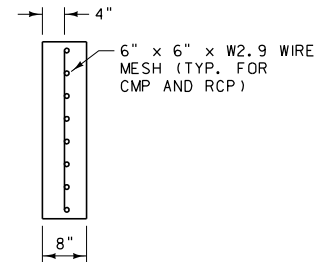
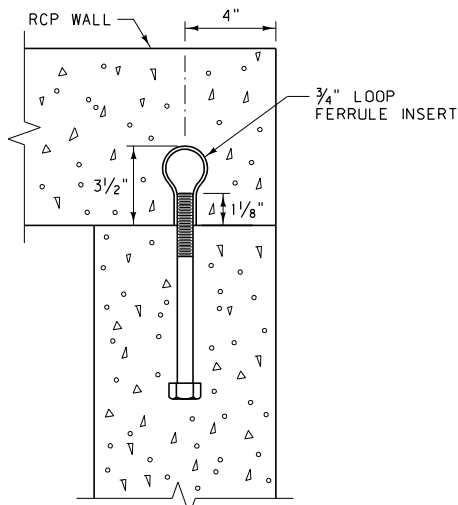
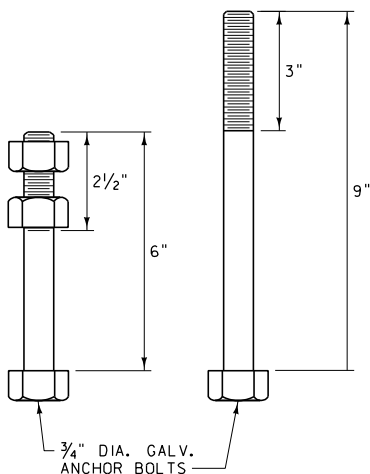
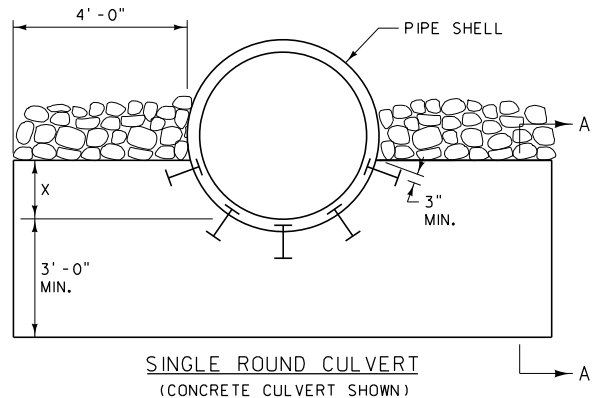
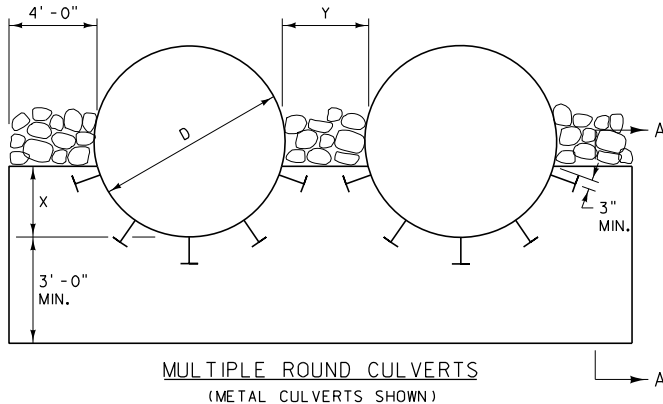


X: VARIABLE (SEE DTL. DWG. NO. 603-10 FOR CONCRETE CULV. AND 603-34 FOR METAL CULV.)

Y: FOR METAL CULV. AND CULV. WITHOUT FETS:
Y = 4'-0" (OUTSIDE WALL TO OUTSIDE WALL)

FOR CONCRETE CULV. WITH FETS: USE Y AS REQUIRED FOR PARALLEL PIPE INSTALLATION, PER DTL. DWG. NO. 613-08

NOTE: Y MAY BE INCREASED ON LARGE DIAMETER PIPES (UP TO A MAX. OF 8'-0") TO AID IN INSTALLATION AND BACKFILL. THE QUANTITIES SHOWN IN 552-04, 06 & 08 WERE FIGURED USING Y = 4'-0". ADJUST QUANTITIES AS NEEDED WHEN Y IS OTHER THAN 4'-0".



NOTES:

USE CL. "DD" CONCRETE OR EQUAL.

SEE DTL. DWG. NO. 603-18 AND 603-19 FOR BEDDING UNDER CULVERTS.

SEE DTL. DWG. NO. 613-14 FOR RIPRAP.

ANCHOR BOLT SPACING:
MIN. OF FIVE 3/4" DIA. GALV. ANCHOR BOLTS
IN WALL. USE MAX. SPACING OF 1.5'.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 552	DWG. NO. 552-00
CONCRETE CUTOFF WALLS FOR CULVERTS	

-- REVISED --
January 2008

EFFECTIVE: FEBRUARY 2005

MDT MONTANA DEPARTMENT OF TRANSPORTATION
serving you with pride


DIAMETER OR SPAN × RISE	CUBIC YARDS OF CLASS DD CONCRETE (EACH END)										CUBIC YARDS OF RIPRAP (EACH END) ①								C. Y. BEDDING MATERIAL ② PER L. F. OF PIPE (DTL. DWG. NO. 603-19)	
	CUTOFF WALL (DTL. DWG. NO. 552-00)	CONCRETE EDGE PROTECTION (DTL. DWG. NO. 613-08)								(DTL. DWG. NO. 613-14)										
		1.5:1		2:1		2.5:1		3:1		1.5:1		2:1		2.5:1		3:1				
		SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.			
RCP (SQ. END)																				
54"	1.1	1.9	2.3	3.4	2.8	4.1	3.4	4.8	3.9	5.6	8.3	13.0	10.3	16.1	12.4	19.5	14.6	22.9	1.0	2.0
60"	1.2	2.0	2.6	3.7	3.1	4.5	3.7	5.3	4.3	6.1	8.8	13.9	11.0	17.3	13.3	20.9	15.6	24.6	1.1	2.2
66"	1.3	2.1	2.8	4.0	3.3	4.8	4.0	5.7	4.6	6.6	9.4	14.8	11.9	18.9	14.4	22.7	16.9	26.7	1.2	2.4
72"	1.3	2.2	3.0	4.3	3.6	5.2	4.3	6.2	5.0	7.2	10.2	16.1	12.6	20.0	15.2	24.1	17.9	28.3	1.3	2.6
78"	1.4	2.3	3.2	4.7	3.9	5.6	4.6	6.7	5.3	7.7	10.7	17.1	13.3	21.1	16.1	25.5	18.9	29.9	1.4	2.8
84"	1.4	2.4	3.4	5.0	4.1	6.0	4.9	7.1	5.7	8.3	11.3	18.0	14.0	22.3	16.9	26.9	19.9	31.6	1.5	3.0
90"	1.5	2.5	3.6	5.3	4.4	6.4	5.2	7.6	6.1	8.8	11.9	18.9	14.7	23.4	17.8	28.2	20.9	33.2	1.6	3.2
96"	1.6	2.6	3.8	5.6	4.7	6.8	5.5	8.1	6.4	9.4	12.5	19.8	15.5	24.6	18.6	29.6	21.9	34.9	1.7	3.4
RPCA (SQ. END)																				
65.00" × 40.00"	1.2	1.9	2.0	3.0	2.4	3.6	2.9	4.3	3.3	4.9	8.3	13.4	10.3	16.6	12.4	20.1	14.6	23.6	1.0	2.1
73.00" × 45.00"	1.2	2.0	2.2	3.3	2.7	4.0	3.2	4.7	3.7	5.4	9.0	14.6	11.1	18.1	13.4	21.8	15.8	25.7	1.1	2.3
88.00" × 54.00"	1.3	2.2	2.6	4.0	3.2	4.8	3.7	5.6	4.3	6.5	10.5	17.3	13.0	21.4	15.7	25.8	18.5	30.3	1.3	2.6
102.00" × 62.00"	1.4	2.4	3.0	4.6	3.6	5.5	4.3	6.5	5.0	7.5	11.9	19.6	14.7	24.3	17.7	29.2	20.8	34.4	1.5	2.9
115.00" × 72.00"	1.5	2.6	3.3	5.1	4.0	6.1	4.8	7.2	5.5	8.4	12.9	21.5	16.1	26.7	19.4	32.1	22.8	37.8	1.7	3.3
122.00" × 77.25"	1.6	2.7	3.6	5.5	4.3	6.6	5.1	7.8	6.0	9.1	13.8	23.0	17.1	28.5	20.7	34.3	24.3	40.4	1.7	3.5
138.00" × 87.13"	1.7	2.8	4.1	6.2	4.9	7.5	5.8	8.9	6.8	10.4	15.5	25.9	19.2	32.1	23.2	38.7	27.2	45.5	1.9	3.8
154.00" × 96.88"	1.8	3.0	4.5	7.1	5.5	8.5	6.5	10.1	7.6	11.7	17.2	29.0	21.4	36.0	25.8	43.3	30.3	50.9	2.1	4.2
168.75" × 106.50"	2.0	3.3	4.9	7.6	5.9	9.2	7.0	10.9	8.1	12.6	18.4	31.2	22.8	38.7	27.5	46.6	32.4	54.7	2.3	4.6

DIAMETER OR SPAN × RISE	CUBIC YARDS OF CLASS DD CONCRETE (EACH END)							CUBIC YARDS OF RIPRAP (EACH END) ① (DTL. DWG. NO. 613-14)					SLOPE	C. Y. BEDDING MATERIAL ② PER L. F. OF PIPE (DTL. DWG. NO. 603-19)	
	CUTOFF WALL (DTL. DWG. NO. 552-00)		CONCRETE EDGE PROTECTION (DTL. DWG. NO. 613-08)												
	SING.	DBL.		SING.	DBL.			SING.	DBL.			SING.		DBL.	
RCP (FETS)															
54"	1.8	3.0		2.7	4.2			12.5	21.2			2.0:1	1.0	2.0	
60"	1.9	3.2		2.5	4.0			11.9	20.1			1.9:1	1.1	2.2	
66"	1.9	3.2		3.0	4.6			13.2	22.5			1.7:1	1.2	2.4	
72"	2.0	3.4		3.3	5.1			14.8	25.1			1.9:1	1.3	2.6	
78"	2.1	3.5		3.5	5.6			15.6	26.6			1.8:1	1.4	2.7	
84"	2.1	3.6		3.5	5.5			15.0	25.8			1.5:1	1.4	2.8	
90"	2.3	3.9		3.6	5.8			15.9	27.4			1.5:1	1.5	3.1	
RPCA (FETS)															
65.00" × 40.00"	1.7	2.9		2.9	4.6			15.3	26.0			3.0:1	1.0	2.1	
73.00" × 45.00"	1.9	3.2		3.1	4.9			16.1	27.5			3.0:1	1.1	2.3	
88.00" × 54.00"	2.1	3.5		2.9	4.6			14.0	24.2			2.0:1	1.3	2.6	
102.00" × 62.00"	2.1	3.6		4.0	6.4			18.4	31.9			2.0:1	1.5	2.9	

NOTES:

① QUANTITIES ARE BASED ON A THICKNESS OF 2 FT. AND ARE PROPORTIONED WHEN A DIFFERENT THICKNESS IS SPECIFIED.


② BEDDING QUANTITIES FOR CONCRETE PIPES ARE BASED ON BEDDING DETAILS SHOWN ON DTL. DWG. NO. 603-19 WITH A WIDTH EQUAL TO (DIAMETER OR SPAN) + 4 FT. + (2 TIMES CONCRETE SHELL THICKNESS) AND A DEPTH EQUAL TO 2 FT. + (D/4 OR R/3) + (CONCRETE SHELL THICKNESS). TO COMPUTE THE TOTAL BEDDING QUANTITY MULTIPLY BY (LENGTH OF PIPE MINUS 24 FT.).

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	552-04
SECTION 552, 603, 613	
CONCRETE, RIPRAP AND BEDDING MATERIAL QUANTITIES FOR SING. AND DBL. CULVERT INSTALLATION	
-- REVISED -- January 2008	EFFECTIVE: APRIL 2006
 MONTANA DEPARTMENT OF TRANSPORTATION	

DIAMETER OR SPAN x RISE	CUBIC YARDS OF CLASS DD CONCRETE (EACH END) ④								CUBIC YARDS OF RIPRAP (EACH END) ① ④								C. Y. BEDDING MATERIAL ② PER L.F. OF PIPE (DTL. DWG. NO. 603-19)	
	CUTOFF WALL (DTL. DWG. NO. 552-00)	CONCRETE EDGE PROTECTION (DTL. DWG. NO. 613-06)						(DTL. DWG. NO. 613-14)										
		1.5:1		2:1		2.5:1		1.5:1		2:1		2.5:1						
		SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.					
SSPPA 6" x 2" CORRUGATIONS 18" CORNER RADIUS																		
6'-1" x 4'-7"	1.5	2.5	1.8	2.8	2.2	3.3	2.5	3.8	7.8	12.8	9.7	15.9	11.7	19.2	1.2	2.4		
6'-4" x 4'-9"	1.5	2.5	2.0	3.0	2.4	3.6	2.8	4.2	8.4	13.7	10.4	17.0	12.5	20.5	1.2	2.3		
6'-9" x 4'-11"	1.6	2.7	2.0	3.0	2.3	3.6	2.7	4.2	8.4	13.8	10.4	17.1	12.5	20.7	1.3	2.5		
7'-0" x 5'-1"	1.6	2.7	2.1	3.2	2.5	3.8	2.9	4.4	8.8	14.5	10.9	18.0	13.2	21.7	1.2	2.5		
7'-3" x 5'-3"	1.6	2.6	2.2	3.4	2.7	4.1	3.2	4.8	9.3	15.4	11.6	19.1	14.0	23.0	1.2	2.5		
7'-8" x 5'-5"	1.7	2.8	2.3	3.5	2.7	4.1	3.2	4.9	9.5	15.7	11.8	19.5	14.2	23.5	1.3	2.7		
7'-11" x 5'-7"	1.7	2.8	2.4	3.6	2.8	4.3	3.3	5.1	9.8	16.2	12.2	20.1	14.7	24.3	1.3	2.6		
8'-2" x 5'-9"	1.6	2.8	2.5	3.8	3.0	4.6	3.6	5.4	10.3	17.1	12.8	21.2	15.5	25.6	1.3	2.6		
8'-7" x 5'-11"	1.7	2.9	2.5	3.9	3.1	4.7	3.6	5.5	10.5	17.5	13.0	21.7	15.7	26.1	1.4	2.8		
8'-10" x 6'-1"	1.7	2.9	2.7	4.1	3.2	4.9	3.8	5.8	10.9	18.2	13.6	22.5	16.3	27.2	1.4	2.8		
9'-4" x 6'-3"	1.8	3.1	2.7	4.1	3.2	5.0	3.8	5.8	11.0	18.4	13.6	22.8	16.4	27.5	1.5	3.0		
9'-6" x 6'-5"	1.8	3.1	2.8	4.4	3.4	5.2	4.0	6.2	11.5	19.3	14.3	23.9	17.2	28.8	1.5	2.9		
9'-9" x 6'-7"	1.8	3.1	3.0	4.5	3.6	5.5	4.2	6.4	11.9	20.0	14.8	24.7	17.9	29.8	1.4	2.9		
10'-3" x 6'-9"	1.9	3.2	3.0	4.7	3.6	5.6	4.3	6.6	12.2	20.4	15.1	25.3	18.2	30.5	1.6	3.1		
10'-8" x 6'-11"	2.0	3.5	3.0	4.7	3.6	5.6	4.2	6.6	12.1	20.4	15.0	25.3	18.1	30.6	1.7	3.4		
10'-11" x 7'-1"	2.0	3.4	3.1	4.9	3.8	5.9	4.5	6.9	12.7	21.3	15.7	26.5	19.0	31.9	1.7	3.3		
11'-5" x 7'-3"	2.1	3.6	3.2	5.0	3.8	6.0	4.5	7.0	12.9	21.8	16.0	27.0	19.3	32.6	1.8	3.6		
11'-7" x 7'-5"	2.1	3.6	3.3	5.2	4.0	6.2	4.7	7.3	13.3	22.5	16.5	28.0	19.9	33.7	1.7	3.5		
11'-10" x 7'-7"	2.0	3.5	3.5	5.4	4.2	6.5	5.0	7.7	13.9	23.5	17.2	29.1	20.8	35.1	1.7	3.4		
12'-4" x 7'-9"	2.2	3.8	3.5	5.5	4.2	6.6	5.0	7.8	14.0	23.7	17.3	29.4	20.9	35.5	1.8	3.7		
12'-6" x 7'-11"	2.1	3.7	3.6	5.7	4.4	6.8	5.2	8.1	14.4	24.5	17.9	30.4	21.6	36.6	1.8	3.6		
12'-8" x 8'-1"	2.1	3.7	3.8	5.9	4.6	7.1	5.4	8.4	15.0	25.4	18.6	31.5	22.4	37.9	1.8	3.6		
12'-10" x 8'-4"	2.1	3.6	3.9	6.1	4.8	7.4	5.6	8.7	15.5	26.3	19.3	32.6	23.2	39.2	1.7	3.5		
13'-5" x 8'-5"	2.2	3.9	3.9	6.2	4.7	7.4	5.6	8.8	15.5	26.4	19.3	32.8	23.2	39.5	1.9	3.8		
13'-11" x 8'-7"	2.3	4.1	4.0	6.3	4.8	7.6	5.7	9.0	15.8	27.0	19.6	33.5	23.6	40.4	2.0	4.0		
14'-1" x 8'-9"	2.3	4.0	4.1	6.5	5.0	7.8	5.9	9.2	16.3	27.7	20.2	34.4	24.3	41.5	2.0	4.0		
14'-3" x 8'-11"	2.3	4.0	4.3	6.7	5.2	8.1	6.1	9.6	16.8	28.6	20.9	35.5	25.1	42.8	1.9	3.9		
14'-10" x 9'-1"	2.4	4.2	4.3	6.8	5.2	8.2	6.2	9.7	17.0	29.0	21.0	36.0	25.4	43.4	2.1	4.2		
15'-4" x 9'-2"	2.5	4.5	4.3	6.9	5.2	8.3	6.2	9.8	17.1	29.4	21.2	36.4	25.6	43.9	2.2	4.5		
15'-6" x 9'-5"	2.5	4.4	4.5	7.2	5.4	8.6	6.4	10.2	17.7	30.4	22.0	37.7	26.5	45.4	2.2	4.4		
15'-8" x 9'-7"	2.4	4.3	4.7	7.4	5.6	8.9	6.7	10.6	18.3	31.3	22.7	38.8	27.3	46.8	2.2	4.3		
15'-10" x 9'-9"	2.4	4.3	4.8	7.6	5.8	9.2	6.9	10.8	18.7	32.0	23.2	39.7	28.0	47.9	2.1	4.2		
16'-5" x 9'-11"	2.6	4.5	4.8	7.7	5.8	9.3	6.9	11.0	18.9	32.5	23.4	40.3	28.3	48.6	2.3	4.5		
16'-7" x 10'-1"	2.5	4.5	5.0	8.0	6.1	9.6	7.2	11.4	19.5	33.4	24.2	41.5	29.1	50.0	2.2	4.4		
SSPPA 6" x 2" CORRUGATIONS 31" CORNER RADIUS																		
13'-3" x 9'-4"	2.5	4.3	3.8	6.0	4.6	7.3	5.5	8.6	15.1	25.7	18.8	32.0	22.6	38.5	2.2	4.3		
13'-6" x 9'-6"	2.5	4.3	4.0	6.2	4.8	7.5	5.6	8.9	15.6	26.5	19.3	32.9	23.3	39.7	2.1	4.3		
14'-0" x 9'-8"	2.6	4.5	4.0	6.3	4.8	7.6	5.7	9.0	15.8	27.0	19.6	33.5	23.6	40.4	2.3	4.5		
14'-3" x 9'-10"	2.6	4.4	4.2	6.6	5.0	8.0	6.0	9.4	16.4	28.0	20.4	34.7	24.5	41.9	2.2	4.5		
14'-5" x 10'-0"	2.5	4.4	4.3	6.8	5.2	8.2	6.2	9.7	16.8	28.7	20.9	35.6	25.2	42.9	2.2	4.4		
14'-11" x 10'-2"	2.7	4.6	4.3	6.9	5.2	8.3	6.2	9.8	17.0	29.1	21.1	36.1	25.4	43.5	2.3	4.7		
15'-4" x 10'-4"	2.8	4.9	4.3	6.9	5.2	8.4	6.2	9.9	17.1	29.4	21.2	36.5	25.6	44.0	2.5	4.9		
15'-7" x 10'-6"	2.8	4.8	4.5	7.2	5.5	8.7	6.5	10.3	17.7	30.4	22.0	37.7	26.5	45.5	2.4	4.9		
15'-10" x 10'-8"	2.7	4.8	4.7	7.5	5.7	9.0	6.7	10.6	18.3	31.4	22.7	38.9	27.4	46.9	2.4	4.8		
16'-3" x 10'-10"	2.9	5.0	4.7	7.5	5.7	9.0	6.7	10.7	18.3	31.6	22.8	39.2	27.4	47.3	2.5	5.1		
16'-6" x 11'-0"	2.8	5.0	4.9	7.8	5.9	9.4	7.0	11.1	18.9	32.6	23.5	40.4	28.3	48.7	2.5	5.0		
17'-0" x 11'-2"	3.0	5.2	4.9	7.8	5.9	9.4	7.0	11.2	19.1	32.9	23.7	40.9	28.5	49.3	2.7	5.3		
17'-2" x 11'-4"	2.9	5.2	5.0	8.1	6.1	9.7	7.2	11.5	19.6	33.8	24.3	41.9	29.3	50.5	2.6	5.2		
17'-5" x 11'-6"	2.9	5.1	5.2	8.3	6.3	10.0	7.5	11.9	20.2	34.8	25.0	43.2	30.2	52.0	2.6	5.2		
17'-11" x 11'-8"	3.0	5.3	5.3	8.5	6.4	10.2	7.5	12.1	20.4	35.4	25.4	43.9	30.6	52.9	2.7	5.5		
18'-1" x 11'-10"	3.0	5.3	5.4	8.7	6.5	10.5	7.8	12.4	20.9	36.2	26.0	44.9	31.3	54.1	2.7	5.4		
18'-7" x 12'-0"	3.1	5.5	5.4	8.8	6.6	10.6	7.8	12.5	21.1	36.6	26.2	45.4	31.6	54.8	2.8	5.7		
18'-9" x 12'-2"	3.1	5.5	5.6	9.0	6.8	10.9	8.1	12.9	21.7	37.6	26.9	46.7	32.5	56.3	2.8	5.6		
19'-3" x 12'-4"	3.2	5.7	5.6	9.2	6.8	11.0	8.1	13.0	21.9	38.1	27.2	47.3	32.8	56.9	3.0	5.9		
19'-6" x 12'-6"	3.2	5.7	5.8	9.4	7.1	11.4	8.4	13.5	22.5	39.1	28.0	48.6	33.7	58.5	2.9	5.8		
19'-8" x 12'-8"	3.2	5.6	6.0	9.6	7.2	11.6	8.6	13.8	23.0	40.0	28.6	49.6	34.4	59.8	2.9	5.8		
19'-11" x 12'-10"	3.1	5.6	6.1	9.9	7.4	12.0	8.8	14.2	23.6	40.9	29.3	50.8	35.3	61.2	2.8	5.7		
20'-5" x 13'-0"	3.3	5.8	6.2	10.0	7.5	12.1	8.9	14.3	23.8	41.5	29.6	51.5	35.6	62.0	3.0	6.0		
20'-7" x 13'-2"	3.2	5.8	6.3	10.2	7.7	12.4	9.1	14.6	24.3	42.3	30.2	52.5	36.4	63.2	3.0	5.9		

NOTES:


- QUANTITIES ARE BASED ON A THICKNESS OF 2 FT. AND ARE PROPORTIONED WHEN A DIFFERENT THICKNESS IS SPECIFIED.
- BEDDING QUANTITIES FOR METAL PIPES ARE BASED ON BEDDING DETAILS SHOWN ON DTL. DWG. NO. 603-19 WITH A WIDTH EQUAL TO (DIAMETER OR SPAN) + 4 FT. + (2 TIMES CORRUGATION WIDTH) AND A DEPTH EQUAL TO 2 FT. + "X" + (CORRUGATION WIDTH). TO COMPUTE THE TOTAL BEDDING QUANTITY MULTIPLY BY (LENGTH OF PIPE MINUS 24 FT.).
- SEE DTL. DWG. NO. 603-32 AND 603-34 FOR "X" DIMENSIONS OF METAL PIPES.
- FOR PIPES WITH SKEW BEVEL ENDS - DIVIDE THE QUANTITIES SHOWN BY COSINE OF SKEW ANGLE.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 552, 603, 613	DWG. NO. 552-06
CONCRETE, RIPRAP AND BEDDING MATERIAL QUANTITIES FOR SING. AND DBL. CULVERT INSTALLATION	
-- REVISED -- January 2008	EFFECTIVE: APRIL 2006
 MONTANA DEPARTMENT OF TRANSPORTATION	

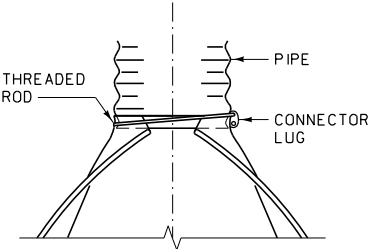
DIAMETER OR SPAN × RISE	CUBIC YARDS OF CLASS DD CONCRETE (EACH END) ④								CUBIC YARDS OF RIPRAP (EACH END) ① ④								C. Y. BEDDING MATERIAL ② PER L. F. OF PIPE (DTL. DWG. NO. 603-19)	
	CUTOFF WALL (DTL. DWG. NO. 552-00)		CONCRETE EDGE PROTECTION (DTL. DWG. NO. 613-06)						(DTL. DWG. NO. 613-14)									
			1.5:1		2:1		2.5:1		1.5:1		2:1		2.5:1					
	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.	SING.	DBL.		
CSP 3" × 1" OR 5" × 1" CORRUGATIONS																		
54"	1.2	2.0	2.1	3.0	2.5	3.6	2.9	4.3	8.3	13.3	10.3	16.5	12.5	20.1	0.9	1.8		
60"	1.3	2.1	2.2	3.3	2.7	4.0	3.2	4.7	8.9	14.3	11.1	17.8	13.4	21.6	1.0	2.0		
66"	1.3	2.2	2.4	3.6	2.9	4.3	3.5	5.1	9.6	15.4	11.9	19.1	14.3	23.1	1.0	2.1		
72"	1.4	2.4	2.6	3.9	3.2	4.6	3.7	5.5	10.2	16.4	12.7	20.4	15.2	24.6	1.1	2.3		
78"	1.5	2.5	2.8	4.1	3.4	5.0	4.0	5.9	10.8	17.5	13.4	21.7	16.2	26.2	1.2	2.4		
84"	1.6	2.7	3.0	4.4	3.6	5.3	4.3	6.3	11.5	18.6	14.2	23.1	17.1	27.7	1.3	2.6		
90"	1.6	2.8	3.2	4.7	3.8	5.7	4.6	6.7	12.1	19.7	15.3	24.9	18.0	29.3	1.4	2.7		
96"	1.7	3.0	3.4	5.0	4.1	6.1	4.8	7.2	13.0	21.2	16.1	26.3	19.0	30.9	1.5	2.9		
102"	1.8	3.1	3.6	5.3	4.3	6.4	5.1	7.6	13.6	22.3	16.9	27.7	19.9	32.5	1.5	3.1		
108"	1.9	3.3	3.8	5.6	4.6	6.8	5.4	8.1	14.3	23.5	17.8	29.1	20.9	34.2	1.6	3.3		
114"	2.0	3.4	4.0	6.0	4.8	7.2	5.7	8.5	15.0	24.6	18.6	30.6	21.9	35.9	1.7	3.4		
120"	2.1	3.6	4.2	6.3	5.1	7.6	6.0	9.0	15.7	25.8	19.5	32.0	22.9	37.6	1.8	3.6		
SSPP 6" × 2" CORRUGATIONS																		
10' - 6"	2.1	3.7	4.4	6.6	5.3	8.0	6.3	9.5	16.4	27.0	20.3	33.5	23.8	39.0	1.9	3.8		
11' - 0"	2.2	3.9	4.6	6.9	5.6	8.4	6.6	10.0	17.1	28.2	21.2	35.0	24.8	40.7	2.0	4.0		
11' - 6"	2.3	4.0	4.8	7.2	5.8	8.8	6.9	10.4	17.8	29.5	22.1	36.5	25.8	42.5	2.1	4.2		
12' - 0"	2.4	4.2	5.0	7.6	6.1	9.2	7.3	10.9	18.5	30.7	23.0	38.1	26.9	44.3	2.2	4.4		
12' - 6"	2.5	4.4	5.2	7.9	6.3	9.6	7.6	11.4	19.3	32.0	23.9	39.7	28.0	46.2	2.3	4.6		
13' - 0"	2.6	4.6	5.4	8.2	6.6	10.0	7.9	11.9	20.0	33.3	24.8	41.2	29.0	48.0	2.4	4.8		
13' - 6"	2.7	4.7	5.6	8.6	6.9	10.4	8.2	12.4	20.8	34.6	25.7	42.8	30.1	49.9	2.5	5.0		
14' - 0"	2.8	4.9	5.9	8.9	7.1	10.8	8.5	12.9	21.5	35.9	26.7	44.5	31.2	51.8	2.6	5.2		
14' - 6"	2.9	5.1	6.1	9.3	7.4	11.3	8.8	13.4	22.3	37.2	27.6	46.1	32.3	53.8	2.7	5.4		
15' - 0"	3.0	5.3	6.3	9.6	7.7	11.7	9.2	13.9	23.0	38.5	28.6	47.8	33.5	55.7	2.8	5.7		
15' - 6"	3.1	5.4	6.5	10.0	7.9	12.1	9.5	14.5	23.8	39.9	29.5	49.5	34.6	57.7	2.9	5.9		
16' - 0"	3.2	5.6	6.7	10.4	8.2	12.6	9.8	15.0	24.6	41.3	30.5	51.2	35.8	59.7	3.0	6.1		
16' - 6"	3.3	5.8	7.0	10.7	8.5	13.0	10.1	15.5	25.4	42.7	31.5	52.9	36.9	61.7	3.2	6.3		
17' - 0"	3.4	6.0	7.2	11.1	8.8	13.5	10.5	16.1	26.2	44.1	32.5	54.7	38.1	63.8	3.3	6.6		
17' - 6"	3.5	6.2	7.4	11.5	9.1	13.9	10.8	16.6	27.0	45.5	33.5	56.4	39.3	65.8	3.4	6.8		
18' - 0"	3.6	6.4	7.7	11.9	9.3	14.4	11.2	17.2	27.8	46.9	34.5	58.2	40.5	67.9	3.5	7.0		
19' - 0"	3.8	6.8	8.1	12.6	9.9	15.3	11.9	18.3	29.5	49.9	36.6	61.8	42.9	72.2	3.8	7.5		
20' - 0"	4.0	7.2	8.6	13.4	10.5	16.3	12.6	19.4	31.2	52.9	38.7	65.6	45.4	76.6	4.0	8.0		
21' - 0"	4.2	7.6	9.1	14.2	11.1	17.3	13.3	20.6	32.9	55.9	40.8	69.3	47.9	81.0	4.3	8.6		
CSPA 2⅔" × ½" CORRUGATIONS																		
64" × 43"	1.3	2.1	1.7	2.6	2.0	3.1	2.4	3.6	7.4	12.0	9.2	15.0	11.1	18.1	0.9	1.9		
71" × 47"	1.3	2.2	1.8	2.8	2.2	3.3	2.6	3.8	7.9	12.8	9.8	16.0	11.7	19.1	1.0	2.1		
77" × 52"	1.4	2.3	2.0	3.0	2.4	3.6	2.8	4.2	8.4	13.7	10.4	17.0	12.4	20.3	1.1	2.2		
83" × 57"	1.5	2.5	2.1	3.2	2.6	3.9	3.0	4.5	8.9	14.6	11.0	18.1	13.1	21.5	1.2	2.4		
CSPA 3" × 1" CORRUGATIONS																		
60" × 46"	1.3	2.2	1.7	2.5	2.0	3.0	2.3	3.5	7.2	11.7	9.0	14.5	10.6	17.1	1.0	2.0		
66" × 51"	1.4	2.3	1.8	2.8	2.2	3.3	2.6	3.8	7.7	12.6	9.8	15.9	11.3	18.2	1.1	2.2		
73" × 55"	1.5	2.5	2.0	2.9	2.3	3.5	2.7	4.1	8.3	13.5	10.3	16.8	11.8	19.2	1.2	2.5		
81" × 59"	1.5	2.5	2.2	3.3	2.6	3.9	3.0	4.5	9.1	14.8	11.2	18.4	12.9	21.0	1.2	2.4		
87" × 63"	1.6	2.7	2.3	3.5	2.8	4.2	3.2	4.9	9.6	15.7	11.9	19.5	13.6	22.2	1.3	2.6		
95" × 67"	1.7	2.9	2.4	3.7	2.9	4.5	3.4	5.2	10.0	16.6	12.5	20.6	14.2	23.3	1.4	2.8		
103" × 71"	1.8	3.0	2.6	4.0	3.1	4.7	3.6	5.5	10.6	17.5	13.1	21.7	14.9	24.5	1.5	3.0		
112" × 75"	1.9	3.2	2.7	4.2	3.3	5.0	3.8	5.8	11.1	18.5	13.8	22.9	15.6	25.7	1.6	3.2		
117" × 79"	2.0	3.4	2.9	4.4	3.4	5.3	4.0	6.2	11.6	19.4	14.4	24.1	16.3	26.9	1.7	3.5		
128" × 83"	2.1	3.5	3.0	4.7	3.6	5.6	4.2	6.5	12.1	20.3	15.1	25.2	16.9	28.0	1.8	3.7		
137" × 87"	2.2	3.7	3.2	4.9	3.8	5.9	4.4	6.9	12.7	21.3	15.7	26.5	17.6	29.3	2.0	3.9		
142" × 91"	2.2	3.9	3.3	5.2	4.0	6.2	4.7	7.2	13.2	22.3	16.4	27.7	18.3	30.4	2.1	4.2		

NOTES:

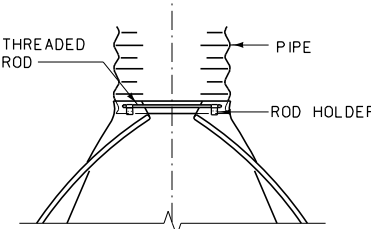
- ① QUANTITIES ARE BASED ON A THICKNESS OF 2 FT. AND ARE PROPORTIONED WHEN A DIFFERENT THICKNESS IS SPECIFIED.
- ② BEDDING QUANTITIES FOR METAL PIPES ARE BASED ON BEDDING DETAILS SHOWN ON DTL. DWG. NO. 603-19 WITH A WIDTH EQUAL TO (DIAMETER OR SPAN) + 4 FT. + (2 TIMES CORRUGATION WIDTH) AND A DEPTH EQUAL TO 2 FT. + "X" + (CORRUGATION WIDTH). TO COMPUTE THE TOTAL BEDDING QUANTITY MULTIPLY BY (LENGTH OF PIPE MINUS 24 FT.).
- ③ SEE DTL. DWG. NO. 603-32 AND 603-34 FOR "X" DIMENSIONS OF METAL PIPES.
- ④ FOR PIPES WITH SKEW BEVEL ENDS - DIVIDE THE QUANTITIES SHOWN BY COSINE OF SKEW ANGLE.

DETAILED DRAWING	
REFERENCE STANDARD SPEC.	DWG. NO. 552-08
SECTION 552, 603, 613	
CONCRETE, RIPRAP AND BEDDING MATERIAL QUANTITIES FOR SING. AND DBL. CULVERT INSTALLATION	
-- REVISED -- January 2008	EFFECTIVE: APRIL 2006
 MONTANA DEPARTMENT OF TRANSPORTATION	

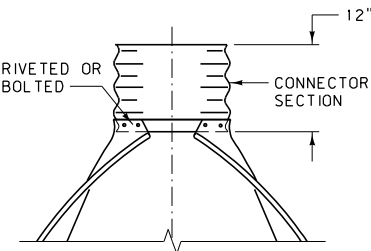
CONNECTIONS



TYPE 1

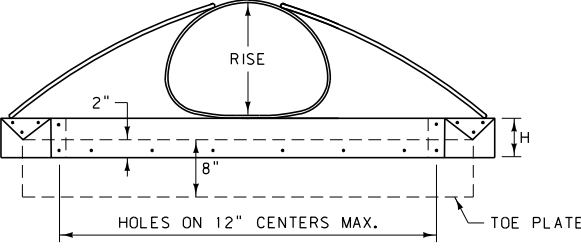


TYPE 2

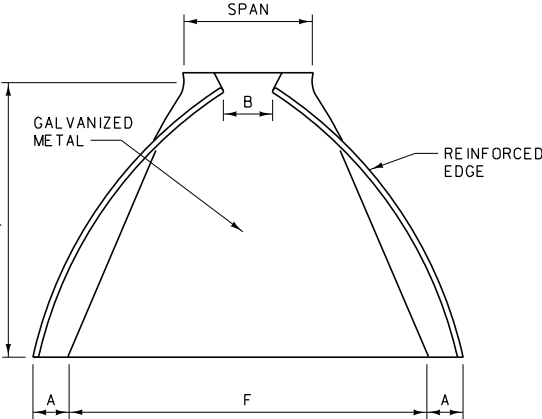


TYPE 3

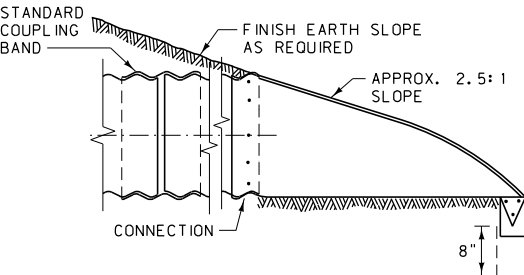
ARCH PIPE



ELEVATION

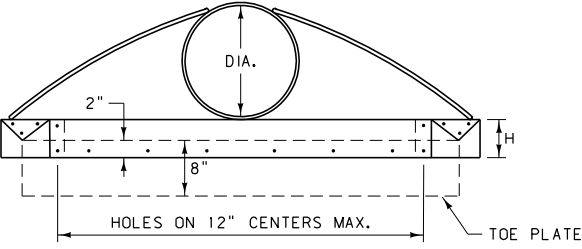


PLAN

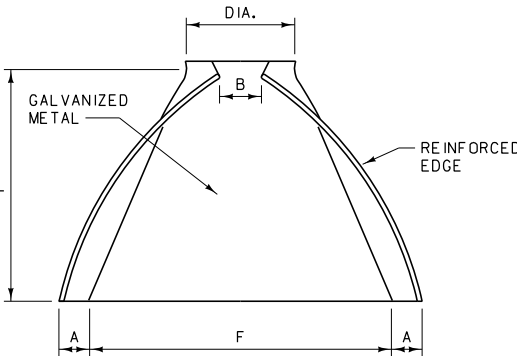


TYPICAL CROSS-SECTION
(ILLUSTRATED WITH TYPE 3 CONNECTION)

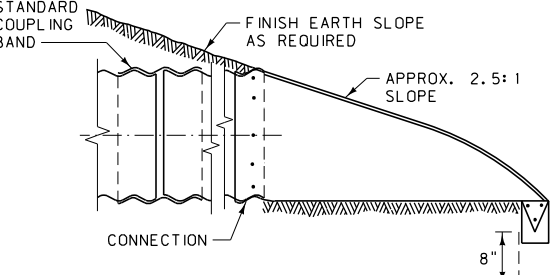
ROUND PIPE



ELEVATION



PLAN



TYPICAL CROSS-SECTION
(ILLUSTRATED WITH TYPE 3 CONNECTION)

NOTES:

PROVIDE TOE PLATE WHEN SPECIFIED.

GALVANIZE ALL PARTS IN ACCORDANCE WITH AASHTO M 36.

PAINT ANY AREAS WHERE GALVANIZING IS BROKEN OR METAL IS BARE WITH ONE COAT OF ZINC CHROMATE PRIME AND TWO COATS OF ALUMINUM PAINT.

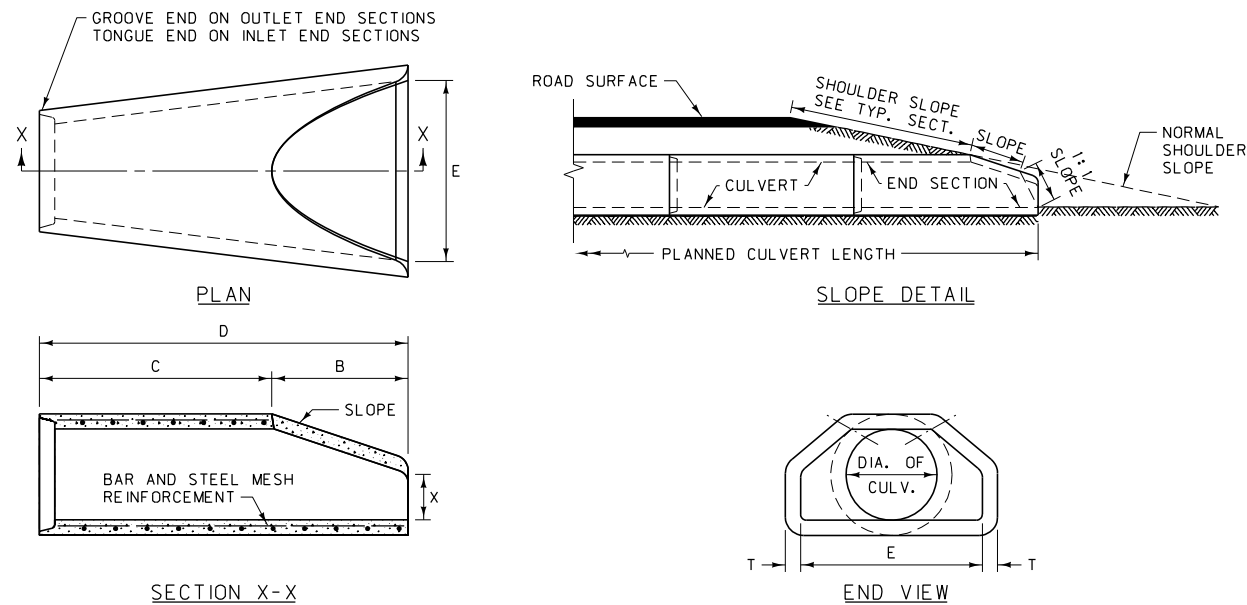
MINOR VARIATIONS IN DESIGN MAY BE ACCEPTABLE ON APPROVAL OF THE ENGINEER.

SEAMS OR JOINTS LENGTHWISE OF THE APRON ARE ACCEPTABLE IF SECURELY BOLTED OR WELDED AND PAINTED AS PROVIDED ABOVE.

3" x 1" CORR. SPAN x RISE	MINIMUM THICKNESS	2 2/3" x 1/2" CORR. SPAN x RISE	MINIMUM THICKNESS	DIMENSIONS					TYPE CONNECTOR
				A 1" TOL.	B MAX.	H 1" TOL.	1 1/2" L TOL.	F 2" TOL.	
		17" x 13"	0.064"	7"	9"	6"	19"	30"	2
		21" x 15"	0.064"	7"	10"	6"	23"	30"	2
		24" x 18"	0.064"	8"	12"	6"	28"	42"	2
		28" x 20"	0.064"	9"	14"	6"	32"	48"	2
		35" x 24"	0.079"	10"	16"	6"	39"	60"	2
40" x 31"	0.079"	42" x 29"	0.079"	12"	18"	8"	46"	75"	3
46" x 36"	0.109"	49" x 33"	0.109"	13"	21"	9"	53"	85"	3
53" x 41"	0.109"	57" x 38"	0.109"	18"	26"	12"	63"	90"	3
60" x 46"	0.109"	64" x 43"	0.109"	18"	30"	12"	70"	102"	3
66" x 51"	0.109"	71" x 47"	0.109"	18"	33"	12"	77"	114"	3
73" x 55"	0.109"	77" x 52"	0.109"	18"	36"	12"	77"	126"	3
81" x 59"	0.109"	83" x 57"	0.109"	18"	36"	12"	77"	138"	3

PIPE DIA.	MINIMUM THICKNESS	DIMENSIONS					TYPE CONNECTOR
		A 1" TOL.	B MAX.	H 1" TOL.	1 1/2" L TOL.	F 2" TOL.	
12"	0.064"	6"	6"	6"	21"	24"	1
15"	0.064"	7"	8"	6"	26"	30"	1
18"	0.064"	8"	10"	6"	31"	36"	1
21"	0.064"	9"	12"	6"	36"	42"	1
24"	0.064"	10"	13"	6"	41"	48"	1
30"	0.079"	12"	16"	8"	51"	60"	2
36"	0.079"	14"	19"	9"	60"	72"	2
42"	0.109"	16"	22"	11"	69"	84"	3
48"	0.109"	18"	27"	12"	78"	90"	3
54"	0.109"	18"	30"	12"	84"	102"	3
60"	0.109"	18"	33"	12"	87"	114"	3
66"	0.109"	18"	36"	12"	87"	120"	3
72"	0.109"	18"	39"	12"	87"	126"	3
78"	0.109"	18"	42"	12"	87"	132"	3
84"	0.109"	18"	45"	12"	87"	138"	3

TYPE "A"

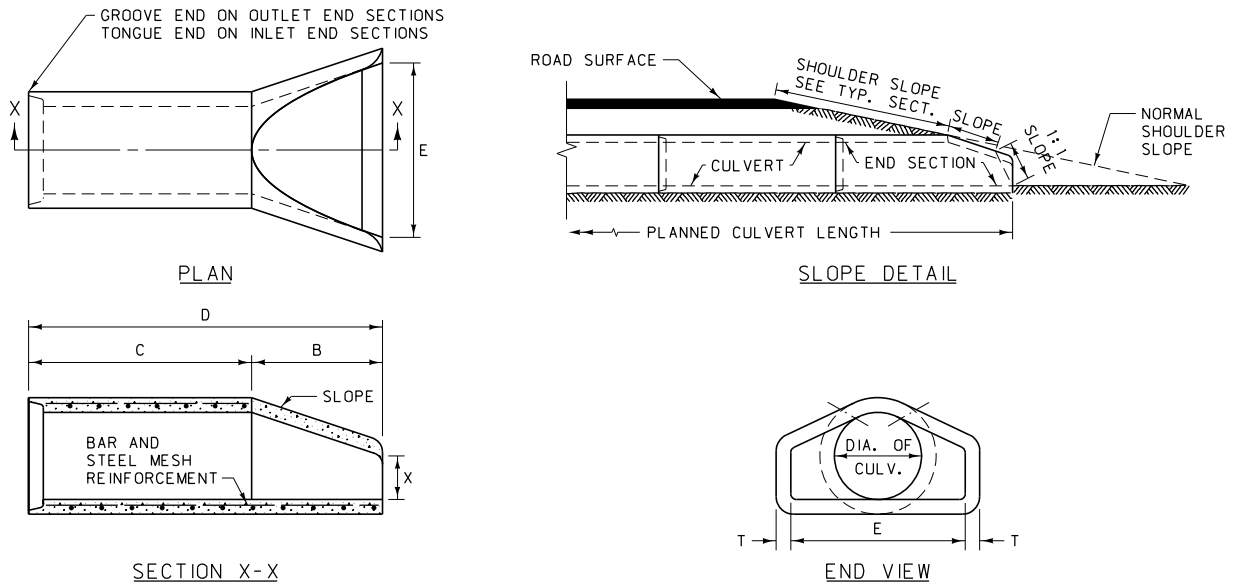


TYPE "A"							
DIA.	SLOPE	X	B	C	D	E	T *
12"	2.4:1	4"	2'-0"	4'-0"	6'-0"	2'-0"	2"
15"	2.4:1	6"	2'-3"	3'-9"	6'-0"	2'-6"	2 1/4"
18"	2.3:1	9"	2'-3"	3'-9"	6'-0"	3'-0"	2 1/2"
24"	2.5:1	9 1/2"	3'-7 1/2"	2'-4 1/2"	6'-0"	4'-0"	3"
30"	2.5:1	1'-0"	4'-6"	1'-6"	6'-0"	5'-0"	3 1/2"
36"	2.5:1	1'-3"	5'-3"	2'-11"	8'-2"	6'-0"	4"
42"	2.5:1	1'-9"	5'-3"	2'-11"	8'-2"	6'-6"	4 1/2"
48"	2.5:1	2'-0"	6'-0"	2'-2"	8'-2"	7'-0"	5"
54"	2.0:1	2'-3"	5'-5"	2'-9 1/2"	8'-2 1/2"	7'-6"	5 1/2"

* WALL "B" THICKNESS

TOLERANCES IN THE ADJACENT TABLES MAY NOT VARY MORE THAN ±1.5% FOR THE DIMENSIONS SHOWN. OTHERWISE THEY MUST CONFORM TO AASHTO M 170.

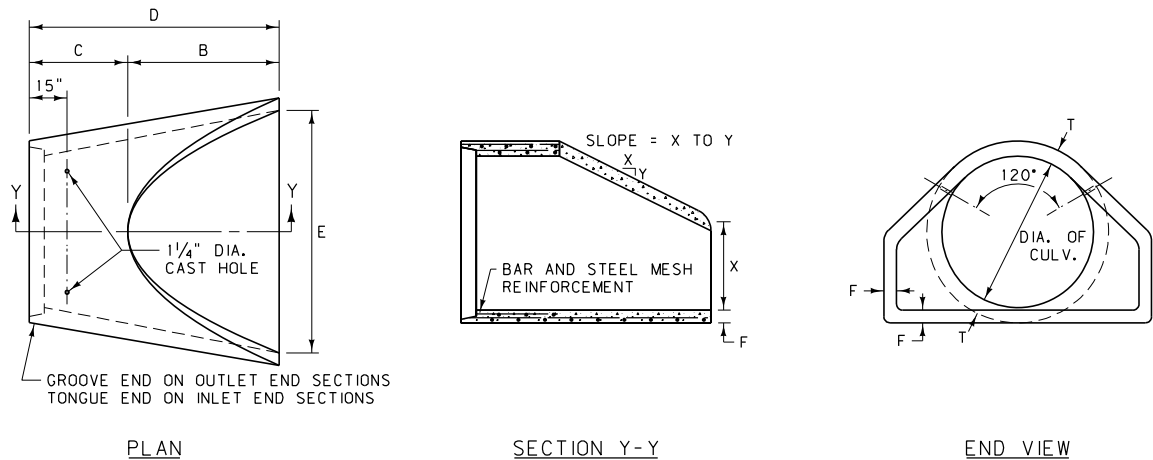
TYPE "B"



TYPE "B"							
DIA.	SLOPE	X	B	C	D	E	T *
12"	2.4:1	4"	2'-0"	4'-0"	6'-0"	2'-0"	2"
15"	2.4:1	6"	2'-3"	3'-9"	6'-0"	2'-6"	2 1/4"
18"	2.3:1	9"	2'-3"	3'-9"	6'-0"	3'-0"	2 1/2"
24"	2.5:1	9 1/2"	3'-7 1/2"	2'-4 1/2"	6'-0"	4'-0"	3"
30"	2.5:1	1'-0"	4'-6"	1'-6"	6'-0"	5'-0"	3 1/2"
36"	2.5:1	1'-3"	5'-3"	2'-11"	8'-2"	6'-0"	4"
42"	2.5:1	1'-9"	5'-3"	2'-11"	8'-2"	6'-6"	4 1/2"
48"	2.5:1	2'-0"	6'-0"	2'-2"	8'-2"	7'-0"	5"
54"	2.0:1	2'-3"	5'-5"	2'-9 1/2"	8'-2 1/2"	7'-6"	5 1/2"

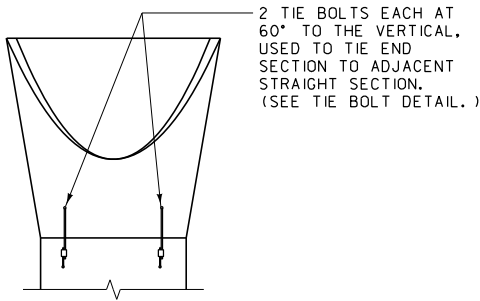
* WALL "B" THICKNESS

LARGE DIAMETER PIPE

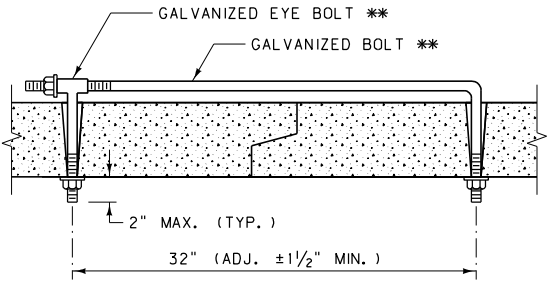


LARGE DIAMETER CULVERT								
DIA.	SLOPE	T *	X	B	C	D	E	F
60"	1.9:1	6"	2'-11"	5'-0"	3'-3"	8'-3"	8'-0"	5"
66"	1.7:1	6 1/2"	2'-6"	6'-0"	2'-3"	8'-3"	8'-6"	5 1/2"
72"	1.9:1	7"	3'-0"	6'-6"	1'-9"	8'-3"	9'-0"	6"
78"	1.8:1	7 1/2"	3'-0"	7'-6"	1'-9"	9'-3"	9'-6"	6 1/2"
84"	1.5:1	8"	3'-0"	7'-6 1/2"	1'-9"	9'-3 1/2"	10'-0"	6 1/2"
90"	1.5:1	8 1/2"	3'-5"	7'-3 1/2"	2'-0"	9'-3 1/2"	11'-0"	6 1/2"

* WALL "B" THICKNESS



TIE BOLT CONNECTION



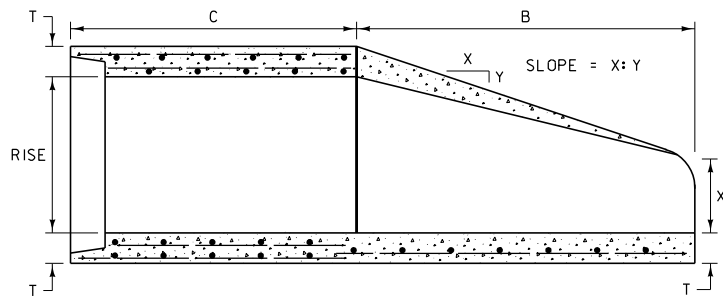
TIE BOLT DETAIL
(TWO PER END SECTION)

TIE BOLTS: USE TWO TIE BOLTS ON ALL FLARED END SECTIONS, ONE ON EACH SIDE AT 60° TO THE VERTICAL. GALVANIZE ALL PARTS. SEE TIE BOLT DETAIL.

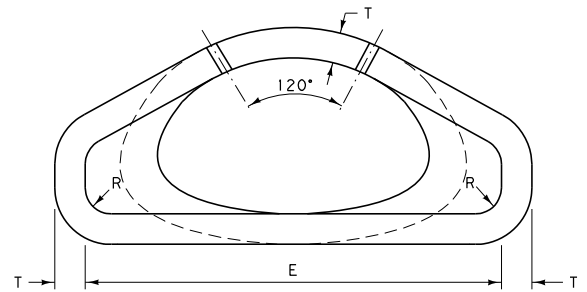
CONSTRUCTION: CONSTRUCT ACCORDING TO CLASS III, AASHTO M 170, AS FAR AS DESIGN WILL PERMIT.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	603-08
PREFABRICATED RCP FLARED END TERMINAL SECTION (FETS)	

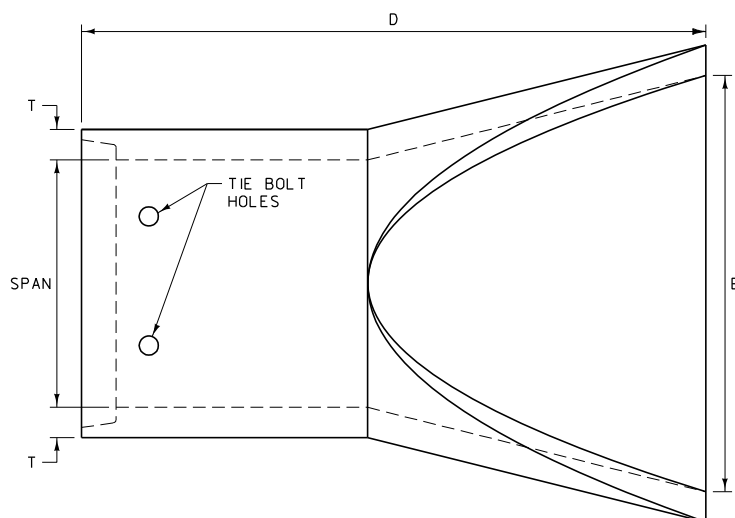
-- REVISED --	EFFECTIVE: FEBRUARY 2005
January 2008	
	MONTANA DEPARTMENT OF TRANSPORTATION



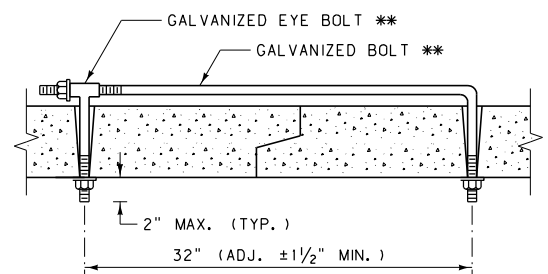
LONGITUDINAL SECTION



END VIEW



PLAN VIEW



** 3/4" FOR 18" TO 54" EQUIV. SIZE
1" FOR 60" TO 72" EQUIV. SIZE


TIE BOLT DETAIL
(TWO PER END SECTION)

TIE BOLTS: USE TIE BOLTS ON ALL FLARED
END SECTIONS, ONE ON EACH SIDE AT 60°
TO THE VERTICAL. GALVANIZE ALL PARTS.
SEE TIE BOLT DETAIL.

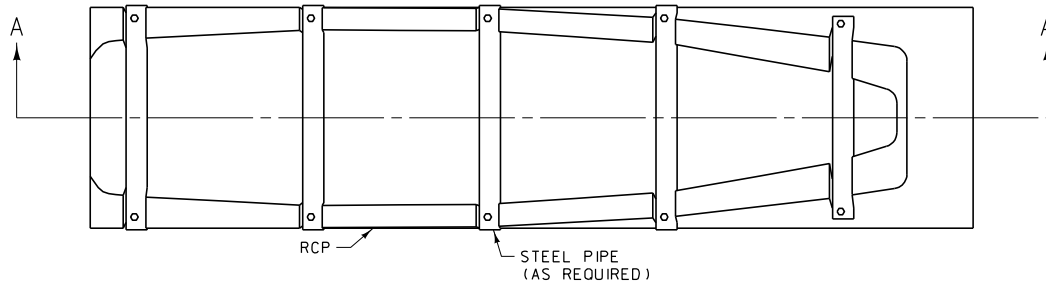
CONSTRUCTION: CONSTRUCT ACCORDING TO
CLASS A-III, AASHTO M 206, AS FAR AS
DESIGN WILL PERMIT.

EQUIV. SIZE	SPAN	RISE	T *	X	B	C	D	E	R	SLOPE
18"	22"	13 1/2"	2 1/2"	7"	27"	45"	72"	36"	3"	3:1
24"	28 1/2"	18"	3 1/2"	8 1/2"	39"	33"	72"	48"	3"	3:1
30"	36 1/4"	22 1/2"	4"	9 1/2"	50"	46"	96"	60"	3"	3:1
36"	43 3/4"	26 5/8"	4 1/2"	11 1/8"	60"	36"	96"	72"	6"	3:1
42"	51 1/8"	31 5/16"	4 1/2"	15 13/16"	60"	36"	96"	78"	6"	3:1
48"	58 1/2"	36"	5"	21"	60"	36"	96"	84"	6"	3:1
54"	65"	40"	5 1/2"	25 1/2"	60"	36"	96"	90"	6"	3:1
60"	73"	45"	6"	31"	60"	36"	96"	96"	6"	3:1
72"	88"	54"	7"	31"	60"	36"	96"	120"	6"	2:1
84"	102"	62"	8"	21 1/2"	84"	24"	108"	144"	6"	2:1

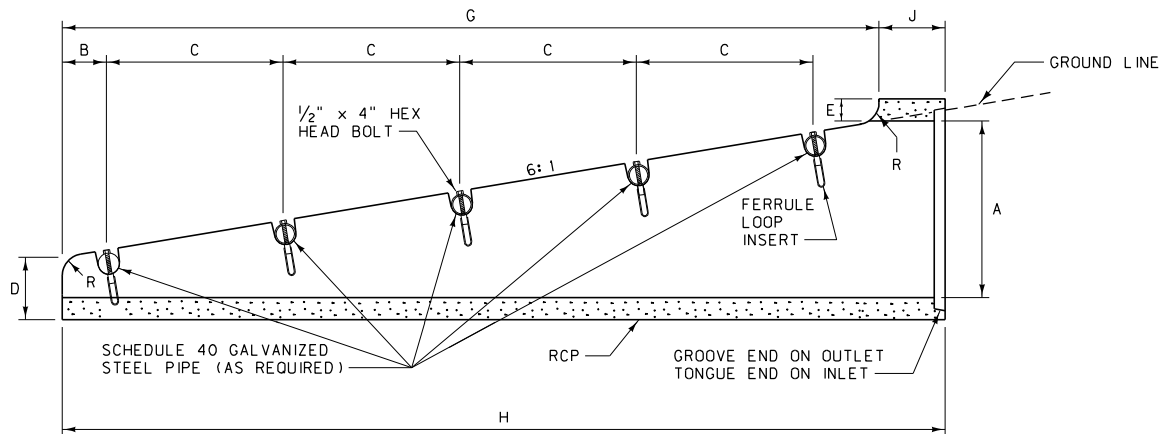
* WALL "B" THICKNESS

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	603-10
SECTION 603	
PREFABRICATED RCP ARCH FLARED END TERMINAL SECTION (FETS)	
EFFECTIVE: FEBRUARY 2005	
 serving you with pride	MONTANA DEPARTMENT OF TRANSPORTATION

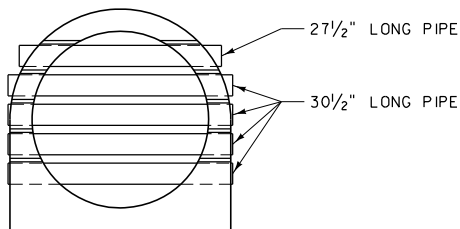
ROAD APPROACH CULVERT END TREATMENT										
QUANTITIES (FOR ESTIMATING ONLY)										
DIA. A RCP	H PIPE LENGTH	F-64 1/2" x 4 1/8" FERRULE LOOP INSERT (EACH)	LENGTH 2 1/2" DIA. SCHEDULE 40 GALV. PIPE	DIMENSIONS (FT.)						
				B	C	D	E	G	R	J
15"	4.75'	~	~	~	~	0.69	0.27	4.0	0.25	0.75
18"	6.5'	~	~	~	~	0.71	0.25	5.75	0.25	0.75
24"	10.0'	10	12.5'	0.5	2.0	0.75	0.21	9.25	0.25	0.75



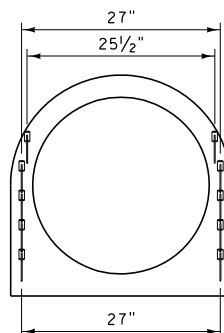
PLAN VIEW



SECTION A-A




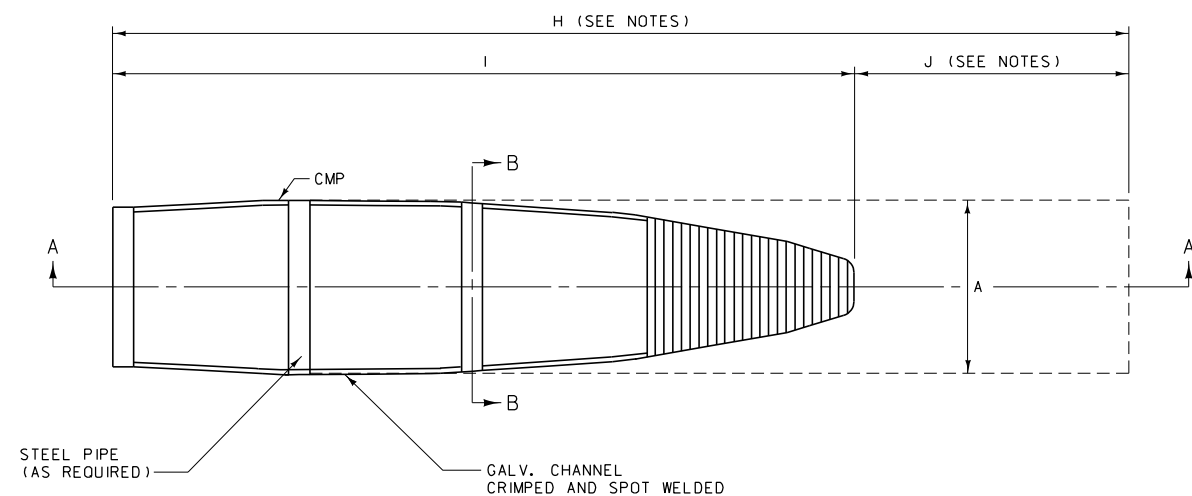
END VIEW



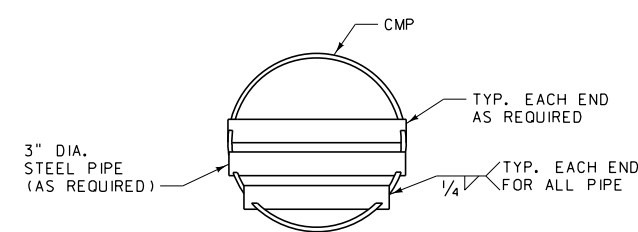
VIEW OF INSERTS

NOTE:
PAINT ALL NON-GALVANIZED PARTS
IN ACCORDANCE WITH SECTION 710
OF THE STANDARD SPECIFICATIONS.

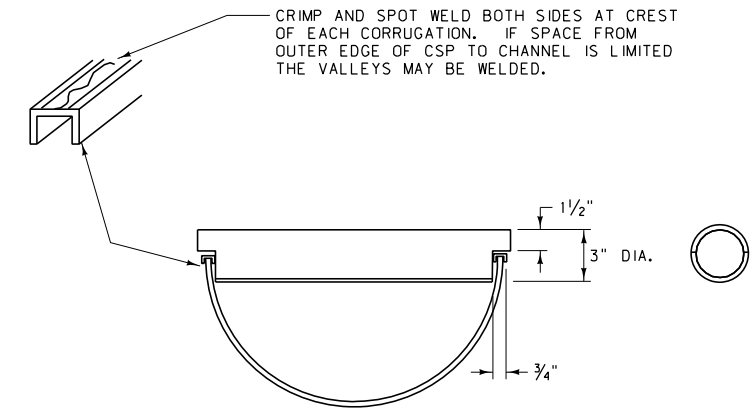
DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	603-12
SECTION 603, 710	
RCP ROAD APPROACH CULVERT END TREATMENT (RACET)	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	



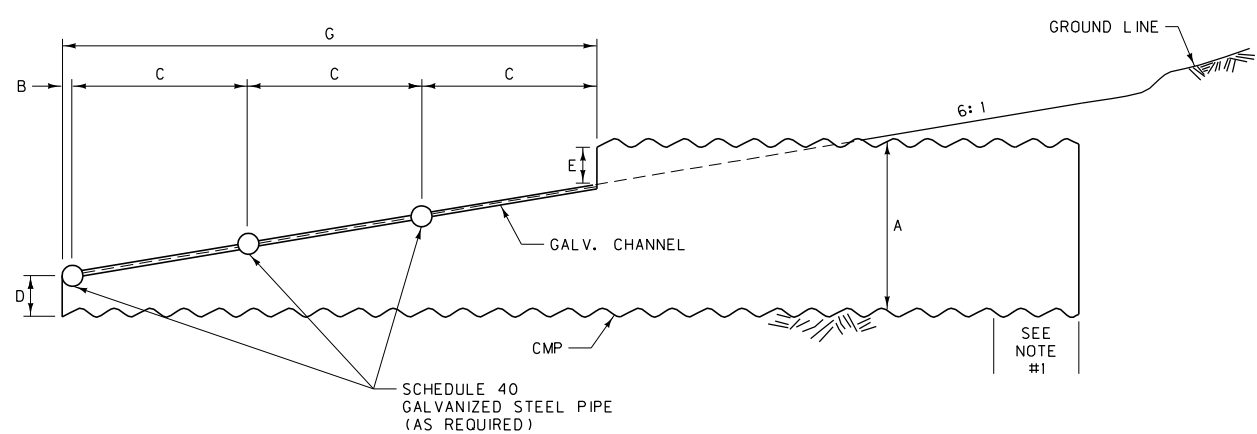
PLAN VIEW



END VIEW




SECTION B-B

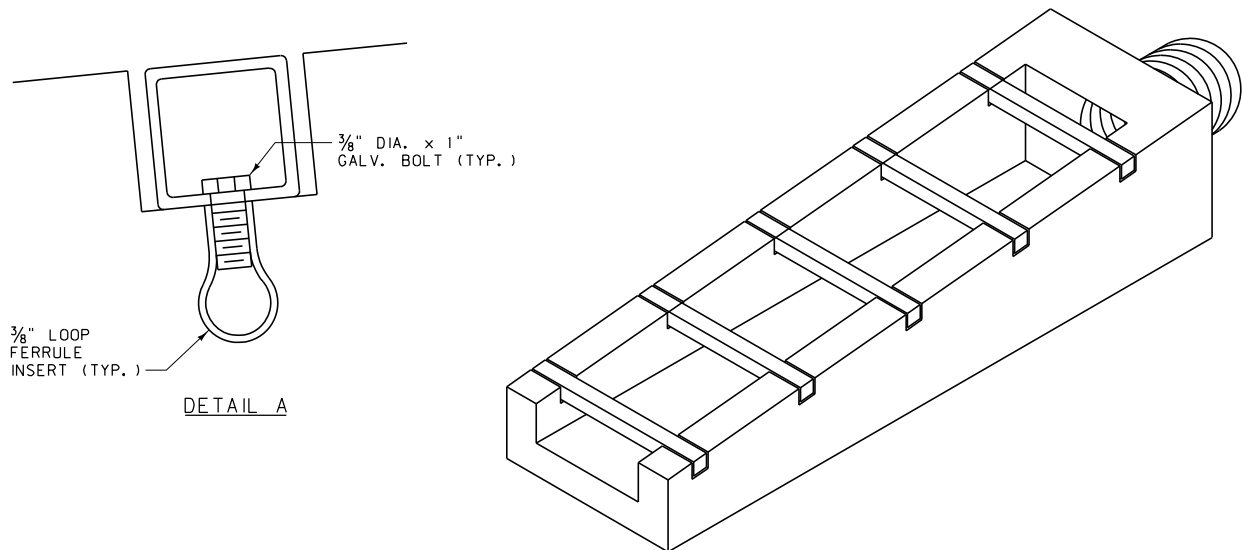
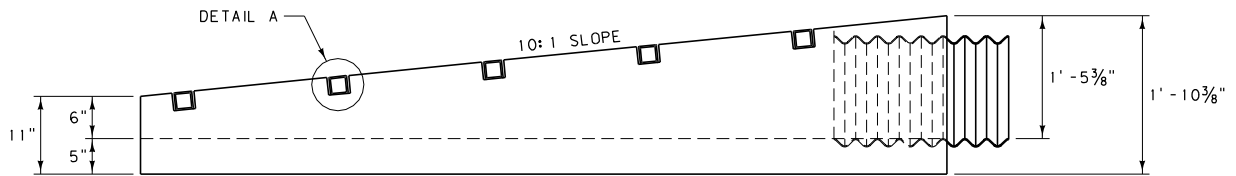
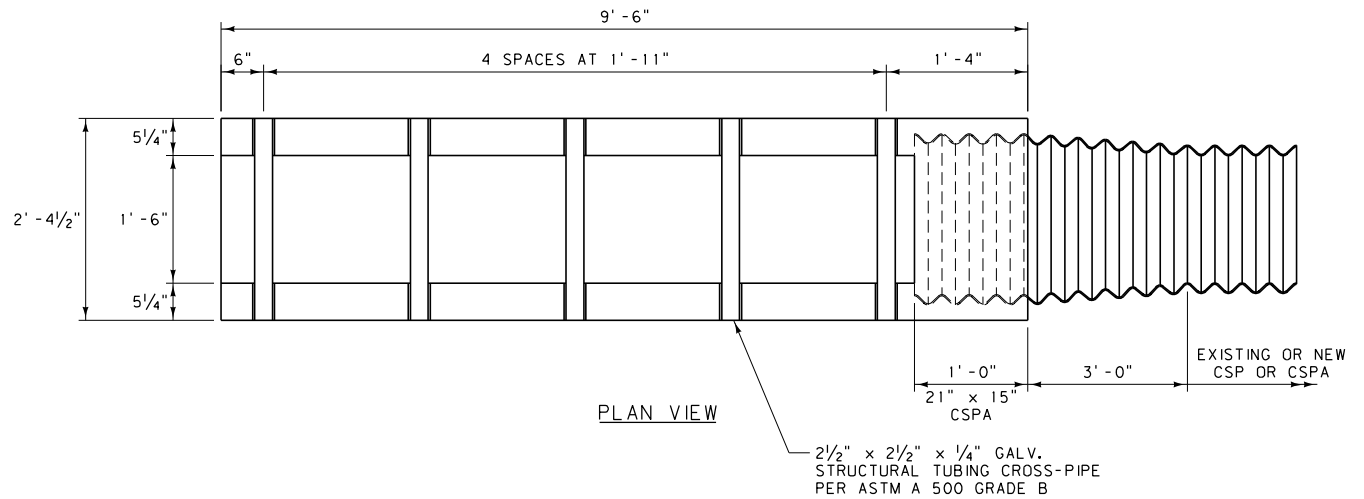


SECTION A-A
ILLUSTRATED WITH 24" CMP (30" CMP UTILIZES FOUR GALV. STEEL PIPES)


ROAD APPROACH CULVERT END TREATMENT										
QUANTITIES (FOR ESTIMATING ONLY)										
DIA. A CMP	H PIPE LENGTH	3/4" x 3/8" x 1/8" GALV. CHANNEL	LENGTH 3" DIA SCHEDULE 40 GALV. PIPE	DIMENSIONS (FT.)						
				B	C	D	E	G	I	J
15"	7.0'	10'	~	~	~	0.20	0.20	5.0	6.0	1.0
18"	8.0'	10'	~	~	~	0.33	0.33	5.0	7.0	1.0
24"	10.0'	12'	6.0'	0.15	1.95	0.50	0.50	6.0	9.0	1.0
30"	12.5'	16'	10.0'	0.20	1.95	0.60	0.60	8.0	11.5	1.0

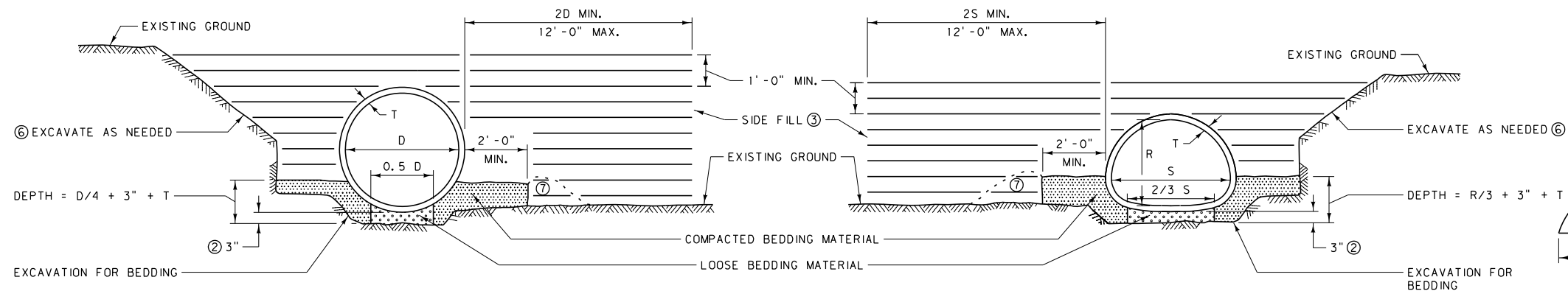
- NOTES:
- 1) PIPE TO HAVE ANNULAR CORRUGATION OR REROLLED ENDS. USE ONLY APPROVED COUPLING BAND PER STANDARD SPECIFICATION 709.02 CMP. FOR RCP END TREATMENT, SEE DTL. DWG. NO. 603-26 FOR CONNECTION.
 - 2) THE TWO 3/4" CHANNELS MAY BE ELIMINATED FROM THE CULVERT END TREATMENT IF:
 - A. THE CULVERT IS FABRICATED WITH 12 GAGE (0.109" THICK) MATERIAL.
 - B. HALF CIRCLE NOTCHES ARE CUT IN THE CULVERT FOR THE STEEL PIPE WITH CONTINUOUS WELD OF THE PERIPHERY IN CONTACT PROVIDED.
 - C. ALL WELDS AND OTHER NON-GALVANIZED PARTS ARE PAINTED IN ACCORDANCE WITH STANDARD SPECIFICATIONS SECTION 710.
 - 3) CONNECTIONS MADE PER DTL. DWG. NO. 603-26 REQUIRE PIPE LENGTHS H AND J TO BE INCREASED BY 3".

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 603, 709, 710	DWG. NO. 603-14
CMP ROAD APPROACH CULVERT END TREATMENT (RACET)	
EFFECTIVE: FEBRUARY 2005	
 serving you with pride	MONTANA DEPARTMENT OF TRANSPORTATION

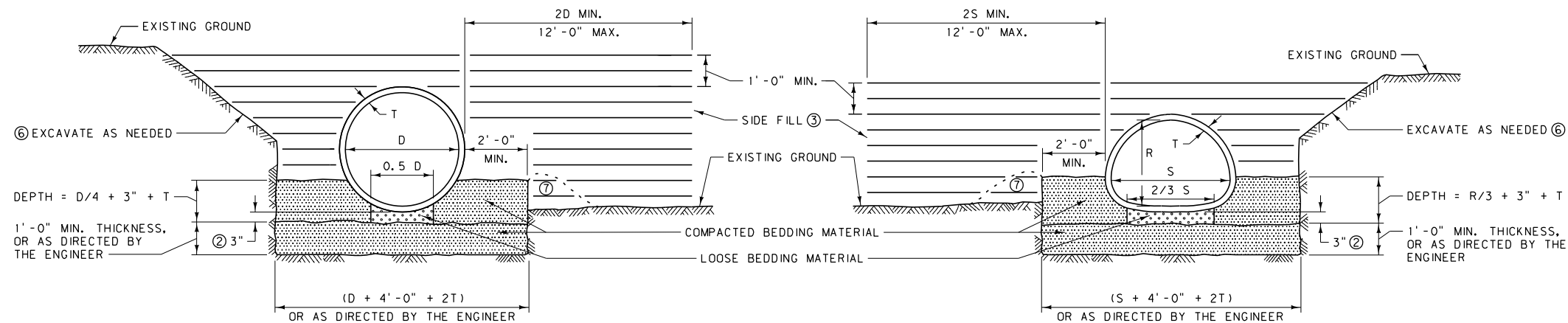
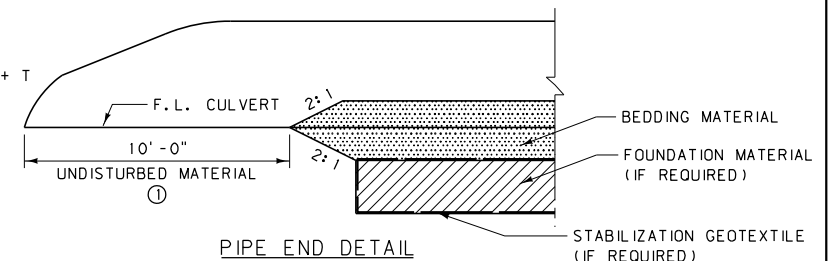


NOTE:
PAINT ALL EXPOSED METAL PARTS WITH ONE COAT OF ZINC RICH PAINT AND TWO COATS OF ALUMINUM PAINT ACCORDING TO STANDARD SPECIFICATION SECTION 710.

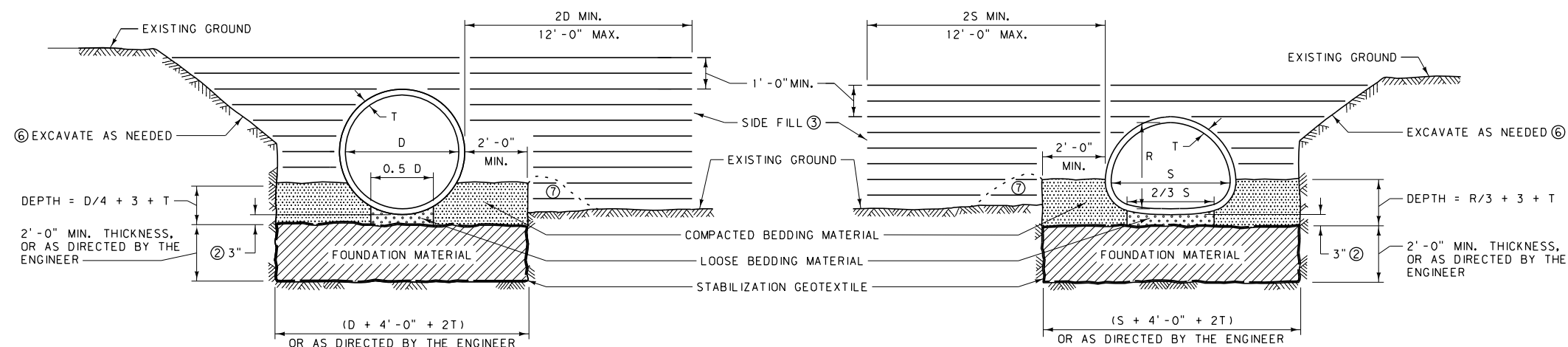
DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	603-17
SECTION 603, 708, 710	
PRECAST MEDIAN U-TURN CROSS DRAIN AND CONC. BEVELED END	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	



1-STANDARD BEDDING INSTALLATION



2-ROCK

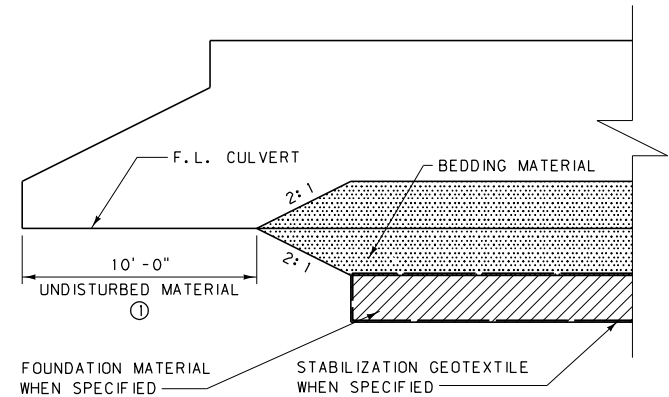
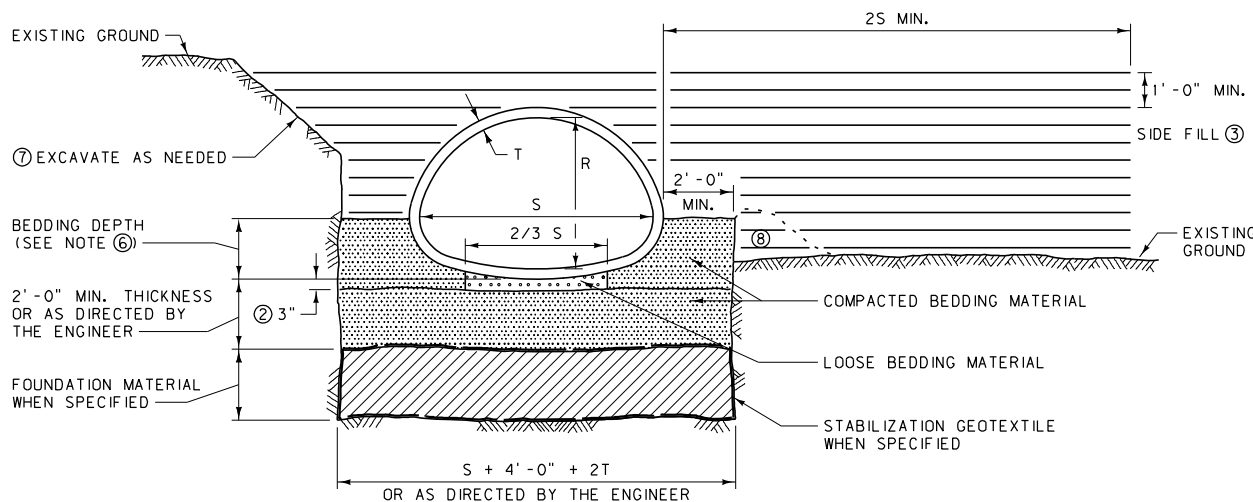
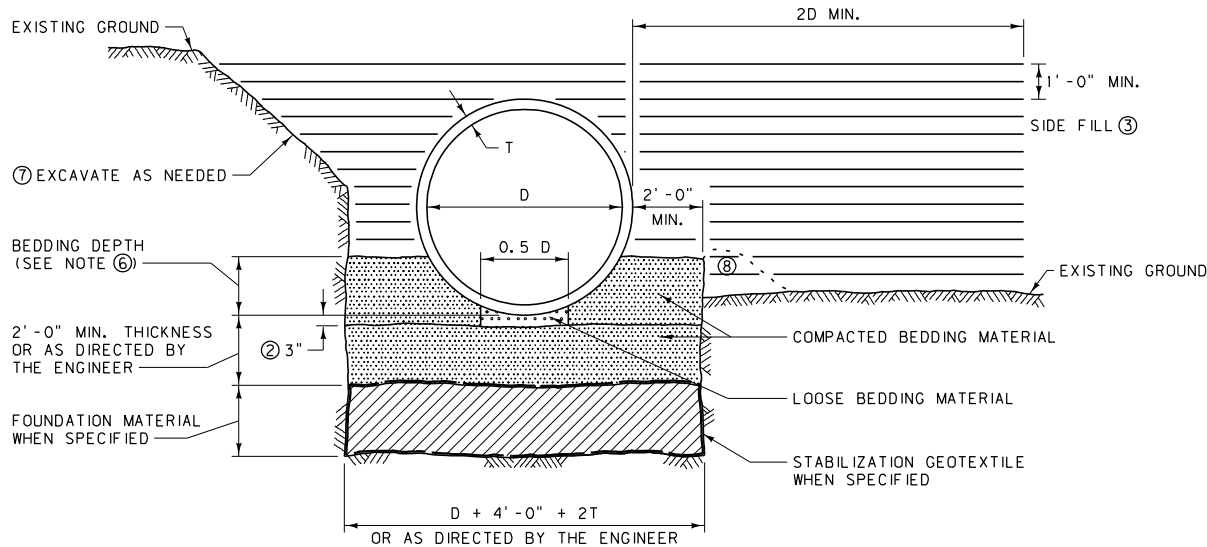


3-FOUNDATION STABILIZATION

NOTES:

- ① DO NOT EXTEND BEDDING MATERIAL TO THE END OF THE PIPE. LEAVE 10' OF UNDISTURBED MATERIAL AT EACH END UNLESS OTHERWISE NOTED IN PLANS. SEE PIPE END DETAIL.
- ② PLACE LOOSE BEDDING MATERIAL UNIFORMLY IN THE BOTTOM OF THE TRENCH AND SHAPE TO FIT BOTTOM OF PIPE. THE MINIMUM THICKNESS BEFORE PLACING PIPE IS 3", 42" AND 48" RCP IRR. REQUIRE 4" DEPTH OF LOOSE BEDDING MATERIAL TO ACCOMMODATE BELL THICKNESS. AFTER LAYING CULVERT, COMPACT BEDDING MATERIAL AT HAUNCHES AND SIDES OF PIPE.
- ③ COMPACT SIDE FILL IN 6" LOOSE LAYERS TO DENSITY SPECIFIED FOR ADJACENT EMBANKMENT. SEE SECTION 203.03.3 OF THE STANDARD SPECIFICATIONS FOR THE DENSITY REQUIREMENTS.
- ④ SEE SECTION 701.04 OF THE STANDARD SPECIFICATIONS FOR BEDDING AND FOUNDATION MATERIAL REQUIREMENTS.
- ⑤ DIMENSIONS D, S AND R ARE INSIDE PIPE DIAMETER, SPAN AND RISE. DIMENSION T IS THE CULVERT SHELL THICKNESS FOR CONCRETE OR CORRUGATION WIDTH FOR METAL. CORRUGATION WIDTHS ARE TYPICALLY 1/2" FOR 48" EQUIVALENT SIZE METAL CULVERTS AND SMALLER.
- ⑥ EXCAVATE A SUFFICIENT AMOUNT TO PROVIDE A SAFE WORKING ENVIRONMENT AND TO ALLOW ACHIEVEMENT OF ALL CULVERT INSTALLATION AND COMPACTION REQUIREMENTS. SLOPE, BENCH OR PROVIDE SHORING FOR ALL EXCAVATIONS IN ACCORDANCE WITH THE U.S. DEPARTMENT OF LABOR, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION.
- ⑦ BUILD BERM WITH FILL MATERIAL AS NEEDED TO CONTAIN THE BEDDING MATERIAL TO THE PROPER DEPTH.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	603-18
SECTION 207, 603, 701	
BEDDING FOR MAINLINE & PUBLIC APPROACH CULVERTS 48" EQUIVALENT & SMALLER	



PIPE END DETAIL

NOTES:

- ① DO NOT EXTEND BEDDING MATERIAL TO THE END OF THE PIPE. LEAVE 10' OF UNDISTURBED MATERIAL AT EACH END UNLESS OTHERWISE NOTED IN PLANS. SEE PIPE END DETAIL.
- ② PLACE LOOSE BEDDING MATERIAL UNIFORMLY IN THE BOTTOM OF THE TRENCH AND SHAPE TO FIT BOTTOM OF PIPE. THE MINIMUM THICKNESS BEFORE PLACING PIPE IS 3". RCP IRR. REQUIRE GREATER THAN 3" OF LOOSE BEDDING MATERIAL TO ACCOMMODATE BELL THICKNESS. AFTER LAYING CULVERT, COMPACT BEDDING MATERIAL AT HAUNCHES AND SIDES OF PIPE.
- ③ COMPACT SIDE FILL IN 6" LOOSE LAYERS TO DENSITY SPECIFIED FOR ADJACENT EMBANKMENT. SEE SECTION 203.03.3 OF THE STANDARD SPECIFICATIONS FOR THE DENSITY REQUIREMENTS.
- ④ SEE SECTION 701.04 OF THE STANDARD SPECIFICATIONS FOR BEDDING AND FOUNDATION MATERIAL REQUIREMENTS.
- ⑤ DIMENSIONS D, S, AND R ARE THE INSIDE PIPE DIAMETER, SPAN, AND RISE. DIMENSION T IS THE CULVERT SHELL THICKNESS FOR CONCRETE OR CORRUGATION WIDTH FOR METAL.
- ⑥ THE BEDDING DEPTH FOR CONCRETE PIPE IS $D/4 + T$ OR $R/3 + T$. THE BEDDING DEPTH FOR METAL PIPE IS "X" + T. SEE DTL. DWG. NO. 603-32 AND 603-34 FOR "X" DIMENSIONS OF METAL PIPES.
- ⑦ EXCAVATE A SUFFICIENT AMOUNT TO PROVIDE A SAFE WORKING ENVIRONMENT AND TO ALLOW ACHIEVEMENT OF ALL CULVERT INSTALLATION AND COMPACTION REQUIREMENTS. SLOPE, BENCH OR PROVIDE SHORING FOR ALL EXCAVATIONS IN ACCORDANCE WITH THE U.S. DEPARTMENT OF LABOR, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION.
- ⑧ BUILD BERM WITH FILL MATERIAL AS NEEDED TO CONTAIN THE BEDDING MATERIAL TO THE PROPER DEPTH.

DETAILED DRAWING	
REFERENCE STANDARD SPEC.	DWG. NO. 603-19
SECTION 207, 603, 701	
BEDDING FOR CULVERTS 54" EQUIVALENT & LARGER	

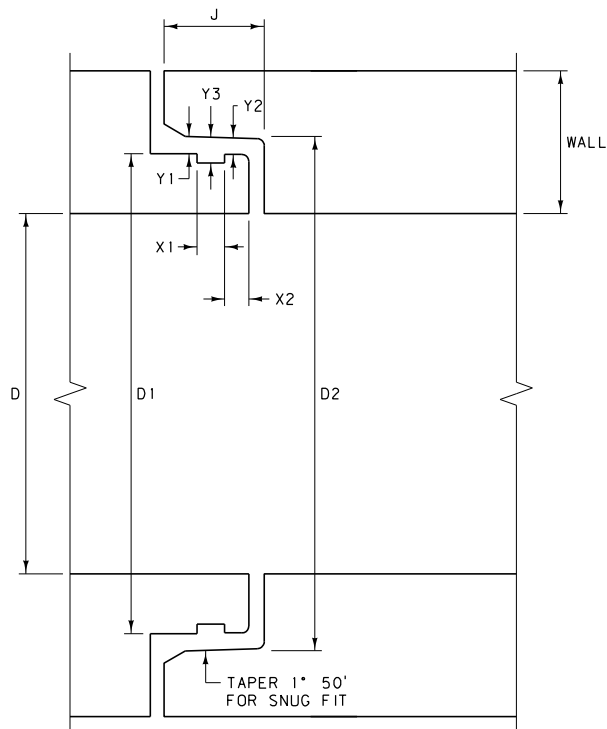
--REVISED--
January 2008

EFFECTIVE: APRIL 2006

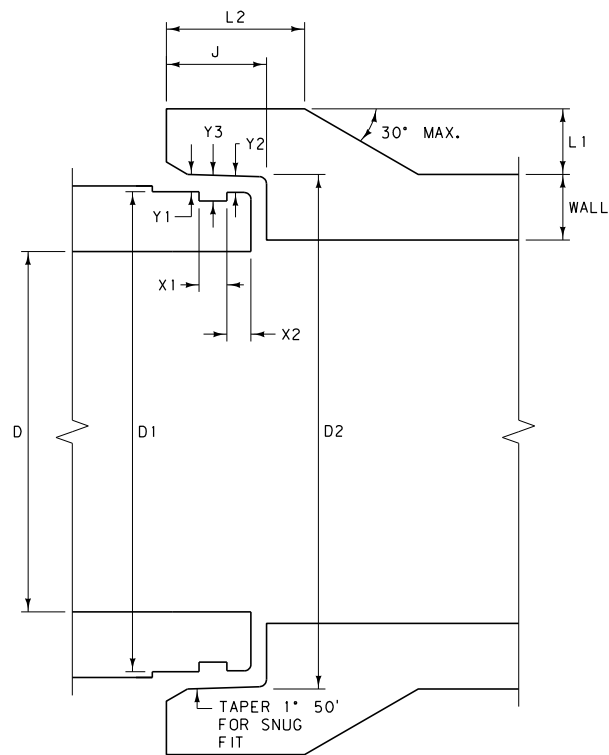
MDT MONTANA DEPARTMENT
OF TRANSPORTATION
serving you with pride

DIA. D	APPROX. DIA. GASKET MATL. NOT STRETCHED	LENGTH OF JOINT J	D1	D2	L2 (MIN.)	L1 (WALL "B")	L1 (WALL "C")	X1	X2	Y1	Y2	Y3
12"	2 ¹ / ₃₂ "	3 ⁵ / ₈ "	15.223"	15.331"	5"	2"	~	1"	7 ⁸ / ₈ "	0.062"	0.090"	0.313"
15"	2 ¹ / ₃₂ "	3 ⁵ / ₈ "	18.723"	18.831"	4 ³ / ₄ "	2 ³ / ₁₆ "	~	1"	7 ⁸ / ₈ "	0.062"	0.090"	0.313"
18"	2 ¹ / ₃₂ "	3 ⁵ / ₈ "	22.098"	22.206"	5"	2 ³ / ₈ "	~	1"	7 ⁸ / ₈ "	0.062"	0.090"	0.313"
21"	2 ¹ / ₃₂ "	3 ⁵ / ₈ "	25.600"	25.724"	5 ¹ / ₄ "	2 ³ / ₁₆ "	~	1"	7 ⁸ / ₈ "	0.062"	0.090"	0.313"
24"	2 ¹ / ₃₂ "	3 ⁷ / ₈ "	28.975"	29.099"	5 ¹ / ₂ "	2 ³ / ₄ "	2"	1"	7 ⁸ / ₈ "	0.062"	0.090"	0.313"
27"	2 ¹ / ₃₂ "	4"	32.476"	32.608"	5 ¹ / ₂ "	2 ³ / ₄ "	2"	1"	7 ⁸ / ₈ "	0.062"	0.090"	0.313"
30"	2 ¹ / ₃₂ "	4"	35.976"	36.108"	5 ¹ / ₂ "	2 ³ / ₄ "	2"	1"	7 ⁸ / ₈ "	0.062"	0.090"	0.313"
33"	2 ¹ / ₃₂ "	4 ¹ / ₈ "	39.476"	39.616"	5 ³ / ₄ "	2 ⁷ / ₈ "	2 ¹ / ₈ "	1"	7 ⁸ / ₈ "	0.062"	0.090"	0.313"
36"	2 ¹ / ₃₂ "	4 ¹ / ₈ "	42.976"	43.116"	6"	3 ¹ / ₈ "	2 ³ / ₈ "	1"	7 ⁸ / ₈ "	0.062"	0.090"	0.313"
42"	3 ¹ / ₄ "	4 ⁵ / ₈ "	50.183"	50.183"	6 ³ / ₄ "	3 ³ / ₄ "	3"	1 ³ / ₁₆ "	1"	0.067"	0.129"	0.376"
48"	3 ¹ / ₄ "	4 ³ / ₄ "	57.023"	57.193"	7 ¹ / ₄ "	4 ¹ / ₈ "	3 ³ / ₈ "	1 ³ / ₁₆ "	1"	0.067"	0.129"	0.376"
54"	3 ¹ / ₄ "	5"	63.007"	63.192"	7 ¹ / ₂ "	3 ⁵ / ₈ "	2 ⁷ / ₈ "	1 ³ / ₁₆ "	1"	0.067"	0.129"	0.376"
60"	3 ¹ / ₄ "	5"	69.007"	69.192"	7 ¹ / ₂ "	3 ¹ / ₈ "	2 ³ / ₈ "	1 ³ / ₁₆ "	1"	0.067"	0.129"	0.376"
66"	1 ³ / ₁₆ "	5"	75.007"	75.192"	7 ¹ / ₂ "	2 ³ / ₄ "	2"	1 ³ / ₁₆ "	1"	0.067"	0.129"	0.376"
72"	1 ³ / ₁₆ "	5 ¹ / ₄ "	79.250"	79.400"	~	~	~	1 ³ / ₁₆ "	1 ¹ / ₄ "	0.093"	0.190"	0.376"
78"	1 ³ / ₁₆ "	5 ¹ / ₄ "	86.250"	86.400"	~	~	~	1 ³ / ₁₆ "	1 ¹ / ₄ "	0.093"	0.190"	0.376"
84"	1 ³ / ₁₆ "	5 ¹ / ₄ "	91.500"	91.650"	~	~	~	1 ³ / ₁₆ "	1 ¹ / ₄ "	0.093"	0.190"	0.376"
90"	1 ³ / ₁₆ "	5 ¹ / ₄ "	97.750"	97.900"	~	~	~	1 ³ / ₁₆ "	1 ¹ / ₄ "	0.093"	0.190"	0.376"
96"	1 ³ / ₁₆ "	5 ¹ / ₄ "	104.250"	104.400"	~	~	~	1 ³ / ₁₆ "	1 ¹ / ₄ "	0.093"	0.190"	0.376"
102"	1 ³ / ₁₆ "	5 ¹ / ₄ "	110.750"	110.900"	~	~	~	1 ³ / ₁₆ "	1 ¹ / ₄ "	0.093"	0.190"	0.376"
108"	1 ³ / ₁₆ "	5 ¹ / ₄ "	117.250"	117.400"	~	~	~	1 ³ / ₁₆ "	1 ¹ / ₄ "	0.093"	0.190"	0.376"

72" DIA. PIPES AND LARGER



66" DIA. PIPES AND SMALLER



NOTES:

TYPICAL FOR STORM DRAIN AND IRRIGATION APPLICATIONS (FOR HEADS UP TO 20 FEET).

USE RUBBER GASKETS THAT MEET THE REQUIREMENTS OF STANDARD SPECIFICATION 707.02.1.

DETAILED DRAWING

REFERENCE DWG. NO.
STANDARD SPEC. 603-22
SECTION 603, 707, 708

WATER TIGHT JOINT FOR
REINFORCED CONCRETE PIPE

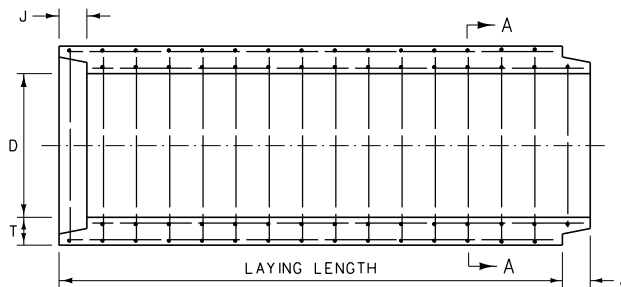
EFFECTIVE: FEBRUARY 2005



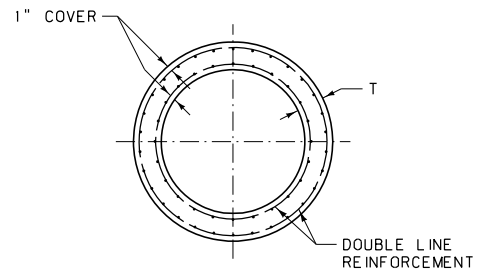
MONTANA DEPARTMENT
OF TRANSPORTATION

DIA. D	XSEC. WATER AREA (SQ. FT.)	WT. PER L.F. OF PIPE (LB.)	T * MIN. WALL THICKNESS	J LENGTH OF JOINT	A (NOMINAL) = $\frac{D2 - D1}{2}$	D1	D2	D3	D4
12"	0.79	92	2"	1 $\frac{3}{4}$ "	$\frac{3}{16}$ "	13 $\frac{1}{4}$ "	13 $\frac{5}{8}$ "	13 $\frac{7}{8}$ "	14 $\frac{1}{4}$ "
15"	1.23	127	2 $\frac{1}{4}$ "	2"	$\frac{3}{16}$ "	16 $\frac{1}{2}$ "	16 $\frac{7}{8}$ "	17 $\frac{1}{4}$ "	17 $\frac{5}{8}$ "
18"	1.77	168	2 $\frac{1}{2}$ "	2 $\frac{1}{4}$ "	$\frac{3}{16}$ "	19 $\frac{5}{8}$ "	20"	20 $\frac{3}{8}$ "	20 $\frac{3}{4}$ "
21"	2.40	214	2 $\frac{3}{4}$ "	2 $\frac{1}{2}$ "	$\frac{3}{16}$ "	22 $\frac{7}{8}$ "	23 $\frac{1}{4}$ "	23 $\frac{3}{4}$ "	24 $\frac{1}{8}$ "
24"	3.14	265	3"	2 $\frac{3}{4}$ "	$\frac{3}{16}$ "	26"	26 $\frac{7}{8}$ "	27"	27 $\frac{3}{8}$ "
27"	3.98	322	3 $\frac{1}{4}$ "	3"	$\frac{3}{16}$ "	29 $\frac{1}{4}$ "	29 $\frac{5}{8}$ "	30 $\frac{1}{4}$ "	30 $\frac{5}{8}$ "
30"	4.91	384	3 $\frac{1}{2}$ "	3 $\frac{1}{4}$ "	$\frac{3}{16}$ "	32 $\frac{3}{8}$ "	32 $\frac{3}{4}$ "	33 $\frac{1}{2}$ "	33 $\frac{3}{8}$ "
33"	5.94	452	3 $\frac{3}{4}$ "	3 $\frac{1}{2}$ "	$\frac{1}{4}$ "	35 $\frac{1}{2}$ "	36"	36 $\frac{3}{4}$ "	37 $\frac{1}{4}$ "
36"	7.07	524	4"	3 $\frac{3}{4}$ "	$\frac{1}{4}$ "	38 $\frac{3}{4}$ "	39 $\frac{1}{4}$ "	40"	40 $\frac{1}{2}$ "
42"	9.62	685	4 $\frac{1}{2}$ "	4"	$\frac{1}{4}$ "	45 $\frac{1}{8}$ "	45 $\frac{3}{8}$ "	46 $\frac{1}{2}$ "	47"
48"	12.57	867	5"	4 $\frac{1}{4}$ "	$\frac{1}{4}$ "	51 $\frac{1}{2}$ "	52"	53"	53 $\frac{1}{2}$ "
54"	15.90	1070	5 $\frac{1}{2}$ "	4 $\frac{1}{2}$ "	$\frac{1}{4}$ "	57 $\frac{7}{8}$ "	58 $\frac{3}{8}$ "	59 $\frac{3}{8}$ "	59 $\frac{7}{8}$ "
60"	19.63	1296	6"	5"	$\frac{1}{4}$ "	64 $\frac{1}{4}$ "	64 $\frac{3}{4}$ "	66"	66 $\frac{1}{2}$ "
66"	23.76	1542	6 $\frac{1}{2}$ "	5 $\frac{1}{2}$ "	$\frac{1}{4}$ "	70 $\frac{5}{8}$ "	71 $\frac{1}{8}$ "	72 $\frac{1}{2}$ "	73"
72"	28.27	1810	7"	6"	$\frac{1}{4}$ "	77"	77 $\frac{1}{2}$ "	79"	79 $\frac{1}{2}$ "
78"	33.18	2098	7 $\frac{1}{2}$ "	6 $\frac{1}{2}$ "	$\frac{1}{4}$ "	83 $\frac{3}{8}$ "	83 $\frac{7}{8}$ "	85 $\frac{5}{8}$ "	86 $\frac{1}{3}$ "
84"	38.48	2410	8"	7"	$\frac{1}{4}$ "	89 $\frac{3}{4}$ "	90 $\frac{1}{4}$ "	92 $\frac{1}{8}$ "	92 $\frac{5}{8}$ "
90"	44.18	2740	8 $\frac{1}{2}$ "	7"	$\frac{1}{4}$ "	95 $\frac{3}{4}$ "	96 $\frac{1}{4}$ "	98 $\frac{1}{8}$ "	98 $\frac{5}{8}$ "
96"	50.27	2950	9"	7"	$\frac{1}{4}$ "	102 $\frac{1}{8}$ "	102 $\frac{5}{8}$ "	104 $\frac{1}{2}$ "	105"
102"	56.75	3075	9 $\frac{1}{2}$ "	7 $\frac{1}{2}$ "	$\frac{1}{4}$ "	109"	109 $\frac{1}{2}$ "	111 $\frac{1}{2}$ "	112"
108"	63.62	3870	10"	7 $\frac{1}{2}$ "	$\frac{1}{4}$ "	115 $\frac{1}{2}$ "	116"	118"	118 $\frac{1}{2}$ "

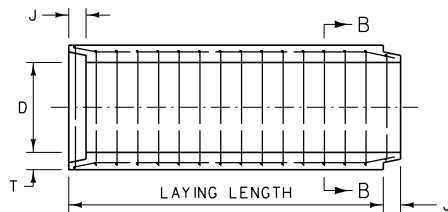
* WALL "B" THICKNESS



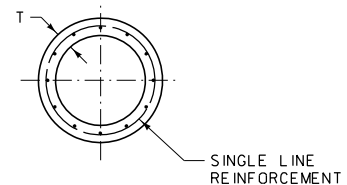
TYPICAL LONGITUDINAL SECTION
36" DIAMETER PIPES AND LARGER



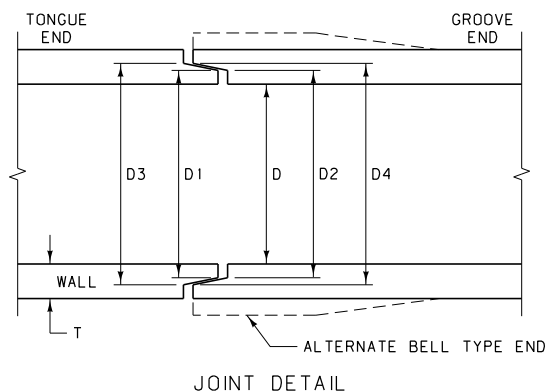
SECTION A-A



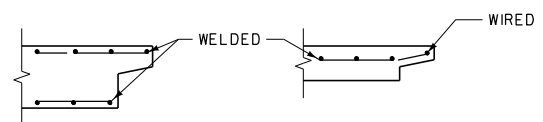
TYPICAL LONGITUDINAL SECTION
33" DIAMETER PIPES AND SMALLER



SECTION B-B



JOINT DETAIL




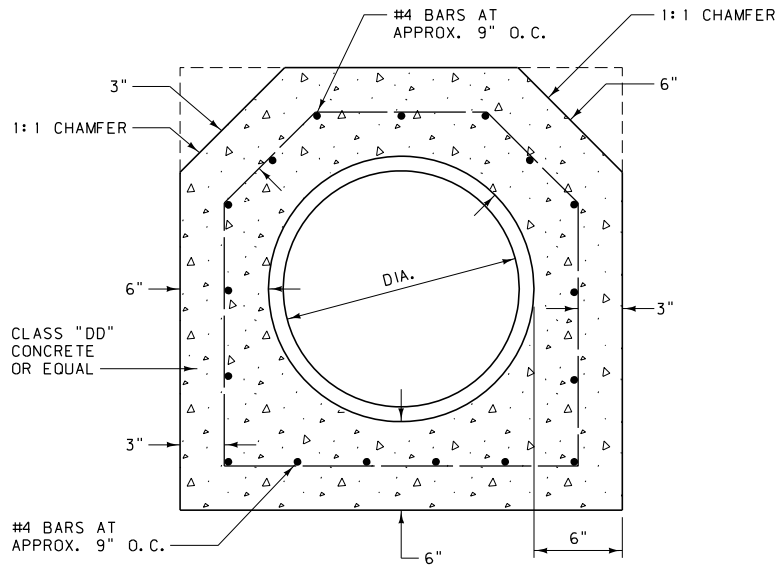
REINFORCING AT ENDS OF PIPE

NOTES:

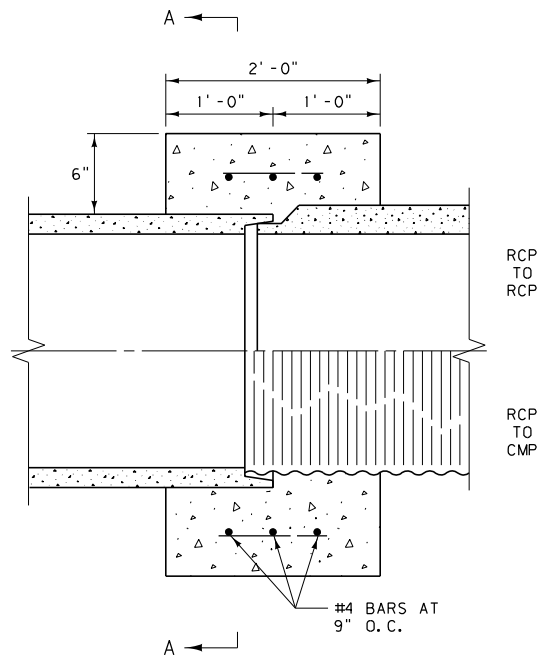
TOLERANCES IN DIMENSIONS IN ACCORDANCE
WITH AASHTO M 170.

TYPICAL FOR DRAINAGE APPLICATIONS.

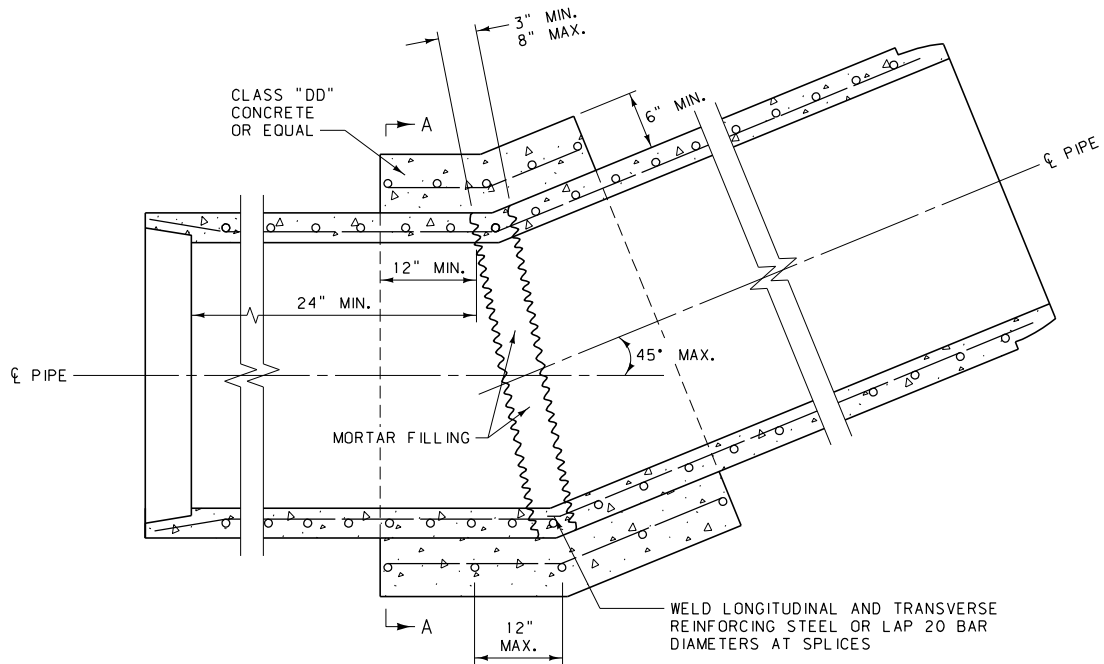
DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 603, 708	DWG. NO. 603-24
REINFORCED CONCRETE PIPE JOINT	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	




SECTION A-A



CONNECTION DETAILS



TYPICAL FIELD CAST CONCRETE BEND

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 603, 708	DWG. NO. 603-26
TYPICAL FIELD CAST CONCRETE CONNECTIONS	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	

4" HIGH CURB (SEE DTL. DWG. NO. 609-05)

5'-0" [1525] R

FINISHED SHOULDER

2'-0" [610]

5'-0" [1525] R

5'-6" [1680]

30'-0" [9140] MINIMUM

PL. MIX. BIT. SURF. TO BE PLACED AND WARPED TO FIT GUTTER AND INLET GRADES *

STD. BIT. CURB *

1/2" [12.70] DIA. GALV. ROD WITH 2 GALV. HEX NUTS EACH END

SLOPE FROM EDGE OF PAVEMENT AT 10%

RAIL FACE

4'-0" [1200]

4'-0" [1200]

18" [450] CMP

18" x 12" [450 x 300] REDUCER

12" [300] CMP

WARP CURB TO FIT


PLAN VIEW OF INLET

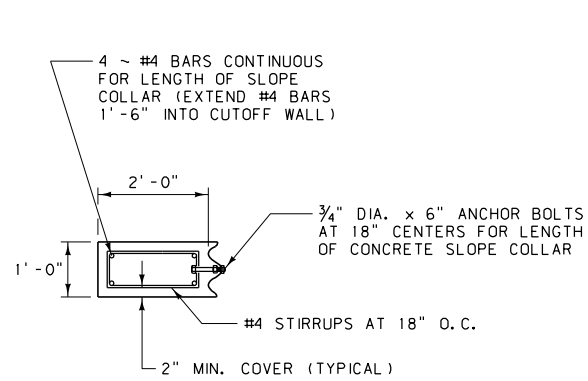


NOTES:

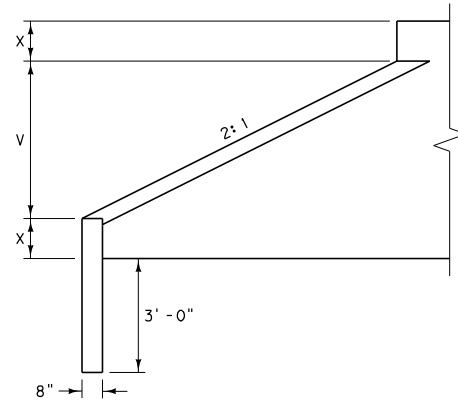
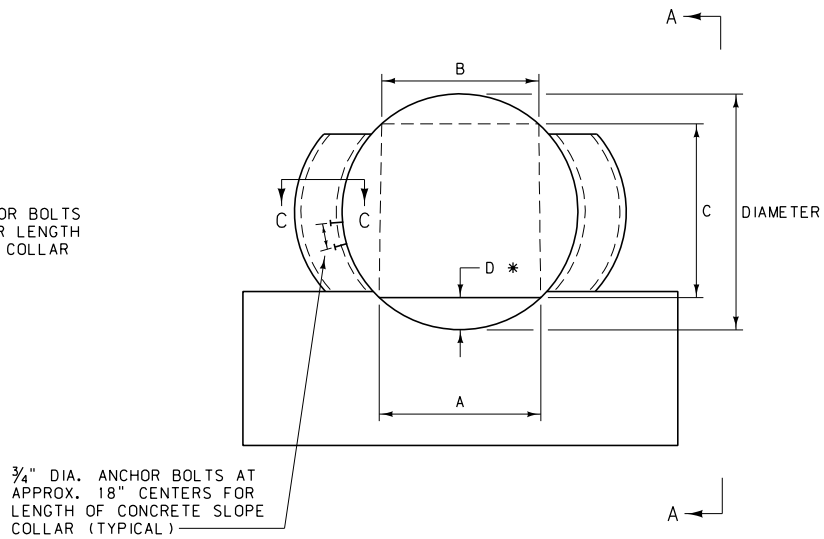
* INCLUDED WITH ROADWAY QUANTITIES.

UNITS SHOWN IN BRACKETS [] ARE
METRIC AND ARE IN MILLIMETERS (mm)
UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	603-28
SECTION 603	
EMBANKMENT PROTECTOR	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	



NOTE:
SEE DTL. DWG. NO. 552-00
FOR ANCHOR BOLT DETAILS.



NOTES:

DESIGNATE THESE STRUCTURES, IN PLANS AND PROPOSAL, AS "VEHICULAR UNDERPASS." CONFORM MATERIALS, INSTALLATION, AND OTHER PROVISIONS TO THE STANDARD SPECIFICATIONS. USE THE TERM "VEHICULAR UNDERPASS," REGARDLESS OF THE USE OR PURPOSE OF THE STRUCTURE.

PROVIDE END TREATMENT FOR ALL VEHICULAR UNDERPASSES INCLUDING CUTOFF WALLS, BACKFILL RETAINING WALLS AND CONCRETE SLOPE COLLARS.

PROVIDE SURFACING FOR THE INSIDE OF THE STRUCTURE, CROSS-SLOPED TO ALLOW A DRAINAGE COURSE ALONG ONE SIDE.

FOR PLATE THICKNESS SEE ROAD DESIGN MANUAL FILL HEIGHT TABLES.

USE CLASS "DD" CONCRETE OR EQUAL.

SEE DTL. DWG. NO. 552-08 FOR QUANTITIES.

SECTION C-C

ELEVATION

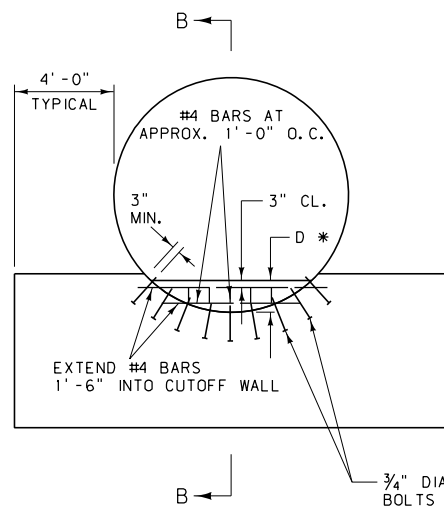
SECTION A-A

DEPTH OF SURFACING *		
MATERIAL	ALTERNATE "A"	ALTERNATE "B"
PL. MIX SURF.	—	0.20'
CRUSHED AGGREGATE COURSE	BAL.	BAL.

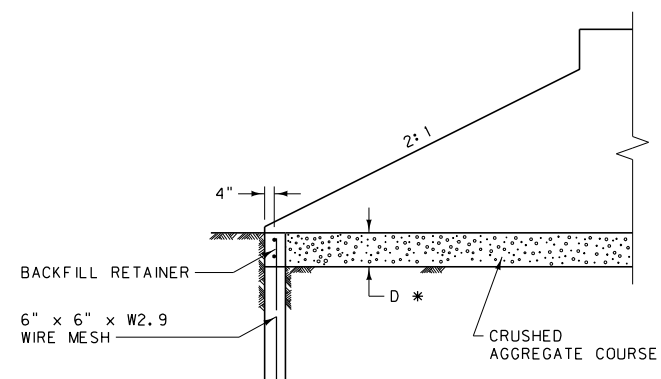
DIAMETER	A	B	C	V	X	* D	BACKFILL RETAINER (C. Y.)	CONCRETE COLLAR (C. Y.)
96"	4'	4'	6.9'	4.0'	2.0'	0.5'	0.04	0.66
120"	7'	7'	7.1'	5.0'	2.5'	1.4'	0.17	0.82
150"	10'	8'	8.6'	6.25'	3.13'	2.5'	0.43	1.08
162"	10'	8'	10.0'	6.75'	3.38'	2.2'	0.38	1.16
186"	12'	10'	10.8'	7.75'	3.88'	2.9'	0.59	1.34
192"	12'	10'	11.5'	8.0'	4.0'	2.7'	0.55	1.38
204"	12'	10'	12.9'	8.5'	4.25'	2.5'	0.51	1.46
216"	12'	10'	14.2'	9.0'	4.50'	2.3'	0.47	1.54
228"	16'	12'	12.5'	9.5'	4.75'	4.4'	1.23	1.72
240"	16'	12'	14.0'	10.0'	5.0'	4.0'	1.10	1.72

SURFACING QUANTITIES PER LINEAR FOOT FOR DEPTH "D" *							
DIAMETER	ALTERNATE "A"	ALTERNATE "B"					
	C. Y. SURFACING	TONS SURFACING		C. Y. SURFACING	TONS BIT. MATL.		
	CRUSHED AGGREGATE COURSE	COVER MATERIAL	PLANT MIX	CRUSHED AGGREGATE COURSE	PLANT MIX	PRIME	SEAL
96"	0.054	0.0056	0.052	0.027	0.0031	0.0005	0.0007
120"	0.255	0.0097	0.097	0.205	0.0058	0.0009	0.0012
150"	0.647	0.0139	0.141	0.574	0.0084	0.0014	0.0017
162"	0.563	0.0139	0.140	0.489	0.0084	0.0014	0.0017
186"	0.882	0.0167	0.169	0.794	0.0102	0.0017	0.0020
192"	0.830	0.0167	0.168	0.744	0.0101	0.0016	0.0020
204"	0.769	0.0167	0.169	0.680	0.0102	0.0016	0.0020
216"	0.702	0.0167	0.168	0.615	0.0101	0.0016	0.0020
228"	1.842	0.0222	0.227	1.725	0.0136	0.0022	0.0026
240"	1.656	0.0222	0.226	1.539	0.0136	0.0022	0.0026

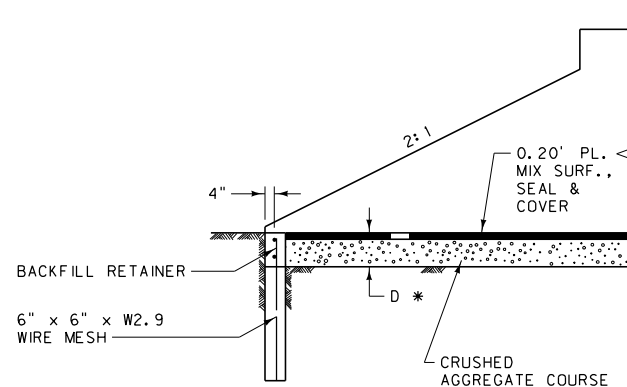
BACKFILL RETAINER & CUTOFF WALL DETAIL



ELEVATION



SECTION B-B
(ALTERNATE "A")



SECTION B-B
(ALTERNATE "B")

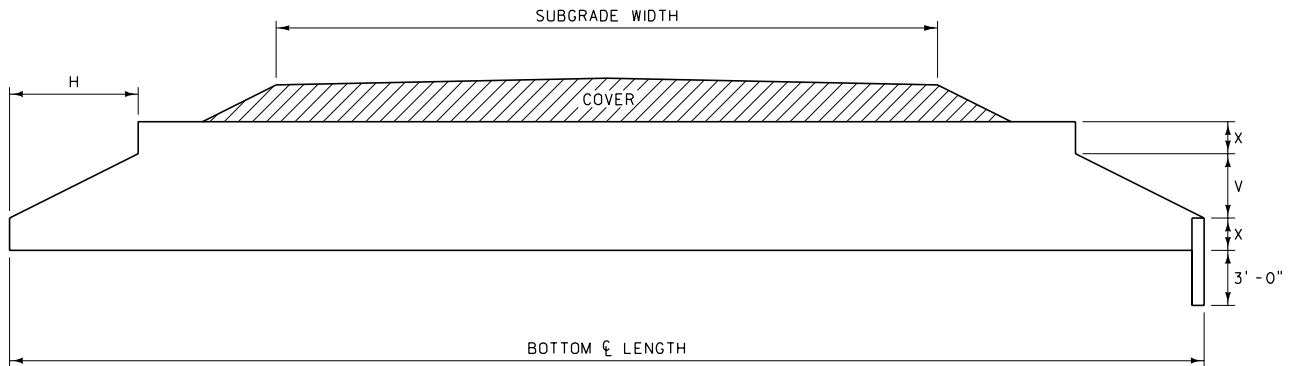
NOTE:
INCLUDE CONCRETE COLLAR
WHEN SPECIFIED.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	603-30
SECTION 552, 603	
VEHICULAR UNDERPASS AND BACKFILL RETAINER & CUTOFF WALL DETAIL	

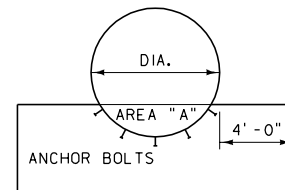
-- REVISED --
January 2008

EFFECTIVE: FEBRUARY 2005

MDT MONTANA DEPARTMENT
OF TRANSPORTATION
serving you with pride




NOTE:
FOR DETAILS COVERING CUTOFF WALLS
SEE DTL. DWG. NO. 552-00.

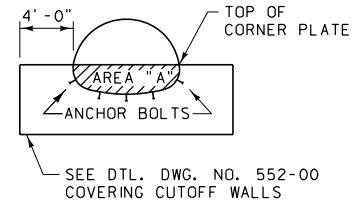
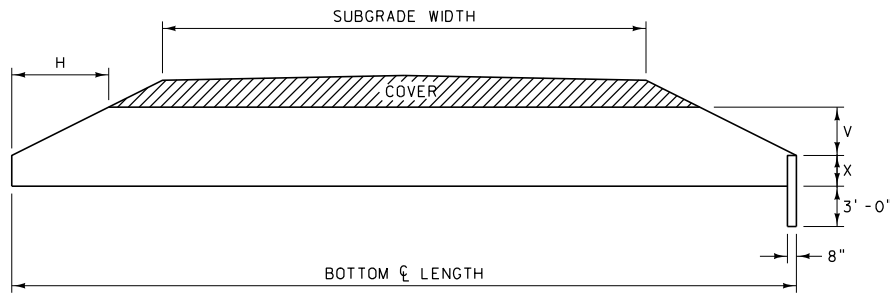


DIA.	X (FT.)	V (FT.)	H (FT.) FOR BEVELS:		AREA "A" (SQ. FT.) *
			1.5: 1	2: 1	
CSP 3" x 1" OR 5" x 1" CORRUGATIONS					
54"	1.125	2.250	3.375	4.500	3.31
60"	1.250	2.500	3.750	5.000	4.06
66"	1.375	2.750	4.125	5.500	4.89
72"	1.500	3.000	4.500	6.000	5.79
78"	1.625	3.250	4.875	6.500	6.77
84"	1.750	3.500	5.250	7.000	7.83
90"	1.875	3.750	5.625	7.500	8.97
96"	2.000	4.000	6.000	8.000	10.18
102"	2.125	4.250	6.375	8.500	11.47
108"	2.250	4.500	6.750	9.000	12.83
114"	2.375	4.750	7.125	9.500	14.27
120"	2.500	5.000	7.500	10.000	15.79

DIA.	X (FT.)	V (FT.)	H (FT.) FOR BEVELS:		AREA "A" (SQ. FT.) *
			1.5: 1	2: 1	
SSPP 6" x 2" CORRUGATIONS					
10' - 6"	2.625	5.250	7.875	10.500	17.39
11' - 0"	2.750	5.500	8.250	11.000	19.06
11' - 6"	2.875	5.750	8.625	11.500	20.81
12' - 0"	3.000	6.000	9.000	12.000	22.64
12' - 6"	3.125	6.250	9.375	12.500	24.54
13' - 0"	3.250	6.500	9.750	13.000	26.52
13' - 6"	3.375	6.750	10.125	13.500	28.58
14' - 0"	3.500	7.000	10.500	14.000	30.71
14' - 6"	3.625	7.250	10.875	14.500	32.92
15' - 0"	3.750	7.500	11.250	15.000	35.21
15' - 6"	3.875	7.750	11.625	15.500	37.57
16' - 0"	4.000	8.000	12.000	16.000	40.01
16' - 6"	4.125	8.250	12.375	16.500	42.53
17' - 0"	4.250	8.500	12.750	17.000	45.12
17' - 6"	4.375	8.750	13.125	17.500	47.79
18' - 0"	4.500	9.000	13.500	18.000	50.54
19' - 0"	4.750	9.500	14.250	19.000	56.26
20' - 0"	5.000	10.000	15.000	20.000	62.29
21' - 0"	5.250	10.500	15.750	21.000	68.63

* AREA "A" IS TO THE MIDDLE OF THE CORRUGATIONS.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 603	DWG. NO. 603-32
STEP BEVEL FOR CIRCULAR METAL CULVERT	
--REVISED-- May 2009	EFFECTIVE: APRIL 2006
 MONTANA DEPARTMENT OF TRANSPORTATION	



SEE DTL. DWG. NO. 552-00
COVERING CUTOFF WALLS

SPAN	RISE	EQUIV. DIA.	X (FT.)	V (FT.)	H (FT.) FOR BEVELS:			AREA "A" (SQ. FT.)
					1.5:1	2:1	2.5:1	
SSPPA 6" x 2" CORRUGATIONS WITH 18" CORNER RADIUS								
6' - 1"	4' - 7"	66"	2.3	2.3	3.4	4.6	5.7	12.8
6' - 9"	4' - 11"	72"	2.4	2.5	3.8	5.0	6.3	14.8
7' - 3"	5' - 3"	78"	2.1	3.2	4.7	6.3	7.9	14.1
7' - 11"	5' - 7"	84"	2.3	3.3	4.9	6.6	8.2	16.8
8' - 7"	5' - 11"	90"	2.3	3.6	5.4	7.2	9.0	18.0
9' - 4"	6' - 3"	96"	2.5	3.8	5.6	7.5	9.4	21.0
9' - 9"	6' - 7"	102"	2.2	4.4	6.6	8.8	11.0	19.8
10' - 8"	6' - 11"	108"	2.8	4.1	6.2	8.2	10.3	26.6
11' - 5"	7' - 3"	114"	2.8	4.5	6.7	8.9	11.1	27.9
11' - 10"	7' - 7"	120"	2.5	5.1	7.6	10.2	13.6	26.4
12' - 6"	7' - 11"	126"	2.7	5.2	7.8	10.4	13.0	30.0
12' - 10"	8' - 4"	132"	2.3	6.0	8.9	11.9	14.9	26.9
SSPPA 6" x 2" CORRUGATIONS WITH 31" CORNER RADIUS								
13' - 3"	9' - 4"	~	3.9	5.5	8.2	10.9	13.6	45.7
13' - 6"	9' - 6"	~	3.8	5.7	8.6	11.5	14.3	45.7
14' - 0"	9' - 8"	144"	4.0	5.7	8.5	11.4	14.2	49.1
14' - 3"	9' - 10"	~	3.8	6.1	9.1	12.1	15.2	47.6
14' - 5"	10' - 0"	~	3.7	6.3	9.5	12.7	15.9	47.4
14' - 11"	10' - 2"	~	4.0	6.2	9.3	12.4	15.5	52.4
15' - 4"	10' - 4"	156"	4.3	6.0	9.1	12.1	15.1	57.6
15' - 7"	10' - 6"	~	4.1	6.4	9.6	12.8	16.1	55.9
15' - 10"	10' - 8"	~	3.9	6.8	10.2	13.6	17.0	54.2
16' - 3"	10' - 10"	~	4.3	6.5	9.8	13.1	16.4	61.1
16' - 6"	11' - 0"	168"	4.1	6.9	10.4	13.9	17.3	59.4
17' - 0"	11' - 2"	~	4.4	6.8	10.2	13.6	17.0	64.7
17' - 2"	11' - 4"	~	4.3	7.1	10.6	14.1	17.6	64.6
17' - 5"	11' - 6"	~	4.1	7.4	11.2	14.9	18.6	62.6
17' - 11"	11' - 8"	180"	4.3	7.4	11.1	14.8	18.5	66.6
18' - 1"	11' - 10"	~	4.2	7.7	11.5	15.3	19.2	66.4
18' - 7"	12' - 0"	~	4.5	7.5	11.3	15.0	18.8	72.2
18' - 9"	12' - 2"	~	4.3	7.9	11.8	15.8	19.7	70.1
19' - 3"	12' - 4"	192"	4.6	7.7	11.6	15.5	19.4	76.3
19' - 6"	12' - 6"	~	4.4	8.1	12.2	16.3	20.3	74.1
19' - 8"	12' - 8"	~	4.3	8.4	12.6	16.8	21.0	73.7
19' - 11"	12' - 10"	~	4.1	8.8	13.2	17.6	22.0	71.3
20' - 5"	13' - 0"	204"	4.4	8.6	12.9	17.3	21.6	77.6
20' - 7"	13' - 2"	~	4.3	8.9	13.4	17.8	22.3	77.2


SPAN	RISE	EQUIV. DIA.	X (FT.)	V (FT.)	H (FT.) FOR BEVELS:			AREA "A" (SQ. FT.)
					1.5:1	2:1	2.5:1	
CSPA 3" x 1" CORRUGATIONS (SEE NOTE ⑧)								
60"	46"	54"	1.7	2.3	3.5	4.7	5.8	7.1
66"	51"	60"	1.9	2.6	3.9	5.2	6.5	8.7
73"	55"	66"	2.1	2.8	4.1	5.5	6.9	10.7
81"	59"	72"	2.0	3.2	4.8	6.5	8.1	11.1
87"	63"	78"	2.1	3.5	5.2	6.9	8.6	13.2
95"	67"	84"	2.3	3.7	5.5	7.3	9.2	15.3
103"	71"	90"	2.5	3.9	5.8	7.7	9.6	17.8
112"	75"	96"	2.6	4.1	6.1	8.1	10.2	20.2
117"	79"	102"	2.8	4.3	6.4	8.5	10.7	23.1
128"	83"	108"	3.0	4.5	6.7	8.9	11.2	25.9
137"	87"	114"	3.1	4.7	7.0	9.4	11.7	29.0
142"	91"	120"	3.3	4.9	7.3	9.7	12.2	32.2
CSPA 2 $\frac{2}{3}$ " x $\frac{1}{2}$ " CORRUGATIONS (SEE NOTE ⑧)								
57"	38"	48"	1.1	2.1	3.1	4.2	5.2	4.5
64"	43"	54"	1.2	2.4	3.5	4.7	5.9	5.6
71"	47"	60"	1.4	2.6	3.8	5.1	6.4	6.9
77"	52"	66"	1.5	2.8	4.3	5.7	7.1	8.2
83"	57"	72"	1.6	3.1	4.7	6.3	7.8	9.6

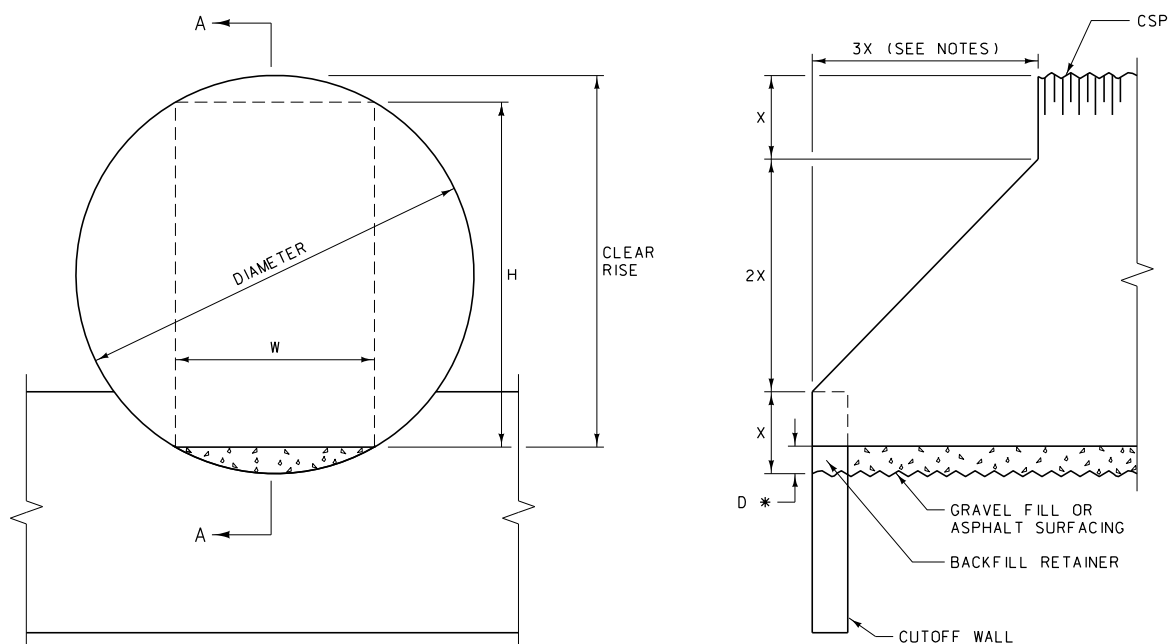
NOTES:

BEVEL TO TOP OF CORNER PLATE.

PIPE ENDS ARE SQUARE (PERPENDICULAR TO CENTERLINE OF PIPE) AND FILL SLOPES ARE WARPED TO ACCOMMODATE THE SQUARE ENDS UNLESS SPECIFIED OTHERWISE ON PLANS.

⑧ TABULATED VALUES BASED ON NOMINAL PIPE DIMENSIONS. IN PLACE DIMENSIONS SUBJECT TO TOLERANCES LISTED IN CURRENT AASHTO M 36 AND M 196.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 603	DWG. NO. 603-34
BEVEL ON ARCH METAL CULVERT	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	



SECTION A-A

DIAMETER	X	* D	CLEAR RISE	H	W	BACKFILL RETAINER (CUBIC YARDS)
84"	21.0"	0.50'	6.5'	6.0'	3.6'	0.1
90"	22.5"	0.75'	6.75'	6.0'	4.5'	0.1
96"	24.0"	0.83'	7.17'	6.34'	4.9'	0.1

SURFACING QUANTITIES PER LINEAR FOOT FOR DEPTH "D" *					
DIAMETER	FULL DEPTH GRAVEL	0.20' PMS AND REMAINING DEPTH GRAVEL			
	C. Y. SURF.	TONS SURF.	C. Y. SURF.	TONS BIT. MATERIAL	
	CR. TOP SURF.	PLANT MIX	CR. TOP SURF.	PLANT MIX	PRIME
84"	0.045	0.046	0.021	0.0028	0.0004
90"	0.085	0.060	0.054	0.0036	0.0006
96"	0.102	0.066	0.068	0.0040	0.0006

NOTES:


UNLESS OTHERWISE SPECIFIED, INSTALL STOCKPASSES WITH CUTOFF WALLS AND BACKFILL RETAINERS AT EACH END, GRAVEL FILL AND BEDDING MATERIAL.

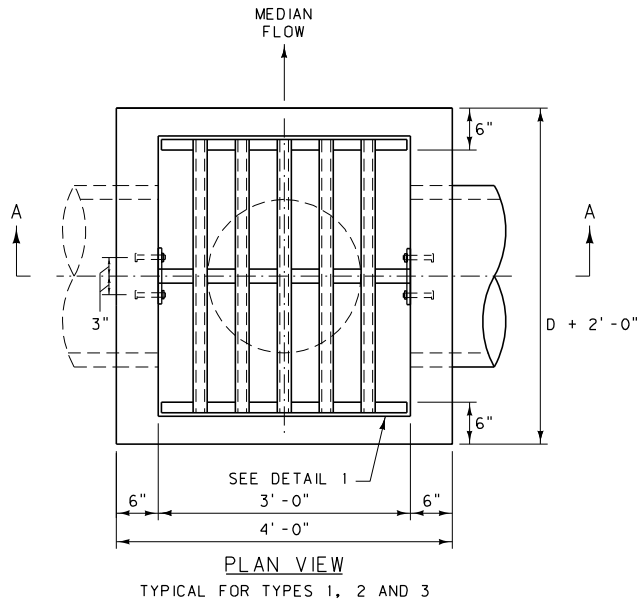
WHEN SPECIFIED, INSTALL COMBINATION STOCKPASSES AND DRAINS WITH CUTOFF WALLS, BACKFILL RETAINERS AT BOTH ENDS, CONCRETE EDGE PROTECTION AT THE INLET END, RANDOM RIPRAP AT THE OUTLET END, BEDDING MATERIAL AND ASPHALT SURFACING; CROSS SLOPE ASPHALT SURFACING TO ALLOW DRAINAGE COURSE ALONG ONE SIDE. (SEE DTL. DWG. NO. 613-14 AND 613-06.)

UNLESS OTHERWISE SPECIFIED, STEP BEVEL PIPE ENDS AT A 1.5:1 SLOPE.

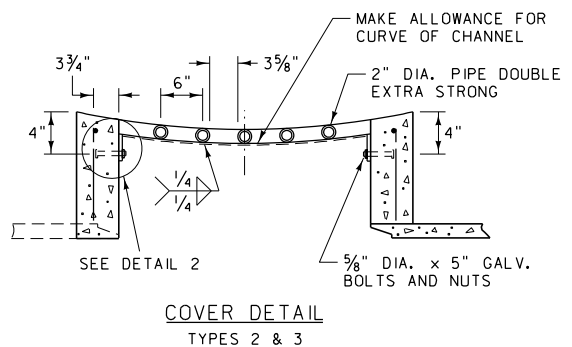
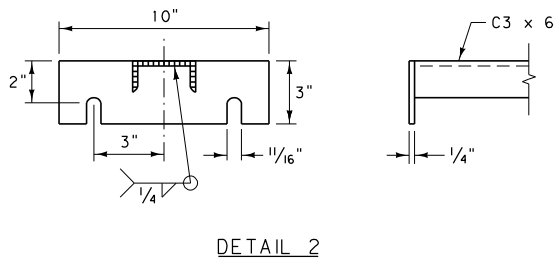
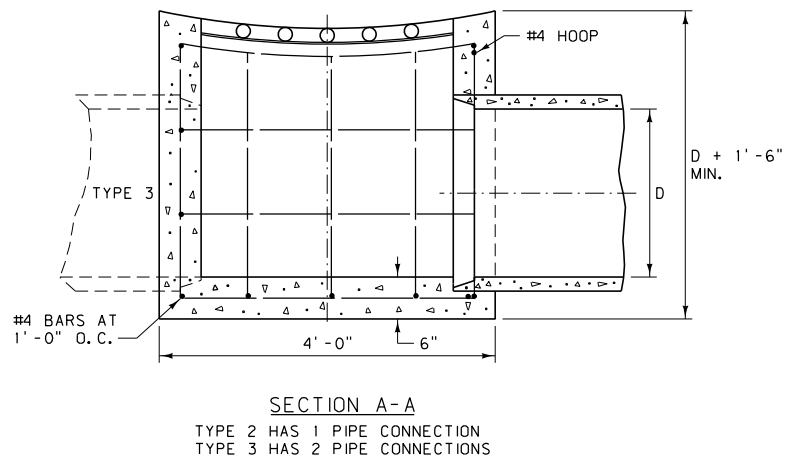
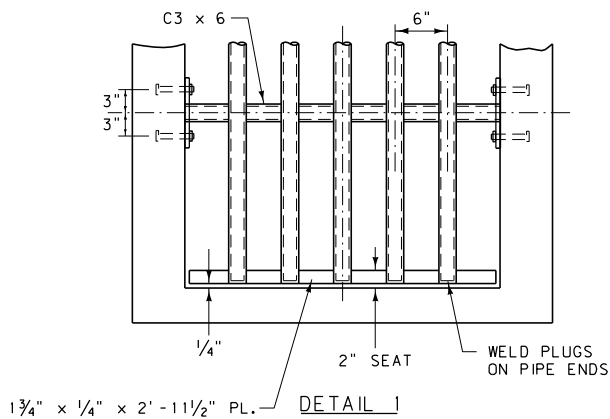
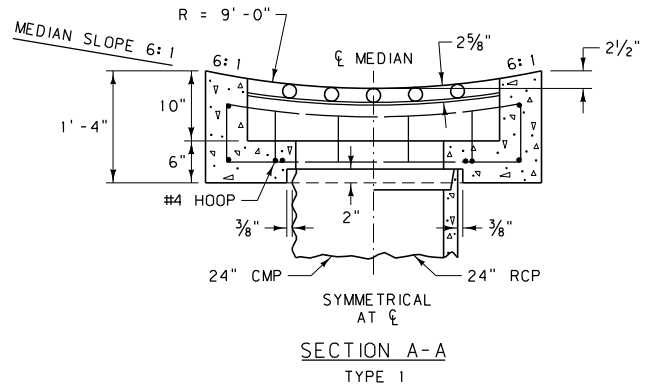
THE MINIMUM THICKNESS FOR CORRUGATED STEEL PIPE STOCKPASS IS 0.079". (SEE FILL HEIGHT TABLES FOR OTHER THAN THE MINIMUM REQUIREMENTS.)

SEE DTL. DWG. NO. 552-00, 603-30 AND 603-18.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 603	DWG. NO. 603-36
CORRUGATED STEEL PIPE STOCKPASS	
EFFECTIVE: FEBRUARY 2005	
 serving you with pride	MONTANA DEPARTMENT OF TRANSPORTATION



NOTE:
WHEN MEDIAN INLET COVER IS INSTALLED OVER PIPES LARGER THAN 36", WITHOUT ADEQUATE COVER TO PERMIT THE USE OF TYPE 1 INSTALLATION, PROVIDE A DETAIL OF THE INSTALLATION IN THE PLANS.




TYPE	GRATE AND REINFORCING STEEL (LB.) *		
	CMP AND RCP		
	24"	30"	36"
1	50	~	~
2	85	95	105
3	85 ⊗	95 ⊗	105 ⊗
GRATE	165	185	210

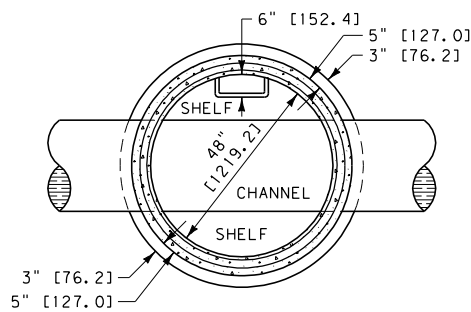
* QUANTITIES ARE FOR ESTIMATING PURPOSES ONLY.

⊗ TYPE 3 IS A SPECIAL CASE TO BE FIGURED FOR THE PARTICULAR INSTALLATION.

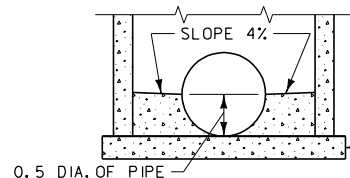
TYPE	CLASS "DD" CONC. OR EQUAL (C.Y.) *					
	24"		30"		36"	
	CMP	RCP	CMP	RCP	CMP	RCP
1	0.4	0.4	~	~	~	~
2	1.0	1.0	1.1	1.0	1.2	1.1
3	0.9 ⊗	0.9 ⊗	1.0 ⊗	0.9 ⊗	1.0 ⊗	0.9 ⊗

NOTE:
PAINT ALL EXPOSED METAL PARTS WITH ONE COAT OF ZINC RICH PAINT AND TWO COATS OF ALUMINUM PAINT IN ACCORDANCE WITH SECTION 710 OF THE STANDARD SPECIFICATIONS.

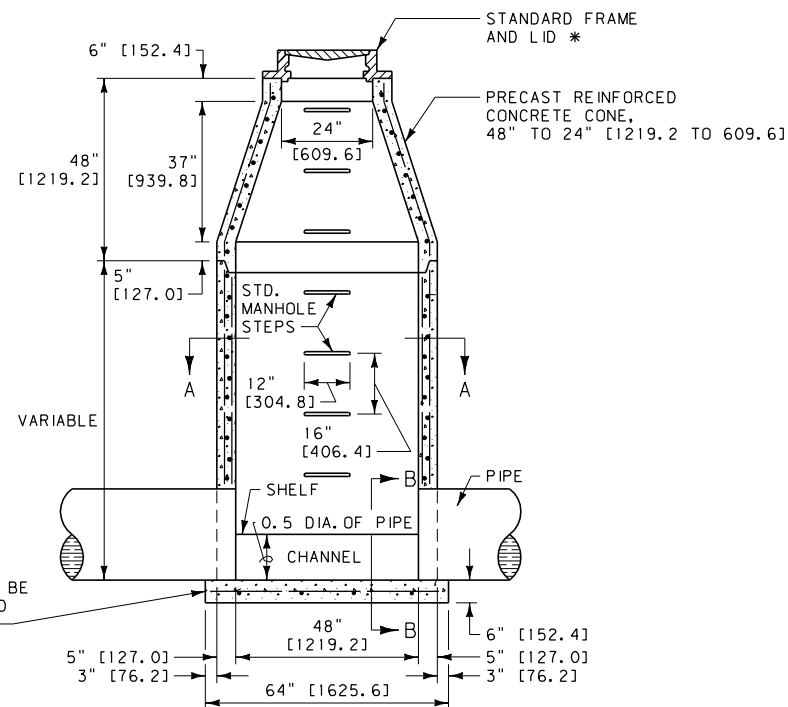
DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 604	DWG. NO. 604-00
MEDIAN INLET COVER	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	



TYPE 1 SECTION A-A



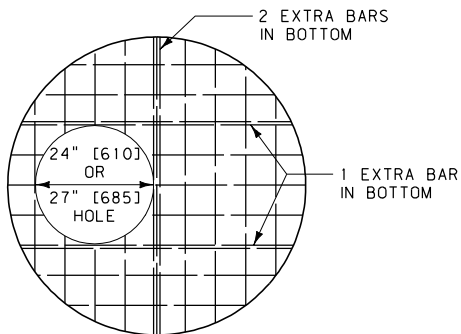
TYPE 1 SECTION B-B



ELEVATION

TYPE 1 MANHOLE

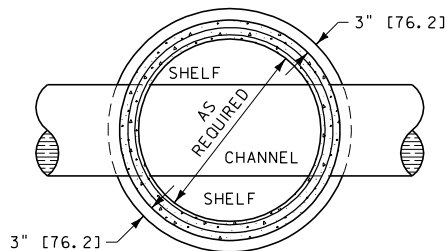
* MINIMUM WEIGHT FOR FRAME AND LID IS 400 LB [180 kg].
TOOL RING AND COVER TO A MACHINE FIT. A LIGHTER
FRAME AND LID MAY BE USED IF APPROVED BY THE
FACILITY OWNER RESPONSIBLE FOR MAINTENANCE OF
THE MANHOLE.



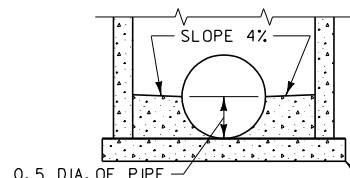
TYPE 3 MANHOLE ROOF SLAB

NOTE:

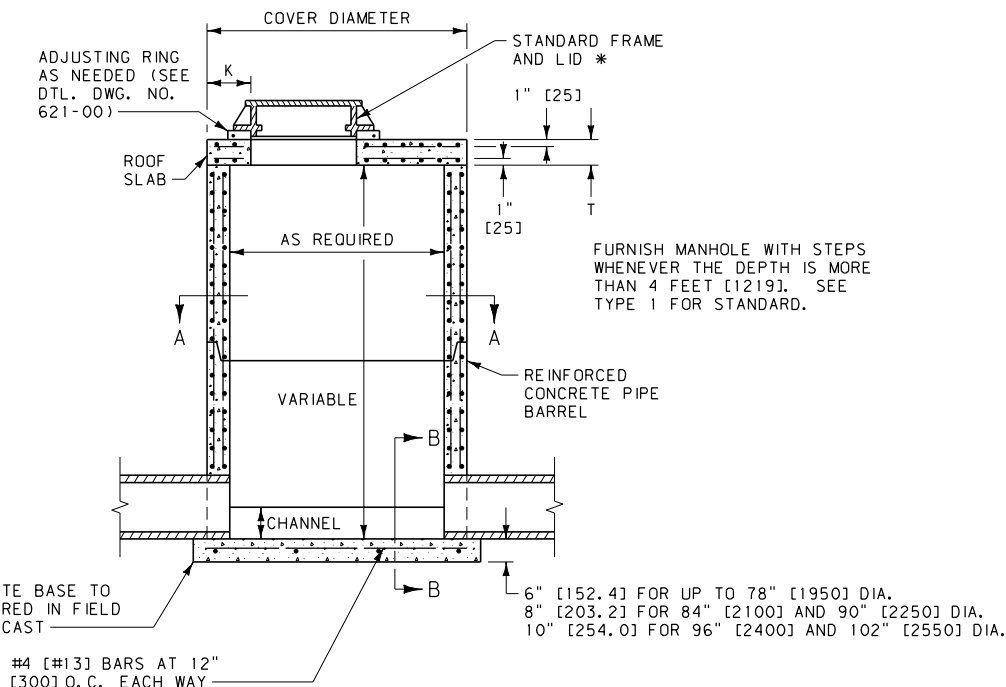
CENTER THE OPENING OVER THE ROOF SLAB
FOR TYPE I, II, IV AND V INLETS ON 48" [1200]
COMBINATION TYPE 3 MANHOLES.



TYPE 3 SECTION A-A



TYPE 3 SECTION B-B



TYPE 3 MANHOLE

UNITS SHOWN IN BRACKETS [] ARE
METRIC AND ARE IN MILLIMETERS (mm)
UNLESS OTHER UNITS ARE SHOWN.

NOTES:

- UPPER PART IS A CONE TO REDUCE DIAMETER FROM 48" TO 24" [1219.2 TO 609.6]. CUT BOTTOM OF LOWER SECTION SQUARE TO FIT BASE. GROUT JOINT BETWEEN BASE AND WALL. A GROUT CONSISTING OF ONE PART PORTLAND CEMENT AND TWO PARTS APPROVED SAND MAY BE USED; AN APPROVED PREMIXED GROUT, AVAILABLE COMMERCIALY, MAY BE USED.
- CONFORM ALL MANHOLE CONSTRUCTION, EXCEPT FRAME, LID, AND BASE, TO AASHTO M 199 [199M]. THIS PROVIDES THAT REINFORCEMENT MAY BE MADE OF (1) COLD DRAWN STEEL WIRE- AASHTO M 32 [32M], (2) STEEL WIRE FABRIC- AASHTO M 55 [55M], OR (3) STEEL BARS- AASHTO M 31 [31M].
- THE CONSTRUCTION AND REINFORCEMENT OF THE BASE FOR EACH TYPE MUST BE COMPATIBLE WITH THE CONDITIONS AND THE WEIGHT OF THE SUPER-STRUCTURE. AASHTO M 199 [199M] PROVIDES FOR 4000 PSI [27.6 MPa] CONCRETE. THE MIX CALLS FOR 6 SACKS OF CEMENT PER CUBIC YARD [335 kg/m³]. REINFORCEMENT SHOWN IS ILLUSTRATIVE ONLY. SEE AASHTO M 199 [199M].
- THE ECCENTRIC CONE TRANSITION WILL BE PERMITTED WHEN ITS USE WILL BE AS GOOD OR BETTER THAN THE ONES SHOWN, OR IF IT IS MORE ADAPTABLE TO EXISTING CONDITIONS.
- USE MANHOLE STEPS THAT ARE METALLIC AND COATED WITH COPOLYMER POLYPROPYLENE, OR AN APPROVED EQUAL. THE MINIMUM DESIGN LIVE LOAD FOR A SINGLE CONCENTRATED LOAD IS 300 POUNDS [135 kg].

TYPE 3 MANHOLE ROOF SLAB

PIPE DIA.	SLAB DIA.	T	K	BOTTOM BARS	TOP BARS
48"	58"	6"	6"	#4 AT 6"	~
54"	65"	8"	6"	#4 AT 6"	~
60"	72"	8"	7"	#4 AT 6"	#3 AT 6"
66"	79"	8"	7"	#4 AT 6"	#3 AT 6"
72"	86"	8"	8"	#4 AT 6"	#3 AT 6"
78"	93"	8"	8"	#4 AT 4"	#4 AT 4"
84"	100"	8"	9"	#4 AT 4"	#4 AT 4"
90"	107"	8"	9"	#4 AT 4"	#4 AT 4"
96"	114"	8"	9"	#5 AT 4"	#4 AT 4"
102"	121"	8"	9"	#5 AT 4"	#4 AT 4"

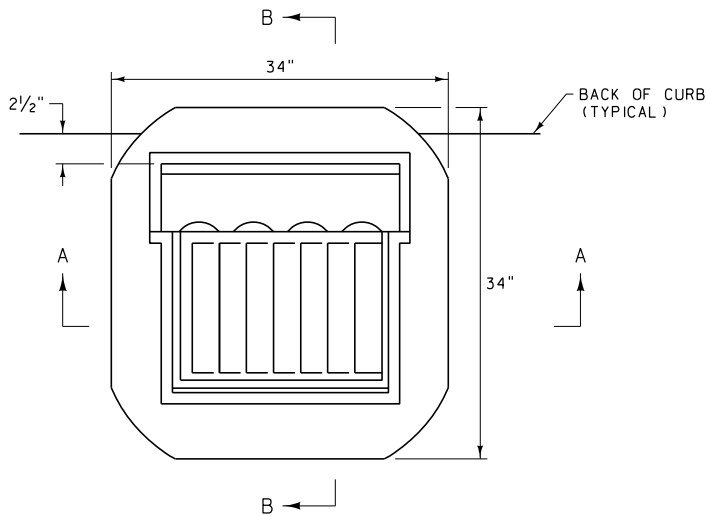
TYPE 3 MANHOLE ROOF SLAB (METRIC)

PIPE DIA.	SLAB DIA.	T	K	BOTTOM BARS	TOP BARS
1200	1473.2	152.4	152.4	#13 AT 150	~
1350	1651.0	203.2	152.4	#13 AT 150	~
1500	1828.8	203.2	177.8	#13 AT 150	#10 AT 150
1650	2006.6	203.2	177.8	#13 AT 150	#10 AT 150
1800	2184.4	203.2	203.2	#13 AT 150	#10 AT 150
1950	2362.2	203.2	203.2	#13 AT 100	#13 AT 100
2100	2540.0	203.2	228.6	#13 AT 100	#13 AT 100
2250	2717.8	203.2	228.6	#13 AT 100	#13 AT 100
2400	2895.6	203.2	228.6	#16 AT 100	#13 AT 100
2550	3073.4	203.2	228.6	#16 AT 100	#13 AT 100

NOTE: ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

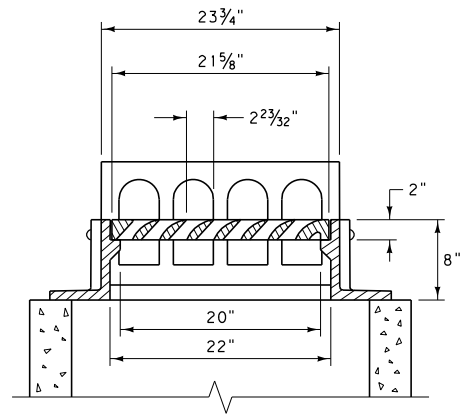
DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	604-02
SECTION 604.711	
CONCRETE MANHOLE	
EFFECTIVE: FEBRUARY 2005	
<div> <div>MDT</div> <div>MONTANA DEPARTMENT OF TRANSPORTATION</div> </div>	

--REVISED--
MAY 2011

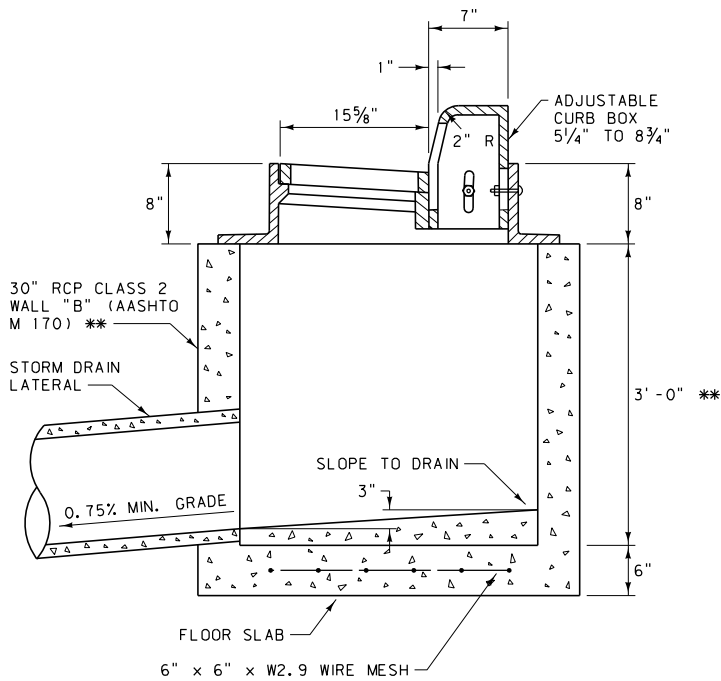


PLAN

NEENAH FOUNDRY R-3286-8V (JUNE 1992 REVISION), D & L FOUNDRY MODEL I-3559, OR APPROVED EQUAL (VANE STYLE)



SECTION A-A

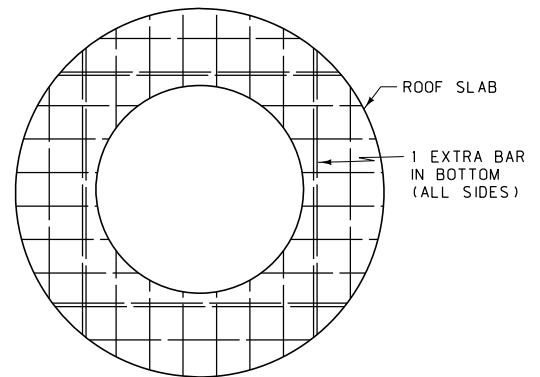
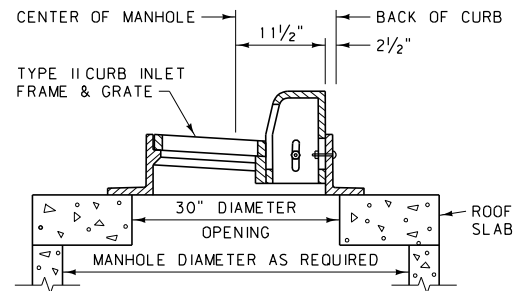


SECTION B-B

** STANDARD UNLESS OTHERWISE NOTED ON THE PLANS.

NOTE:
ALL CONCRETE IS CLASS "DD" OR
APPROVED EQUAL.

COMBINATION



ROOF SLAB

SEE DETAILED DRAWING NO. 604-02 FOR DIAMETER, SLAB THICKNESS AND REINFORCING REQUIREMENTS FOR COMBINATION TYPE 3 MANHOLE, TYPE II CURB INLET.

DETAILED DRAWING

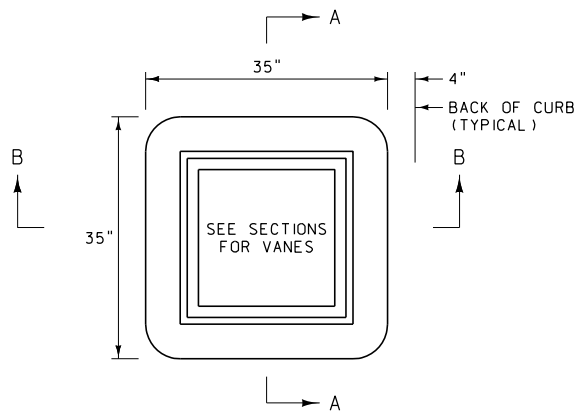
REFERENCE	DWG. NO.
STANDARD SPEC.	604-03
SECTION 604	

CURB INLET
TYPE II

-- REVISED --
January 2008

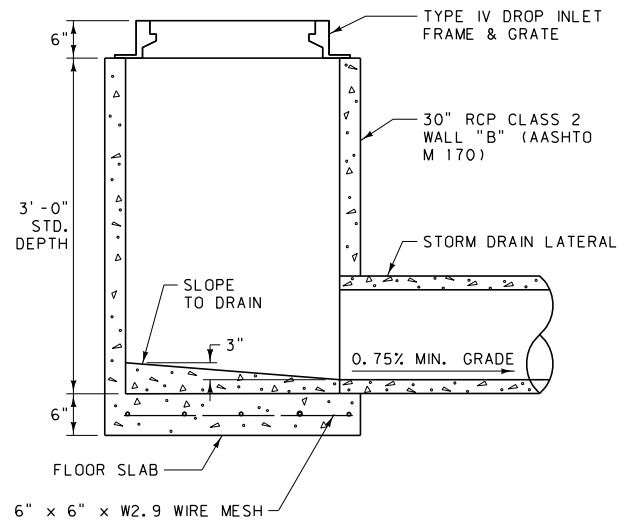
EFFECTIVE: FEBRUARY 2005

MDT MONTANA DEPARTMENT
OF TRANSPORTATION
serving you with pride

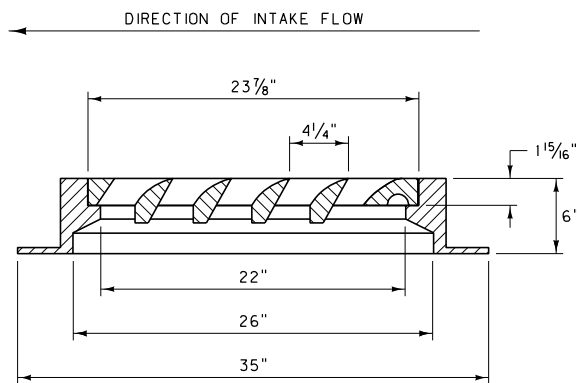


PLAN

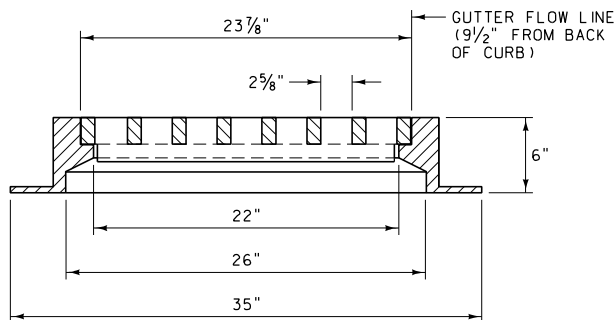
NEENAH CASTING R-3210-L (VANE STYLE), D & L FOUNDRY MODEL I-3425, OR APPROVED EQUAL



SINGLE DROP INLET
TYPE IV



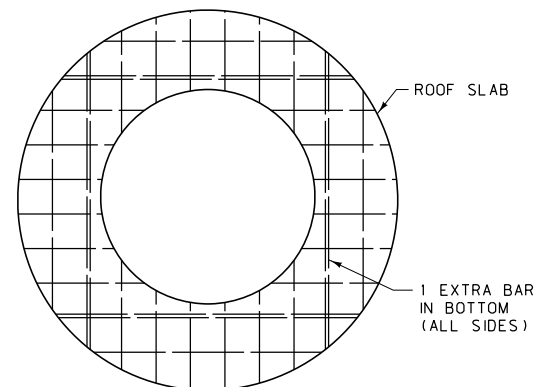
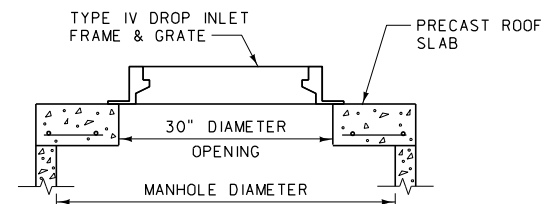
SECTION A-A



SECTION B-B

NOTE:
ALL CONCRETE IS CLASS "DD" OR
APPROVED EQUAL.

COMBINATION



ROOF SLAB

SEE DETAILED DRAWING NO. 604-02 FOR DIAMETER, SLAB THICKNESS AND REINFORCING REQUIREMENTS FOR COMBINATION TYPE 3 MANHOLE, TYPE IV DROP INLET.

DETAILED DRAWING

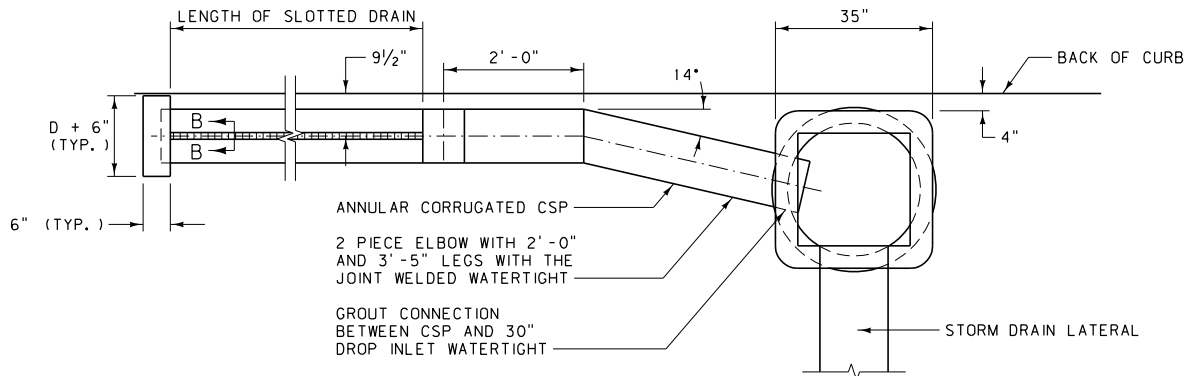
REFERENCE	DWG. NO.
STANDARD SPEC.	604-04
SECTION 604	

DROP INLET
TYPE IV

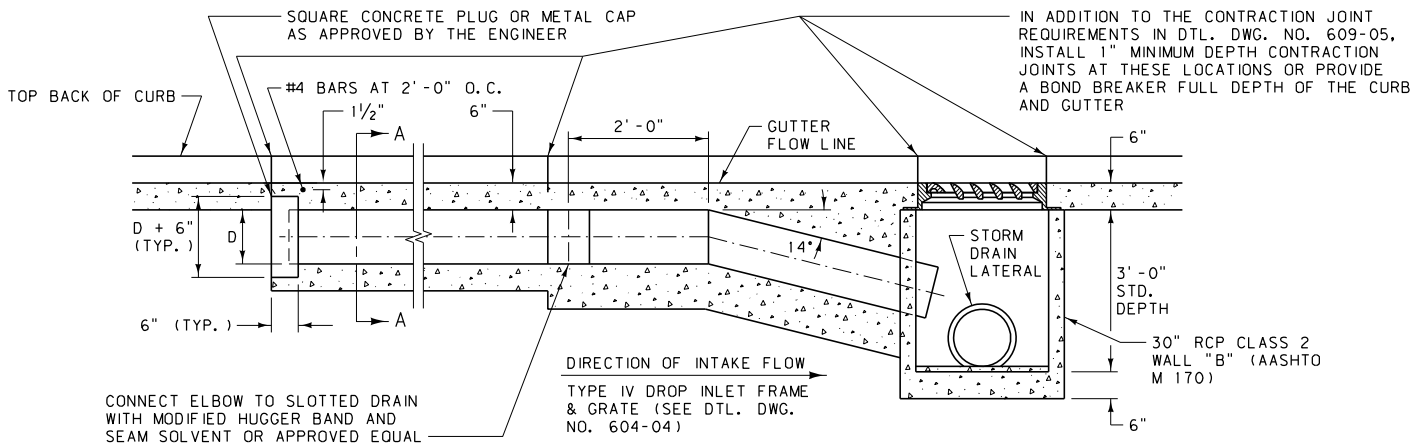
-- REVISED --
January 2008

EFFECTIVE: FEBRUARY 2005

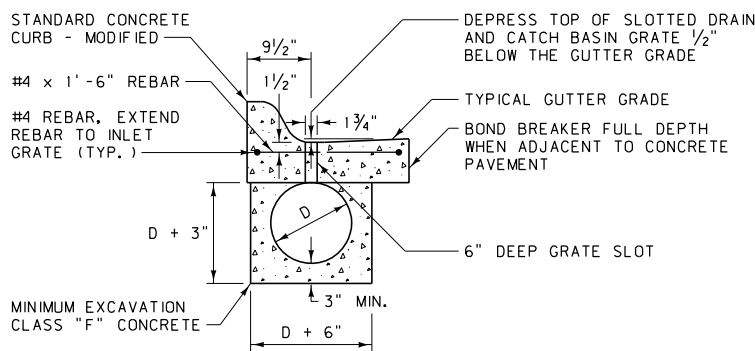
MDT MONTANA DEPARTMENT
OF TRANSPORTATION
serving you with pride



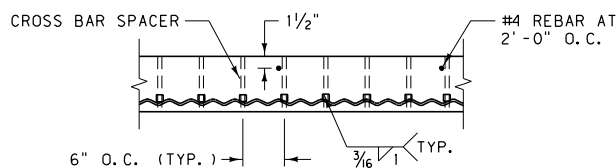
PLAN



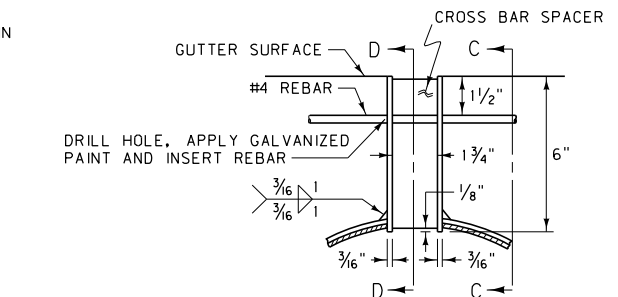
ELEVATION



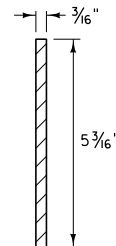
SECTION A-A



SECTION C-C
GRATE SLOT WELDING DETAIL



SECTION B-B
GRATE SLOT DETAIL




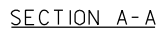
SECTION D-D
CROSS BAR SPACER

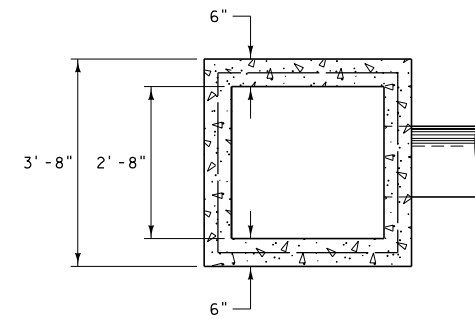
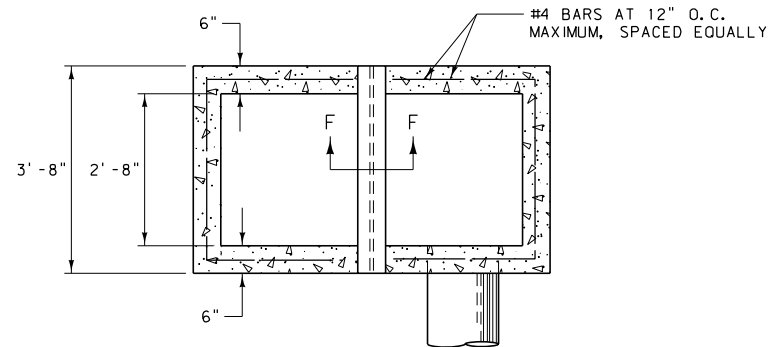
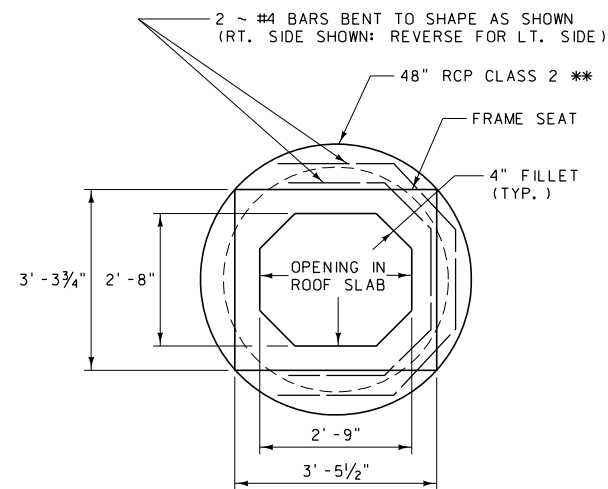
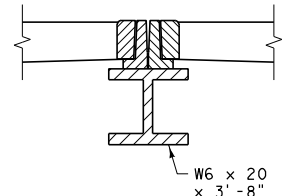
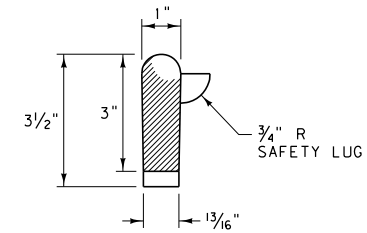
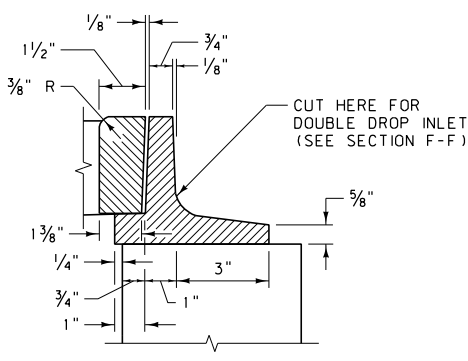
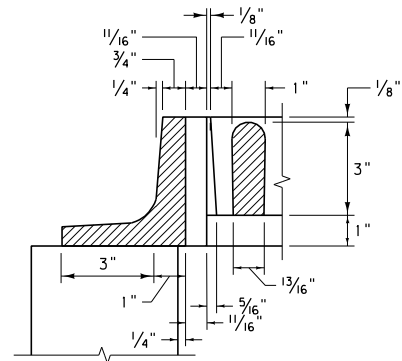
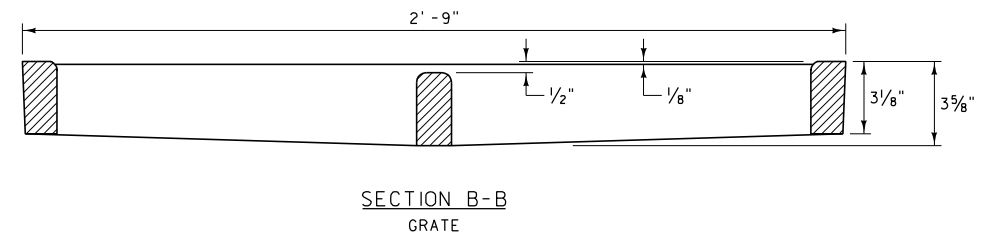
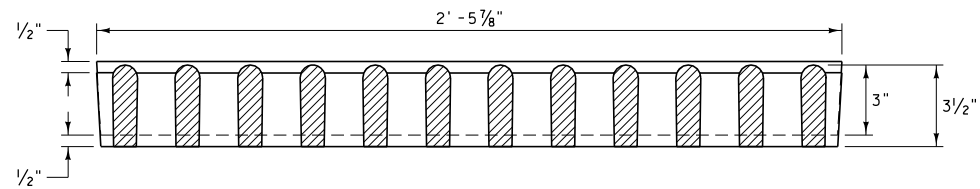
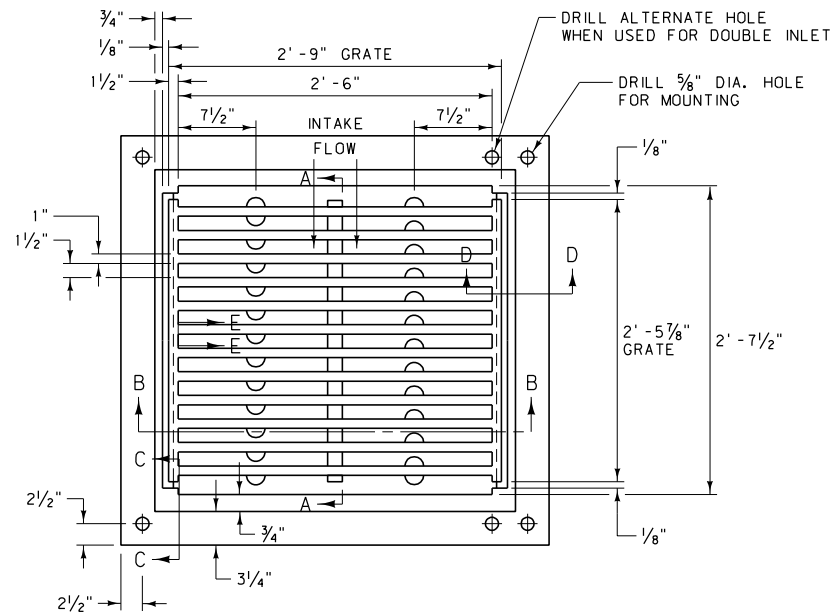
NOTES:

PAINT ALL WELDS AND OTHER NON-GALVANIZED PARTS, EXCEPT REBAR IN ACCORDANCE WITH STD. SPEC. SECTION 710.

USE A 15 OR 30 POUND ROOFING FELT MATERIAL, OR OTHER PRODUCT AS APPROVED BY THE ENGINEER, FOR A BOND BREAKER.

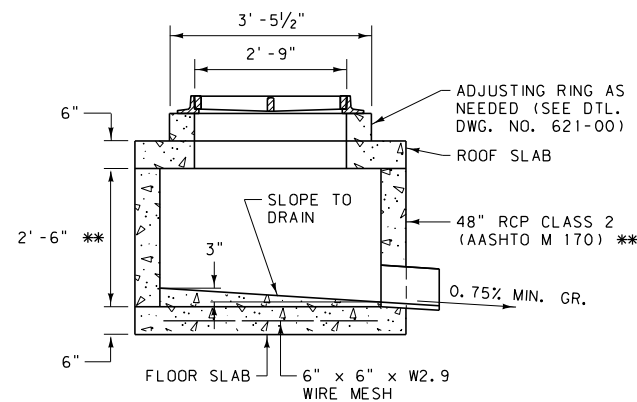
DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	604-06
SECTION 604	
TYPE IV DROP INLET WITH SLOTTED DRAIN	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	



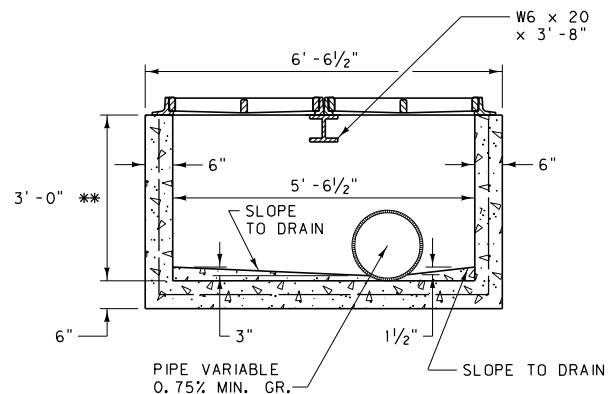


QUANTITIES *		
	CONCRETE	REINF. STL.
TYPE I	0.45 C.Y.	40 LB.
TYPE II	1.5 C.Y.	145 LB.
TYPE III	1.0 C.Y.	90 LB.

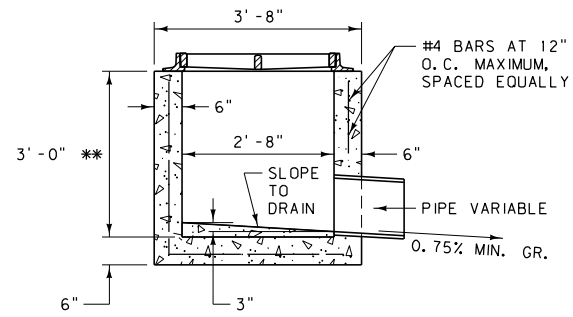
* FOR ESTIMATING PURPOSES ONLY



ROUND, SINGLE DROP INLET
TYPE I



DOUBLE DROP INLET
TYPE II



SINGLE DROP INLET
TYPE III


NOTES:

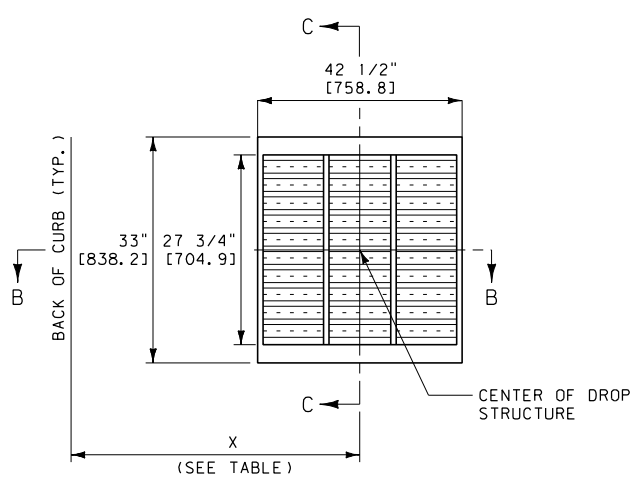
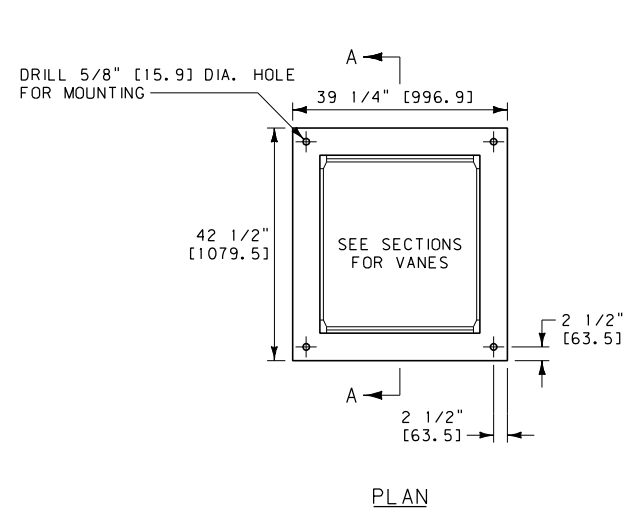
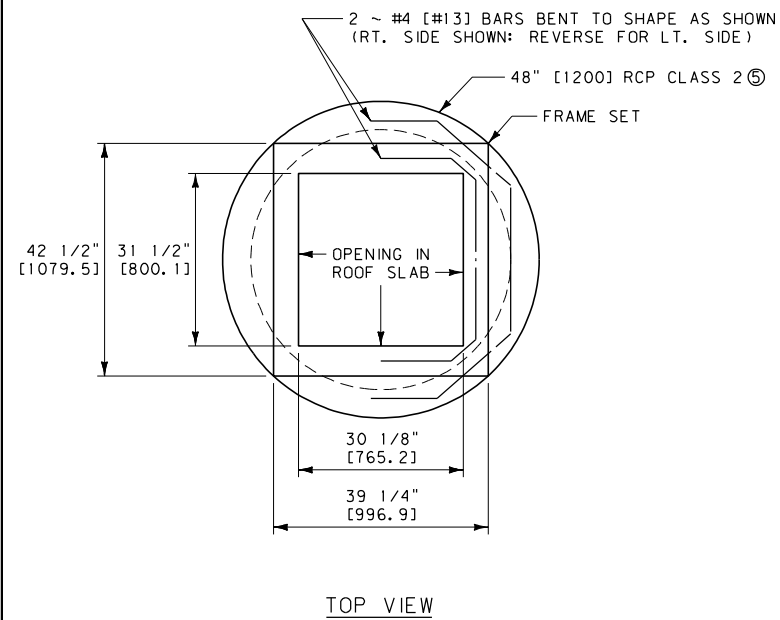
USE TYPE I, TYPE II AND TYPE III DROP INLETS IN SAG LOCATIONS ONLY.

ALL CONCRETE IS CLASS "DD" OR APPROVED EQUAL.

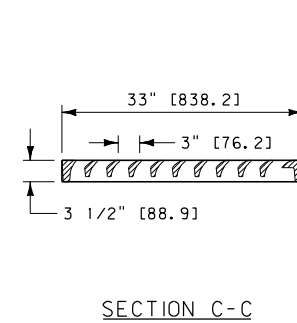
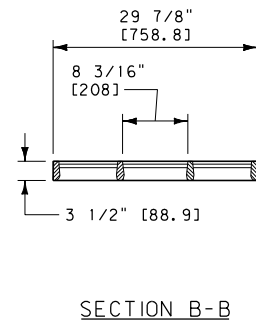
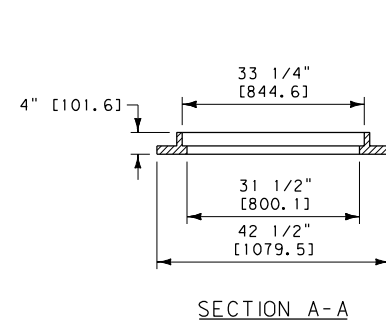
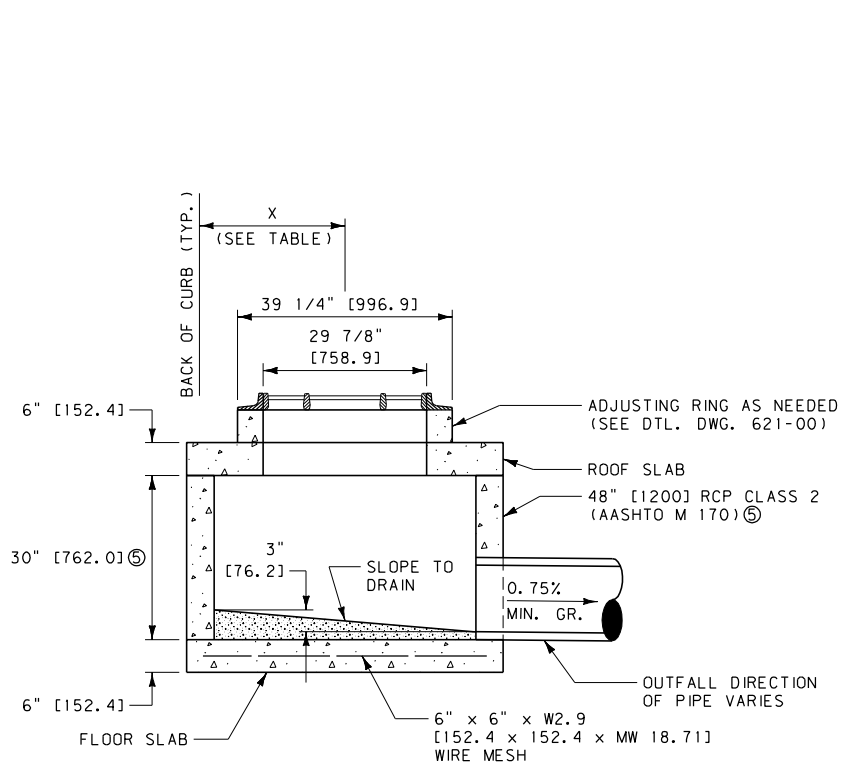
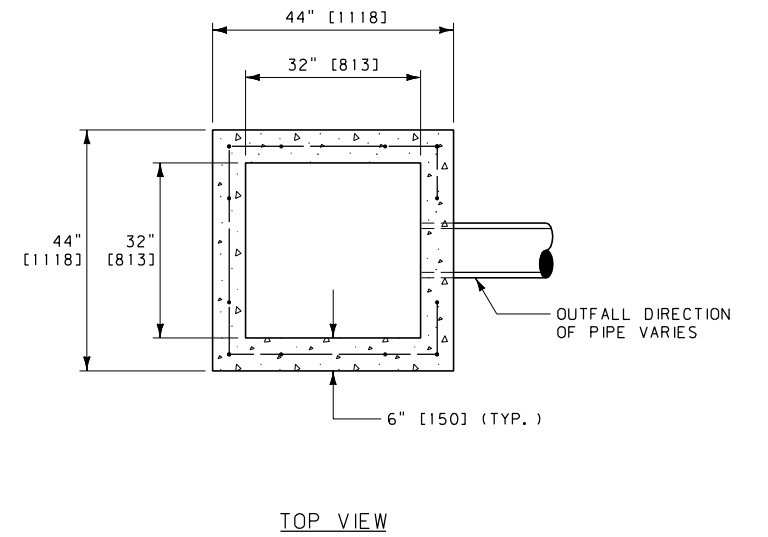
SEE PLANS FOR DETAILS AND QUANTITIES.

** STANDARD UNLESS OTHERWISE NOTED ON PLANS.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	604-14
SECTION 604	
DROP INLETS	
-- REVISED --	EFFECTIVE: FEBRUARY 2005
January 2008	
 MONTANA DEPARTMENT OF TRANSPORTATION	



GRATE
D & L FOUNDRY MODEL 1-3420V (VANE STYLE),
NEENAH CASTING R-3540, OR APPROVED EQUAL

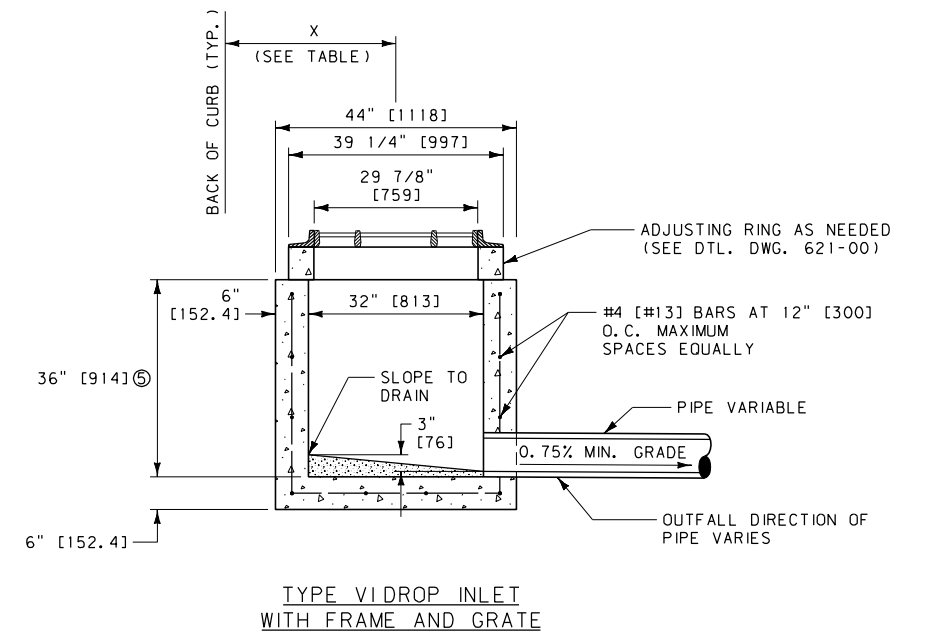


STRUCTURE OFFSET FROM BACK OF CURB

GRATE TYPE	X
NEENAH R-3540	25 3/16" [640.0]
D & L FOUNDRY I-3420 V	24 1/32" [619.4]

NOTES:

- ① ALL CONCRETE IS CLASS "DD" OR APPROVED EQUAL.
- ② SEE PLANS FOR LOCATIONS AND QUANTITIES.
- ③ PLAN STATION AND OFFSET FOR THE TYPE V & VI DROP INLETS IS BASED ON D & L FOUNDRY GRATE I-3420V.
- ④ SET ALL FINAL INLET GRATE ELEVATIONS TO ENSURE THAT POSITIVE DRAINAGE IS PROVIDED FROM THE FLOWLINE OF THE CURB AND GUTTER SECTION INTO THE INLET.
- ⑤ STANDARD UNLESS OTHERWISE NOTED ON PLANS.
- ⑥ WHEN USED AS A COMBINATION M. H. AND THE DEPTH IS GREATER THAN 4 FEET [1.2 m], OFFSET THE ACCESS HOLE/GRATE OVER THE M. H. STEPS.



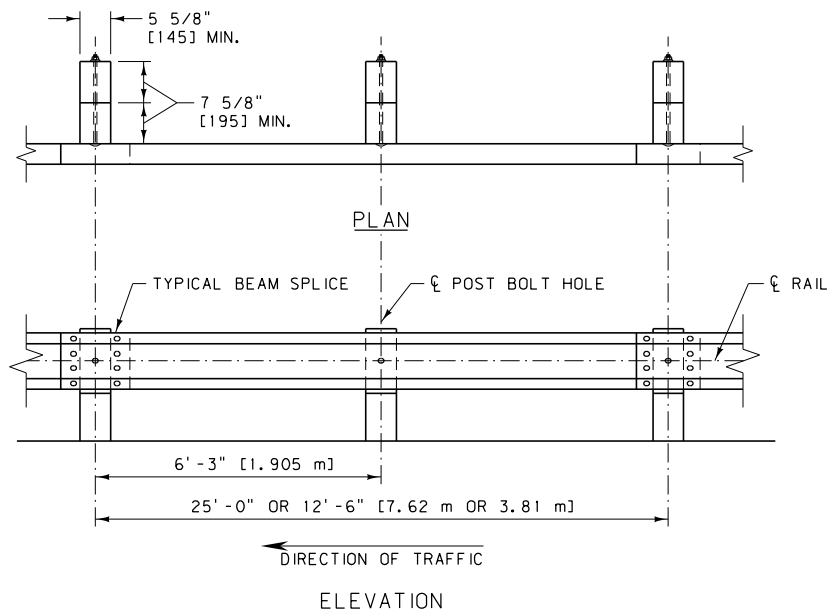
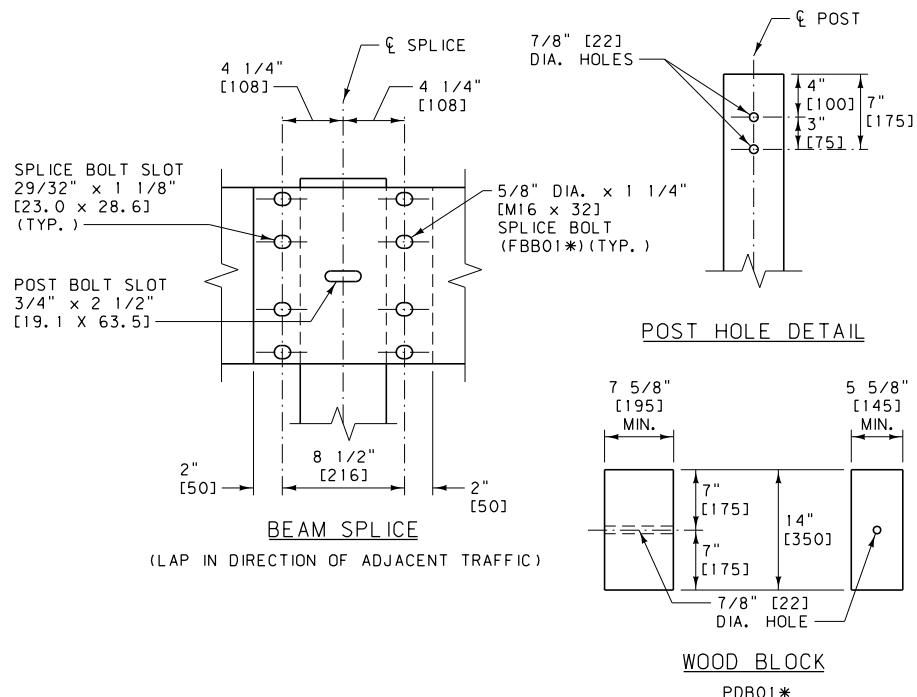
UNITS SHOWN IN BRACKETS [] ARE
METRIC AND ARE IN MILLIMETERS (mm)
UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING	DWG. NO.
REFERENCE	604-016
STANDARD SPEC.	
SECTION 604	

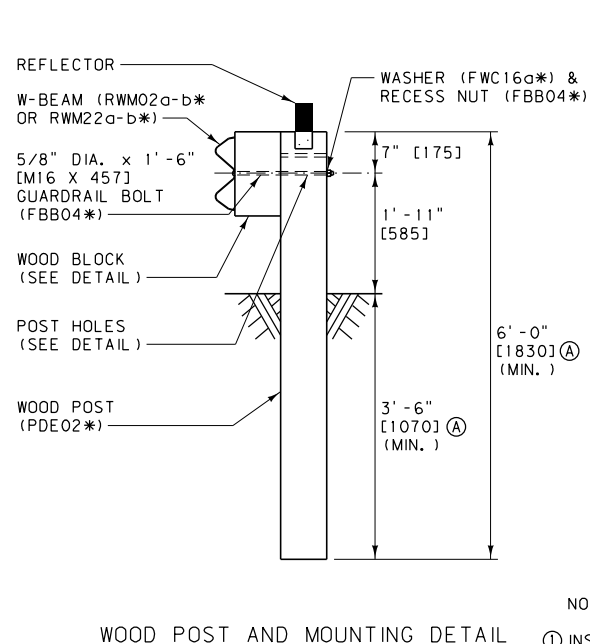
DROP INLET STRUCTURE
TYPE V AND VI

EFFECTIVE: MAY 2011

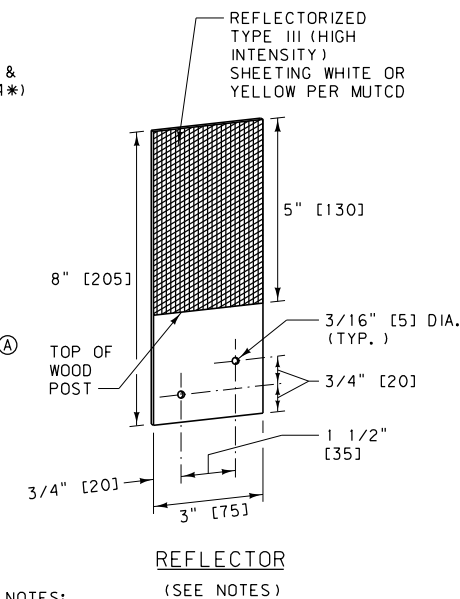
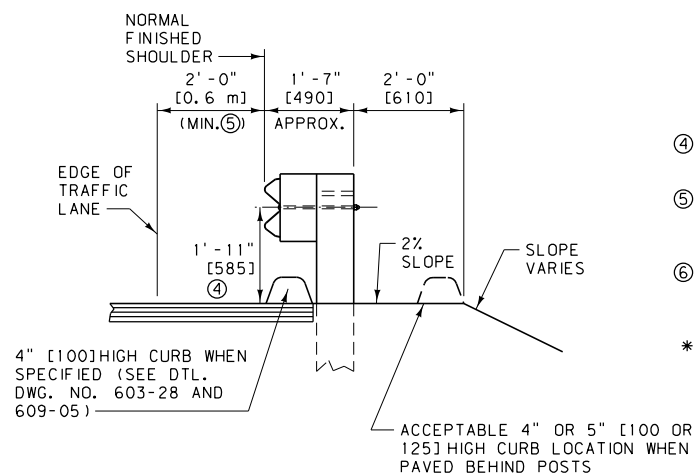
MDT MONTANA DEPARTMENT
OF TRANSPORTATION



UNITS SHOWN IN BRACKETS [] ARE
METRIC AND ARE IN MILLIMETERS (mm)
UNLESS OTHER UNITS ARE SHOWN.



(A) STANDARD UNLESS SPECIFIED
OTHERWISE IN PLANS.

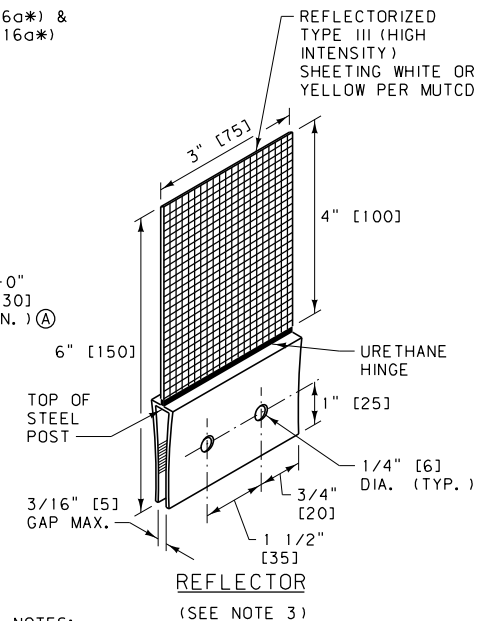
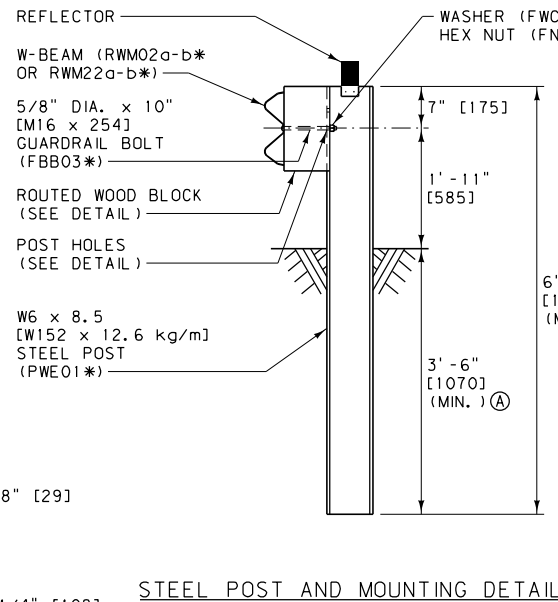
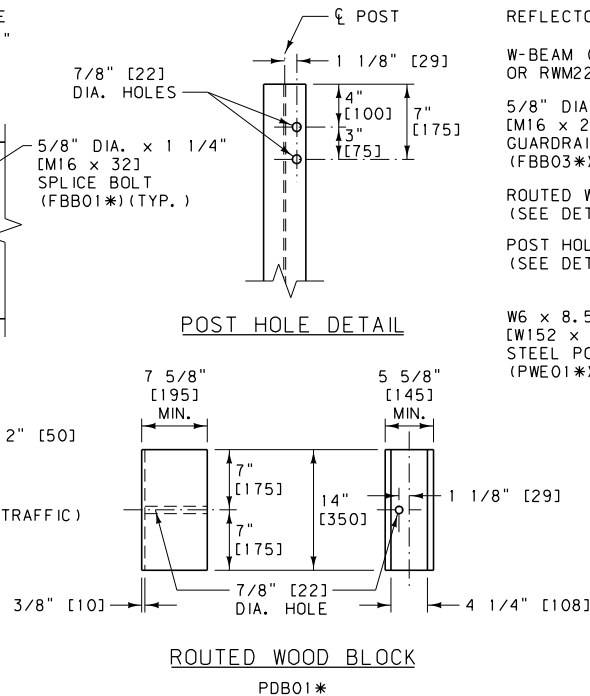
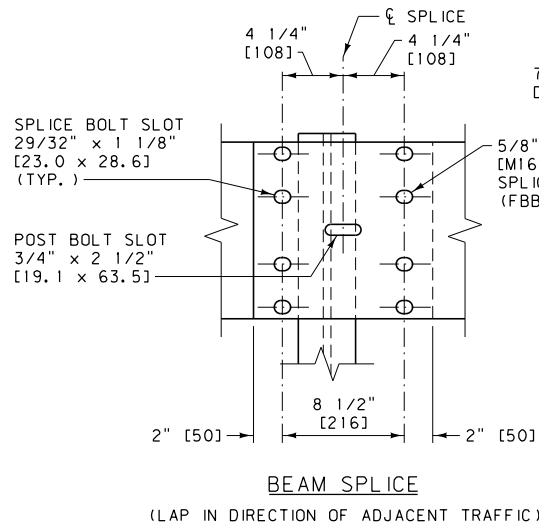


NOTES:

- INSTALL ALL BOLTS WITH HEADS ON TRAFFIC SIDE OF INSTALLATION.
- USE WOOD BLOCKS OR OTHER NCHRP 350 APPROVED BLOCKS. AFFIX BLOCKS TO POSTS WITH TWO 16 PENNY GALV. NAILS OR 14 GAGE WIRE WRAP.
- ATTACH REFLECTORS TO POSTS EVERY 25 FEET [7.62 m], INCLUDING TERMINAL SECTIONS, WITH THE REFLECTORIZED SURFACE FACING ADJACENT TRAFFIC. FABRICATE REFLECTORS FROM 0.063" [1.6 mm] THICK ALUMINUM ALLOW PER SECTION 704. FASTEN REFLECTOR TO WOOD POST USING TWO 16 PENNY RING-SHANKED GALVANIZED NAILS AND TWO 3/16" [4.8 mm] DIA. WASHERS IN PRE-DRILLED HOLES.
- ON EXISTING GUARDRAIL INSTALLATIONS, THE MINIMUM RAIL HEIGHT IS 1' - 8" [510 mm].
- WIDENING IS REQUIRED IF FINISHED SHOULDER IS LESS THAN 2' - 0" [0.6 m] FROM THE TRAFFIC LANE.
- DO NOT INSTALL W-BEAM GUARDRAIL FOR OBSTACLES WITHIN 5.6' [1.7 m] OF THE FACE OF THE RAIL.

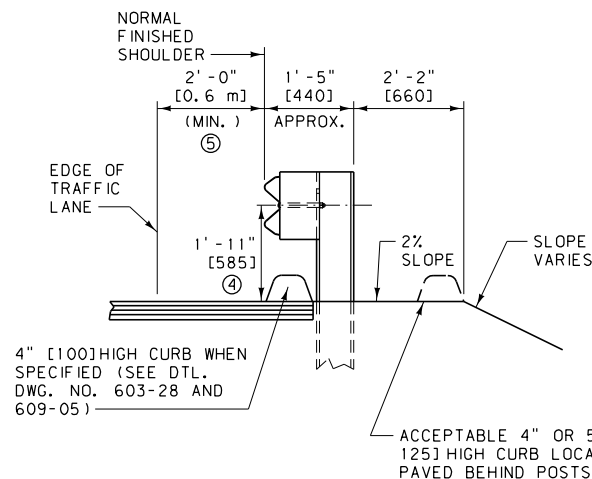
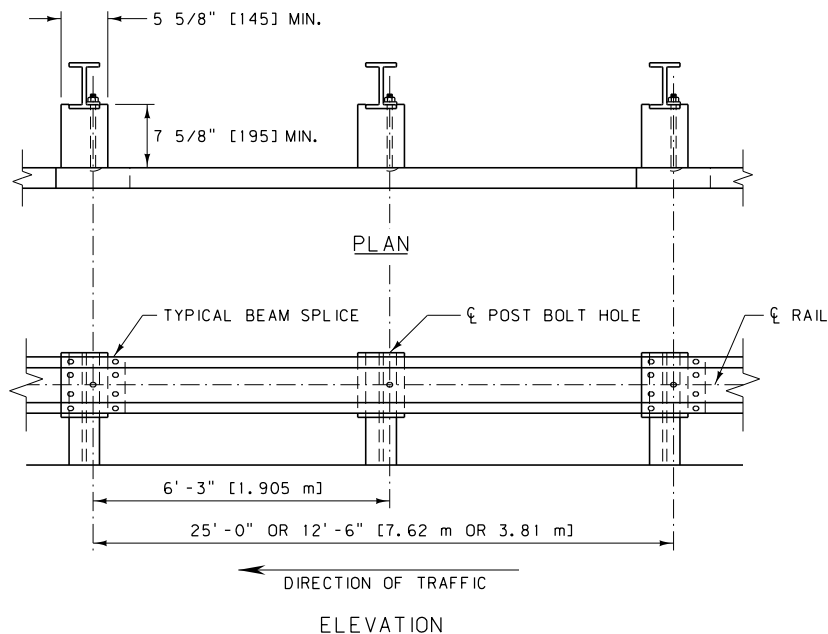
* SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	606-05A
SECTION 606, 704	
METAL GUARDRAIL - WOOD POSTS	
--REVISED--	EFFECTIVE: APRIL 2006
MAY 2011	
DECEMBER 2011	
MDT MONTANA DEPARTMENT OF TRANSPORTATION	



NOTES:

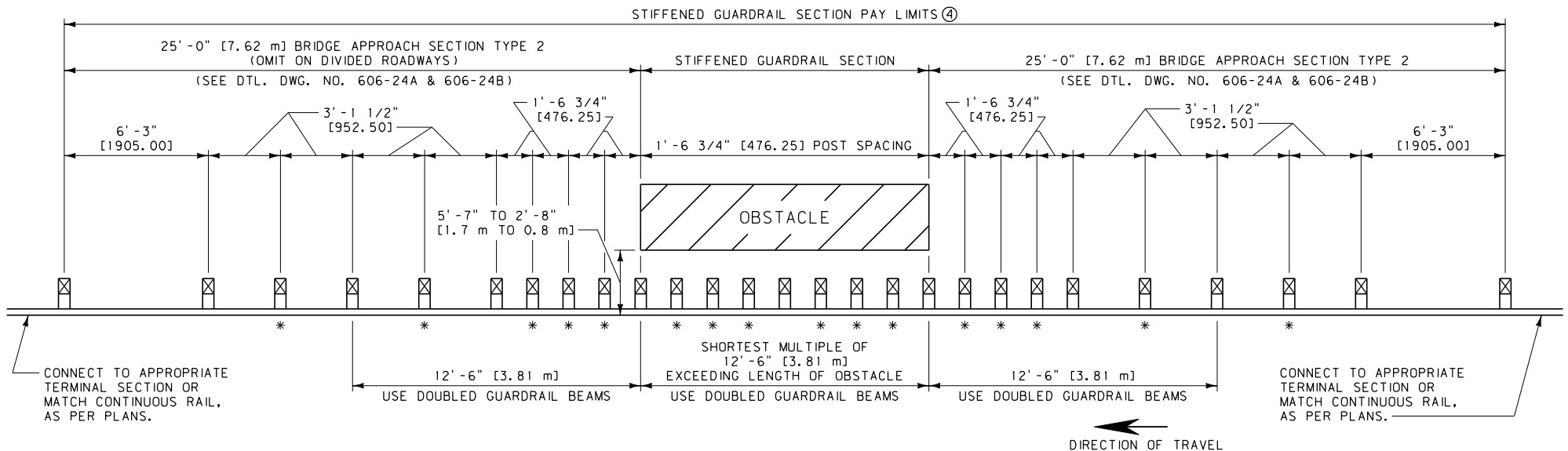
- INSTALL ALL BOLTS WITH HEADS ON TRAFFIC SIDE OF INSTALLATION.
 - USE ROUTED WOOD BLOCKS OR OTHER NCHRP 350 APPROVED BLOCKS.
 - ATTACH REFLECTORS TO POSTS EVERY 25 FEET [7.62 m], INCLUDING TERMINAL SECTIONS, WITH THE REFLECTORIZED SURFACE FACING ADJACENT TRAFFIC. FASTEN REFLECTOR TO STEEL POST USING AN APPROVED ADHESIVE. REFLECTORS MAY BE BOLTED TO POSTS PROVIDED HOLES IN POSTS ARE DRILLED BEFORE BEING GALVANIZED.
 - ON EXISTING GUARDRAIL INSTALLATIONS, THE MINIMUM RAIL HEIGHT IS 1'-8" [510 mm].
 - WIDENING IS REQUIRED IF FINISHED SHOULDER IS LESS THAN 2'-0" [0.6 m] FROM THE TRAFFIC LANE.
 - STEEL POSTS WITH OTHER POST HOLE CONFIGURATIONS MAY BE ACCEPTED, PROVIDED THEY HAVE AT LEAST THE HOLES DETAILED ON THIS DRAWING AND THEY MEET AASHTO'S PUBLICATION, "A GUIDE TO STANDARDIZED HIGHWAY BARRIER HARDWARE" AND NCHRP 350 REQUIREMENTS.
 - DO NOT INSTALL W-BEAM GUARDRAIL FOR OBSTACLES WITHIN 5.6' [1.7 m] OF THE FACE OF THE RAIL.
- * SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.



DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	606-05B
SECTION 606	
METAL GUARDRAIL - STEEL POSTS	

--REVISED--	EFFECTIVE: APRIL 2006
MAY 2011	
DECEMBER 2011	
MDTA	MONTANA DEPARTMENT OF TRANSPORTATION

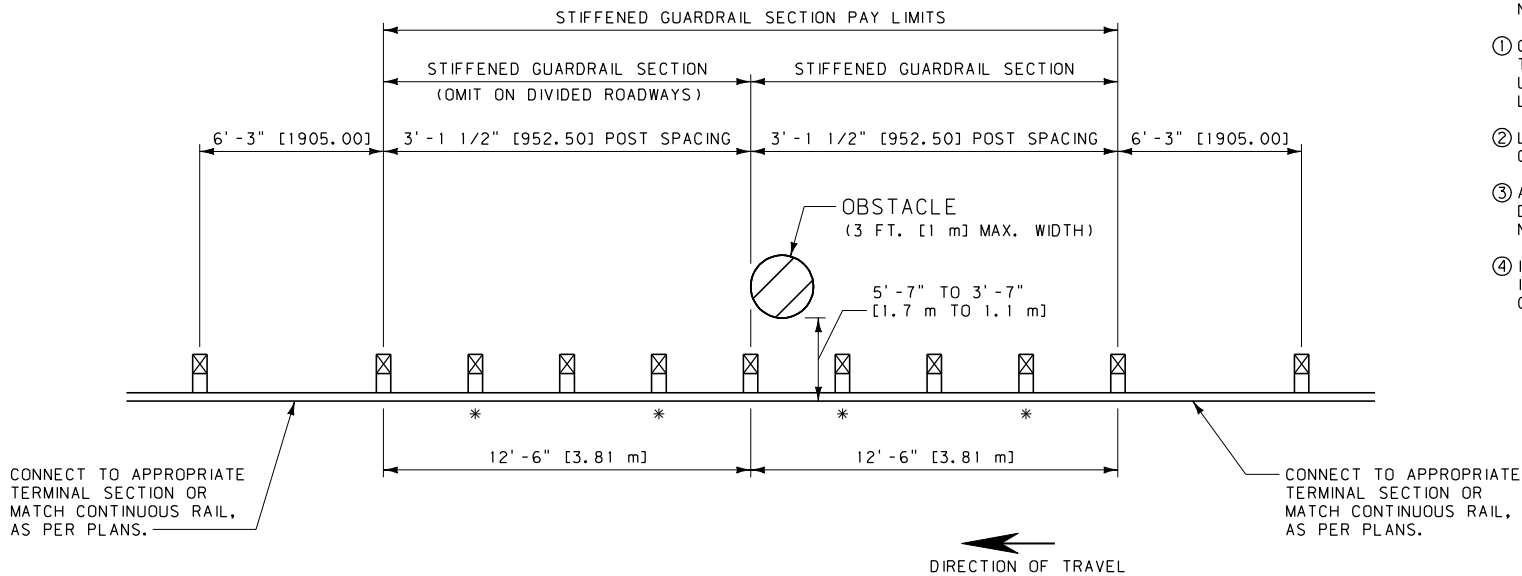
UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.



* GUARDRAIL NOT ATTACHED TO ADDED
POSTS. BLOCK-OUT FASTENED TO
POST WITH STANDARD POST BOLT.

GUARDRAIL ATTACHED TO POSTS ONLY AT
STANDARD MULTIPLES OF 6'-3" [1.905 m]
THROUGH OBSTACLE SECTION.

LINE OBSTACLE APPLICATION



NOTES:

- ① OBSTACLES CLOSER TO THE FACE OF RAIL
THAN THE INDICATED LIMITS REQUIRE THE
USE OF A RIGID BARRIER SYSTEM WITH
LITTLE TO NO DYNAMIC DEFLECTION.
- ② LAP ALL DOUBLED RAIL IN THE DIRECTION
OF ADJACENT TRAFFIC.
- ③ ALL POSTS AND BLOCKS ARE STANDARD
DIMENSIONS AS PER DETAILED DRAWING
NO. 606-05A AND 606-05B.
- ④ INCLUDE BRIDGE APPROACH SECTION(S)
IN PAYMENT LENGTH OF STIFFENED
GUARDRAIL.

UNITS SHOWN IN BRACKETS [] ARE
METRIC AND ARE IN MILLIMETERS (mm)
UNLESS OTHER UNITS ARE SHOWN.

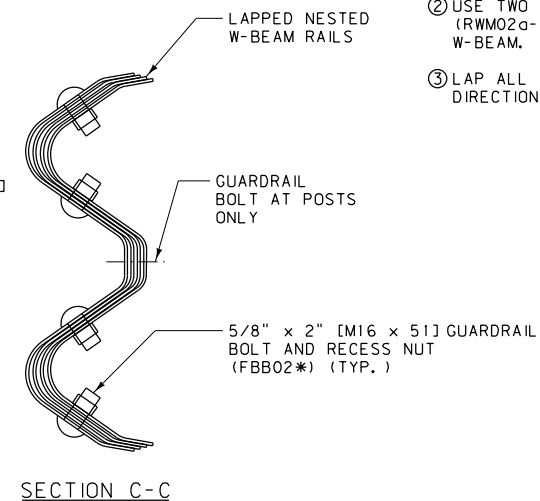
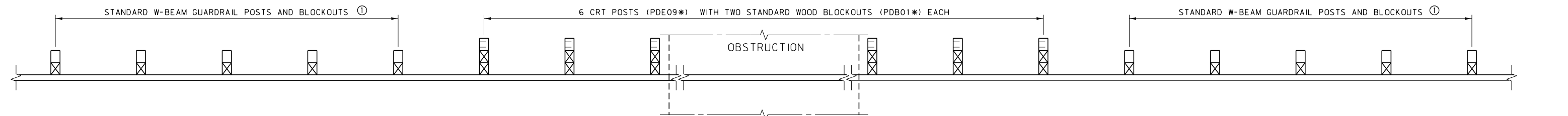
DETAILED DRAWING
REFERENCE DWG. NO.
STANDARD SPEC. 606-07
SECTION 606

STIFFENED GUARDRAIL
SECTIONS

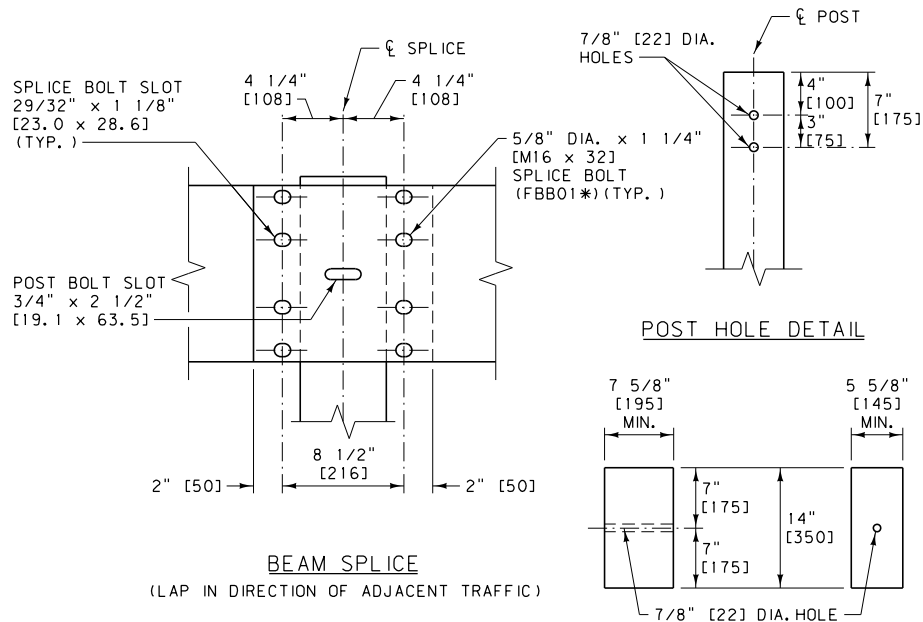
--REVISED-- EFFECTIVE: APRIL 2006
MAY 2011

MDTA MONTANA DEPARTMENT
OF TRANSPORTATION

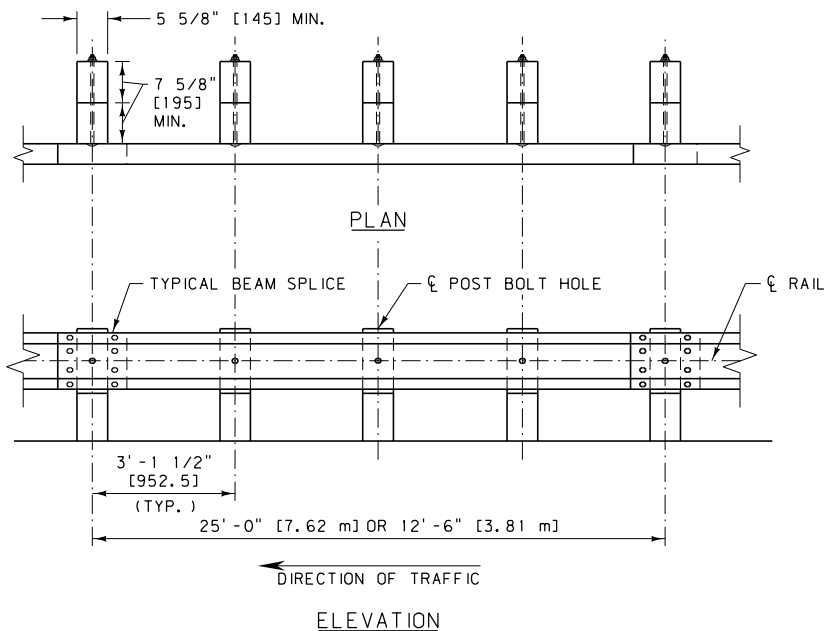
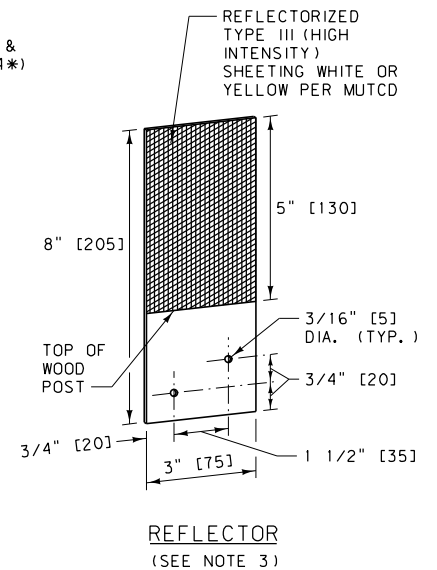
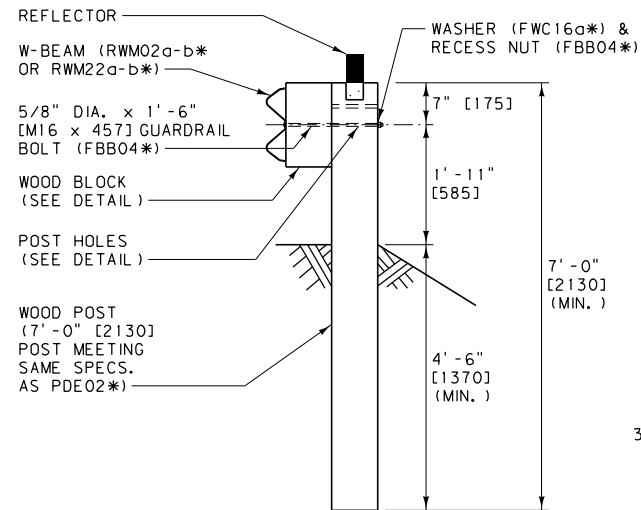
POINT OBSTACLE APPLICATION



UNITS SHOWN IN BRACKETS [] ARE
METRIC AND ARE IN MILLIMETERS (mm)
UNLESS OTHER UNITS ARE SHOWN.



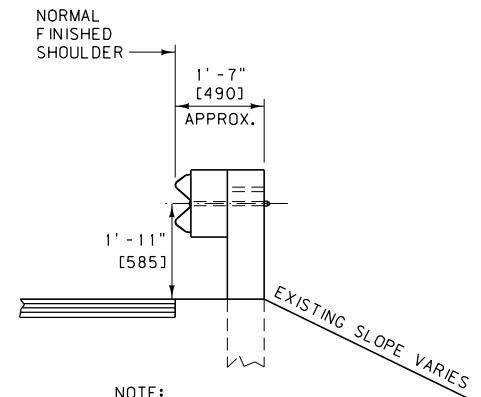
WOOD BLOCK
PDB01*



NOTES:

- ① INSTALL ALL BOLTS WITH HEADS ON TRAFFIC SIDE OF INSTALLATION.
- ② USE WOOD BLOCKS OR OTHER NCHRP 350 APPROVED BLOCKS. AFFIX BLOCKS TO POSTS WITH TWO 16 PENNY GALV. NAILS OR 14 GAGE WIRE WRAP.
- ③ ATTACH REFLECTORS TO POSTS EVERY 25' [7.62 m], INCLUDING TERMINAL SECTIONS, WITH THE REFLECTORIZED SURFACE FACING ADJACENT TRAFFIC. FABRICATE REFLECTORS FROM 0.063" [1.6] THICK ALUMINUM ALLOY PER SECTION 704. FASTEN REFLECTOR TO WOOD POST USING TWO 16 PENNY RING-SHANKED GALVANIZED NAILS AND TWO 3/16" [4.8] DIA. WASHERS IN PRE-DRILLED HOLES.
- ④ ON EXISTING GUARDRAIL INSTALLATIONS, THE MINIMUM RAIL HEIGHT IS 1'-8" [510].
- ⑤ THE W-BEAM RAIL ON THIS SYSTEM REQUIRES ADDITIONAL HOLES TO ACCOMMODATE BEING BOLTED TO POSTS AT HALF THE NORMAL POST SPACING. DRILL ADDITIONAL HOLES IN THE W-BEAM RAIL PRIOR TO APPLYING CORROSION PROTECTION.
- ⑥ DO NOT INSTALL W-BEAM GUARDRAIL WITH 7' [2.1 m] POSTS FOR OBSTACLES WITHIN 4.6' [1.4 m] OF THE FACE OF THE RAIL.

* SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

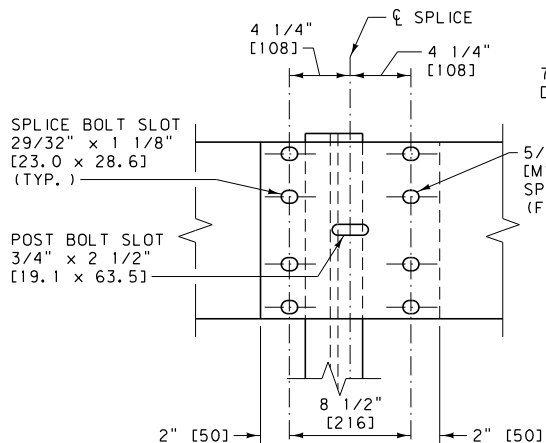


NOTE:
THIS GUARDRAIL SYSTEM IS USED WHEN THE 2'-0" [610] WIDENING BEHIND THE POSTS CANNOT BE PROVIDED, AS PER DTL. DWG. NO. 606-05A & 606-05B.

PROFILE

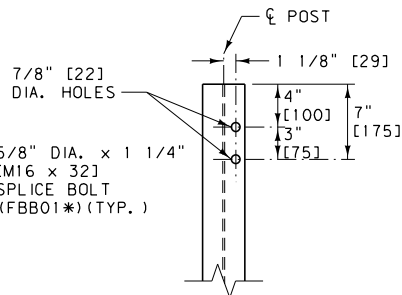
DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	606-11A
SECTION 606, 704	
METAL GUARDRAIL - 7' [2.1 m] WOOD POSTS	
--REVISED-- DECEMBER 2011	EFFECTIVE: APRIL 2006
MONTANA DEPARTMENT OF TRANSPORTATION	

UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

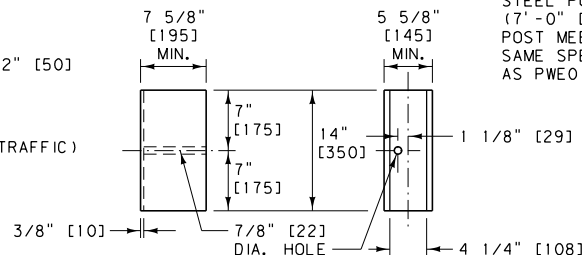


BEAM SPLICE

(LAP IN DIRECTION OF ADJACENT TRAFFIC)

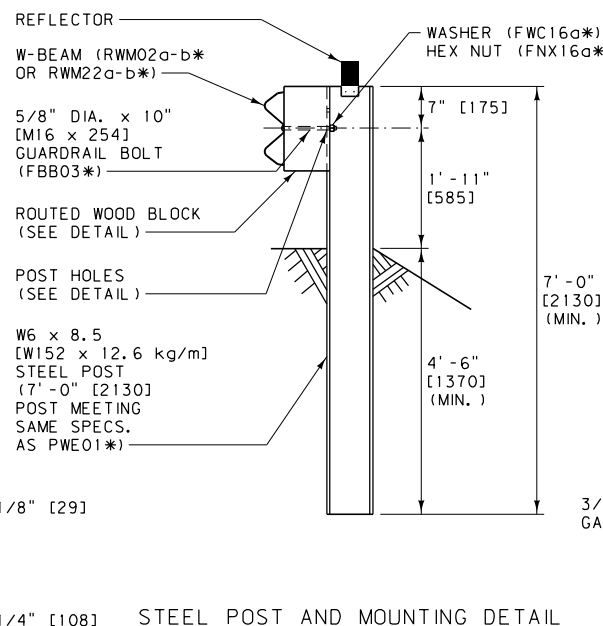
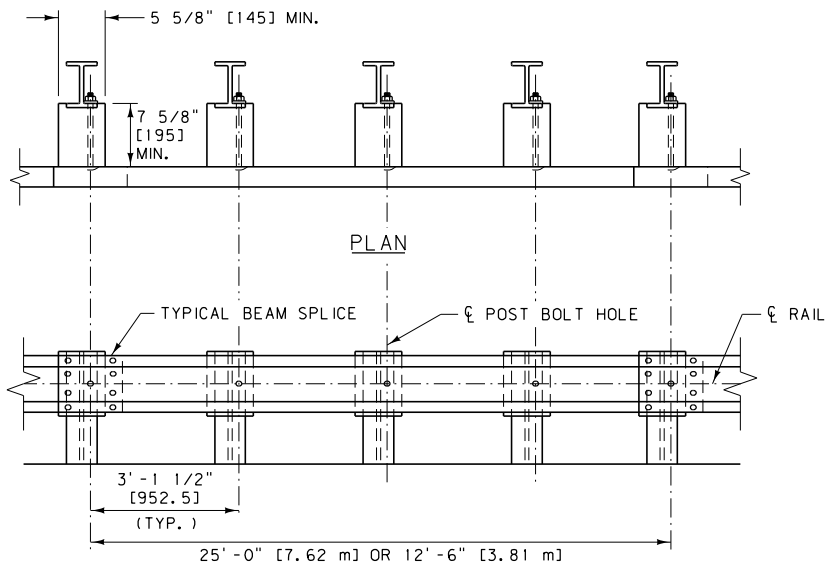


POST HOLE DETAIL

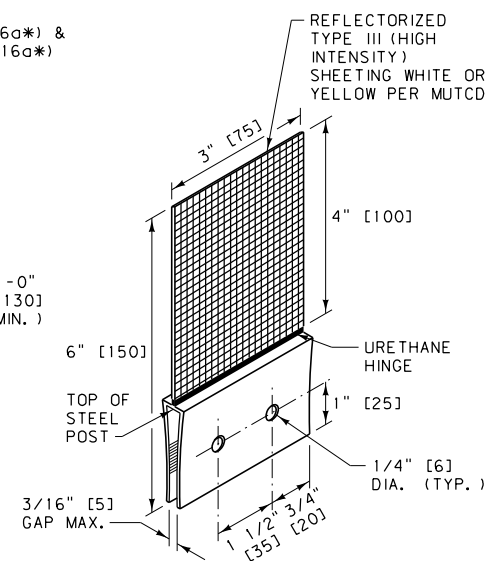


ROUTED WOOD BLOCK

PDB01*

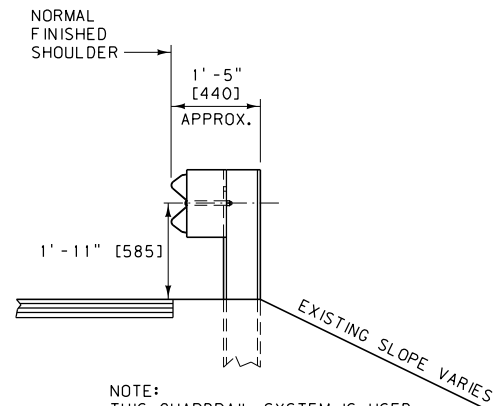


STEEL POST AND MOUNTING DETAIL



REFLECTOR

(SEE NOTE 3)



NOTE:
THIS GUARDRAIL SYSTEM IS USED
WHEN THE 2' - 0" [610] WIDENING
BEHIND THE POSTS CANNOT BE
PROVIDED, AS PER DTL. DWG. NO.
606-05A & 606-05B.

PROFILE

NOTES:

- ① INSTALL ALL BOLTS WITH HEADS ON TRAFFIC SIDE OF INSTALLATION.
- ② USE ROUTED WOOD BLOCKS OR OTHER NCHRP 350 APPROVED BLOCKS.
- ③ ATTACH REFLECTORS TO POSTS EVERY 25' [7.62 m], INCLUDING TERMINAL SECTIONS, WITH THE REFLECTORIZED SURFACE FACING ADJACENT TRAFFIC. FASTEN REFLECTOR TO STEEL POST USING AN APPROVED ADHESIVE. REFLECTORS MAY BE BOLTED TO POSTS PROVIDED HOLES IN POSTS ARE DRILLED BEFORE BEING GALVANIZED.
- ④ ON EXISTING GUARDRAIL INSTALLATIONS, THE MINIMUM RAIL HEIGHT IS 1' - 8" [510].
- ⑤ STEEL POSTS WITH OTHER POST HOLE CONFIGURATIONS MAY BE ACCEPTED, PROVIDED THEY HAVE AT LEAST THE HOLES DETAILED ON THIS DRAWING AND THEY MEET AASHTO'S PUBLICATION, "A GUIDE TO STANDARDIZED HIGHWAY BARRIER HARDWARE" AND NCHRP 350 REQUIREMENTS.
- ⑥ THE W-BEAM RAIL ON THIS SYSTEM REQUIRES ADDITIONAL HOLES TO ACCOMMODATE BEING BOLTED TO POSTS AT HALF THE NORMAL POST SPACING. DRILL ADDITIONAL HOLES IN THE W-BEAM RAIL PRIOR TO APPLYING CORROSION PROTECTION.
- ⑦ DO NOT INSTALL W-BEAM GUARDRAIL WITH 7' [2.1 m] POSTS FOR OBSTACLES WITHIN 4.6' [1.4 m] OF THE FACE OF THE RAIL.

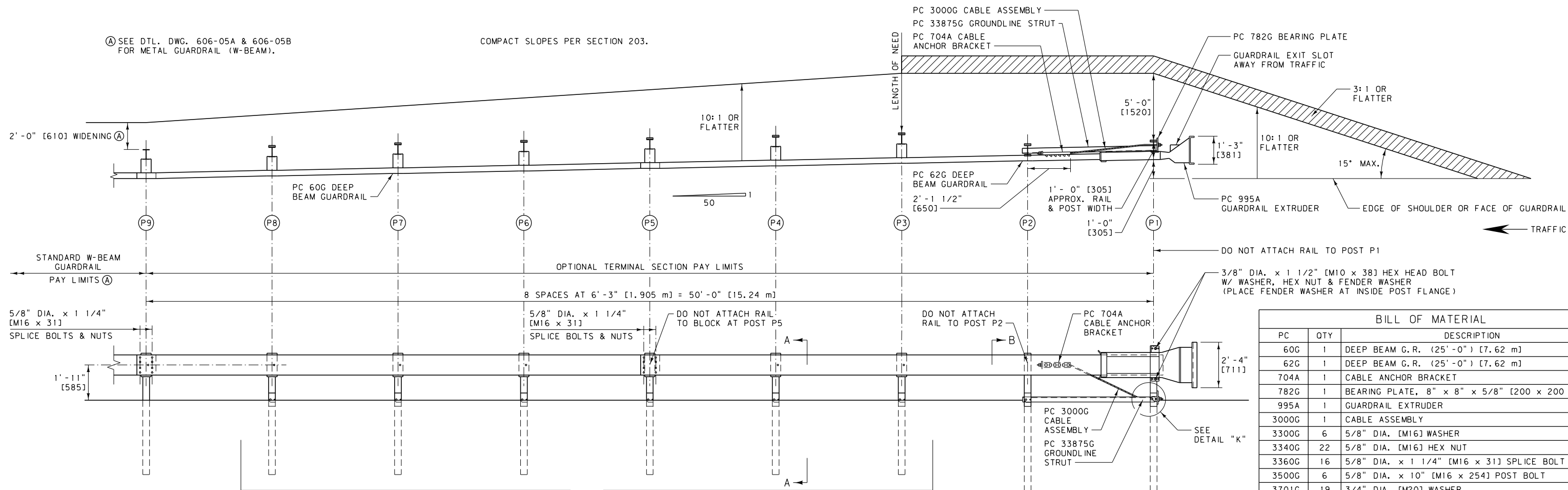
*SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	606-11B
SECTION 606	
METAL GUARDRAIL - 7' [2.1 m] STEEL POSTS	
--REVISED-- DECEMBER 2011	EFFECTIVE: APRIL 2006
MONTANA DEPARTMENT OF TRANSPORTATION	

UNITS SHOWN IN BRACKETS [] ARE
METRIC AND ARE IN MILLIMETERS (mm)
UNLESS OTHER UNITS ARE SHOWN.

(A) SEE DTL. DWG. 606-05A & 606-05B
FOR METAL GUARDRAIL (W-BEAM).

COMPACT SLOPES PER SECTION 203.



BILL OF MATERIAL		
PC	QTY	DESCRIPTION
60G	1	DEEP BEAM G.R. (25'-0") [7.62 m]
62G	1	DEEP BEAM G.R. (25'-0") [7.62 m]
704A	1	CABLE ANCHOR BRACKET
782G	1	BEARING PLATE, 8" x 8" x 5/8" [200 x 200 x 16]
995A	1	GUARDRAIL EXTRUDER
3000G	1	CABLE ASSEMBLY
3300G	6	5/8" DIA. [M16] WASHER
3340G	22	5/8" DIA. [M16] HEX NUT
3360G	16	5/8" DIA. x 1 1/4" [M16 x 31] SPLICE BOLT
3500G	6	5/8" DIA. x 10" [M16 x 254] POST BOLT
3701G	19	3/4" DIA. [M20] WASHER
3704G	16	3/4" DIA. [M20] HEX NUT
3717G	15	3/4" DIA. x 2 1/2" [M20 x 64] HEX HEAD BOLT
3718G	1	3/4" DIA. x 3" [M20 x 76] HEX HEAD BOLT
3900G	2	1" DIA. [M24] WASHER
3910G	2	1" DIA. [M24] HEX NUT
4076B	6	WOOD BLOCK, 6" x 8" x 1'-2" [150 x 200 x 350]
4254G	18	3/8" DIA. [M10] WASHER
4255G	2	3/8" DIA. [M10] FENDER WASHER (1 1/2" [38] O.D.)
4258G	16	3/8" DIA. [M10] LOCKWASHER
4261G	2	3/8" DIA. x 1 1/2" [M10 x 38] HEX HEAD BOLT
4699G	16	3/4" DIA. [M20] LOCKWASHER
6321G	16	3/8" DIA. x 2" [M10 x 51] HEX HEAD BOLT
6405G	18	3/8" DIA. [M10] HEX NUT
33871A	1	ETPLUS HBA POST P1 (UPPER)
33872A	7	ETPLUS HBA POST P2 TO P8 (UPPER)
33873A	2	ETPLUS HBA POST P1 & P2 (LOWER)
33874A	6	ETPLUS HBA POST P3 TO P8 (LOWER)
33875G	1	6'-6" [1981] ANGLE STRUT ET HBA

NOTE:

SECTION "A-A" IS SIMILAR
AT POST P5 EXCEPT RAIL
IS NOT ATTACHED.

PC 33872A POST
(UPPER) W6 x 8.5
[W152 x 12.6 kg/m]

SEE DETAIL "H"

PC 33873A POST
(LOWER) W6 x 8.5
[W152 x 12.6 kg/m]

PC 33874A POST (LOWER)
W6 x 8.5 [W152 x 12.6 kg/m]

VIEW H-H

PC 782G
BEARING PLATE

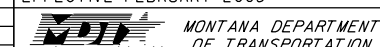
TRAFFIC
SIDE

VIEW K-K

NOTES:

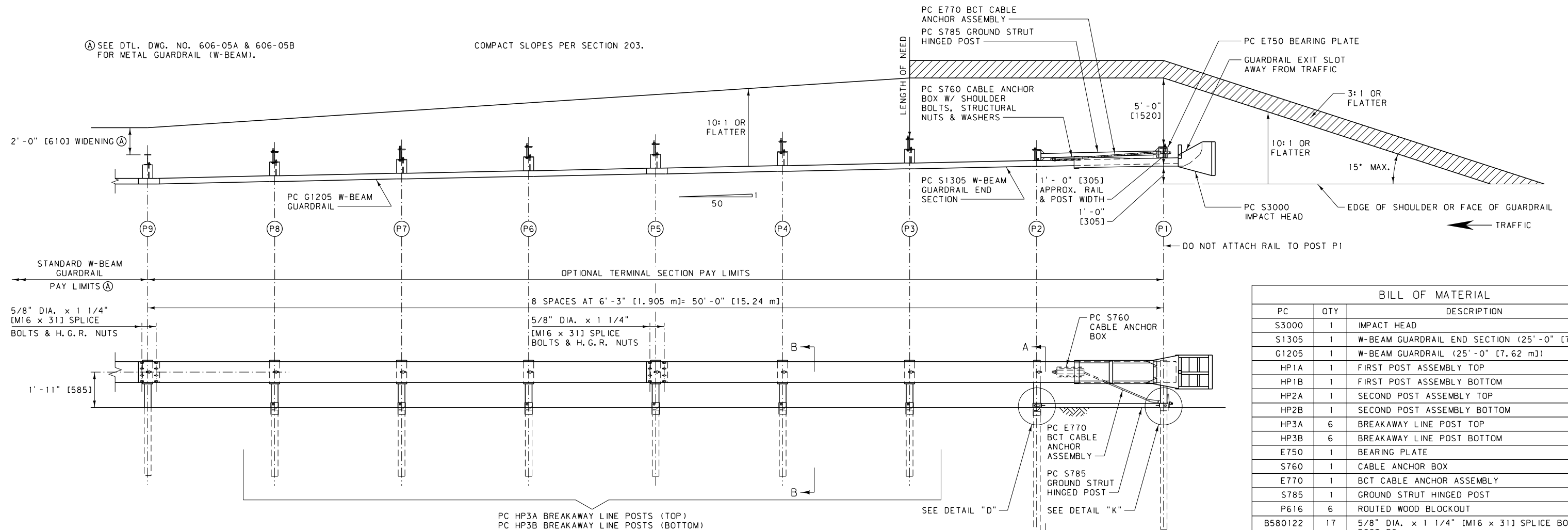
- THE 5/8" DIA. [M16] FLAT WASHER IS USED UNDER THE NUT, BEHIND THE POST ONLY. NO WASHER IS USED AT THE RAIL.
- USE THE ET-PLUS TERMINAL SECTION ON DIVIDED ROADWAYS IF THE WIDTH IS 25 FEET [7.5 m] OR GREATER BETWEEN FINISHED SURFACES. CONSIDER OTHER TERMINAL SECTIONS IF THE WIDTH IS LESS THAN 25 FEET [7.5 m] BETWEEN FINISHED SURFACES.
- FLARE THE END SECTION AWAY FROM TRAFFIC AT A RATE OF 50:1 FOR 50 FEET [15.24 m] (ILLUSTRATED). FLARES OF 50:1 FOR 100 FEET [30.48 m] MAY ALSO BE USED. THE FLARE MAY BE OMITTED ON ROADS WITH SHOULDERS GREATER THAN 2 FEET [0.6 m] IN WIDTH.
- PLACE A SELF-ADHESIVE OBJECT MARKER ON THE GUARDRAIL EXTRUDER FACE, HAVING ALTERNATING RETRO-REFLECTIVE BLACK AND YELLOW STRIPES SLOPED DOWNWARD AT AN ANGLE OF 45° TOWARDS THE SIDE ON WHICH TRAFFIC IS TO PASS.
- ATTACH REFLECTORS TO TERMINAL SECTION POSTS, PER DTL. DWG. NO. 606-05A & 606-05B.
- OBTAIN ENGINEER'S APPROVAL OF MANUFACTURER INSTALLATION OPTIONS WHEN SITE CONDITIONS PREVENT THE USE OF THE OPTION SHOWN ON THIS DETAIL.
- AFTER FINAL ASSEMBLY, RECHECK CABLE TO MAKE SURE IT IS TAUT AND HAS NOT RELAXED.
- LAP ALL W-BEAM SPLICES IN THE DIRECTION OF ADJACENT TRAFFIC.

UNITS SHOWN IN BRACKETS [] ARE
METRIC AND ARE IN MILLIMETERS (mm)
UNLESS OTHER UNITS ARE SHOWN.

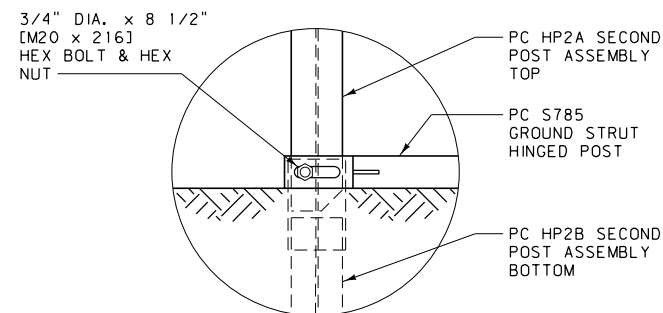
DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	606-13A
SECTION 606, 203	
OPTIONAL TERMINAL SECTION - ET-PLUS	
EFFECTIVE: FEBRUARY 2005	
--REVISED-- DECEMBER 2011	

(A) SEE DTL. DWG. NO. 606-05A & 606-05B FOR METAL GUARDRAIL (W-BEAM).

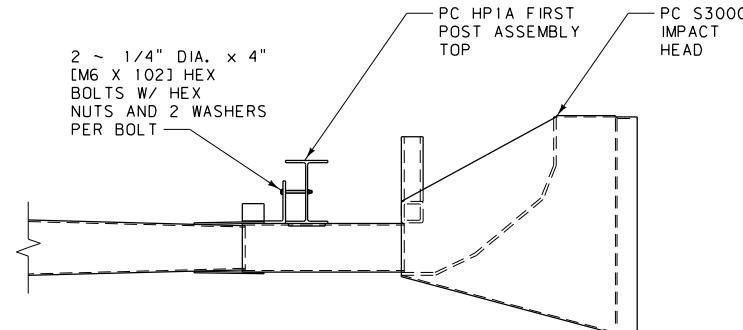
COMPACT SLOPES PER SECTION 203.



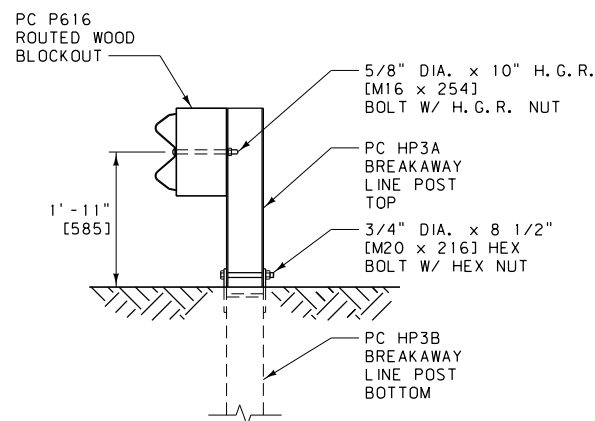
BILL OF MATERIAL		
PC	QTY	DESCRIPTION
S3000	1	IMPACT HEAD
S1305	1	W-BEAM GUARDRAIL END SECTION (25'-0" [7.62 m])
G1205	1	W-BEAM GUARDRAIL (25'-0" [7.62 m])
HP1A	1	FIRST POST ASSEMBLY TOP
HP1B	1	FIRST POST ASSEMBLY BOTTOM
HP2A	1	SECOND POST ASSEMBLY TOP
HP2B	1	SECOND POST ASSEMBLY BOTTOM
HP3A	6	BREAKAWAY LINE POST TOP
HP3B	6	BREAKAWAY LINE POST BOTTOM
E750	1	BEARING PLATE
S760	1	CABLE ANCHOR BOX
E770	1	BCT CABLE ANCHOR ASSEMBLY
S785	1	GROUND STRUT HINGED POST
P616	6	ROUTED WOOD BLOCKOUT
B580122	17	5/8" DIA. x 1 1/4" [M16 x 31] SPLICE BOLT, POST P2
B580904A	1	5/8" DIA. x 9" [M16 x 229] HEX BOLT
B581002	6	5/8" DIA. x 10" [M16 x 254] H.G.R. BOLT
N050	24	5/8" DIA. [M16] H.G.R. NUT
W050	2	5/8" DIA. [M16] WASHER
B340854A	7	3/4" DIA. x 8 1/2" [M20 x 216] HEX BOLT
N030	7	3/4" [M20] DIA. HEX NUT
N100	2	1" DIA. [M24] ANCHOR CABLE HEX NUT
W100	2	1" DIA. [M24] ANCHOR CABLE WASHER
B140404	2	1/4" DIA. x 4" [M6 x 102] HEX BOLT
N014	2	1/4" DIA. [M6] HEX NUT
W014	4	1/4" DIA. [M6] WASHER
SB58A	8	CABLE ANCHOR BOX SHOULDER BOLT
N055A	8	1/2" DIA. [M12] A325 STRUCTURAL NUT
W050A	16	9/16" DIA. [M14] (1 1/16" [27] O.D.) A325 STRUCTURAL WASHER



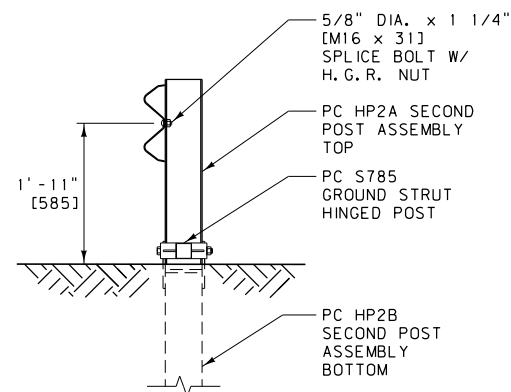
DETAIL D
(AT POST P2)



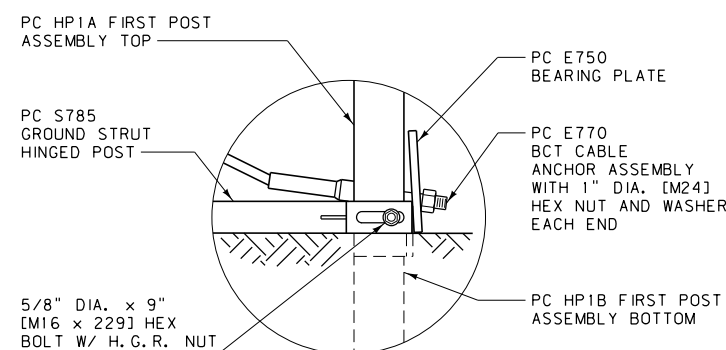
IMPACT HEAD CONNECTION DETAIL



SECTION B-B
(TYP. AT POSTS P3 THRU P8)



SECTION A-A
(AT POST P2)



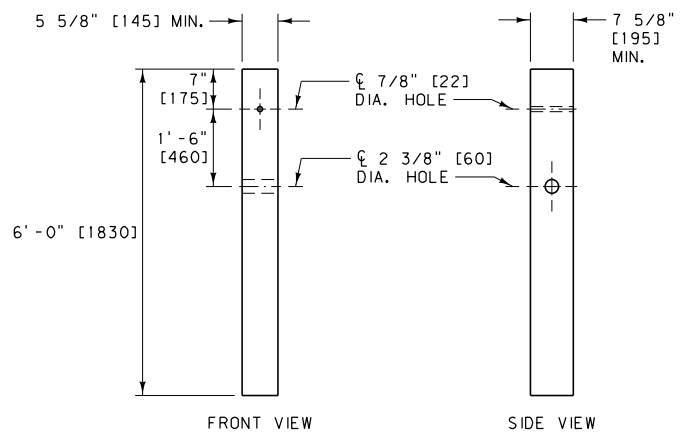
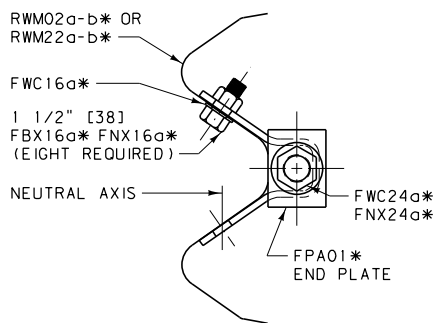
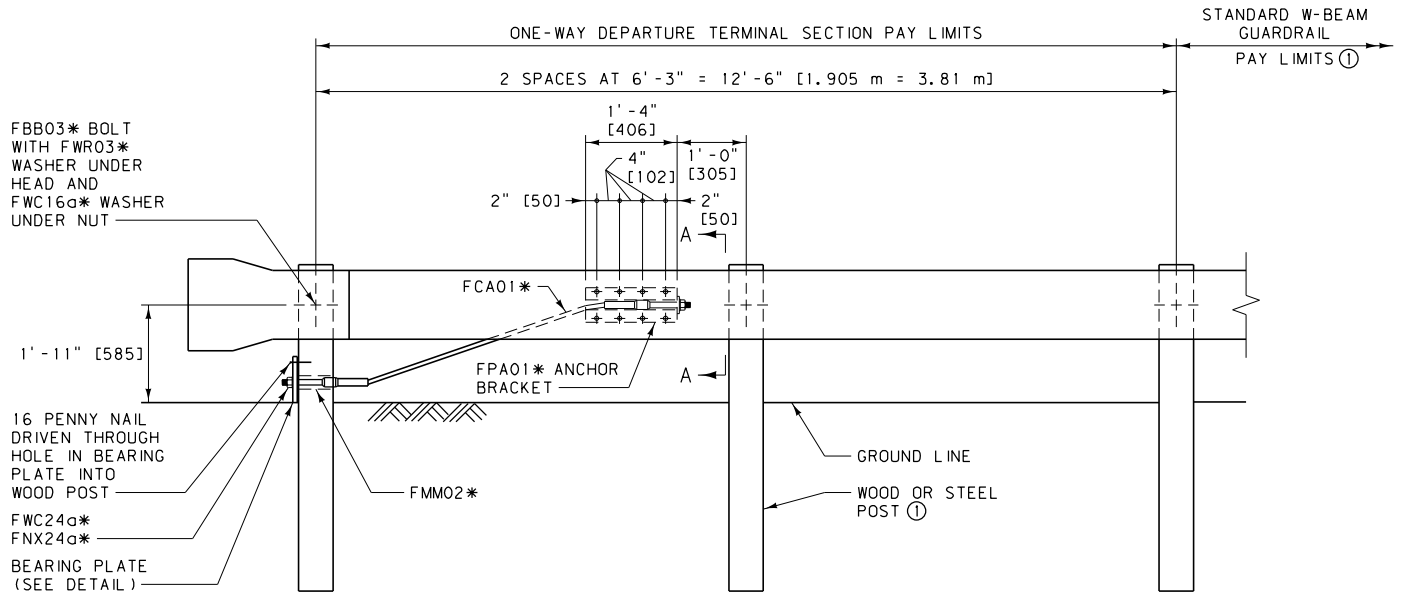
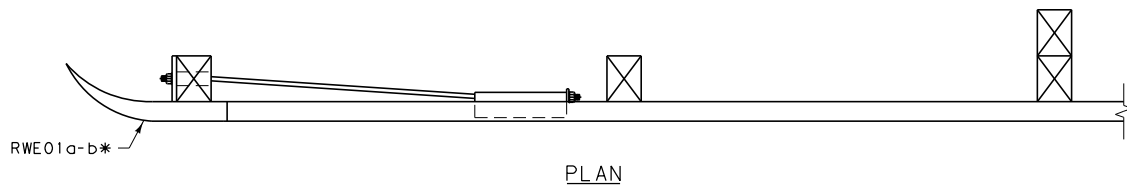
DETAIL K
(AT POST P1)

NOTES:

- USE THE SKT 350 TERMINAL SECTION ON DIVIDED ROADWAYS IF THE WIDTH IS 25 FEET [7.5 m] OR GREATER BETWEEN FINISHED SURFACES. CONSIDER OTHER TERMINAL SECTIONS IF THE WIDTH IS LESS THAN 25 FEET [7.5 m] BETWEEN FINISHED SURFACES.
- FLARE THE END SECTION AWAY FROM TRAFFIC AT A RATE OF 50:1 FOR 50 FEET [15.24 m] (ILLUSTRATED). FLARES OF 50:1 FOR 100 FEET [30.48 m] MAY ALSO BE USED. THE FLARE MAY BE OMITTED ON ROADS WITH SHOULDERS GREATER THAN 2 FEET [0.6 m] IN WIDTH.
- PLACE A SELF-ADHESIVE OBJECT MARKER ON THE GUARDRAIL IMPACT HEAD FACE, HAVING ALTERNATING RETRO-REFLECTIVE BLACK AND YELLOW STRIPES SLOPED DOWNWARD AT AN ANGLE OF 45° TOWARDS THE SIDE ON WHICH TRAFFIC IS TO PASS.
- ATTACH REFLECTORS TO TERMINAL SECTION POSTS, PER DTL. DWG. NO. 606-05A & 606-05B.
- AFTER FINAL ASSEMBLY, RECHECK CABLE TO MAKE SURE IT IS TAUT AND HAS NOT RELAXED.
- OBTAIN ENGINEER'S APPROVAL OF MANUFACTURER INSTALLATION OPTIONS WHEN SITE CONDITIONS PREVENT THE USE OF THE OPTION SHOWN ON THIS DETAIL.
- LAP ALL W-BEAM SPLICES IN THE DIRECTION OF ADJACENT TRAFFIC.

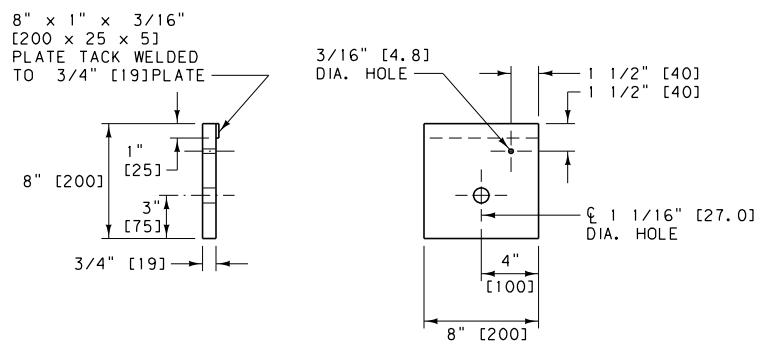
UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	606-13B
SECTION 606, 203	
OPTIONAL TERMINAL SECTION - SKT 350	
EFFECTIVE: APRIL 2006	
--REVISED-- DECEMBER 2011	MDT MONTANA DEPARTMENT OF TRANSPORTATION



END POST DETAILS

PDF03*



BEARING PLATE DETAIL

FPB01*

NOTE:

① SEE DTL. DWG. NO. 606-05A AND 606-05B FOR METAL GUARDRAIL (W-BEAM).

* SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING

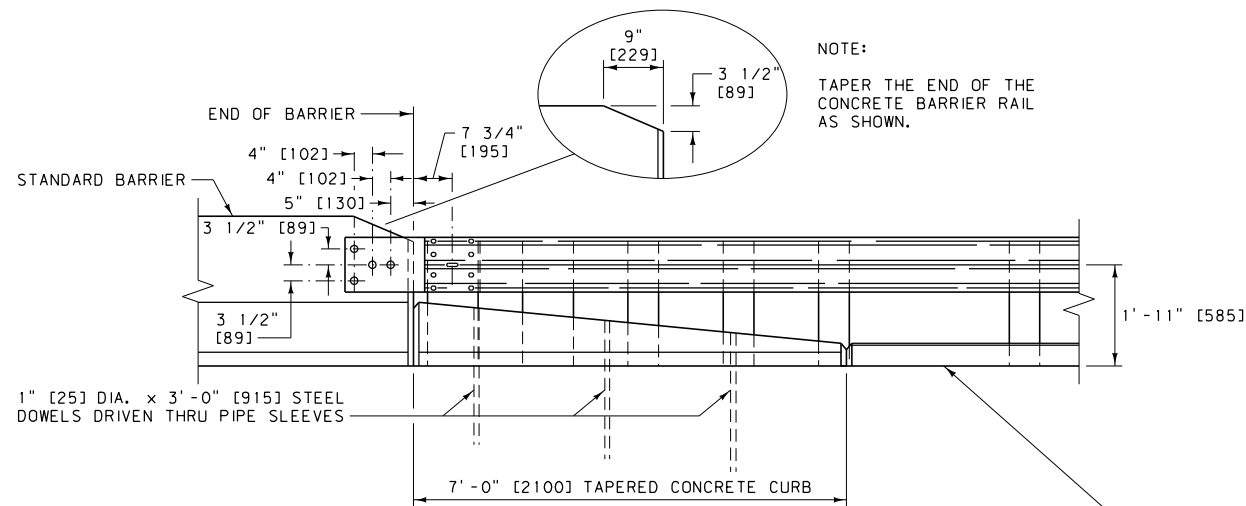
REFERENCE DWG. NO. STANDARD SPEC. 606-18

ONE-WAY DEPARTURE TERMINAL SECTION

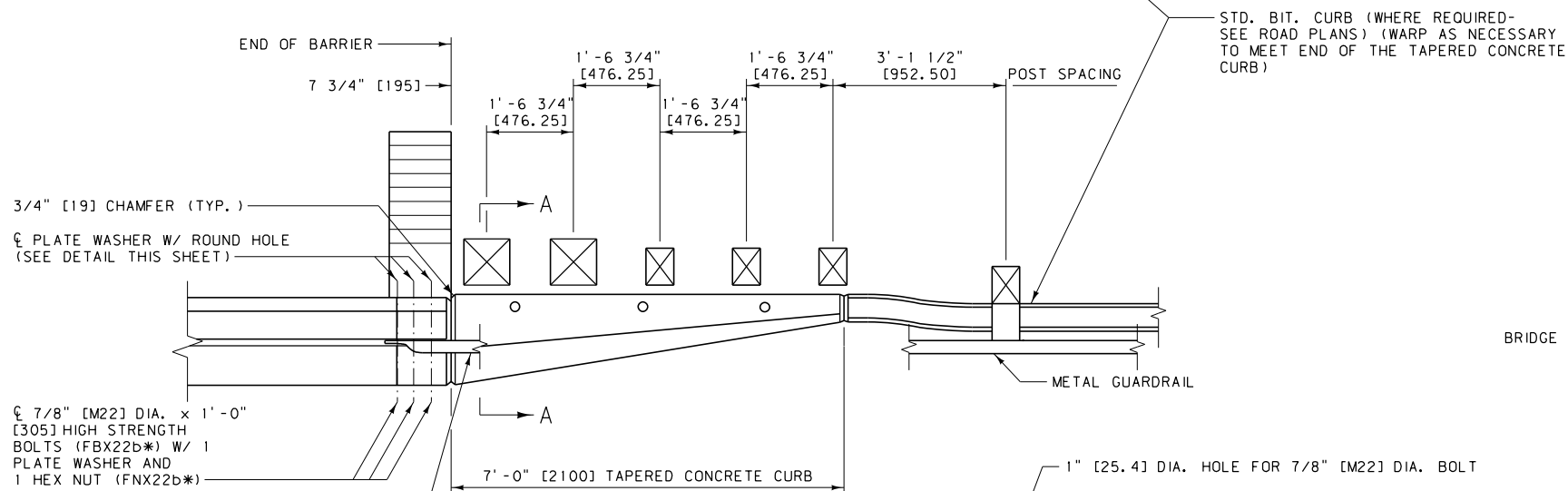
EFFECTIVE: FEBRUARY 2005

--REVISED--
DECEMBER 2011

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ELEVATION



PLAN

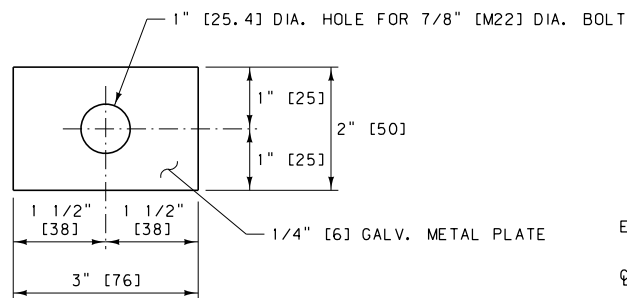
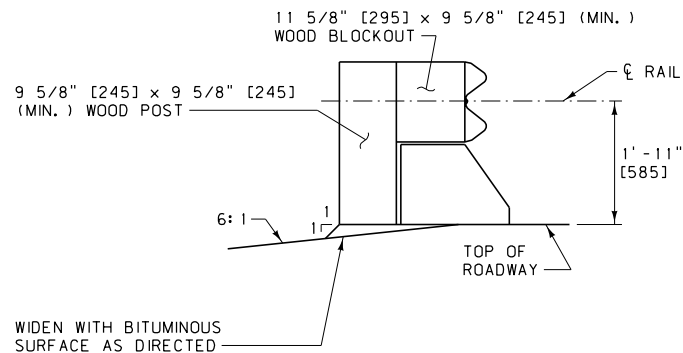
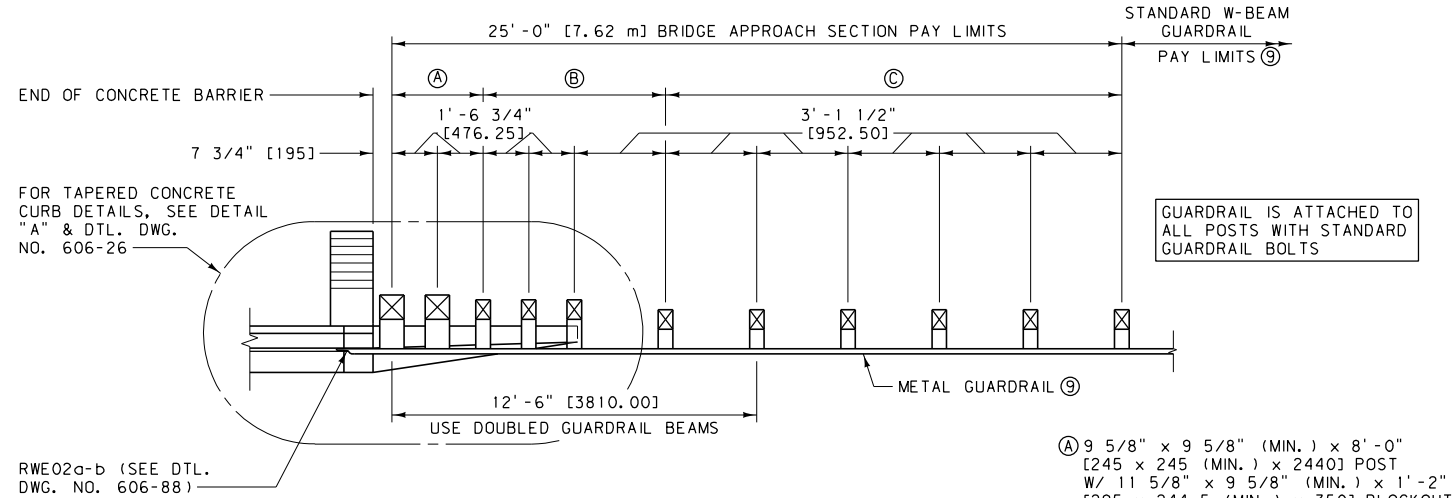


PLATE WASHER



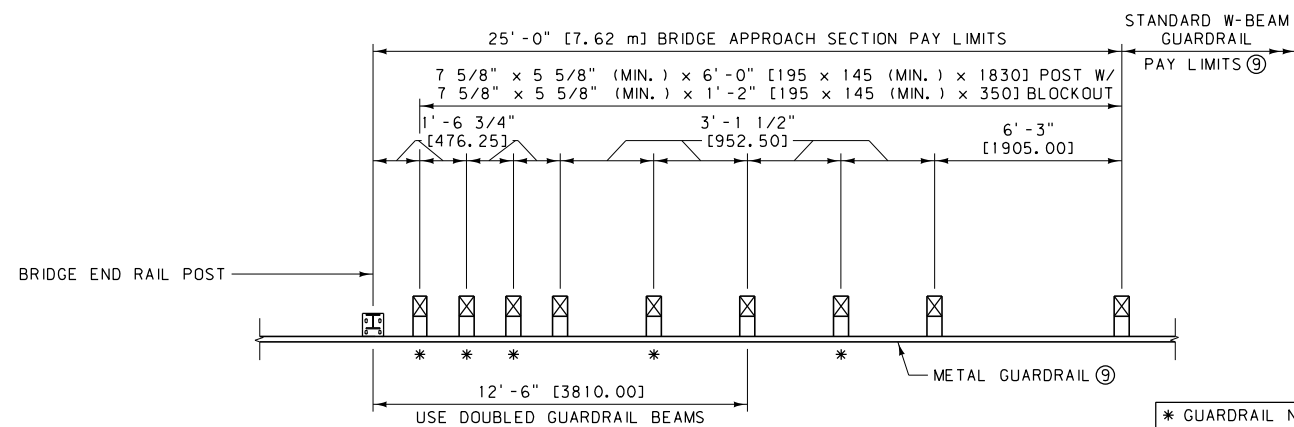
NOTES:

- ① TAPERED CONCRETE CURBS:
TYPE 1, SEE DTL. DWG. NO. 606-26
TYPE 3, SEE DTL. DWG. NO. 606-27
 - ② TAPERED CONCRETE CURBS ARE ALSO REQUIRED ON CONCRETE APPROACH SLABS.
 - ③ PORTIONS OF GUARDRAIL & BLOCKOUTS ARE OMITTED FOR CLARITY.
 - ④ LAP GUARDRAIL IN THE DIRECTION OF THE ADJACENT TRAFFIC LANE. (SEE DTL. DWG. NO. 606-05A).
 - ⑤ LAP W-BEAM TERMINAL CONNECTOR (RWE02a-b) IN THE DIRECTION OF THE ADJACENT TRAFFIC LANE.
 - ⑥ USE WOOD BLOCKS OR OTHER NCHRP 350 APPROVED BLOCKS FOR BLOCKOUTS.
 - ⑦ DO NOT FLARE BRIDGE APPROACH SECTIONS.
 - ⑧ SEE DTL. DWG. NO. 606-25A FOR SKEWED BRIDGES.
 - ⑨ SEE DTL. DWG. NO. 606-05A FOR METAL GUARDRAIL (W-BEAM).
- * SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

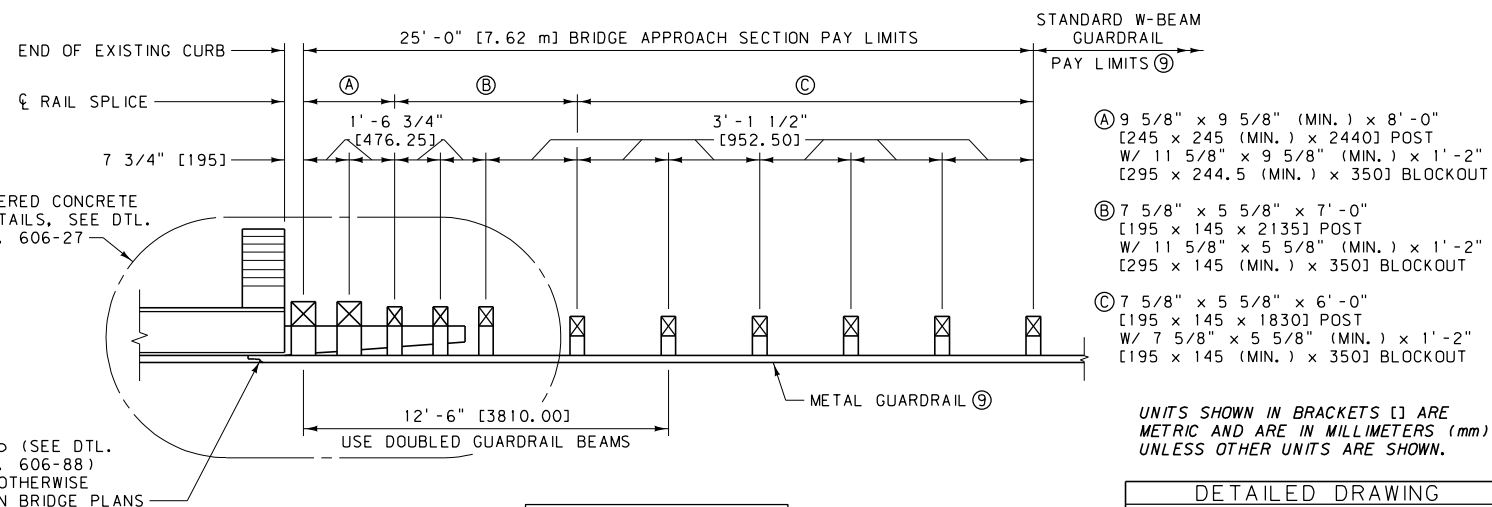


METAL GUARDRAIL-BRIDGE APPROACH SECTION TYPE 1
(FOR BRIDGES USING CONCRETE BARRIER RAIL)

- ① 9 5/8" x 9 5/8" (MIN.) x 8'-0" [245 x 245 (MIN.) x 2440] POST W/ 11 5/8" x 9 5/8" (MIN.) x 1'-2" [295 x 244.5 (MIN.) x 350] BLOCKOUT
- ② 7 5/8" x 5 5/8" x 7'-0" [195 x 145 x 2135] POST W/ 11 5/8" x 5 5/8" (MIN.) x 1'-2" [295 x 145 (MIN.) x 350] BLOCKOUT
- ③ 7 5/8" x 5 5/8" x 6'-0" [195 x 145 x 1830] POST W/ 7 5/8" x 5 5/8" (MIN.) x 1'-2" [195 x 145 (MIN.) x 350] BLOCKOUT



METAL GUARDRAIL-BRIDGE APPROACH SECTION TYPE 2
(FOR BRIDGES WITHOUT CURBS)



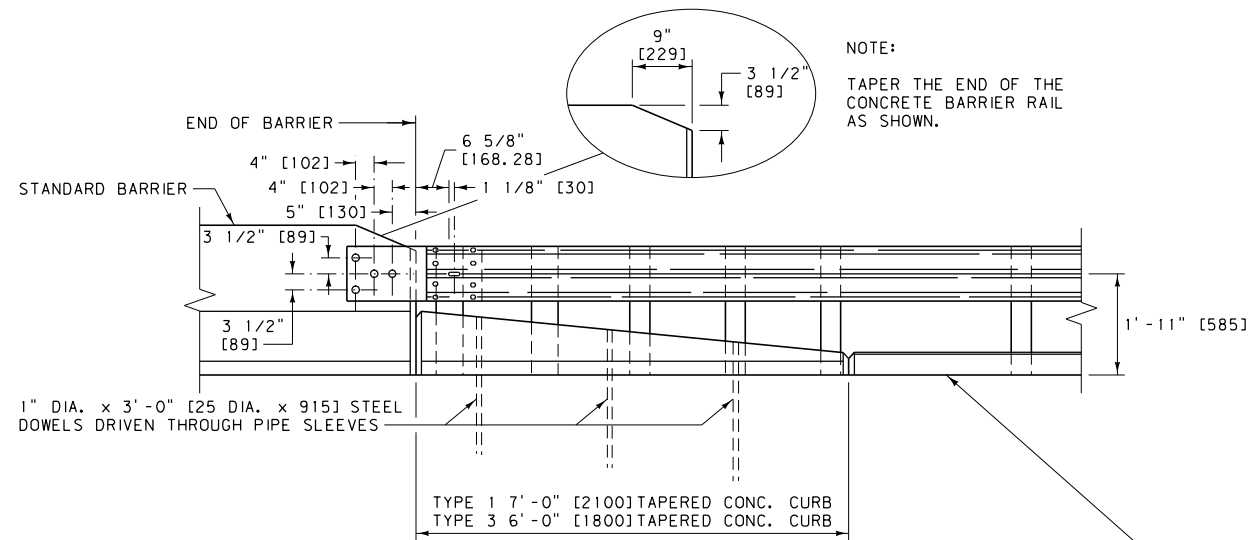
METAL GUARDRAIL-BRIDGE APPROACH SECTION TYPE 3
(FOR BRIDGES WITH EXISTING CONCRETE CURBS)

UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

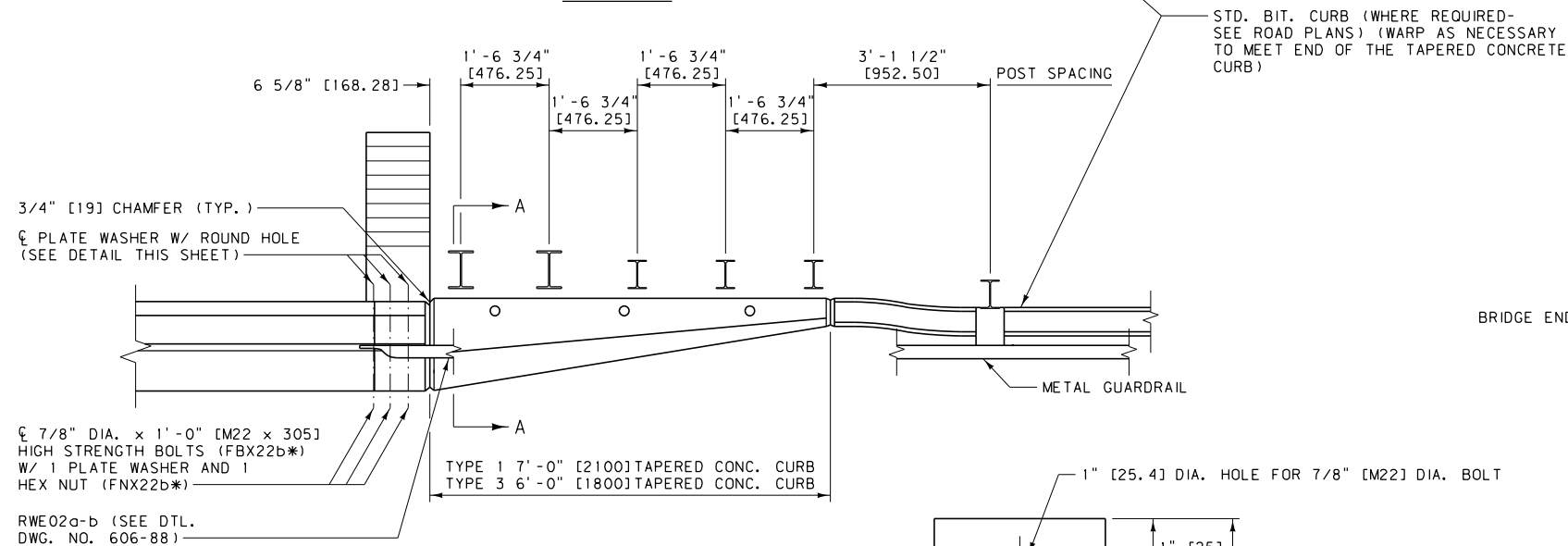
DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	606-24A
SECTION 606	

BRIDGE APPROACH SECTIONS - WOOD POSTS	
--REVISED--	EFFECTIVE: FEBRUARY 2005
JANUARY 2008	
DECEMBER 2011	

MDT MONTANA DEPARTMENT OF TRANSPORTATION

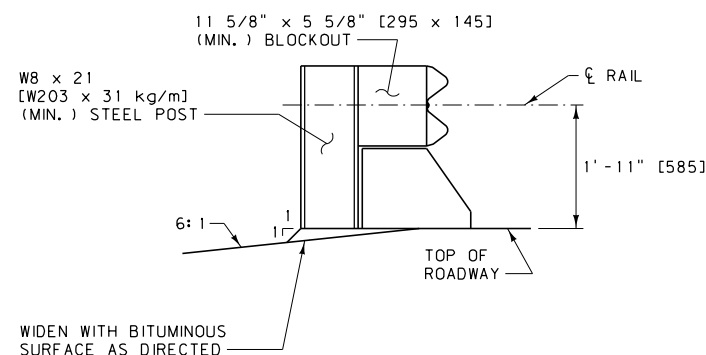


ELEVATION



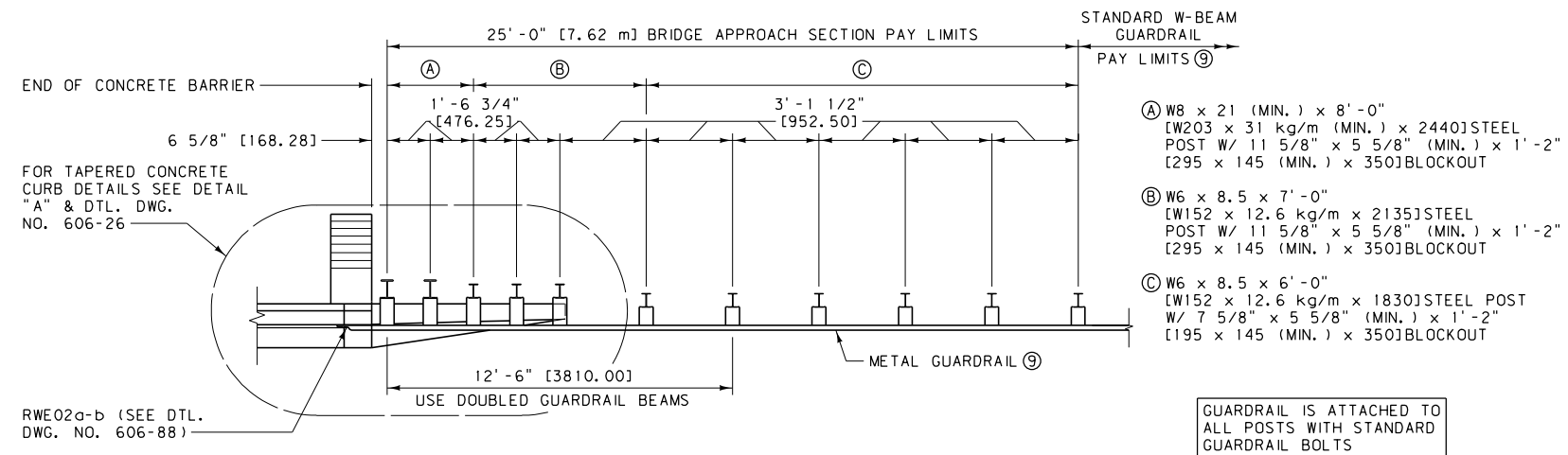
PLAN

DETAIL "A"

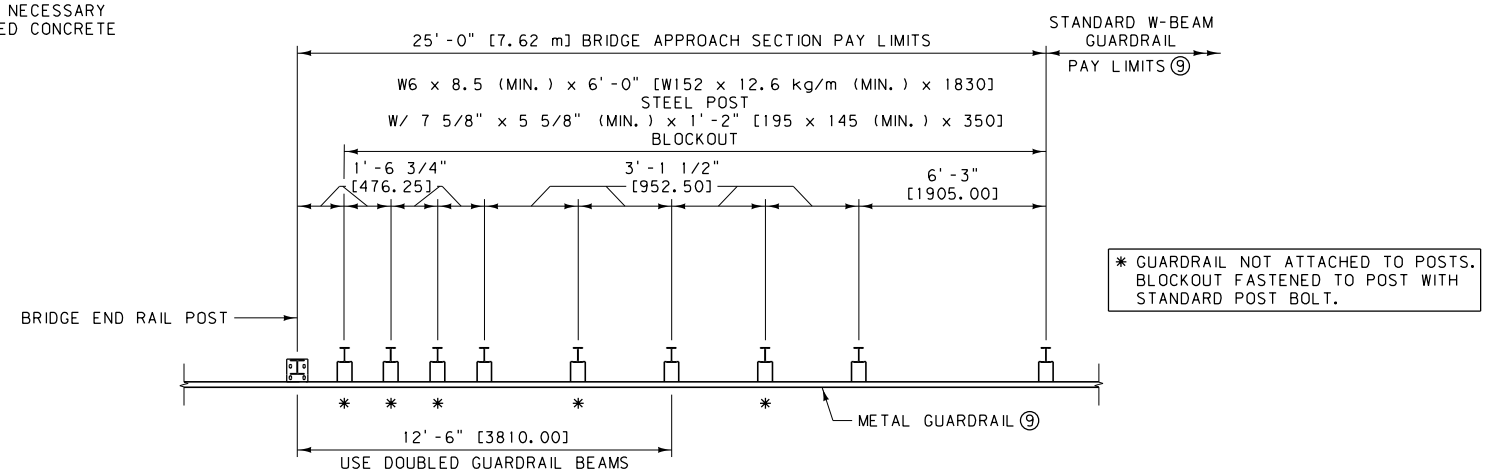


SECTION A-A

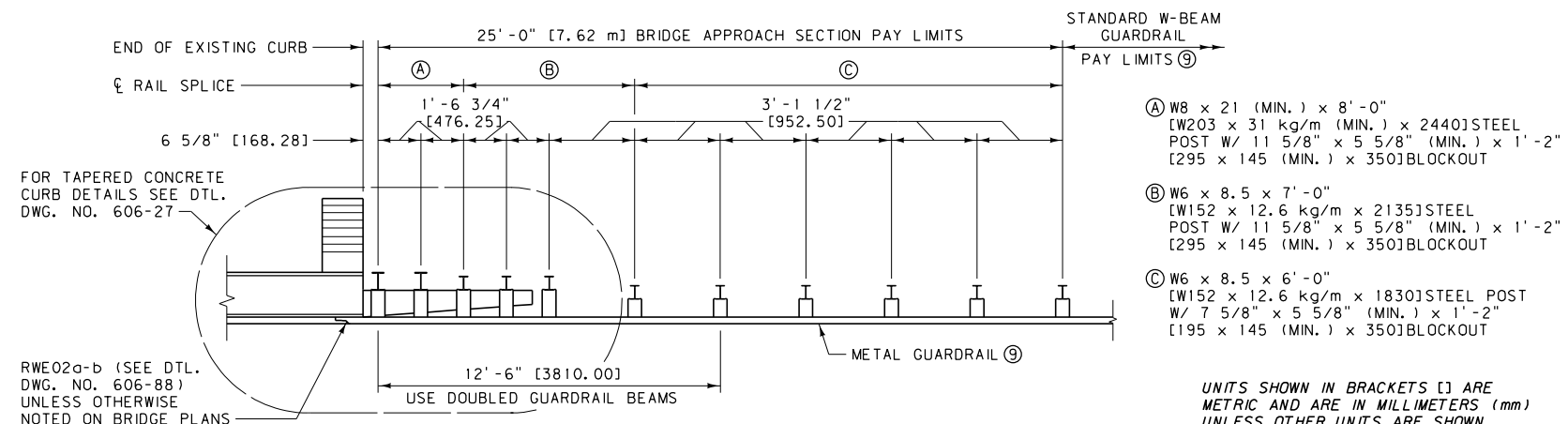
- NOTES:
- ① TAPERED CONCRETE CURBS:
TYPE 1, SEE DTL. DWG. NO. 606-26
TYPE 3, SEE DTL. DWG. NO. 606-27
 - ② TAPERED CONCRETE CURBS ARE ALSO REQUIRED ON CONCRETE APPROACH SLABS.
 - ③ PORTIONS OF GUARDRAIL & BLOCKOUTS ARE OMITTED FOR CLARITY.
 - ④ LAP GUARDRAIL IN THE DIRECTION OF THE ADJACENT TRAFFIC LANE. (SEE DTL. DWG. NO. 606-05B).
 - ⑤ LAP W-BEAM TERMINAL CONNECTOR (RWE02a-b) IN THE DIRECTION OF THE ADJACENT TRAFFIC LANE.
 - ⑥ USE ROUTED WOOD BLOCKS OR OTHER NCHRP 350 APPROVED BLOCKS FOR BLOCKOUTS.
 - ⑦ DO NOT FLARE BRIDGE APPROACH SECTIONS.
 - ⑧ SEE DTL. DWG. NO. 606-25B FOR SKEWED BRIDGES.
 - ⑨ SEE DTL. DWG. NO. 606-05B FOR METAL GUARDRAIL (W-BEAM).
- * SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.



METAL GUARDRAIL-BRIDGE APPROACH SECTION TYPE 1
(FOR BRIDGES USING CONCRETE BARRIER RAIL)



METAL GUARDRAIL-BRIDGE APPROACH SECTION TYPE 2
(FOR BRIDGES WITHOUT CURBS)



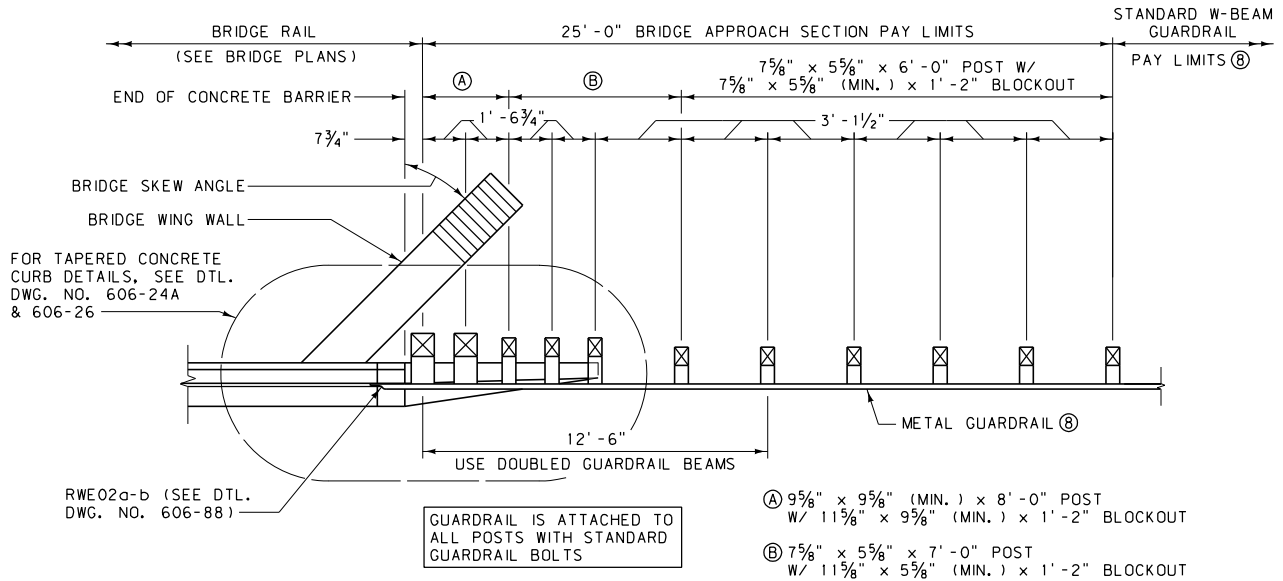
METAL GUARDRAIL-BRIDGE APPROACH SECTION TYPE 3
(FOR BRIDGES WITH EXISTING CONCRETE CURBS)

UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

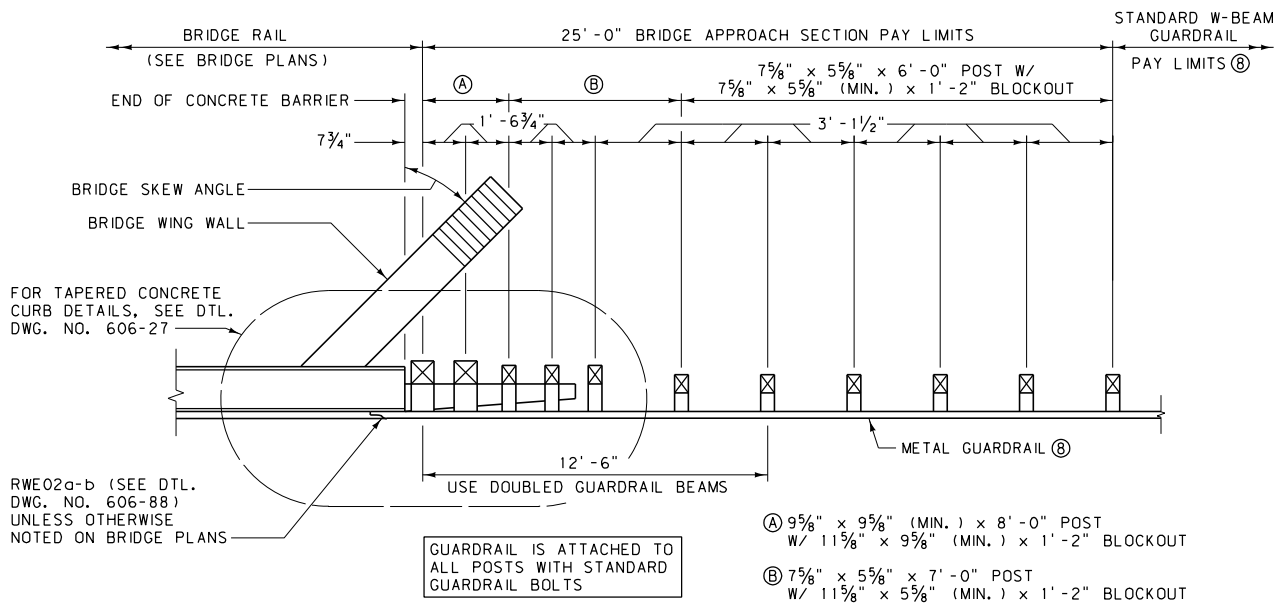
DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	606-24B
SECTION 606	
BRIDGE APPROACH SECTIONS - STEEL POSTS	

--REVISED--	EFFECTIVE: FEBRUARY 2005
JANUARY 2008	
DECEMBER 2011	

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METAL GUARDRAIL-BRIDGE APPROACH SECTION TYPE 1
(FOR SKEWED BRIDGES USING CONCRETE BARRIER RAIL)

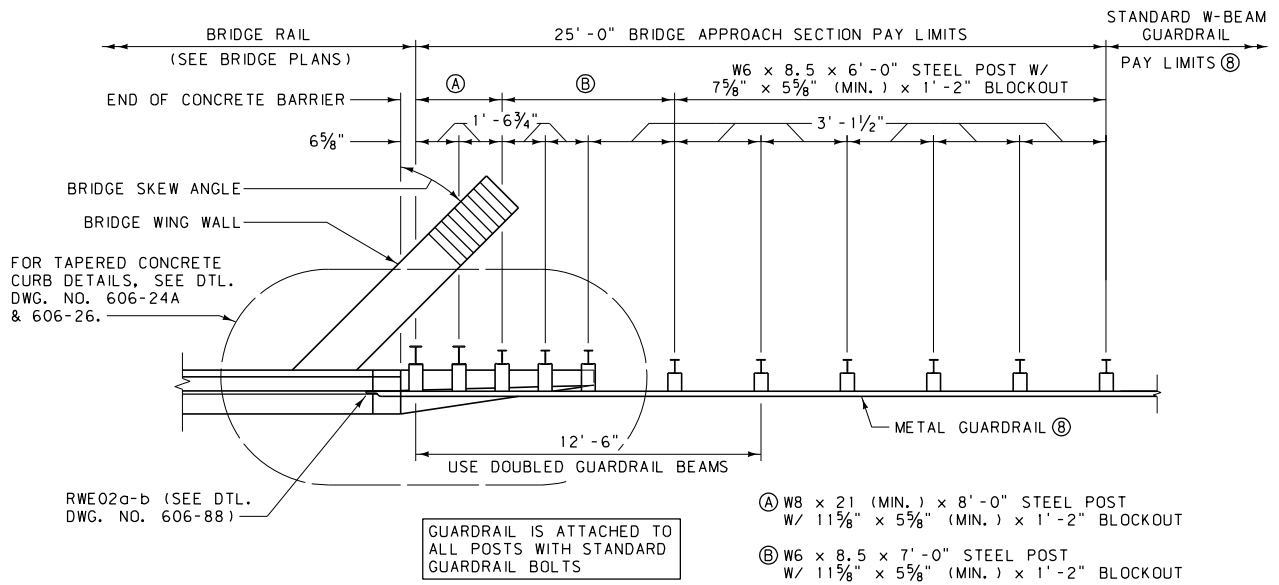


METAL GUARDRAIL-BRIDGE APPROACH SECTION TYPE 3
(FOR SKEWED BRIDGES WITH EXISTING CONCRETE CURBS)

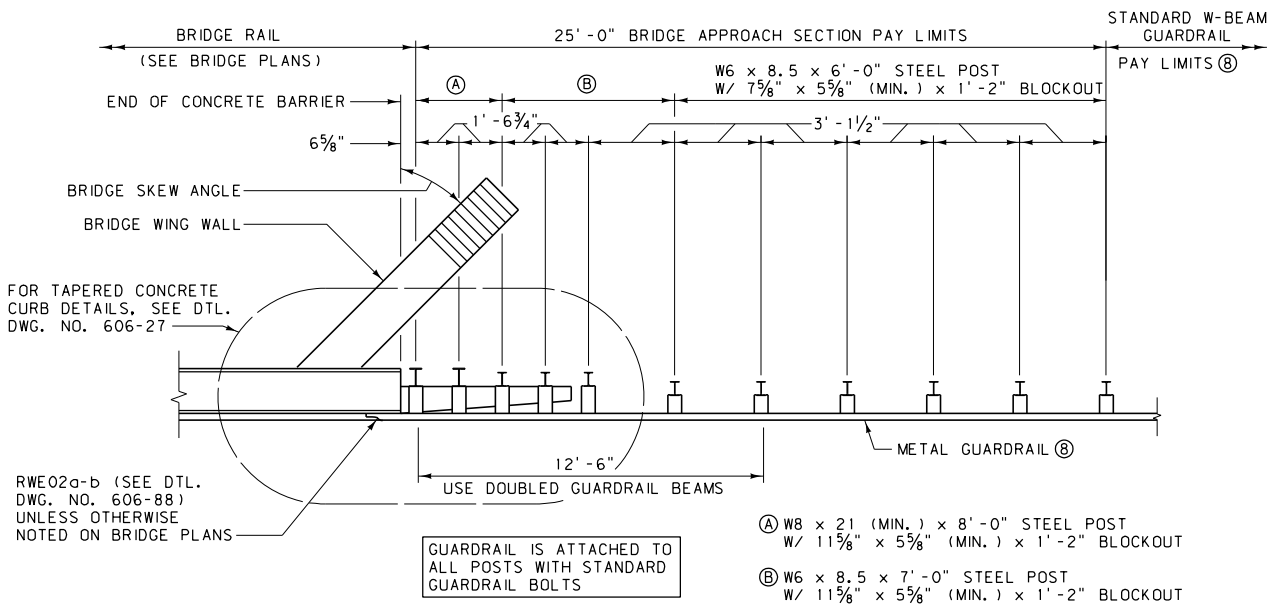
NOTES:

- ① TAPERED CONCRETE CURBS:
TYPE 1, SEE DTL. DWG. NO. 606-26
TYPE 3, SEE DTL. DWG. NO. 606-27
- ② TAPERED CONCRETE CURBS ARE ALSO REQUIRED ON CONCRETE APPROACH SLABS.
- ③ LAP GUARDRAIL IN THE DIRECTION OF THE ADJACENT TRAFFIC LANE.
(SEE DTL. DWG. NO. 606-05A).
- ④ LAP W-BEAM TERMINAL CONNECTOR (RWE02a-b) IN THE DIRECTION OF THE ADJACENT TRAFFIC LANE.
- ⑤ USE WOOD BLOCKS OR OTHER NCHRP 350 APPROVED BLOCKS FOR BLOCKOUTS.
- ⑥ DO NOT FLARE BRIDGE APPROACH SECTIONS.
- ⑦ SEE DTL. DWG. NO. 606-24A FOR ADDITIONAL INFORMATION.
- ⑧ SEE DTL. DWG. NO. 606-05A FOR METAL GUARDRAIL (W-BEAM).

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	606-25A
SECTION 606	
SKEWED BRIDGE APPROACH SECTIONS - WOOD POSTS	
EFFECTIVE: FEBRUARY 2005	
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METAL GUARDRAIL-BRIDGE APPROACH SECTION TYPE 1
(FOR SKEWED BRIDGES USING CONCRETE BARRIER RAIL)

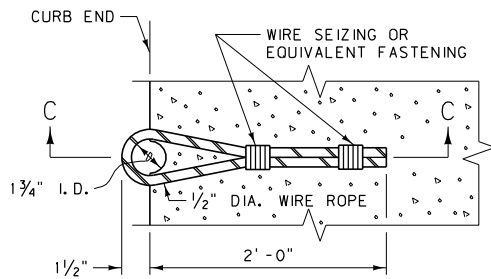


METAL GUARDRAIL-BRIDGE APPROACH SECTION TYPE 3
(FOR SKEWED BRIDGES WITH EXISTING CONCRETE CURBS)

NOTES:

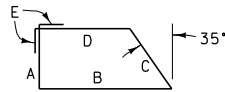
- ① TAPERED CONCRETE CURBS:
TYPE 1, SEE DTL. DWG. NO. 606-26
TYPE 3, SEE DTL. DWG. NO. 606-27
- ② TAPERED CONCRETE CURBS ARE ALSO REQUIRED ON CONCRETE APPROACH SLABS.
- ③ LAP GUARDRAIL IN THE DIRECTION OF THE ADJACENT TRAFFIC LANE. (SEE DTL. DWG. NO. 606-05B).
- ④ LAP W-BEAM TERMINAL CONNECTOR (RWE02a-b) IN THE DIRECTION OF THE ADJACENT TRAFFIC LANE.
- ⑤ USE WOOD BLOCKS OR OTHER NCHRP 350 APPROVED BLOCKS FOR BLOCKOUTS.
- ⑥ DO NOT FLARE BRIDGE APPROACH SECTIONS.
- ⑦ SEE DTL. DWG. NO. 606-24B FOR ADDITIONAL INFORMATION.
- ⑧ SEE DTL. DWG. NO. 606-05B FOR METAL GUARDRAIL (W-BEAM).

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 606	DWG. NO. 606-25B
SKEWED BRIDGE APPROACH SECTIONS - STEEL POSTS	
EFFECTIVE: FEBRUARY 2005	
 serving you with pride	MONTANA DEPARTMENT OF TRANSPORTATION



WIRE ROPE DETAIL

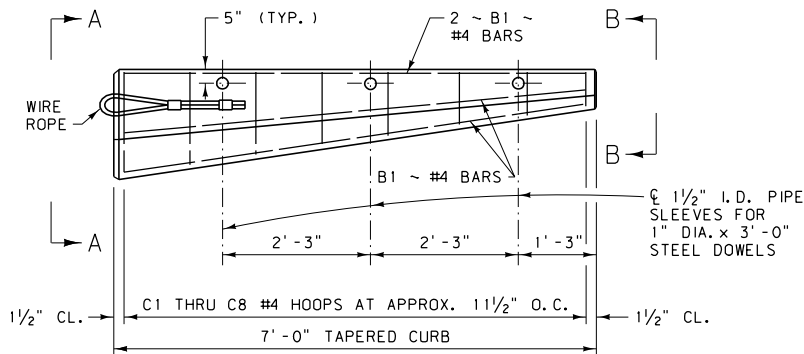
BILL OF REINFORCING STEEL (ONE SECTION ONLY)



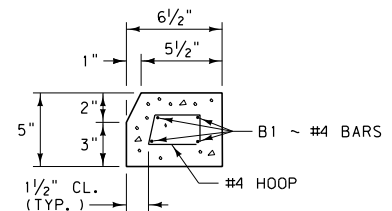
TYPE 1

BENT BARS (ALL DIMENSIONS ARE OUT TO OUT)

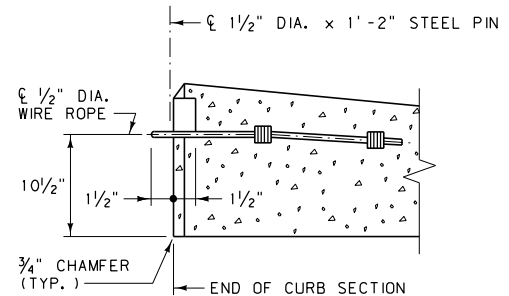
MARK	SIZE	NO.	TYPE	LENGTH	A	B	C	D	E
C1	#4	1	1	4' - 8"	11"	1' - 4"	1' - 1"	9"	3 1/2"
C2				4' - 2"	9 1/2"	1' - 2"	11 1/2"	8"	
C3				3' - 9"	8 1/2"	1' - 1/2"	10"	7"	
C4				3' - 3"	7"	10 1/2"	8"	6 1/2"	
C5				2' - 11"	6"	9"	7"	6"	
C6				2' - 4"	4"	7"	5"	5"	
C7				2' - 0"	3 1/2"	5 1/2"	3 1/2"	4 1/2"	3 1/2"
C8		1	1	1' - 6"	2"	3 1/2"	2"	3 1/2"	1 1/2"
B1	#4	4	STRAIGHT	6' - 9"	~	~	~	~	~



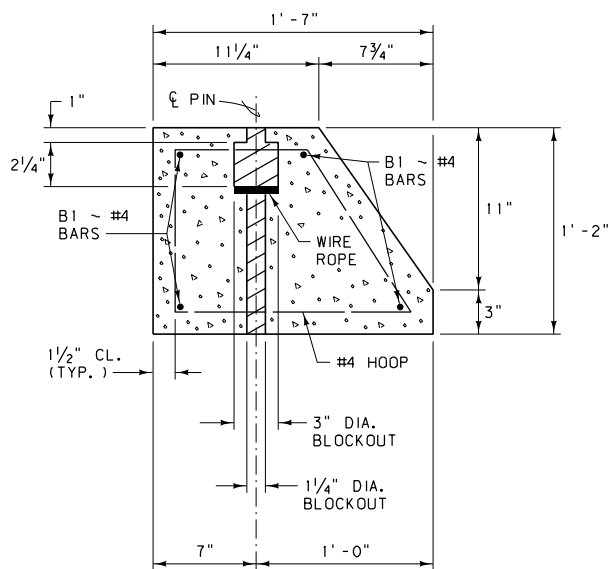
PLAN



VIEW B-B



SECTION C-C



VIEW A-A

NOTES:

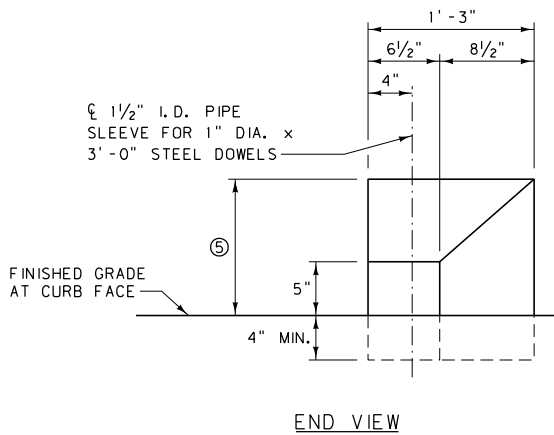
- ① TAPERED CONCRETE CURB IS USED WITH BRIDGE APPROACH SECTION TYPE 1 (SEE DTL. DWG. NO. 606-24A AND 606-24B).
- ② WIRE ROPE CONSISTS OF ZINC-COATED STEEL WIRE 7 STRAND UTILITY GRADE WITH A MINIMUM BREAKING STRENGTH OF 25,000 LB., CONFORMING TO ASTM SPECIFICATION A 475.
- ③ ALL REINFORCING STEEL IS OF THE DEFORMED TYPE, MEETING THE REQUIREMENTS OF AASHTO M 31 (ASTM A 615, GRADE 60).
- ④ ALL CONCRETE IS CLASS "DD".
TOTAL CONCRETE PER 7' TAPERED CURB EST. = 0.2 C. Y.
TOTAL REBAR WEIGHT PER 7' TAPERED CURB EST. = 34 LB.


DETAILED DRAWING

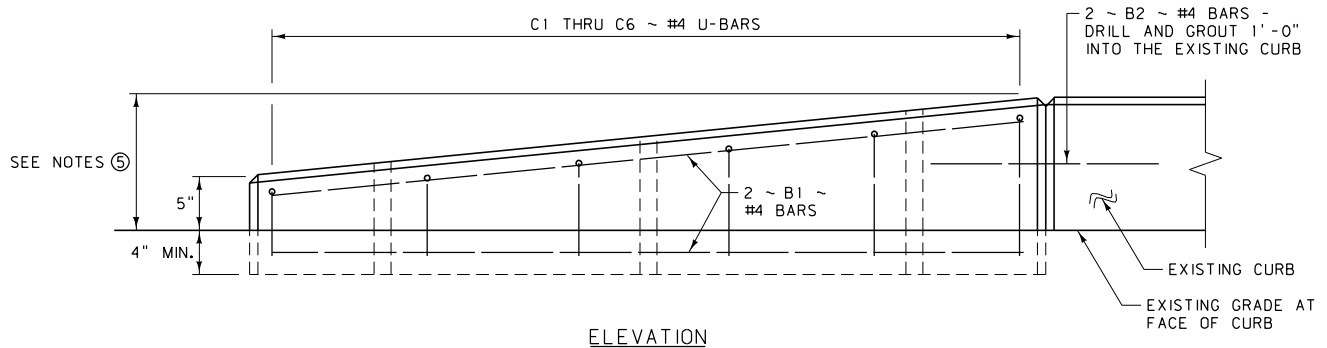
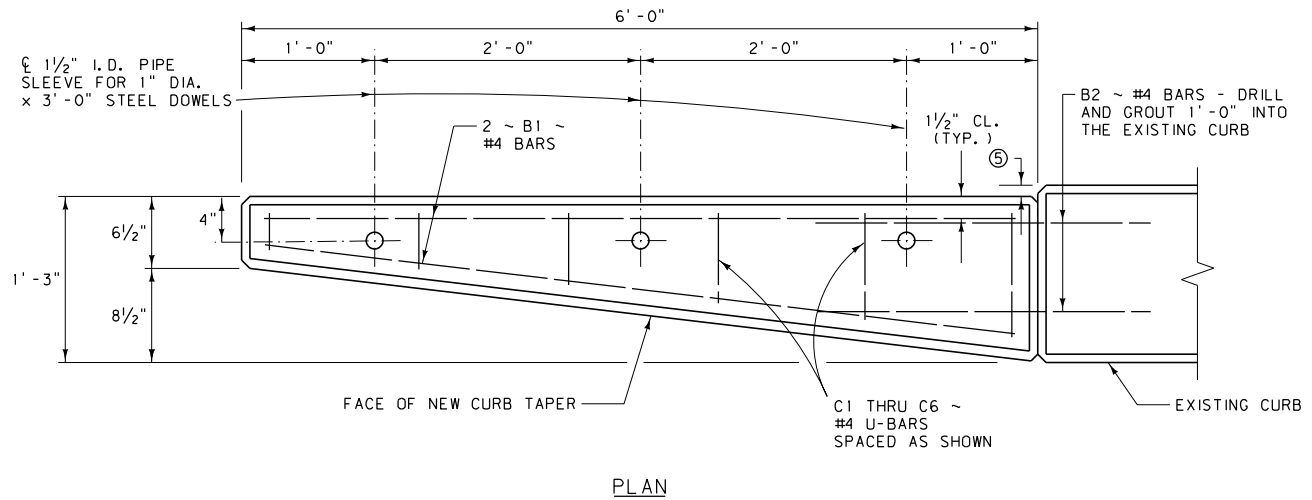
REFERENCE DWG. NO.
STANDARD SPEC. 606-26
SECTION 606

TAPERED CONCRETE
CURB DETAIL

EFFECTIVE: FEBRUARY 2005




BILL OF REINFORCING STEEL (ONE SECTION ONLY)						
 TYPE 1						
BENT BARS (ALL DIMENSIONS ARE OUT TO OUT)						
MARK	SIZE	NO.	TYPE	LENGTH	A	B
C1	#4	1	I	1'-4"	6"	4"
C2				1'-8"	7"	6"
C3				1'-11"	8"	7"
C4				2'-3"	9"	9"
C5				2'-6"	10"	10"
C6		1	I	2'-10"	11"	1'-0"
B1		4	STRAIGHT	5'-8"	~	~
B2	#4	2	STRAIGHT	2'-0"	~	~



NOTES:

- REMOVE THE EXISTING SURFACE UNDER THE NEW TAPERED CONCRETE CURB AS APPROVED BY THE ENGINEER. EMBED THE TAPERED CONCRETE CURB A MINIMUM OF 4" BELOW THE GRADE MEASURED AT THE INSIDE FACE OF THE TAPER.
- ALL REINFORCING STEEL IS OF THE DEFORMED TYPE, MEETING THE REQUIREMENTS OF AASHTO M 31 (ASTM A 615, GRADE 60).
- ALL CONCRETE IS CLASS "DD".
TOTAL CONCRETE PER 6' TAPERED CURB EST. = 0.2 C.Y.
TOTAL REBAR WEIGHT PER 6' TAPERED CURB EST. = 27 LB.
- TAPERED CONCRETE CURB IS USED WITH BRIDGE APPROACH SECTION TYPE 3 (SEE DTL. DWG. NO. 606-24A AND 606-24B).
- ADJUST DIMENSION TO MATCH EXISTING CURB.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 606	DWG. NO. 606-27
TAPERED CONCRETE CURB DETAIL	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION serving you with pride	

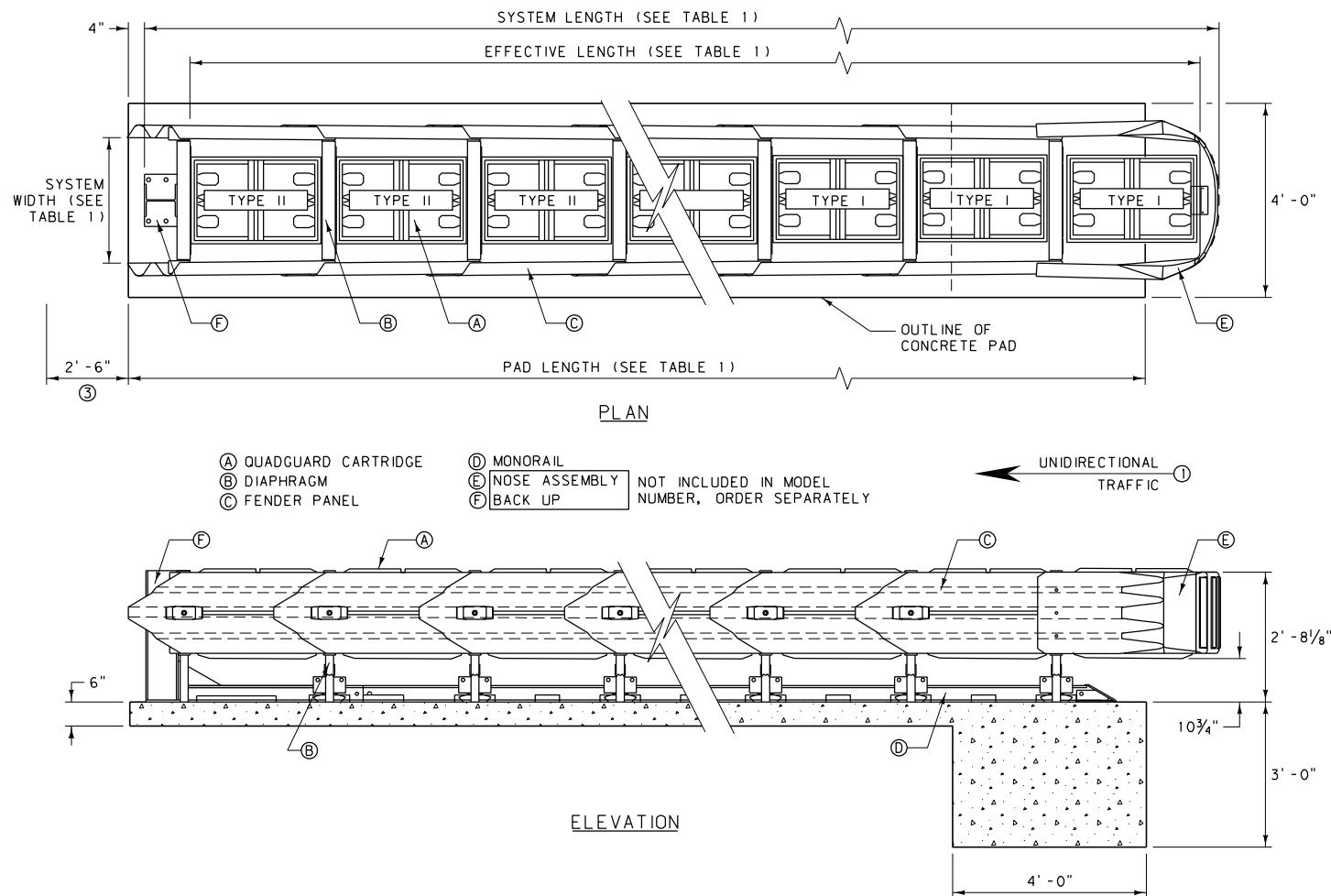


TABLE 1:

BAYS	24" WIDTH MODEL NO.	30" WIDTH MODEL NO.	36" WIDTH MODEL NO.	SYSTEM LENGTH	EFFECTIVE LENGTH	PAD LENGTH	MAX DESIGN SPEED (M. P. H.)	NO. OF CARTRIDGES	
								TYPE I	TYPE II
1	QS2401*	QS3001*	QS3601*	7' - 1"	5' - 8"	9' - 0"	25	2	0
2	QS2402*	QS3002*	QS3602*	10' - 1"	8' - 8"	9' - 0"	37	2	1
3	QS2403*	QS3003*	QS3603*	13' - 1"	11' - 8"	12' - 0"	44	3	1
4	QS2404*	QS3004*	QS3604*	16' - 1"	14' - 8"	15' - 0"	50	3	2
5	QS2405*	QS3005*	QS3605*	19' - 1"	17' - 8"	18' - 0"	56	4	2
6	QS2406*	QS3006*	QS3606*	22' - 1"	20' - 8"	21' - 0"	62	4	3
7	QS2407*	QS3007*	QS3607*	25' - 1"	23' - 8"	24' - 0"	65	4	4
8	QS2408*	QS3008*	QS3608*	28' - 1"	26' - 8"	27' - 0"	68	4	5
9	QS2409*	QS3009*	QS3609*	31' - 1"	29' - 8"	30' - 0"	71	4	6
10	QS2410*	QS3010*	QS3610*	34' - 1"	32' - 8"	33' - 0"	75	5	6
11	QS2411*	QS3011*	QS3611*	37' - 1"	35' - 8"	36' - 0"	75	5	7
12	QS2412*	QS3012*	QS3612*	40' - 1"	38' - 8"	39' - 0"	75	5	8

* G = GREY OR Y = YELLOW

NOTES:

- ATTACHMENT SHOWN IS TO SHAPES WITH RECTANGULAR CROSS SECTIONS SUCH AS: PIERS, PARAPETS AND MODIFIED CONCRETE BARRIER RAIL. TRAFFIC FLOW IS UNIDIRECTIONAL. ATTACHMENTS AND TRANSITIONS TO OTHER SHAPES, BARRIERS, RAILINGS AND BIDIRECTIONAL TRAFFIC FLOWS ARE AVAILABLE FROM THE MANUFACTURER.
- THE SYSTEM SHOWN INCLUDES THE TENSION STRUT BACKUP ASSEMBLY AND THE CONCRETE PAD AS DETAILED. SEE THE MANUFACTURER FOR DRAWINGS DETAILING THE REINFORCING STEEL FOR THE CONCRETE PAD AND FOR OTHER BACKUP & CONCRETE PAD OPTIONS.
- PROVIDE ADEQUATE CLEARANCE FOR THE DISTANCE SHOWN TO ALLOW FENDER PANELS TO SLIDE REARWARD UPON IMPACT.
- SEE MANUFACTURER FOR MORE INFORMATION ON SPECIFIC DESIGNS, INSTALLATION AND MAINTENANCE OF THE QUADGUARD SYSTEM.

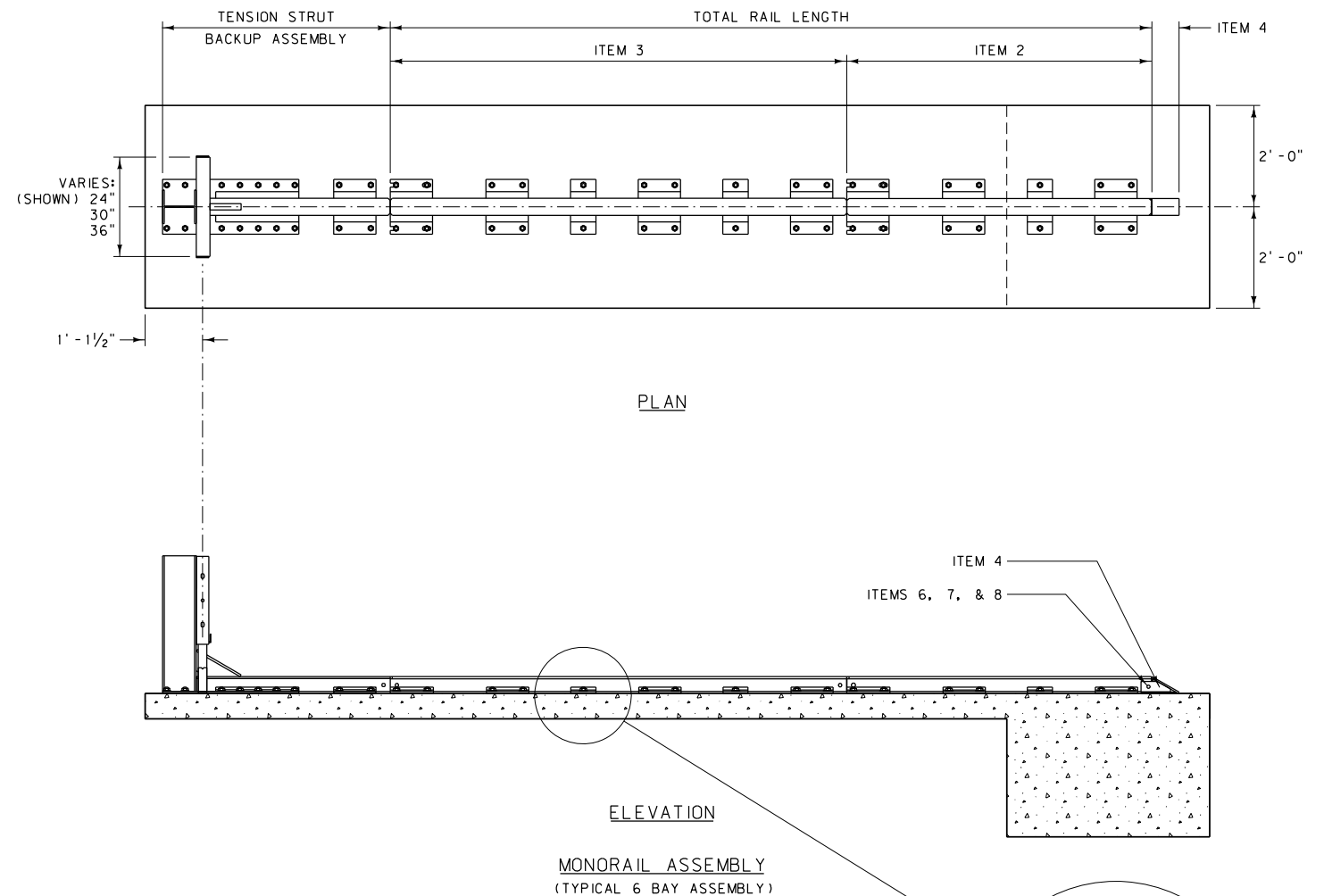
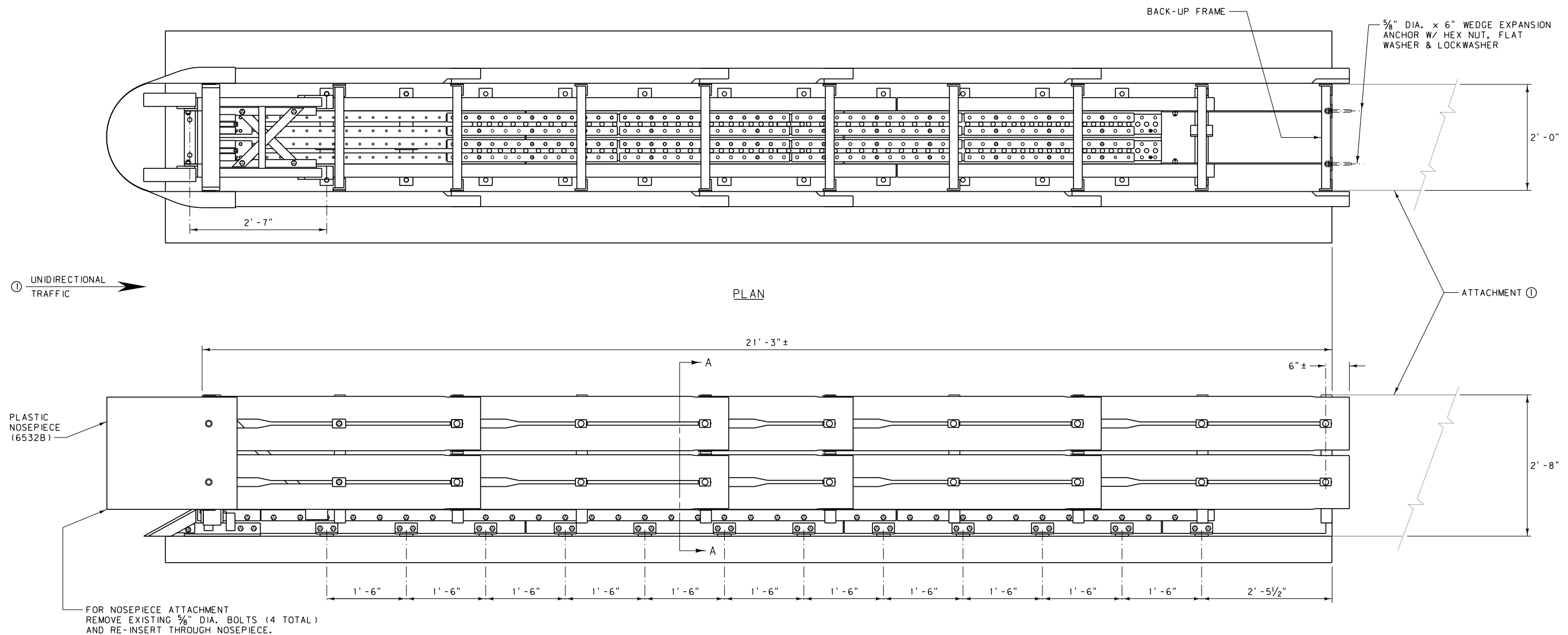


TABLE 2:

ITEM	STOCK NO.	DESCRIPTION	REQ'D
1	2760051-0000	MONORAIL, ONE BAY	#
2	2760061-0000	MONORAIL, TWO BAYS	#
3	2760071-0000	MONORAIL, THREE BAYS	#
4	2760041-0000	MONORAIL END CAP	1
5	3525300-0000	ANCHOR KIT	#
6	2699571-0000	5/8" DIA. x 3 1/2" HEX BOLT	1
7	2704141-0000	5/8" DIA. HEX NUT	1
8	2708231-0000	5/8" DIA. LOCK WASHER	1

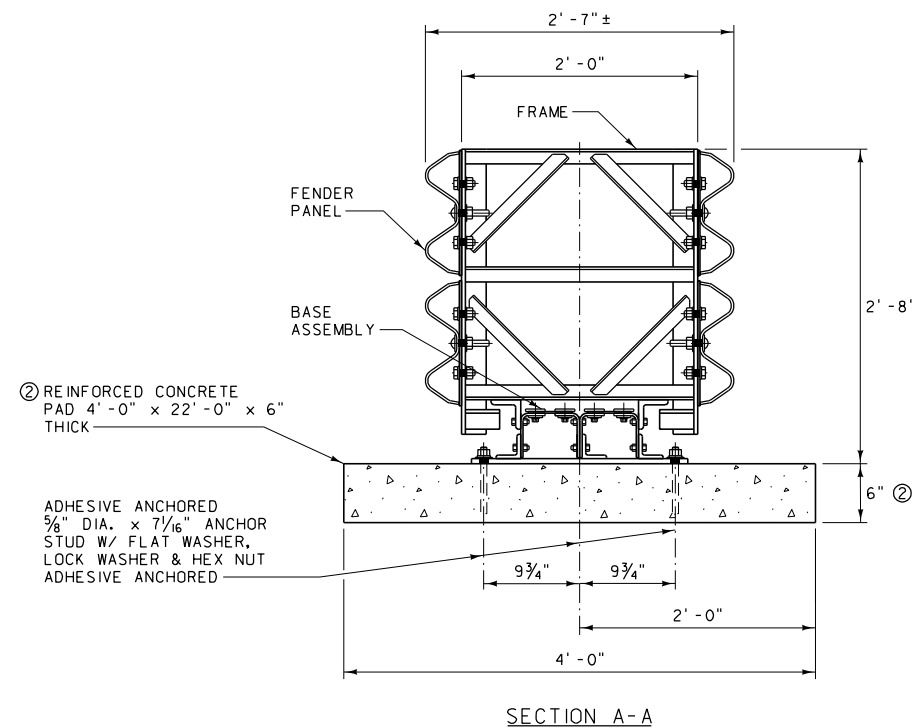
TABLE 3:

ASSEMBLY NO.	TOTAL RAIL LENGTH	# ITEM 1	# ITEM 2	# ITEM 3	# ITEM 5	NO. OF BAYS
3540060-0100	0"	0	0	0	0	1
3540060-0200	36.0"	1	0	0	2	2
3540060-0300	72.0"	0	1	0	3	3
3540060-0400	108.1"	0	0	1	4	4
3540060-0500	144.1"	1	0	1	5	5
3540060-0600	180.1"	0	1	1	6	6
3540060-0700	216.1"	0	0	2	7	7
3540060-0800	252.1"	1	0	2	8	8
3540060-0900	288.2"	0	1	2	9	9
3540060-1000	324.2"	0	0	3	10	10
3540060-1100	360.2"	1	0	3	12	11
3540060-1200	396.2"	0	1	3	13	12




TRACC BILL OF MATERIAL		
PART NUMBER	QTY	DESCRIPTION
* 25980A	1	TRACC UNIT (FULLY ASSEMBLED **)
3310G	4	5/8" DIA. LOCKWASHER
4451G	4	5/8" DIA. x 6" WEDGE EXP. ANCHOR
6825B	4	REFLECTIVE TAPE
6532B	1	PLASTIC NOSEPIECE
ANCHOR HARDWARE (FULL CONCRETE BASE)		
5204G	26	5/8" DIA. x 7 1/16" ANCHOR STUD
3310G	26	5/8" DIA. LOCKWASHER
3361G	26	5/8" DIA. HEX NUT
3300G	26	5/8" DIA. FLAT WASHER
5206B	3	ADHESIVE HIT HY 150 (CARTRIDGE)
ANCHOR HARDWARE (ASPHALT BASE)		
6380G	26	5/8" DIA. x 18" ALL THREADED ROD
3310G	26	5/8" DIA. LOCKWASHER
3361G	26	5/8" DIA. HEX NUT
3300G	26	5/8" DIA. FLAT WASHER
5206B	5	ADHESIVE HIT HY 150 (CARTRIDGE)

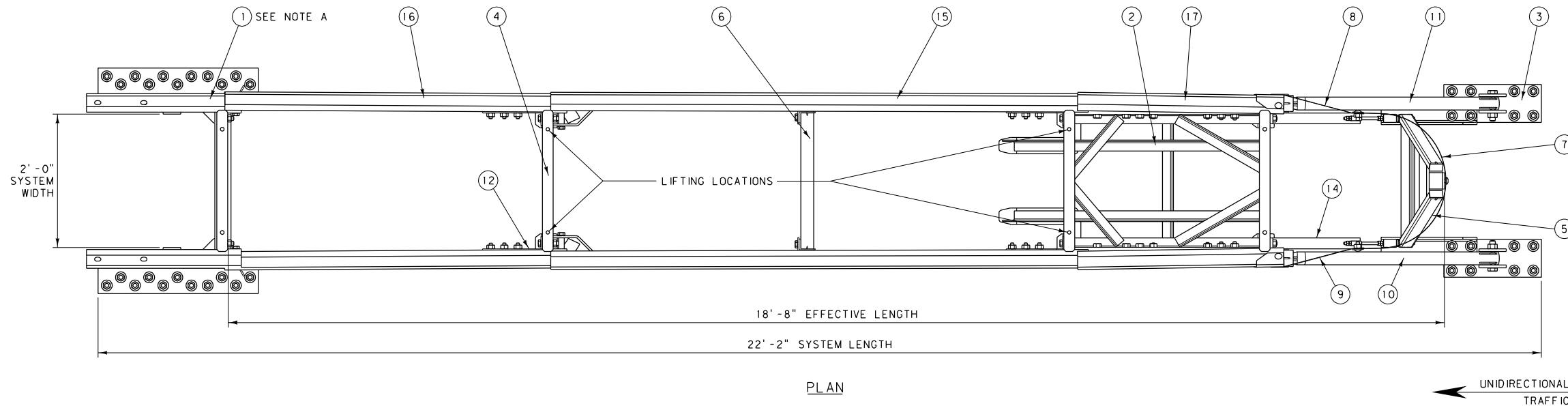
* SEE DET. DWG. NO. 606-31B
 ** EACH UNIT SHIPS 100% ASSEMBLED
 (PLASTIC NOSE INSTALLED AFTER PLACEMENT)



NOTES:

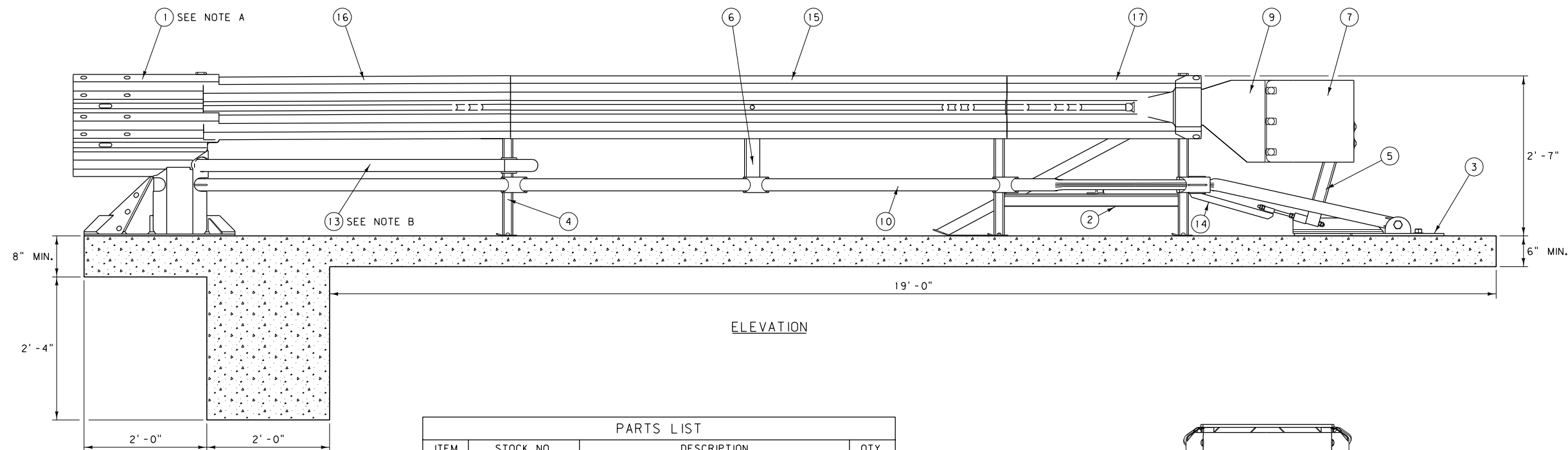
- ATTACHMENT SHOWN IS TO SHAPES WITH RECTANGULAR CROSS SECTIONS SUCH AS: PIERS, PARAPETS, AND MODIFIED CONCRETE BARRIER RAIL. TRAFFIC FLOW IS UNIDIRECTIONAL. ATTACHMENTS AND TRANSITIONS TO OTHER SHAPES, BARRIERS, RAILINGS AND BIDIRECTIONAL TRAFFIC FLOWS ARE AVAILABLE FROM THE MANUFACTURER.
- A 6" REINFORCED CONCRETE PAD IS SHOWN. OTHER FOUNDATION OPTIONS ARE:
 - 8" THICK UNREINFORCED CONCRETE
 - 8" THICK ASPHALT
 - 3" THICK ASPHALT OVER 3" THICK CONCRETE
 - 6" THICK ASPHALT OVER 6" THICK COMPACTED SUBBASE
- REINFORCEMENT DRAWINGS FOR THE REINFORCED CONCRETE PAD SHOWN ARE AVAILABLE FROM THE MANUFACTURER.
- SEE MANUFACTURER FOR MORE INFORMATION ON SPECIFIC DESIGNS, PRODUCT OPTIONS, INSTALLATION AND MAINTENANCE OF THE TRACC SYSTEM.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 606	DWG. NO. 606-30B
IMPACT ATTENUATOR - TRACC	
EFFECTIVE: APRIL 2006	
 MONTANA DEPARTMENT OF TRANSPORTATION serving you with pride	

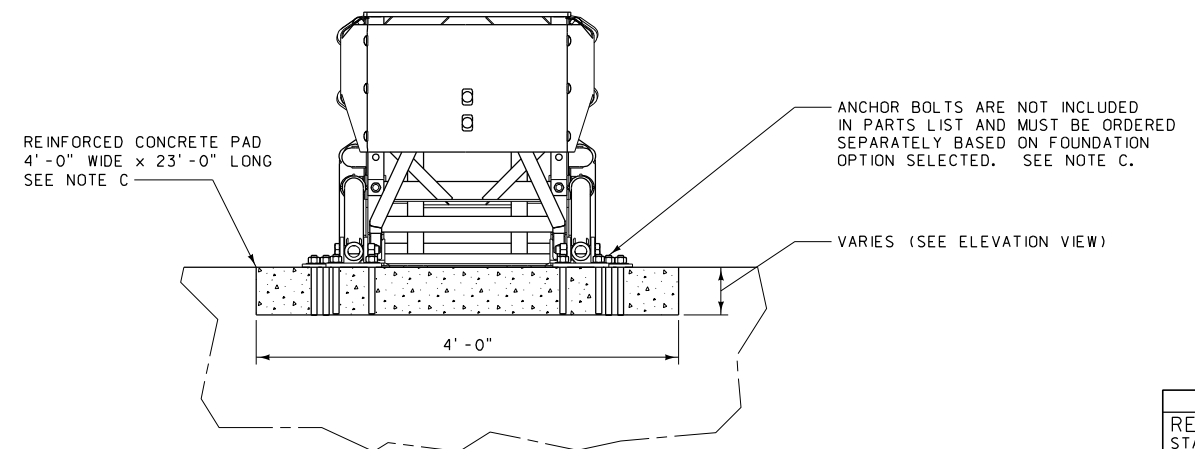



NOTES:

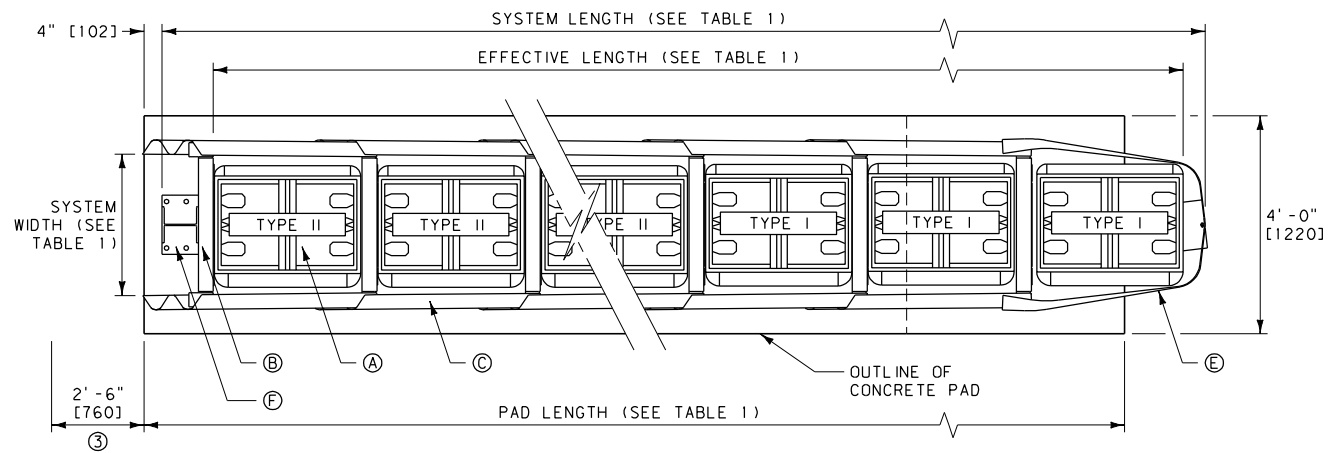
- Ⓐ ATTACHMENT SHOWN IS TO SHAPES WITH RECTANGULAR CROSS SECTIONS SUCH AS: PIERS, PARAPETS, AND MODIFIED CONCRETE BARRIER RAIL. TRAFFIC FLOW IS UNIDIRECTIONAL. ATTACHMENTS AND TRANSITIONS TO OTHER SHAPES, BARRIERS, RAILINGS AND BIDIRECTIONAL TRAFFIC FLOWS ARE AVAILABLE FROM THE MANUFACTURER.
- Ⓑ PROVIDE ADEQUATE CLEARANCE (5'-0" MIN.) TO ALLOW REAR RAILS TO SLIDE REARWARD UPON IMPACT.
- Ⓒ A 6" REINFORCED CONCRETE PAD IS SHOWN. OTHER FOUNDATION OPTIONS ARE:
- a) 8" THICK UNREINFORCED CONCRETE
 - b) 8" THICK ASPHALT
 - c) 3' THICK ASPHALT OVER 3" THICK CONCRETE
 - d) 6" THICK ASPHALT OVER 6" THICK COMPACTED SUBBASE
 - e) 7" THICK REINFORCED DECK STRUCTURE
- SEE MANUFACTURER FOR REINFORCEMENT DRAWINGS AND ANCHORAGE REQUIREMENTS FOR ALL FOUNDATION OPTIONS.
- Ⓓ SEE MANUFACTURER FOR MORE INFORMATION ON SPECIFIC DESIGNS, INSTALLATION AND MAINTENANCE OF THE QUEST SYSTEM.



PARTS LIST			
ITEM	STOCK NO.	DESCRIPTION	QTY.
1	3562003-0000	BACKUP ASSEMBLY, 24, QUEST	1
2	3562002-0000	SUPPORT FRAME ASSY, BAY 1, 24, QUEST	1
3	2762015-0000	ANCHOR, FRONT, QUEST, G	2
4	3562005-0000	DIAPHRAGM ASSEMBLY, 24, BAY 3, QUEST	1
5	3562001-0000	TRIGGER ASSEMBLY, QUEST	1
6	3562004-0000	BRIDGE, 24, BAY 2, QUEST	1
7	2762026-0000	NOSE, QUEST, G	1
8	2762024-0000	NOSE TRANSITION, R, QUEST, G	1
9	2762025-0000	NOSE TRANSITION, L, QUEST, G	1
10	276200L-0000	SHAPER RAIL, L, QUEST, G	1
11	276200R-0000	SHAPER RAIL, R, QUEST, G	1
12	2762022-0000	BRACKET, PANEL, DIAPHRAGM, G	2
13	2762023-0000	REAR RAIL, QUEST, G	2
14	2762007-0000	TRIGGER STRAP, QUEST, G	2
15	2762013-0000	PANEL, BAY 2, QUEST, G	2
16	2762014-0000	PANEL, BAY 3, QUEST, G	2
17	2762033-0000	PANEL, BAY 1, QUEST, G	2



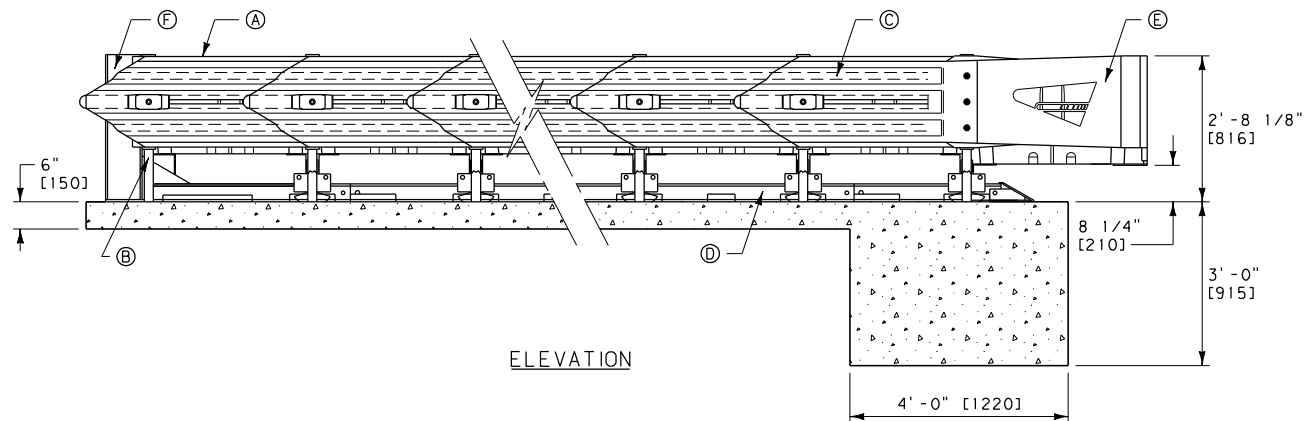
DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	606-30C
SECTION 606	
IMPACT ATTENUATOR - QUEST	
EFFECTIVE: APRIL 2006	
 serving you with pride	MONTANA DEPARTMENT OF TRANSPORTATION



PLAN

- (A) QUADGUARD CARTRIDGE
 (B) DIAPHRAGM
 (C) FENDER PANEL
 (D) MONORAIL
 (E) NOSE ASSEMBLY
 (F) BACK UP
- NOT INCLUDED IN MODEL NUMBER, ORDER SEPARATELY

UNIDIRECTIONAL TRAFFIC ①



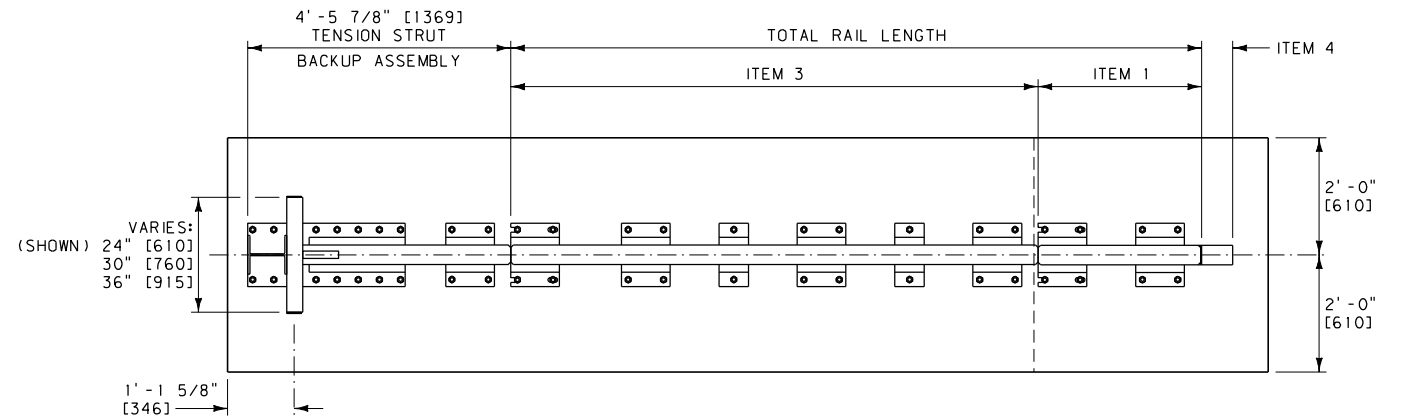
ELEVATION

TABLE 1:

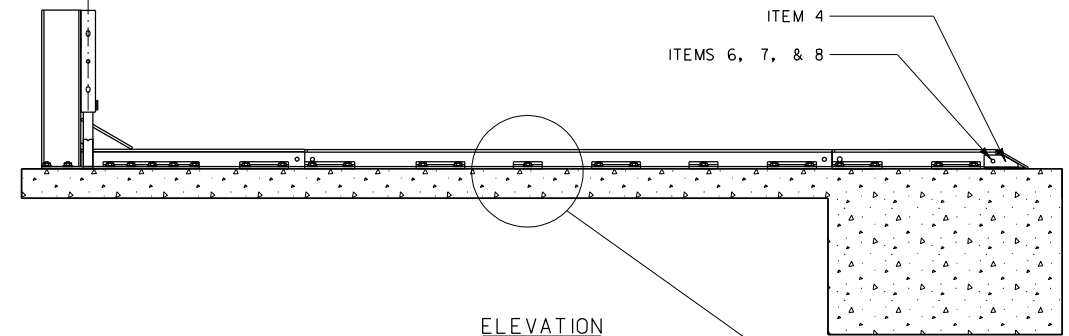
BAYS	24" [610] WIDTH MODEL NO.	30" [760] WIDTH MODEL NO.	36" [915] WIDTH MODEL NO.	SYSTEM LENGTH	METRIC SYSTEM LENGTH (m)	EFFECTIVE LENGTH	METRIC EFFECTIVE LENGTH (m)	PAD LENGTH	METRIC PAD LENGTH (m)	MAX DESIGN SPEED (M. P. H.)	METRIC MAX DESIGN SPEED (km/hr)	NO. OF CARTRIDGES	
												TYPE I	TYPE II
1	QG24024	QG24030	QG24036	7' -0"	2.13	5' -8"	1.73	9' -0"	2.74	25	40	2	0
2	QG27024	QG27030	QG27036	10' -0"	3.05	8' -8"	2.64	9' -0"	2.74	43	70	2	1
3	QG28024	QG28030	QG28036	13' -0"	3.96	11' -8"	3.56	12' -0"	3.66	50	80	2	2
4	QG29024	QG29030	QG29036	16' -0"	4.87	14' -8"	4.47	15' -0"	4.57	56	90	3	2
5	QG210024	QG210030	QG210036	19' -0"	5.79	17' -8"	5.38	18' -0"	5.49	62	100	3	3
6	QG210524	QG210530	QG210536	22' -0"	6.71	20' -8"	6.30	21' -0"	6.40	65	105	4	3
7	QG212024	QG211030	QG211036	25' -0"	7.63	23' -8"	7.21	24' -0"	7.32	68	110	4	4
8	QG211524	QG211530	QG211536	28' -0"	8.53	26' -8"	8.13	27' -0"	8.23	71	115	4	5
9	QG212024	QG212030	QG212036	31' -0"	9.45	29' -8"	9.04	30' -0"	9.14	75	120	4	6

NOTES:

- ATTACHMENT SHOWN IS TO SHAPES WITH RECTANGULAR CROSS SECTIONS SUCH AS: PIERS, PARAPETS AND MODIFIED CONCRETE BARRIER RAIL. TRAFFIC FLOW IS UNIDIRECTIONAL. ATTACHMENTS AND TRANSITIONS TO OTHER SHAPES, BARRIERS, RAILINGS AND BIDIRECTIONAL TRAFFIC FLOWS ARE AVAILABLE FROM THE MANUFACTURER.
- THE SYSTEM SHOWN INCLUDES THE TENSION STRUT BACKUP ASSEMBLY AND THE CONCRETE PAD AS DETAILED. SEE THE MANUFACTURER FOR DRAWINGS DETAILING THE REINFORCING STEEL FOR THE CONCRETE PAD AND FOR OTHER BACKUP & CONCRETE PAD OPTIONS.
- PROVIDE ADEQUATE CLEARANCE FOR THE DISTANCE SHOWN TO ALLOW FENDER PANELS TO SLIDE REARWARD UPON IMPACT.
- SEE MANUFACTURER FOR MORE INFORMATION ON SPECIFIC DESIGNS, INSTALLATION AND MAINTENANCE OF THE QUADGUARD II SYSTEM.



PLAN



ELEVATION

MONORAIL ASSEMBLY
(TYPICAL 5 BAY ASSEMBLY)

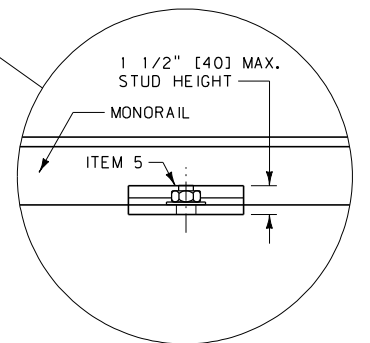


TABLE 2:

ITEM	STOCK NO.	DESCRIPTION	METRIC DESCRIPTION	REQ'D
1	2760051-0000	MONORAIL, ONE BAY	MONORAIL, ONE BAY	#
2	2760061-0000	MONORAIL, TWO BAYS	MONORAIL, TWO BAYS	#
3	2760071-0000	MONORAIL, THREE BAYS	MONORAIL, THREE BAYS	#
4	2760041-0000	MONORAIL END CAP	MONORAIL END CAP	1
5	3525300-0000	ANCHOR KIT	ANCHOR KIT	#
6	2699571-0000	5/8" DIA. x 3 1/2" HEX BOLT	M16 x 89 HEX BOLT	1
7	2704141-0000	5/8" DIA. HEX NUT	M16 HEX NUT	1
8	2708231-0000	5/8" DIA. LOCK WASHER	M16 LOCK WASHER	1

- SEE TABLE 3 BELOW

TABLE 3:

ASSEMBLY NO.	TOTAL RAIL LENGTH	METRIC TOTAL RAIL LENGTH (mm)	# ITEM 1	# ITEM 2	# ITEM 3	# ITEM 5	NO. OF BAYS
3540060-0100	0"	0	0	0	0	0	1
3540060-0200	36.0"	915	1	0	0	2	2
3540060-0300	72.0"	1 830	0	1	0	3	3
3540060-0400	108.1"	2 745	0	0	1	4	4
3540060-0500	144.1"	3 660	1	0	1	5	5
3540060-0600	180.1"	4 575	0	1	1	6	6
3540060-0700	216.1"	5 490	0	0	2	7	7
3540060-0800	252.1"	6 405	1	0	2	8	8
3540060-0900	288.2"	7 320	0	1	2	9	9

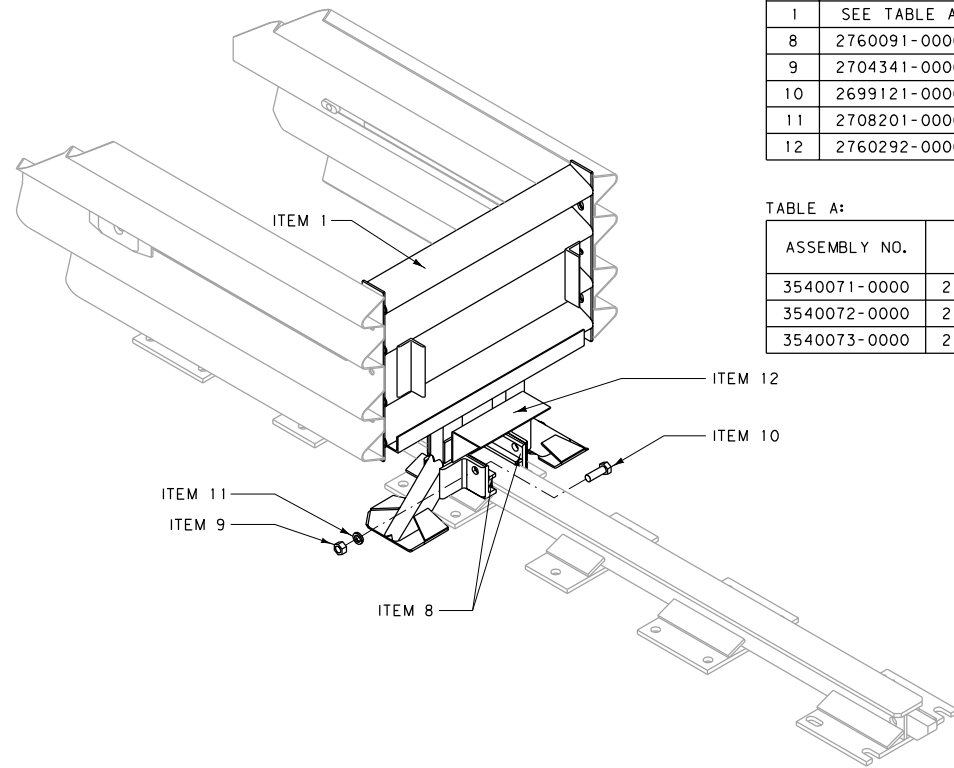
UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 606	DWG. NO. 606-30D

IMPACT ATTENUATOR -
QUADGUARD II

EFFECTIVE: MAY 2011

MDT MONTANA DEPARTMENT OF TRANSPORTATION

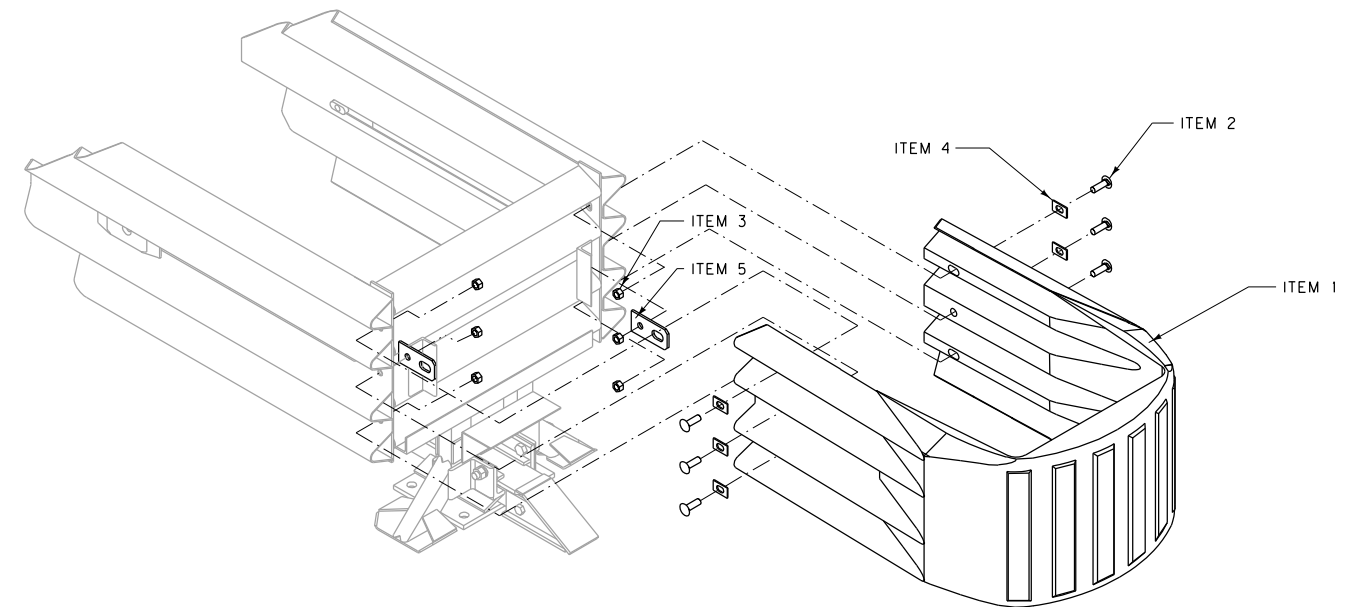


ITEM	STOCK NO.	DESCRIPTION	REQ'D
1	SEE TABLE A	DIAPHRAGM	1
8	2760091-0000	MONORAIL GUIDE	2
9	2704341-0000	3/4" DIA. HEX NUT	4
10	2699121-0000	3/4" DIA. x 2" HEX BOLT	4
11	2708201-0000	3/4" DIA. LOCK WASHER	4
12	2760292-0000	CARTRIDGE SUPPORT BRACKET	2

TABLE A:

ASSEMBLY NO.	STOCK NO.	DESCRIPTION
3540071-0000	2761011-0000	24" WIDE DIAPHRAGM
3540072-0000	2761021-0000	30" WIDE DIAPHRAGM
3540073-0000	2761031-0000	36" WIDE DIAPHRAGM

DIAPHRAGM ASSEMBLY

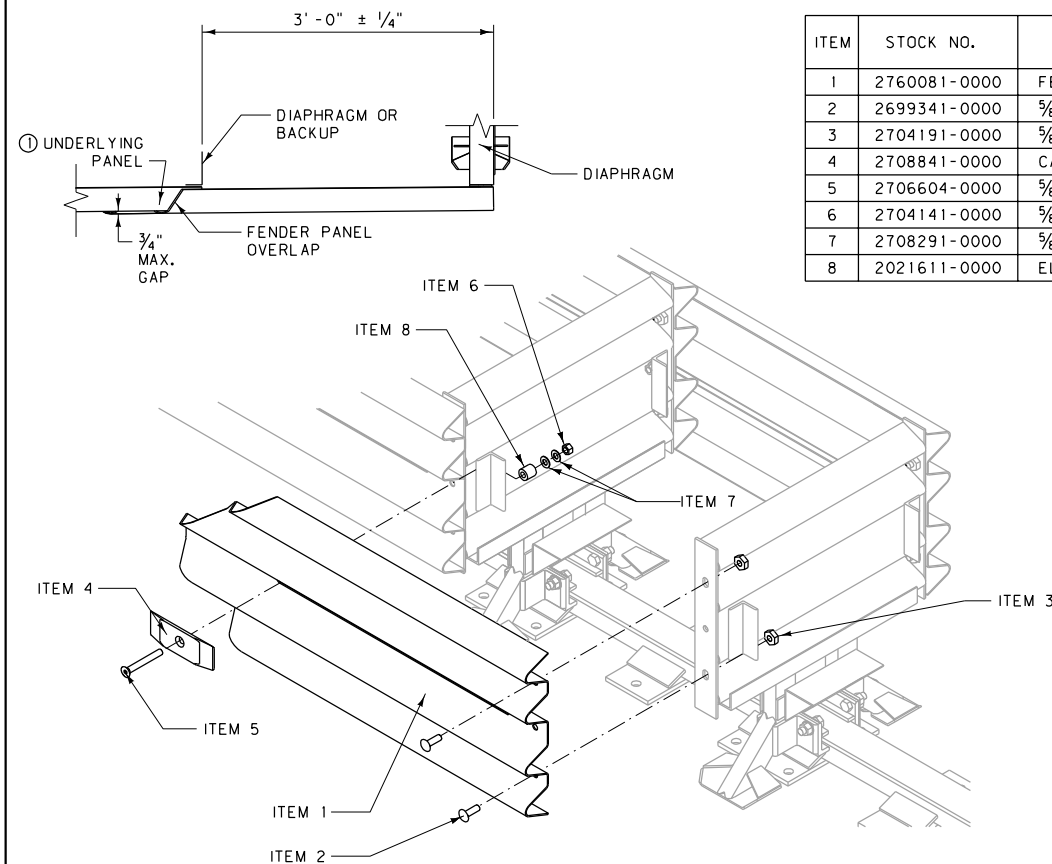


ITEM	STOCK NO.	DESCRIPTION	REQ'D
1	3540130-0*00	NOSE, W/ SUPPORT BRACKET	1
2	2699341-0000	5/8" DIA. x 2" RAIL BOLT	6
3	2704191-0000	5/8" DIA. HEX NUT	6
4	2708871-0000	WASHER (BAR 1/8" x 1 1/4" x 2", W/ 5/8" DIA. HOLE)	6
5	2760251-0000	PULL-OUT BRACKET	2

* 0 INDICATES GRAY
* 1 INDICATES YELLOW

NOSE ASSEMBLY

ASSEMBLY NO. 3540050-0100 (YELLOW)
ASSEMBLY NO. 3540050-0000 (GRAY)

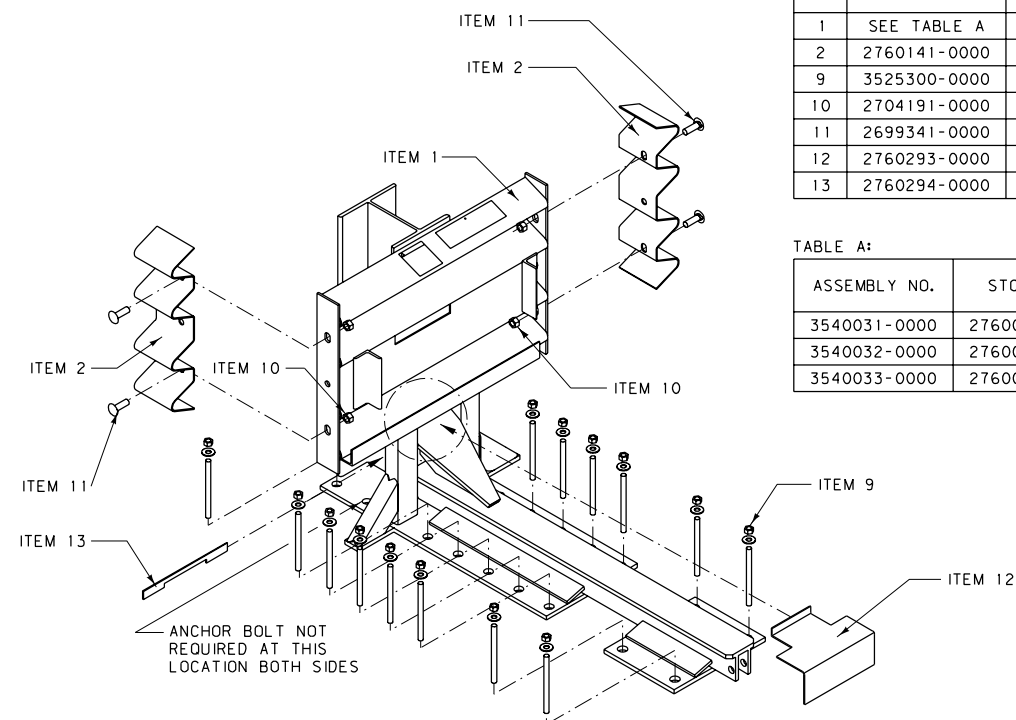


ITEM	STOCK NO.	DESCRIPTION	REQ'D
1	2760081-0000	FENDER PANEL	1
2	2699341-0000	5/8" DIA. x 2" RAIL BOLT	2
3	2704191-0000	5/8" DIA. HEX NUT	2
4	2708841-0000	CAST MUSHROOM WASHER	1
5	2706604-0000	5/8" DIA. x 5" SCREW	1
6	2704141-0000	5/8" DIA. HEX NUT	1
7	2708291-0000	5/8" DIA. WASHER	4
8	2021611-0000	ELASTOMERIC BUSHING	1

NOTE:

- ① UNDERLYING PANEL IS EITHER ANOTHER FENDER PANEL OR, IN THE CASE OF THE LAST FENDER PANEL IT COULD BE A BACKUP SIDE PANEL, EXTENSION PANEL OR TRANSITION PANEL.
- ② TWO FENDER PANEL ASSEMBLIES ARE REQUIRED PER BAY.

FENDER PANEL ASSEMBLY
ASSEMBLY NO. 3540040-0000



ITEM	STOCK NO.	DESCRIPTION	REQ'D
1	SEE TABLE A	TENSION BACKUP	1
2	2760141-0000	SIDE PANEL	2
9	3525300-0000	ANCHOR KIT	3
10	2704191-0000	5/8" DIA. HEX NUT	4
11	2699341-0000	5/8" DIA. x 2" RAIL BOLT	4
12	2760293-0000	CARTRIDGE SUPPORT BRACKET	1
13	2760294-0000	CARTRIDGE SUPPORT LOCKING BAR	1


TABLE A:

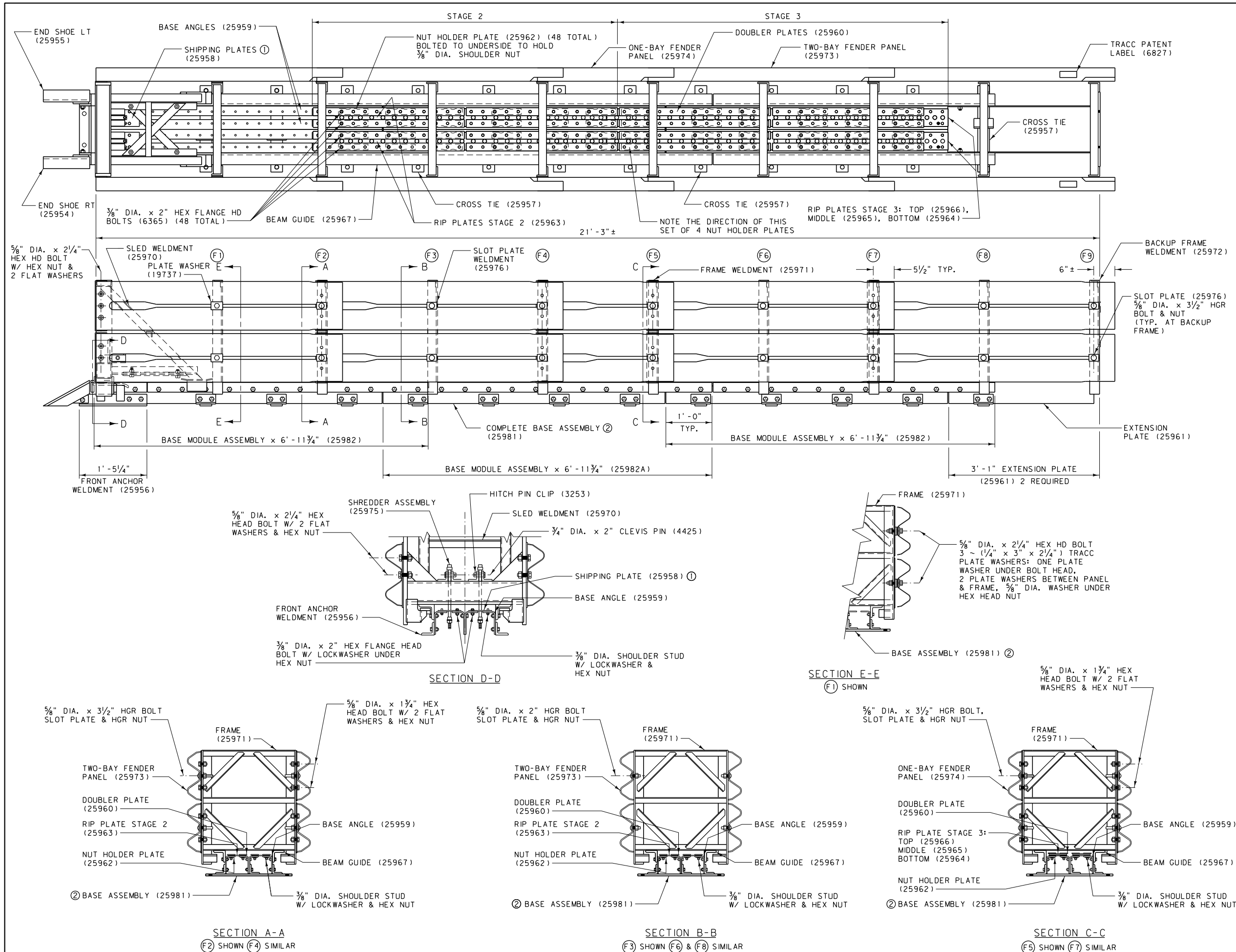
ASSEMBLY NO.	STOCK NO.	DESCRIPTION
3540031-0000	2760011-0000	24" WIDE TENSION BACKUP
3540032-0000	2760021-0000	30" WIDE TENSION BACKUP
3540033-0000	2760031-0000	36" WIDE TENSION BACKUP

NOTE:

- ③ WHEN TRANSITIONING THE QUADGUARD SYSTEM TO EXISTING BARRIERS, SEE MANUFACTURER FOR PROPER USE OF SIDE PANEL (ITEM 2).

BACKUP ASSEMBLY


DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 606	DWG. NO. 606-31A
IMPACT ATTENUATOR - QUADGUARD ASSEMBLY DETAILS	
EFFECTIVE: FEBRUARY 2005	
 serving you with pride	MONTANA DEPARTMENT OF TRANSPORTATION

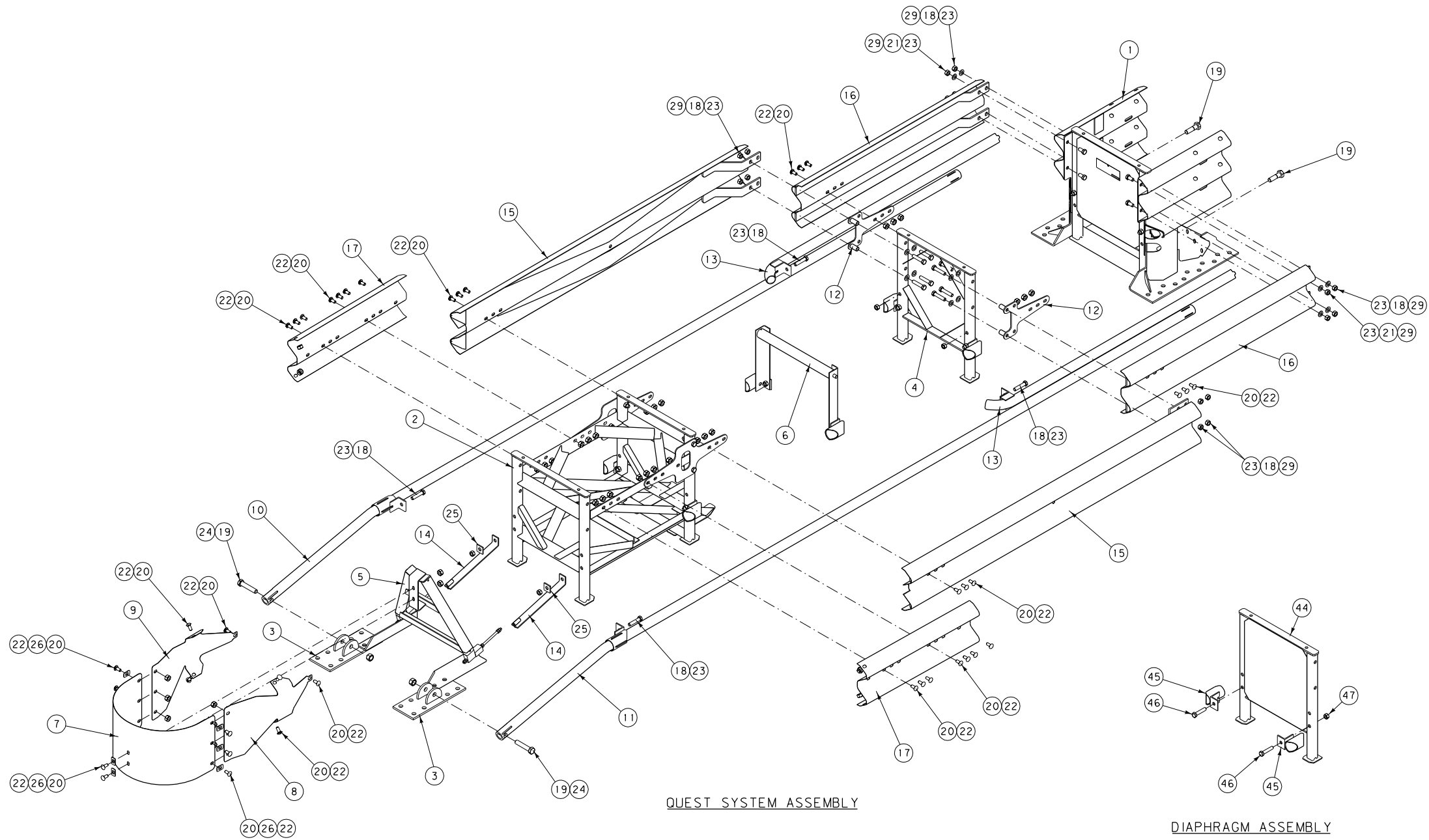


BILL OF MATERIAL		
PART NUMBER	QTY	DESCRIPTION
TRACC (25980A)		
19737G	12	1/4" x 3" x 2 1/4" TRACC WASHER
25970A	1	SLED WELDMENT
25971A	8	FRAME WELDMENT
25972A	1	BACKUP FRAME WELDMENT
25973A	16	TWO-BAY FENDER PANEL
25974A	4	ONE-BAY FENDER PANEL
25975A	2	SHREDDER ASSEMBLY
25976A	32	SLOT PLATE
25981A	1	ASSEMBLED BASE (SEE NOTE 2)
TRACC BASE (25981A)		
3256G	48	3/8" DIA. SHOULDER NUT
3361G	40	5/8" DIA. HEAVY HEX NUT
3391G	40	5/8" DIA. x 1 3/4" HEX HEAD BOLT
4252G	180	3/8" DIA. HEX NUT
4258G	180	3/8" DIA. LOCK WASHER
6340G	178	3/4" DIA. x 1 1/2" SHOULDER STUD
6365G	50	3/8" DIA. x 2" HEX FLANGE HD BOLT
25954A	1	END SHOE, RIGHT
25955A	1	END SHOE, LEFT
25956A	1	FRONT ANCHOR WELDMENT
25957A	3	CROSS TIE
25958G	2	RIP PLATE, STAGE 1 (SHIPPING PL.)
25960G	16	DOUBLERS
25961G	2	EXTENSION PLATE, REAR
25962G	48	NUT HOLDER (NUT RETAINER PLATE)
25963G	2	RIP PLATE, STAGE 2
25964G	2	RIP PLATE, STAGE 3, BOTTOM
25965G	2	RIP PLATE, STAGE 3, MIDDLE
25966G	2	RIP PLATE, STAGE 3, TOP
25982A	3	BASE MODULE ASSEMBLY
SHOP HARDWARE		
3253G	2	HITCH PIN CLIP
3340G	32	5/8" DIA. HGR NUT
3361G	46	5/8" DIA. HEX NUT
3391G	32	5/8" DIA. x 1 3/4" HEX HEAD BOLT
3400G	12	5/8" DIA. x 2" HGR BOLT
3435G	20	5/8" DIA. x 3 1/2" HGR BOLT
4372G	88	5/8" DIA. FLAT WASHER
4425G	2	3/4" DIA. x 2" CLEVIS PIN
5306G	14	5/8" DIA. x 2 1/4" HEX HEAD BOLT
6827B	2	TRACC PATENT LABEL

NOTES:

- ① SHIPPING PLATES MAINTAIN SLED POSITION DURING SHIPPING. IT IS NOT NECESSARY TO REMOVE SHIPPING PLATES AFTER INSTALLATION OR REPLACE AFTER REPAIRING DAMAGE TO TRACC UNIT.
- ② SEE MANUFACTURER FOR ADDITIONAL DETAILS AND DRAWINGS SHOWING COMPLETE ASSEMBLY OF ALL BASE COMPONENTS.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 606	DWG. NO. 606-31B
IMPACT ATTENUATOR TRACC ASSEMBLY DETAILS	
EFFECTIVE: APRIL 2006	
 serving you with pride	MONTANA DEPARTMENT OF TRANSPORTATION



QUEST SYSTEM ASSEMBLY

DIAPHRAGM ASSEMBLY
(ITEM 4)

TRIGGER ASSEMBLY
(ITEM 5)

SUPPORT FRAME ASSEMBLY
(ITEM 2)

BRIDGE
(ITEM 6)

BACKUP ASSEMBLY
(ITEM 1)

PARTS LIST

ITEM	STOCK NO.	DESCRIPTION	QTY.
1	3562003-0000	BACKUP ASSEMBLY, 24, QUEST	1
2	3562002-0000	SUPPORT FRAME ASSY, BAY 1, 24, QUEST	1
3	2762015-0000	ANCHOR, FRONT, QUEST, G	2
4	3562005-0000	DIAPHRAGM ASSEMBLY, 24, BAY 3, QUEST	1
5	3562001-0000	TRIGGER ASSEMBLY, QUEST	1
6	3562004-0000	BRIDGE ASSEMBLY, 24, BAY 2, QUEST	1
7	2762026-0000	NOSE, QUEST, G	1
8	2762024-0000	NOSE TRANSITION, R, QUEST, G	1
9	2762025-0000	NOSE TRANSITION, L, QUEST, G	1
10	276200L-0000	SHAPER RAIL, L, QUEST, G	1
11	276200R-0000	SHAPER RAIL, R, QUEST, G	1
12	2762022-0000	BRACKET, PANEL, DIAPHRAGM, G	2
13	2762023-0000	REAR RAIL, QUEST, G	2
14	2762007-0000	TRIGGER STRAP, QUEST, G	2
15	2762013-0000	PANEL, BAY 2, QUEST, G	2
16	2762014-0000	PANEL, BAY 3, QUEST, G	2
17	2762033-0000	PANEL, BAY 1, QUEST, G	2
18	2699251-0000	BOLT, HX, 3/4" DIA. x 3 1/2", G5, G	16
19	2701014-0000	BOLT, HX, 1" DIA. x 5", G8, G	4
20	2701811-0000	BOLT, RAIL, 5/8" DIA. x 1 1/4", G5, G	40
21	2701931-0000	BOLT, HX, 3/4" DIA. x 1 1/2", G5, G	4
22	2704191-0000	NUT, HX, 5/8" DIA., G, RAIL	40
23	2704091-0000	NUT, HX, 3/4" DIA., G	20
24	2704161-0000	NUT, HX, 1" DIA., G	2
25	2708161-0000	WASHER, BAR, 2" x 2" x 1/4", G	2
26	2708871-1000	WASHER, BAR, 1 1/4" x 2" x 1/8", ROUNDED, G	8
27	2700031-0000	INSTALL INSTRUCTIONS, QUEST	1
28	2735831-3500	MATERIAL SAFETY INFO NOTICE	1
29	2708081-0000	WASHER, FLAT, 3/4" DIA. (2" O.D.), HVY, G	16
TRIGGER ASSEMBLY (ITEM 5)			
30	2762008-0000	TRIGGER FRAME, QUEST, G	1
31	2762011-0000	ANCHOR, TRIGGER, R, QUEST, G	1
32	2762012-0000	ANCHOR, TRIGGER, L, QUEST, G	1
33	2699034-0000	ROD, THREADED, 1/2" DIA. x 13 1/2", B7, G	2
34	2704911-0000	NUT, HX, 1/2" DIA., G5, G	12
SUPPORT FRAME ASSEMBLY (ITEM 2)			
35	2762010-0000	SUPPORT FRAME, BAY 1, 24, QUEST, G	1
36	2762003-0000	RAIL GUIDE, DIAPHRAGM, QUEST, G	2
37	2699251-0000	BOLT, HX, 3/4" DIA. x 3 1/2", G5, G	6
38	2704091-0000	NUT, HX, 3/4" DIA., G	6
39	2762021-0000	BRACKET, PANEL, BAY 1 FRAME, QUEST, G	2
BRIDGE (ITEM 6)			
40	2762016-0000	BRIDGE, 24, QUEST, G	1
41	2762003-0000	RAIL GUIDE, DIAPHRAGM, QUEST, G	2
42	2704091-0000	NUT, HX, 3/4" DIA., G	2
43	2701931-0000	BOLT, HX, 3/4" DIA. x 1 1/2", G5, G	2
DIAPHRAGM ASSEMBLY (ITEM 4)			
44	2762018-0000	DIAPHRAGM, 24, BAY 3, QUEST, G	1
45	2762003-0000	RAIL GUIDE, DIAPHRAGM, QUEST, G	2
46	2699251-0000	BOLT, HX, 3/4" DIA. x 3 1/2", G5, G	2
47	2704091-0000	NUT, HX, 3/4" DIA., G	2
BACKUP ASSEMBLY (ITEM 1)			
48	2762020-0000	BACKUP, 24, QUEST, G	1
49	2762017-0000	SHAPER, BACKUP, QUEST, G	2
50	2704091-0000	NUT, HX, 3/4" DIA., G	2
51	2699251-0000	BOLT, HX, 3/4" DIA. x 3 1/2", G5, G	2
52	2735711-0000	DECAL, CAUTION, ALL PRODUCTS	1
53	2735712-3500	DECAL, PRODUCT, QUEST	1
54	2705121-0000	RIVET, ST, SD68BS, 3/16" DIA. x 1/2", DH	1

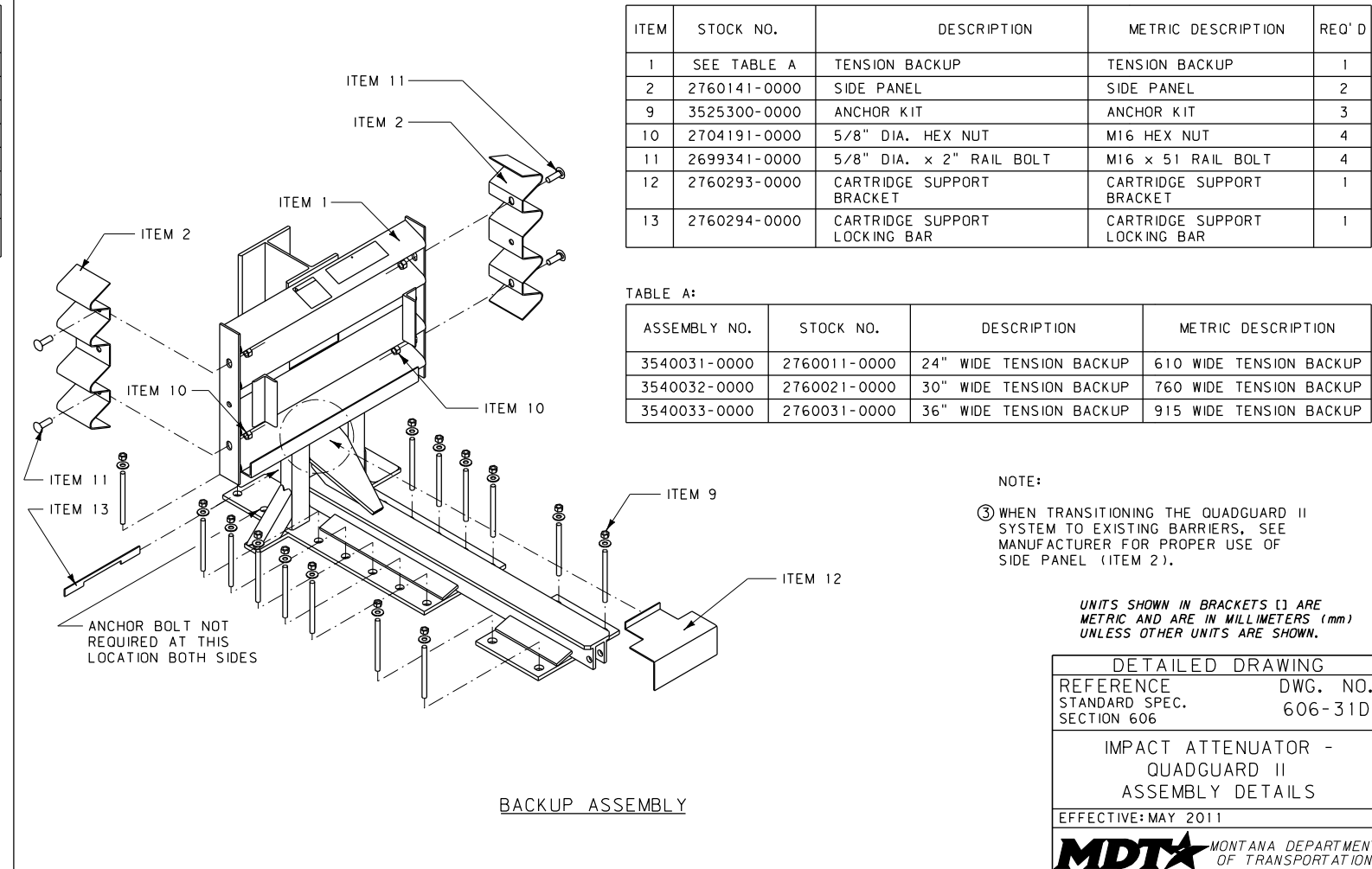
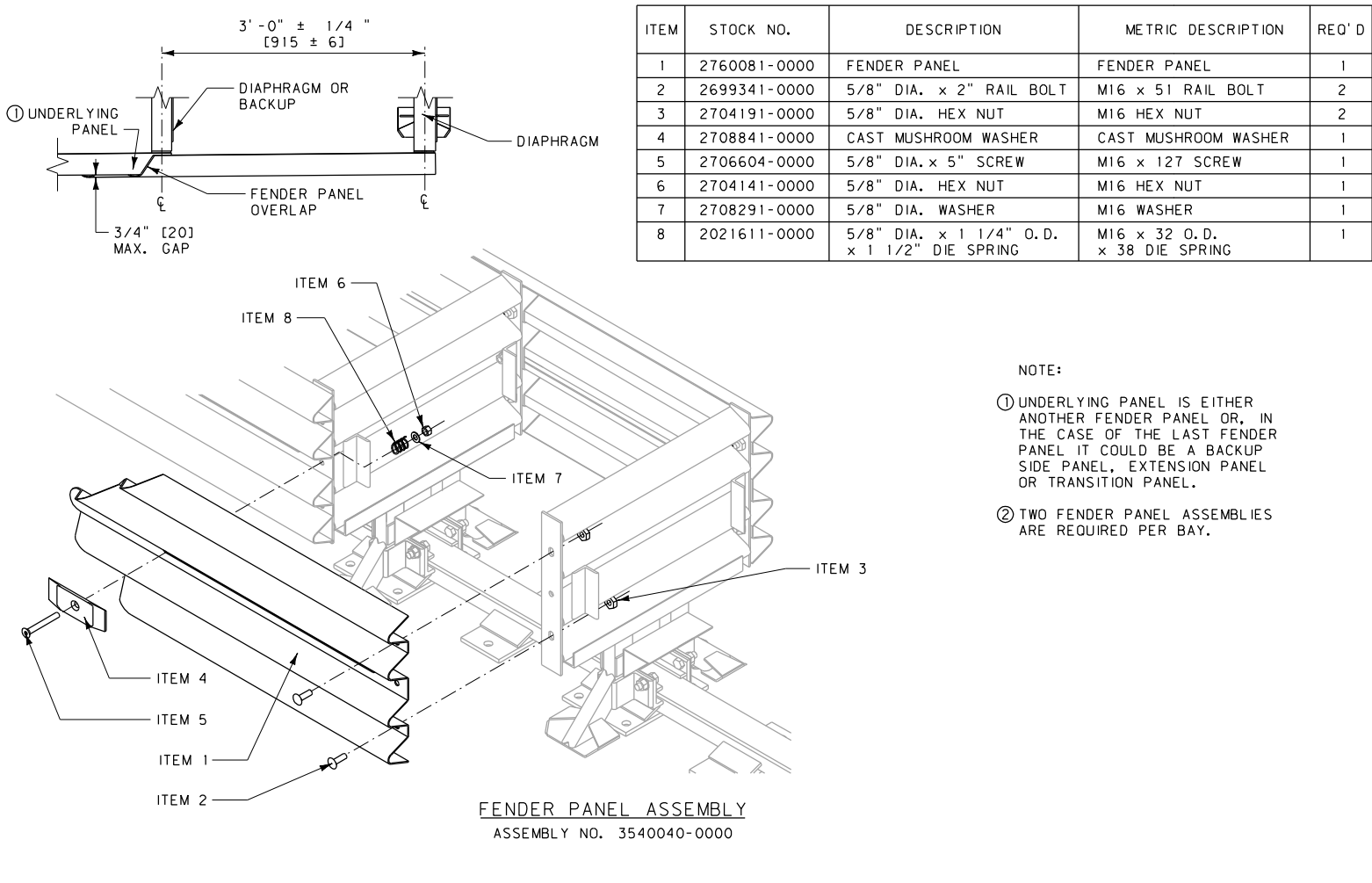
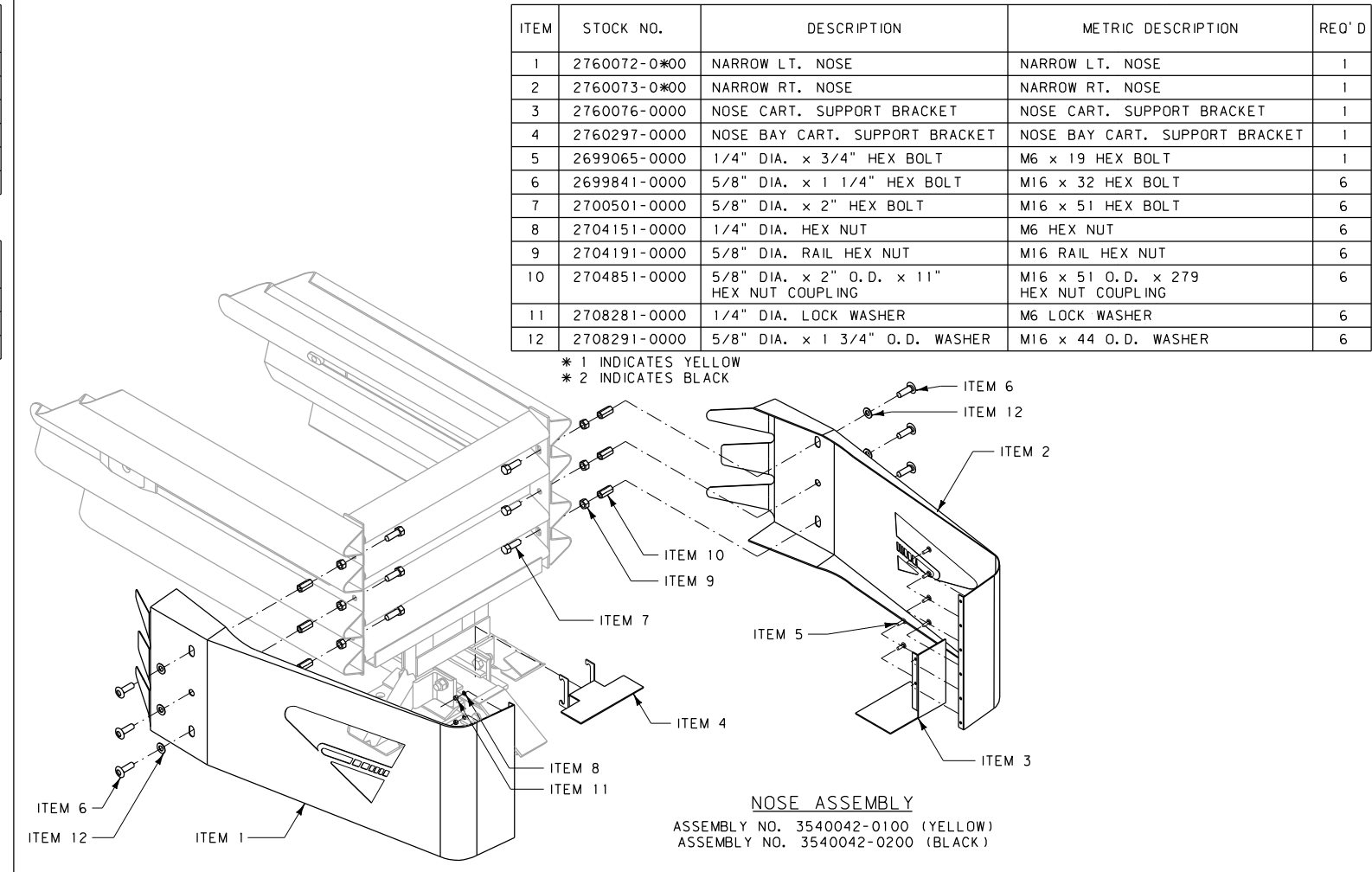
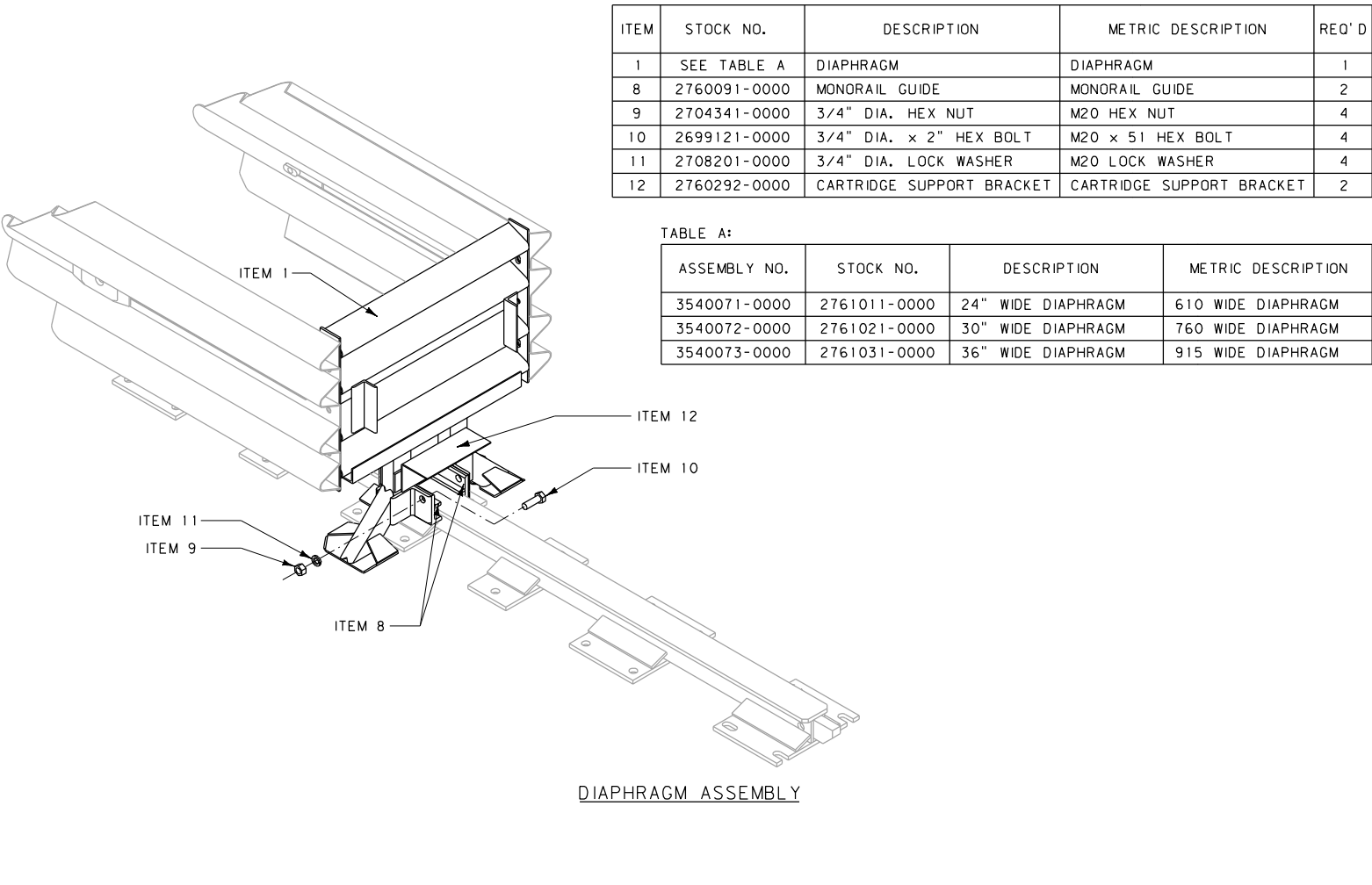
DETAILED DRAWING

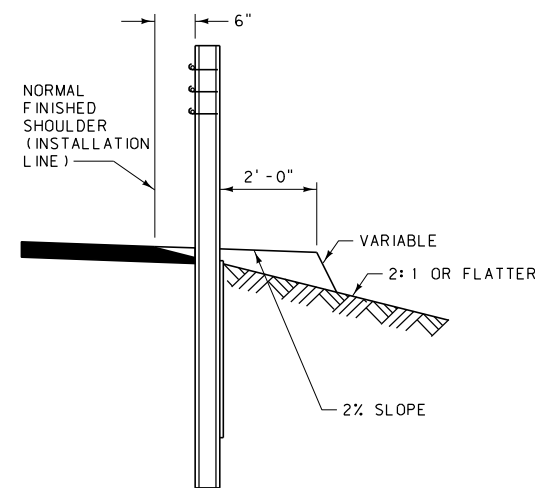
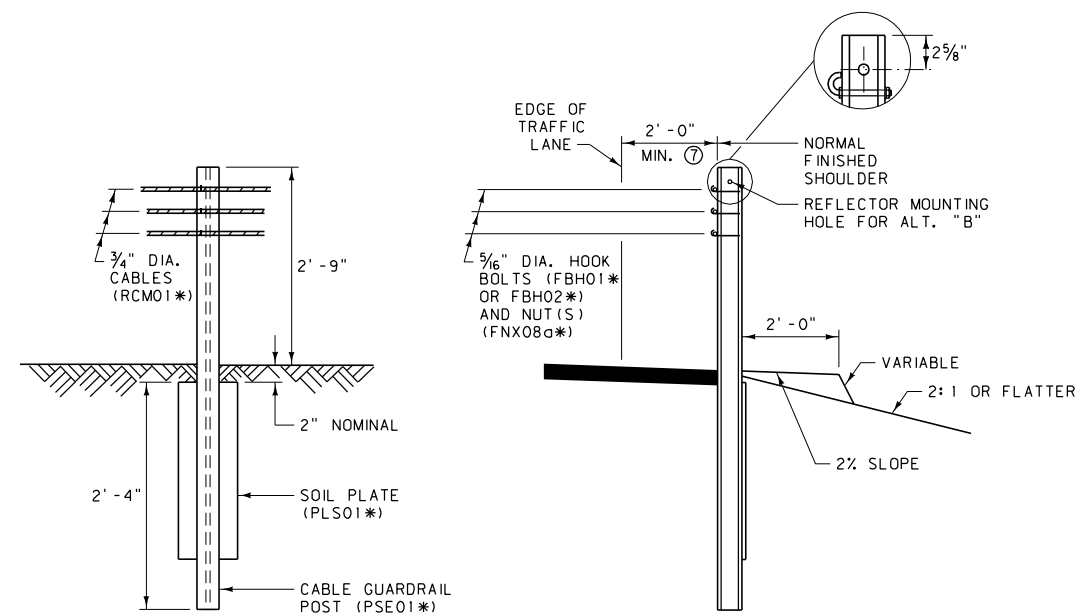
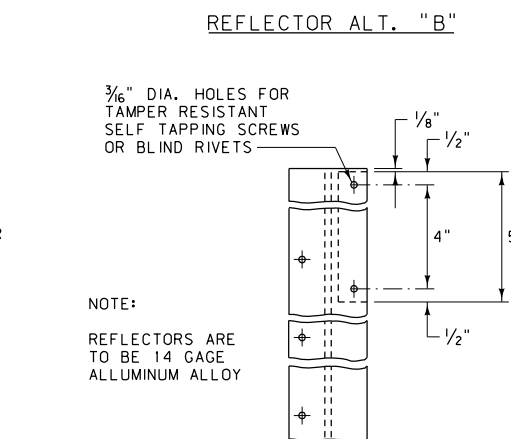
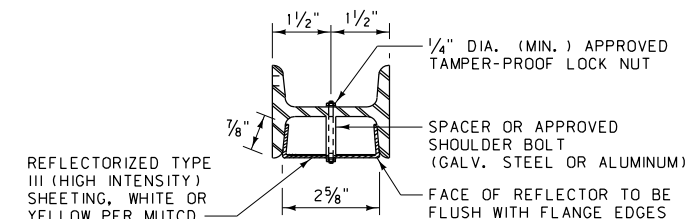
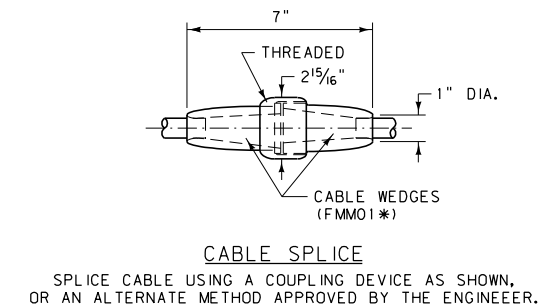
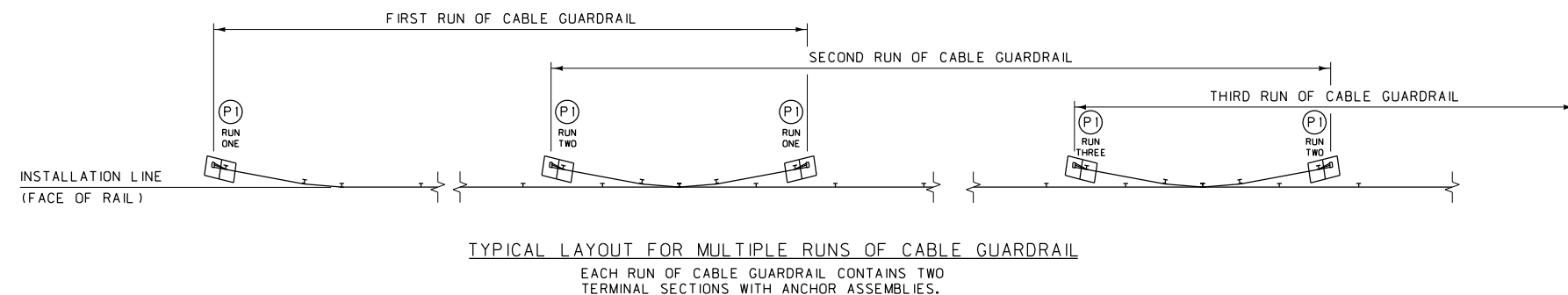
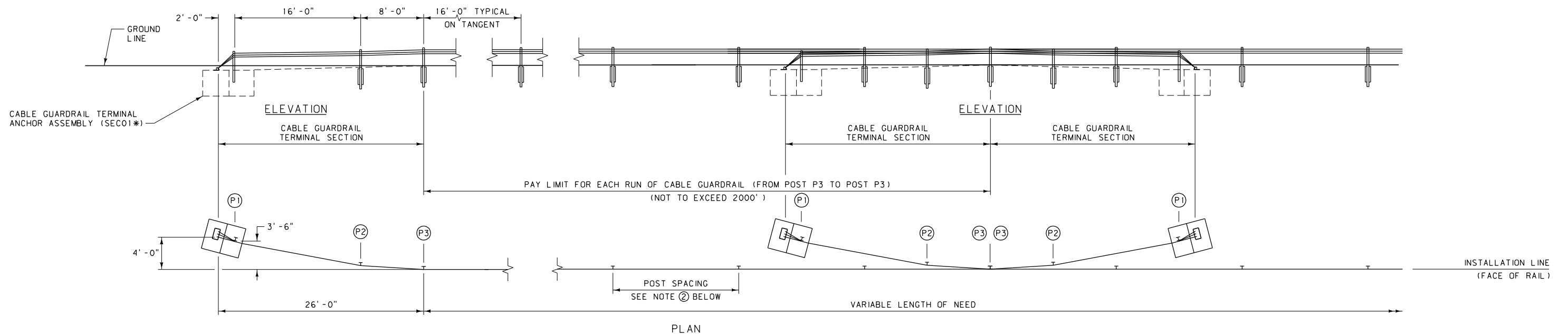
REFERENCE DWG. NO.
STANDARD SPEC. 606-31C
SECTION 606

IMPACT ATTENUATOR -
QUEST
ASSEMBLY DETAILS


EFFECTIVE: APRIL 2006

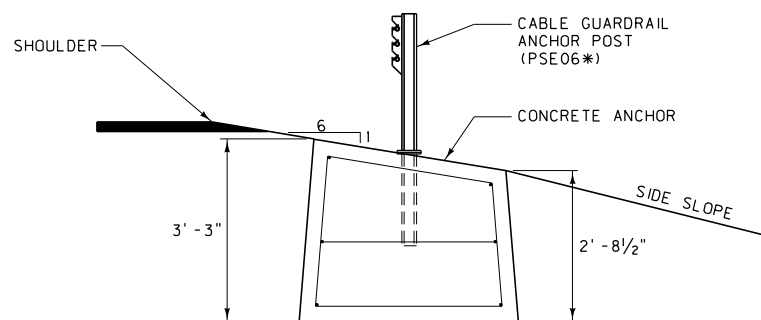
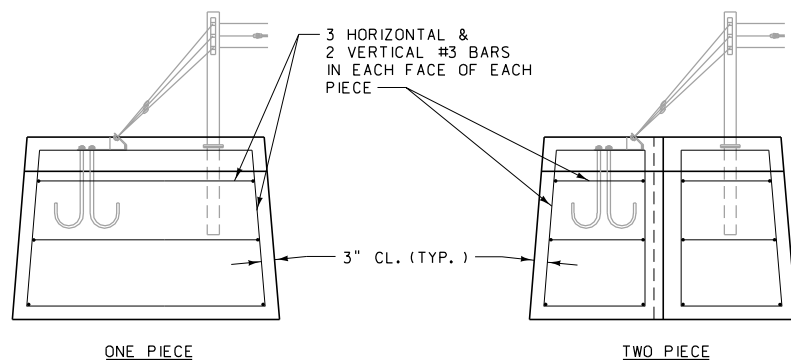
MDT MONTANA DEPARTMENT
OF TRANSPORTATION
serving you with pride



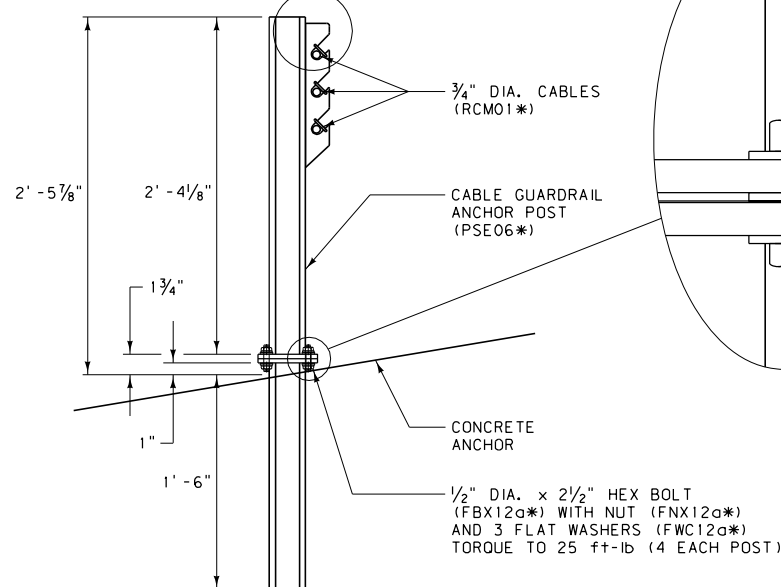
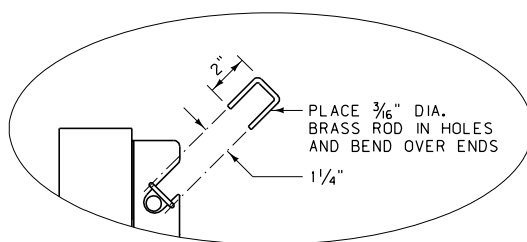


- NOTES:**
- ① FOR CABLE GUARDRAIL RUNS OF:
1044 FEET OR LESS: USE COMPENSATING CABLE END ASSEMBLY (RCE01*) ON ONE END AND TURNBUCKLE CABLE END ASSEMBLY * ON THE OTHER END OF EACH CABLE.
GREATER THAN 1044 FEET, UP TO 2052 FEET MAXIMUM: USE COMPENSATING CABLE END ASSEMBLY (RCE01*) ON BOTH ENDS OF EACH CABLE.
 - ② LINE POST SPACING:
TANGENTS AND CURVES WITH RADII 700 FT AND GREATER: 16 FEET.
CURVES WITH RADII LESS THAN 700 FT DOWN TO 440 FT: 12 FEET.
NOTE: DO NOT INSTALL CABLE GUARDRAIL ON THE INSIDE SHOULDER OF ANY CURVE.
 - ③ UNIFORMLY TENSION ALL CABLES TO COMPRESS SPRINGS BY 3 1/2".
 - ④ DO NOT INSTALL CABLE GUARDRAIL FOR OBSTACLES WITHIN 12 FEET OF THE INSTALLATION LINE.
 - ⑤ DO NOT USE CABLE GUARDRAIL WITH FILL SLOPES STEEPER THAN 2:1, UNLESS THE DISTANCE BETWEEN THE BACK OF THE POSTS AND THE BREAK IN THE FILL SLOPE IS AT LEAST 8 FEET.
 - ⑥ ATTACH REFLECTORS TO EVERY OTHER LINE POST (32 FEET TYP.), BEGINNING AT POST P3. DO NOT ATTACH REFLECTORS TO POSTS P1 AND P2.
 - ⑦ WIDENING IS REQUIRED IF FINISHED SHOULDER IS LESS THAN 2'-0" FROM THE TRAFFIC LANE.
- * SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

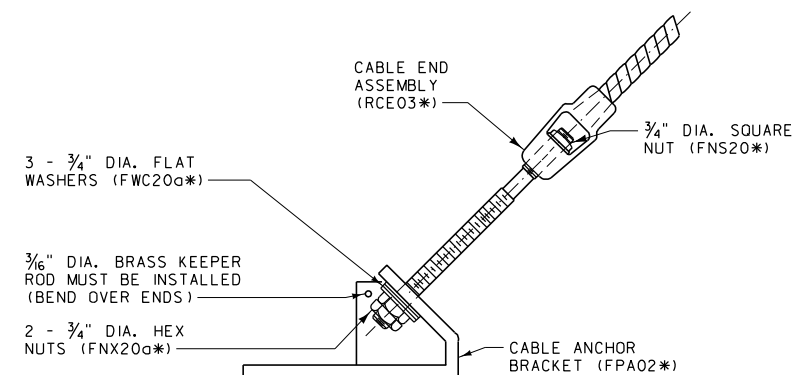
DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 606	DWG. NO. 606-40
CABLE GUARDRAIL	
-- REVISED -- January 2008	EFFECTIVE: FEBRUARY 2005
 MONTANA DEPARTMENT OF TRANSPORTATION serving you with pride	



ANCHOR UNIT & RE-BAR INSTALLATION DETAILS



ANCHOR POST DETAIL



CABLE END ASSEMBLY TO ANCHOR BRACKET DETAIL

NOTE:
INSTALL ONE WASHER UNDER HEAD, ONE BETWEEN PLATES & ONE UNDER NUT. AN ADDITIONAL WASHER MAY BE PLACED BETWEEN PLATES TO PLUMB THE ANCHOR POST.

NOTES:

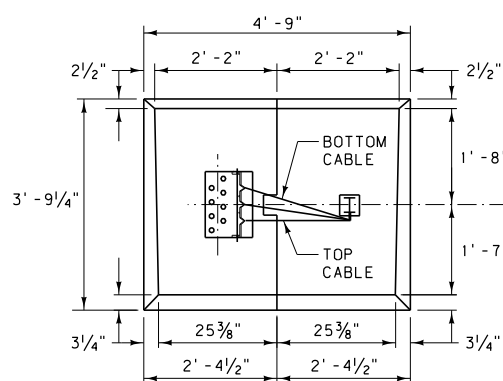
- ① INSTALL THE CONCRETE ANCHOR INTO THE EXCAVATION, AS DETAILED, SO THAT THE BOTTOM OF THE ANCHOR HAS A FULL AND EVEN BEARING ON THE SURFACE UNDER IT. BACKFILL AROUND THE CONCRETE ANCHOR IN ACCORDANCE WITH SECTION 203.03.3 OF THE STANDARD SPECIFICATIONS.
- ② THE CONCRETE ANCHOR CAN BE PLACED AS ONE OR TWO PIECES. THIS DETAIL PRIMARILY SHOWS A TWO PIECE INSTALLATION. FOR ONE PIECE INSTALLATIONS, USE ALL THE SAME DIMENSIONS, LESS THE TAPERED KEYWAY AND THE ADDITIONAL REBAR, AS SHOWN.
- ③ IF LIFTING DEVICES ARE EMBEDDED INTO THE CONCRETE ANCHORS, INSURE THAT THEY HAVE A SAFE WORKING LOAD OF 4 TONS FOR THE ONE PIECE ANCHOR AND 2 TONS EACH FOR EACH OF THE HALVES OF THE TWO PIECE ANCHOR UNIT.
- ④ USE CLASS "DD" CONCRETE TO CONSTRUCT ANCHOR.

* SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

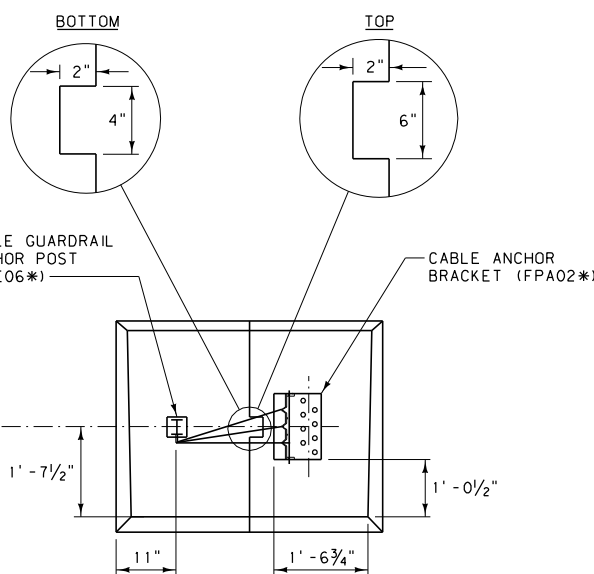
TAPERED KEYWAY DETAIL
(TWO PIECE INSTALLATION)

NOTE:

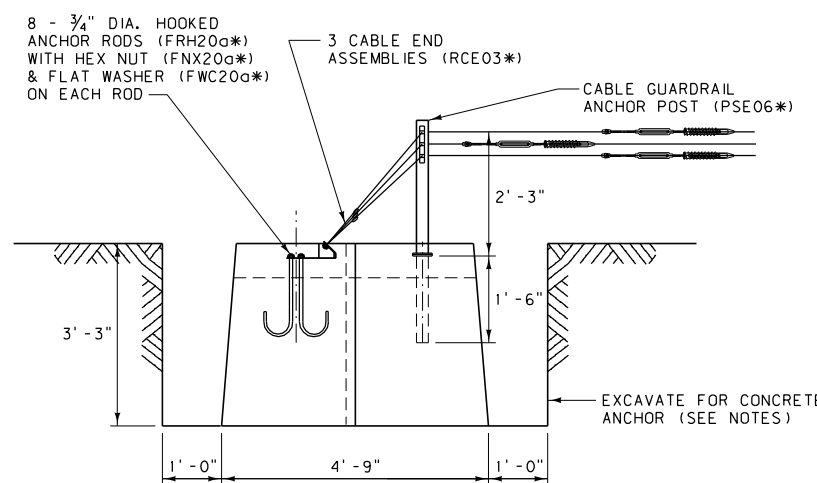
DIMENSIONS FOR LEFT AND RIGHT HAND ANCHOR UNITS ARE THE SAME, WITH THE POSITION OF THE ANCHOR POST AND ANCHOR BRACKET BEING THE ONLY DIFFERENCE.



PLAN
(LEFT HAND ANCHOR UNIT)



PLAN
(RIGHT HAND ANCHOR UNIT)

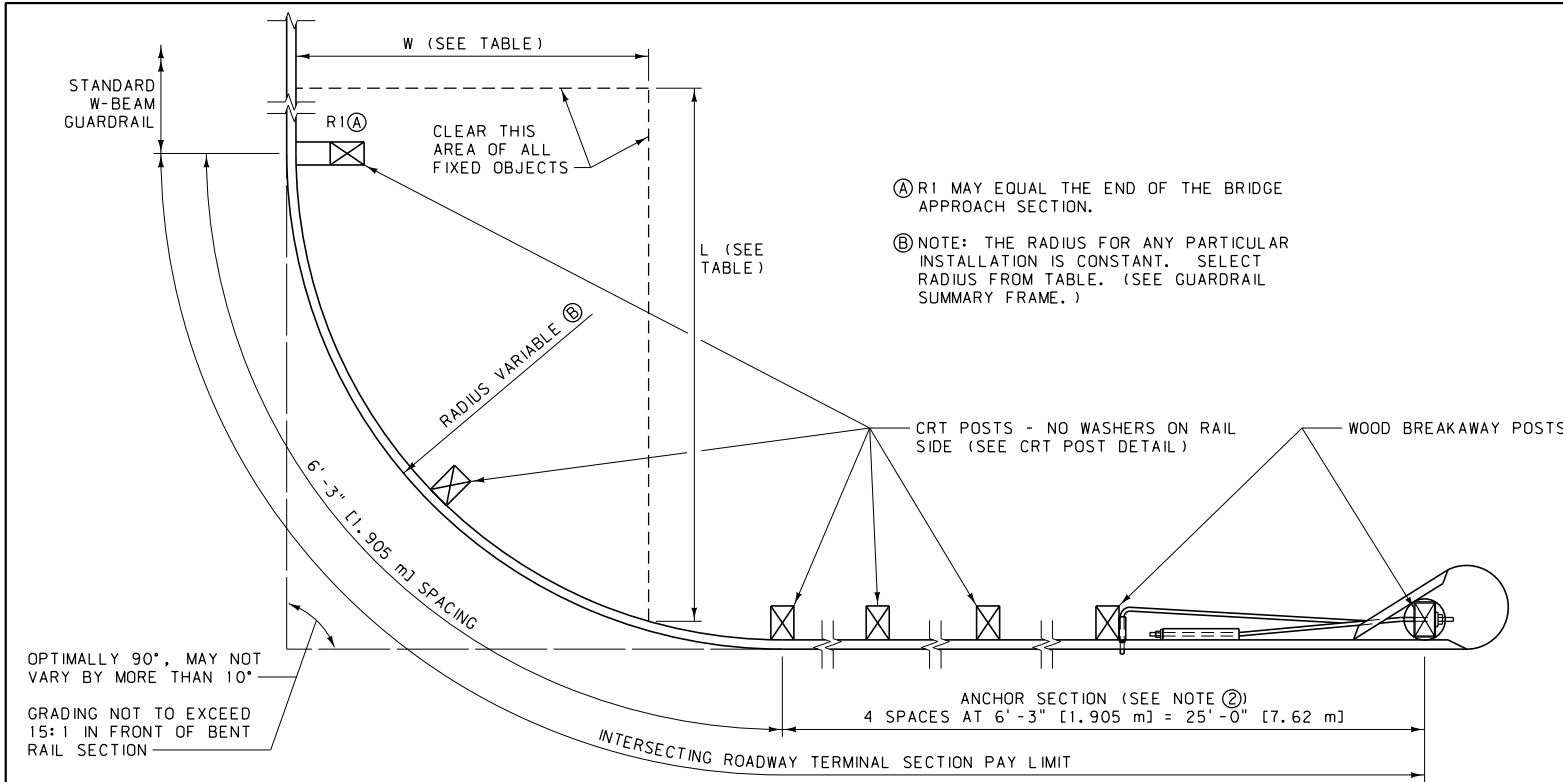


ELEVATION
(LEFT HAND ANCHOR UNIT)

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 606	DWG. NO. 606-41
CABLE GUARDRAIL TERMINAL ANCHOR ASSEMBLY	

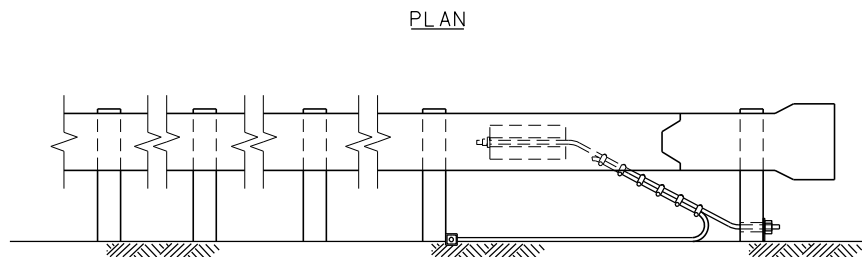
-- REVISED --
January 2008

EFFECTIVE: FEBRUARY 2005
MONTANA DEPARTMENT OF TRANSPORTATION
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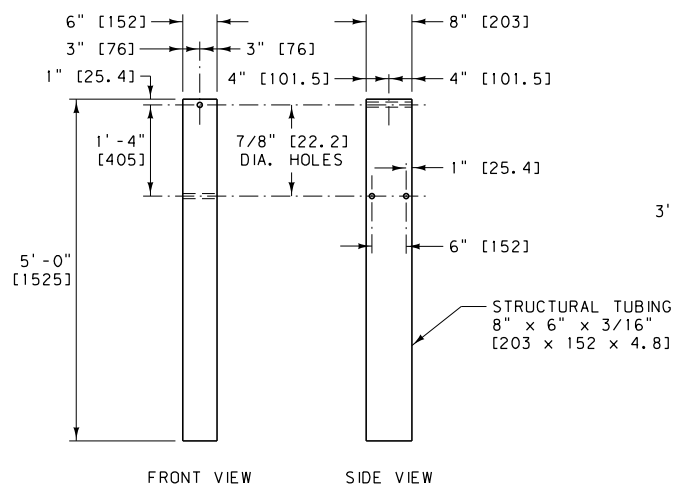


RADIUS TABLE			
RADIUS	LENGTH OF BENT RAIL	L	W
8'	12.5'	25'	15'
16'	25.0'	30'	15'
24'	37.5'	40'	20'
32'	50.0'	50'	20'

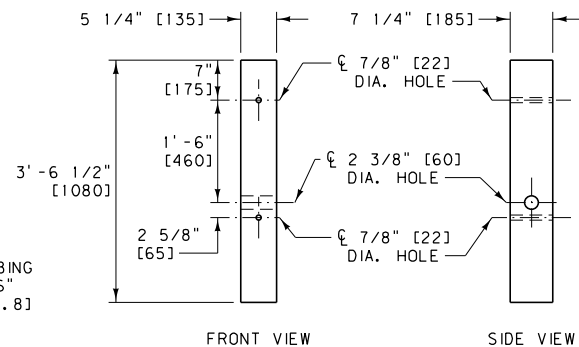
METRIC RADIUS TABLE			
RADIUS	LENGTH OF BENT RAIL	L	W
2450 mm	3.81 m	7.6 m	4.6 m
4850 mm	7.62 m	9.1 m	4.6 m
7300 mm	11.43 m	12.2 m	6.1 m
9700 mm	15.24 m	15.2 m	6.1 m



ELEVATION



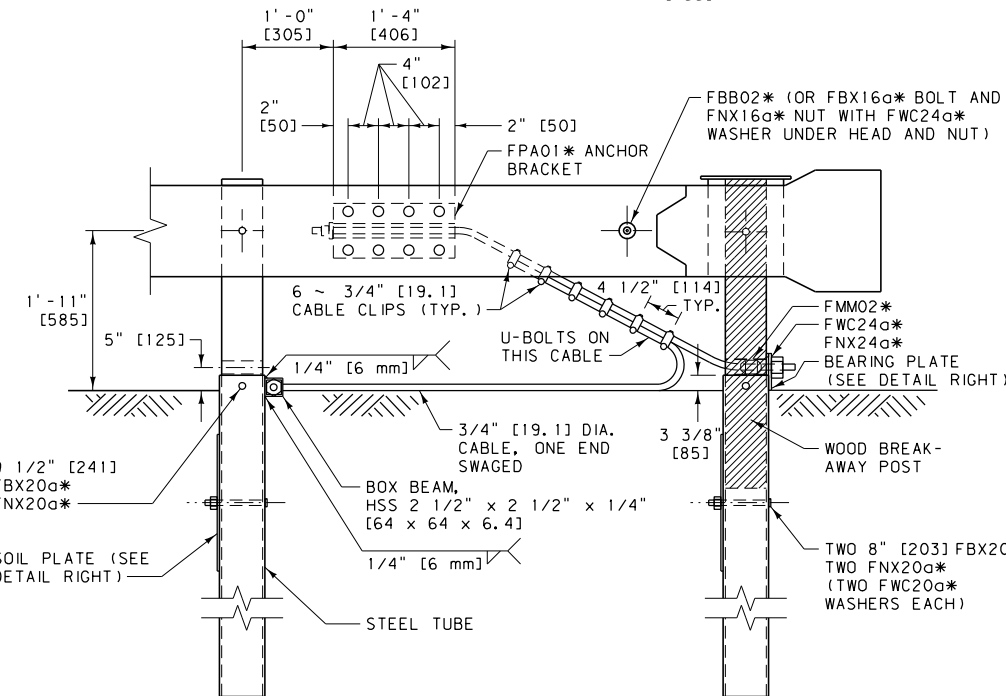
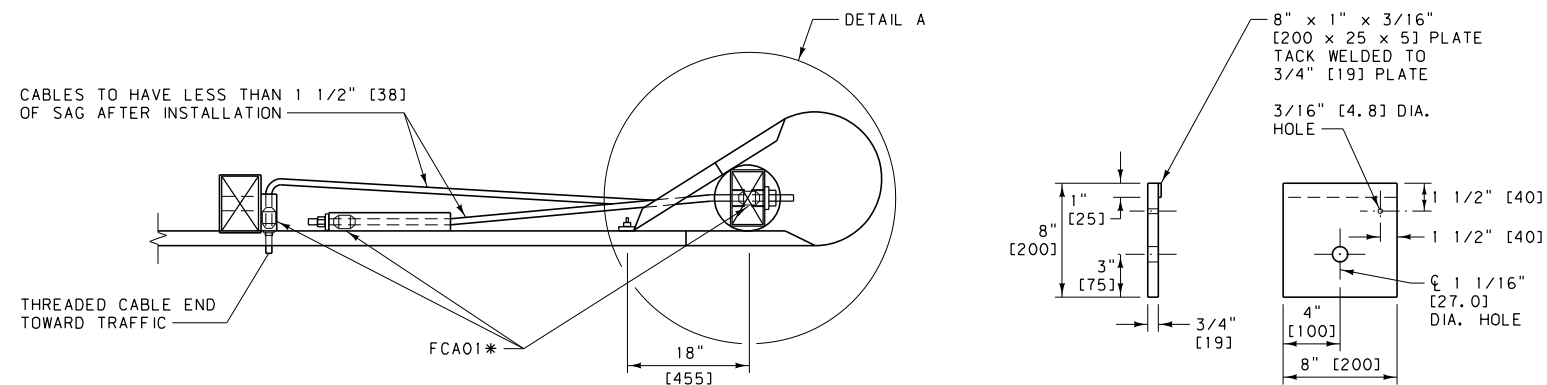
STEEL TUBE DETAILS
PTE05*



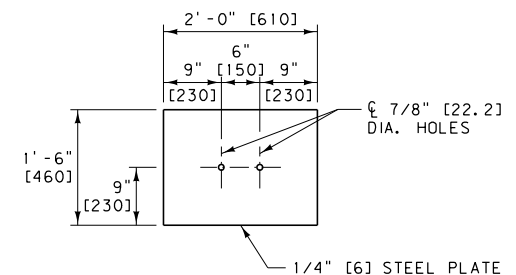
WOOD BREAKAWAY POST DETAILS
PDF01*

NOTES:

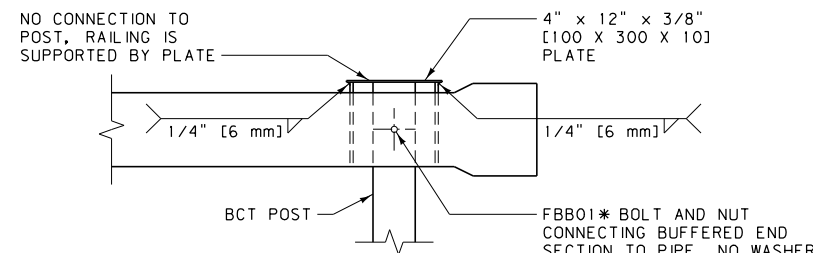
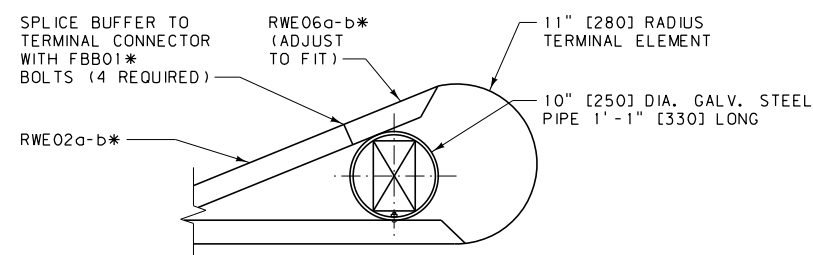
- DO NOT INSTALL ON SLOPES STEEPER THAN 2:1.
 - DO NOT OMIT OR SHORTEN ANCHOR SECTION.
 - SEE DTL. DWG. NO. 606-05A FOR GUARDRAIL WIDENING REQUIREMENTS.
- * SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.



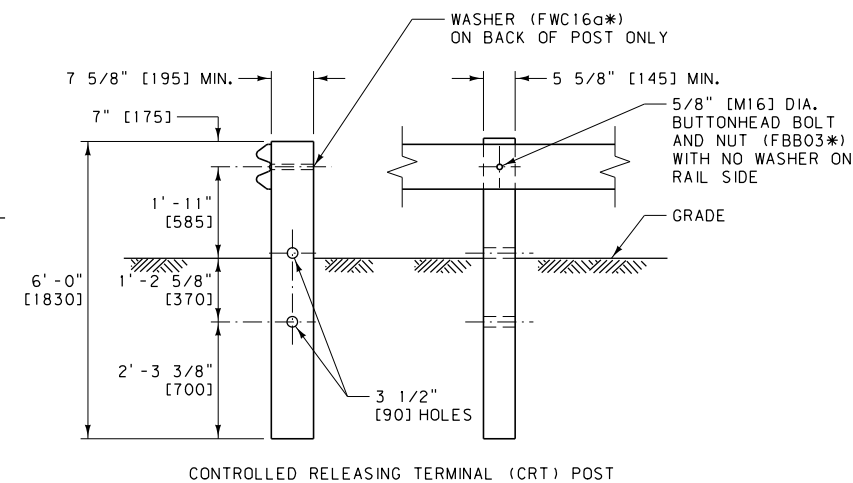
BEARING PLATE DETAIL
FPB01*



SOIL PLATE DETAIL
PLS03*



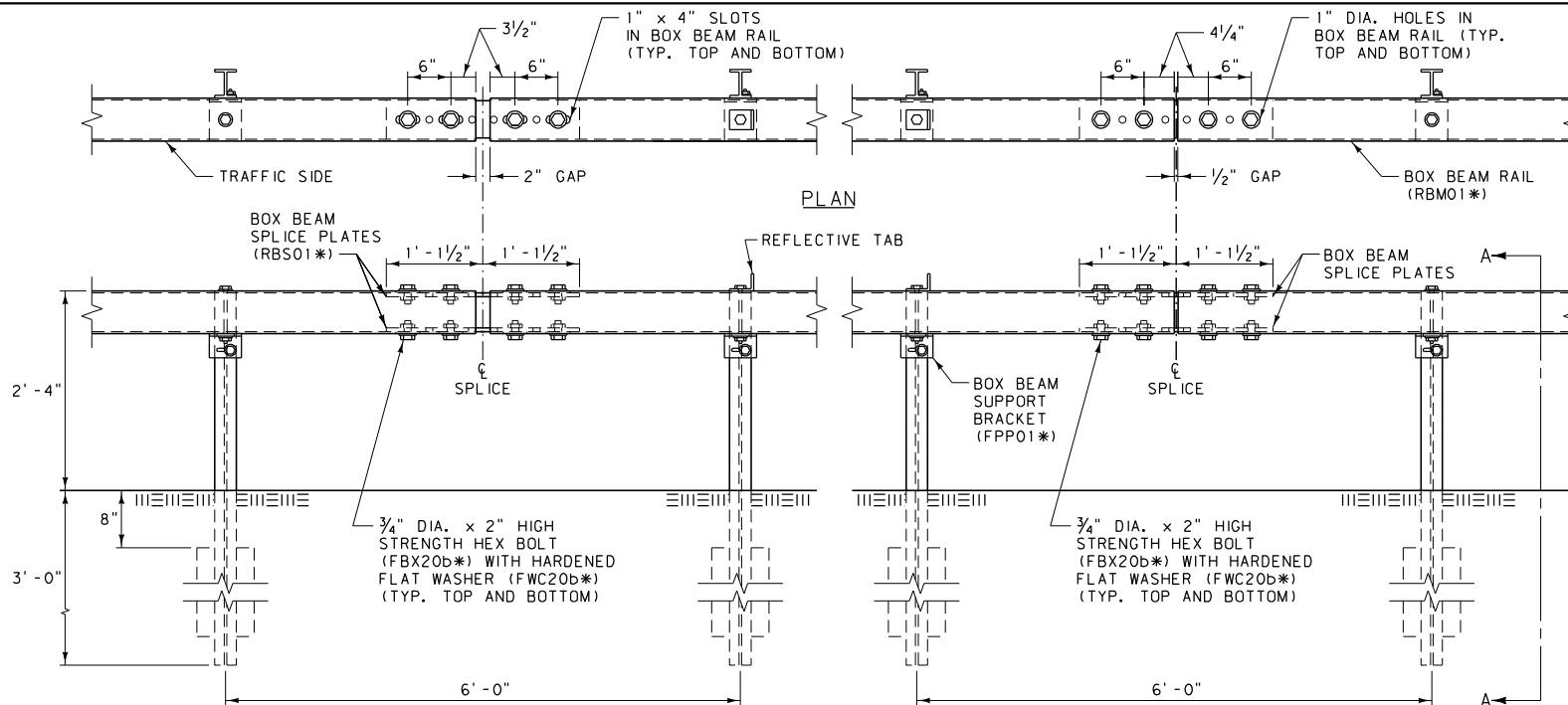
DETAIL A



CONTROLLED RELEASING TERMINAL (CRT) POST

CRT POST DETAIL
PDE09*

UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

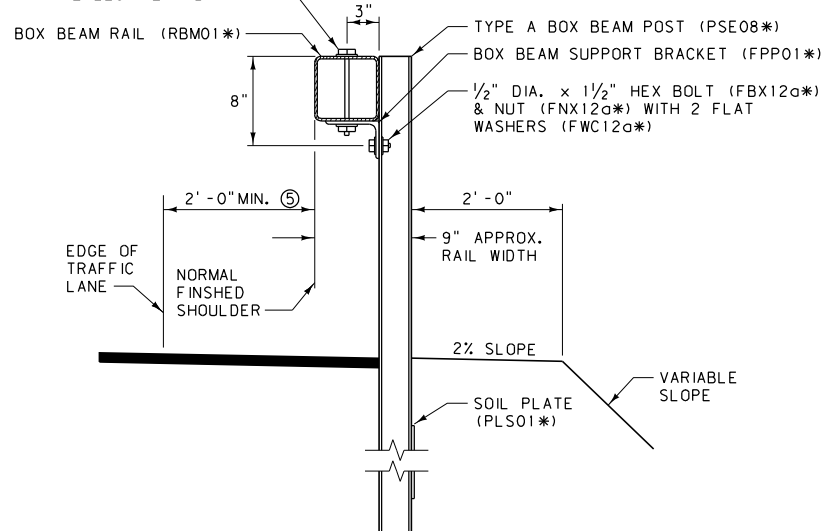


PLAN

ELEVATION

SPLICE DETAIL

1/2" DIA. HOLES FOR 3/8" DIA. x 7/2" HEX BOLT (FBX10a*) AND NUT (FNX10a*) WITH 2 FLAT WASHERS (FWC10a*) (1 WASHER ON POSTS WITH REFLECTIVE TAB)

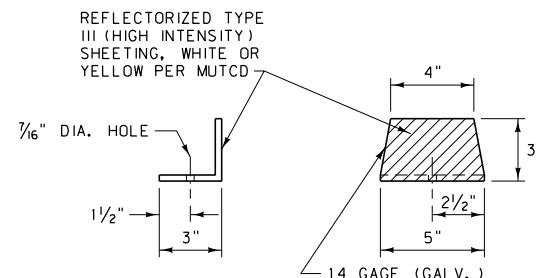


SECTION A-A


NOTES:

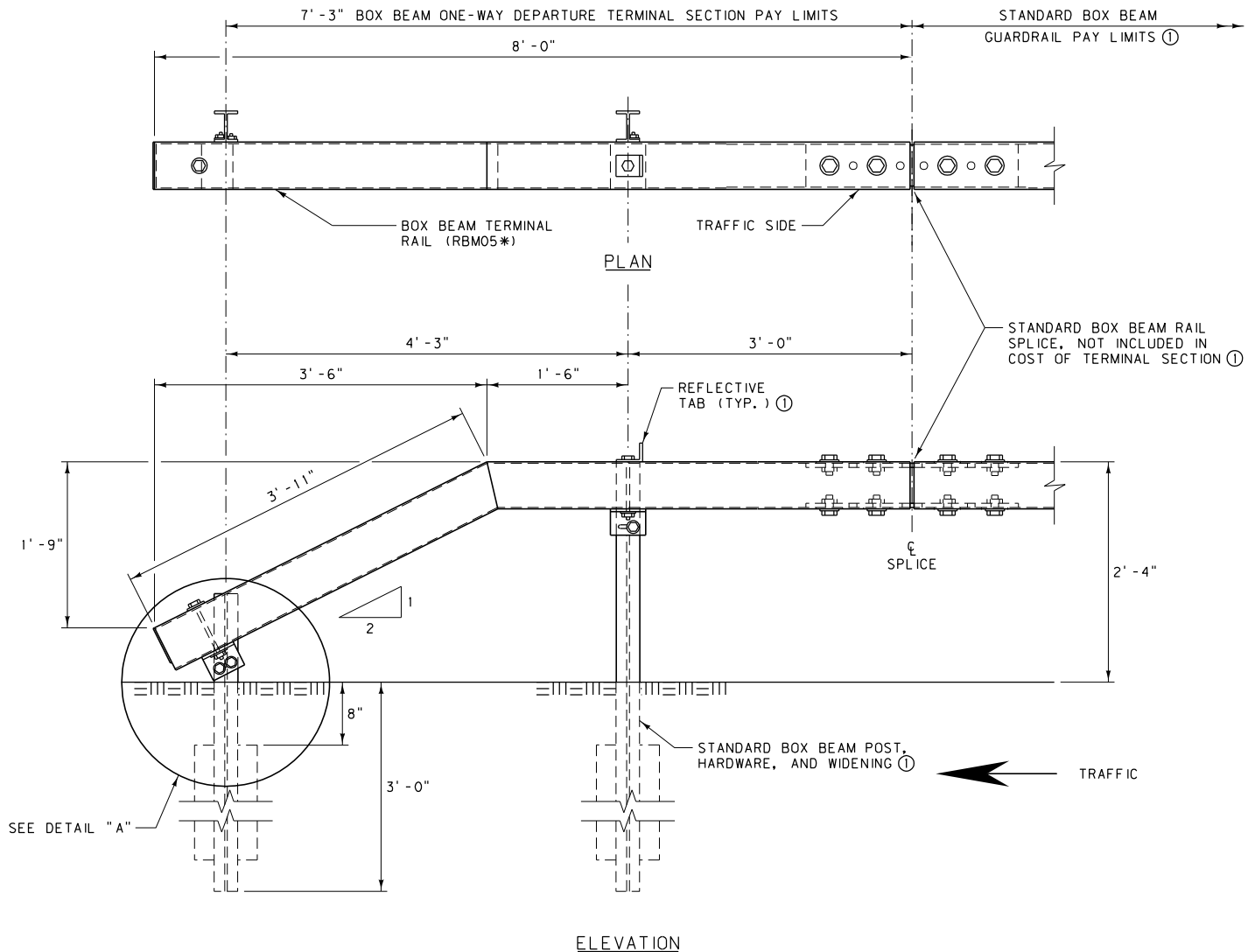
- 1 USE BOX BEAM RAIL IN MINIMUM NOMINAL LENGTHS OF 18 FEET UNLESS APPROVED BY THE ENGINEER.
- 2 INSTALL EXPANSION JOINTS ON ALL BOX BEAM GUARDRAIL INSTALLATIONS GREATER THAN 300 FEET IN LENGTH AT INTERVALS NOT TO EXCEED 500 FEET.
- 3 ATTACH REFLECTIVE TABS TO EVERY FOURTH POST (24 FEET TYP.) ANGLE TABS SLIGHTLY TOWARDS TRAFFIC. DO NOT USE REFLECTIVE TABS ON WY-BET TERMINALS. WY-BET TERMINALS RECEIVE REFLECTIVE CHANNELS.
- 4 DO NOT INSTALL BOX BEAM GUARDRAIL FOR OBSTACLES WITHIN 5.8' OF THE FACE OF THE RAIL.
- 5 WIDENING IS REQUIRED IF FINISHED SHOULDER IS LESS THAN 2'-0" FROM THE TRAFFIC LANE.

* SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

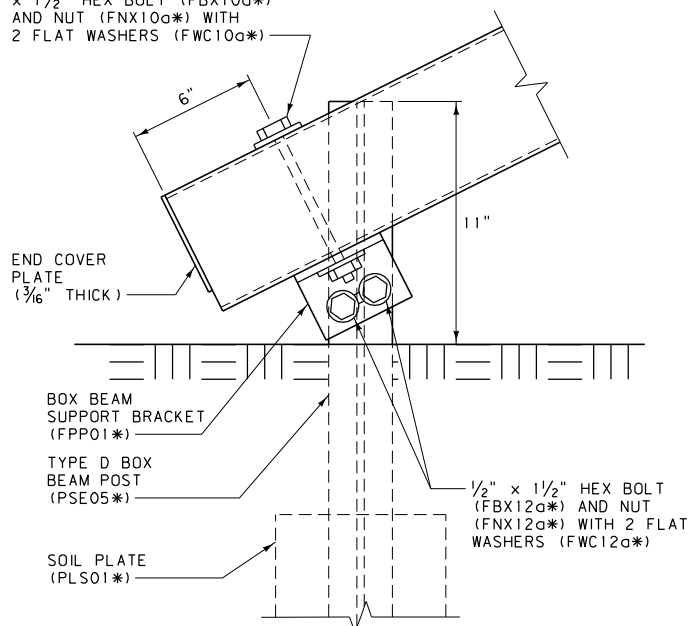


REFLECTIVE TAB

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 606	DWG. NO. 606-50
BOX BEAM GUARDRAIL	
EFFECTIVE: APRIL 2006	
 MONTANA DEPARTMENT OF TRANSPORTATION	



1/2" DIA. HOLES FOR 3/8" DIA.
x 7 1/2" HEX BOLT (FBX10a*)
AND NUT (FNX10a*) WITH
2 FLAT WASHERS (FWC10a*)




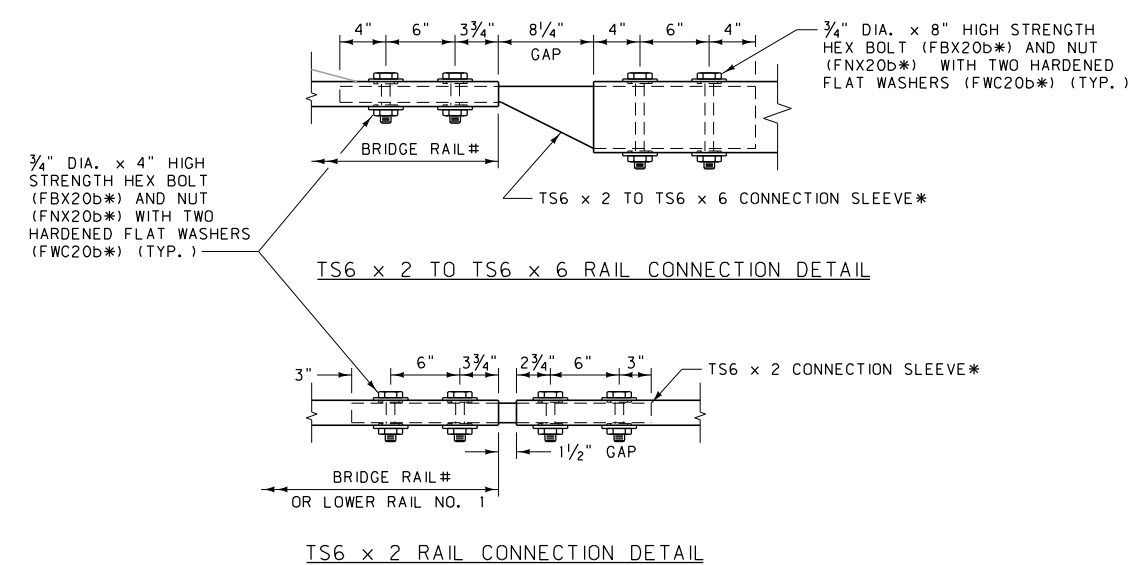
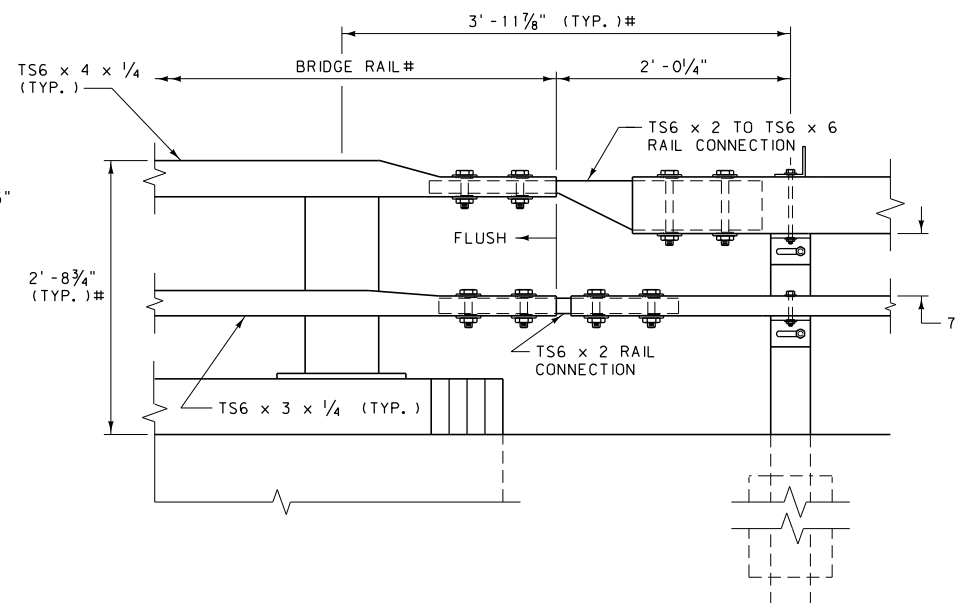
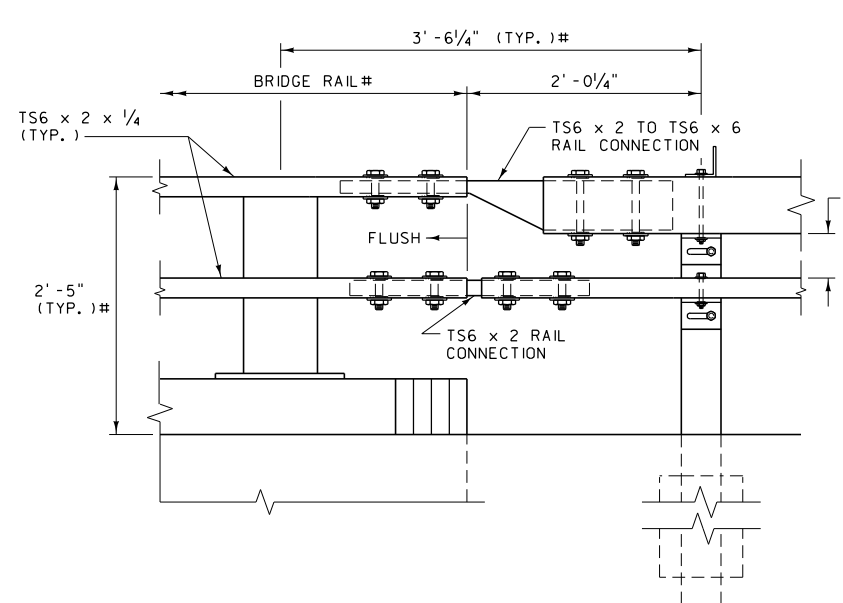
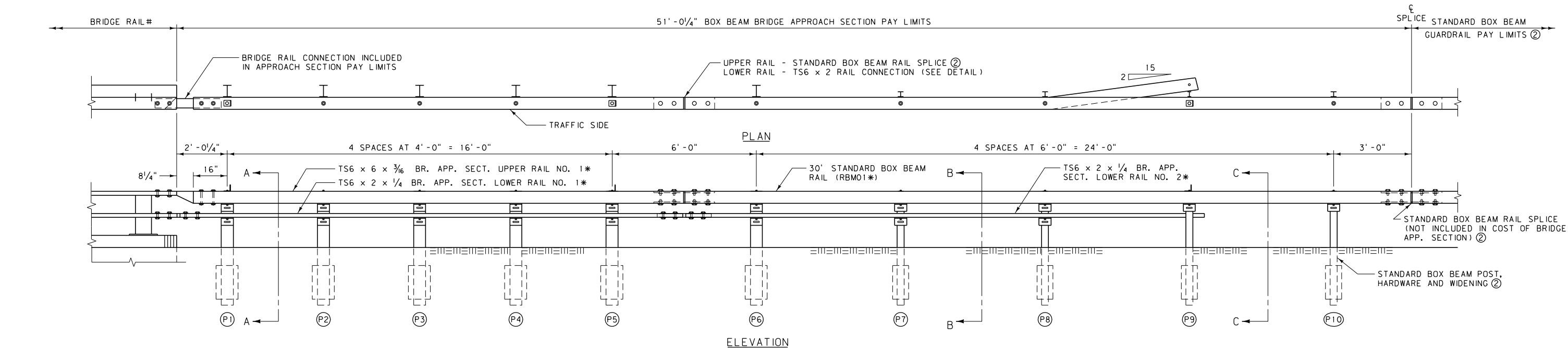
DETAIL "A"

NOTES:

① SEE DTL. DWG. NO. 606-50 FOR
STANDARD BOX BEAM GUARDRAIL
AND ASSOCIATED DETAILS.

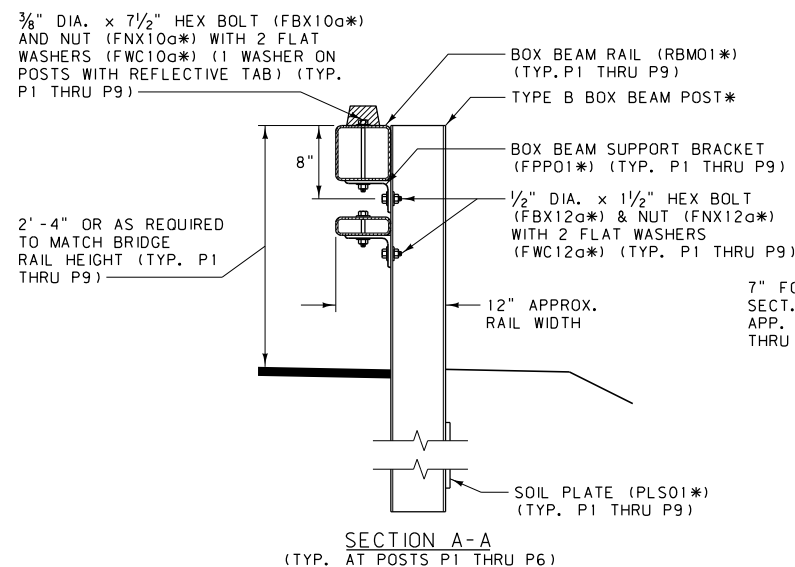
* SEE DTL. DWG. NO. 606-80 FOR
SCHEDULE OF GUARDRAIL HARDWARE.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	606-52
SECTION 606	
BOX BEAM ONE-WAY DEPARTURE TERMINAL SECTION	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	

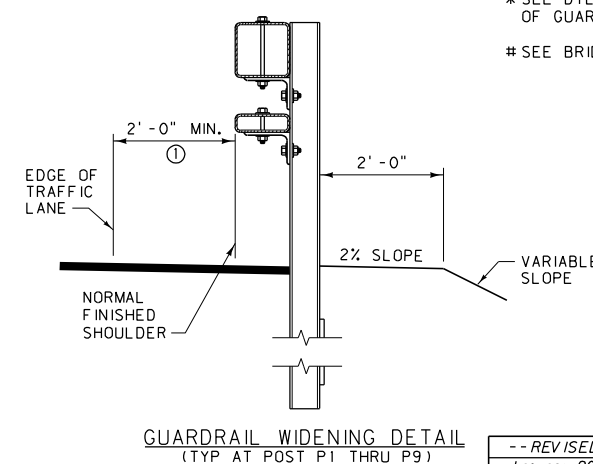
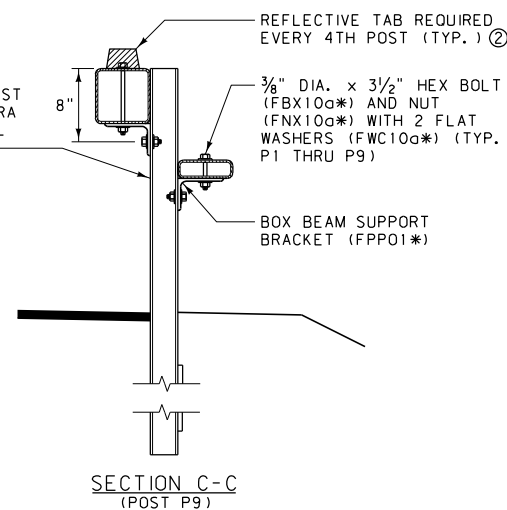
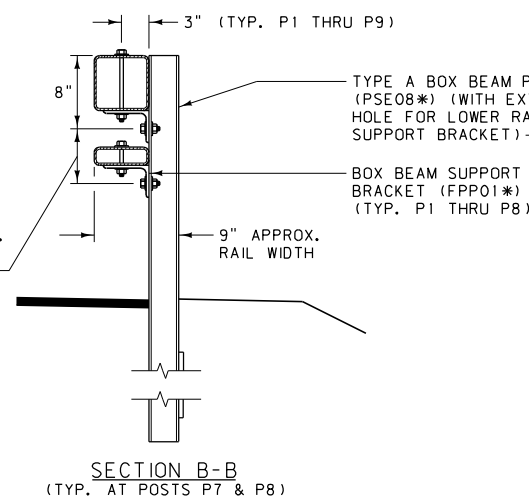


BOX BEAM - BRIDGE APPROACH SECTION TYPE 1

BOX BEAM - BRIDGE APPROACH SECTION TYPE 2



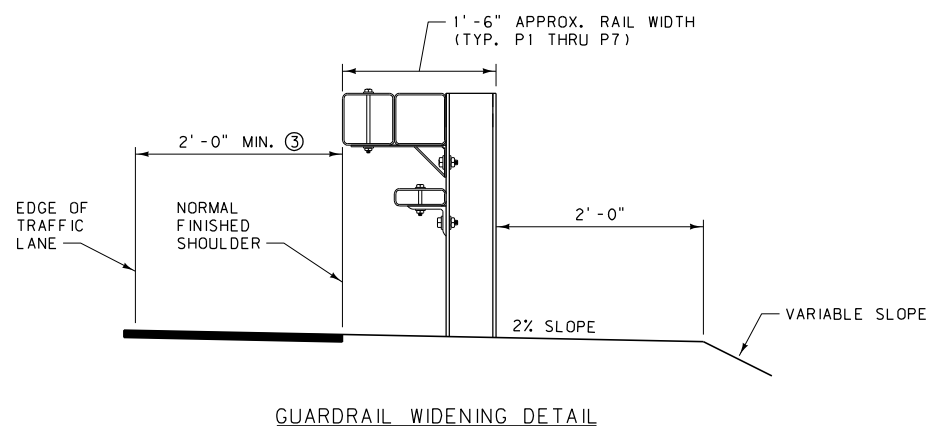
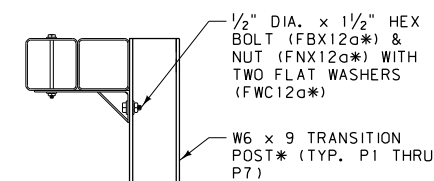
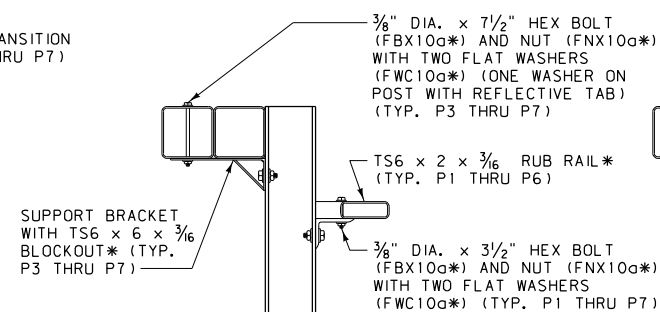
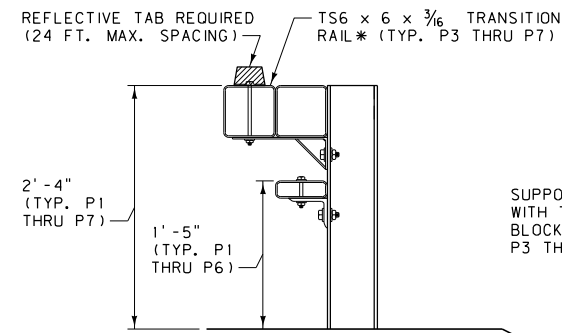
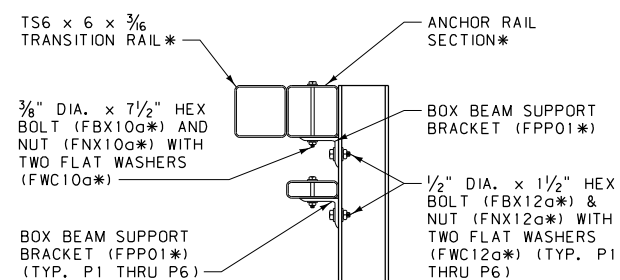
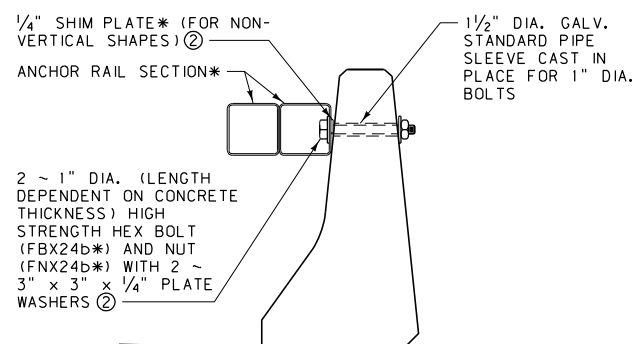
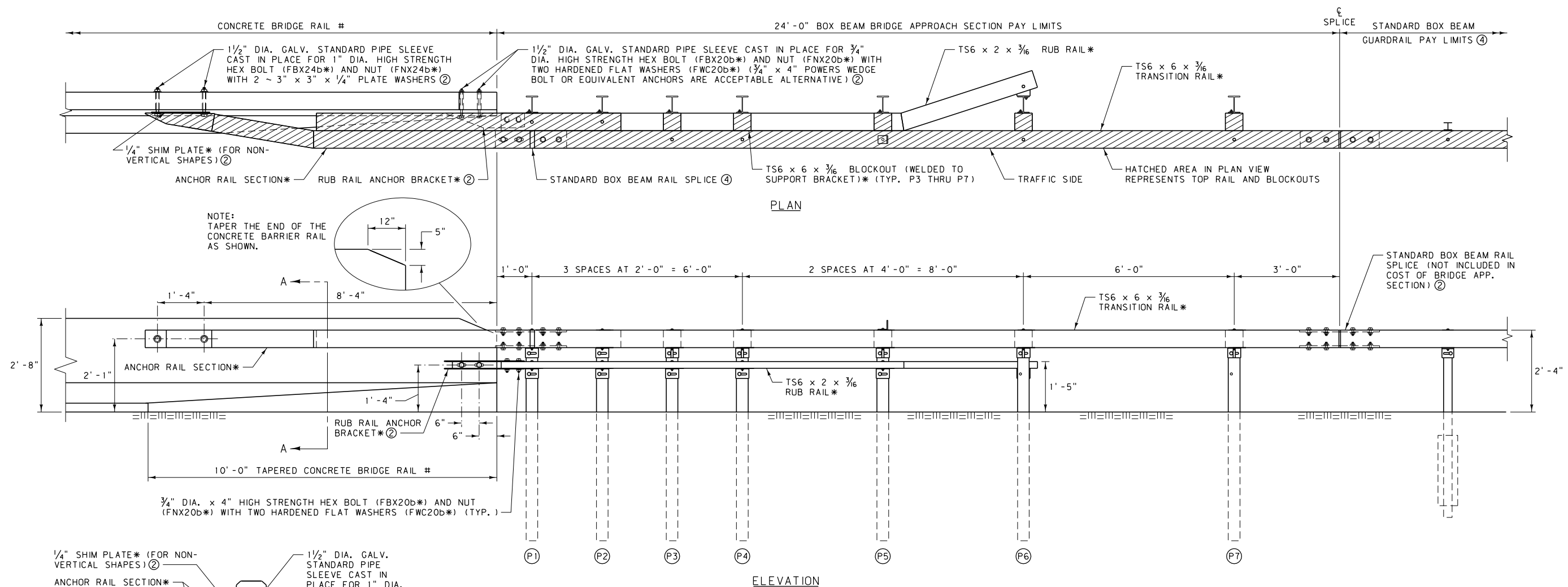
7" FOR TYPE 1 BR. APP. SECT. 9" FOR TYPE 2 BR. APP. SECT. (TYP. P1 THRU P9)



NOTES:

- ① WIDENING IS REQUIRED IF FINISHED SHOULDER IS LESS THAN 2'-0" FROM THE TRAFFIC LANE.
 - ② SEE DTL. DWG. NO. 606-50 FOR STANDARD BOX BEAM GUARDRAIL AND ASSOCIATED DETAILS.
- * SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.
- # SEE BRIDGE PLANS.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	606-53
SECTION 606	
BOX BEAM BRIDGE APPROACH SECTION - TYPES 1 & 2	
EFFECTIVE: FEBRUARY 2005	
-- REVISED -- January 2008	
MONTANA DEPARTMENT OF TRANSPORTATION serving you with pride	



NOTES:

- ① INCLUDE COST OF ENTIRE ANCHOR RAIL SECTION, ALONG WITH ALL HARDWARE NECESSARY FOR ATTACHMENT TO CONCRETE BRIDGE RAIL, IN COST OF BRIDGE APPROACH SECTION.
- ② THE LENGTHS OF CONCRETE ANCHOR BOLTS, TYPE OF RUB RAIL ANCHOR BRACKET AND THE NEED FOR THE 1/4" SHIM PLATE IS DEPENDENT UPON THE SHAPE AND THE THICKNESS OF THE CONCRETE BRIDGE RAIL.

- ③ WIDENING IS REQUIRED IF FINISHED SHOULDER IS LESS THAN 2'-0" FROM THE TRAFFIC LANE.

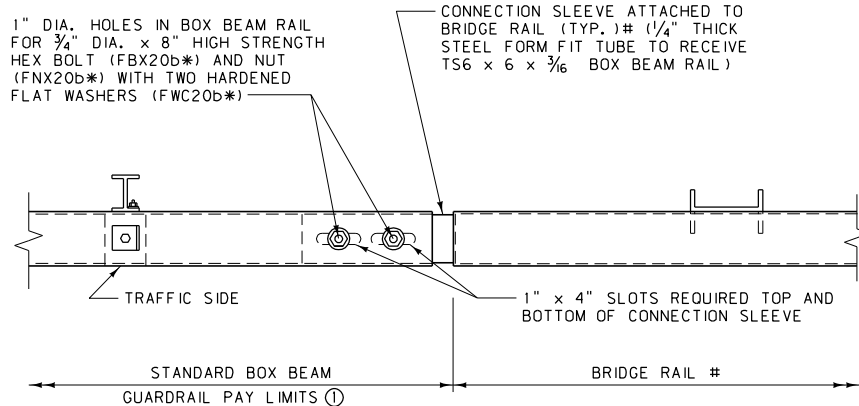
- ④ SEE DTL. DWG. NO. 606-50 FOR STANDARD BOX BEAM GUARDRAIL AND ASSOCIATED DETAILS.

* SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

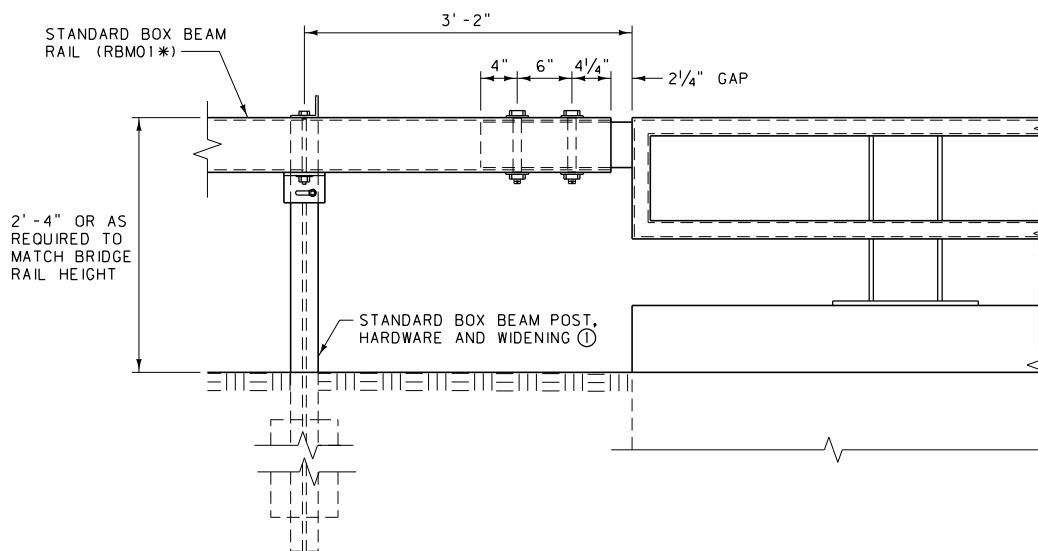
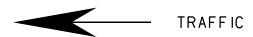
SEE BRIDGE PLANS.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	606-53A
SECTION 606	
BOX BEAM BRIDGE APPROACH SECTION - TYPE 3	

-- REVISED --	EFFECTIVE: JANUARY 2008
	MONTANA DEPARTMENT OF TRANSPORTATION




PLAN

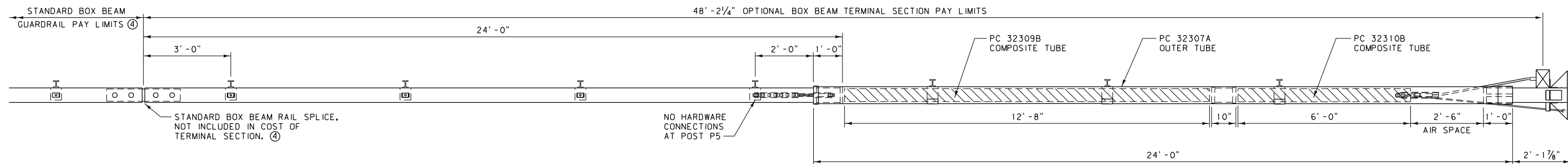


ELEVATION

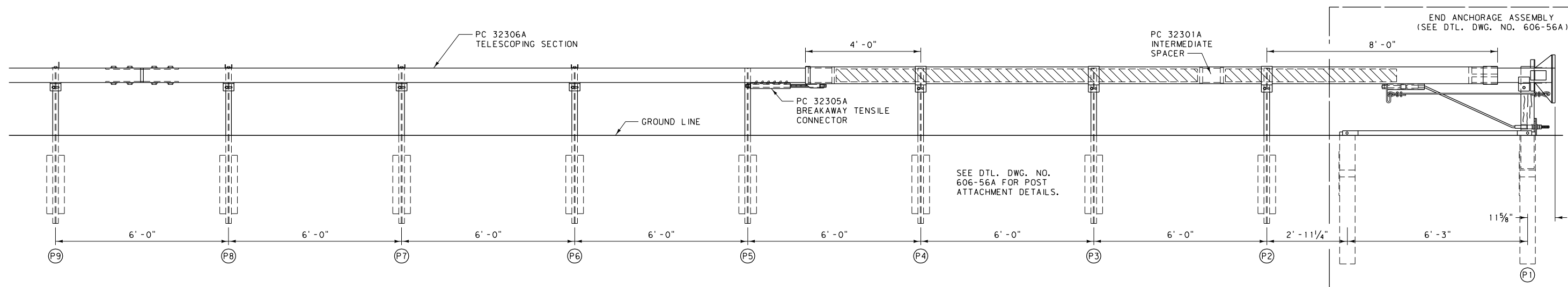
NOTES:

- ① SEE DTL. DWG. NO. 606-50 FOR STANDARD BOX BEAM GUARDRAIL AND ASSOCIATED DETAILS.
- ② USE ON EXIT END OF ONE-WAY TRAFFIC BRIDGES ONLY.
- * SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.
- # SEE BRIDGE PLANS FOR MORE DETAILED INFORMATION ON BRIDGE RAIL AND CONNECTION DETAILS.

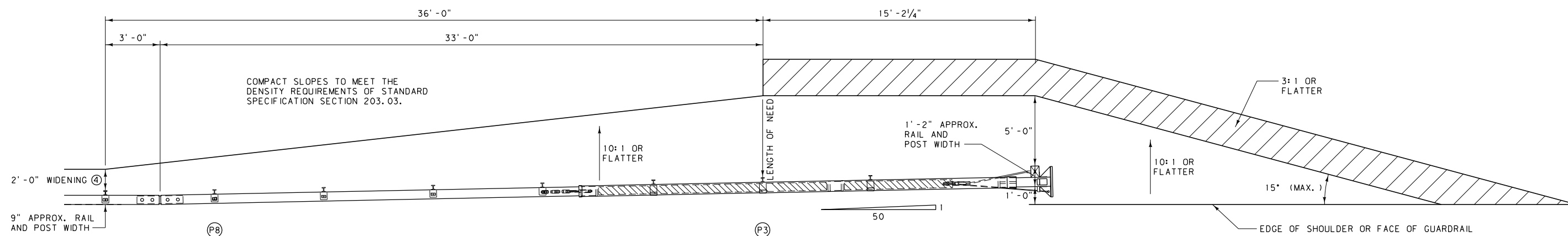
DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 606	DWG. NO. 606-54
BOX BEAM ONE-WAY BRIDGE DEPARTURE SECTION	
EFFECTIVE: FEBRUARY 2005	
-- REVISED -- January 2008	
 MONTANA DEPARTMENT OF TRANSPORTATION	



PLAN




ELEVATION

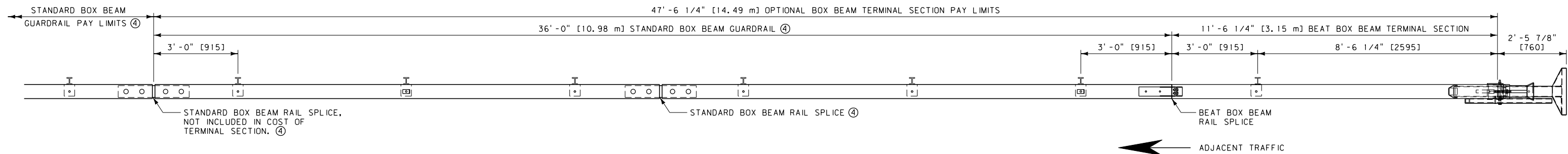


NOTES:

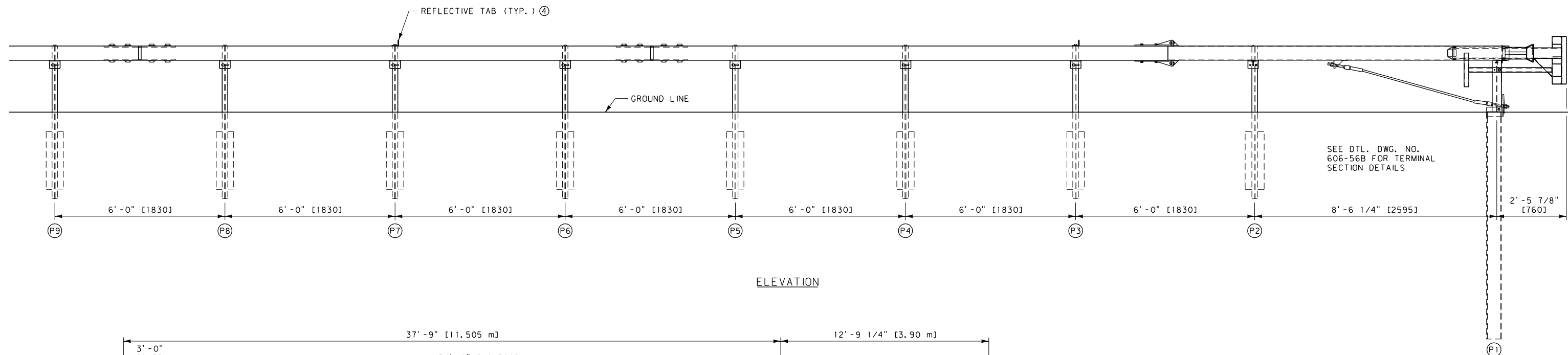
- ① PLACE A SELF-ADHESIVE OBJECT MARKER ON THE FACE OF THE NOSE ASSEMBLY, HAVING ALTERNATING RETRO-REFLECTIVE BLACK AND YELLOW STRIPES SLOPED DOWNWARD AT AN ANGLE OF 45° TOWARDS THE SIDE ON WHICH TRAFFIC IS TO PASS.
- ② FLARE THE END SECTION AWAY FROM TRAFFIC AT A RATE OF 50:1 FOR 50 FEET (ILLUSTRATED). FLARES OF 50:1 FOR 100 FEET MAY ALSO BE USED. THE FLARE MAY BE OMITTED ON ROADS WITH SHOULDERS GREATER THAN 2 FEET IN WIDTH.
- ③ OBTAIN ENGINEERS APPROVAL OF MANUFACTURER INSTALLATION OPTIONS WHEN SITE CONDITIONS PREVENT THE USE OF THE OPTION SHOWN ON THIS DETAIL.
- ④ SEE DTL. DWG. NO. 606-50 FOR STANDARD BOX BEAM GUARDRAIL AND ASSOCIATED DETAILS.

GUARDRAIL WIDENING

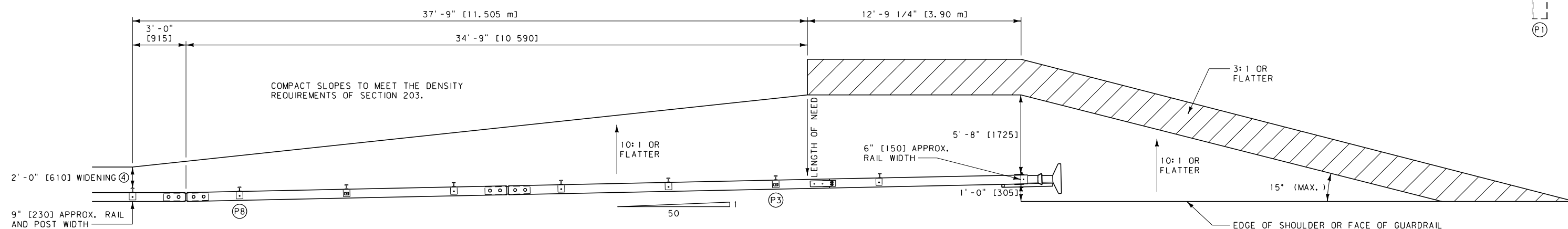
DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 606	DWG. NO. 606-55A
OPTIONAL BOX BEAM TERMINAL SECTION - WY-BET	
EFFECTIVE: FEBRUARY 2005	
 serving you with pride	MONTANA DEPARTMENT OF TRANSPORTATION



PLAN



ELEVATION



GUARDRAIL WIDENING

NOTES:

- ① PLACE A SELF-ADHESIVE OBJECT MARKER ON THE FACE OF THE NOSE ASSEMBLY, HAVING ALTERNATING RETRO-REFLECTIVE BLACK AND YELLOW STRIPES SLOPED DOWNWARD AT AN ANGLE OF 45° TOWARDS THE SIDE ON WHICH TRAFFIC IS TO PASS.
- ② FLARE THE END SECTION AWAY FROM TRAFFIC AT A RATE OF 50:1 FOR 50 FEET [15.24 m] (ILLUSTRATED). FLARES OF 50:1 FOR 100 FEET [30.48 m] MAY ALSO BE USED. THE FLARE MAY BE OMITTED ON ROADS WITH SHOULDERS GREATER THAN 2 FEET [0.6 m] IN WIDTH.

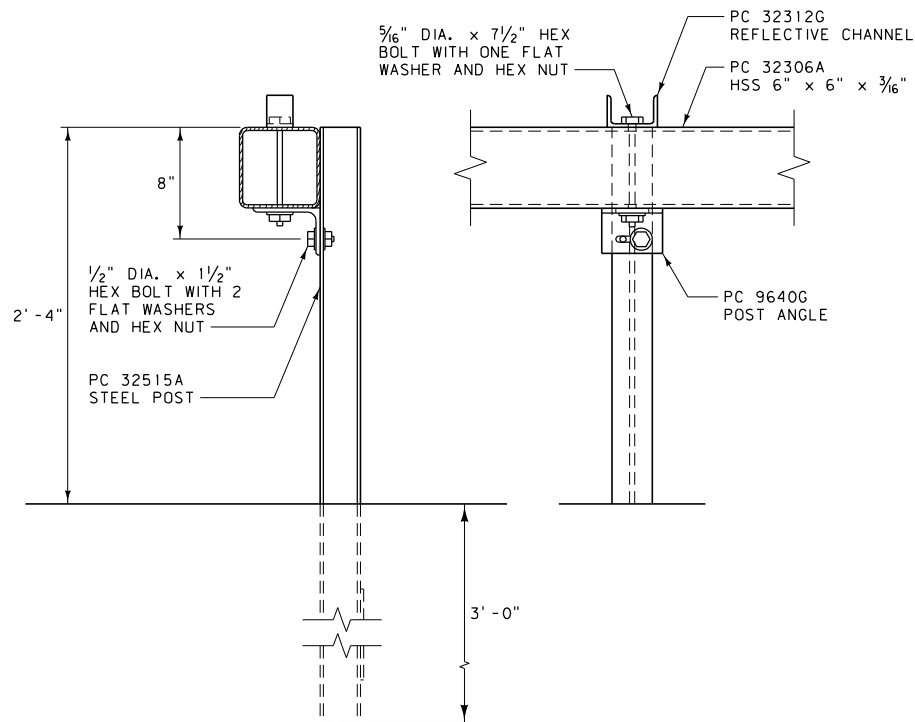
- ③ OBTAIN PROJECT MANAGER'S APPROVAL OF MANUFACTURER INSTALLATION OPTIONS WHEN SITE CONDITIONS PREVENT THE USE OF THE OPTION SHOWN ON THIS DETAIL.
- ④ SEE DTL. DWG. NO. 606-50 FOR STANDARD BOX BEAM GUARDRAIL AND ASSOCIATED DETAILS.

UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

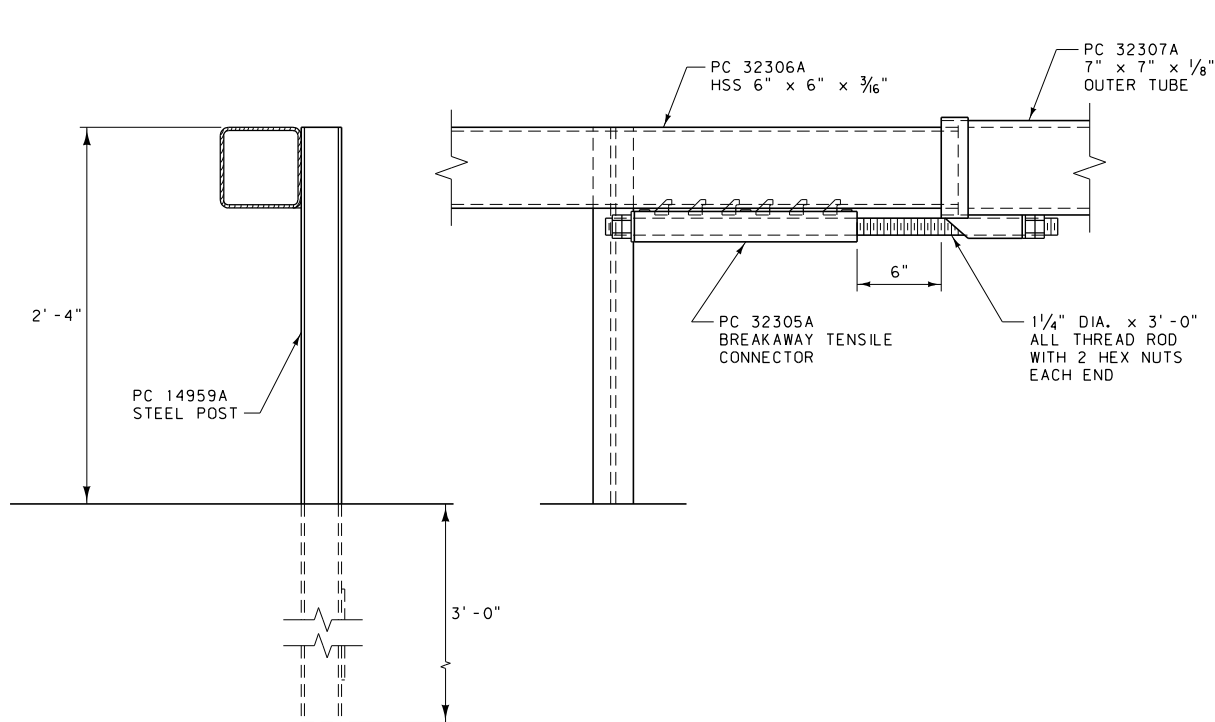
DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	606-55B
SECTION 606	
OPTIONAL BOX BEAM TERMINAL SECTION - BEAT	

--REVISED--
MAY 2011

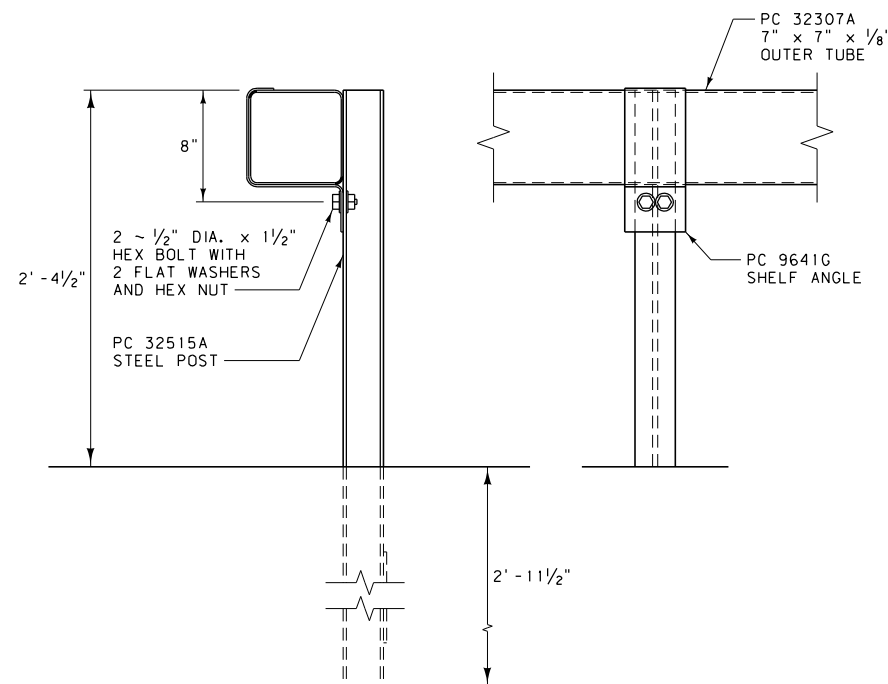
EFFECTIVE: FEBRUARY 2005
MDT MONTANA DEPARTMENT OF TRANSPORTATION



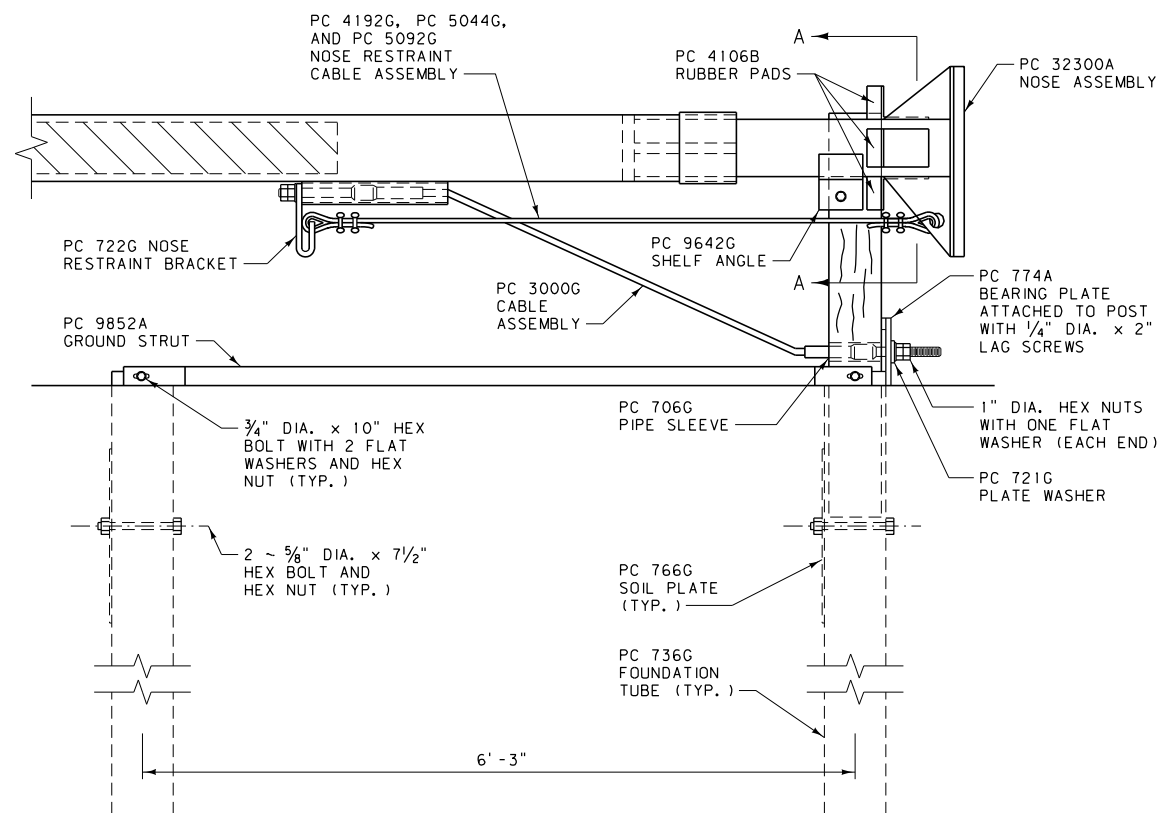
POST ATTACHMENT DETAIL
(TYP. AT POSTS P6, P7 AND P8)



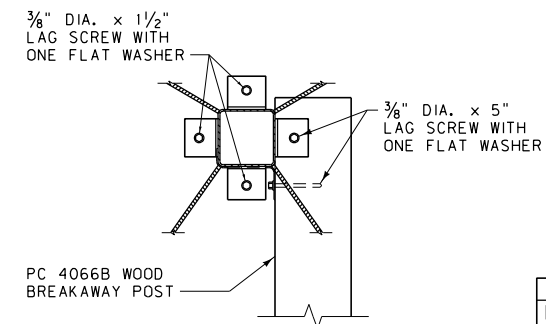
POST ATTACHMENT DETAIL
(POST P5)



POST ATTACHMENT DETAIL
(TYP. AT POSTS P2, P3 AND P4)




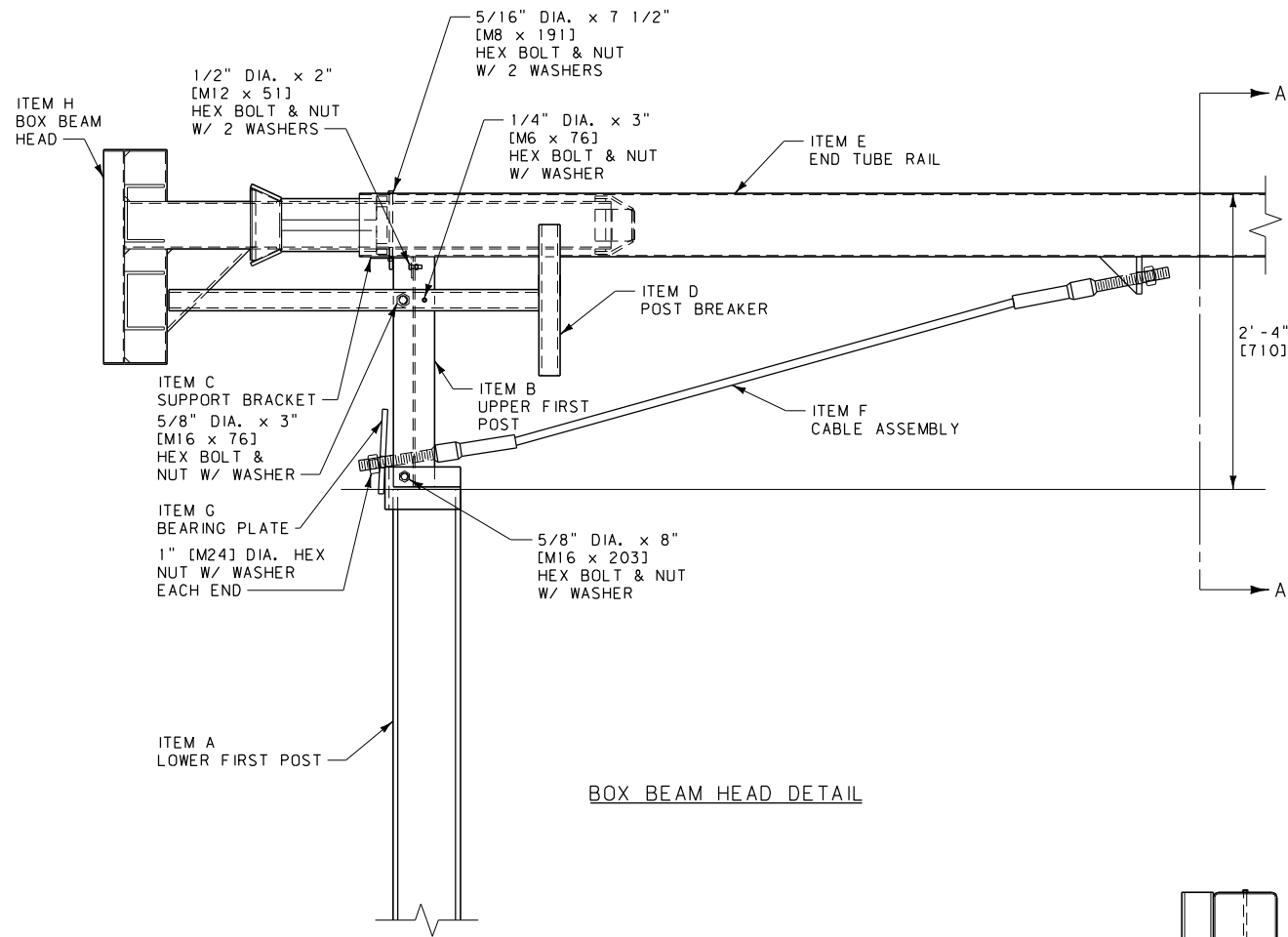
END ANCHORAGE ASSEMBLY



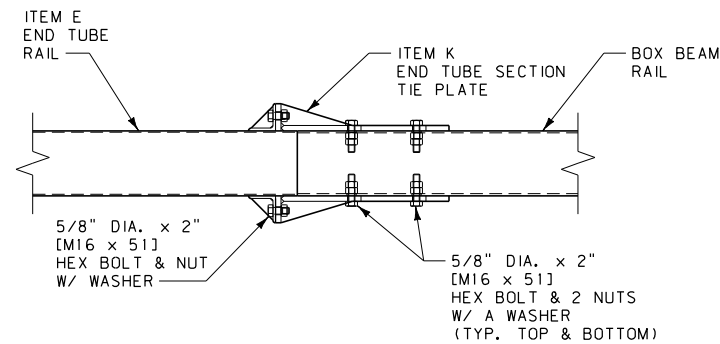
SECTION A-A

BILL OF MATERIAL		
PC	QTY	DESCRIPTION
706G	1	PIPE SLEEVE, 2" DIA. x 6"
721G	1	PLATE WASHER, 3" x 4" x 3/8"
722G	1	NOSE RESTRAINT CABLE BRACKET
736G	2	STEEL TUBE, 6" x 8" x 5' - 0"
766G	2	SOIL PLATE, 18" x 24" x 1/4"
774A	1	SLOTTED BEARING PLATE
3000G	1	CABLE ASSEMBLY
3148G	2	1/4" DIA. x 2" LAG SCREW
3240G	3	3/16" DIA. ROUND WASHER
3245G	3	5/16" DIA. HEX NUT
3254G	3	3/8" DIA. x 1 1/2" LAG SCREW
3255G	5	3/8" DIA. ROUND WASHER
3264G	2	3/8" DIA. x 5" LAG SCREW
3350G	4	3/8" DIA. HEX NUT
3478G	4	5/8" DIA. x 7 1/2" HEX BOLT
3700G	4	3/4" DIA. ROUND WASHER
3710G	2	3/4" DIA. HEX NUT
4044G	4	1 1/4" DIA. HEX NUT
4066B	1	WOOD POST, 6" x 8" x 3' - 6 1/2"
4106B	3	RUBBER PAD, 1 1/2" x 3 1/2" x 4"
4192G	4	1/4" CABLE CLAMP
4300G	18	1/2" DIA. ROUND WASHER
4303G	9	1/2" DIA. HEX NUT
4308G	9	1/2" DIA. x 1 1/2" HEX BOLT
4719G	2	3/4" DIA. x 10" HEX BOLT
4902G	2	1" DIA. ROUND WASHER
4903G	4	1" DIA. HEX NUT
5044G	1	AIRCRAFT CABLE, 1/4" DIA. x 6' - 10"
5092G	2	1/4" AIRCRAFT CABLE THIMBLE
5188G	3	5/16" DIA. x 7 1/2" HEX BOLT
5423G	1	1 1/4" DIA. x 36" ALL THREAD ROD
9640G	3	POST ANGLE, 5" x 3 1/2" x 3/8" x 4 1/2"
9641G	3	SHELF ANGLE, 4 1/2" x 1/8" x 1' - 7 1/8"
9642G	1	SHELF ANGLE, 4 1/2" x 1/8" x 11 1/8"
9852A	1	STRUT AND YOKE ASSEMBLY
14959A	1	5' - 4" STEEL POST
32300A	1	WY-BET NOSE ASSEMBLY
32301A	1	HSS 6" x 6" x 10" INTERMEDIATE SPACER
32305A	1	BREAKAWAY TENSILE CONNECTOR
32306A	1	HSS 6" x 6" x 3/16" TELESCOPING SECTION
32307A	1	OUTER TUBE
32309B	1	6" O.D. x 1/4" x 12' - 7 1/8" COMPOSITE TUBE
32310B	1	6" O.D. x 1/8" x 5' - 11 1/8" COMPOSITE TUBE
32312G	3	REFLECTOR CHANNEL
32515A	6	5' - 4" STEEL POST

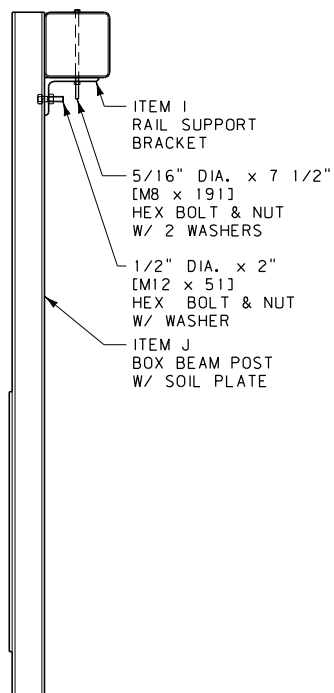
DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 606	DWG. NO. 606-56A
WY-BET BOX BEAM TERMINAL SECTION DETAILS	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	



BOX BEAM HEAD DETAIL



FIRST RAIL TIE DETAIL



SECTION "A-A"

BILL OF MATERIAL			
ITEM	QTY	DESCRIPTION	METRIC DESCRIPTION
A	1	LOWER FIRST POST, W6x15, 8'-0" LG.	LOWER FIRST POST, W152 x 22.3 kg/m, 2440 LG.
B	1	UPPER FIRST POST, W6x9, 1'-9 1/2" LG.	UPPER FIRST POST, W152 x 13.4 kg/m, 546 LG.
C	1	SUPPORT BRACKET, 10 GAGE BENT PLATE	SUPPORT BRACKET, 10 GA. (3.5 THK.) BENT PLATE
D	1	POST BREAKER	POST BREAKER
E	1	END TUBE RAIL, TS 6" x 6" x 1/8" x 12'-0"	END TUBE RAIL, TS 152 x 152 x 3.2 x 3660
F	1	CABLE ASSEMBLY	CABLE ASSEMBLY
G	1	BEARING PLATE	BEARING PLATE
H	1	BOX BEAM HEAD	BOX BEAM HEAD
I	1	RAIL SUPPORT BRACKET, L 5" x 3 1/2" x 3/8" x 4 1/2"	RAIL SUPPORT BRACKET, L 127 x 89 x 9.5 x 115
J	1	BOX BEAM POST W/ SOIL PLATE	BOX BEAM POST W/ SOIL PLATE
K	2	END TUBE SECTION TIE PLATE	END TUBE SECTION TIE PLATE
a	2	5/16" DIA. x 7 1/2" HEX BOLT (GRADE 5)	M8 x 191 HEX BOLT (GRADE 5)
b	1	1/4" DIA. x 3" HEX BOLT (GRADE 2)	M6 x 76 HEX BOLT (GRADE 2)
c	2	1/2" DIA. x 2" HEX BOLT (GRADE 2)	M12 x 51 HEX BOLT (GRADE 2)
d	8	5/8" DIA. x 2" HEX BOLT (GRADE 5)	M16 x 51 HEX BOLT (GRADE 5)
e	1	5/8" DIA. x 8" HEX BOLT (GRADE 5)	M16 x 203 HEX BOLT (GRADE 5)
f	1	5/8" DIA. x 3" HEX BOLT (GRADE 5)	M16 x 76 HEX BOLT (GRADE 5)
g	2	5/16" DIA. HEX NUT	M8 HEX NUT
h	1	1/4" DIA. HEX NUT	M6 HEX NUT
j	2	1/2" DIA. HEX NUT	M12 HEX NUT
k	14	5/8" DIA. HEX NUT	M16 HEX NUT
n	2	1" DIA. ANCHOR CABLE HEX NUT	M24 ANCHOR CABLE HEX NUT
p	4	5/16" DIA. WASHER	M8 WASHER
q	1	1/4" DIA. WASHER	M6 WASHER
r	3	1/2" DIA. WASHER	M12 WASHER
s	10	5/8" DIA. WASHER	M16 WASHER
u	2	1" DIA. ANCHOR CABLE WASHER	M24 ANCHOR CABLE WASHER

NOTES:

- ① BEAT TERMINAL SECTION TO INCLUDE 36'-0" [10.98 m] OF BOX BEAM GUARDRAIL AS SHOWN ON DTL. DWG. NO. 606-55B.
- ② PLACE POST BREAKER ON TRAFFIC SIDE OF FIRST POST.

UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

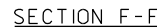
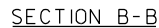
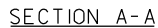
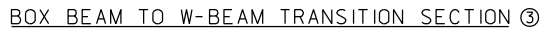
DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	606-56B
SECTION 606	

BEAT
BOX BEAM TERMINAL
SECTION DETAILS

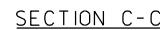
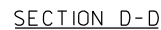
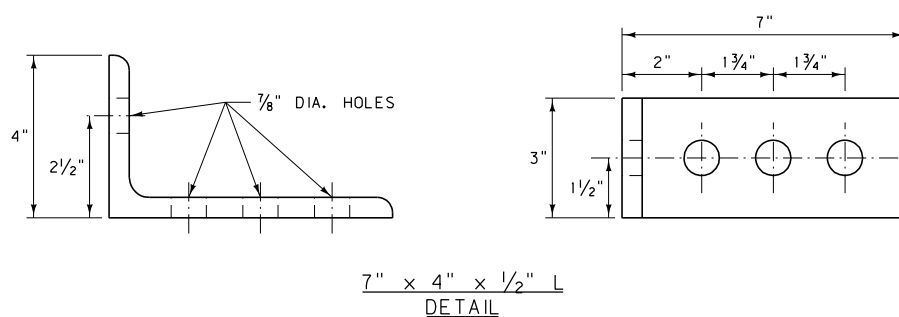
EFFECTIVE: FEBRUARY 2005

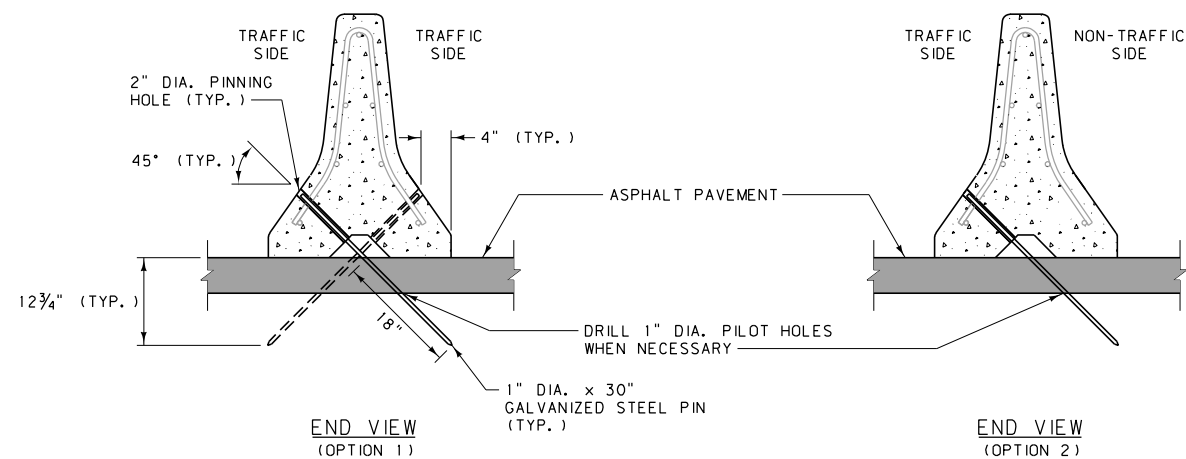
MDT MONTANA DEPARTMENT OF TRANSPORTATION

--REVISED--
MAY 2011



- ① SEE DTL. DWG. NO. 606-50 FOR STANDARD BOX BEAM GUARDRAIL AND ASSOCIATED DETAILS.
 - ② SEE DTL. DWG. NO. 606-05A AND 606-05B FOR STANDARD W-BEAM GUARDRAIL AND ASSOCIATED DETAILS.
 - ③ MANUFACTURE ANCHOR ANGLES USING AASHTO M 270 GRADE 36 STEEL. ALL WELDING IS TO CONFORM TO THE APPLICABLE AWS CODE.
 - ④ GALVANIZE ANCHOR ANGLES IN ACCORDANCE WITH AASHTO M 111. NO PUNCHING, DRILLING, WELDING OR CUTTING IS PERMITTED ON COMPONENTS AFTER GALVANIZING.
 - ⑤ USE CLASS "DD" CONCRETE TO CONSTRUCT ANCHOR.
 - ⑥ ANY HOLES, CUTS, SLOTS OR WELDS MADE ON THE W-BEAM OR BOX BEAM RAIL AFTER GALVANIZING IS TO BE PAINTED WITH AN APPROVED GALVANIZING PAINT.
 - ⑦ LAP ALL W-BEAM SPLICES IN THE DIRECTION OF ADJACENT TRAFFIC.
- * SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

BOX BEAM TO W-BEAM
TRANSITION SECTION

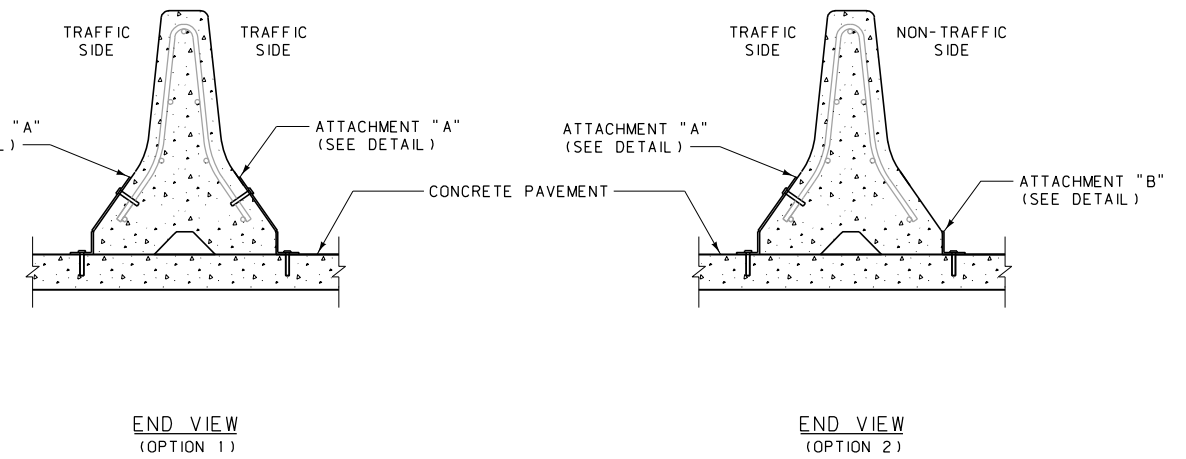


END VIEW
(OPTION 1)

END VIEW
(OPTION 2)

OPTION 1 = TRAFFIC ON BOTH SIDES OF C.B.R.
OPTION 2 = TRAFFIC ON ONE SIDE OF C.B.R.

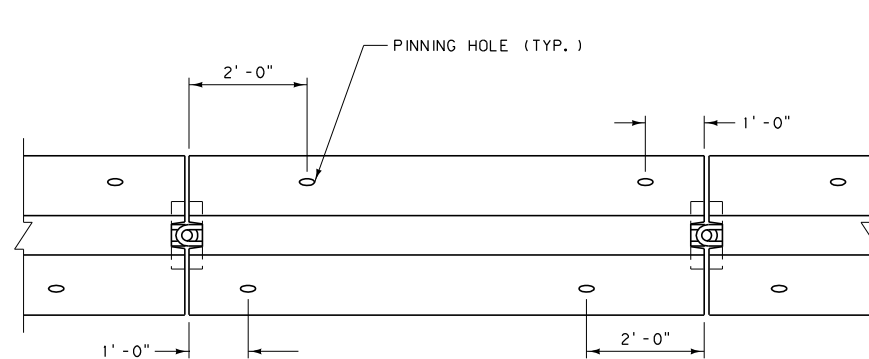
TYPE 1 ANCHOR
(FOR TEMPORARY OR PERMANENT CONCRETE BARRIER
RAIL INSTALLATIONS ON ASPHALT PAVEMENT)



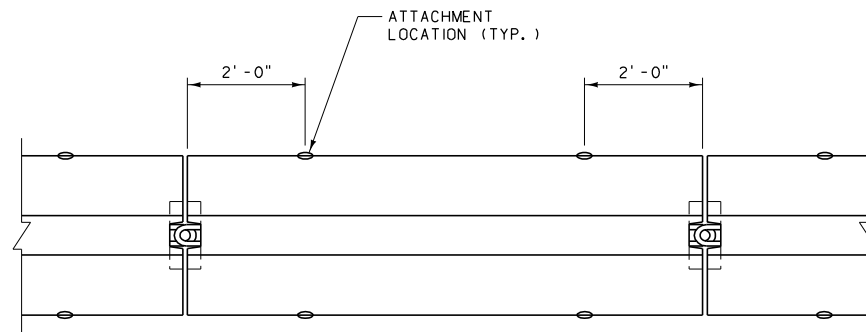
END VIEW
(OPTION 1)

END VIEW
(OPTION 2)

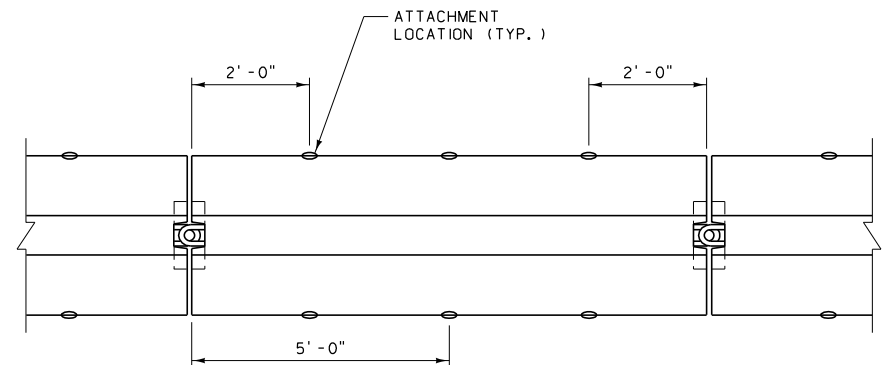
TYPE 2 & 3 ANCHORS
(FOR TEMPORARY CONCRETE BARRIER RAIL
INSTALLATIONS ON CONCRETE PAVEMENT)



TYPE 1 ANCHOR
PLAN VIEW



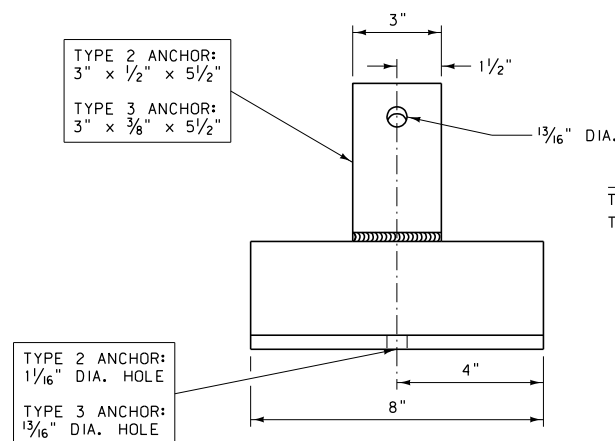
TYPE 2 ANCHOR
PLAN VIEW



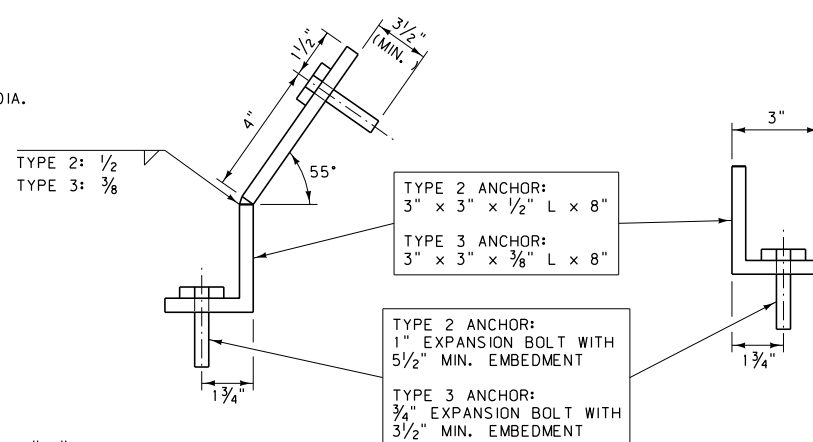
TYPE 3 ANCHOR
PLAN VIEW

NOTES:

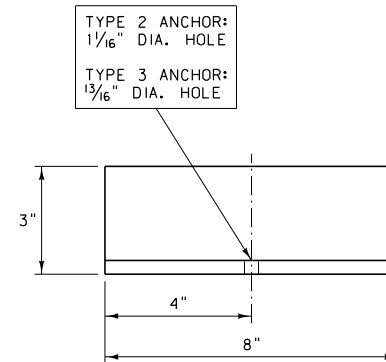
- USE THESE ANCHORS WITH STANDARD CONCRETE BARRIER RAIL (C.B.R.), AS SHOWN IN DTL. DWG. NO. 606-60, WHEN DEFLECTION OF THE SYSTEM NEEDS TO BE LIMITED.
- CAST THE PINNING HOLES INTO THE C.B.R. USING 2" I.D. STEEL PIPE. DO NOT DRILL THE PINNING HOLES.
- USE STEEL CONFORMING TO AASHTO M270, GRADE 36 OR BETTER FOR PINS AND ATTACHMENT ANGLES. GALVANIZE IN ACCORDANCE WITH AASHTO M111.
- USE TYPE 2 ANCHORS WHEN A DEEPER EMBEDMENT (5 1/2") INTO THE BRIDGE DECK OR CONCRETE PAVEMENT IS PERMISSIBLE.
- ADJUST THE LOCATION OF THE TYPE 2 OR TYPE 3 ANCHORS TO AVOID THE MAIN REINFORCING WHEN PLACED ON BRIDGE DECK.
- USE SHIMS TO PROPERLY FIT THE TYPE 2 AND TYPE 3 ANCHORS TO THE BARRIER AND ROADWAY SURFACES.
- AFTER REMOVING TYPE 2 OR TYPE 3 ANCHORS, CLEAN THE HOLES IN THE CONCRETE PAVEMENT AND FILL WITH AN APPROVED NON-SHRINK OR EPOXY GROUT.
- REMOVE TYPE 1 ANCHORS BY FIRST DRIVING THE STEEL PINS DOWN THROUGH THE BARRIER TO ALLOW LIFTING OF THE BARRIER WITHOUT INTERFERENCE. THEN REMOVE THE PINS FROM THE PAVEMENT AND FILL THE PINNING HOLES WITH AN APPROVED SEALANT.
- DO NOT INSTALL ANCHORED CONCRETE BARRIER RAIL FOR OBSTACLES WITHIN 3.5' OF THE BASE (TRAFFIC SIDE) OF THE RAIL.




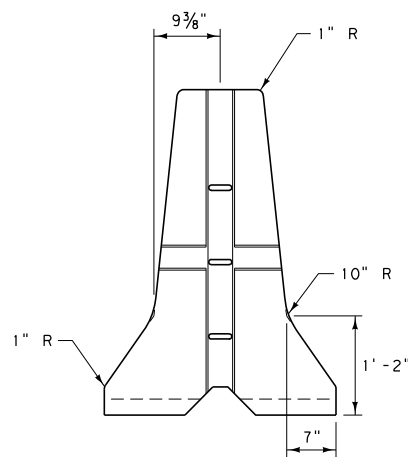
ATTACHMENT "A" DETAIL



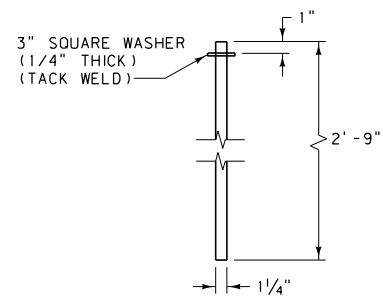
ATTACHMENT "B" DETAIL



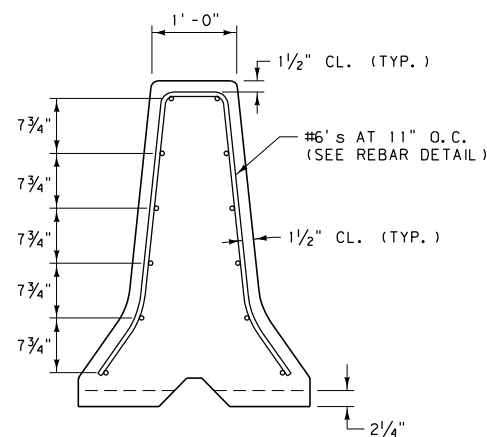
DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	606-62
SECTION 554,606	
CONCRETE BARRIER RAIL ANCHORS	
EFFECTIVE: APRIL 2006	
 MONTANA DEPARTMENT OF TRANSPORTATION	



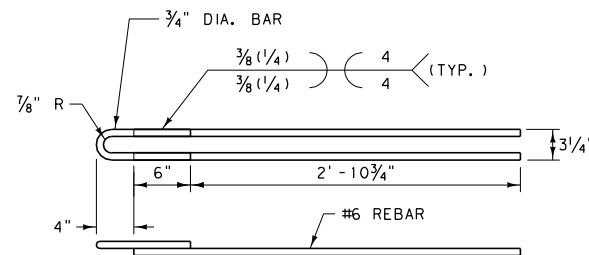
END VIEW



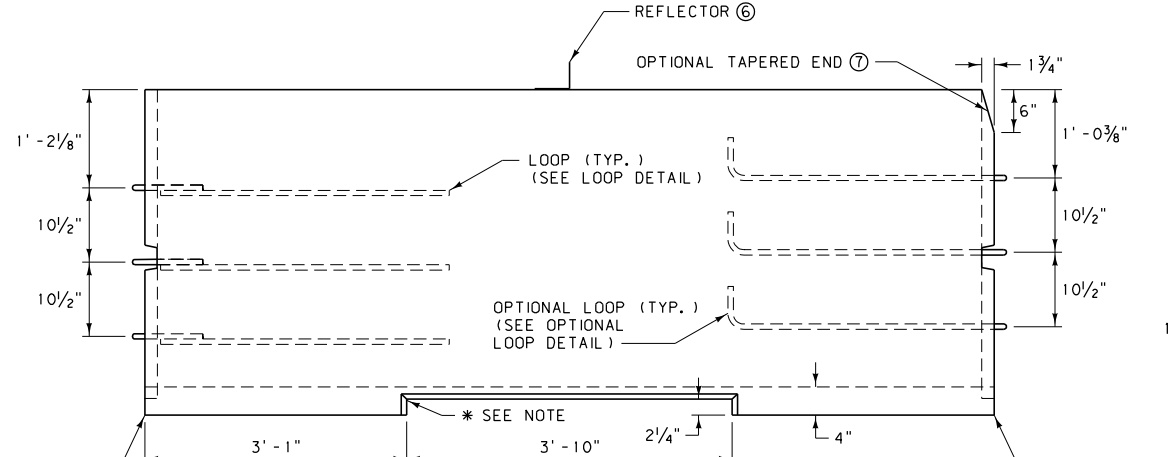
CONNECTING PIN DETAIL



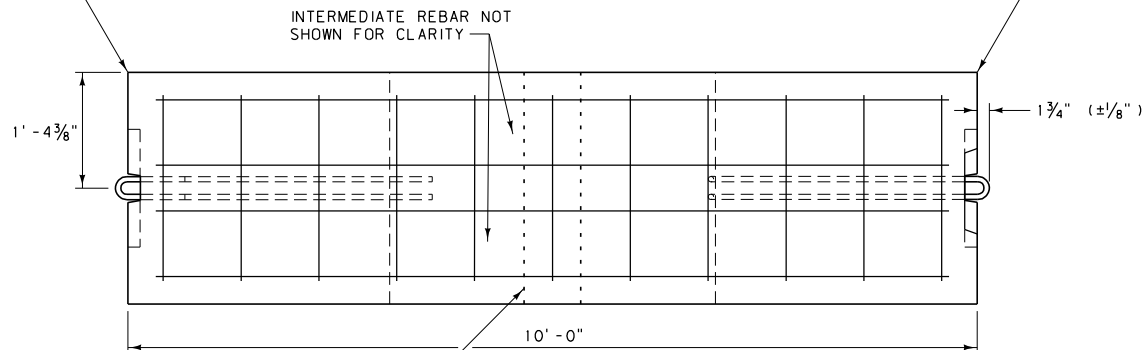
END VIEW



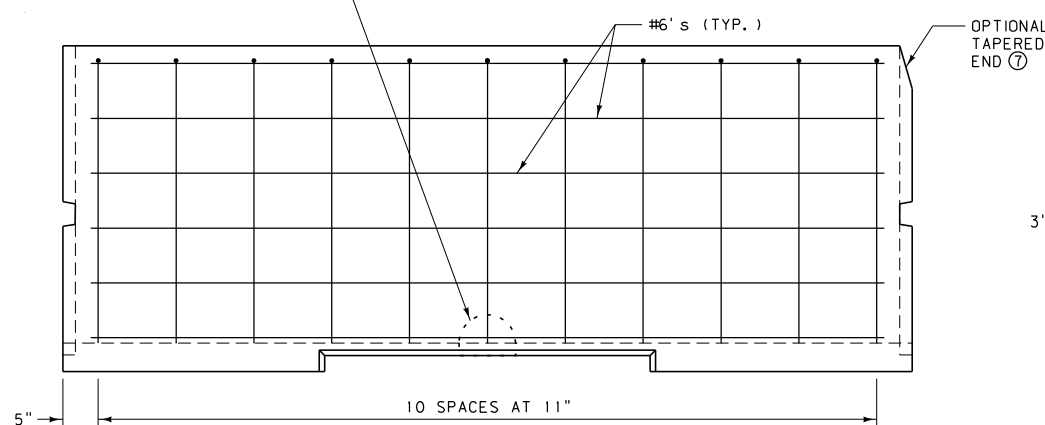
LOOP DETAIL



ELEVATION VIEW



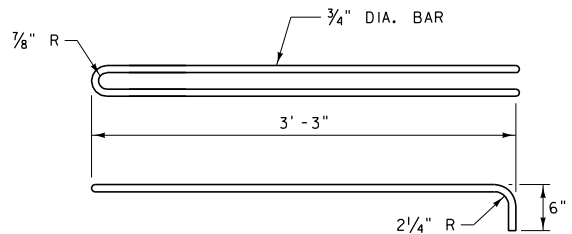
PLAN VIEW



ELEVATION VIEW

LOOP FABRICATION REQUIREMENTS:

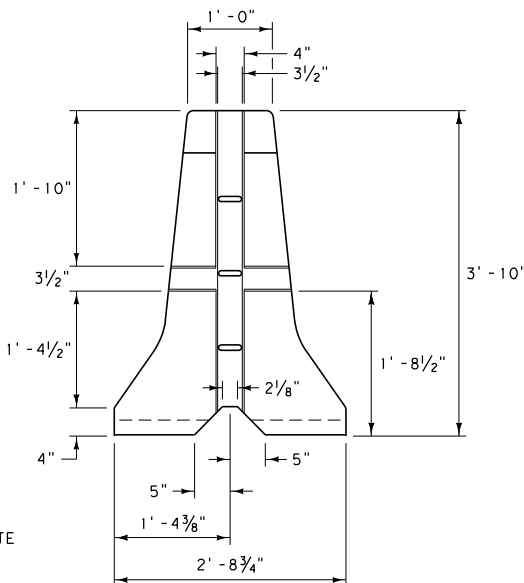
1. USE REINFORCING STEEL CONFORMING TO ASTM A 706, GRADE 60 FOR REBAR BEING WELDED TO LOOPS.
2. LOOP ENDS CONSIST OF SMOOTH ROUND BARS CONFORMING TO AASHTO M 270, GRADE 36.
3. COLD BEND THE LOOPS BY USING A JIG THAT WILL PRODUCE AN ACCURATE RADIUS WITHOUT MARRING THE BAR. DO NOT HEAT THE BAR TO FACILITATE BENDING.
4. WELD REBAR TO LOOPS USING 1/8" DIA. E8018 ROD. DO NOT TACK WELD THE PIECES TOGETHER PRIOR TO WELDING.
5. USE A CERTIFIED WELDER IN ACCORDANCE WITH THE CURRENT EDITION OF AWS D1.4. DO NOT PLACE THE WELDED ASSEMBLY IN THE FORM UNTIL IT HAS BEEN INSPECTED.
6. NO ADDITIONAL WELDING IS PERMITTED ON THE SMOOTH ROUND BARS OR REINFORCING STEEL.



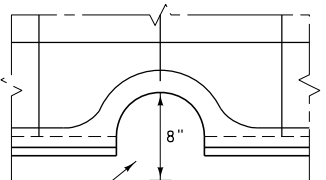
OPTIONAL LOOP DETAIL

OPTIONAL LOOP FABRICATION REQUIREMENTS:

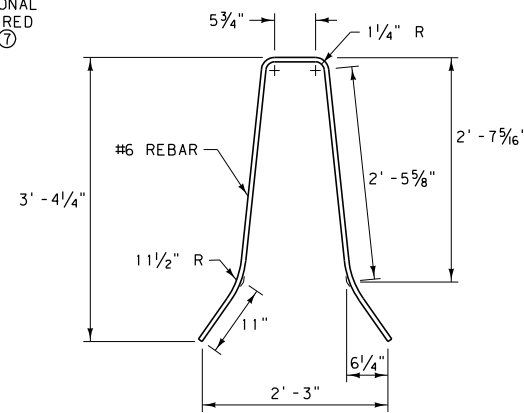
1. USE CONTINUOUS SMOOTH ROUND BARS CONFORMING TO AASHTO M 270, GRADE 36 TO FABRICATE THE OPTIONAL LOOPS.
2. COLD BEND THE LOOPS BY USING A JIG THAT WILL PRODUCE AN ACCURATE RADIUS WITHOUT MARRING THE BAR. DO NOT HEAT THE BAR TO FACILITATE BENDING.
3. NO WELDING IS PERMITTED ON THE SMOOTH ROUND BARS OR REINFORCING STEEL.



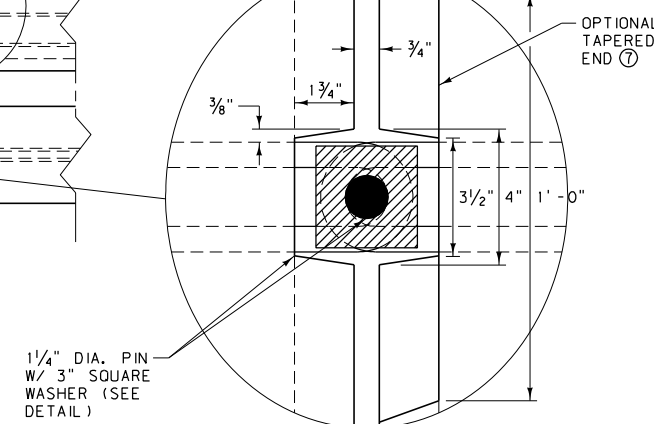
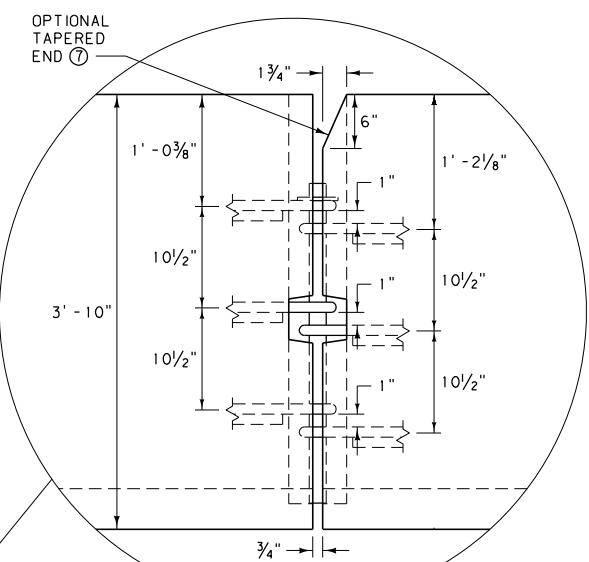
END VIEW



ALTERNATE TALL CONCRETE BARRIER RAIL DETAIL



REBAR DETAIL

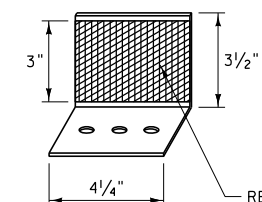


NOTES:

- ① USE CLASS "DD" CONCRETE OR EQUIVALENT.
- ② REINFORCING STEEL CONSISTS OF DEFORMED BARS CONFORMING TO AASHTO M 31, GRADE 60.
- ③ CONNECT EACH 10' SECTION WITH CONNECTING PINS AS DETAILED AND CONFORMING TO AASHTO M 270, GRADE 36 OR BETTER. CONNECTING PINS NEED NOT BE PAINTED.
- ④ CUTOUTS ON ENDS OF EACH SECTION ARE SHOWN WITH SLIGHT TAPER TO FACILITATE FORM REMOVAL. RECTANGULAR CUTOUTS ARE ACCEPTABLE.
- ⑤ THE CONTRACTOR IS RESPONSIBLE FOR THE PROPER FIT-UP OF THE PRECAST CONCRETE BARRIER RAIL. ASSEMBLE AND PIN SUFFICIENT NUMBER OF PRECAST SECTIONS IN THE FABRICATIONS PLANT TO DETERMINE THAT PROPER FIT-UP CAN BE MAINTAINED ON ALL ROADWAY ALIGNMENT, CURVES AS WELL AS ON TANGENT. THIS IS TO BE DETERMINED EARLY IN FABRICATION.
- ⑥ ATTACH REFLECTORS TO RAIL EVERY 30'. FOLLOW THE MANUFACTURER'S SPECIFICATIONS FOR ADHESIVE MOUNTING. IN NARROW PAVED (FLUSH) MEDIAN APPLICATIONS, REFLECTORIZE BOTH SIDES.
- ⑦ THE OPTIONAL TAPERED END SHOWN IS AN ACCEPTABLE ALTERNATE TO THE VERTICAL END FOR ALL CONCRETE BARRIER RAIL ENDS.


* 3/4" CHAMFER ENTIRE OPENING (OR SUFFICIENTLY ROUNDED SO THAT A SMOOTH EDGE RESULTS.) 1/2" CHAMFER IS ACCEPTABLE.

** USE THE ALTERNATE 8" DIA. HOLE IN THIS RAIL ON A CASE-BY-CASE BASIS AS SPECIFIED IN THE PLANS



REFLECTOR (SEE NOTES)

REFLECTORIZED TYPE III (HIGH INTENSITY) SHEETING, WHITE OR YELLOW PER MUTCD ⑥

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 554.606	DWG. NO. 606-64
TALL CONCRETE BARRIER RAIL	
--REVISED-- January 2008	EFFECTIVE: FEBRUARY 2005
 MONTANA DEPARTMENT OF TRANSPORTATION	

⑥ REFLECTORIZED TYPE III (HIGH INTENSITY) SHEETING, WHITE OR YELLOW PER MUTCD

REFLECTOR
(SEE NOTES)

LOOP DETAIL

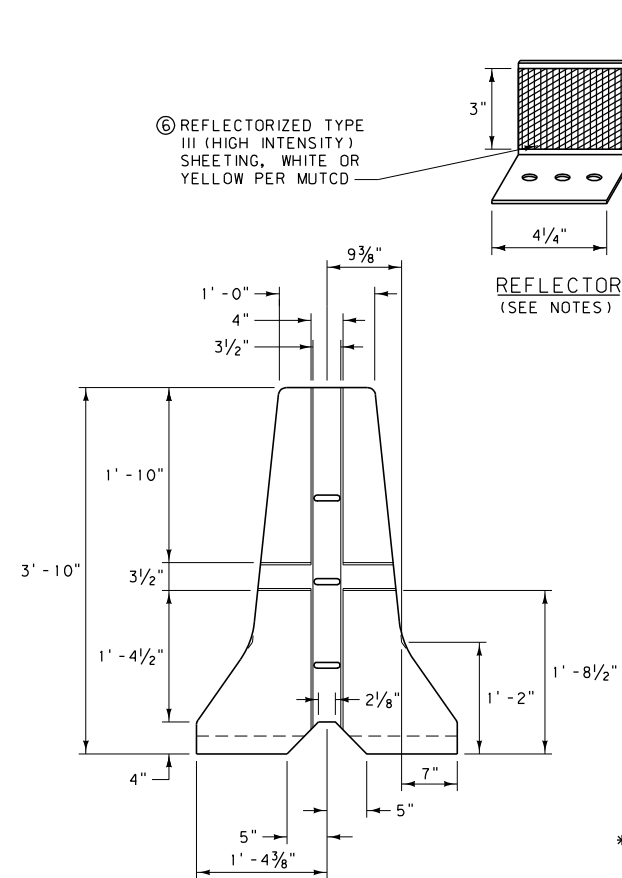
OPTIONAL LOOP DETAIL

LOOP FABRICATION REQUIREMENTS:

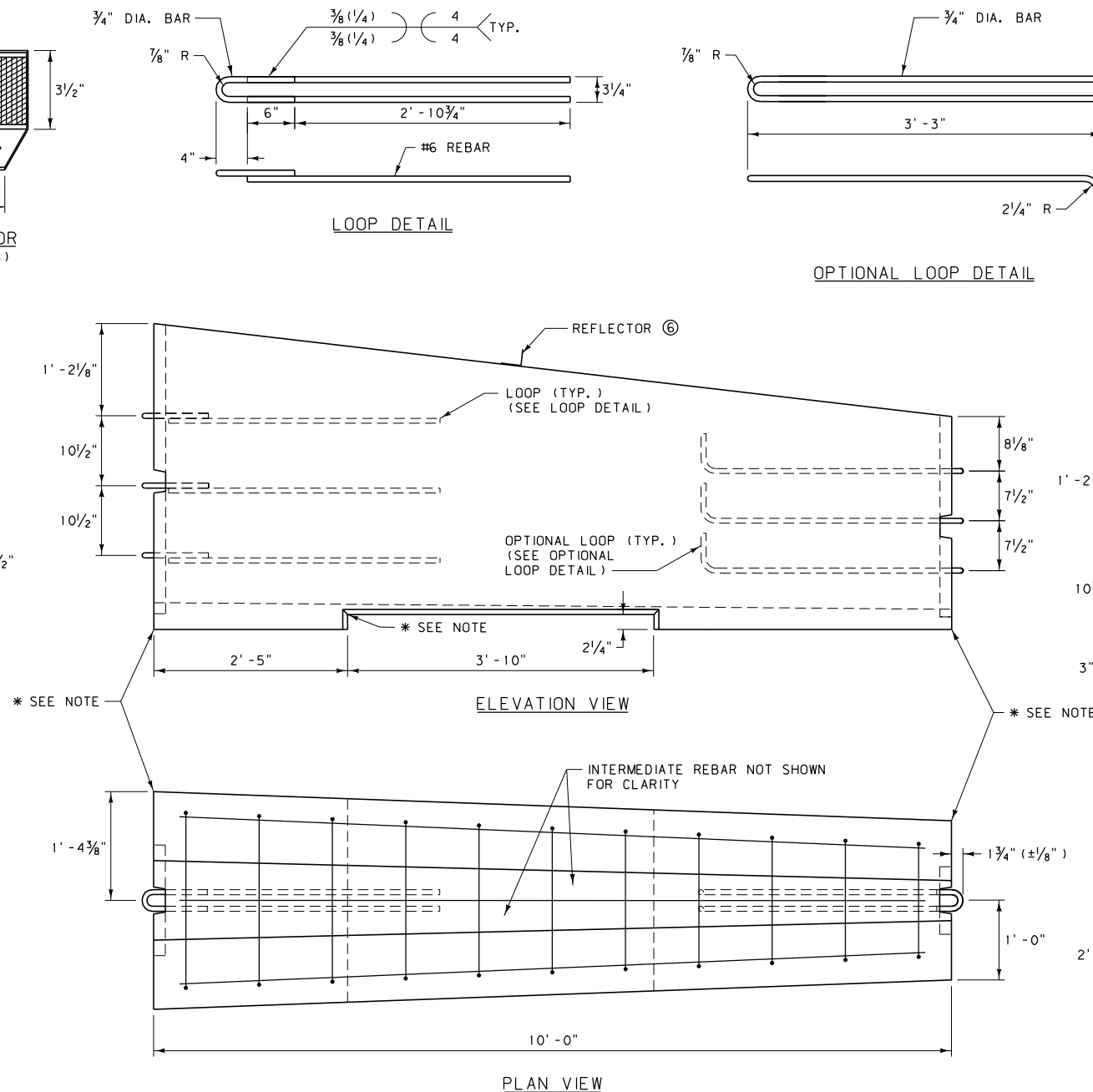
1. USE REINFORCING STEEL CONFORMING TO ASTM A 706, GRADE 60 FOR REBAR BEING WELDED TO LOOPS.
2. LOOP ENDS CONSIST OF SMOOTH ROUND BARS CONFORMING TO AASHTO M 270, GRADE 36.
3. COLD BEND THE LOOPS BY USING A JIG THAT WILL PRODUCE AN ACCURATE RADIUS WITHOUT MARRING THE BAR. DO NOT HEAT THE BAR TO FACILITATE BENDING.
4. WELD REBAR TO LOOPS USING $\frac{1}{8}$ " DIA. E8018 ROD. DO NOT TACK WELD THE PIECES TOGETHER PRIOR TO WELDING.
5. USE A CERTIFIED WELDER IN ACCORDANCE WITH THE CURRENT EDITION OF AWS D1.4. DO NOT PLACE THE WELDED ASSEMBLY IN THE FORM UNTIL IT HAS BEEN INSPECTED.
6. NO ADDITIONAL WELDING IS PERMITTED ON THE SMOOTH ROUND BARS OR REINFORCING STEEL.

OPTIONAL LOOP FABRICATION REQUIREMENTS:

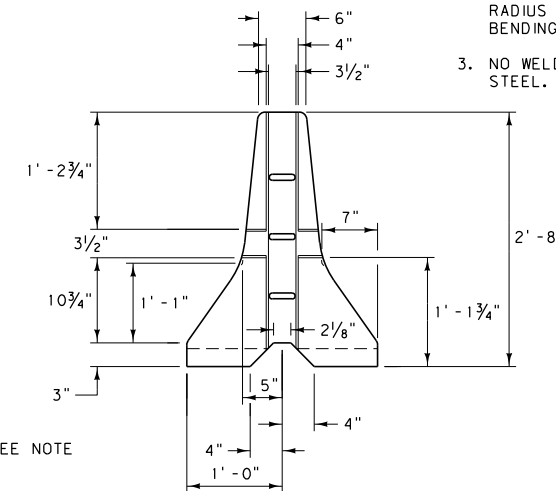
1. USE CONTINUOUS SMOOTH ROUND BARS CONFORMING TO AASHTO M 270, GRADE 36 TO FABRICATE THE OPTIONAL LOOPS.
2. COLD BEND THE LOOPS BY USING A JIG THAT WILL PRODUCE AN ACCURATE RADIUS WITHOUT MARRING THE BAR. DO NOT HEAT THE BAR TO FACILITATE BENDING.
3. NO WELDING IS PERMITTED ON THE SMOOTH ROUND BARS OR REINFORCING STEEL.



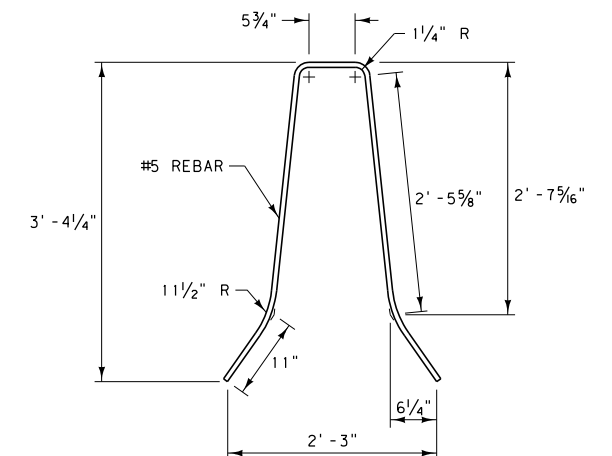
LEFT END VIEW



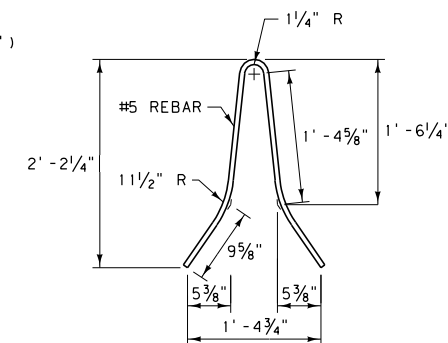
PLAN VIEW



RIGHT END VIEW



REBAR DETAIL LEFT END

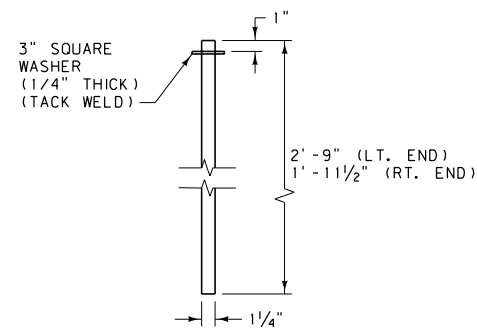


REBAR DETAIL RIGHT END

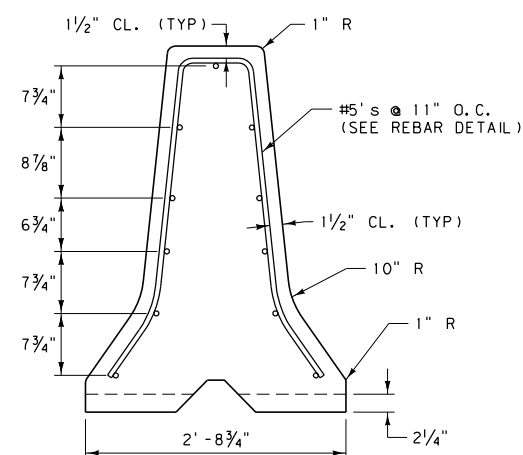
NOTES:

- ① USE CLASS "DD" CONCRETE OR EQUIVALENT.
- ② REINFORCING STEEL CONSISTS OF DEFORMED BARS CONFORMING TO AASHTO M 31, GRADE 60.
- ③ CONNECT EACH 10' SECTION WITH CONNECTING PINS AS DETAILED AND CONFORMING TO AASHTO M 270, GRADE 36 OR BETTER. CONNECTING PINS NEED NOT BE PAINTED.
- ④ CUTOUTS ON ENDS OF EACH SECTION ARE SHOWN WITH SLIGHT TAPER TO FACILITATE FORM REMOVAL. RECTANGULAR CUTOUTS ARE ACCEPTABLE.
- ⑤ THE CONTRACTOR IS RESPONSIBLE FOR THE PROPER FIT-UP OF THE PRECAST CONCRETE BARRIER RAIL. ASSEMBLE AND PIN SUFFICIENT NUMBER OF PRECAST SECTIONS IN THE FABRICATIONS PLANT TO DETERMINE THAT PROPER FIT-UP CAN BE MAINTAINED ON ALL ROADWAY ALIGNMENT, CURVES AS WELL AS ON TANGENT. THIS IS TO BE DETERMINED EARLY IN FABRICATION.
- ⑥ ATTACH REFLECTORS TO RAIL EVERY 30'. FOLLOW THE MANUFACTURER'S SPECIFICATIONS FOR ADHESIVE MOUNTING. IN NARROW PAVED (FLUSH) MEDIAN APPLICATIONS, REFLECTORIZE BOTH SIDES.
- ⑦ SEE DETAILED DRAWINGS 606-60 AND 606-64 FOR INFORMATION ON THE ADJACENT CONCRETE BARRIER RAIL SECTIONS. THE OPTIONAL TAPERED END DETAIL MAY ALSO BE USED HERE.

* $\frac{3}{4}$ " CHAMFER ENTIRE OPENING (OR SUFFICIENTLY ROUNDED SO THAT A SMOOTH EDGE RESULTS.) $\frac{1}{2}$ " CHAMFER IS ACCEPTABLE.



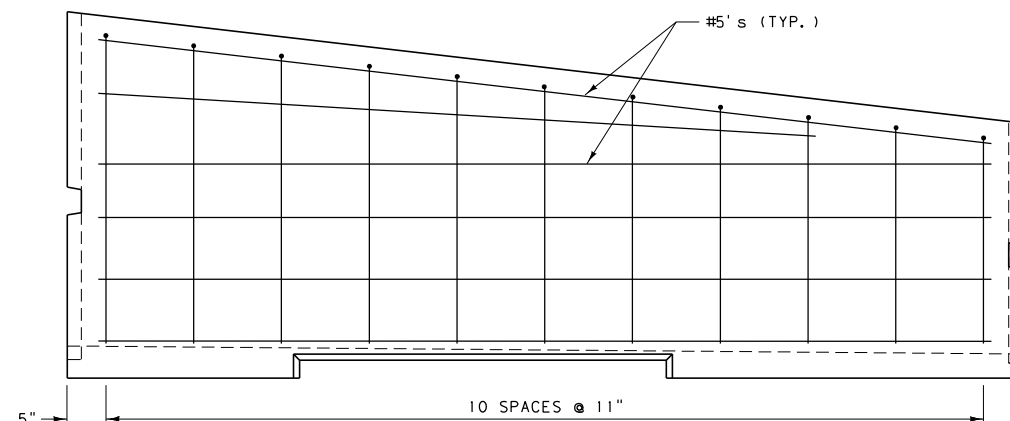
CONNECTING PIN DETAIL



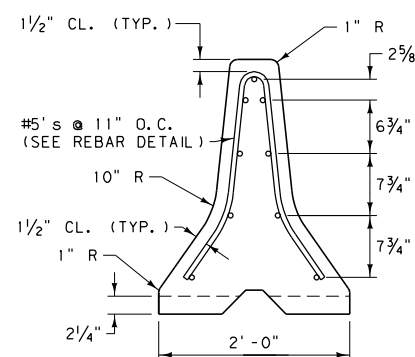
LEFT END VIEW

NOTE:

LEFT AND RIGHT REBAR DETAILS ARE FOR NORMAL TALL AND REGULAR CONCRETE BARRIER RAIL SECTIONS. TAPER REBAR HEIGHT AND WIDTH AS NEEDED BY MAINTAINING THE VERTICAL POSITION FROM THE BOTTOM AND THE $\frac{1}{2}$ " CLEARANCE AT ALL LOCATIONS.

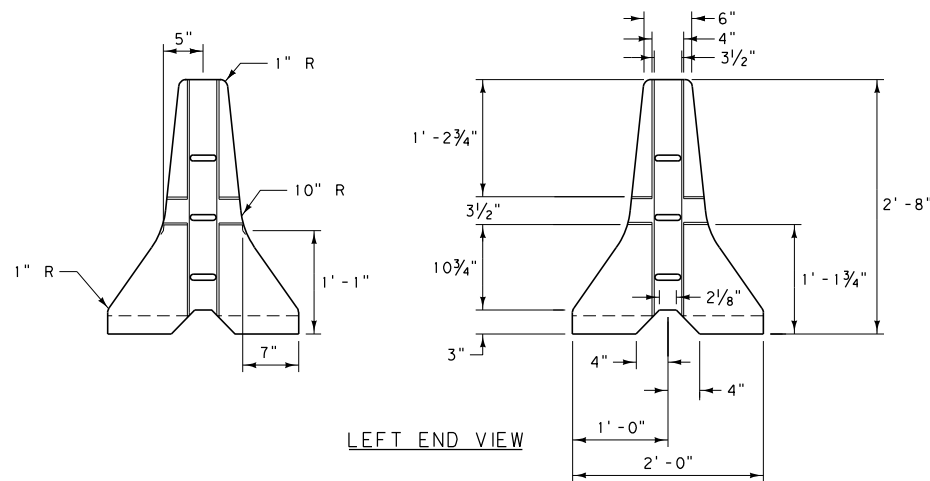


ELEVATION VIEW

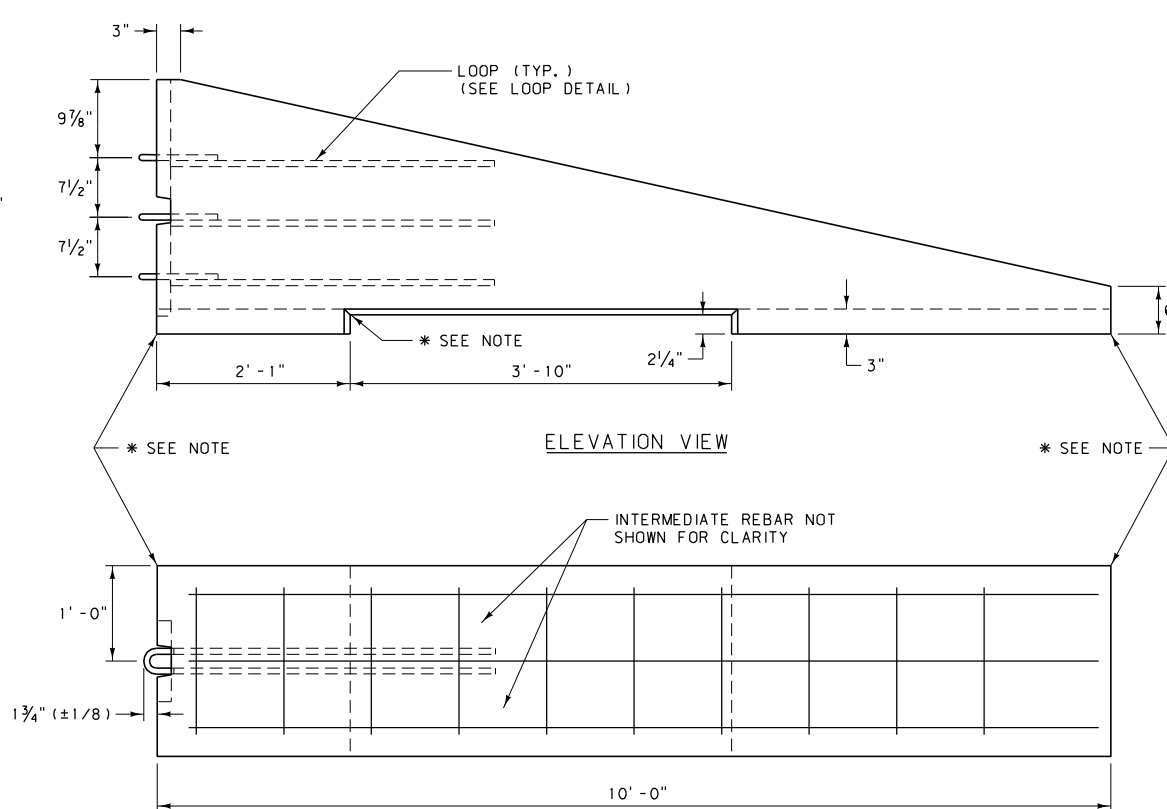


RIGHT END VIEW

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	606-66
SECTION 554, 606	
CONCRETE BARRIER RAIL TRANSITION	
-- REVISED --	
January 2008	EFFECTIVE: FEBRUARY 2005
MONTANA DEPARTMENT OF TRANSPORTATION	



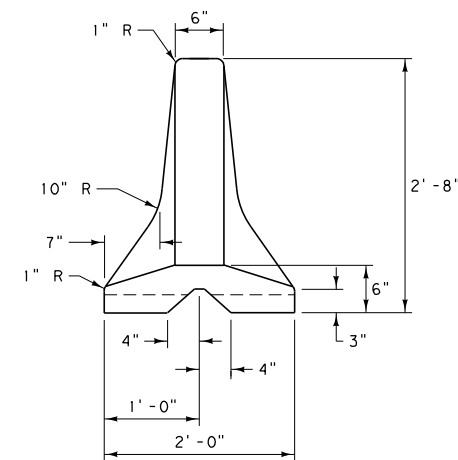
LEFT END VIEW



ELEVATION VIEW



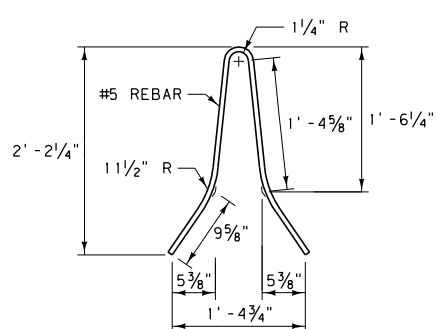
PLAN VIEW



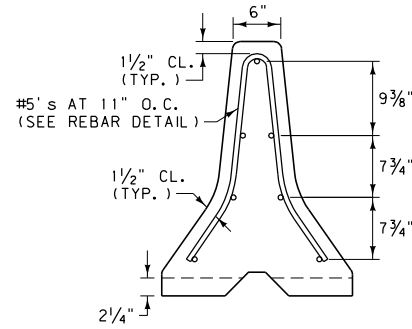
RIGHT END VIEW

NOTE:

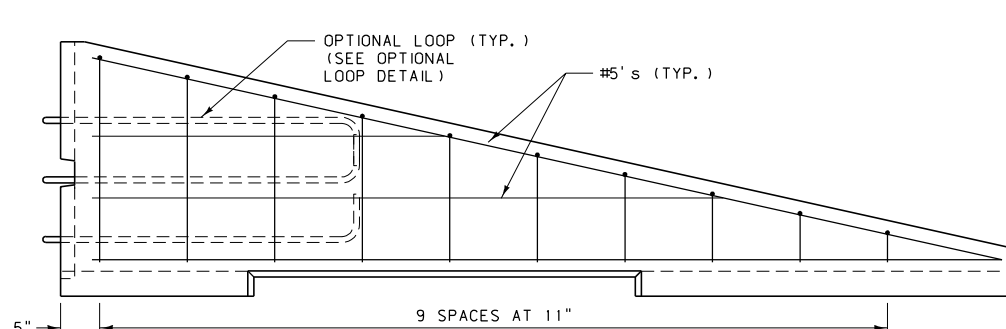
REBAR TYPICAL AT LEFT END ONLY. TAPER THE REBAR HEIGHT AS NEEDED, BY MAINTAINING THE VERTICAL POSITION FROM THE BOTTOM AND THE 1/2" CLEARANCE AT ALL LOCATIONS.



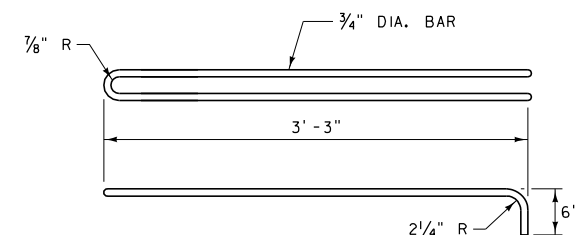
REBAR DETAIL LEFT END



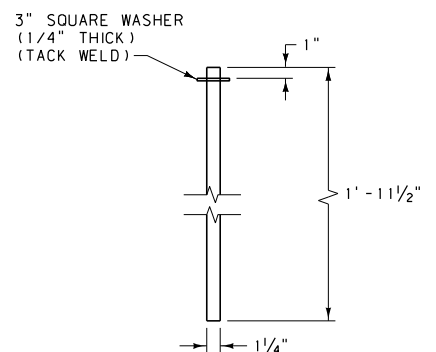
LEFT END VIEW



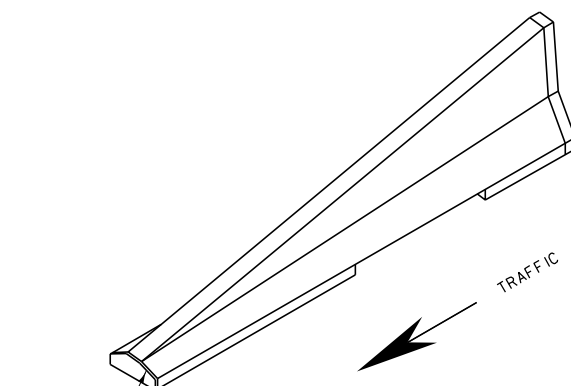
ELEVATION VIEW



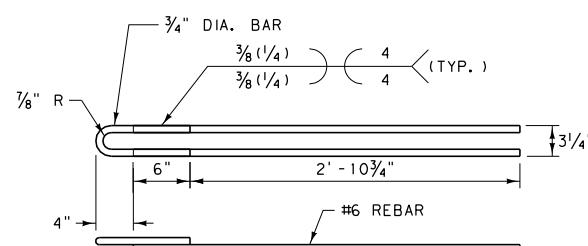
OPTIONAL LOOP DETAIL



CONNECTING PIN DETAIL



ISOMETRIC VIEW



LOOP DETAIL

LOOP FABRICATION REQUIREMENTS:

1. USE REINFORCING STEEL CONFORMING TO ASTM A 706, GRADE 60 FOR REBAR BEING WELDED TO LOOPS.
2. LOOP ENDS CONSIST OF SMOOTH ROUND BARS CONFORMING TO AASHTO M 270, GRADE 36.
3. COLD BEND THE LOOPS BY USING A JIG THAT WILL PRODUCE AN ACCURATE RADIUS WITHOUT MARRING THE BAR. DO NOT HEAT THE BAR TO FACILITATE BENDING.
4. WELD REBAR TO LOOPS USING 1/8" DIA. E8018 ROD. DO NOT TACK WELD THE PIECES TOGETHER PRIOR TO WELDING.
5. USE A CERTIFIED WELDER IN ACCORDANCE WITH THE CURRENT EDITION OF AWS D1.4. DO NOT PLACE THE WELDED ASSEMBLY IN THE FORM UNTIL IT HAS BEEN INSPECTED.
6. NO ADDITIONAL WELDING IS PERMITTED ON THE SMOOTH ROUND BARS OR REINFORCING STEEL.

OPTIONAL LOOP FABRICATION REQUIREMENTS:

1. USE CONTINUOUS SMOOTH ROUND BARS CONFORMING TO AASHTO M 270, GRADE 36 TO FABRICATE THE OPTIONAL LOOPS.
2. COLD BEND THE LOOPS BY USING A JIG THAT WILL PRODUCE AN ACCURATE RADIUS WITHOUT MARRING THE BAR. DO NOT HEAT THE BAR TO FACILITATE BENDING.
3. NO WELDING IS PERMITTED ON THE SMOOTH ROUND BARS OR REINFORCING STEEL.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	606-68
SECTION 554.606	
CONCRETE BARRIER RAIL TERMINAL SECTION (ONE-WAY DEPARTURE)	

--REVISED--	EFFECTIVE: FEBRUARY 2005
January 2008	
	MONTANA DEPARTMENT OF TRANSPORTATION

SCHEDULE OF GUARDRAIL HARDWARE				DTL. DWGS. WHERE PARTS USED																			
DESIGNATION ①	DESCRIPTION	DTL. DWG. NO. (606-####)	GUARDRAIL TYPE ②	606-05A	606-05B	606-09	606-11A	606-11B	606-18	606-24A	606-24B	606-25A	606-25B	606-40	606-41	606-46	606-50	606-52	606-53	606-53A	606-54	606-58	
FBB01-05	5/8" DIA. GUARDRAIL BOLT AND RECESSED NUT	82	W	X	X	X	X	X	X														X
FBH01	5/16" DIA. HOOK BOLT	92	C											X		X							
FBH02	5/16" DIA. ALTERNATE HOOK BOLT	92	C											X									
FBX10a	3/8" DIA. HEX BOLT	82	B														X	X	X	X			X
FBX12a	1/2" DIA. HEX BOLT	82	B, C												X		X	X	X	X			X
FBX14a	9/16" DIA. HEX BOLT	82	B																				X
FBX16a	5/8" DIA. HEX BOLT	82	W						X							X							
FBX20a	3/4" DIA. HEX BOLT	82	W													X							
FBX20b	3/4" DIA. HIGH STRENGTH HEX BOLT	82	B														X		X	X	X	X	X
FBX22b	7/8" DIA. HIGH STRENGTH HEX BOLT	82	W							X	X												
FBX24b	1" DIA. HIGH STRENGTH HEX BOLT	82	B																	X			
FCA01	CABLE ASSEMBLY	84	W						X							X							
FMM01	CABLE WEDGE	94	C											X									
FMM02	POST SLEEVE	84	W						X							X							
FNS20	3/4" DIA. SQUARE NUT	82	C												X								
FNX08a	5/16" DIA. HEX NUT	82	C											X									
FNX10a	3/8" DIA. HEX NUT	82	B														X	X	X	X			X
FNX12a	1/2" DIA. HEX NUT	82	B, C												X		X	X	X	X			X
FNX14a	9/16" DIA. HEX NUT	82	B																				X
FNX16a	5/8" DIA. HEX NUT	82	W						X							X							
FNX20a	3/4" DIA. HEX NUT	82	C, W												X	X							X
FNX20b	3/4" DIA. HIGH STRENGTH HEX NUT	82	B																X	X	X	X	X
FNX22b	7/8" DIA. HIGH STRENGTH HEX NUT	82	W							X	X												
FNX24a	1" DIA. HEX NUT	82	W						X							X							
FNX24b	1" DIA. HIGH STRENGTH HEX NUT	82	B																	X			
FPA01	GUARDRAIL ANCHOR BRACKET & END PLATE	84	W						X							X							
FPA02	CABLE ANCHOR BRACKET	95	C												X								
FPB01	BEARING PLATE	18 & 46	W						X							X							
FPP01	BOX BEAM SUPPORT BRACKET	97	B														X	X	X	X			X
FRH20a	3/4" DIA. HOOKED ANCHOR ROD	82	C												X								X
FWC10a	3/8" DIA. FLAT WASHER	82	B														X	X	X	X			X
FWC12a	1/2" DIA. FLAT WASHER	82	B, C												X		X	X	X	X			X
FWC14a	9/16" DIA. FLAT WASHER	82	B																				X
FWC16a	5/8" DIA. FLAT WASHER	82	W	X	X	X	X	X	X							X							
FWC20a	3/4" DIA. FLAT WASHER	82	C, W												X	X							X
FWC20b	3/4" DIA. HARDENED FLAT WASHER	82	B														X		X	X	X	X	X
FWC24a	1" DIA. FLAT WASHER	82	W						X							X							
FWR03	RECTANGULAR PLATE WASHER	84	W						X														
PDB01	WOOD BLOCKOUT	05A & 05B	W	X	X	X	X	X															
PDE02	WOOD GUARDRAIL POST	05A	W	X			X																
PDE09	CRT POST	46	W			X										X							
PDF01	WOOD BREAKAWAY POST	46	W													X							
PDF03	END POST	18	W						X														
PLS01	SOIL PLATE	92 & 97	B, C											X			X	X	X				
PLS03	SOIL PLATE	46	W													X							
PSE01	CABLE GUARDRAIL LINE POST	92	C											X									
PSE05	TYPE D BOX BEAM POST	97	B															X					
PSE06	CABLE GUARDRAIL ANCHOR POST	95	C												X								
PSE08	TYPE A BOX BEAM POST	97	B														X		X				X
PTE05	STEEL TUBE	46	W													X							
PWE01	STEEL GUARDRAIL POST	05B	W		X			X															
RBM01	BOX BEAM RAIL	98	B														X		X			X	X
RBM05	BOX BEAM TERMINAL RAIL	98	B															X					
RBS01	BOX BEAM SPLICE PLATE	98	B														X						
RCE01	COMPENSATING CABLE END ASSEMBLY	94	C											X									
RCE03	CABLE END ASSEMBLY	94	C												X								
RCM01	3/4" DIA. CABLE	94	C																				X
RWE01a-b	W-BEAM END SECTION (FLARED)	88	W						X						X	X							
RWE02a-b	W-BEAM TERMINAL CONNECTOR	88	W							X	X	X	X			X							
RWE06a-b	W-BEAM END SECTION (BUFFER)	88	W													X							
RWM02a-b	W-BEAM (12' - 6" LENGTH)	88	W	X	X	X	X	X	X														X
RWM22a-b	W-BEAM (25' - 0" LENGTH)	88	W	X	X	X	X	X	X														X
SEC01	CABLE GUARDRAIL TERMINAL ANCHOR ASSEMBLY	41	C											X									

SCHEDULE OF GUARDRAIL HARDWARE				DTL. DWGS. WHERE PARTS USED																		
DESIGNATION ①	DESCRIPTION	DTL. DWG. NO. (606-###)	GUARDRAIL TYPE ②	606-05A	606-05B	606-09	606-11A	606-11B	606-18	606-24A	606-24B	606-25A	606-25B	606-40	606-41	606-46	606-50	606-52	606-53	606-53A	606-54	606-58
N/A	TURNBUCKLE CABLE END ASSEMBLY	94	C											X								
N/A	KEEPER PLATE	95	C												X							
N/A	TYPE B BOX BEAM POST	97	B																X			
N/A	SUPPORT BRACKET WITH TS6 x 6 x 3⁄16 BLOCKOUT	97	B																	X		
N/A	TRANSITION POST	97	B																	X		
N/A	TS6 x 6 x 3⁄16 BR. APP. SECT. UPPER RAIL NO. 1	98	B																X			
N/A	TS6 x 2 x 1⁄4 BR. APP. SECT. LOWER RAIL NO. 1	98	B																X			
N/A	TS6 x 2 x 1⁄4 BR. APP. SECT. LOWER RAIL NO. 2	98	B																X			
N/A	TS6 x 2 TO TS6 x 6 CONNECTION SLEEVE	98	B																X			
N/A	TS6 x 2 CONNECTION SLEEVE	98	B																X			
N/A	TS6 x 6 x 3⁄16 TRANSITION RAIL	98	B																	X		
N/A	1⁄4" SHIM PLATE	99	B																	X		
N/A	ANCHOR RAIL SECTION	99	B																	X		
N/A	RUB RAIL ANCHOR BRACKET (JERSEY RAIL)	99	B																	X		
N/A	RUB RAIL ANCHOR BRACKET (VERTICAL BRIDGE RAIL)	99	B																	X		
N/A	TS6 x 2 x 3⁄16 RUB RAIL	99	B																	X		

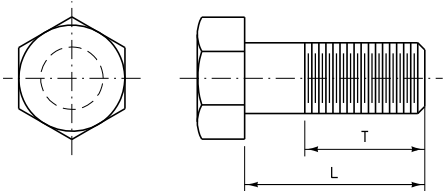
NOTES:

① SEE AASHTO-AGC-ARTBA JOINT COMMITTEE TASK FORCE 13 REPORT "A GUIDE TO STANDARDIZED HIGHWAY BARRIER HARDWARE" PUBLICATION FOR ADDITIONAL AND DETAILED HARDWARE SPECIFICATIONS.

② GUARDRAIL TYPE CODES:

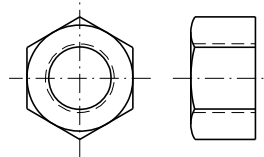
W = W-BEAM METAL GUARDRAIL
C = CABLE GUARDRAIL
B = BOX BEAM GUARDRAIL

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 606	DWG. NO. 606-80
SCHEDULE OF GUARDRAIL HARDWARE	



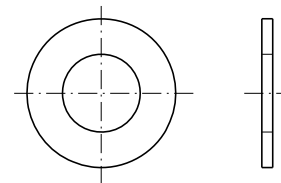
HEX BOLTS

BOLT SIZE	DESIGNATION *	L	T (MIN.)
REGULAR HEX BOLTS			
3/8" DIA.	FBX10a	3 1/2"	1 1/2"
3/8" DIA.	FBX10a	7 1/2"	1 1/2"
1/2" DIA.	FBX12a	1 1/2"	FULL
1/2" DIA.	FBX12a	2 1/2"	1 3/4"
9/16" DIA.	FBX14a	8"	2"
5/8" DIA.	FBX16a	1 1/2"	FULL
3/4" DIA.	FBX20a	8"	2"
3/4" DIA.	FBX20a	9 1/2"	2"
HIGH STRENGTH HEX BOLTS			
3/4" DIA.	FBX20b	2"	1 1/2"
3/4" DIA.	FBX20b	4"	2"
3/4" DIA.	FBX20b	8"	2"
7/8" DIA.	FBX22b	1' - 0"	AS REQUIRED
1" DIA.	FBX24b	AS REQUIRED	AS REQUIRED



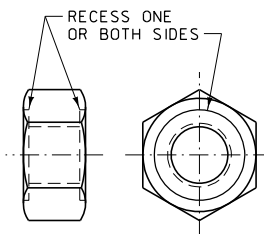
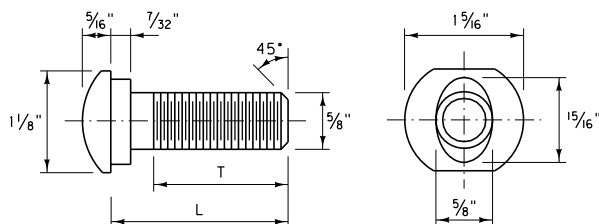
HEX NUT

NUT SIZE	DESIGNATION *
REGULAR HEX NUTS	
5/16" DIA.	FNX08a
3/8" DIA.	FNX10a
1/2" DIA.	FNX12a
9/16" DIA.	FNX14a
5/8" DIA.	FNX16a
3/4" DIA.	FNX20a
1" DIA.	FNX24a
HIGH STRENGTH HEX NUTS	
3/4" DIA.	FNX20b
5/8" DIA.	FNX22b
1" DIA.	FNX24b



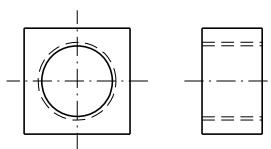
FLAT WASHERS

WASHER SIZE	DESIGNATION *
REGULAR FLAT WASHERS	
3/8" DIA.	FWC10a
1/2" DIA.	FWC12a
9/16" DIA.	FWC14a
5/8" DIA.	FWC16a
3/4" DIA.	FWC20a
1" DIA.	FWC24a
HARDENED FLAT WASHERS	
3/4" DIA.	FWC20b

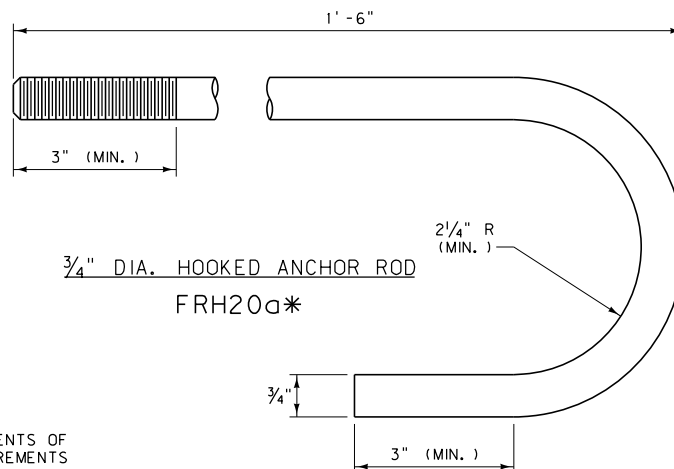


DESIGNATION *	L	T (MIN.)
FBB01	1 1/4"	1 1/8"
FBB02	2"	1 3/4"
FBB03	10"	4"
FBB04	1' - 6"	4"
FBB05	2' - 1"	4"

5/8" DIA. GUARDRAIL BOLT & RECESSED NUT
FBB01-05*



3/4" DIA. SQUARE NUT
FNS20*




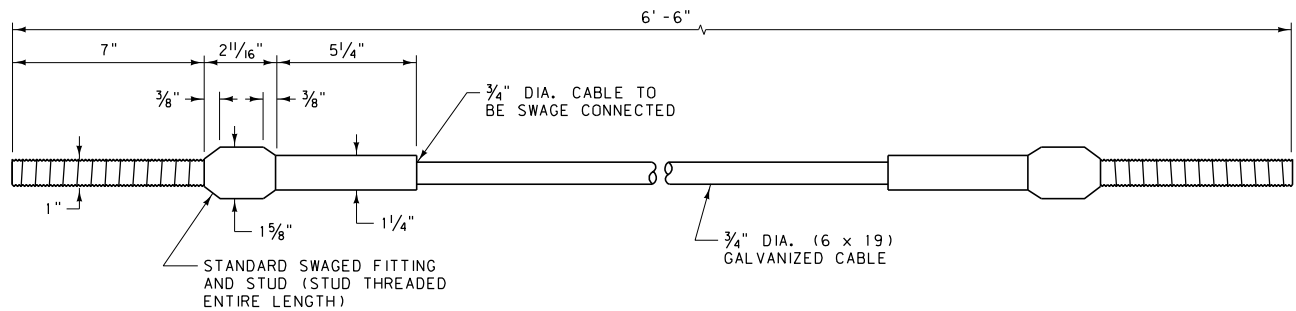
3/4" DIA. HOOKED ANCHOR ROD
FRH20a*

NOTES:

- BOLTS AND ANCHOR RODS ARE TO CONFORM TO THE REQUIREMENTS OF ASTM A 307 GRADE A. NUTS ARE TO CONFORM TO THE REQUIREMENTS OF AASHTO M 291 (ASTM A 563) GRADE A. USE STEEL WASHERS.
- HIGH STRENGTH BOLTS ARE TO CONFORM TO THE REQUIREMENTS OF AASHTO M 164 (ASTM A 325) TYPE 1. HIGH STRENGTH NUTS ARE TO CONFORM TO THE REQUIREMENTS OF AASHTO M 291 (ASTM A 563) GRADE DH. HARDENED WASHERS ARE TO CONFORM TO THE REQUIREMENTS OF AASHTO M 293 (ASTM F 436).
- GALVANIZE BOLTS, NUTS AND WASHERS IN ACCORDANCE WITH AASHTO M 232 (ASTM A 153). NO PUNCHING, DRILLING OR CUTTING IS PERMITTED AFTER GALVANIZING.

*SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 606	DWG. NO. 606-82
GUARDRAIL HARDWARE	
EFFECTIVE: FEBRUARY 2005	
-- REVISED -- January 2008	 MONTANA DEPARTMENT OF TRANSPORTATION serving you with pride

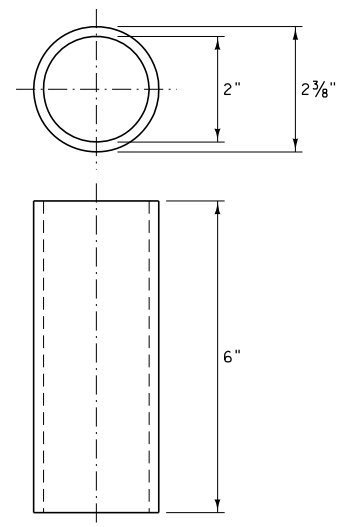
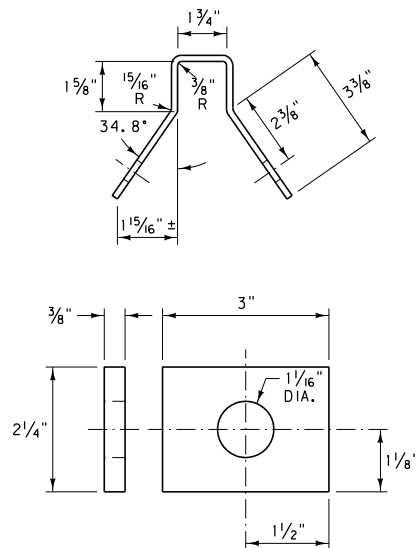
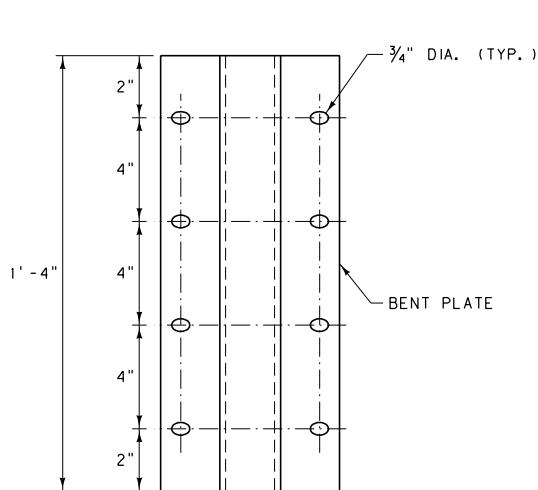


NOTES:

- ① FOR RELATED FASTENER HARDWARE SEE FWC24a*, FNX24a* AND FPA01*.
- ② MACHINE THE SWAGED FITTING FROM HOT-ROLLED CARBON STEEL, CONFORMING TO THE REQUIREMENTS OF ASTM A576, GRADE 1035, AND ANNEAL SUITABLE FOR COLD SWAGING. GALVANIZE THE SWAGED FITTING IN ACCORDANCE WITH AASHTO M111 (ASTM A123) BEFORE SWAGING. DRILL A LOCK PIN HOLE TO ACCOMMODATE A 1/4", PLATED SPRING STEEL PIN THROUGH THE HEAD OF THE SWAGED FITTING TO RETAIN THE STUD IN THE PROPER POSITION.
- ③ THE STUD IS TO CONFORM TO THE REQUIREMENTS OF ASTM F568 CLASS 8.8 AND BE GALVANIZED IN ACCORDANCE WITH AASHTO M232 (ASTM A153). PRIOR TO GALVANIZING, MILL A 3/8" SLOT INTO THE STUD END FOR THE LOCKING PIN.
- ④ WIRE ROPE IS TO CONFORM TO THE REQUIREMENTS OF AASHTO M30 AND BE 3/4" PREFORMED, 6 x 19, WIRE STRAND CORE OR INDEPENDENT WIRE ROPE CORE (IWRC), GALVANIZED, RIGHT REGULAR LAY, MANUFACTURED OF IMPROVED PLOW STEEL WITH A MINIMUM BREAKING STRENGTH OF 42,800 POUNDS.
- ⑤ THE SWAGED FITTING, STUD AND NUT (FNX24a*) MUST DEVELOP THE BREAKING STRENGTH OF THE WIRE ROPE.

CABLE ASSEMBLY

FCA01*

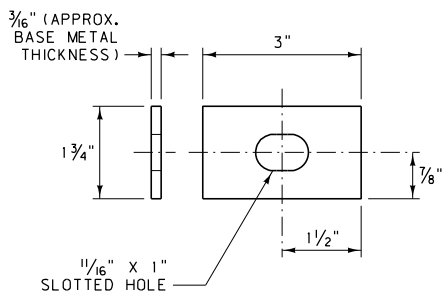


ANCHOR BRACKET & END PLATE

FPA01*

POST SLEEVE

FMM02*




RECTANGULAR PLATE WASHER


FWR03*

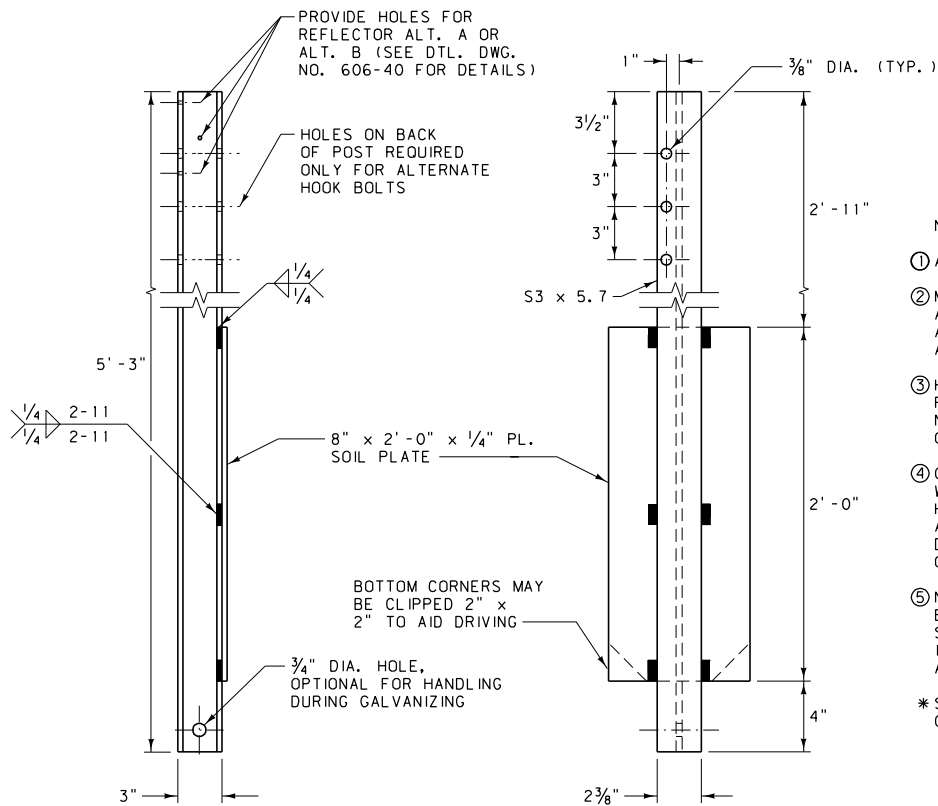
NOTES:

- ⑥ ANCHOR BRACKETS, END PLATES AND RECTANGULAR PLATE WASHERS ARE TO CONFORM TO THE REQUIREMENTS OF AASHTO M270 (ASTM A709) GRADE 36 STEEL PLATE. POST SLEEVES ARE TO CONFORM TO THE REQUIREMENTS OF ASTM A53 GRADE B.
- ⑦ GALVANIZE FABRICATED PARTS IN ACCORDANCE WITH AASHTO M111 (ASTM A123). NO PUNCHING, DRILLING OR CUTTING IS PERMITTED AFTER GALVANIZING.

* SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 606	DWG. NO. 606-84
W-BEAM METAL GUARDRAIL HARDWARE	
EFFECTIVE: FEBRUARY 2005	
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DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	606-88
SECTION 606	
W-BEAM METAL GUARDRAIL HARDWARE	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	

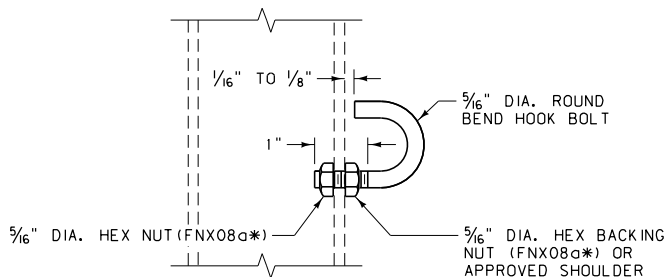


NOTES:

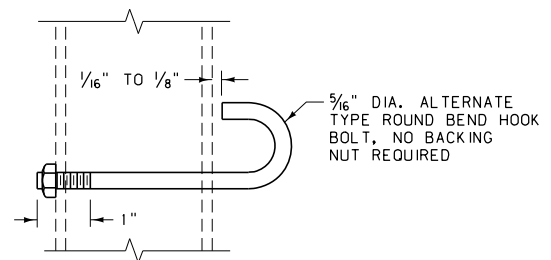
- ① ALL HOLES ARE 3/8" DIA. EXCEPT AS NOTED.
- ② MANUFACTURE POSTS AND SOIL PLATES USING AASHTO M270 (ASTM A709) GRADE 36 STEEL. ALL WELDING IS TO CONFORM TO THE APPLICABLE AWS CODE.
- ③ HOOK BOLTS ARE TO CONFORM TO THE REQUIREMENTS OF ASTM 568 CLASS 4.6. NUTS ARE TO CONFORM TO THE REQUIREMENTS OF AASHTO M291 (ASTM A563) CLASS 5.
- ④ GALVANIZE FABRICATED PARTS IN ACCORDANCE WITH AASHTO M111 (ASTM A123). GALVANIZE HOOK BOLTS AND NUTS IN ACCORDANCE WITH AASHTO M232 (ASTM A153). NO PUNCHING, DRILLING, WELDING OR CUTTING IS PERMITTED ON COMPONENTS AFTER GALVANIZING.
- ⑤ NUTS ARE OF THE HEAVY HEX TYPES. INSTALL BOLTS TO DEVELOP AN ULTIMATE PULL OPEN STRENGTH FROM 500 LB. TO 1000 LB. APPLIED IN A DIRECTION NORMAL TO THE LONGITUDINAL AXIS OF THE POST.

* SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.


CABLE GUARDRAIL POST AND SOIL PLATE
PSE01* AND PLS01*

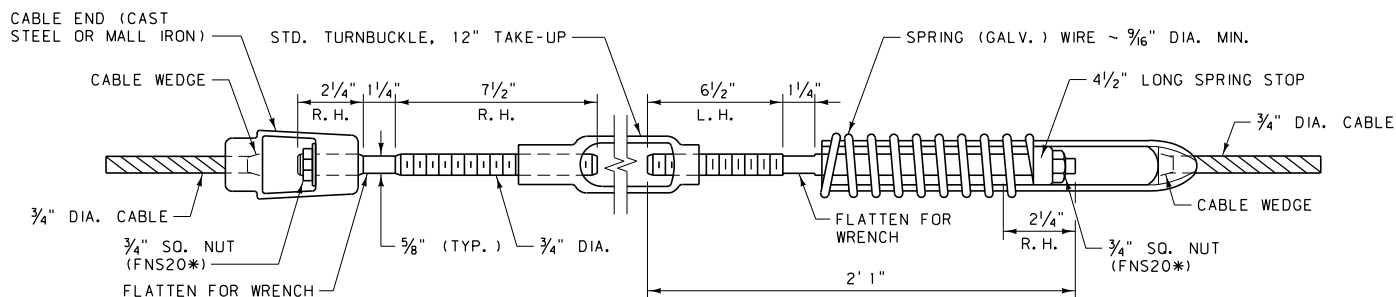


5/16" DIA. HOOK BOLT
FBH01*



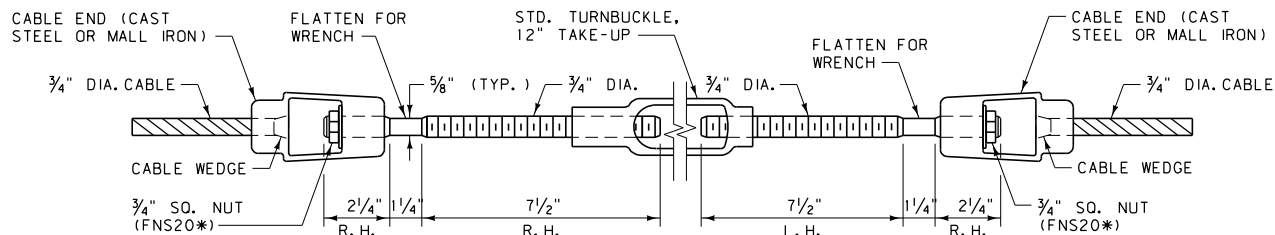
ALTERNATE 5/16" DIA. HOOK BOLT
FBH02*

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 606	DWG. NO. 606-92
CABLE GUARDRAIL HARDWARE	
EFFECTIVE: APRIL 2006	
 MONTANA DEPARTMENT OF TRANSPORTATION	



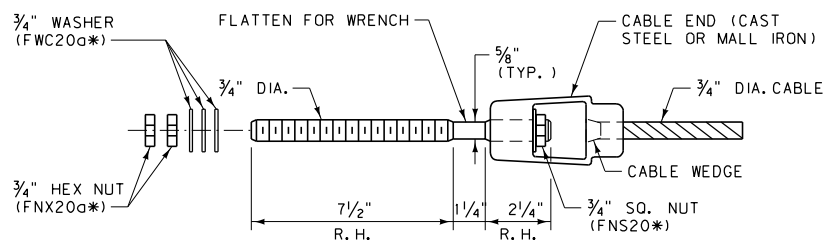
COMPENSATING CABLE END ASSEMBLY

RCE01*



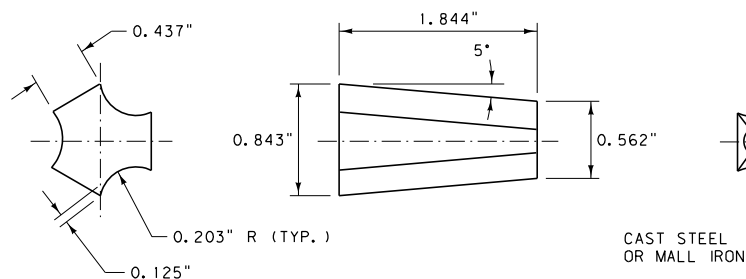
TURNBUCKLE CABLE END ASSEMBLY

R. H. = RIGHT HAND
L. H. = LEFT HAND



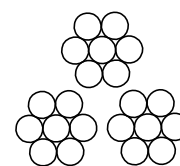
CABLE END ASSEMBLY

RCE03*



CABLE WEDGE

FMM01*



3/4\" DIA. - 3 x 7 WIRE ROPE


3/4\" DIA. CABLE

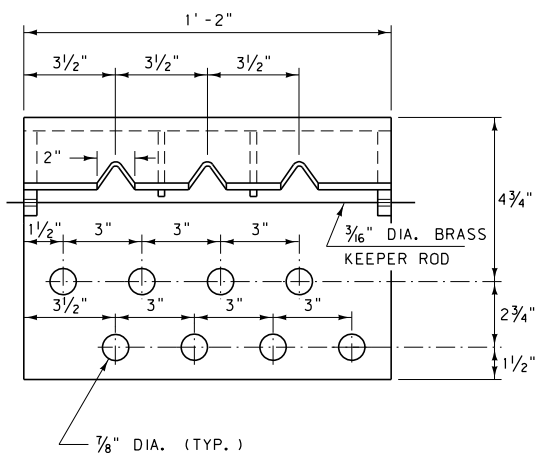
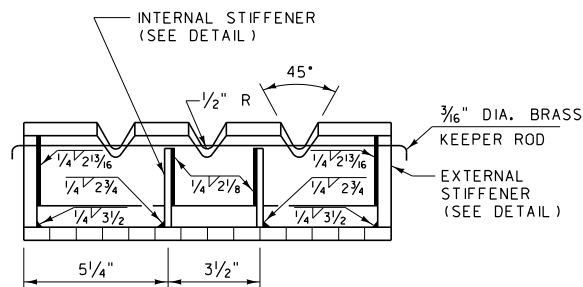
RCM01*

NOTES:

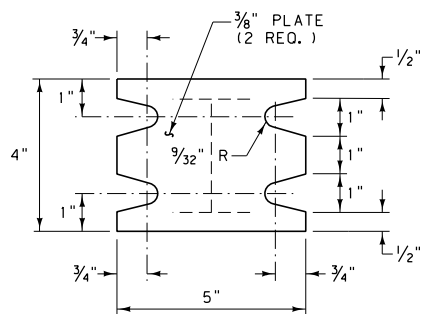
- ① WIRE ROPE AND CONNECTING HARDWARE ARE TO CONFORM TO THE REQUIREMENTS OF AASHTO M30 TYPE 1 CLASS A, 3/4\" ROPE. CONNECTING HARDWARE MUST DEVELOP THE FULL STRENGTH OF A SINGLE CABLE (25,000 LB.). CAST STEEL COMPONENTS ARE TO CONFORM TO THE REQUIREMENTS OF AASHTO M103 (ASTM A27). MALLEABLE IRON CASTINGS ARE TO CONFORM TO THE REQUIREMENTS OF ASTM A47.
- ② AT ALL LOCATIONS WHERE THE CABLE IS CONNECTED TO A CABLE SOCKET WITH A WEDGE TYPE CONNECTION, CRIMP ONE WIRE OF THE CABLE OVER THE BASE OF THE WEDGE TO HOLD IT FIRMLY IN PLACE.
- ③ COMPENSATING DEVICES ARE TO HAVE SPRING CONSTANTS OF 450 POUNDS PER INCH, PLUS OR MINUS 50 POUNDS PER INCH, AND PERMIT A TRAVEL OF 6 INCHES PLUS OR MINUS 1 INCH.
- ④ DESIGN SOCKET BASKETS FOR USE WITH THE WEDGE DETAILED IN THIS DRAWING.
- ⑤ ALTERNATE HARDWARE DESIGNS WILL BE CONSIDERED FOR APPROVAL PROVIDED THEIR CONNECTION DETAILS, FOR THE PURPOSE OF MAINTENANCE SUBSTITUTIONS, ARE COMPATIBLE WITH THE DETAILS OF THIS DRAWING AND THEIR OPERATING CHARACTERISTICS ARE SIMILAR TO THOSE OF THE HARDWARE IN THIS DRAWING.

* SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

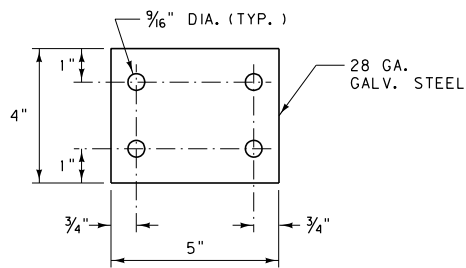
DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 606	DWG. NO. 606-94
CABLE GUARDRAIL HARDWARE	
EFFECTIVE: FEBRUARY 2005	
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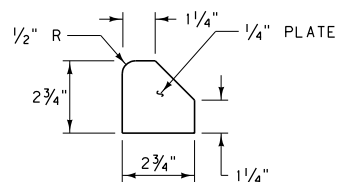
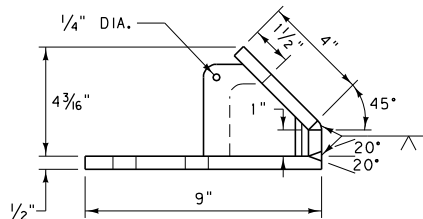
CABLE ANCHOR BRACKET
FPA02*



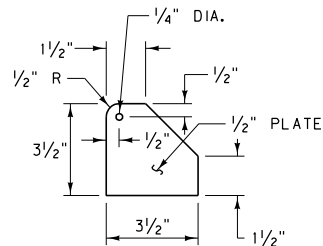
SLIP IMPACT BASE
(KEEPER PLATE NOT SHOWN)



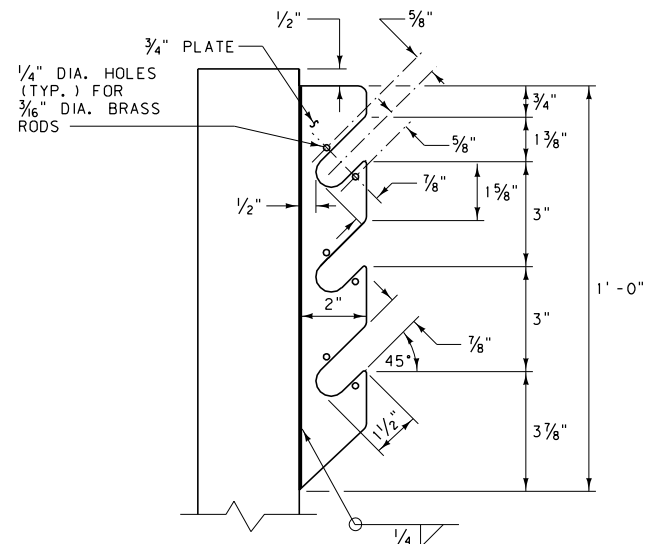
KEEPER PLATE



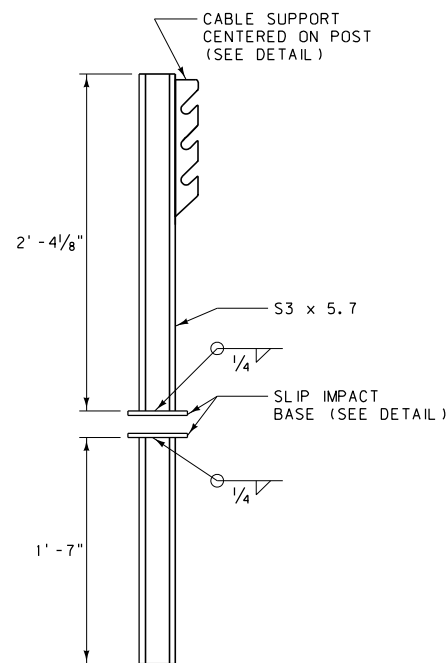
INTERNAL STIFFENER



EXTERNAL STIFFENER



CABLE SUPPORT DETAIL




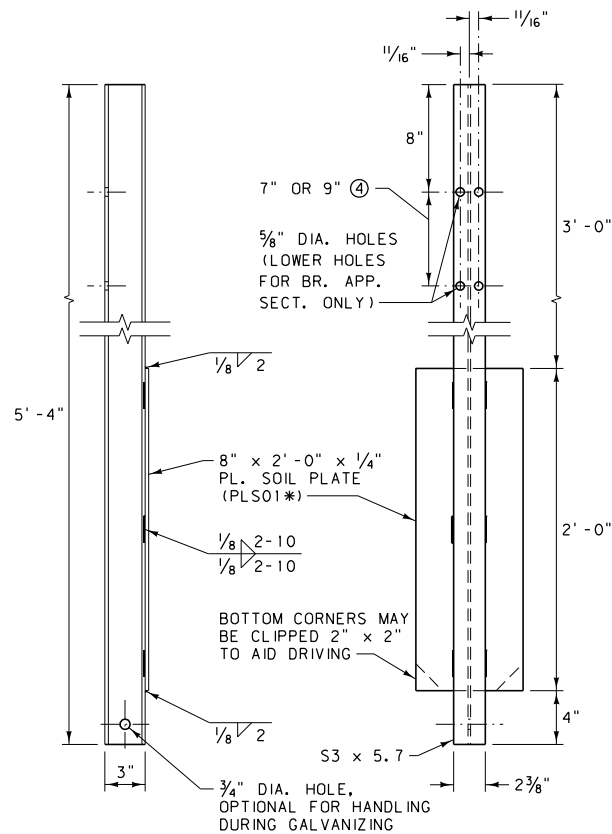
CABLE GUARDRAIL ANCHOR POST
PSE06*

NOTES:

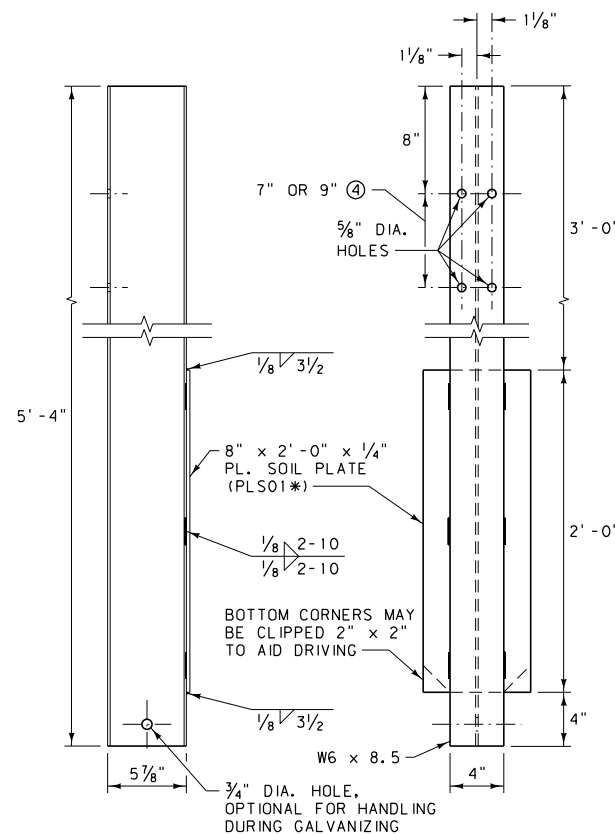
- ① MANUFACTURE ANCHOR POSTS AND BRACKETS USING AASHTO M270 (ASTM A709) GRADE 36 STEEL. ALL WELDING IS TO CONFORM TO THE APPLICABLE AWS CODE.
- ② GALVANIZE FABRICATED PARTS IN ACCORDANCE WITH AASHTO M111 (ASTM A123). NO PUNCHING, DRILLING, WELDING OR CUTTING IS PERMITTED ON COMPONENTS AFTER GALVANIZING.

* SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

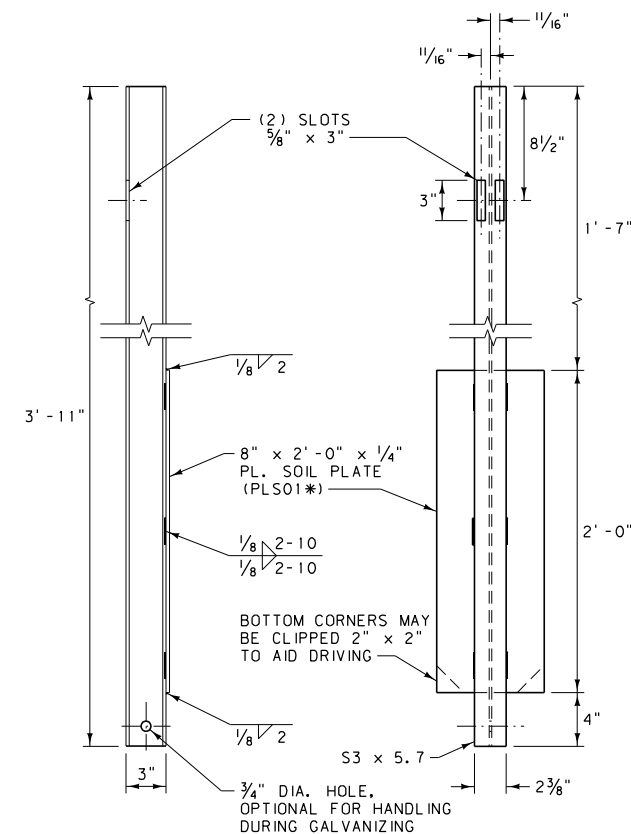
DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 606	DWG. NO. 606-95
CABLE GUARDRAIL HARDWARE	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION serving you with pride	



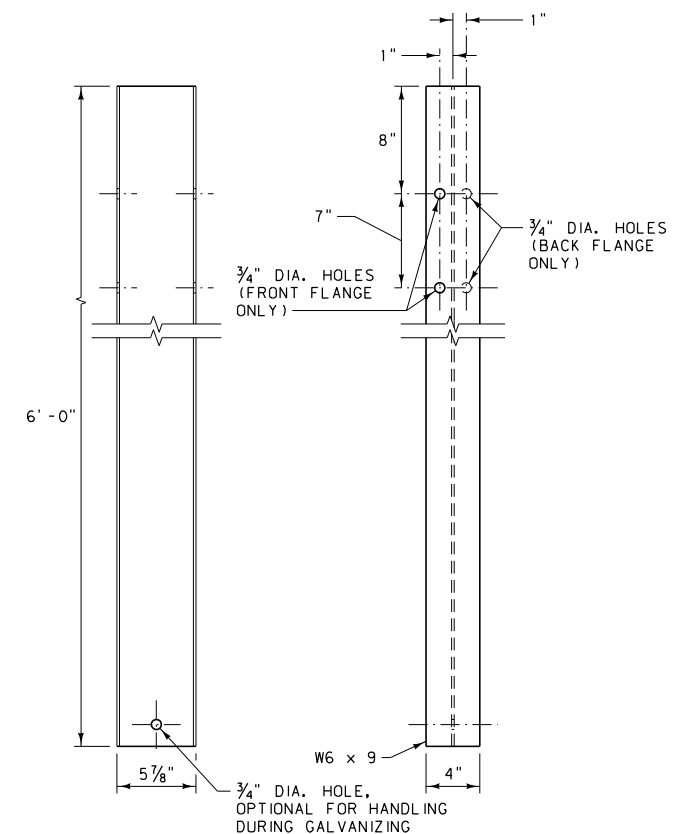
TYPE A BOX BEAM POST AND SOIL PLATE
PSE08* AND PLS01*



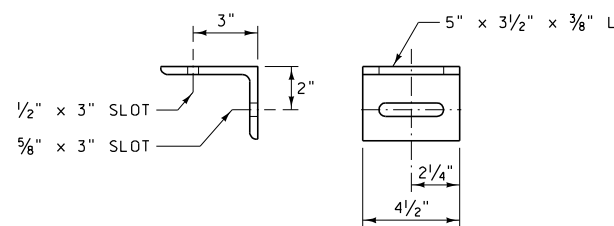
TYPE B BOX BEAM
POST AND SOIL PLATE
PLS01*



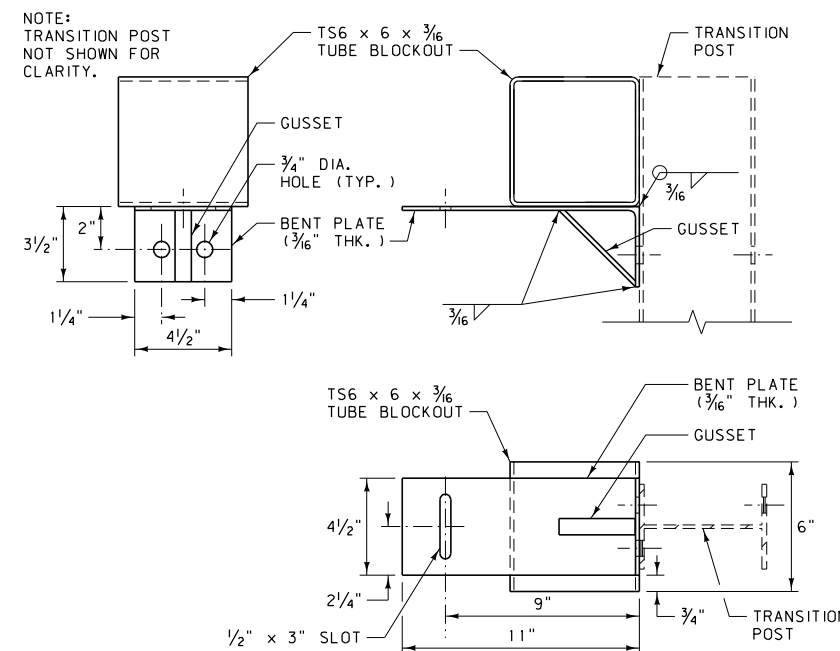
TYPE D BOX BEAM POST AND SOIL PLATE
PSE05* AND PLS01*



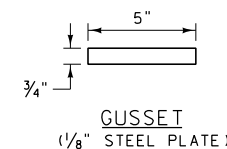
TRANSITION POST



BOX BEAM SUPPORT BRACKET
FPP01*




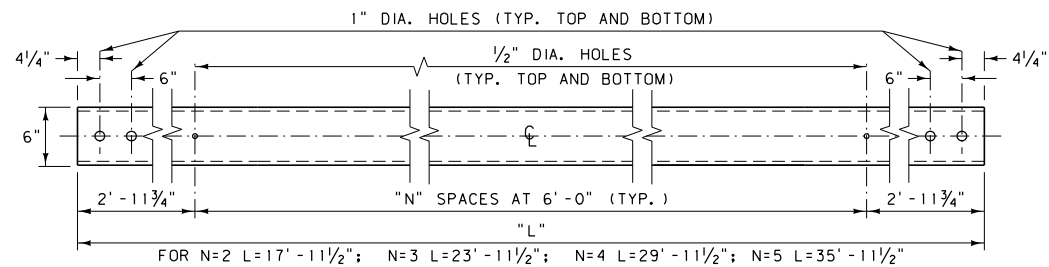
SUPPORT BRACKET W/BLOCKOUT



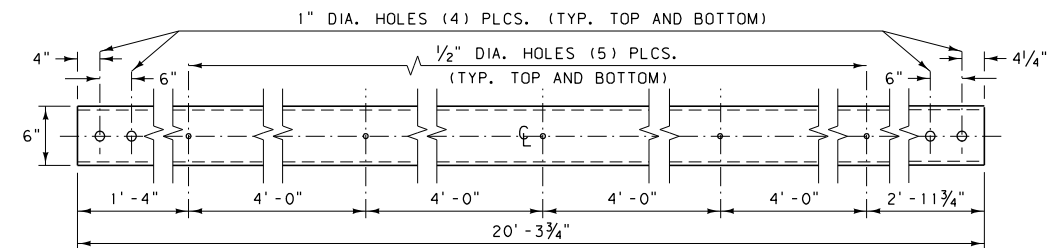
NOTES:

- MANUFACTURE POSTS USING STEEL CONFORMING TO AASHTO M 183 (ASTM A 36). MANUFACTURE SOIL PLATES, SUPPORT BRACKETS AND MISC. COMPONENTS USING AASHTO M 270 (ASTM A 709) GRADE 36 STEEL. ALL WELDING IS TO CONFORM TO THE APPLICABLE AWS CODE.
 - MANUFACTURE BLOCKOUTS FROM EITHER ASTM A 500 GRADE B COLD-ROLLED TUBING, ASTM A 501 HOT-ROLLED TUBING OR AUTOMOTIVE ROLLOVER PROTECTIVE STEEL (ROPS). WHEN ASTM A 500 GRADE B STEEL IS USED, TEST THE MATERIAL PER ASTM E 436.
 - GALVANIZE FABRICATED POSTS, BLOCKOUTS, BRACKETS AND MISC. COMPONENTS IN ACCORDANCE WITH AASHTO M 111 (ASTM A 123). NO PUNCHING, DRILLING, WELDING OR CUTTING IS PERMITTED ON COMPONENTS AFTER GALVANIZING.
 - SEE DTL. DWG. NO. 606-53 (BOX BEAM BR. APP. SECT.) FOR REQUIRED LOCATION OF LOWER HOLES IN TYPE A AND B POSTS.
- *SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

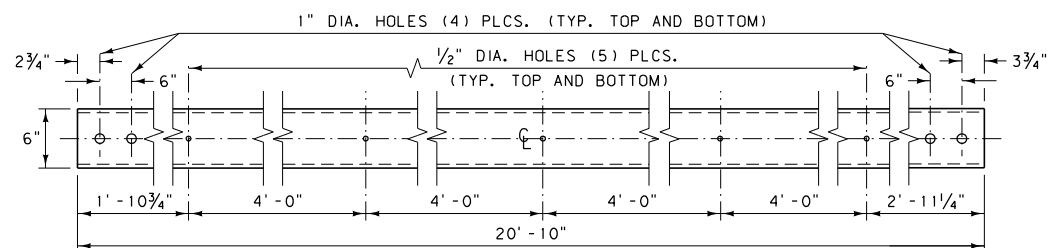
DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 606	DWG. NO. 606-97
BOX BEAM GUARDRAIL HARDWARE	
-- REVISED -- January 2008	EFFECTIVE: FEBRUARY 2005
 MONTANA DEPARTMENT OF TRANSPORTATION serving you with pride	



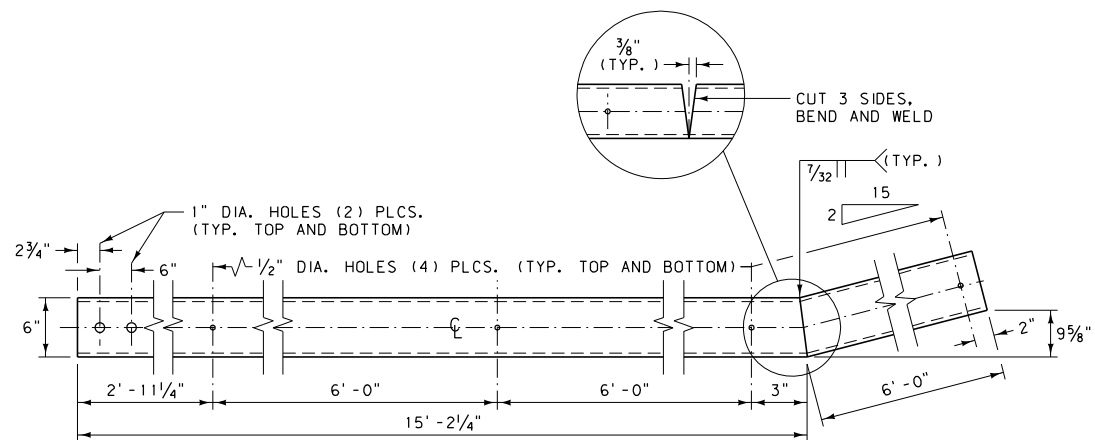
BOX BEAM RAIL (TS6 x 6 x $\frac{3}{16}$)
RBM01*



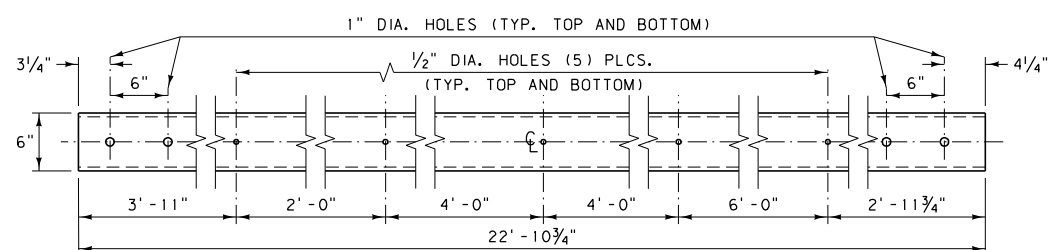
TS6 x 6 x $\frac{3}{16}$ BR. APP. SECT. UPPER RAIL NO. 1



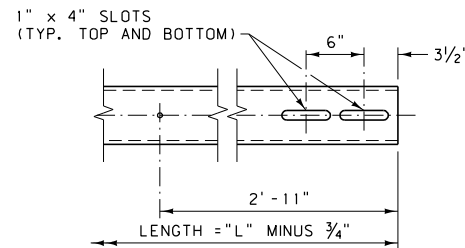
TS6 x 2 x $\frac{1}{4}$ BR. APP. SECT. LOWER RAIL NO. 1



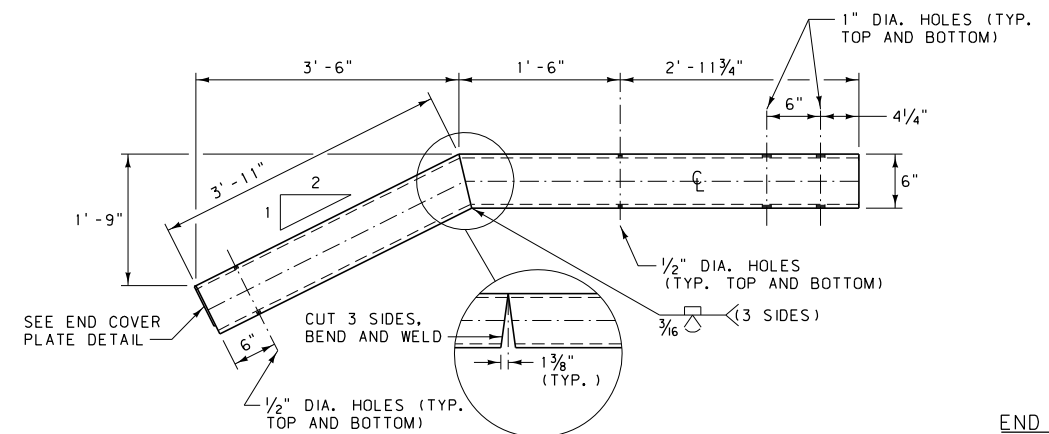
TS6 x 2 x $\frac{1}{4}$ BR. APP. SECT. LOWER RAIL NO. 2



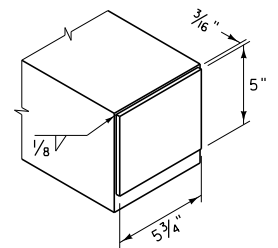
TRANSITION RAIL (TS6 x 6 x $\frac{3}{16}$)



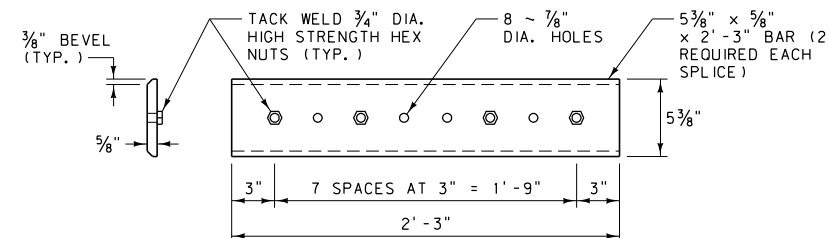
BOX BEAM EXPANSION SPLICE END
ONE END OF BOX BEAM RAIL ONLY. REQUIRED
FOR BOTH RAILS AT THE EXPANSION SPLICE.



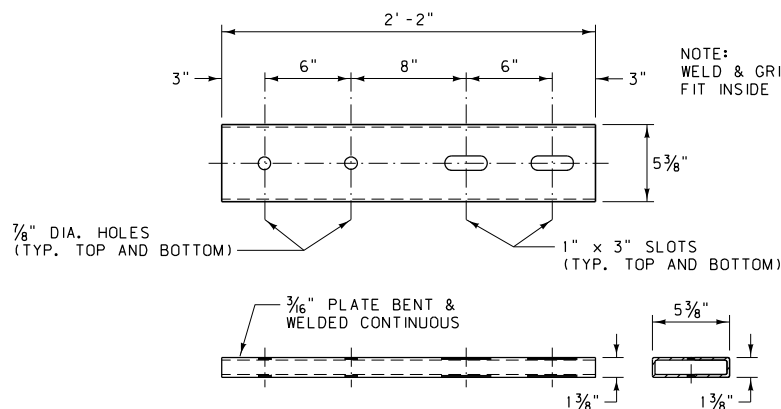
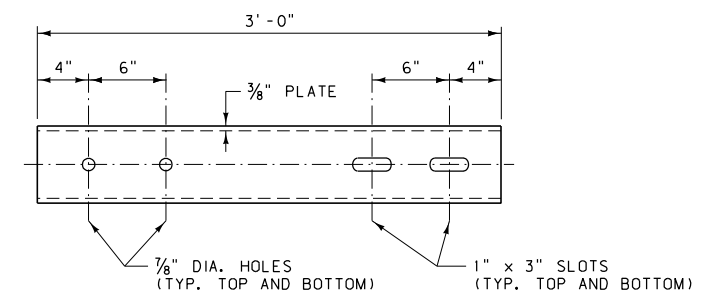
BOX BEAM TERMINAL RAIL (TS6 x 6 x $\frac{3}{16}$)
RBM05*



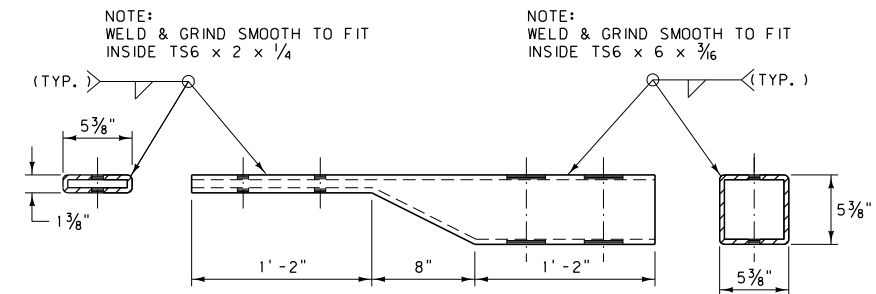
END COVER PLATE DETAIL
(BAR 5" x $\frac{3}{16}$ " x 0'-5 3/4")



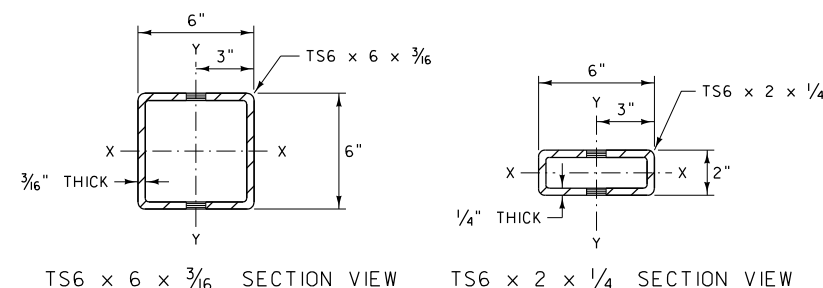
BOX BEAM SPLICE PLATE
RBS01*



TS6 x 2 CONNECTION SLEEVE



TS6 x 2 TO TS6 x 6 CONNECTION SLEEVE



TS6 x 6 x $\frac{3}{16}$ SECTION VIEW

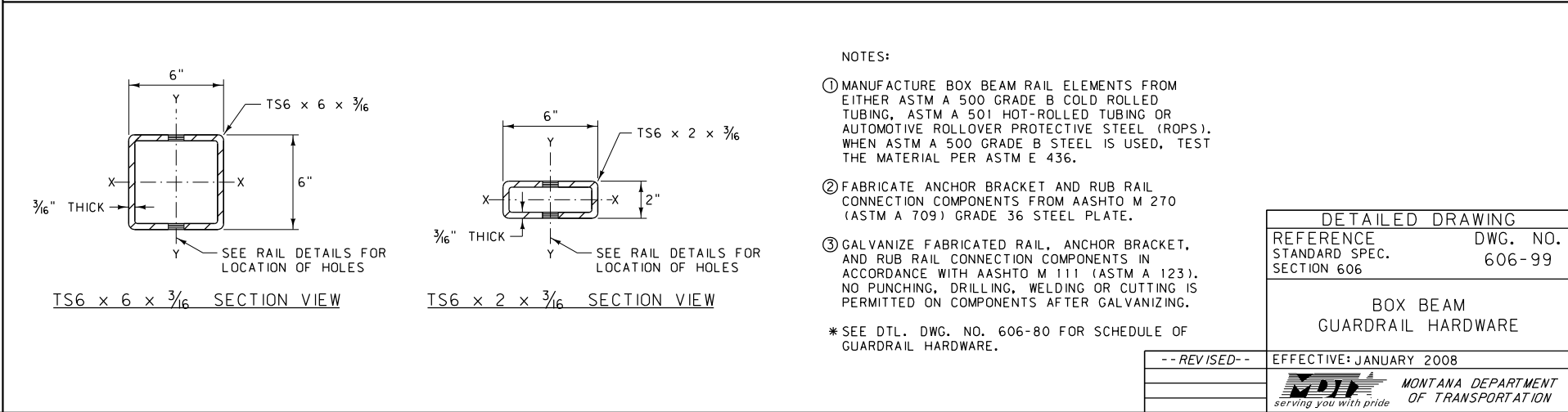
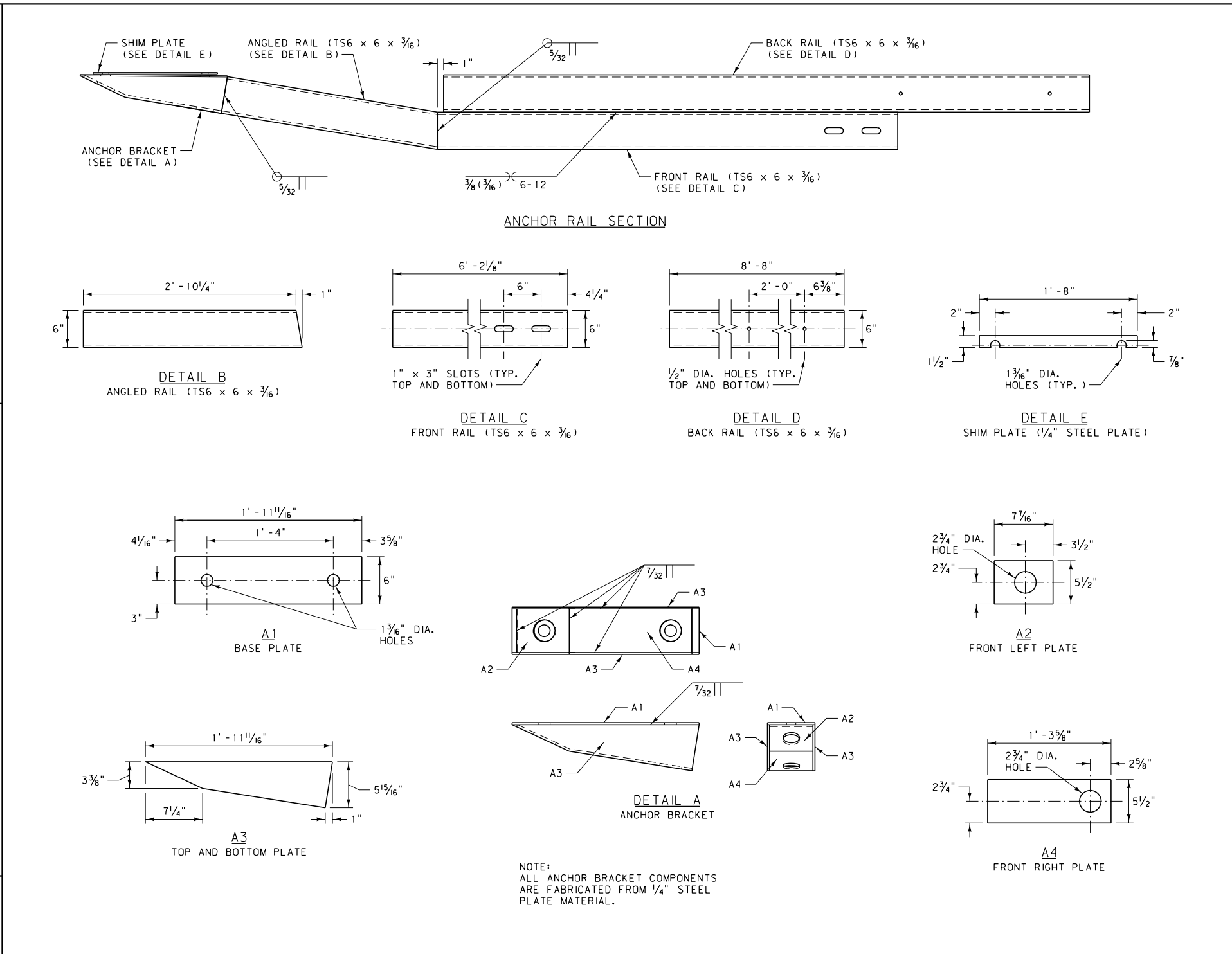
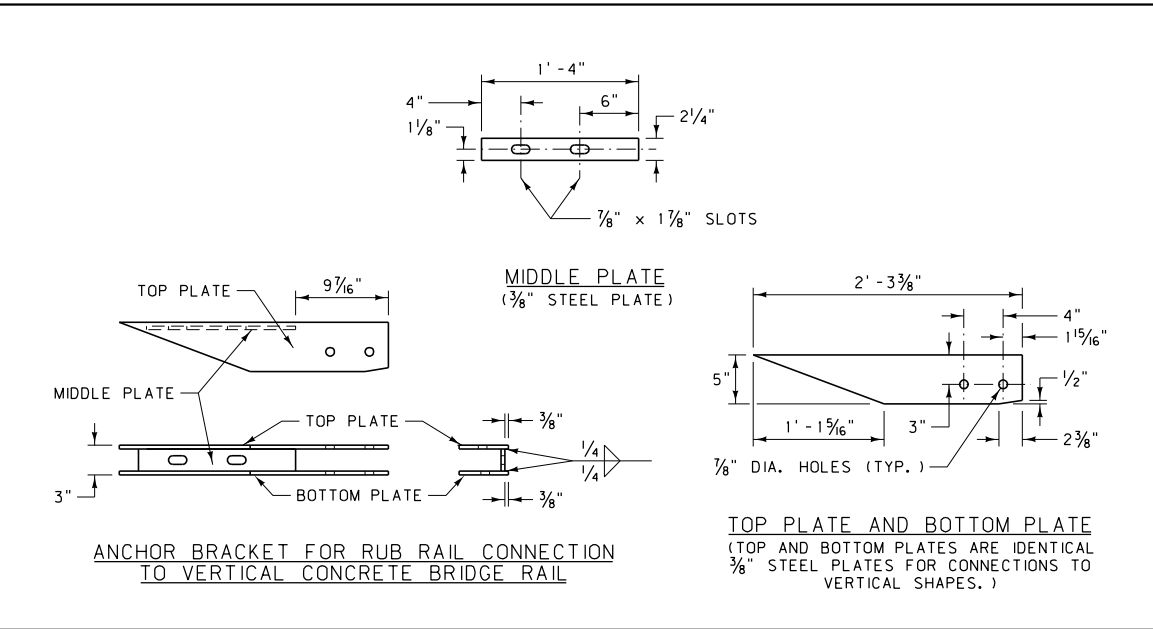
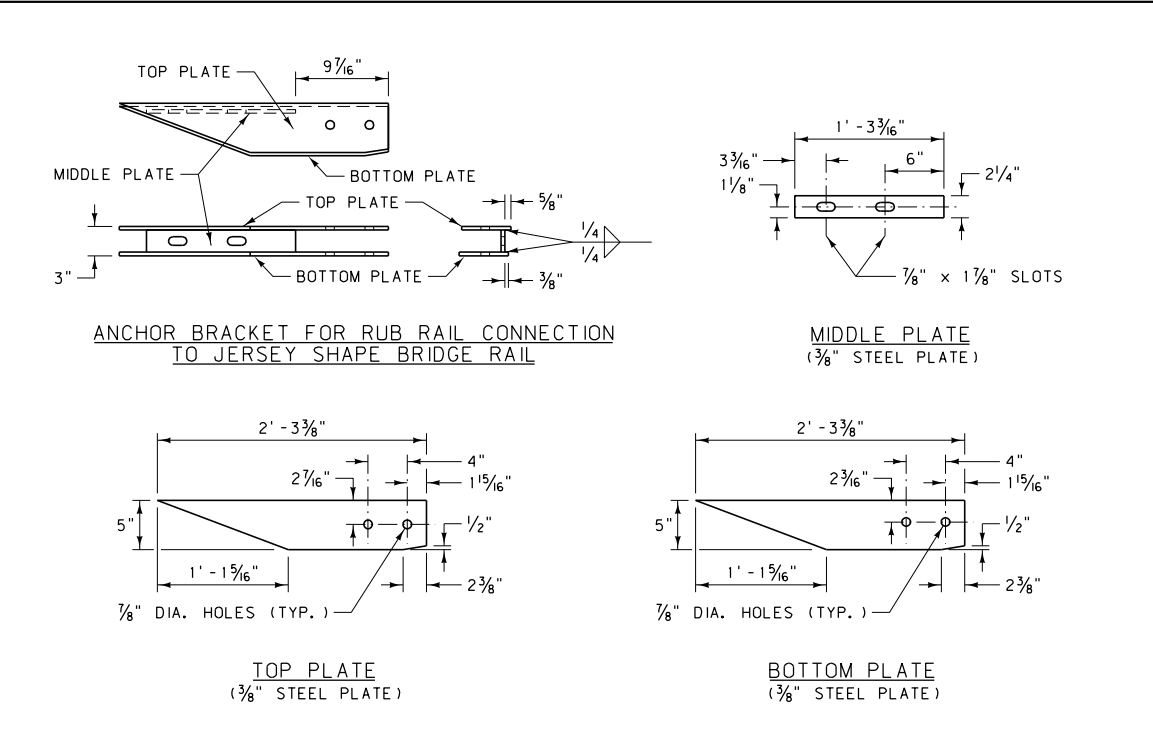
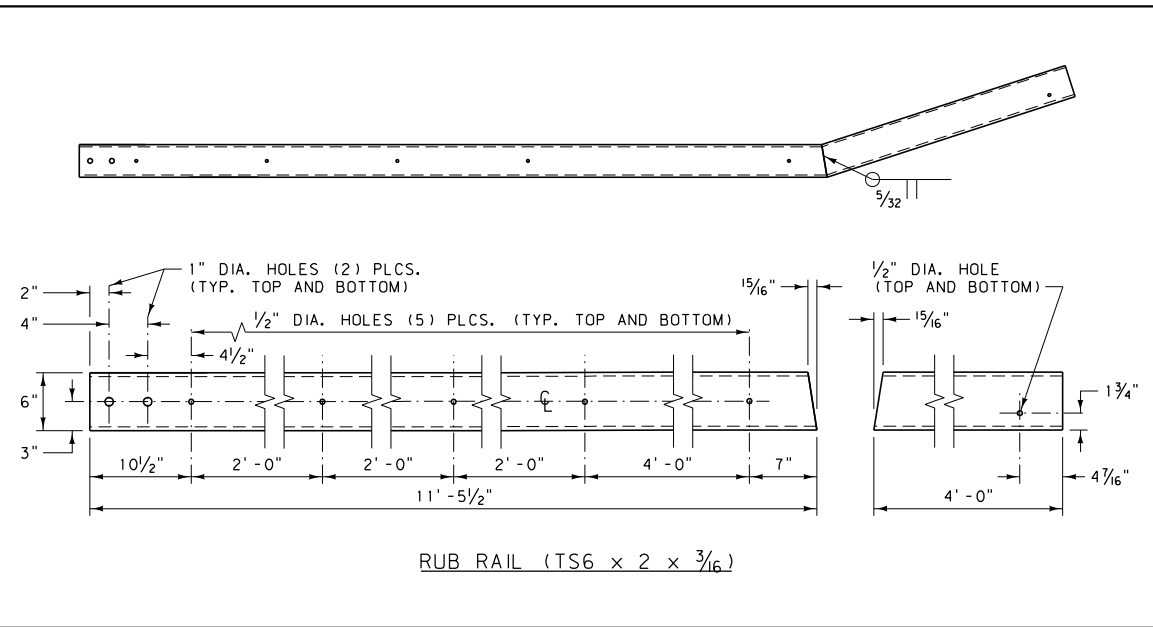
TS6 x 2 x $\frac{1}{4}$ SECTION VIEW

NOTES:

- MANUFACTURE BOX BEAM RAIL ELEMENTS FROM EITHER ASTM A 500 GRADE B COLD ROLLED TUBING, ASTM A 501 HOT-ROLLED TUBING OR AUTOMOTIVE ROLLOVER PROTECTIVE STEEL (ROPS). WHEN ASTM A 500 GRADE B STEEL IS USED, TEST THE MATERIAL PER ASTM E 436.
- FABRICATE SPLICE PLATES AND CONNECTION SLEEVES FROM AASHTO M 270 (ASTM A 709) GRADE 36 STEEL PLATE. THE NUTS ARE TO BE PLAIN UN-COATED $\frac{3}{4}$ " DIA. HIGH STRENGTH HEX NUTS. WELD THE NUTS TO THE PLATES IN ACCORDANCE WITH THE APPLICABLE AWS CODE.
- GALVANIZE FABRICATED RAIL, CONNECTION SLEEVES, AND SPLICE PLATES IN ACCORDANCE WITH AASHTO M 111 (ASTM A 123). NO PUNCHING, DRILLING, WELDING OR CUTTING IS PERMITTED ON COMPONENTS AFTER GALVANIZING.

*SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.


-- REVISED --	EFFECTIVE: FEBRUARY 2005
January 2008	
	<div> <div> </div> <div> MONTANA DEPARTMENT OF TRANSPORTATION </div> </div>

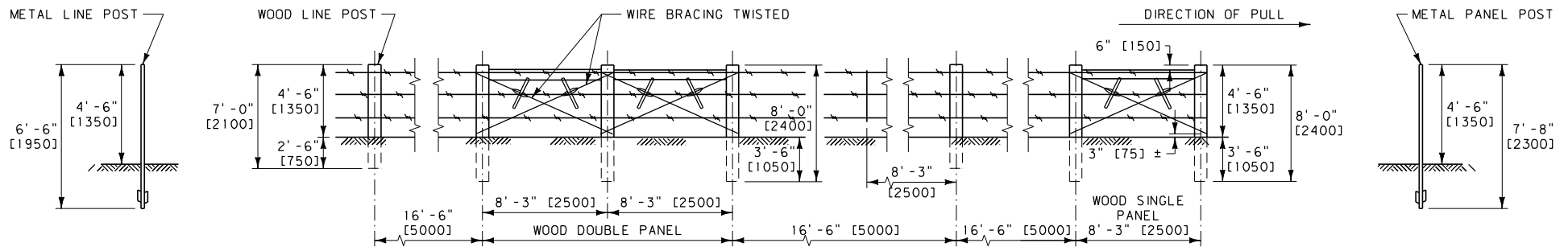


NOTES:

- MANUFACTURE BOX BEAM RAIL ELEMENTS FROM EITHER ASTM A 500 GRADE B COLD ROLLED TUBING, ASTM A 501 HOT-ROLLED TUBING OR AUTOMOTIVE ROLLOVER PROTECTIVE STEEL (ROPS). WHEN ASTM A 500 GRADE B STEEL IS USED, TEST THE MATERIAL PER ASTM E 436.
- FABRICATE ANCHOR BRACKET AND RUB RAIL CONNECTION COMPONENTS FROM AASHTO M 270 (ASTM A 709) GRADE 36 STEEL PLATE.
- GALVANIZE FABRICATED RAIL, ANCHOR BRACKET, AND RUB RAIL CONNECTION COMPONENTS IN ACCORDANCE WITH AASHTO M 111 (ASTM A 123). NO PUNCHING, DRILLING, WELDING OR CUTTING IS PERMITTED ON COMPONENTS AFTER GALVANIZING.

* SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 606	DWG. NO. 606-99
BOX BEAM GUARDRAIL HARDWARE	
-- REVISED --	EFFECTIVE: JANUARY 2008
 MONTANA DEPARTMENT OF TRANSPORTATION	



WIRE SPACING TABLE							
COMBINATION WOVEN WIRE & BARBED WIRE FENCE				BARBED WIRE FENCE			
48" [1200] FENCE HEIGHT		51" [1280] FENCE HEIGHT		48" [1.2 m] FENCE HEIGHT			
32" [813] WW-2 BW *	32" [813] WW-3 BW *	39" [990] WW-2 BW *		3 BW	4 BW	5 BW	6 BW
TYPE F2-32WW [813WW]	TYPE F3-32WW [813WW]	TYPE F2-39WW [990WW]		TYPE F3	TYPE F4	TYPE F5	TYPE F6
APPROXIMATE WEIGHT OF 32" [813] WOVEN WIRE FABRIC (832-6-12 1/2) PER 20 ROD [100 m] ROLL IS 150 LB. [68 kg] ±10 LB. [5 kg] (NOTE: 12 1/2 GAGE)				APPROXIMATE WEIGHT OF 39" [990] WOVEN WIRE FABRIC (939-6-12 1/2) PER 20 ROD [100 m] ROLL IS 170 LB. [77 kg] ±10 LB. [5 kg] (NOTE: 12 1/2 GAGE)			
○ DENOTES STAPLE LOCATIONS							

* OTHER WOVEN WIRE HEIGHTS AND NUMBER OF BARBED WIRE COMBINATIONS ARE AVAILABLE.

STAYS

- USE WIRE STAYS ON ALL FENCES UNLESS WOOD STAYS ARE SPECIFIED.
- LOCATE STAYS HALFWAY BETWEEN LINE POSTS.
- WIRE STAYS FOR BARBED WIRE FENCING ARE 2" [50] LONGER THAN THE DISTANCE BETWEEN THE TOP AND BOTTOM WIRES.
- FOR WOVEN WIRE FENCING WITH BARBED WIRE ON TOP, EXTEND WIRE STAYS 6" [150] MINIMUM BELOW THE TOP OF THE WOVEN WIRE.
- WHEN WOOD STAYS ARE SPECIFIED, USE EITHER 2" [50] ROUND, A ROUGH DIMENSION 2" x 2" [50 x 50], OR A 1 1/2" x 3 1/2" [37.5 x 87.5] (NOMINAL 2" x 4" [50 x 100]). THE STAY MUST BE OF SUFFICIENT LENGTH TO BE PLACED ON THE GROUND WITH THE TOP OF THE STAY EXTENDING 2" [50] ABOVE THE TOP WIRE. ATTACH EACH WIRE TO THE WOOD STAYS USING 1 3/4" [44] x 9 GAGE STAPLES. WOOD STAYS DO NOT NEED TO BE TREATED.

NOTES:

- "M" DENOTES METAL POSTS, IE. TYPE F3M.
"W" DENOTES WOOD POSTS, IE. TYPE F4W.
- SEE DTL. DWG. NO. 607-05 FOR SINGLE AND DOUBLE PANEL DETAILS.
SEE DTL. DWG. NO. 607-10 AND 607-15 FOR ADDITIONAL FENCING DETAILS.

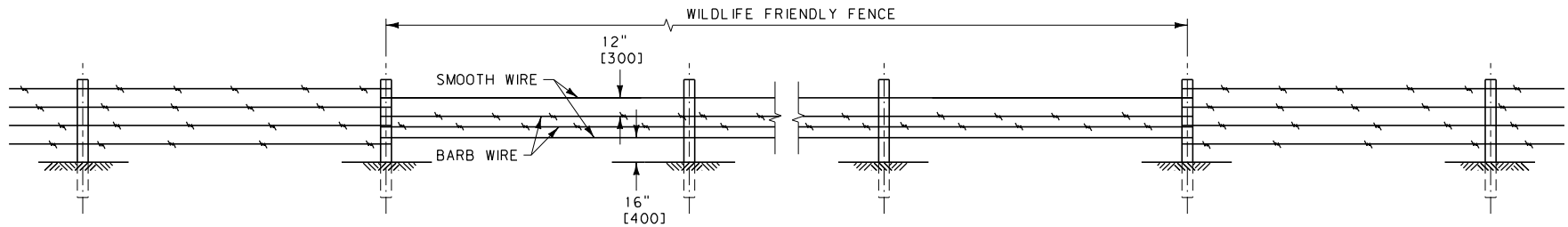
UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING

REFERENCE DWG. NO.
STANDARD SPEC. 607-00
SECTION 607

FARM FENCE

--REVISED-- EFFECTIVE: FEBRUARY 2005
MAY 2011
MDT MONTANA DEPARTMENT OF TRANSPORTATION



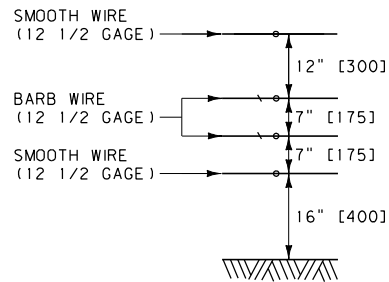
WIRE SPACING TABLE

WILDLIFE-FRIENDLY FARM FENCE TYPE 1

42" [1050] FENCE HEIGHT

WF-2 BW/2 SW-16" [400]

TYPE WF4-SBBS-16 [400]



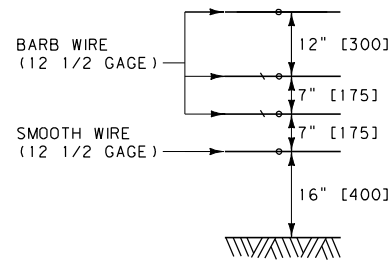
WIRE SPACING TABLE

WILDLIFE-FRIENDLY FARM FENCE TYPE 2

42" [1050] FENCE HEIGHT

WF-3 BW/1 SW-16" [400]

TYPE WF4-3BS-16 [400]



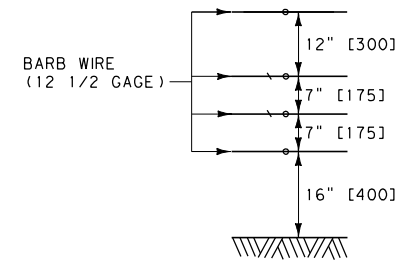
WIRE SPACING TABLE

WILDLIFE-FRIENDLY FARM FENCE TYPE 3

42" [1050] FENCE HEIGHT

WF-4 BW-16" [400]

TYPE WF4-4B-16 [400]



STAYS

- ① USE WIRE STAYS ON ALL FENCES UNLESS WOOD STAYS ARE SPECIFIED.
- ② LOCATE STAYS HALFWAY BETWEEN LINE POSTS.
- ③ WIRE STAYS ARE 2" [50] LONGER THAN THE DISTANCE BETWEEN THE TOP AND BOTTOM WIRES.

NOTES:

- ① SEE DTL. DWG. NO. 607-05 FOR SINGLE AND DOUBLE PANEL DETAILS.
SEE DTL. DWG. NO. 607-10 AND 607-15 FOR ADDITIONAL FENCING DETAILS.

UNITS SHOWN IN BRACKETS [] ARE
METRIC AND ARE IN MILLIMETERS (mm)
UNLESS OTHER UNITS ARE SHOWN.

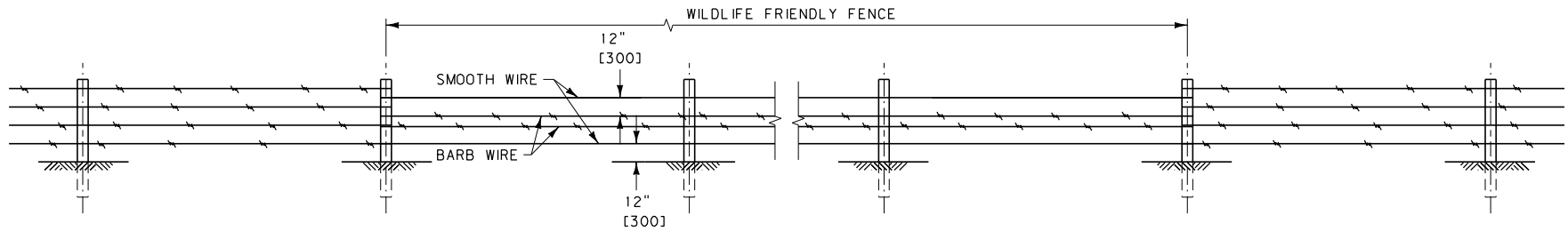
DETAILED DRAWING

REFERENCE DWG. NO.
STANDARD SPEC. 607-01
SECTION 607

WILDLIFE FRIENDLY FENCE
16" [400] BOTTOM
WIRE HEIGHT

EFFECTIVE: MAY 2011

MDTA MONTANA DEPARTMENT
OF TRANSPORTATION



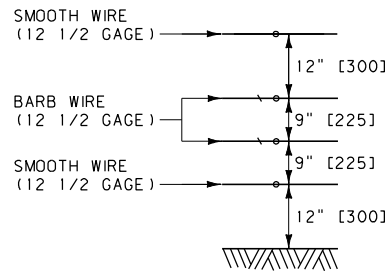
WIRE SPACING TABLE

WILDLIFE-FRIENDLY FARM FENCE TYPE 4

42" [1050] FENCE HEIGHT

WF-2 BW/2 SW-12" [300]

TYPE WF4-SBBS-12 [300]



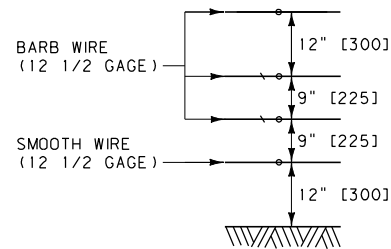
WIRE SPACING TABLE

WILDLIFE-FRIENDLY FARM FENCE TYPE 5

42" [1050] FENCE HEIGHT

WF-3 BW/1 SW-12" [300]

TYPE WF4-3BS-12 [300]



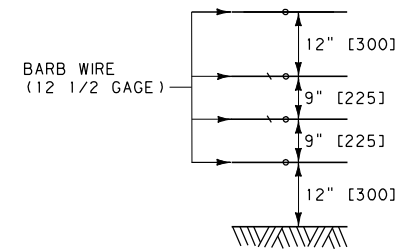
WIRE SPACING TABLE

WILDLIFE-FRIENDLY FARM FENCE TYPE 6

42" [1050] FENCE HEIGHT

WF-4 BW-12" [300]

TYPE WF4-4B-12 [300]



STAYS

- ① USE WIRE STAYS ON ALL FENCES UNLESS WOOD STAYS ARE SPECIFIED.
- ② LOCATE STAYS HALFWAY BETWEEN LINE POSTS.
- ③ WIRE STAYS ARE 2" [50] LONGER THAN THE DISTANCE BETWEEN THE TOP AND BOTTOM WIRES.

NOTES:

- ① SEE DTL. DWG. NO. 607-05 FOR SINGLE AND DOUBLE PANEL DETAILS.
SEE DTL. DWG. NO. 607-10 AND 607-15 FOR ADDITIONAL FENCING DETAILS.

UNITS SHOWN IN BRACKETS [] ARE
METRIC AND ARE IN MILLIMETERS (mm)
UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING

REFERENCE DWG. NO.
STANDARD SPEC. 607-02
SECTION 607

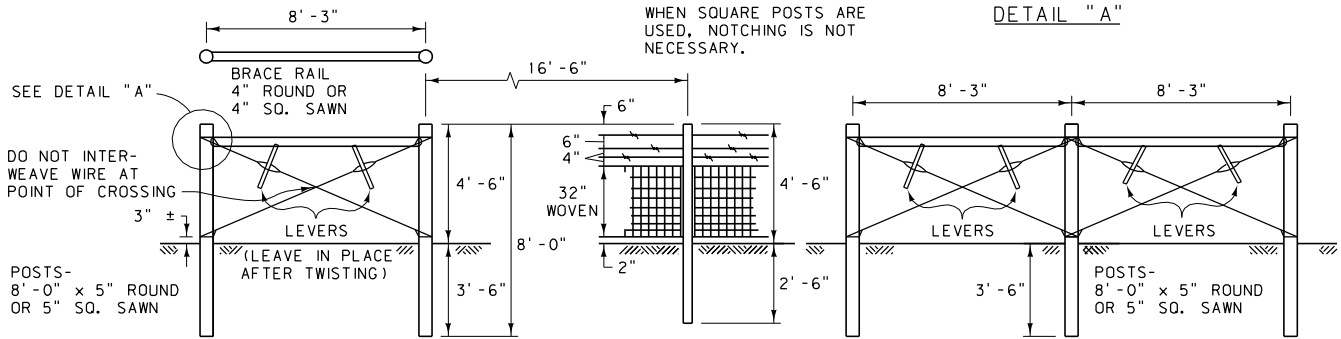
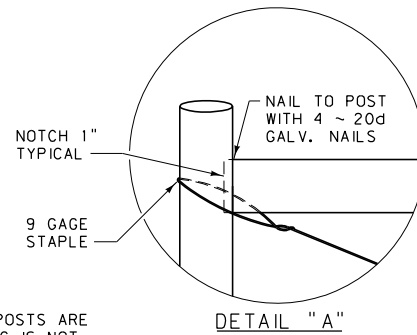
WILDLIFE FRIENDLY FENCE
12" [300] BOTTOM
WIRE HEIGHT

EFFECTIVE: MAY 2011

MDTA MONTANA DEPARTMENT
OF TRANSPORTATION

BRACE WIRES - ONE CONTINUOUS 9 OR 12½ GAGE SMOOTH WIRE DOUBLED TO FORM A FOUR WIRE BRACE. TIE THE TWO ENDS NEAR THE TOP OF THE PANEL POSTS.

LEVERS - 1½" x 2" x 12" MINIMUM SIZE.



SINGLE PANEL

FOR PULLING, STRETCHING, CHANGES IN VERTICAL ALIGNMENT OR PANELS ON A RUN OF LESS THAN 330'.

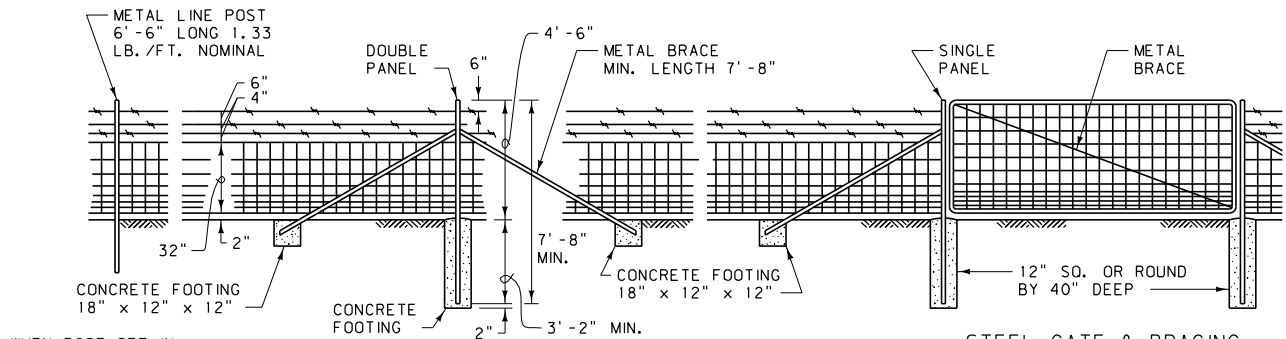
LINE POST

7'-0" x 4" MIN. ROUND OR 4" x 4" SQ. SAWN

DOUBLE PANEL

FOR CORNERS, PULLING OR STRETCHING, AND CHANGES IN HORIZONTAL ALIGNMENT.

TYPE "CW" - "STRAIGHT RUN" FENCE WITH WOOD POSTS



WHEN POST SET IN SOLID ROCK, PROVIDE 18" MIN. BURIAL.

TYPE "CM" - FENCE WITH STEEL POSTS

STEEL GATE & BRACING

NOTES:

SEE THE STANDARD SPECIFICATIONS FOR POST AND GATE REQUIREMENTS.

PLACE ALL FENCE WIRE ON PASTURE SIDE OF POST, EXCEPT ON CURVES. THEN, PLACE THE WIRE ON THE OUTSIDE OF THE CURVE.

IN AREAS SUBJECT TO HIGH VELOCITY WINDS AND MOVING DEBRIS, WIRES MAY BE PLACED ON WINDWARD SIDE OF POSTS, EXCEPT ON CURVES.

ALL CONCRETE IS CLASS "F" OR BETTER.

POST SPACING IS GENERALLY MEASURED PARALLEL TO GROUND.

LINE POST SPACING IS 16'-6" CENTER TO CENTER. LINE POST SPACING FROM BRACE OR PANEL POST IS 16'-6" CENTER TO CENTER.

PLACE 24" WIRE STAY HALFWAY BETWEEN POSTS. DO NOT PLACE STAYS ON PANELS FOR "CM" AND "CW" FENCE.

TYPE "CW" FENCE HAS ONE METAL POST IN PLACE OF A WOODEN LINE POST IN EACH 500' RUN FOR LIGHTNING PROTECTION.

USE TYPE "CW" (WOOD) PANELS ON ALL TYPE "CM" (METAL) FENCES INSTEAD OF STEEL PANELS UNLESS OTHERWISE SPECIFIED.

SET STEEL CORNER, END, GATE AND PULL POSTS, AND EACH BRACE IN CONCRETE AS SHOWN.


SEE DTL. DWG. NO. 607-10 FOR ADDITIONAL FENCING DETAILS.

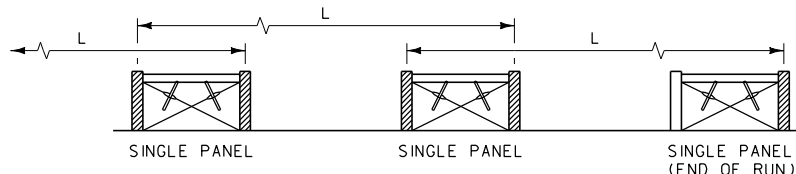
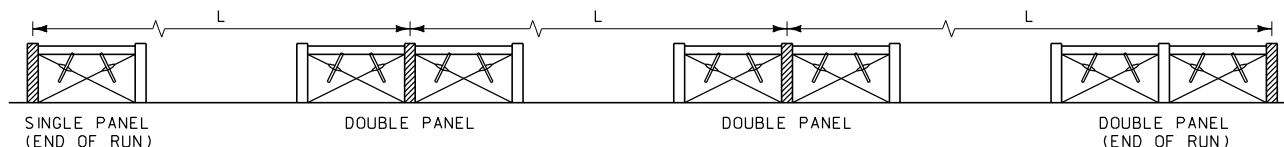
A DEADMAN MAY BE A PRECAST CONCRETE BLOCK, A CAST IN PLACE CONCRETE BLOCK, A ROCK OR OTHER APPROVED OBJECT WEIGHING AT LEAST 150 LB. BURY THE DEADMAN IN THE GROUND WITH AT LEAST 2'-0" OF COVER. ATTACH THE DEADMAN TO THE FENCE WITH 3 STRANDS OF 9 GAGE WIRE OR 6 STRANDS OF 12½ GAGE WIRE. SEE DETAILED DRAWING NO. 607-10 FOR ALTERNATE DEADMAN.

STAPLE THE BOTTOM, TOP, CENTER AND ALTERNATE WIRES OF WOVEN WIRE TO WOOD LINE POSTS.

TIE THE BOTTOM, TOP, CENTER AND ALTERNATE WIRES OF WOVEN WIRE TO STEEL LINE POSTS.

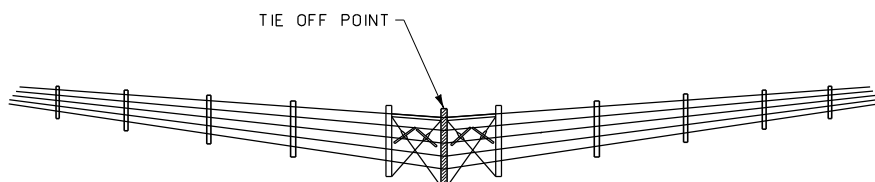
STAPLE ALL WIRES OF WOVEN WIRE TO WOOD CORNER POSTS OR POST USED TO TIE-OFF WIRE.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 607	DWG. NO. 607-05
INTERSTATE FENCE	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION serving you with pride	



FENCE TYPE	RUN = L	PANELS REQUIRED
COMBINATION WOVEN BARBED	LESS THAN 33'	NONE
	33' - 330'	SINGLE
	OVER 330' TO 660' MAX.	DOUBLE
BARBED	LESS THAN 66'	NONE
	66' - 660'	SINGLE
	OVER 660' TO 990' MAX.	DOUBLE

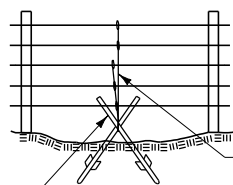
FENCE TYPE	RUN = L (m)	PANELS REQUIRED
COMBINATION WOVEN BARBED	LESS THAN 10	NONE
	10 - 100	SINGLE
	OVER 100 TO 200 MAX.	DOUBLE
BARBED	LESS THAN 20	NONE
	20 - 200	SINGLE
	OVER 200 TO 300 MAX.	DOUBLE



DOUBLE PANEL AT FENCE
CORNER OR ANGLE BREAK

FENCE PANEL TYPES

- ① LIMIT RUN LENGTHS IN POOR SOIL CONDITIONS TO REDUCE RESULTING TENSION AT CORNER OR ANGLE BREAK PANELS.
- ② TIE OFF ON ALL CROSS HATCHED OR SHADED POSTS.



METAL LINE POSTS DRIVEN INTO
GROUND AT LEAST THREE FEET [900]

THREE STRANDS OF
9 GAGE WIRE TIED
AROUND ALL WIRES
AND AROUND THE
JUNCTION OF THE
METAL POSTS

ALTERNATE DEADMAN

WHEN APPROVED BY THE PROJECT MANAGER THE ABOVE
DEADMAN MAY BE USED IN LIEU OF A ROCK OR PRECAST
CONCRETE BLOCK AS SPECIFIED ON DTL. DWG. NO. 607-05.

NOTES:

- ① ATTACH BARBED WIRES TO POSTS BY WRAPPING AROUND THE POST AT LEAST TWO TIMES, THEN WRAPPING AROUND ITSELF FIVE TIMES.
- ② TO ATTACH WOVEN WIRE TO AN END POST, REMOVE TWO OR THREE VERTICAL STAY WIRES FROM THE END OF THE FENCE. PLACE THE FIRST COMPLETE VERTICAL STAY WIRE AGAINST THE POST. START AT THE MIDDLE OF THE HORIZONTAL LINE WIRES, WRAPPING AROUND THE END POST AT LEAST TWO TIMES AND THEN WRAPPING AROUND ITSELF FIVE TIMES.

UNITS SHOWN IN BRACKETS [] ARE
METRIC AND ARE IN MILLIMETERS (mm)
UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING

REFERENCE DWG. NO.
STANDARD SPEC. 607-10
SECTION 607

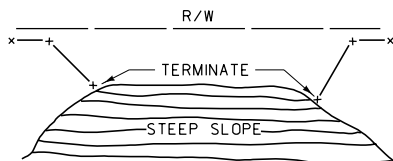
FENCING DETAILS

--REVISED--

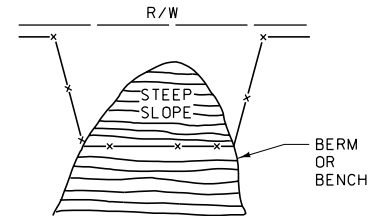
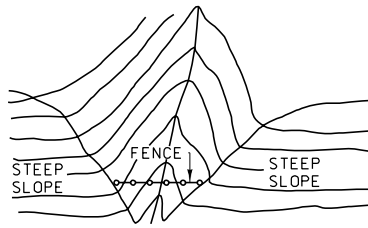
MAY 2011

EFFECTIVE: FEBRUARY 2005

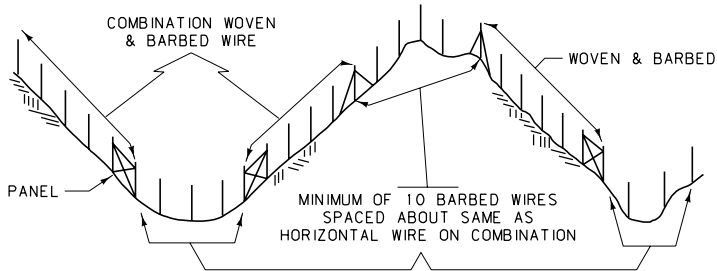
MDTA MONTANA DEPARTMENT
OF TRANSPORTATION



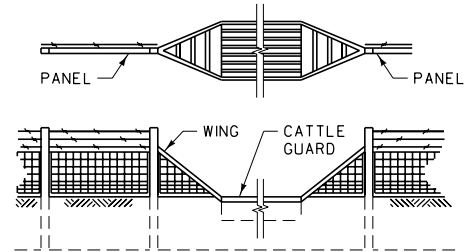
SLOPE MUST BE STEEP ENOUGH TO DETER
PASSAGE OF TRESPASSERS.



FENCE LAYOUT ON STEEP SLOPES

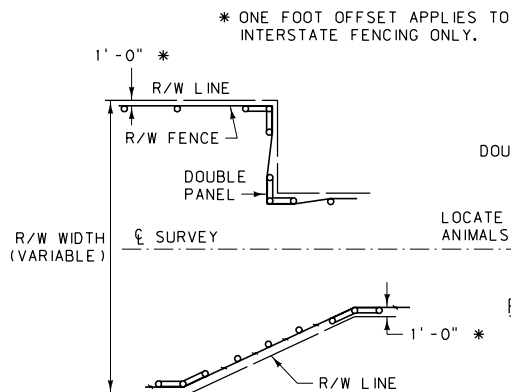


FENCE LAYOUT ON SHARP VERTICAL CURVES TO AVOID TRYING TO CONFORM WOVEN WIRE TO UNEVEN TERRAIN

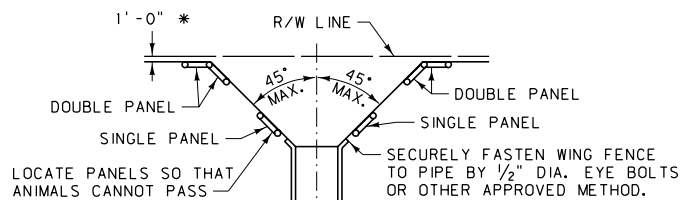


FENCE CONNECTION TO CATTLE GUARD

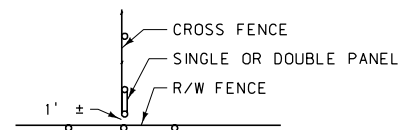
SECURELY FASTEN FENCE WIRE TO THE WINGS
AND ARRANGE SO THAT ANIMALS CANNOT PASS.



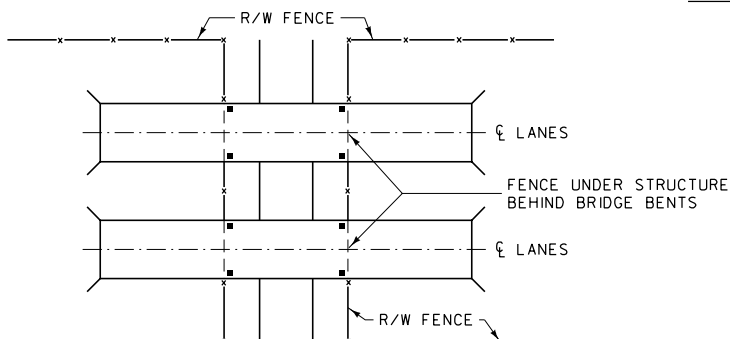
FENCE LAYOUT AT CHANGE IN R/W WIDTH



FENCE LAYOUT AT STOCKPASS, BRIDGES AND LARGE PIPES



FENCE LAYOUT AT CROSS-FENCE CONNECTION




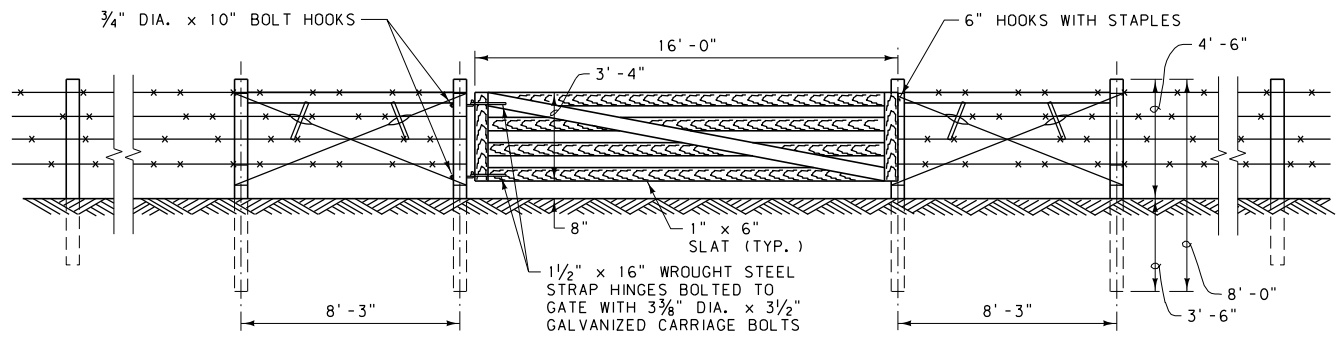
FENCE LAYOUT AT LOCAL ROAD UNDER INTERSTATE

NOTES:

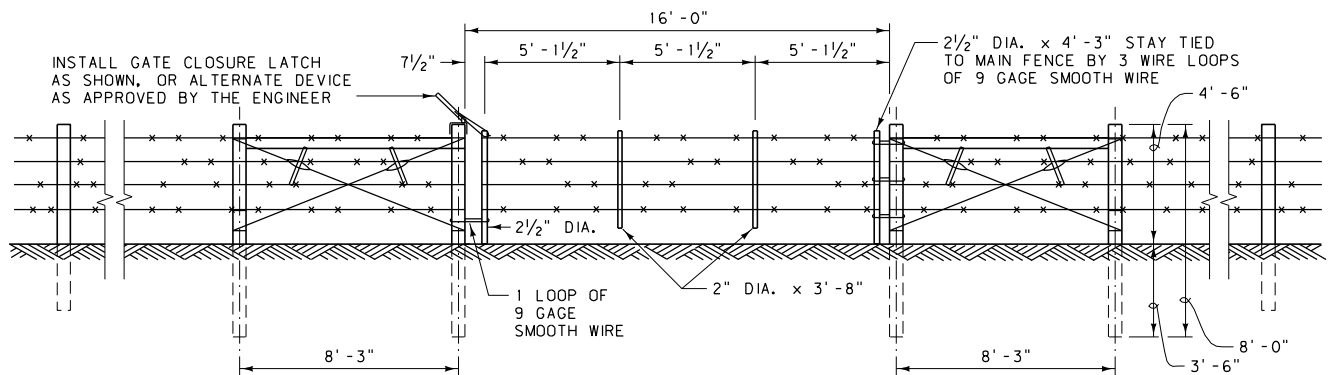
INSTALL NON-INTERSTATE FENCE ON THE
RIGHT-OF-WAY LINE.

DO NOT DAMAGE SURVEY MONUMENTS.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 607	DWG. NO. 607-15
FENCING DETAILS	
-- REVISED -- October 2008	EFFECTIVE: FEBRUARY 2005
 MONTANA DEPARTMENT OF TRANSPORTATION serving you with pride	

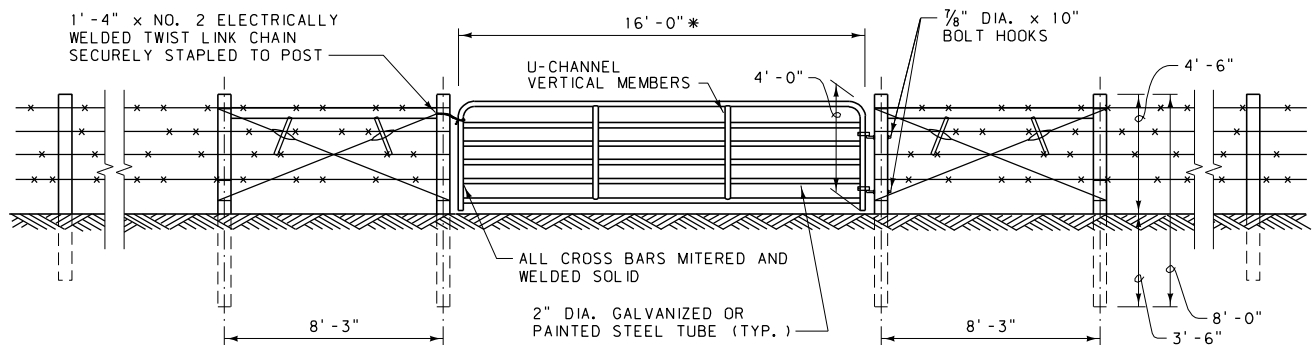


WOOD FARM ENTRANCE GATE (TYPE G-1)
NOTE: USE 10d NAILS AND CLINCH FOR GATE CONSTRUCTION.



WIRE FARM ENTRANCE GATE (TYPE G-2)

NOTE:
USE SAME WIRE SCHEME ON GATE
AS THAT USED ON FENCE, UNLESS
STATED OTHERWISE IN R/W AGREEMENT.




METAL FARM ENTRANCE GATE (TYPE G-3)

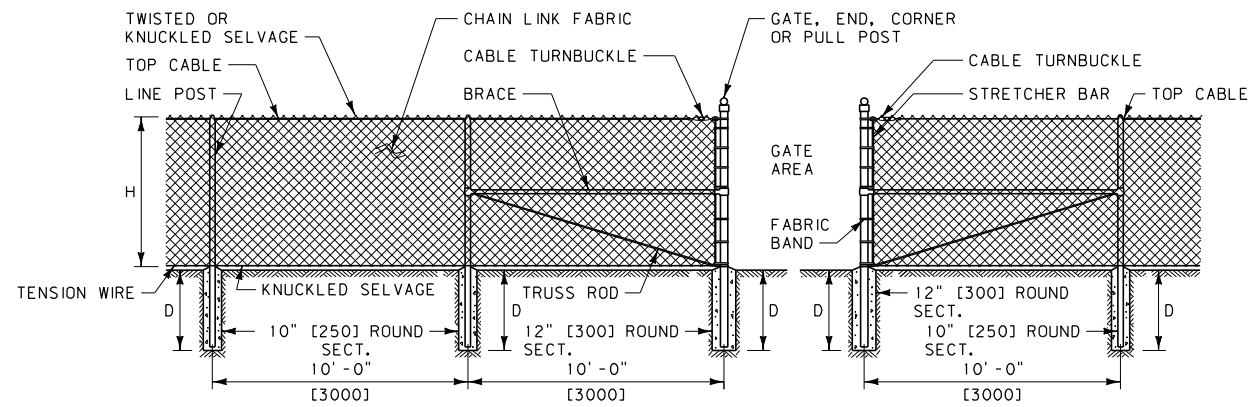
NOTES:

ALL GATES ARE 16'-0" WIDE UNLESS R/W AGREEMENT STATES OTHERWISE.

ALL GATES WILL HAVE A SINGLE OR DOUBLE PANEL AT EACH END.

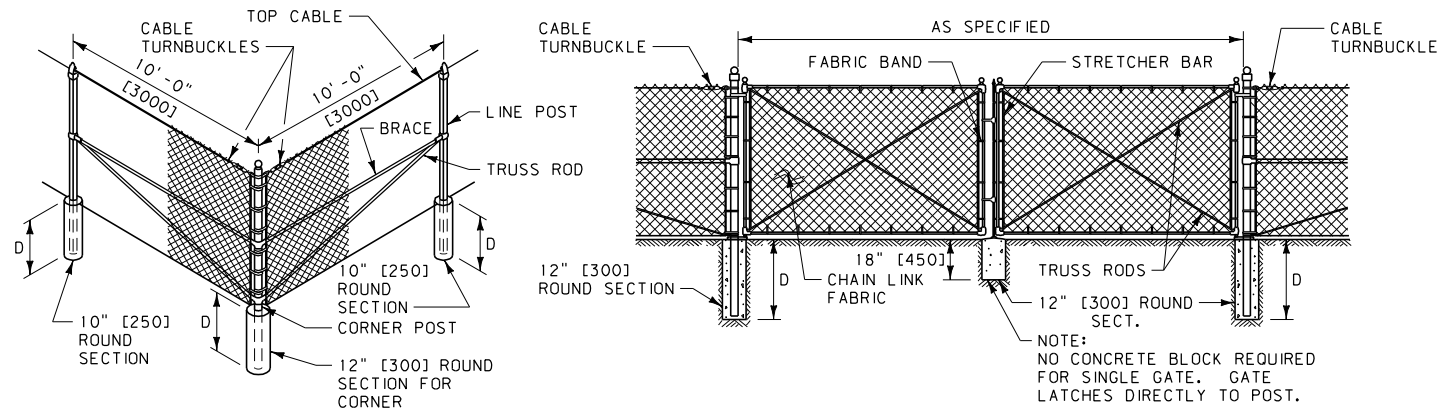
* TYPE G-3 GATES ARE AVAILABLE IN WIDTHS FROM 4' TO 20' IN 2' INCREMENTS.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 607	DWG. NO. 607-20
FARM ENTRANCE GATES	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION serving you with pride	



CHAIN LINK FENCE - 6' [1.8 m] AND 8' [2.4 m]

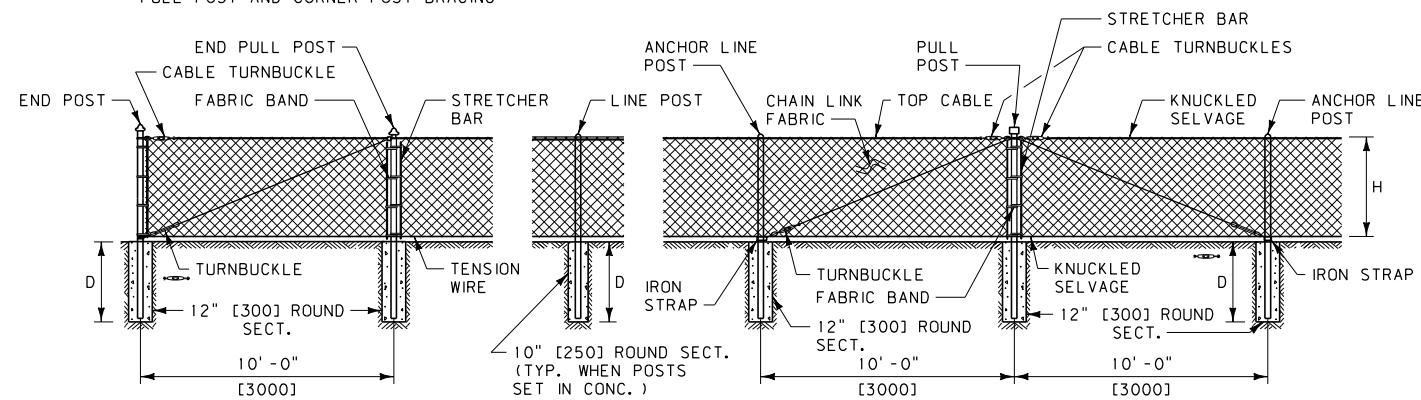
SINGLE PANEL



DOUBLE PANEL

PULL POST AND CORNER POST BRACING

GATES



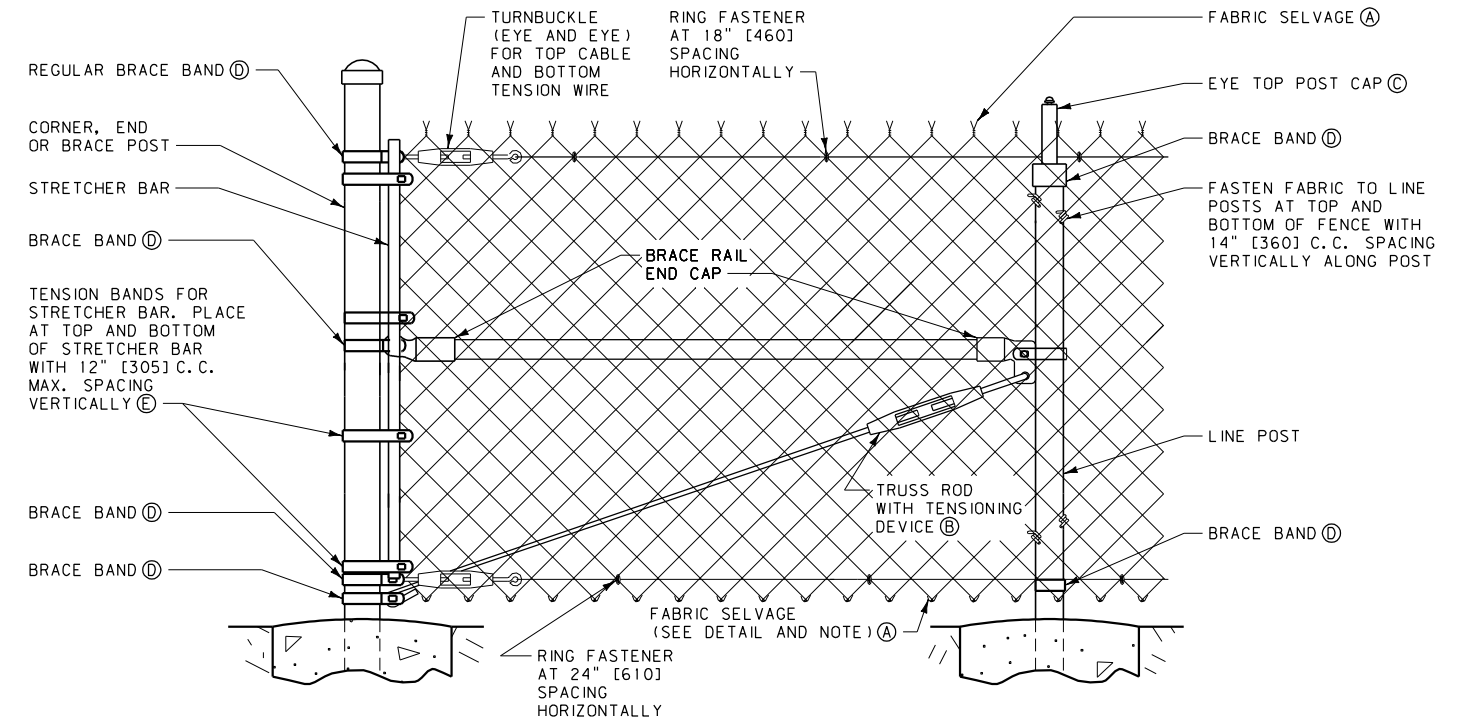
CHAIN LINK FENCE - 3' [0.9 m], 4' [1.2 m] AND 5' [1.5 m]

NOTES:

- DO NOT INSTALL DOUBLE PANELS MORE THAN 300' [90 m] APART ON TANGENTS OR MORE THAN 250' [75 m] APART ON ANY CURVE. FOR CURVES WITH RADIUS SHARPER THAN 1150' [350 m], INSTALL A DOUBLE PANEL ON EACH CURVE END, PLUS ONE ADDITIONAL PANEL FOR EACH 10' OF DEFLECTION, EVENLY SPACED, BETWEEN THE CURVE ENDS.
- PULL POST BRACING ON 6' [1.8 m] AND 8' [2.4 m] FENCE IS THE SAME AS CORNER BRACING.
- A DROP BAR LOCKING DEVICE IS REQUIRED FOR ALL DOUBLE GATE INSTALLATIONS. THE DROP BAR MUST BE ABLE TO BE INSERTED INTO THE CONCRETE BLOCK AT LEAST SIX INCHES [150].

- ALL CONCRETE IS CLASS "F" OR BETTER.
- INSTALL A 3/8" [10] DIAMETER GALVANIZED STEEL TOP CABLE ALONG ALL FENCE. TERMINATE TOP CABLE WITH GALVANIZED CABLE TURNBUCKLES FASTENED VIA THE FABRIC BAND AT THE POST.

HEIGHT OF FABRIC, H	WIRE FABRIC ABOVE GROUND	DEPTH OF CONCRETE, D	DEPTH OF POST IN CONC. (MIN.)
8' [2440]	1"-2" [25-50]	42" [1050]	38" [950]
6' [1830]	1"-2" [25-50]	36" [900]	32" [800]
5' [1525]	1"-2" [25-50]	36" [900]	32" [800]
4' [1220]	1"-2" [25-50]	30" [750]	26" [650]
3' [915]	1"-2" [25-50]	30" [750]	26" [650]

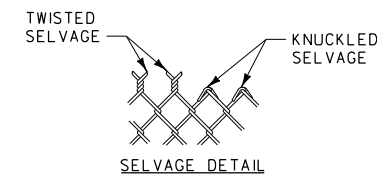


CONNECTION DETAILS

GENERAL NOTES

PROVIDE CHAIN LINK FENCE MATERIALS PER SECTION 712.

- A FABRIC SELVAGE: FENCE HEIGHT UNDER 6' [1.8 m]: TOP AND BOTTOM KNUCKLED SELVAGE.
FENCE HEIGHT 6' [1.8 m] AND OVER: TOP - TWIST SELVAGE
BOTTOM - KNUCKLED SELVAGE



- B TRUSS RODS: SEE SECTION 712.01.4



- C POST CAPS: PROVIDE EYE-TOP CAPS FOR ALL POSTS CARRYING A TOP CABLE THROUGH THE POST. PROVIDE ROUNDED TOPS FOR ALL OTHER ROUND POSTS. FIT POST CAPS TIGHTLY TO PREVENT REMOVAL.

- D BRACE BANDS: SEE SECTION 712.01.5.

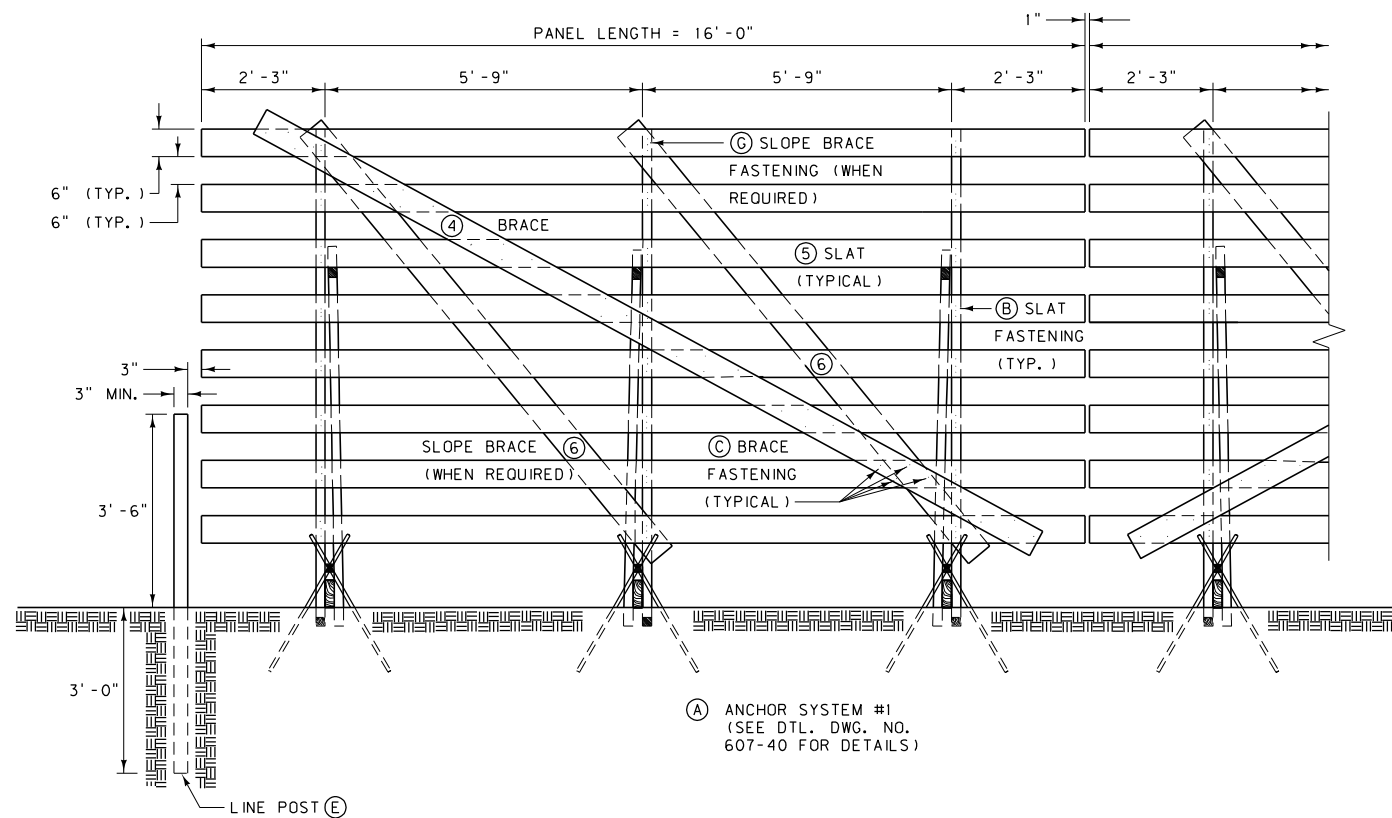


- E TENSION BANDS: SEE SECTION 712.01.5

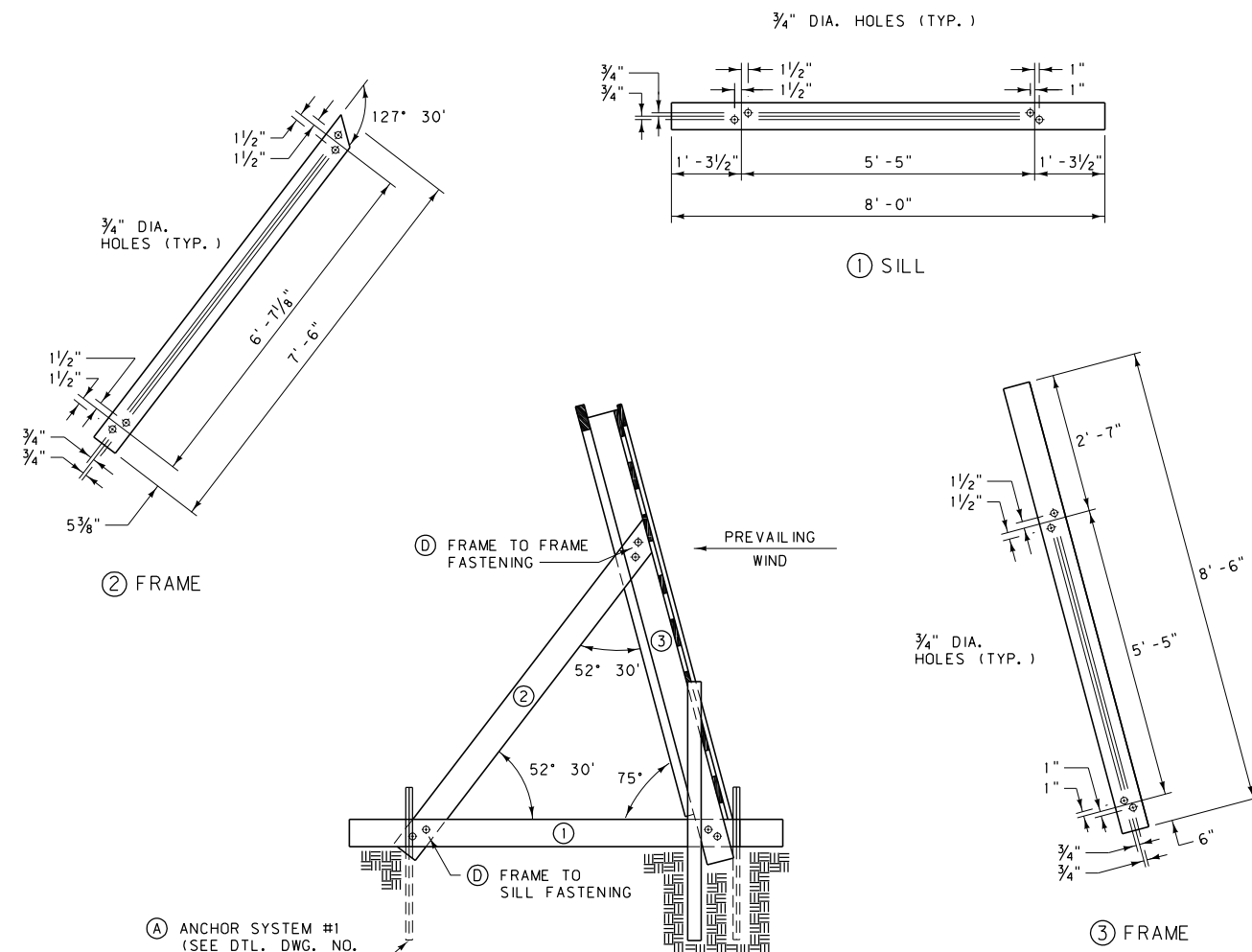


UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 607	DWG. NO. 607-25
CHAIN LINK FENCE	
--REVISED-- MAY 2009 MAY 2011	EFFECTIVE: APRIL 2006 MDT MONTANA DEPARTMENT OF TRANSPORTATION



FRONT VIEW



END VIEW

GENERAL NOTES


- (A) ANCHOR SYSTEM DETAIL
USE ANCHOR SYSTEM #1 UNLESS SOIL AND MOISTURE CONDITIONS NECESSITATE THE USE OF AN ALTERNATE SYSTEM, OR AS DIRECTED BY THE ENGINEER. CONSULT DETAILED DRAWING NUMBERS 607-40 AND 607-45 FOR ANCHOR SYSTEMS #3 (ROCKY CONDITIONS) AND #2 (SWAMPY CONDITIONS).
- (B) SLAT FASTENING
FASTEN SLATS TO THE FRAME WITH 3 ~ 12d COMMON BARBED SHANK NAILS AT EACH LOCATION.
- (C) BRACE FASTENING
FASTEN BRACES TO THE FRAME WITH 4 ~ 8d COMMON NAILS AT EACH LOCATION AND CLINCH.
- (D) FRAME TO SILL AND FRAME TO FRAME FASTENING
FASTEN THE SILL AND FRAME MEMBERS TO THE FRAME AT EACH LOCATION WITH 2 ~ 5/8" DIA. x 5" STANDARD MACHINE BOLTS, EACH WITH HEX NUT AND TWO FLAT WASHERS. SEE NOTE (X) AT RIGHT.
- (E) LINE POSTS
PLACE LINE POSTS AT EACH END OF EACH LINE OF SNOW FENCE AS SHOWN. POSTS ARE 6'-6" LONG WITH A MINIMUM DIAMETER OF 3" AND A MAXIMUM DIAMETER OF 6". BUTT TREAT 3' MINIMUM.
- (F) WIRE TIE
USE 12 GAGE OR HEAVIER GALVANIZED WIRE TO FORM THE WIRE TIES.
- (G) SLOPE BRACE FASTENING
FASTEN SLOPE BRACES WITH 3 ~ 16d COMMON BARBED SHANK NAILS AT EACH LOCATION.

LUMBER - 8' SNOW FENCE W/ ANCHOR SYSTEM #1			
BILL OF MATERIALS FOR ONE PANEL			
ITEM NO.	NO. OF PIECES	LUMBER SIZE	DESCRIPTION
(1)*	3	2" x 6" x 8'-0"	FRAME (SILL)
(2)*	3	2" x 6" x 7'-6"	FRAME
(3)*	3	2" x 6" x 8'-6"	FRAME
* NOTE: PRESSURE TREAT ALL 2" x 6" MEMBERS (ENTIRE FRAME)			
(4)	1	1" x 6" x 16'-0"	BRACE
(5)	8	1" x 6" x 16'-0"	SLAT
(6)**	2	2" x 6" x 10'-0"	SLOPE BRACE
** NOTE: USE ONLY WHEN SLOPE IS 5:1 OR GREATER			

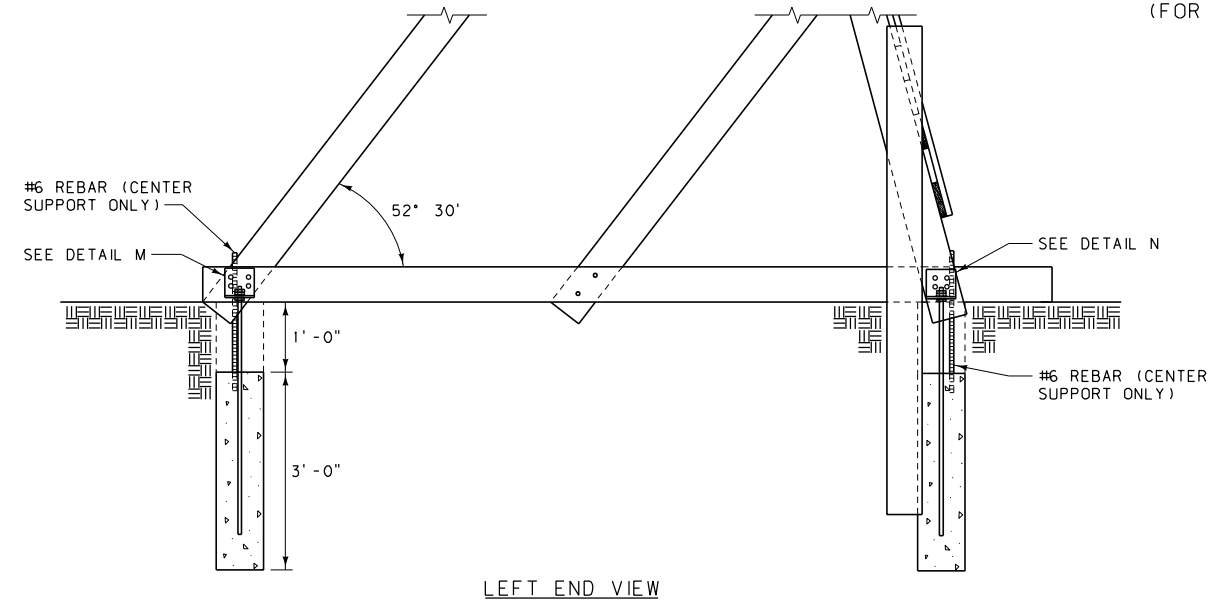
HARDWARE - 8' SNOW FENCE W/ ANCHOR SYSTEM #1		
BILL OF MATERIALS FOR ONE PANEL		
QUANTITY	DESCRIPTION	
(D)	18	5/8" DIA. x 5" HEX BOLT (THREADED FULL LENGTH) AND NUT
(D)	36	FLAT WASHER FOR 5/8" DIA. BOLT
(B)	1 LB.	12d COMMON BARBED SHANK NAIL
(A)	12	#6 REBAR x 5'-0" (3/4" DIA.)
(F)	6 PIECES	12 GAGE TIE WIRE x 5'-0" ±
(C)	1/3 LB.	8d COMMON NAILS
(G)	1/4 LB.	16d COMMON BARBED SHANK NAILS

ALL NAILS MAY BE EITHER HAND DRIVEN OR DRIVEN WITH A PNEUMATIC NAILER.

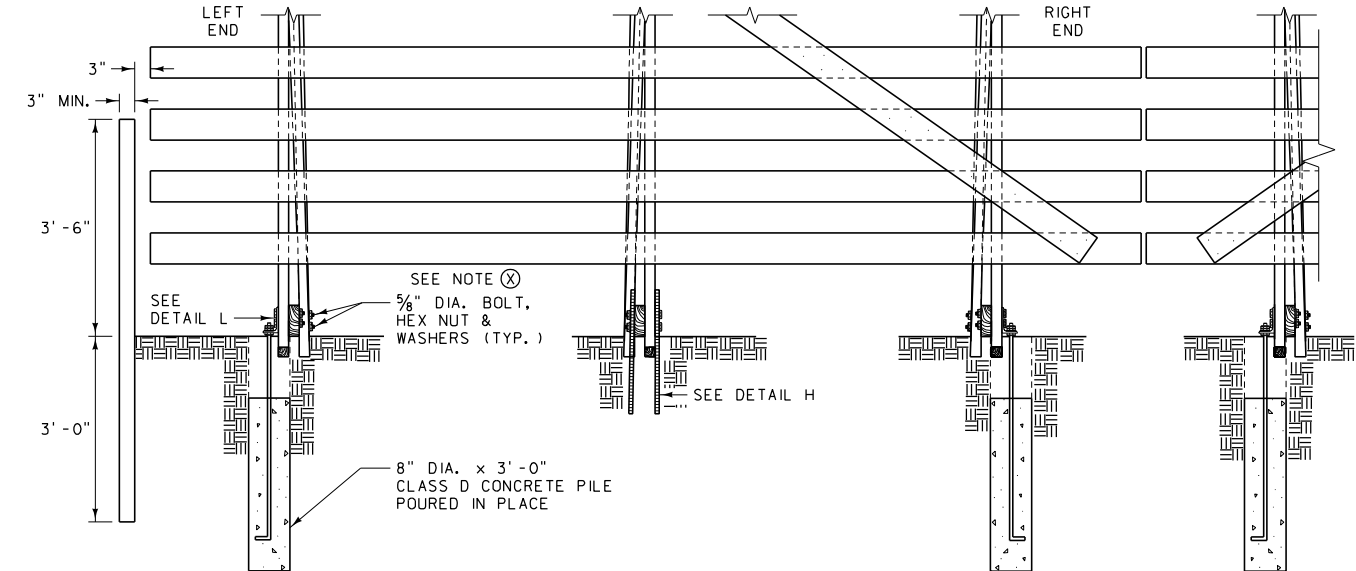
(X) NOTE:
AFTER 5/8" DIA. BOLTS HAVE BEEN TIGHTENED, BURR THE THREAD DIRECTLY BEHIND THE NUT TO PREVENT EVENTUAL LOOSENING OF THE NUTS.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 607	DWG. NO. 607-30
8' WOOD SNOW FENCE W/ ANCHOR SYSTEM #1	
EFFECTIVE: FEBRUARY 2005	
 serving you with pride	MONTANA DEPARTMENT OF TRANSPORTATION

ANCHOR SYSTEM #3
(FOR ROCKY CONDITIONS)

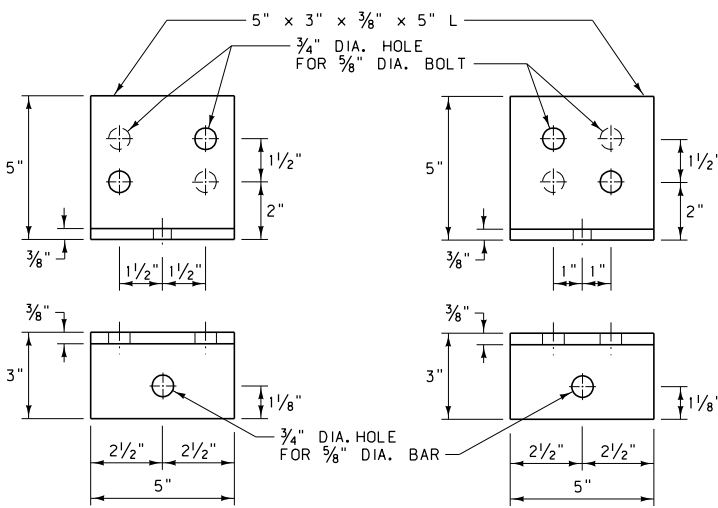


LEFT END VIEW



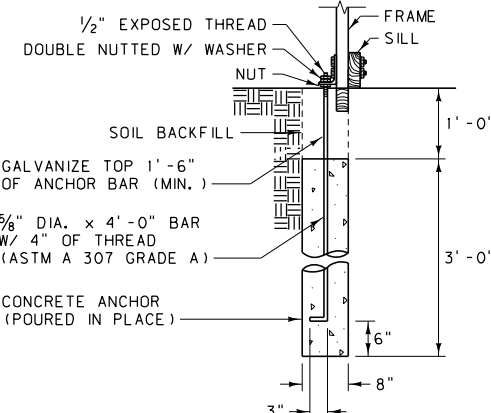
FRONT VIEW

NOTE:
HOLES SHOWN IN DETAILS BELOW ARE FOR LEFT END OF FENCE.
HOLES SHOWN HIDDEN ARE FOR RIGHT END OF FENCE.

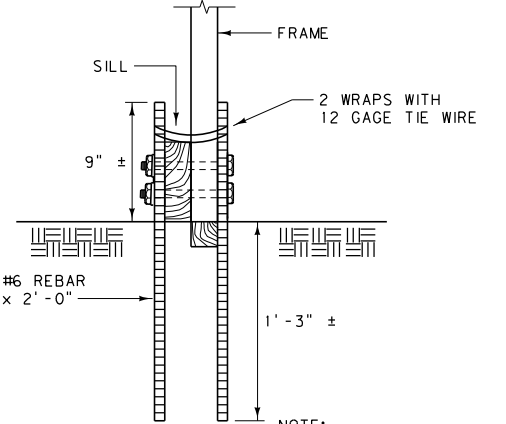


DETAIL M

DETAIL N



DETAIL L



DETAIL H

NOTE:
USE ON FRONT AND BACK
OF CENTER SUPPORT.

LUMBER - SNOW FENCE W/ ANCHOR SYSTEM #3

BILL OF MATERIALS FOR ONE PANEL

SAME AS FOR SNOW FENCE W/ ANCHOR SYSTEM #1

HARDWARE - SNOW FENCE W/ ANCHOR SYSTEM #3

BILL OF MATERIALS FOR ONE PANEL

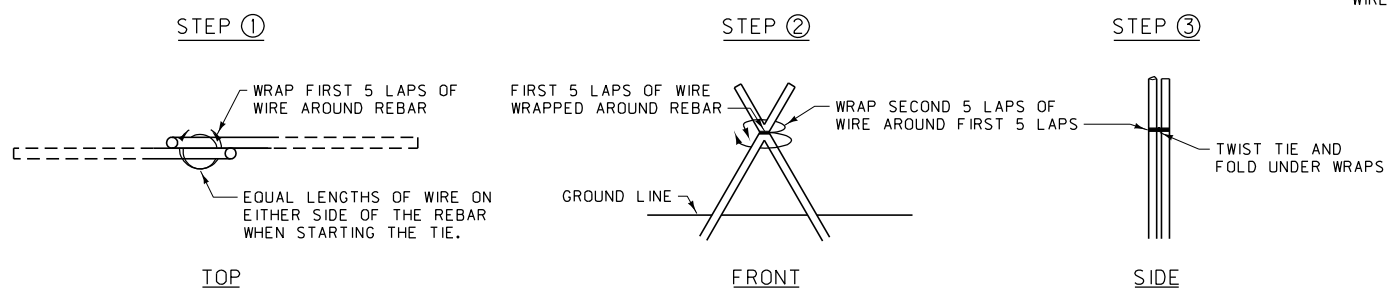
QUANTITY	DESCRIPTION
4	5" x 3" x 3/8" x 5" L
4	5/8" DIA. x 4'-0" BAR W/ 3 HEX NUTS
4	FLAT WASHERS FOR 5/8" DIA. BAR
0.16 C.Y.	CLASS D CONCRETE
4	#6 REBAR x 2'-0" (3/4" DIA.)
4 PIECES	12 GAGE TIE WIRE x 2'-0" ±
30	5/8" DIA. x 5" HEX BOLT (THREADED FULL LENGTH) AND NUT
60	FLAT WASHERS FOR 5/8" DIA. BOLT

NOTE: NAILS REQUIRED ARE SAME AS SHOWN ON HARDWARE SUMMARY FOR SNOW FENCE W/ ANCHOR SYSTEM #1

SEE NOTE
(X) BELOW

(X) NOTE:
AFTER 5/8" DIA. BOLTS HAVE BEEN TIGHTENED,
BURR THE THREAD DIRECTLY BEHIND THE NUT
TO PREVENT EVENTUAL LOOSENING OF THE NUTS.

ANCHOR SYSTEM #1
(STANDARD)



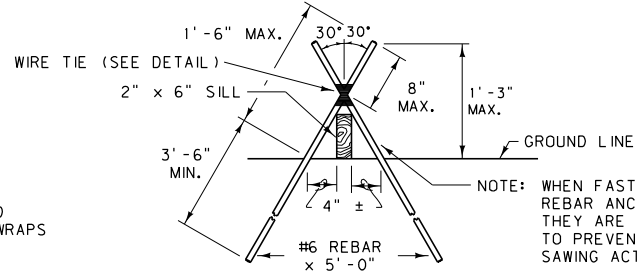
TOP

FRONT

SIDE


WIRE TIE DETAIL

USE 12 GAGE OR HEAVIER GALVANIZED
WIRE TO FORM THE WIRE TIES.

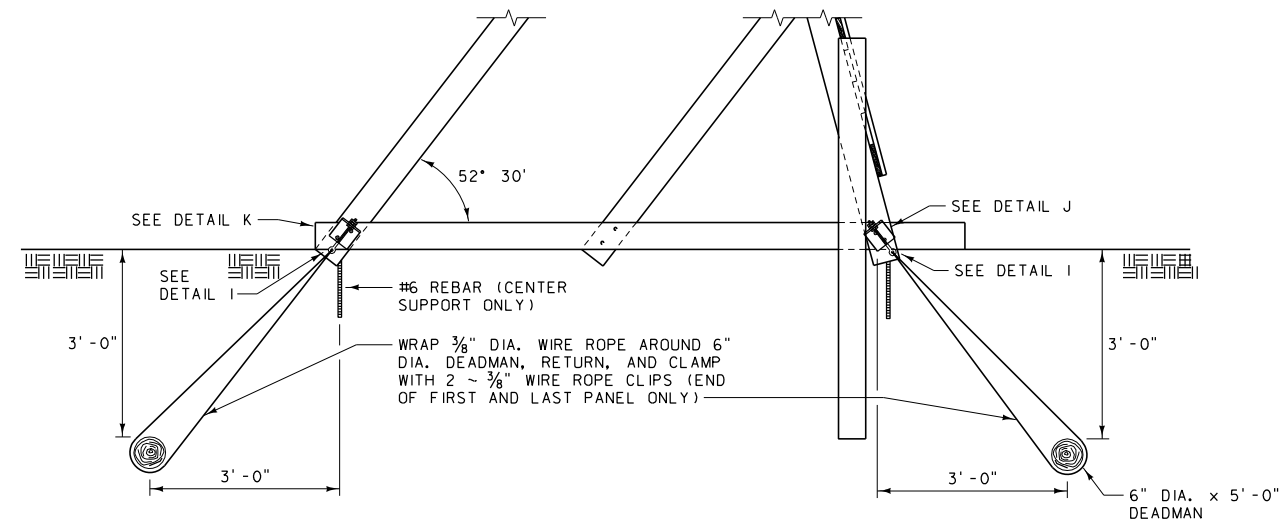


USE TWO #6 REINFORCING BARS FOR EACH END OF EACH
SILL MEMBER. DRIVE THE BARS UP TIGHT TO THE FRAME
TO PREVENT SLIDING. TIE THE REINFORCING BARS AS SHOWN
IN THE WIRE TIE DETAIL. THE PLACEMENT OF THE ANCHORS
IS CRITICAL IN PREVENTING OVERTURNING AND SLIDING OF
THE FENCE.

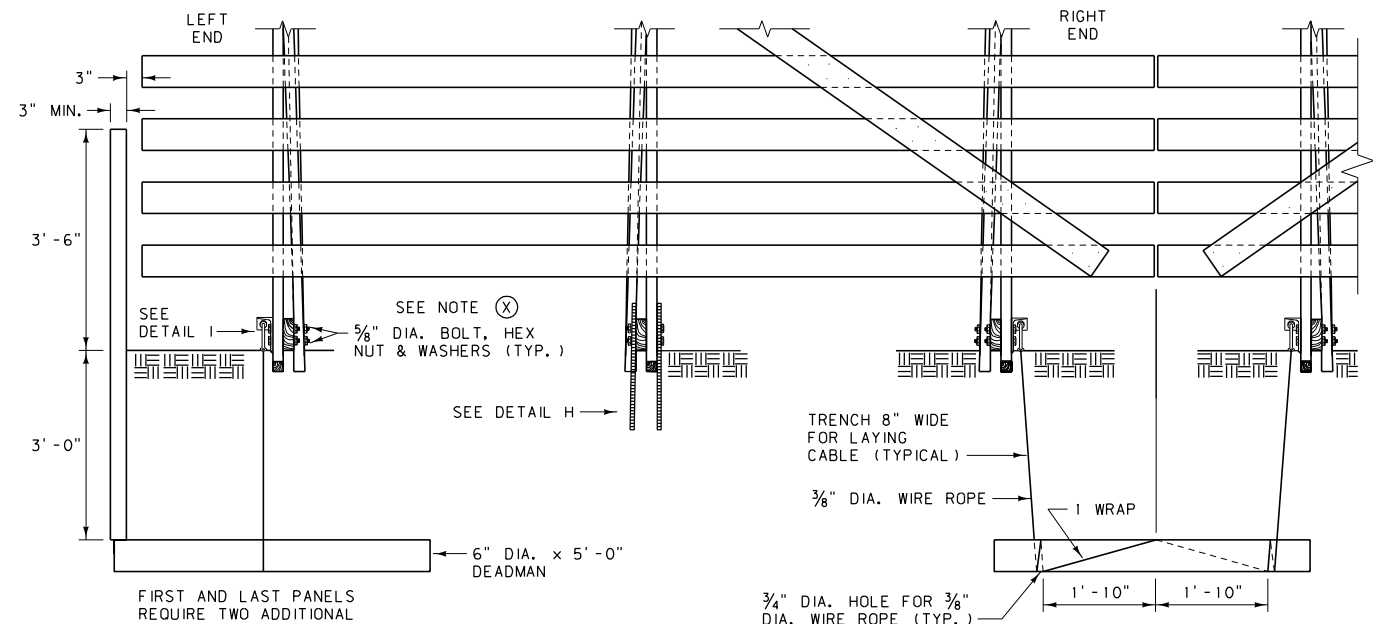
STANDARD ANCHOR DETAIL

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	607-40
SECTION 607	
WOOD SNOW FENCE ANCHOR SYSTEM #3 AND #1 DETAILS	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	

ANCHOR SYSTEM #2
(FOR SWAMPY CONDITIONS)



LEFT END VIEW

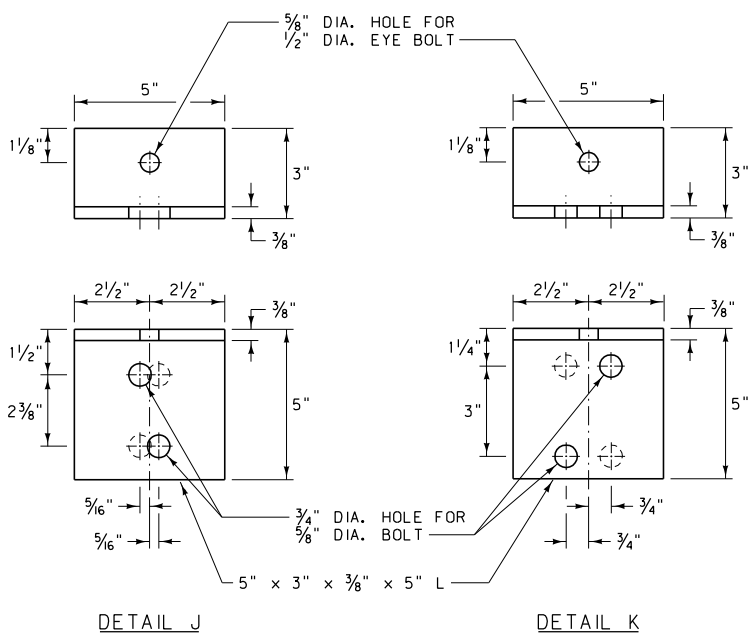


FRONT VIEW

LUMBER - SNOW FENCE W/ ANCHOR SYSTEM #2	
BILL OF MATERIALS FOR ONE PANEL	
SAME AS FOR SNOW FENCE W/ ANCHOR SYSTEM #1	

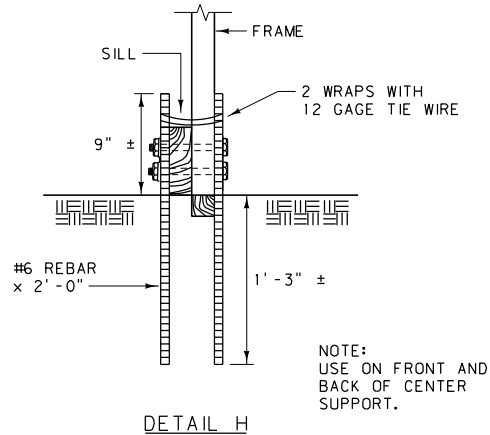
HARDWARE - SNOW FENCE W/ ANCHOR SYSTEM #2	
BILL OF MATERIALS FOR ONE PANEL	
QUANTITY	DESCRIPTION
4	5" x 3" x 3/8" x 5" L
8	3/8" WIRE CLAMPS
4	1/2" DIA. DROP FORGED EYEBOLTS W/ 3 HEX NUTS
4	FLAT WASHERS FOR 1/2" DIA. EYEBOLTS
4	#6 REBAR x 2'-0" (3/4" DIA.)
4 PIECES	12 GAGE TIE WIRE x 2'-0" ±
29 FT.	3/8" DIA. WIRE ROPE
2	6" DIA. x 5'-0" POST DEADMEN
30	5/8" DIA. x 5" HEX BOLT (THREADED FULL LENGTH) AND NUT
60	FLAT WASHERS FOR 5/8" BOLT
NOTE: NAILS REQUIRED ARE SAME AS SHOWN ON HARDWARE SUMMARY FOR SNOW FENCE W/ ANCHOR SYSTEM #1	

NOTE:
HOLES SHOWN IN DETAILS BELOW ARE FOR LEFT END OF FENCE.
HOLES SHOWN HIDDEN ARE FOR RIGHT END OF FENCE.

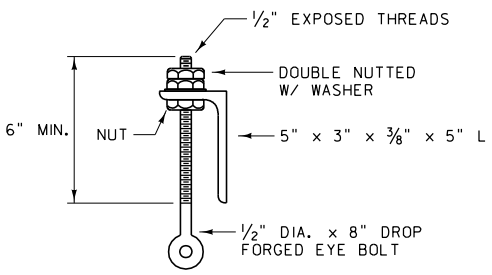


DETAIL J

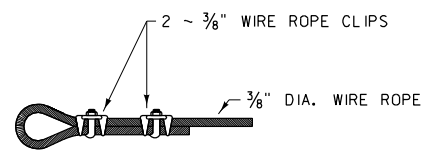
DETAIL K



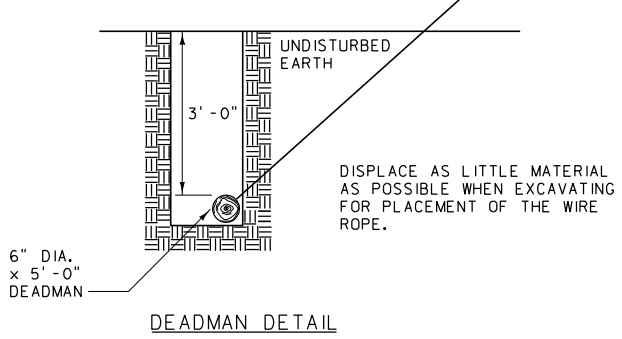
DETAIL H



DETAIL I




WIRE ROPE CONNECTION



DEADMAN DETAIL

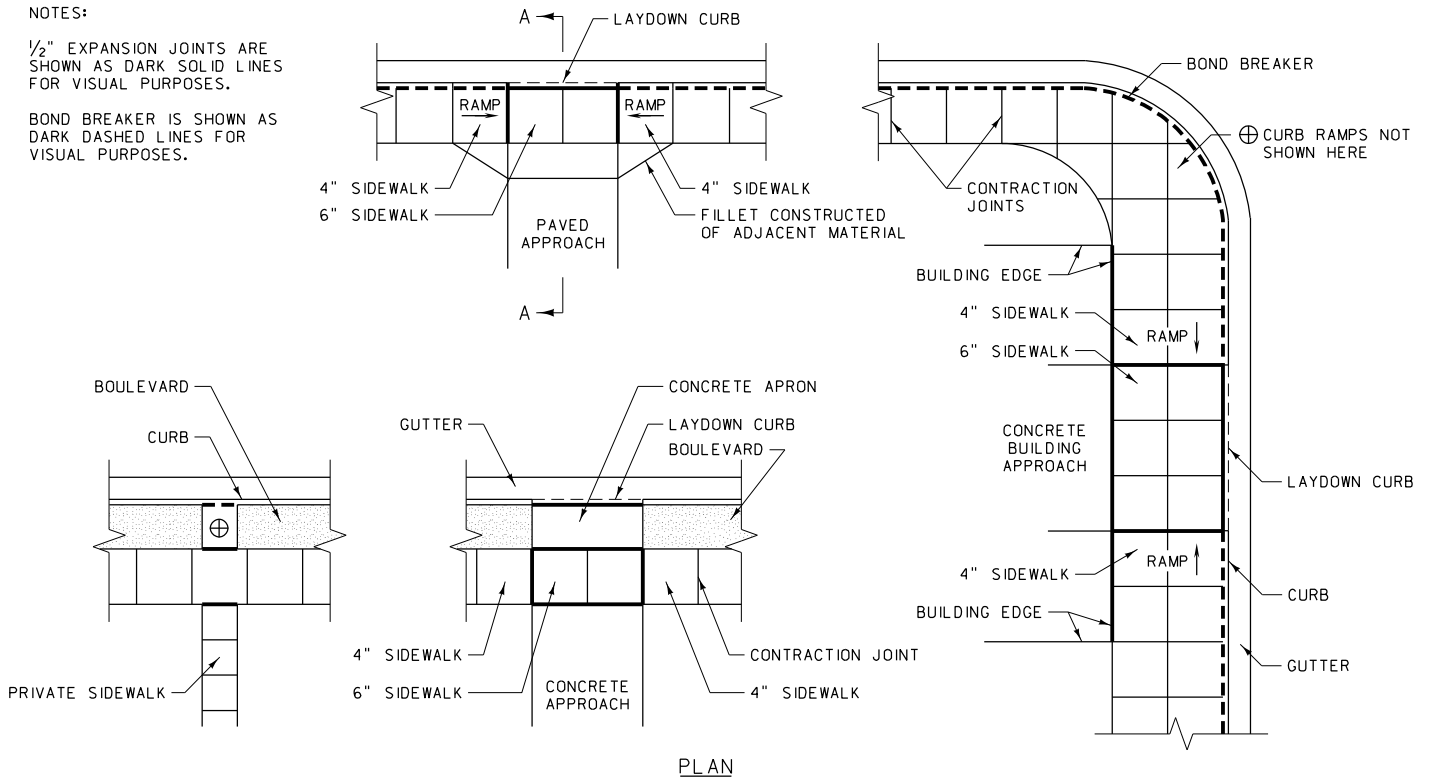
(X) NOTE:
AFTER 5/8" DIA. BOLTS HAVE BEEN TIGHTENED, BURR THE THREAD DIRECTLY BEHIND THE NUT TO PREVENT EVENTUAL LOOSENING OF THE NUTS.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	607-45
SECTION 607	
WOOD SNOW FENCE ANCHOR SYSTEM #2 DETAILS	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	

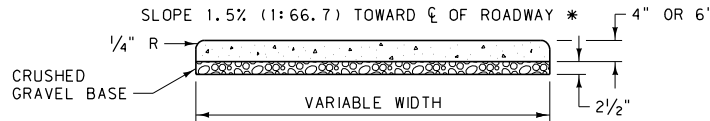
NOTES:

1/2" EXPANSION JOINTS ARE SHOWN AS DARK SOLID LINES FOR VISUAL PURPOSES.

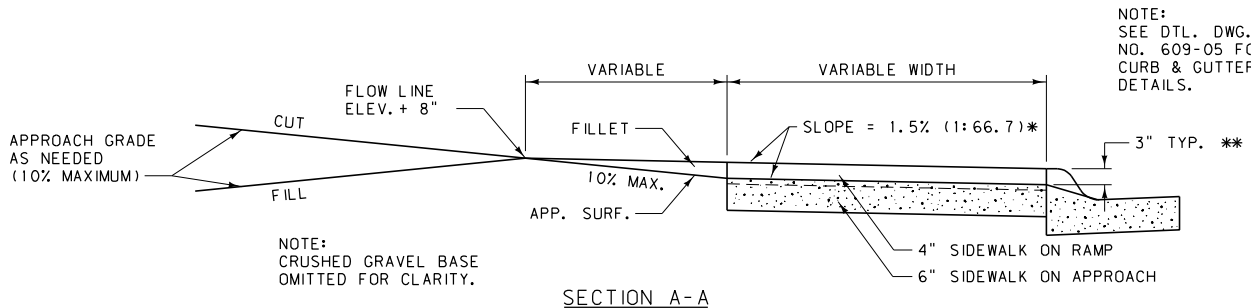
BOND BREAKER IS SHOWN AS DARK DASHED LINES FOR VISUAL PURPOSES.



PLAN



SECTION OF SIDEWALK



NOTE:
SEE DTL. DWG.
NO. 609-05 FOR
CURB & GUTTER
DETAILS.

NOTES:

INSTALL PREFORMED EXPANSION JOINT FILLER, STD. SPEC. 707.01.3, AT ALL EXPANSION JOINTS, FOR THE FULL THICKNESS OF THE SIDEWALK AND USE AT ALL JOINTS BETWEEN NEW CONCRETE SIDEWALK AND STRUCTURES IN PLACE.

INSTALL A BOND BREAKER FOR THE FULL THICKNESS OF THE SIDEWALK AT LOCATIONS SPECIFIED ON THIS DETAIL. USE A 15 OR 30 POUND ROOFING FELT MATERIAL, OR OTHER PRODUCT AS APPROVED BY THE ENGINEER, FOR THE BOND BREAKER. DO NOT USE EXPANSION JOINT MATERIAL AS A BOND BREAKER.

ALL JOINTS MUST BE STRAIGHT AND PERPENDICULAR TO THE CENTERLINE AND THE SURFACE OF THE SIDEWALK. WHERE PRACTICAL, ALIGN ALL JOINTS WITH LIKE JOINTS IN ADJOINING WORK. USE JOINTS TO OUTLINE ALL PANELS IN THE SIDEWALK, WHICH ARE TO BE, SO FAR AS POSSIBLE, SQUARE. THE LENGTHS OF THE PANELS ARE DETERMINED BY THE WIDTH OF THE SIDEWALK.

WHERE RIGHT-OF-WAY PERMITS, NEW SIDEWALKS LESS THAN 5 FEET IN WIDTH MUST HAVE A PASSING AREA AT A MAXIMUM SPACING OF 200 FEET. THE PASSING AREA IS A MINIMUM OF 5 FEET BY 5 FEET IN SIZE.

CONTRACTION JOINTS MAY NOT BE MORE THAN 1/8" WIDE AND NOT LESS THAN 1" IN DEPTH AND MAY BE CUT BY A GROOVE FORMING TOOL.


LOCATE EXPANSION JOINTS EVERY 100 FEET (\pm 30 FEET) AT INTERVALS EQUAL TO THE NEAREST MULTIPLE OF THE CONTRACTION JOINT INTERVAL.

USE A LONGITUDINAL CONTRACTION JOINT IN THE CENTERLINE OF ALL SIDEWALKS WIDER THAN 5 FEET.

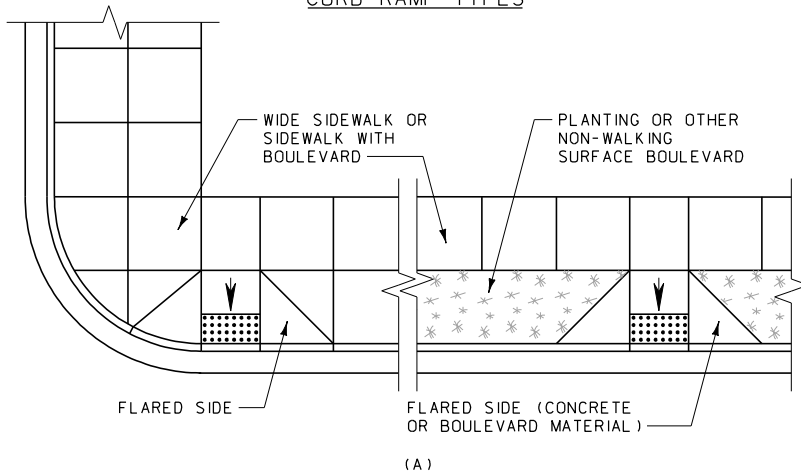
* THE MAXIMUM CROSS SLOPE OF THE SIDEWALK IS 2% (1:50).

** THIS DEPTH IS STANDARD IN NEW CONSTRUCTION. ALTERATIONS TO EXISTING FACILITIES MAY RESULT IN A LARGER DEPTH, WHICH WILL REQUIRE A GREATER RAMP LENGTH.

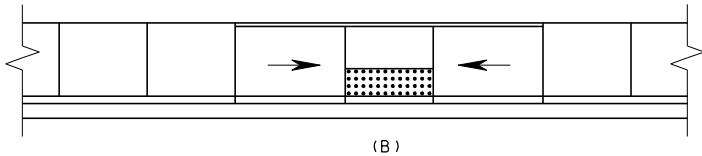
⊕ SEE DTL. DWG. NO. 608-15 AND 608-20 FOR GUIDELINES ON RAMP DESIGN WHEN RAMPS ARE REQUIRED FOR ADA ACCESSIBILITY.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 608	DWG. NO. 608-05
CONCRETE SIDEWALK	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION serving you with pride	

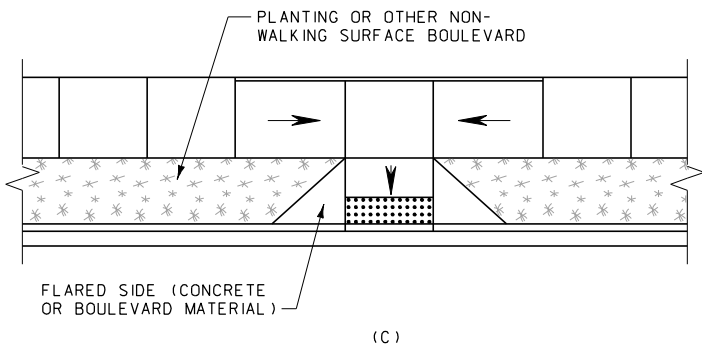
CURB RAMP TYPES



PERPENDICULAR PUBLIC SIDEWALK CURB RAMP
(SEE DETAILED DRAWING NUMBER 608-25 FOR
ADDITIONAL DETAILS)



PARALLEL PUBLIC SIDEWALK CURB RAMP
(SEE DETAILED DRAWING NUMBER 608-30
FOR ADDITIONAL DETAILS)



COMBINED (PARALLEL/PERPENDICULAR) PUBLIC
SIDEWALK CURB RAMP (SEE DETAILED DRAWING
NUMBERS 608-25 AND 608-30 FOR ADDITIONAL
DETAILS)

GENERAL NOTES:

- IN NEW CONSTRUCTION, USE PUBLIC SIDEWALK CURB RAMPS IN THE FOLLOWING ORDER OF PREFERENCE:
 - PERPENDICULAR PUBLIC SIDEWALK CURB RAMP.
 - PARALLEL PUBLIC SIDEWALK CURB RAMP.
 - COMBINED (PARALLEL/PERPENDICULAR) PUBLIC SIDEWALK CURB RAMP.
 - DIAGONAL PERPENDICULAR PUBLIC SIDEWALK CURB RAMP.
- WHEN ALTERING EXISTING FACILITIES, MEET NEW CONSTRUCTION REQUIREMENTS FOR PUBLIC SIDEWALK CURB RAMPS TO THE MAXIMUM EXTENT FEASIBLE.

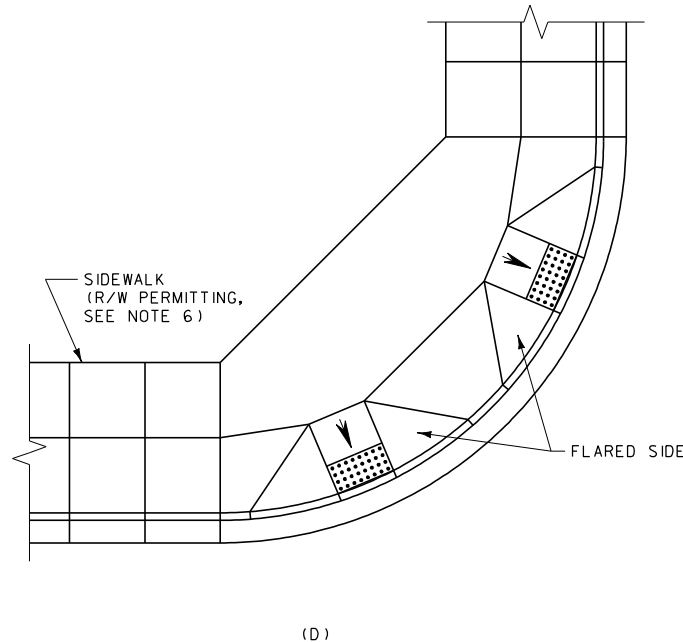
SINGLE DIAGONAL OR DEPRESSED CORNER PUBLIC SIDEWALK CURB RAMPS SERVING TWO STREET CROSSING DIRECTIONS ARE NOT RECOMMENDED IN NEW CONSTRUCTION.

CONSTRUCTION REQUIREMENTS:

- OBTAIN A SURFACE TEXTURE ON THE RAMP BY COARSE BROOMING, TRANSVERSE TO THE RAMP SLOPE.
- TAKE CARE DURING CONSTRUCTION TO ASSURE UNIFORM RAMP GRADES, FREE OF SAGS AND SHARP GRADE CHANGES.


- IF POSSIBLE, DO NOT PLACE DRAINAGE STRUCTURES IN CONFLICT WITH PUBLIC SIDEWALK CURB RAMPS. LOCATION OF CURB RAMPS TAKES PRECEDENCE OVER LOCATION OF DRAINAGE STRUCTURES EXCEPT WHERE EXISTING DRAINAGE STRUCTURES ARE BEING UTILIZED.
- USE THE FLATTEST SLOPES POSSIBLE FOR ALL CURB RAMPS. MAXIMUM SLOPES ARE SHOWN FOR GUIDANCE AT DIFFICULT SITES.
- FINAL FIELD LOCATION OF THE CURB RAMPS WILL BE DETERMINED BY THE PROJECT MANAGER.
- IF R/W DOES NOT PERMIT LANDINGS FOR THESE RAMPS, USE ANOTHER RAMP DESIGN.
- PEDESTRIAN ACCESS POINTS AT CROSSWALKS ARE TO BE WHOLLY CONTAINED WITHIN THE CROSSWALK LINES.
- FOR ADDITIONAL INFORMATION CONSULT:

DRAFT PUBLIC RIGHTS-OF-WAY
ACCESSIBILITY GUIDELINES (PROWAG)

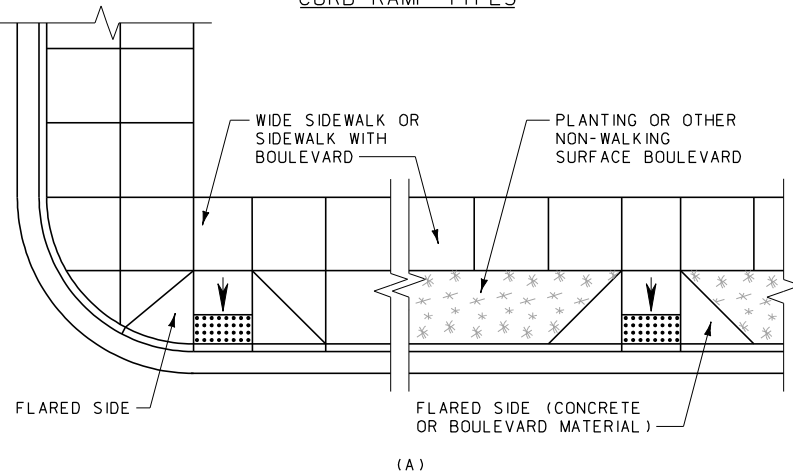


DIAGONAL PERPENDICULAR PUBLIC SIDEWALK
CURB RAMP (SEE DETAILED DRAWING NUMBER
608-35 FOR ADDITIONAL DETAILS)

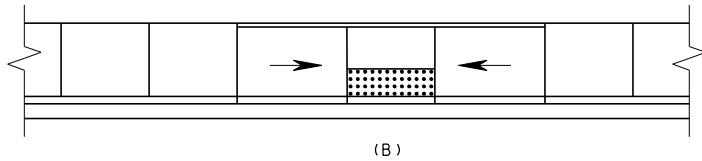
UNITS SHOWN IN BRACKETS [] ARE
METRIC AND ARE IN MILLIMETERS (mm)
UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	608-15
SECTION 608	
NEW CONSTRUCTION PUBLIC SIDEWALK CURB RAMPS	
--REVISED--	EFFECTIVE: FEBRUARY 2005
MAY 2011	
 MONTANA DEPARTMENT OF TRANSPORTATION	

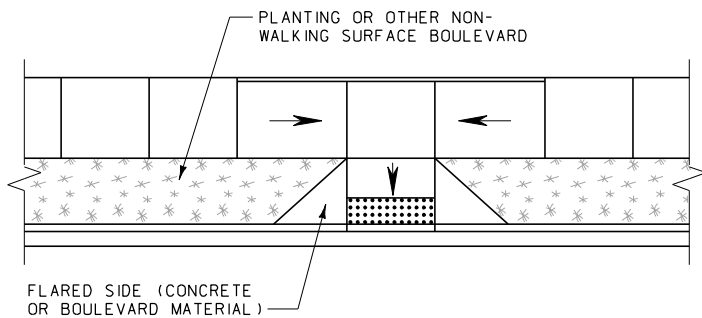
CURB RAMP TYPES



(A)
PERPENDICULAR PUBLIC SIDEWALK CURB RAMP
(SEE DETAILED DRAWING NUMBER 608-25 FOR
ADDITIONAL DETAILS)

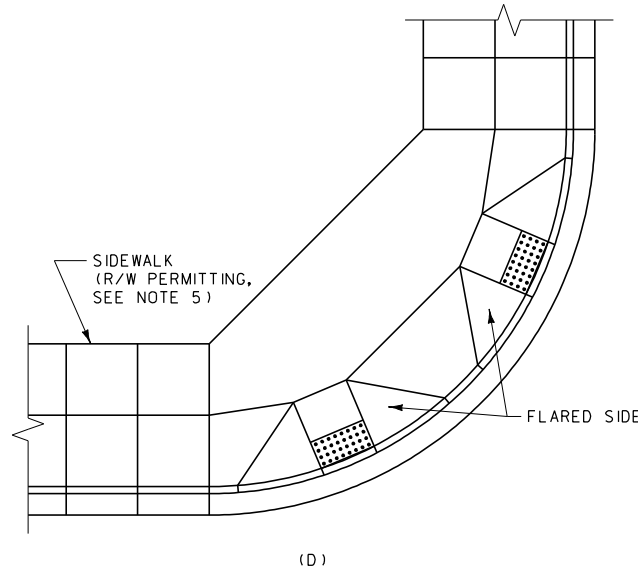


(B)
PARALLEL PUBLIC SIDEWALK CURB RAMP
(SEE DETAILED DRAWING NUMBER 608-30
FOR ADDITIONAL DETAILS)

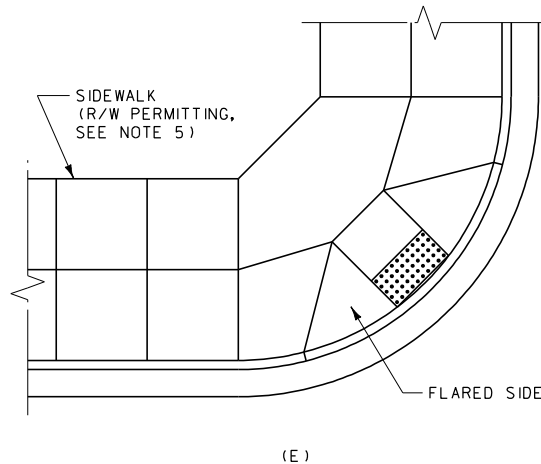


(C)
COMBINED (PARALLEL/PERPENDICULAR) PUBLIC
SIDEWALK CURB RAMP (SEE DETAILED DRAWING
NUMBERS 608-25 AND 608-30 FOR ADDITIONAL
DETAILS)

CURB RAMP TYPES



(D)
DIAGONAL PERPENDICULAR PUBLIC SIDEWALK
CURB RAMP (SEE DETAILED DRAWING NUMBER
608-35 FOR ADDITIONAL DETAILS)



(E)
SINGLE DIAGONAL PERPENDICULAR PUBLIC
SIDEWALK CURB RAMP (SEE DETAILED DRAWING
NUMBER 608-35 FOR ADDITIONAL DETAILS)

GENERAL NOTES:

1. WHEN ALTERING EXISTING FACILITIES,
USE PUBLIC SIDEWALK CURB RAMP IN
THE FOLLOWING ORDER OF PREFERENCE:
 - A. PERPENDICULAR PUBLIC SIDEWALK
CURB RAMP
 - B. PARALLEL PUBLIC SIDEWALK CURB
RAMP
 - C. COMBINED (PARALLEL/PERPENDICULAR)
PUBLIC SIDEWALK CURB RAMP
 - D. DIAGONAL PERPENDICULAR PUBLIC
SIDEWALK CURB RAMP
 - E. SINGLE DIAGONAL PERPENDICULAR
PUBLIC SIDEWALK CURB RAMP

NOTE: USE DIAGONAL PUBLIC SIDEWALK
CURB RAMP AS THE LAST OPTION AND
CONSTRUCT TO COMPLY WITH ALL ADA
SLOPE AND CONSTRUCTION CRITERIA TO
THE GREATEST EXTENT POSSIBLE.

2. PLACE CURB RAMP TO AVOID EXISTING
DRAINAGE STRUCTURES AND OTHER
OBSTRUCTIONS TO THE GREATEST EXTENT
POSSIBLE.
3. USE THE FLATTEST SLOPES POSSIBLE
FOR ALL CURB RAMP. MAXIMUM SLOPES
ARE SHOWN FOR GUIDANCE AT DIFFICULT
SITES AND SHOULD BE AVOIDED IF POSSIBLE.
4. FINAL FIELD LOCATION OF THE CURB
RAMP WILL BE DETERMINED BY THE
PROJECT MANAGER.
5. IF R/W DOES NOT PERMIT LANDINGS
FOR THESE RAMP, USE ANOTHER
RAMP DESIGN.
6. PEDESTRIAN ACCESS POINTS AT CROSSWALKS
ARE TO BE WHOLLY CONTAINED WITHIN THE
CROSSWALK LINES.
7. FOR ADDITIONAL INFORMATION CONSULT:
DRAFT PUBLIC RIGHTS-OF-WAY
ACCESSIBILITY GUIDELINES (PROWAG)

CONSTRUCTION REQUIREMENTS:

1. OBTAIN A SURFACE TEXTURE ON THE
RAMP BY COARSE BROOMING, TRANSVERSE
TO THE RAMP SLOPE.
2. PROVIDE UNIFORM RAMP GRADES FREE
OF SAGS AND GRADE CHANGES.

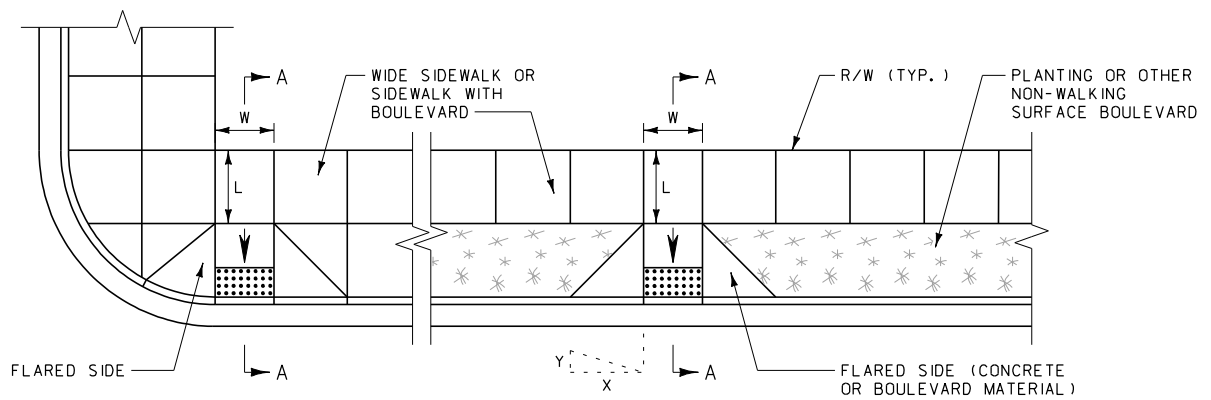
UNITS SHOWN IN BRACKETS [] ARE
METRIC AND ARE IN MILLIMETERS (mm)
UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING

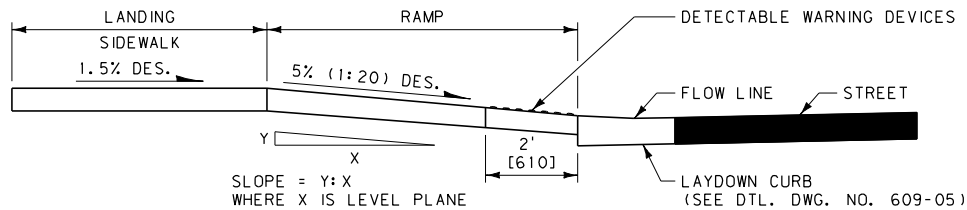
REFERENCE	DWG. NO.
STANDARD SPEC.	608-20
SECTION 608	

ALTERATIONS TO EXISTING
FACILITIES - PUBLIC
SIDEWALK CURB RAMP

--REVISED--	EFFECTIVE: FEBRUARY 2005
MAY 2011	
 MONTANA DEPARTMENT OF TRANSPORTATION	



PERPENDICULAR PUBLIC SIDEWALK CURB RAMP



SECTION A-A

NEW CONSTRUCTION REQUIREMENTS:

1. THE DESIRABLE WIDTH OF THE CURB RAMP (DIMENSION "W" ABOVE) IS 5 FEET [1525 mm] OR WIDER. THE MINIMUM WIDTH ("W") IS 4 FEET [1220 mm].
2. THE DESIRABLE LENGTH OF THE LANDING AT THE TOP OF THE CURB RAMP (DIMENSION "L" ABOVE) IS 5 FEET [1525 mm]. THE MINIMUM LENGTH "L" IS 4 FEET [1220 mm]. THE LANDING WIDTH IS EQUAL TO THE RAMP WIDTH.
3. THE DESIRABLE SLOPE FOR THE CURB RAMP IS 5% (1:20) OR FLATTER. THE MAXIMUM CURB RAMP SLOPE IS 8.3% (1:12).
4. THE DESIRABLE SLOPE FOR THE FLARED SIDE OF THE CURB RAMP IS 8.3% (1:12) OR FLATTER. THE MAXIMUM FLARED SIDE SLOPE IS 10% (1:10).
5. THE DESIRABLE CROSS SLOPE OF THE SIDEWALK, RAMP, OR LANDING IS 1.5% (1:66.7). THE MAXIMUM CROSS SLOPE OF THE SIDEWALK, RAMP, OR LANDING IS 2% (1:50).
6. PROVIDE DETECTABLE WARNING DEVICES ON THE BOTTOM 2 FEET [610 mm] OF EACH RAMP AS SHOWN ABOVE. SEE DETAILED DRAWING NUMBER 608-40 FOR DETECTABLE WARNING DEVICES DETAILS.

REQUIREMENTS FOR ALTERATIONS TO EXISTING FACILITIES:

NOTE: WHEREVER POSSIBLE, ALTER EXISTING FACILITIES TO COMPLY WITH THE NEW CONSTRUCTION REQUIREMENTS.

1. THE MINIMUM WIDTH OF THE CURB RAMP (DIMENSION "W" ABOVE) IS 4 FEET [1220 mm].
2. WHERE RIGHT-OF-WAY WIDTH IS INSUFFICIENT TO ACCOMMODATE A TOP LANDING OF 5 FEET [1525 mm], PROVIDE A TOP LANDING OF 4 FEET [1220 mm]. THE LANDING WIDTH IS EQUAL TO THE RAMP WIDTH.
3. THE MAXIMUM CURB RAMP SLOPE IS 10% (1:10), PROVIDED THE RISE (DIMENSION "Y" ABOVE) IS 6 INCHES [150 mm] OR LESS. AN 8.3% (1:12) OR FLATTER SLOPE IS DESIRABLE.
4. THE MAXIMUM FLARED SIDE SLOPE IS 10% (1:10).
5. THE DESIRABLE CROSS SLOPE OF THE SIDEWALK, RAMP, OR LANDING IS 1.5% (1:66.7). THE MAXIMUM CROSS SLOPE OF THE SIDEWALK, RAMP, OR LANDING IS 2% (1:50).
6. PROVIDE DETECTABLE WARNING DEVICES ON THE BOTTOM 2 FEET [610 mm] OF EACH RAMP AS SHOWN ABOVE. SEE DETAILED DRAWING NUMBER 608-40 FOR DETECTABLE WARNING DEVICES DETAILS.
7. WHERE EXISTING SITE DEVELOPMENT CONDITIONS PROHIBIT THE STRICT AND FULL COMPLIANCE OF ALL ADA CRITERIA, PROVIDE ACCESSIBILITY TO THE MAXIMUM EXTENT FEASIBLE.

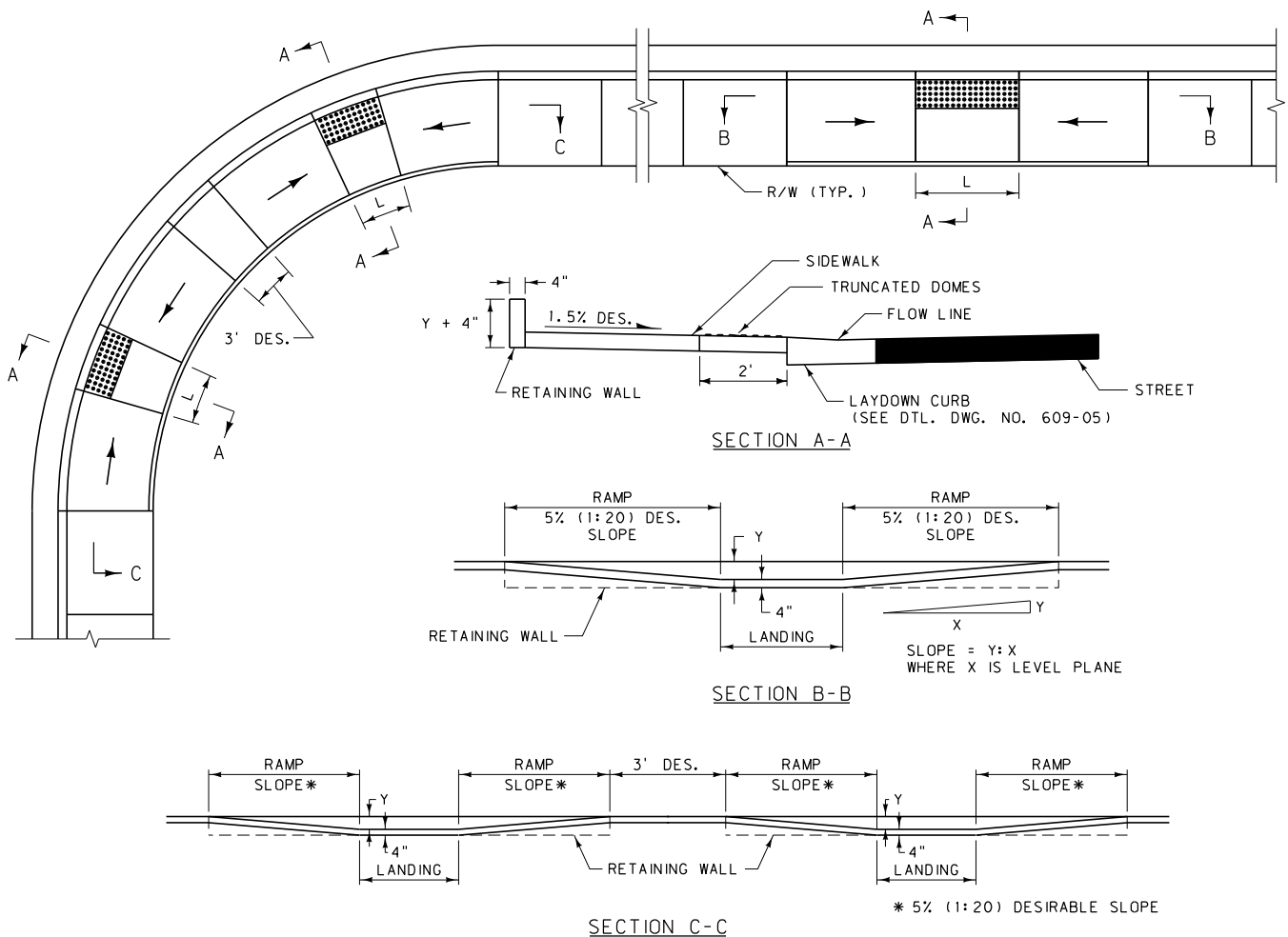
GENERAL NOTES:

1. WHERE THE RIGHT-OF-WAY WILL NOT ACCOMMODATE A PERPENDICULAR PUBLIC SIDEWALK CURB RAMP AND LANDING MEETING THESE REQUIREMENTS, USE A COMBINED (PARALLEL/PERPENDICULAR) OR PARALLEL PUBLIC SIDEWALK CURB RAMP.
2. COMBINED (PARALLEL/PERPENDICULAR) PUBLIC SIDEWALK CURB RAMPS ARE TO MEET THE CRITERIA FOR BOTH THE PARALLEL AND PERPENDICULAR PUBLIC SIDEWALK CURB RAMPS. (SEE DETAILED DRAWING NUMBER 608-30 AND THIS DRAWING.)

UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	608-25
SECTION 608	
PERPENDICULAR PUBLIC SIDEWALK CURB RAMPS	
--REVISED--	EFFECTIVE: FEBRUARY 2005
MAY 2011	
MDTA MONTANA DEPARTMENT OF TRANSPORTATION	

PARALLEL PUBLIC SIDEWALK CURB RAMPS



NEW CONSTRUCTION REQUIREMENTS:

1. THE MINIMUM LENGTH OF THE LANDING (DIMENSION "L" ABOVE) IS 5 FEET.
2. THE DESIRABLE SLOPE FOR THE CURB RAMPS IS 5% (1:20) OR FLATTER. THE MAXIMUM CURB RAMP SLOPE IS 8.3% (1:12).
3. THE DESIRABLE CROSS SLOPE OF THE SIDEWALK, RAMP, OR LANDING IS 1.5% (1:66.7). THE MAXIMUM CROSS SLOPE OF THE SIDEWALK, RAMP, OR LANDING IS 2% (1:50).
4. PROVIDE TRUNCATED DOMES ON THE BOTTOM 2 FEET OF EACH LANDING AS SHOWN ABOVE. SEE DETAIL DRAWING NUMBER 608-40 FOR TRUNCATED DOMES DETAILS.


REQUIREMENTS FOR ALTERATIONS TO EXISTING FACILITIES:

NOTE: WHEREVER POSSIBLE, ALTER EXISTING FACILITIES TO COMPLY WITH THE NEW CONSTRUCTION REQUIREMENTS.

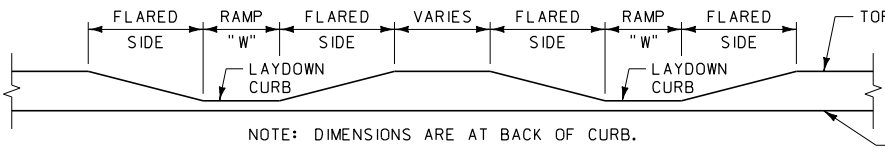
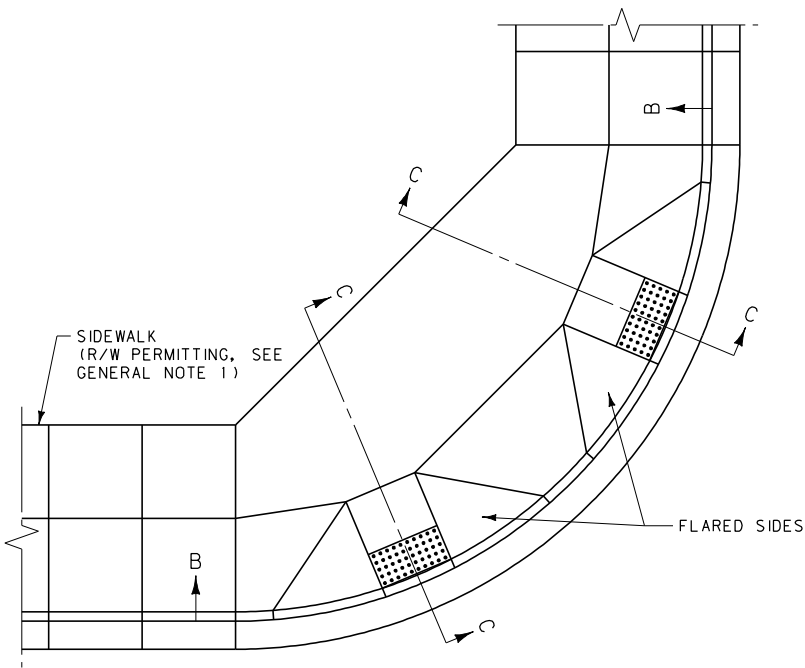
1. THE DESIRABLE LENGTH OF THE LANDING (DIMENSION "L" ABOVE) IS 5 FEET. THE MINIMUM LANDING LENGTH IS 4 FEET.
2. THE MAXIMUM CURB RAMP SLOPE IS 10% (1:10), PROVIDED THE RISE (DIMENSION "Y" ABOVE) IS 6 INCHES OR LESS. AN 8.3% (1:12) OR FLATTER SLOPE IS DESIRABLE.
3. THE DESIRABLE CROSS SLOPE OF THE SIDEWALK, RAMP, OR LANDING IS 1.5% (1:66.7). THE MAXIMUM CROSS SLOPE OF THE SIDEWALK, RAMP, OR LANDING IS 2% (1:50).
4. PROVIDE TRUNCATED DOMES ON THE BOTTOM 2 FEET OF EACH LANDING AS SHOWN ABOVE. SEE DETAILED DRAWING NUMBER 608-40 FOR TRUNCATED DOMES DETAILS.
5. WHERE EXISTING SITE DEVELOPMENT CONDITIONS PROHIBIT THE STRICT AND FULL COMPLIANCE OF ALL ADA CRITERIA, PROVIDE ACCESSIBILITY TO THE MAXIMUM EXTENT FEASIBLE.

GENERAL NOTES:

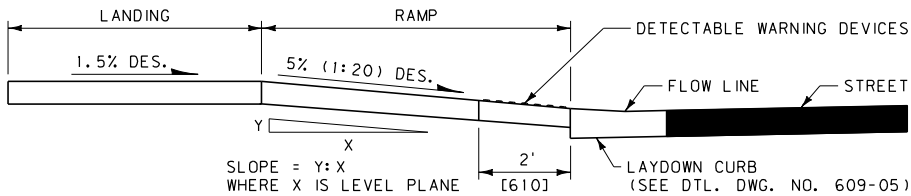
1. THE COST OF THE RETAINING WALL IS INCLUDED IN THE UNIT PRICE BID FOR CONCRETE SIDEWALK.
2. COMBINED (PARALLEL/PERPENDICULAR) PUBLIC SIDEWALK CURB RAMPS ARE TO MEET THE CRITERIA FOR BOTH THE PARALLEL AND PERPENDICULAR PUBLIC SIDEWALK CURB RAMPS. (SEE DETAILED DRAWING NUMBER 608-25 AND THIS DRAWING.)

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 608	DWG. NO. 608-30
PARALLEL PUBLIC SIDEWALK CURB RAMPS	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	

DIAGONAL PERPENDICULAR PUBLIC SIDEWALK CURB RAMP



SECTION B-B



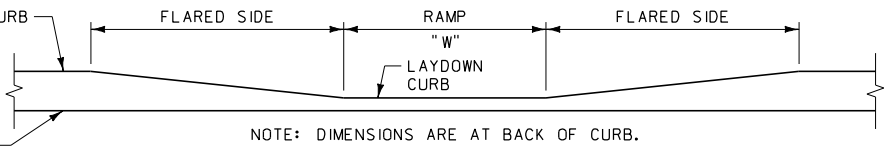
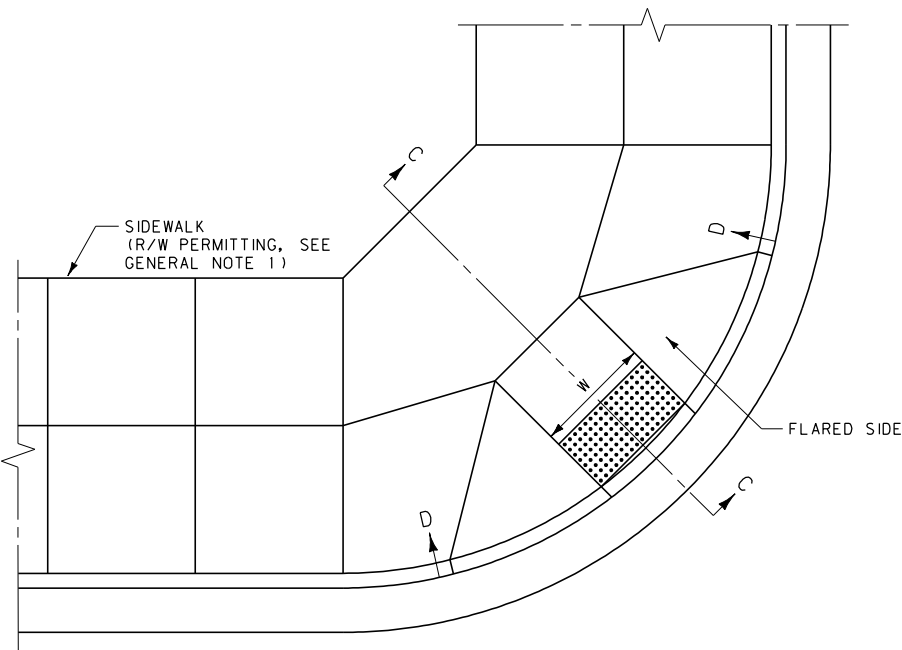
SECTION C-C

NEW CONSTRUCTION REQUIREMENTS:

1. THE DESIRABLE WIDTH OF THE CURB RAMP (DIMENSION "W" ABOVE) IS 5 FEET [1525 mm] OR WIDER. THE MINIMUM WIDTH ("W") IS 4 FEET [1220 mm].
2. THE DESIRABLE LENGTH OF THE LANDING AT THE TOP OF THE CURB RAMP IS 5 FEET [1525 mm]. THE MINIMUM LENGTH OF THE LANDING IS 4 FEET [1220 mm]. THE LANDING WIDTH IS EQUAL TO THE RAMP WIDTH.
3. THE DESIRABLE SLOPE FOR THE CURB RAMP IS 5% (1:20) OR FLATTER. THE MAXIMUM CURB RAMP SLOPE IS 8.3% (1:12).
4. THE DESIRABLE SLOPE FOR THE FLARED SIDE OF THE CURB RAMP IS 8.3% (1:12) OR FLATTER. THE MAXIMUM FLARED SIDE SLOPE IS 10% (1:10).
5. THE DESIRABLE CROSS SLOPE OF THE SIDEWALK, RAMP, OR LANDING IS 1.5% (1:66.7). THE MAXIMUM CROSS SLOPE OF THE SIDEWALK, RAMP, OR LANDING IS 2% (1:50).
6. PROVIDE DETECTABLE WARNING DEVICES ON THE BOTTOM 2 FEET [610 mm] OF EACH RAMP AS SHOWN ABOVE. SEE DETAILED DRAWING NUMBER 608-40 FOR DETECTABLE WARNING DEVICES DETAILS.

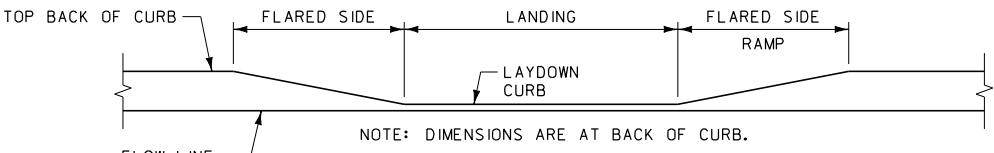
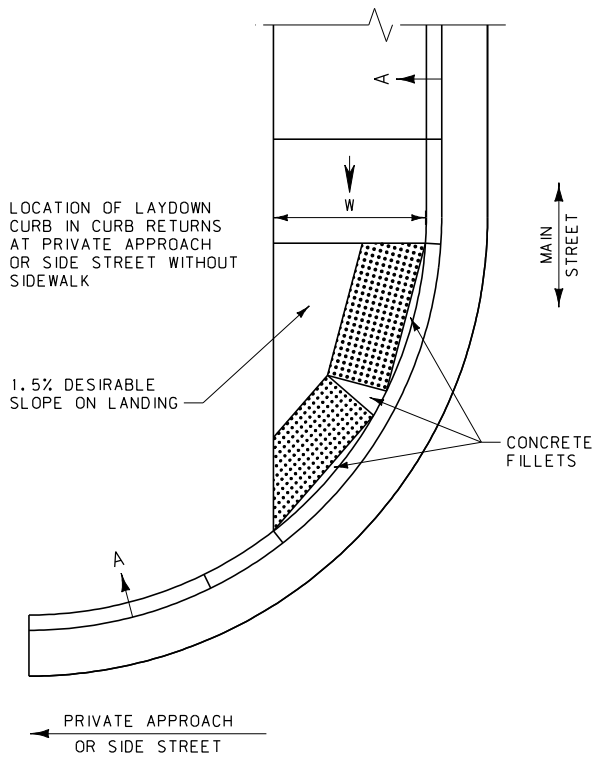
SINGLE DIAGONAL PERPENDICULAR PUBLIC SIDEWALK CURB RAMP

NOTE: SINGLE DIAGONAL PERPENDICULAR PUBLIC SIDEWALK CURB RAMPS SERVING TWO STREET CROSSING DIRECTIONS ARE NOT RECOMMENDED IN NEW CONSTRUCTION.



SECTION D-D

PRIVATE APPROACH SIDEWALK CURB RAMP



SECTION A-A

REQUIREMENTS FOR ALTERATIONS TO EXISTING FACILITIES:

NOTE: WHEREVER POSSIBLE, ALTER EXISTING FACILITIES TO COMPLY WITH THE NEW CONSTRUCTION REQUIREMENTS.

1. THE MINIMUM WIDTH OF THE CURB RAMP (DIMENSION "W" ABOVE) IS 4 FEET [1220 mm].
2. WHERE RIGHT-OF-WAY WIDTH IS INSUFFICIENT TO ACCOMMODATE A TOP LANDING OF 5 FEET [1525 mm], PROVIDE A TOP LANDING OF 4 FEET [1220 mm]. THE LANDING WIDTH IS EQUAL TO THE RAMP WIDTH.
3. THE MAXIMUM CURB RAMP SLOPE IS 10% (1:10), PROVIDED THE RISE (DIMENSION "Y" ABOVE) IS 6 INCHES [150 mm] OR LESS. AN 8.3% (1:12) OR FLATTER SLOPE IS DESIRABLE.
4. THE MAXIMUM FLARED SIDE SLOPE IS 10% (1:10).
5. THE DESIRABLE CROSS SLOPE OF THE SIDEWALK, RAMP, OR LANDING IS 1.5% (1:66.7). THE MAXIMUM CROSS SLOPE OF THE SIDEWALK, RAMP, OR LANDING IS 2% (1:50).
6. PROVIDE DETECTABLE WARNING DEVICES ON THE BOTTOM 2 FEET [610 mm] OF EACH RAMP AS SHOWN ABOVE. SEE DETAILED DRAWING NUMBER 608-40 FOR DETECTABLE WARNING DEVICES DETAILS.
7. WHERE EXISTING SITE DEVELOPMENT CONDITIONS PROHIBIT THE STRICT AND FULL COMPLIANCE OF ALL ADA CRITERIA, PROVIDE ACCESSIBILITY TO THE MAXIMUM EXTENT FEASIBLE.

GENERAL NOTES:

1. WHERE THE RIGHT-OF-WAY WILL NOT ACCOMMODATE A DIAGONAL PERPENDICULAR PUBLIC SIDEWALK CURB RAMP AND LANDING MEETING THESE REQUIREMENTS, USE ANOTHER RAMP DESIGN.
2. TRIM PRECAST DETECTABLE WARNING DEVICES PANELS TO FIT ON PRIVATE APPROACH SIDEWALK CURB RAMPS AS SHOWN ABOVE.

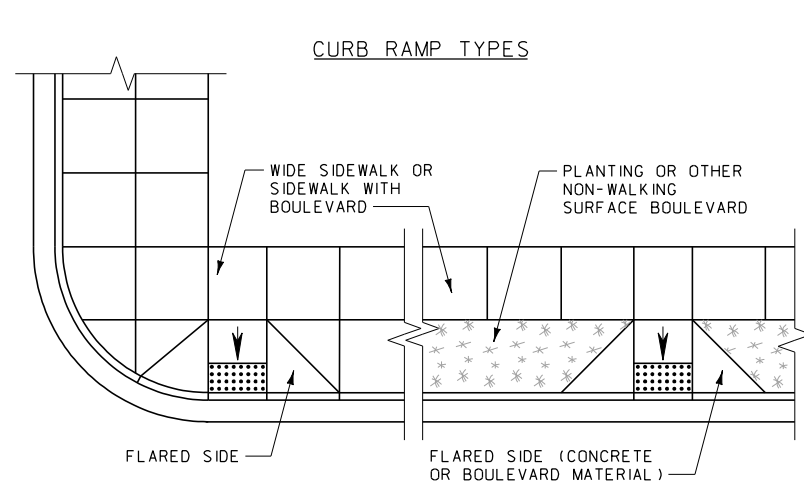
UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	608-35
SECTION 608	
DIAGONAL PERPENDICULAR PUBLIC SIDEWALK CURB RAMPS	

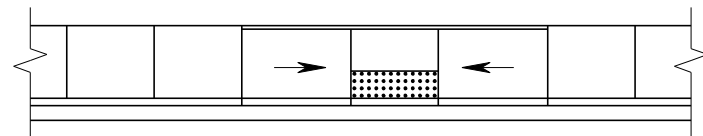
EFFECTIVE: FEBRUARY 2005

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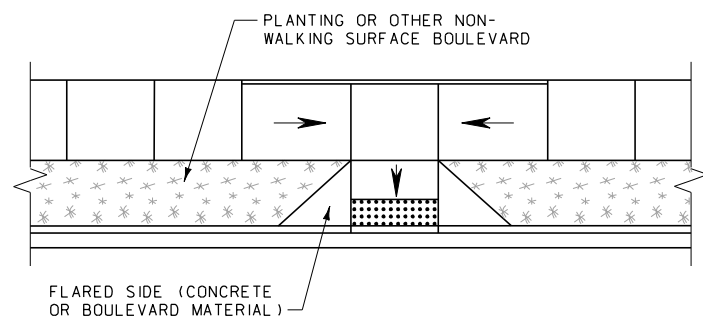
--REVISED--
MAY 2011



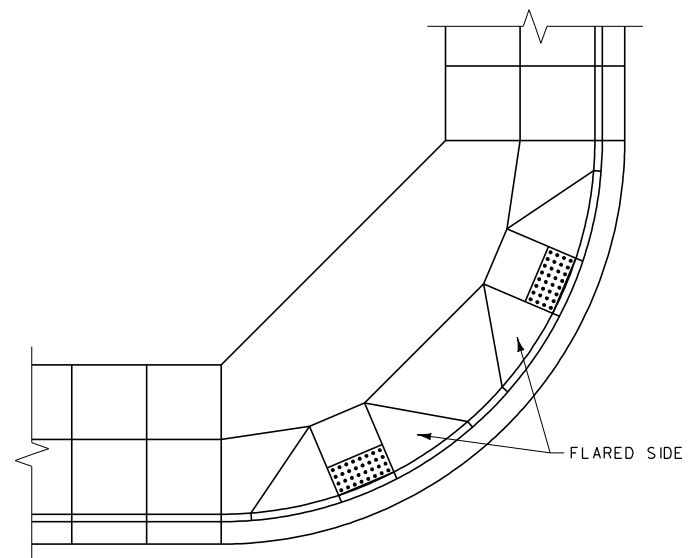
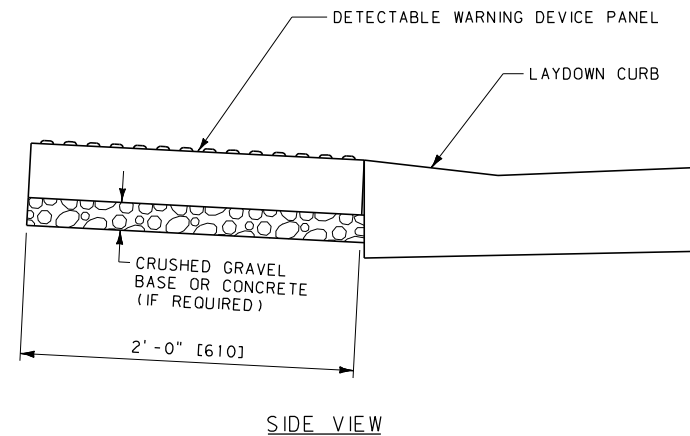
PERPENDICULAR PUBLIC SIDEWALK CURB RAMP
(SEE DETAILED DRAWING NUMBER 608-25 FOR
ADDITIONAL DETAILS)



PARALLEL PUBLIC SIDEWALK CURB RAMP
(SEE DETAILED DRAWING NUMBER 608-30
FOR ADDITIONAL DETAILS)

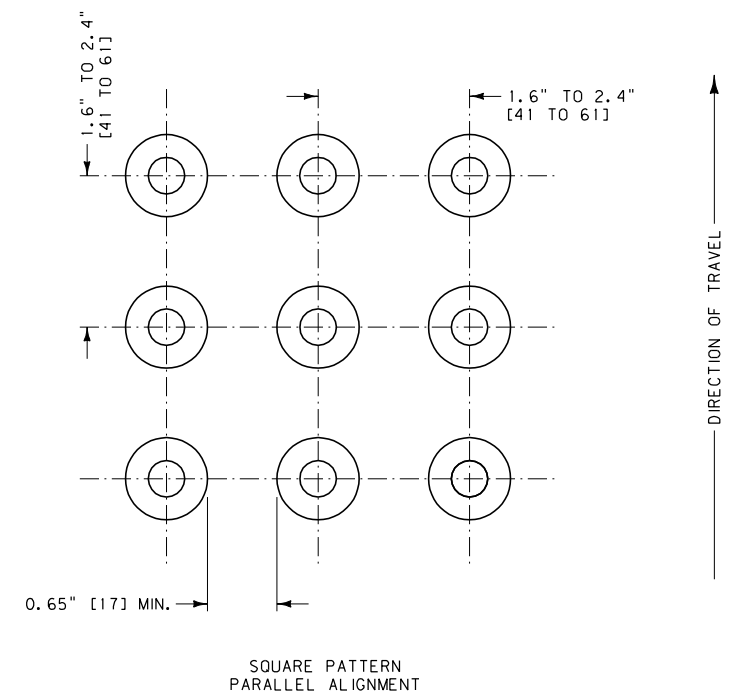


COMBINED (PARALLEL/PERPENDICULAR) PUBLIC
SIDEWALK CURB RAMP (SEE DETAILED DRAWING
NUMBERS 608-25 AND 608-30 FOR ADDITIONAL
DETAILS)

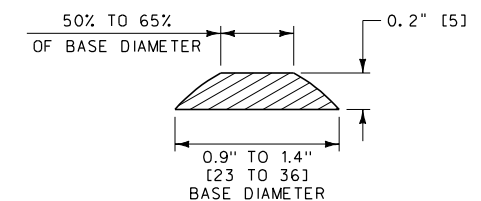


DIAGONAL PERPENDICULAR PUBLIC SIDEWALK
CURB RAMP (SEE DETAILED DRAWING NUMBER
608-35 FOR ADDITIONAL DETAILS)

DETECTABLE WARNING DEVICE ALIGNMENT AND PATTERN



DOME PROFILE



CONSTRUCTION REQUIREMENTS:

1. INSTALL DETECTABLE WARNING DEVICES THAT EXTEND THE FULL WIDTH OF THE RAMP, 2 FEET [610 mm] IN DEPTH.
2. INSTALL THE DOME PANEL ADJACENT TO THE BACK OF CURB. IF THE PANEL IS OFFSET, LOCATE THE EDGE OF THE PANEL NO MORE THAN 6 INCHES [150 mm] FROM THE BACK OF CURB.
3. IF THE DETECTABLE WARNING DEVICE IS EMBEDDED IN CONCRETE, INSTALL SO THE TOP OF THE PANEL IS FLUSH WITH THE ADJACENT CONCRETE AND THE DOMES WILL PROTRUDE ABOVE THE ADJACENT SURFACE.
4. ENSURE A UNIFORM GRADE ON THE DETECTABLE WARNING DEVICES FREE OF SAGS AND IRREGULAR EDGES.
5. USE DETECTABLE WARNING DEVICES - TYPE I FOR NEW SIDEWALK CONSTRUCTION. DETECTABLE WARNING DEVICES - TYPE I ARE CAST DIRECTLY INTO SIDEWALK. USE DETECTABLE WARNING DEVICES - TYPE II FOR RETROFITS ON EXISTING SIDEWALKS WHERE NEW CONCRETE IS NOT BEING PLACED. DETECTABLE WARNING DEVICES - TYPES II ARE SURFACE APPLIED ON THE SIDEWALK. MEET THE DEPARTMENT'S REQUIREMENTS ON THE QUALIFIED PRODUCTS LIST (QPL) FOR DETECTABLE WARNING DEVICES - TYPE I AND FOR DETECTABLE WARNING DEVICES - TYPE II.
6. USE DETECTABLE WARNING DEVICES THAT VISUALLY CONTRAST WITH ADJACENT WALKWAY SURFACES.

UNITS SHOWN IN BRACKETS [] ARE
METRIC AND ARE IN MILLIMETERS (mm)
UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	608-40
SECTION 608	

DETECTABLE WARNING DEVICES

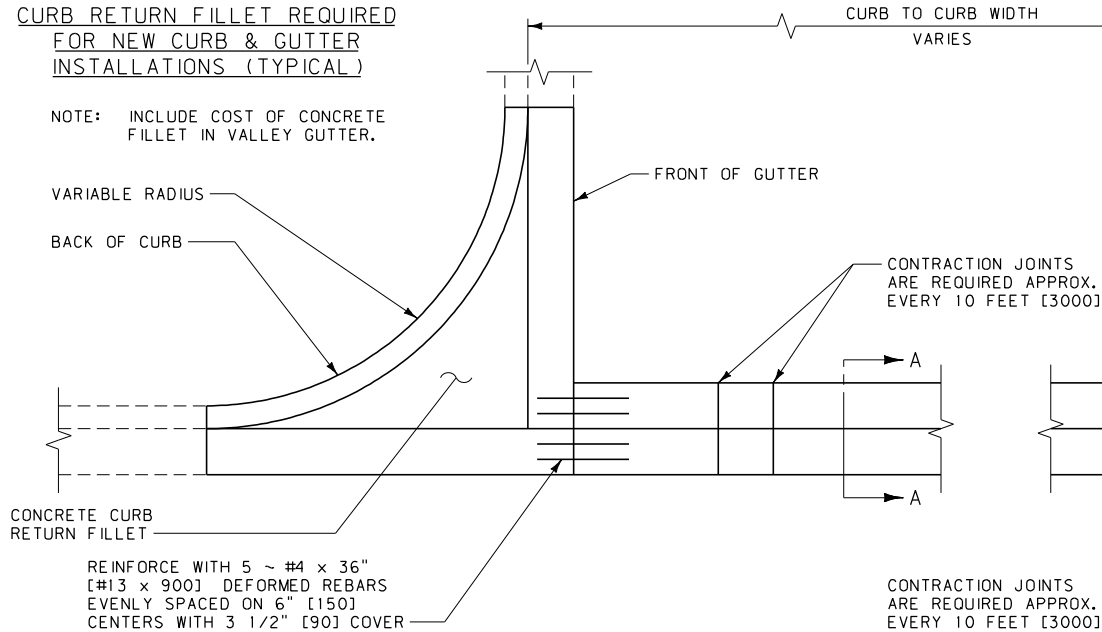
EFFECTIVE: FEBRUARY 2005

--REVISED--
MAY 2009
MAY 2011

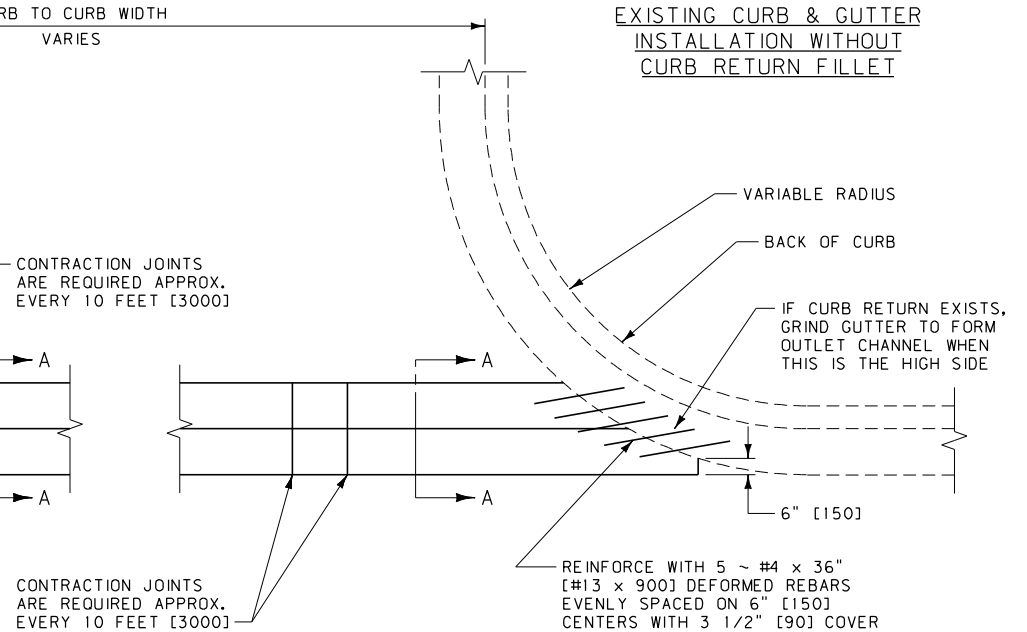
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**CURB RETURN FILLET REQUIRED
FOR NEW CURB & GUTTER
INSTALLATIONS (TYPICAL)**

NOTE: INCLUDE COST OF CONCRETE
FILLET IN VALLEY GUTTER.



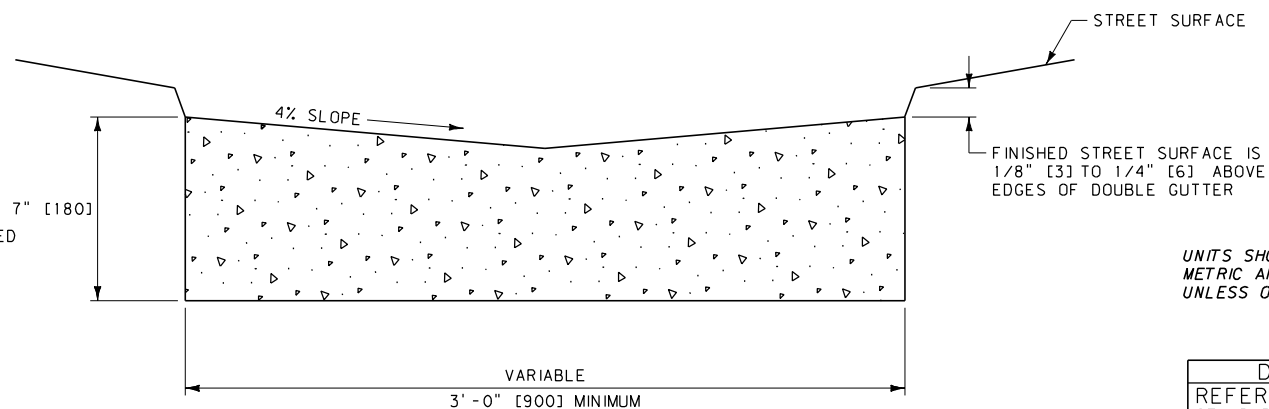
**EXISTING CURB & GUTTER
INSTALLATION WITHOUT
CURB RETURN FILLET**



PLAN

NOTES:

- ① INDIVIDUAL LOCATIONS MAY REQUIRE MORE DETAILS FOR ELEVATIONS AND DIMENSIONS.
- ② INSTALL REINFORCEMENT AT ALL CONSTRUCTION JOINTS.
- ③ CONTRACTION JOINTS ARE 1/8" [3 mm] MIN. AND 3/8" [10 mm] MAX. IN WIDTH. FORM JOINTS BY SAWING OR SCORING TO A MINIMUM DEPTH OF 1" [25 mm]. FORM SCORED JOINTS BY A TOOL WHICH WILL LEAVE ROUNDED CORNERS AND DESTROY AGGREGATE INTERLOCK TO A MINIMUM DEPTH OF 1" [25 mm].
- ④ TO BE USED ON PLANT MIX SURFACING PROJECTS ONLY. PROVIDE PROJECT SPECIFIC DETAILS FOR PCCP PROJECTS.



SECTION A-A

UNITS SHOWN IN BRACKETS [] ARE
METRIC AND ARE IN MILLIMETERS (mm)
UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING

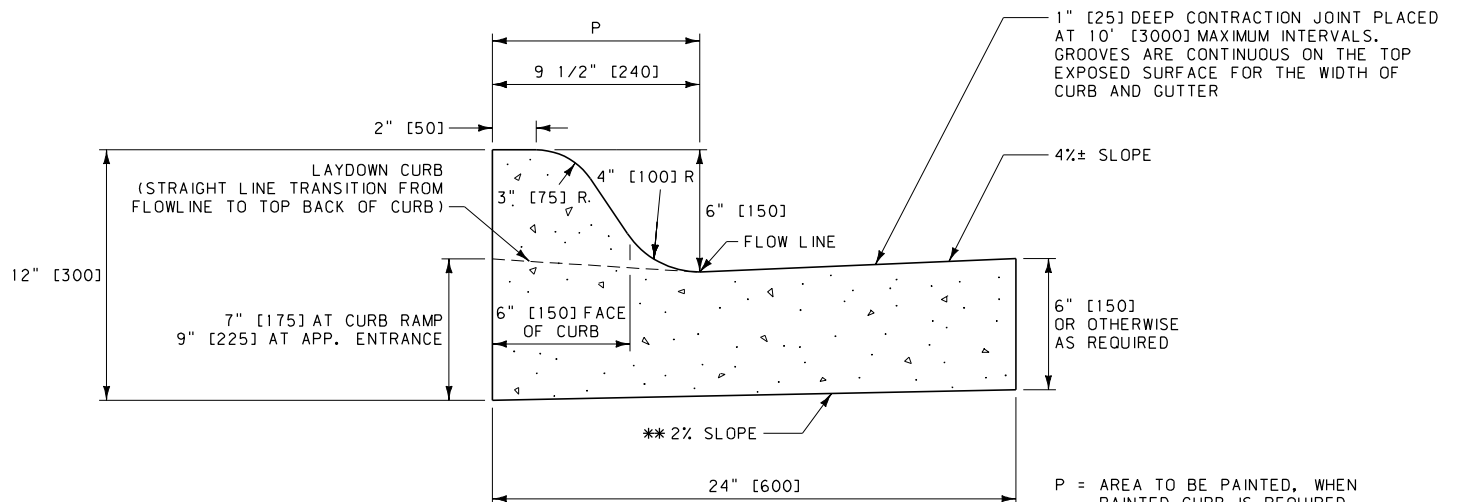
REFERENCE DWG. NO.
STANDARD SPEC. 609-00
SECTION 609

**CONCRETE VALLEY
GUTTER**

--REVISED-- EFFECTIVE: FEBRUARY 2005
MAY 2011

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CONCRETE CURBS



CURB & GUTTER SECTION

0.048 C.Y. CONC. PER 1.0'
[0.110 CUBIC METERS CONC. PER METER]
OF CURB FOR 6" [150] GUTTER. *

JOINTS:

(A) WHEN INTEGRAL WITH, TIED TO, OR PLACED AGAINST PORTLAND CEMENT CONCRETE PAVEMENT (P.C.C.P.): MATCH TRANSVERSE CONTRACTION AND/OR EXPANSION JOINTS IN THE ADJACENT P.C.C.P. SLAB. IF REQUIRED, EXTEND 1/2" [13] MIN. WIDTH PREFORMED EXPANSION JOINTS COMPLETELY THROUGH CURB AND GUTTER THE SAME WIDTH AS THE P.C.C.P. SLAB JOINT. FILL CURB AND GUTTER EXPANSION JOINTS WITH PREFORMED EXPANSION JOINT FILLER.

(B) ALL OTHER CASES:
SPACE CONTRACTION JOINTS IN CURB AND GUTTER AT 10 FOOT [3000] INTERVALS OR LESS EXCEPT AS SPECIFIED IN (A) ABOVE. EXTEND 1/2" [13] MIN. WIDTH EXPANSION JOINTS COMPLETELY THROUGH CURB AND GUTTER EVERY 100 FEET [30 m] (± 30 FEET [10 m]), AT INTERVALS EQUAL TO THE NEAREST MULTIPLE OF THE CONTRACTION JOINT INTERVAL, AND FILL WITH EXPANSION JOINT FILLER.

(C) CONTRACTION JOINTS:
CONTRACTION JOINTS ARE 1/8" [3] MIN. AND 3/8" [10] MAX. IN WIDTH. FORM JOINTS BY SAWING OR SCORING TO A MINIMUM DEPTH OF 1" [25]. FORM SCORED JOINTS BY A TOOL WHICH WILL LEAVE ROUNDED CORNERS AND DESTROY AGGREGATE INTERLOCK TO A MINIMUM DEPTH OF 1" [25].

(D) OTHER JOINTS:
SEPARATE THE CURB AND GUTTER FROM ADJACENT SIDEWALK AT POINTS SHOWN ON DTL. DWG. NO. 608-05 WITH A BOND BREAKER MATERIAL, EXCEPT AT APPROACH LAYDOWN CURB LOCATIONS, WHICH REQUIRE SEPARATION USING 1/2" [13] MIN. WIDTH PREFORMED EXPANSION JOINT MATERIAL. PLACE 1/2" [13] MIN. WIDTH PREFORMED EXPANSION JOINT MATERIAL AT ALL CURB RETURNS, BRIDGES, DROP INLETS, AND WHERE MEETING CURB AND GUTTER IN PLACE.

EXPANSION JOINT FILLER MATERIAL:

USE PREFORMED EXPANSION JOINT FILLER MEETING THE REQUIREMENTS OF SECTION 707.

BOND BREAKER MATERIAL:

USE A 15 OR 30 POUND [6.8 OR 13.6 KILOGRAM] ROOFING FELT MATERIAL, OR OTHER PRODUCT AS APPROVED BY THE PROJECT MANAGER. DO NOT USE EXPANSION JOINT MATERIAL.

RADII:

MINIMUM CURB RETURN RADII = 10' [3050]. 15' [4575] RADII ARE DESIRABLE FOR STREETS.

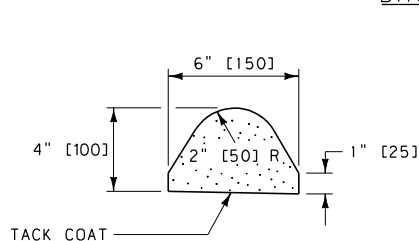
CONCRETE:

UNLESS OTHERWISE SPECIFIED, CONSTRUCT CONCRETE CURBS AND CONCRETE INTEGRAL CURB AND GUTTER WITH CLASS "D" CONCRETE OR APPROVED EQUAL.

* QUANTITIES FOR ESTIMATING PURPOSES ONLY.

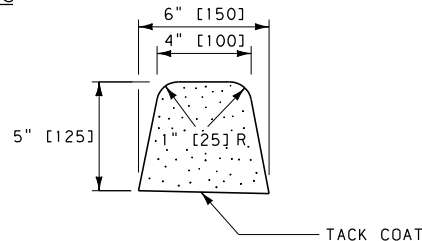
** THE SLOPE OF THE BOTTOM OF THE CURB AND GUTTER SHOULD MATCH THE SUPERELEVATION OF THE ROADWAY.

BITUMINOUS CURBS



CURB SECTION

1 CUBIC FOOT OF MATERIAL WILL MAKE ABOUT 8 LINEAR FEET OF CURB. *
[1 CUBIC METER OF MATERIAL WILL MAKE ABOUT 89 METERS OF CURB]



CURB SECTION

1 CUBIC FOOT OF MATERIAL WILL MAKE ABOUT 5 LINEAR FEET OF CURB. *
[1 CUBIC METER OF MATERIAL WILL MAKE ABOUT 64 METERS OF CURB]

NOTES:

- WHEN CURB IS USED IN CONJUNCTION WITH GUARDRAIL, USE THE 4" [100] HIGH TYPE. OTHERWISE, THE CONTRACTOR MAY USE EITHER SECTION.
- CONFORM ALL MATERIALS AND CONSTRUCTION PER SECTION 609.
- CONCRETE MAY BE SUBSTITUTED FOR THE BITUMINOUS MATERIAL.

UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING

REFERENCE DWG. NO.
STANDARD SPEC. 609-05
SECTION 609, 707

MISCELLANEOUS CURBS

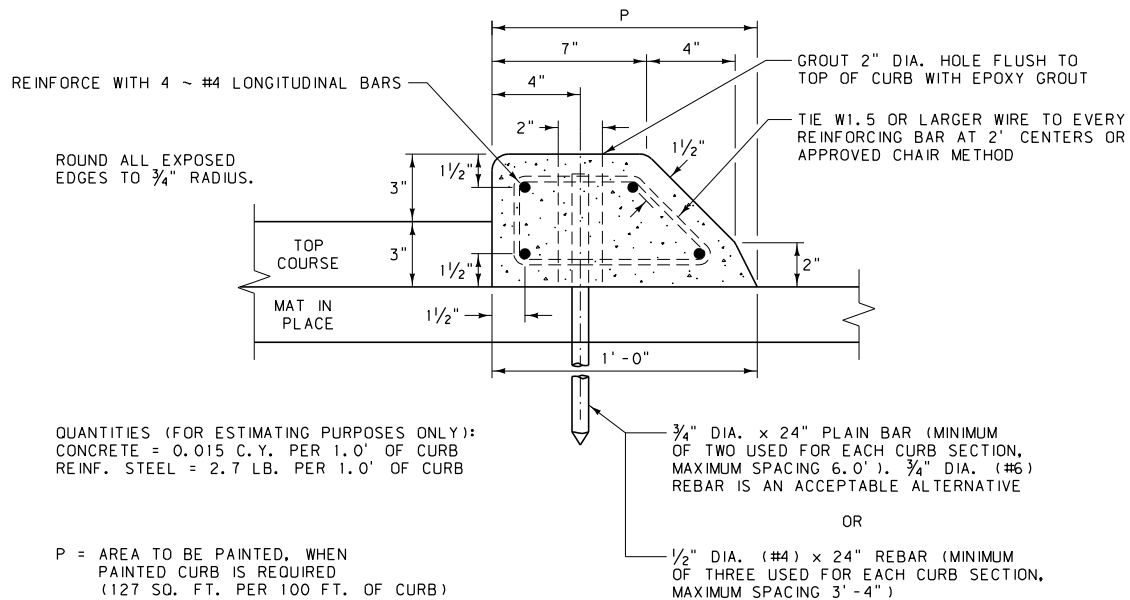
--REVISED--

JAN 2008

MAY 2011

EFFECTIVE: FEBRUARY 2005

MDTA MONTANA DEPARTMENT OF TRANSPORTATION



TYPE "A" - MAT IN PLACE

CONSTRUCTION:

CURBS MAY BE CONSTRUCTED USING ANY OF THE FOLLOWING THREE METHODS:

- (1) PRECAST
- (2) CAST IN PLACE
- (3) CONSTRUCTED BY THE USE OF AN APPROVED CURB FORMING OR SLIP FORM MACHINE.

WHEN USING EITHER METHOD (2) OR (3), REINFORCING STEEL IS NOT REQUIRED, WITH THE EXCEPTION OF THE PINS, AND THE CURBS ARE SCORED OR SAWN TO A DEPTH OF 1" TO FORM CONTRACTION JOINTS AT INTERVALS OF 10 FEET OR LESS. EXTEND $\frac{1}{2}$ " MIN. WIDTH EXPANSION JOINTS COMPLETELY THROUGH CURB EVERY 100 FEET (\pm 30 FEET), AT INTERVALS EQUAL TO THE NEAREST MULTIPLE OF THE CONTRACTION JOINT INTERVAL AND FILL WITH PREFORMED EXPANSION JOINT FILLER MEETING STD. SPEC. 707.

FORM PRECAST CURBS IN THEIR INVERTED POSITION, IN LENGTHS NOT LESS THAN FOUR FEET, OR MORE THAN TEN FEET.

MATERIAL:

CONSTRUCT CURBS OF CLASS "D" CONCRETE, OR AN APPROVED EQUIVALENT MIX.

EPOXY BINDER FOR GROUTING MUST MEET THE REQUIREMENTS OF AASHTO M 235 (ASTM C 881).

DETAILED DRAWING

REFERENCE	DWG. NO.
STANDARD SPEC.	609-10
SECTION 609	

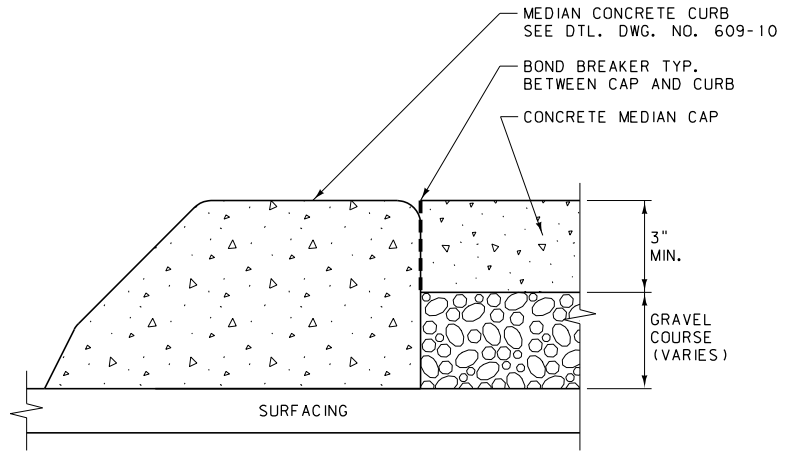
MEDIAN CONCRETE CURBS

-- REVISED --
January 2008

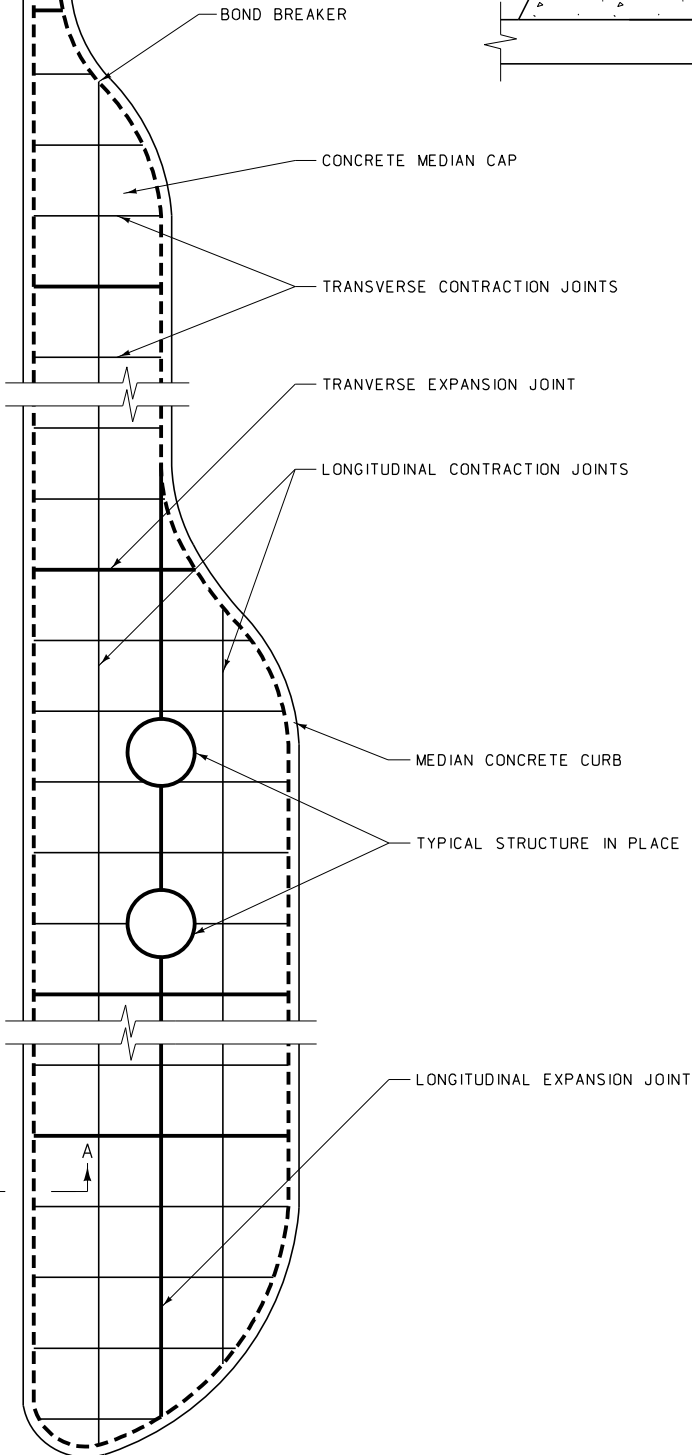
EFFECTIVE: FEBRUARY 2005

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OF TRANSPORTATION
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NOTES:
 1/2" EXPANSION JOINTS ARE SHOWN AS DARK SOLID LINES FOR VISUAL PURPOSES.
 BOND BREAKER IS SHOWN AS DARK DASHED LINE FOR VISUAL PURPOSES.



SECTION A-A



NOTES:

INSTALL PREFORMED EXPANSION JOINT FILLER, STD. SPEC. 707.01.3, AT ALL EXPANSION JOINTS, FOR THE FULL THICKNESS OF THE CONCRETE MEDIAN CAP.

INSTALL A BOND BREAKER FOR THE FULL THICKNESS OF THE CONCRETE MEDIAN CAP BETWEEN THE CAP AND THE CURB. USE A 15 OR 30 POUND ROOFING FELT MATERIAL, OR OTHER PRODUCT AS APPROVED BY THE ENGINEER, FOR THE BOND BREAKER. DO NOT USE EXPANSION JOINT MATERIAL AS A BOND BREAKER.

ALL JOINTS MUST BE STRAIGHT AND PERPENDICULAR TO THE CENTERLINE AND THE SURFACE OF THE MEDIAN CAP. WHERE PRACTICAL, ALIGN ALL JOINTS WITH LIKE JOINTS IN ADJOINING WORK. USE JOINTS TO OUTLINE ALL PANELS IN THE MEDIAN CAP. USE SQUARE PANELS WHEN PRACTICAL. ON NARROW MEDIAN CAPS RECTANGULAR SHAPED PANELS ARE ACCEPTABLE.

CONTRACTION JOINTS MAY NOT BE MORE THAN 1/8" WIDE AND NOT LESS THAN 1" IN DEPTH AND MAY BE CUT BY A GROOVE FORMING TOOL.

LOCATE EXPANSION JOINTS AT ALL JOINTS BETWEEN THE MEDIAN CAP AND STRUCTURES IN PLACE AND EVERY 100 FEET (± 30 FEET) AT INTERVALS EQUAL TO THE NEAREST MULTIPLE OF THE CONTRACTION JOINT INTERVAL. USE A LONGITUDINAL EXPANSION JOINT IN THE CENTERLINE OF ALL MEDIAN CAPS WIDER THAN 12 FEET.

USE LONGITUDINAL CONTRACTION JOINTS IN MEDIAN CAPS WIDER THAN 6 FEET, WITH SPACING NOT TO EXCEED 6 FEET. SPACE TRANSVERSE CONTRACTION JOINTS EQUAL TO THE LONGITUDINAL SPACING ON MEDIAN CAPS WIDER THAN 6 FEET. FOR MEDIAN CAPS NARROWER THAN 6 FEET, SPACE TRANSVERSE CONTRACTION JOINTS 10 FEET OR LESS.

DETAILED DRAWING

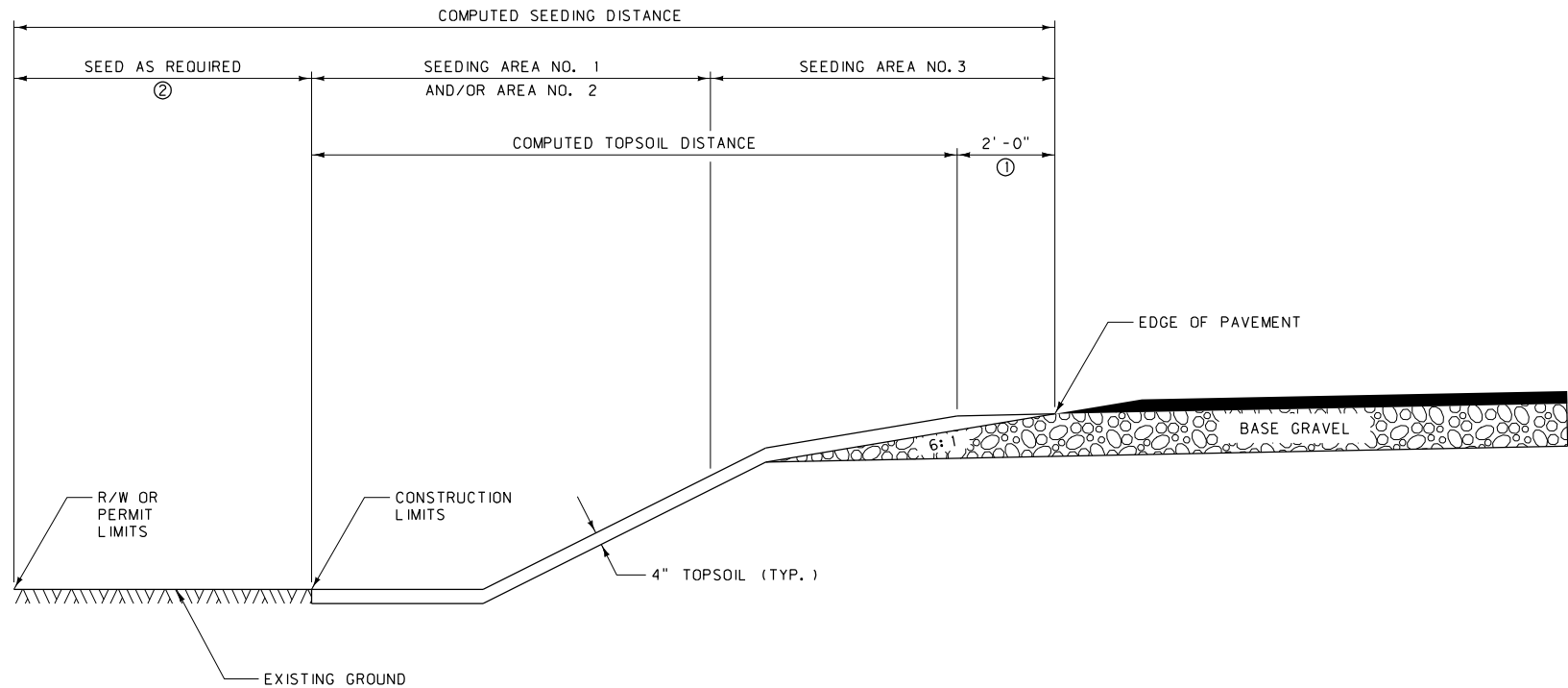
REFERENCE	DWG. NO.
STANDARD SPEC.	609-12
SECTION 609	

CONCRETE MEDIAN CAPS

-- REVISED --
 January 2008

EFFECTIVE: FEBRUARY 2005


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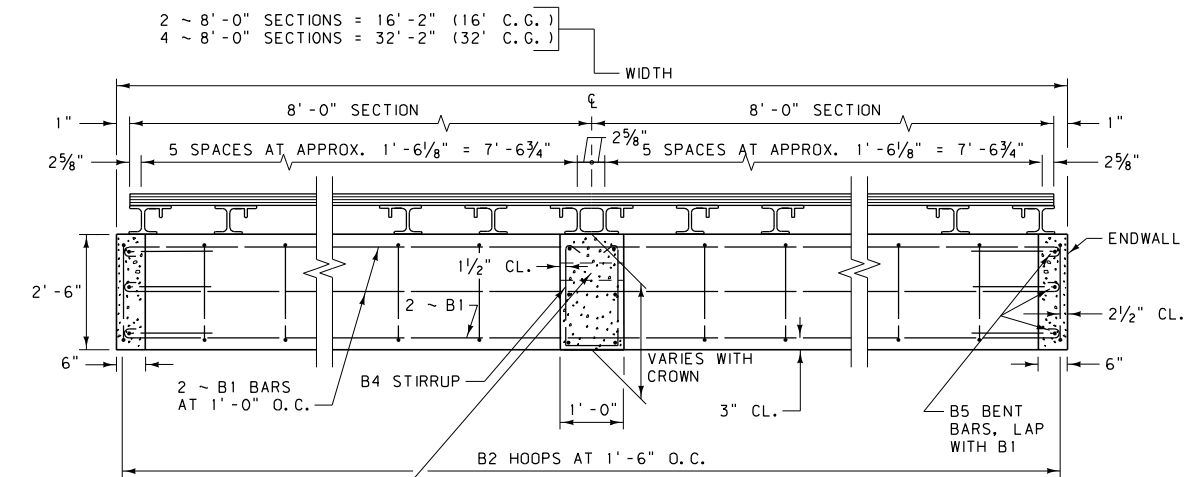


NOTES:

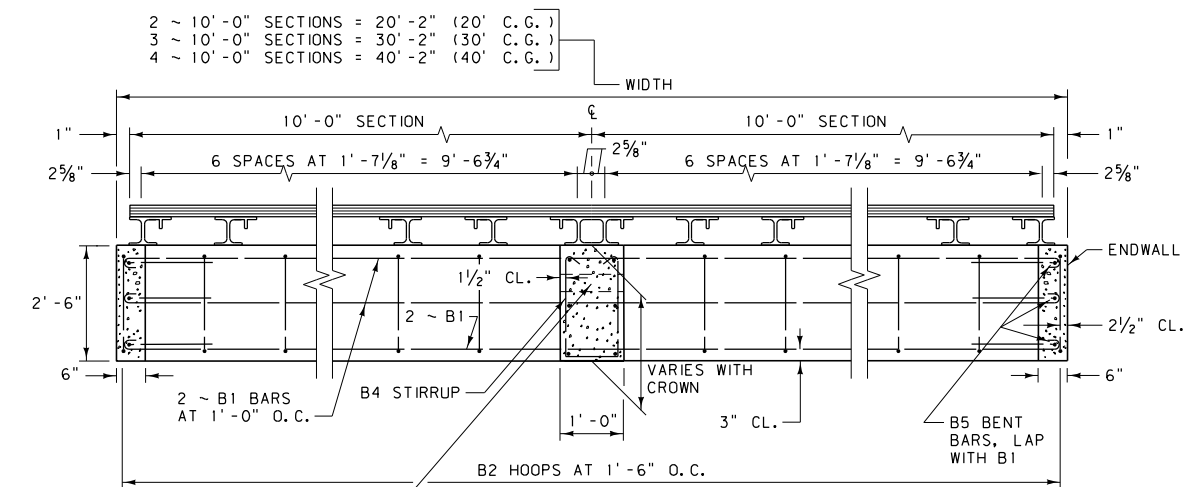
- ① PLACE TOPSOIL ON THE SURFACING INSLOPE TO A DEPTH OF 4" (\pm) NOT LESS THAN 2'-0" FROM THE EDGE OF PAVEMENT. FEATHER TOPSOIL TO THE EDGE OF PAVEMENT.
- ② SEED AREAS BEYOND THE CONSTRUCTION LIMITS WITHIN THE RIGHT-OF-WAY OR PERMIT BOUNDARIES THAT HAVE BEEN DISTURBED (ie. STAGING AREAS, TOPSOIL PILES, EQUIPMENT TRAILS, etc.)
- ③ SALVAGE SUFFICIENT AMOUNTS OF TOPSOIL TO ASSURE QUANTITIES ARE AVAILABLE TO COVER ALL CLEARED AND GRUBBED AREAS WITH 4" OF TOPSOIL. IF QUANTITIES ARE NOT AVAILABLE, RE-SPREAD TOPSOIL TO AN EVEN DEPTH ACROSS ALL DISTURBED GROUND.

SEEDING		
AREA NO.	DEFINITION	TREATMENT
1	3:1 OR FLATTER SLOPES	CONDITION SEEDBED, SEED & FERTILIZE
2	STEEPER THAN 3:1 SLOPES	SEED, FERTILIZE & MULCH
3	15' OR TO THE EDGE OF THE SURFACING INSLOPE, WHICHEVER IS GREATER	CONDITION SEEDBED & SEED

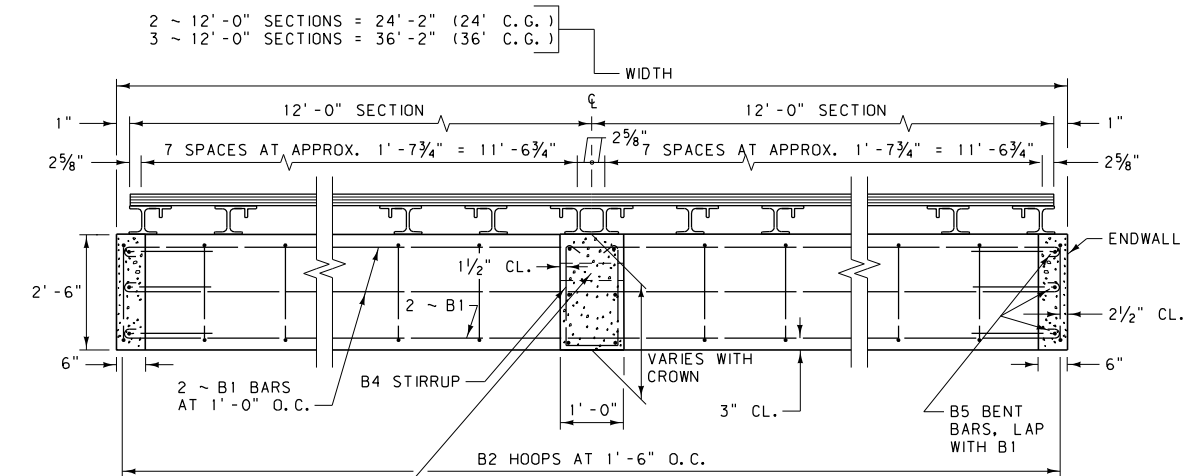
DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 610	DWG. NO. 610-00
TOPSOIL AND SEEDING	
EFFECTIVE: FEBRUARY 2005	
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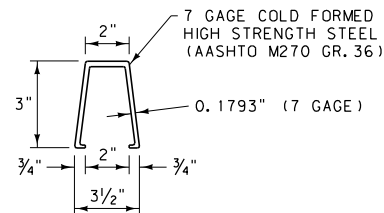
SECTION A-A
(8' SECTIONS)



SECTION A-A
(10' SECTIONS)

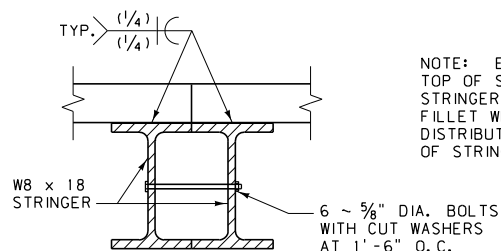


SECTION A-A
(12' SECTIONS)

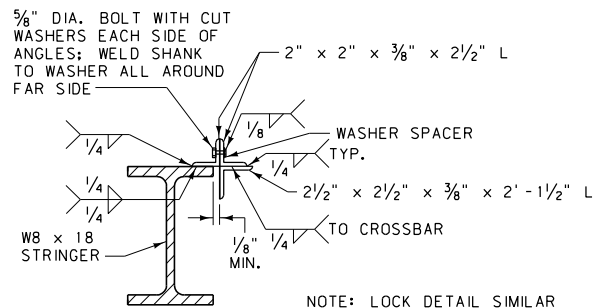


CROSSBAR

NOTE: WELD CROSSBARS TO 2 1/2" x 2 1/2" x 3/8" x 2'-1 1/2" ANGLES HINGED AREA ONLY. SEE HINGE DETAIL.

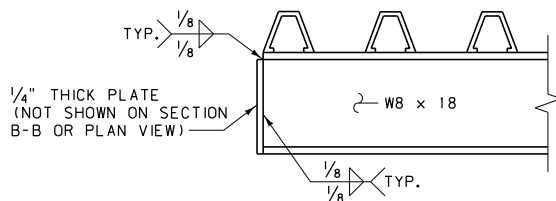


MULTIPLE
INSTALLATION JOINT



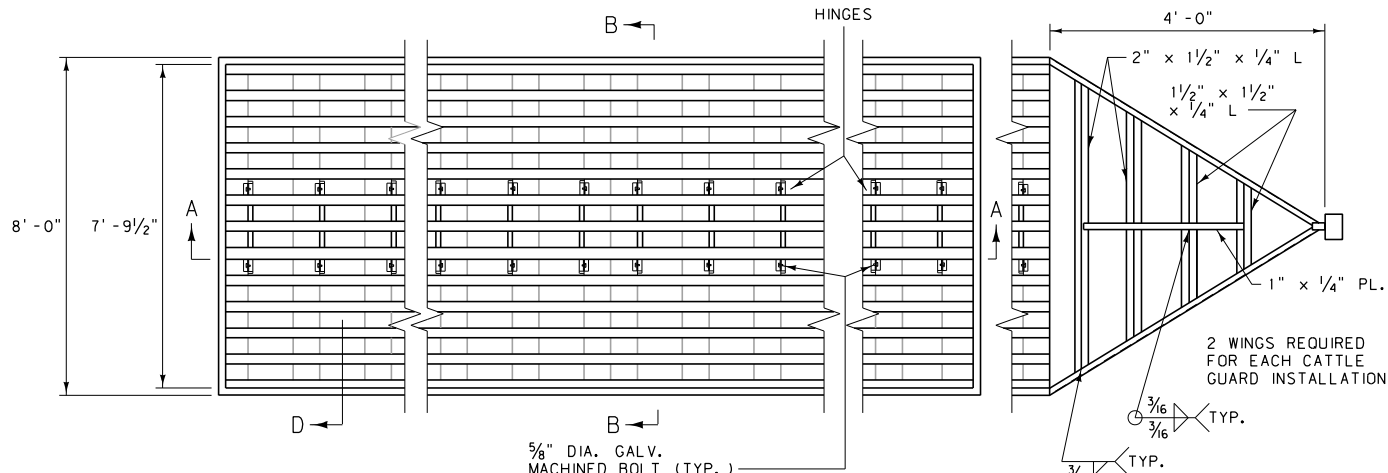
HINGE DETAIL
(HINGED AREA OPENS FOR CLEANOUT)

NOTE: LOCK DETAIL SIMILAR EXCEPT USE 5/8" DIA. GALV. MACHINED BOLT WITH CALV. CUT WASHER & CALV. HEX NUTS INSTEAD OF WELDED STUD BOLT.



SECTION D

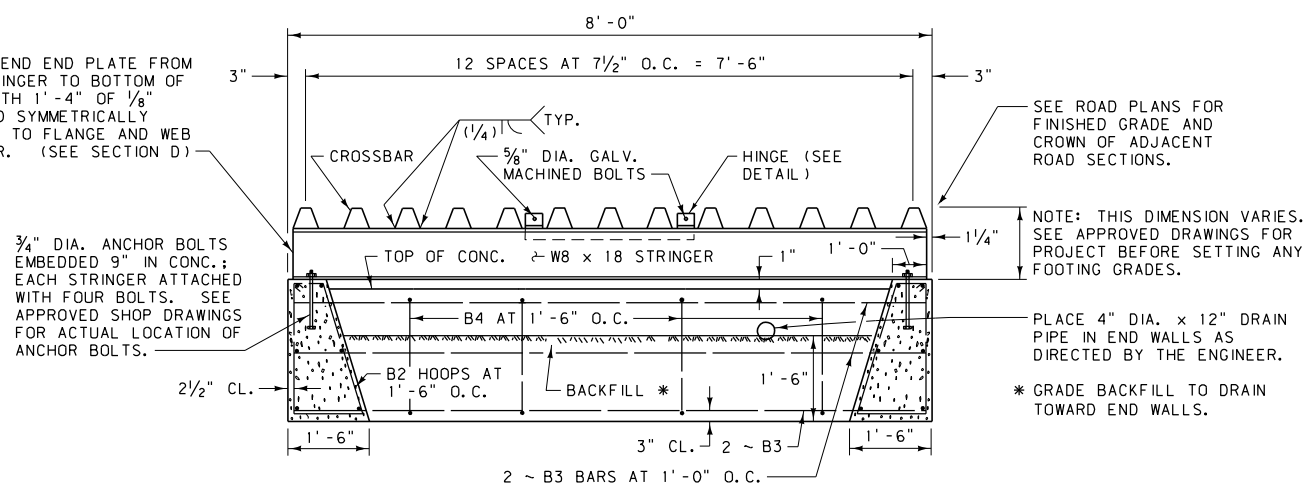
LIVE LOADING: STANDARD (HS20) LOADING



PLAN

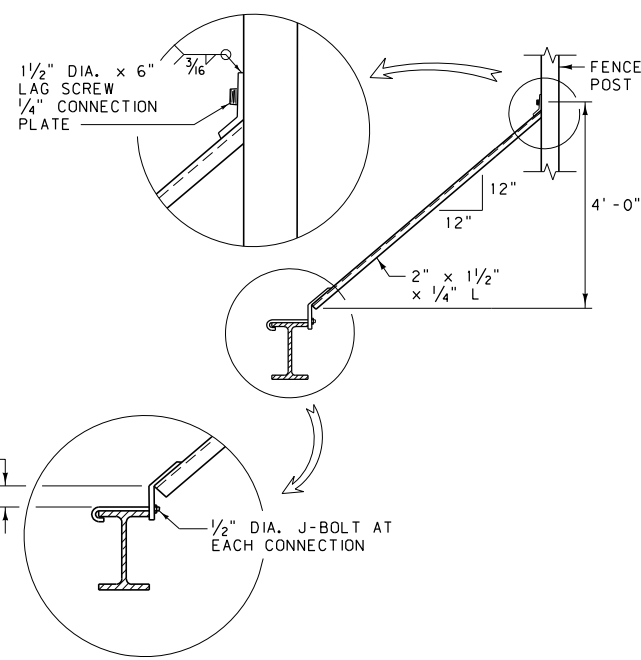
STEEL WING

NOTE: EXTEND END PLATE FROM TOP OF STRINGER TO BOTTOM OF STRINGER WITH 1'-4" OF 1/8" FILLET WELD SYMMETRICALLY DISTRIBUTED TO FLANGE AND WEB OF STRINGER. (SEE SECTION D)



SECTION B-B

MAX. FOOTING PRESS = 1.1 TONS/SQ. FT.



STEEL WING CONNECTION DETAILS

NOTES:

C.G. = CATTLE GUARD.

THE CONTRACTOR HAS THE OPTION OF USING PRECAST CONCRETE BASES FOR CATTLE GUARDS. SEE DTL. DWG. NO. 611-15.

FOR CATTLE GUARDS ON FIELD OR PRIVATE APPROACHES, THE PRECAST CONCRETE BASES IN DTL. DWG. NO. 611-10 MAY BE USED.


USE AN EVEN NUMBER OF STEEL CATTLE GUARD GRATES WHEN A CROWNED INSTALLATION IS REQUIRED.

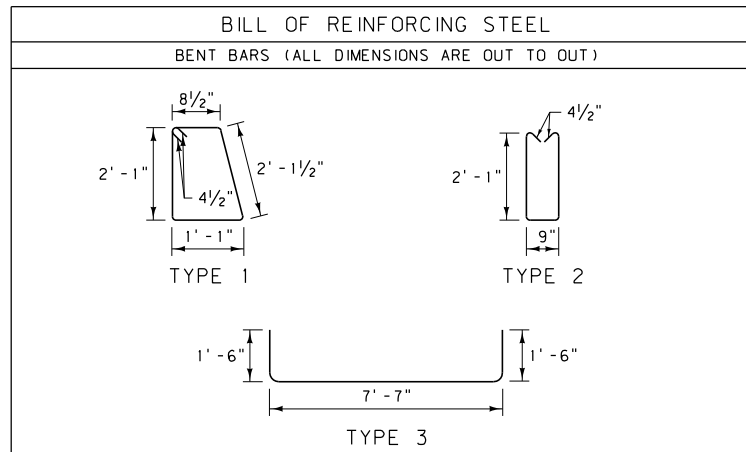
SEE DTL. DWG. NO. 611-05 FOR CAST-IN-PLACE CATTLE GUARD REBAR DETAILS.

STRUCTURAL STEEL IS TO CONFORM TO AASHTO M270 GRADE 36.

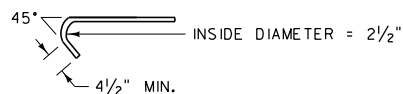
ANCHOR BOLTS ARE TO CONFORM TO AASHTO M314 GRADE 36.

ALL NUTS, BOLTS, AND WASHERS ARE TO CONFORM TO ASTM A307 AND BE GALVANIZED PER AASHTO M232.

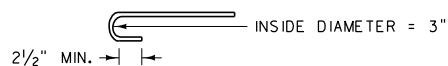
DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	611-00
SECTION 611	
CAST-IN-PLACE CATTLE GUARD	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	



16 FT. C. G.					30 FT. C. G.				
MARK	SIZE	NO.	TYPE	LENGTH	MARK	SIZE	NO.	TYPE	LENGTH
B1	#4	12	STR.	16' - 9"	B1	#4	12	STR.	30' - 9"
B2	#4	22	1	6' - 9"	B2	#4	42	1	6' - 9"
B3	#4	6	STR.	7' - 7"	B3	#4	12	STR.	7' - 7"
B4	#4	4	2	5' - 8"	B4	#4	8	2	5' - 8"
B5	#4	6	3	10' - 7"	B5	#4	6	3	10' - 7"
ESTIMATED WT. = 321 LB.					ESTIMATED WT. = 569 LB.				
20 FT. C. G.					32 FT. C. G.				
B1	#4	12	STR.	20' - 9"	B1	#4	12	STR.	32' - 9"
B2	#4	28	1	6' - 9"	B2	#4	44	1	6' - 9"
B3	#4	6	STR.	7' - 7"	B3	#4	18	STR.	7' - 7"
B4	#4	4	2	5' - 8"	B4	#4	12	2	5' - 8"
B5	#4	6	3	10' - 7"	B5	#4	6	3	10' - 7"
ESTIMATED WT. = 381 LB.					ESTIMATED WT. = 640 LB.				
24 FT. C. G.					36 FT. C. G.				
B1	#4	12	STR.	24' - 9"	B1	#4	12	STR.	36' - 9"
B2	#4	34	1	6' - 9"	B2	#4	50	1	6' - 9"
B3	#4	6	STR.	7' - 7"	B3	#4	12	STR.	7' - 7"
B4	#4	4	2	5' - 8"	B4	#4	8	2	5' - 8"
B5	#4	6	3	10' - 7"	B5	#4	6	3	10' - 7"
ESTIMATED WT. = 440 LB.					ESTIMATED WT. = 654 LB.				
					40 FT. C. G.				
B1	#4	12	STR.	40' - 9"	B1	#4	12	STR.	40' - 9"
B2	#4	54	1	6' - 9"	B2	#4	54	1	6' - 9"
B3	#4	18	STR.	7' - 7"	B3	#4	18	STR.	7' - 7"
B4	#4	12	2	5' - 8"	B4	#4	12	2	5' - 8"
B5	#4	6	3	10' - 7"	B5	#4	6	3	10' - 7"
					ESTIMATED WT. = 749 LB.				



BENT BARS
(TYPES 1 AND 2)



B1 AND B3 STRAIGHT BARS


REBAR DETAILS

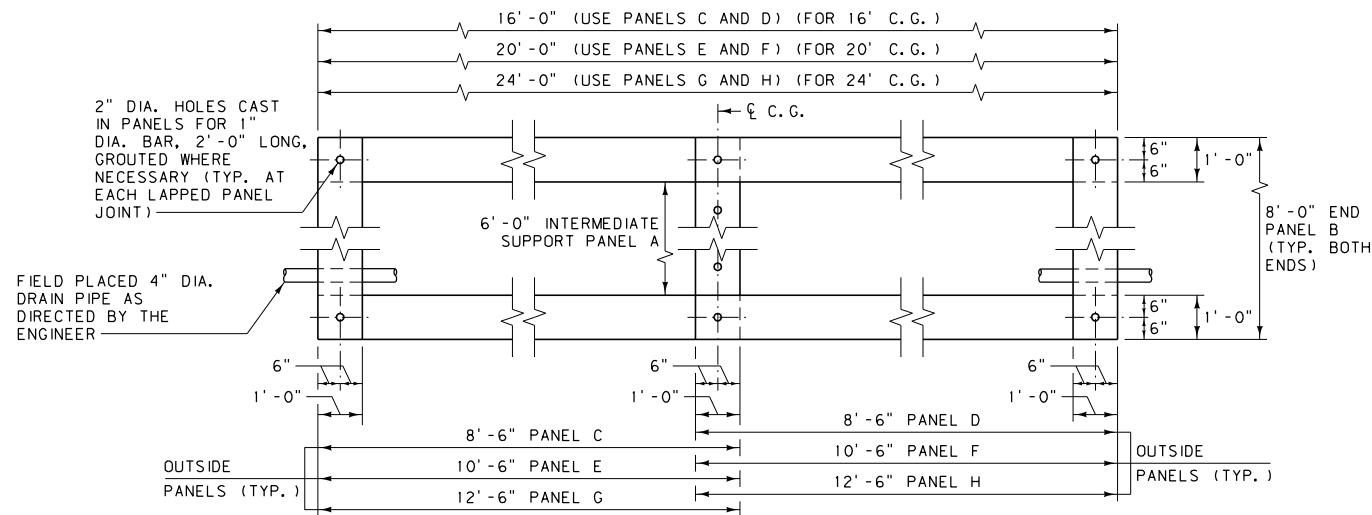
ESTIMATED CLASS "A" CONC. QUANTITIES		
16' C. G. =	4.76	C. Y.
20' C. G. =	5.69	C. Y.
24' C. G. =	6.61	C. Y.
30' C. G. =	8.51	C. Y.
32' C. G. =	9.48	C. Y.
36' C. G. =	9.90	C. Y.
40' C. G. =	11.33	C. Y.

NOTES:

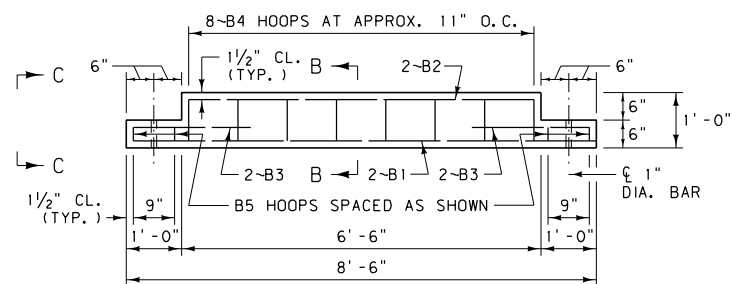
C. G. = CATTLE GUARD.

CONCRETE QUANTITIES WERE FIGURED WITHOUT A CROWN. INCREASE WHEN A CROWNED INSTALLATION IS USED.

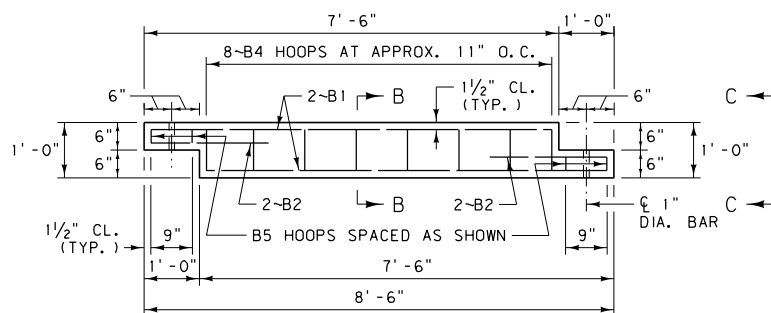
DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 611	DWG. NO. 611-05
CAST-IN-PLACE CATTLE GUARD REBAR DETAILS	
EFFECTIVE: FEBRUARY 2005	
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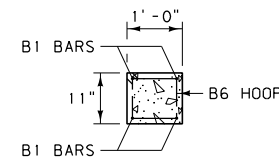
TYPICAL PLAN VIEW



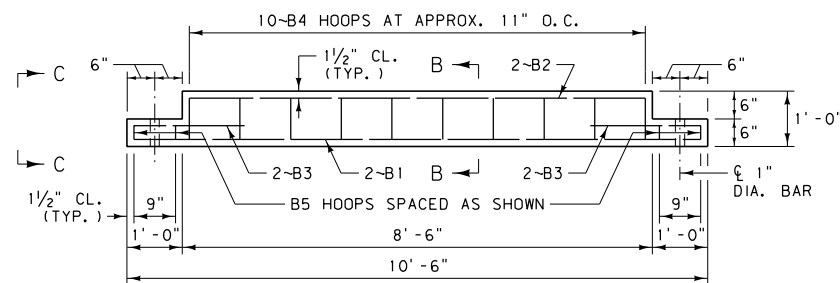
PANEL C ELEVATION



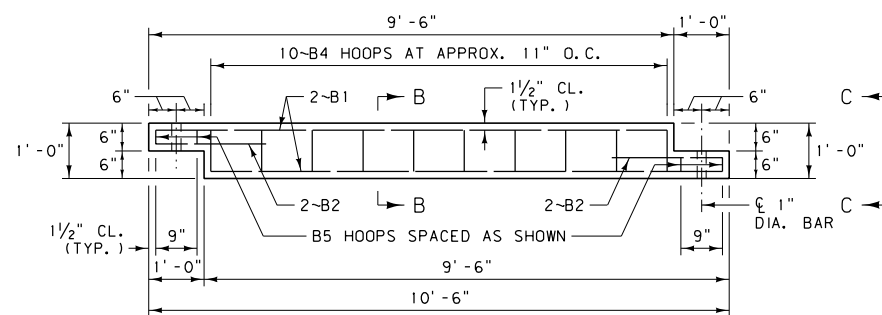
PANEL D ELEVATION



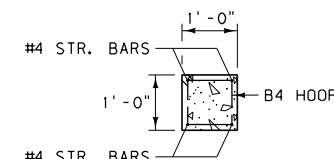
SECTION A-A



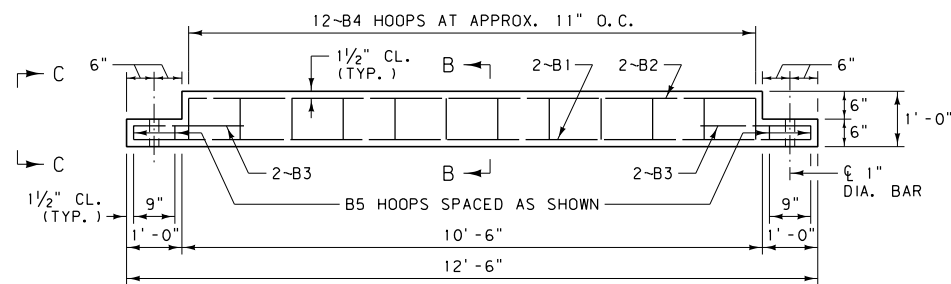
PANEL E ELEVATION



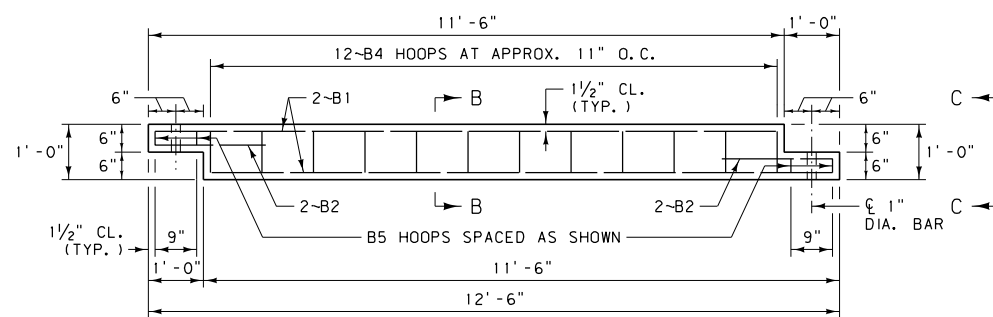
PANEL F ELEVATION



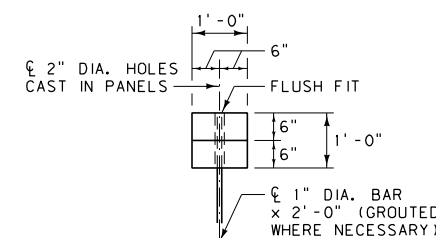
SECTION B-B



PANEL G ELEVATION



PANEL H ELEVATION



VIEW C-C
(TYP. LAPPED PANEL JOINT)

NOTES:

C.G. = CATTLE GUARD.

USE ONLY ON FIELD OR PRIVATE APPROACHES.

PROVIDE CAST-IN ANCHOR BOLTS AS SHOWN IN DTL. DWG. NO. 611-00 AT THE APPROPRIATE LOCATIONS. CAST-IN LAG PLATES, SIMILAR TO THOSE SHOWN IN DTL. DWG. NO. 611-15, MAY ALSO BE USED.

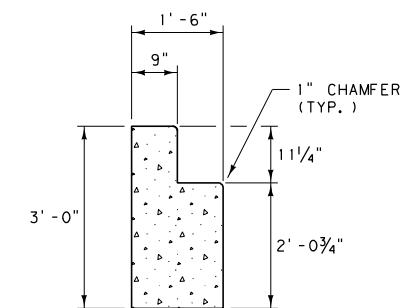
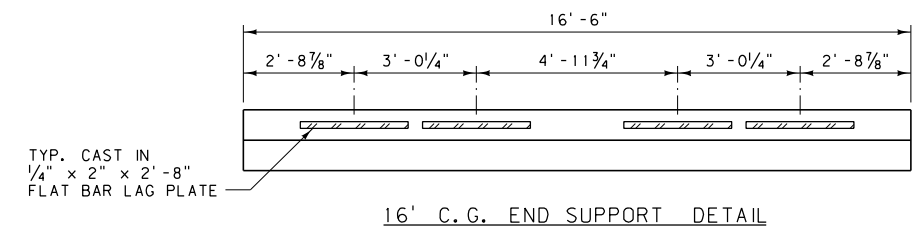
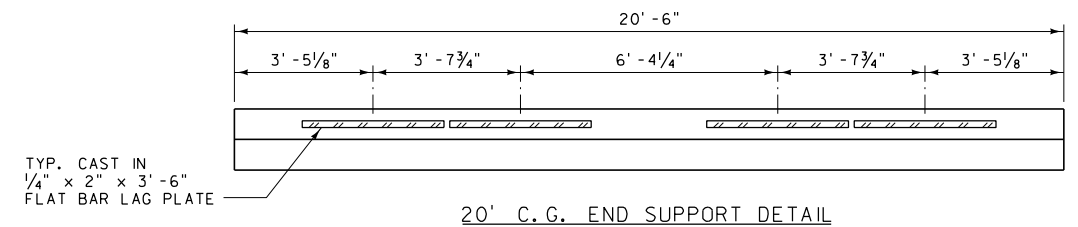
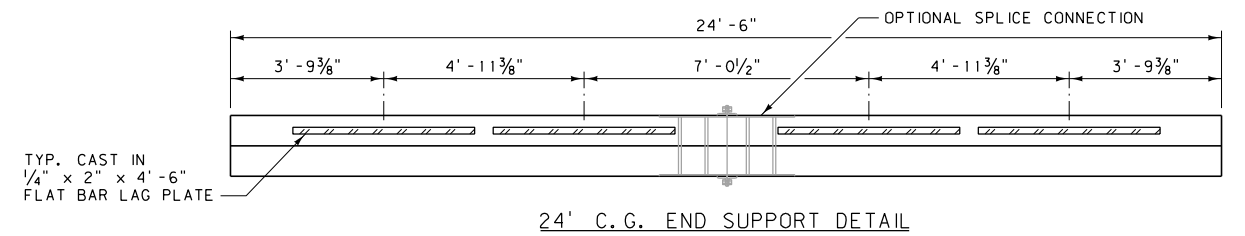
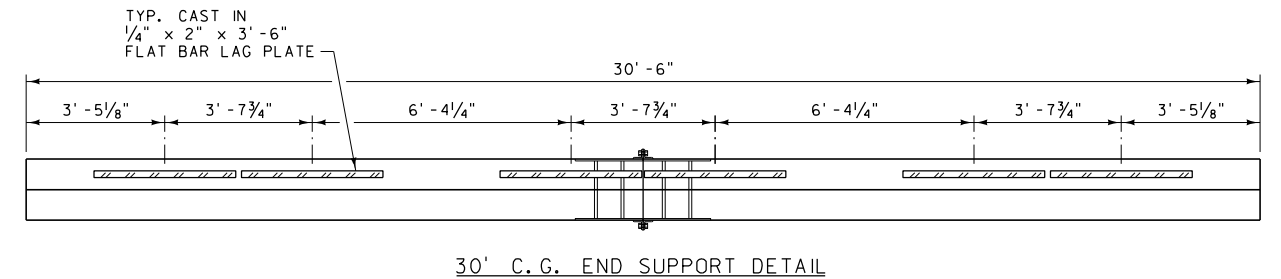
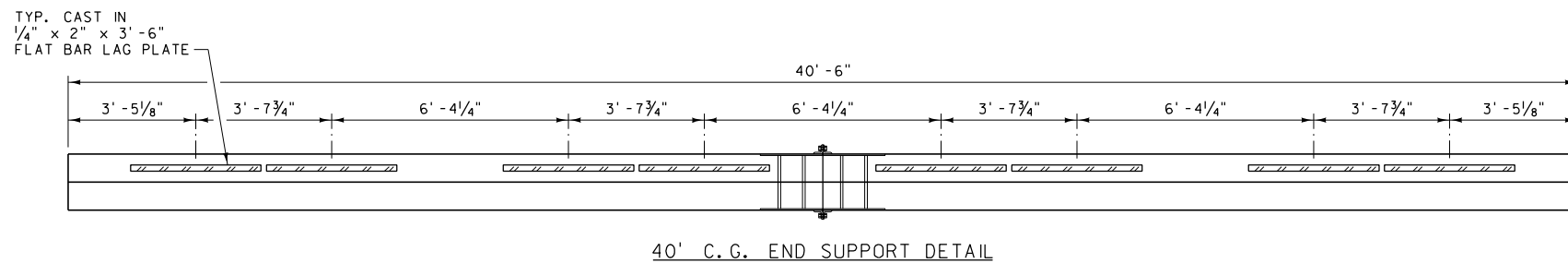
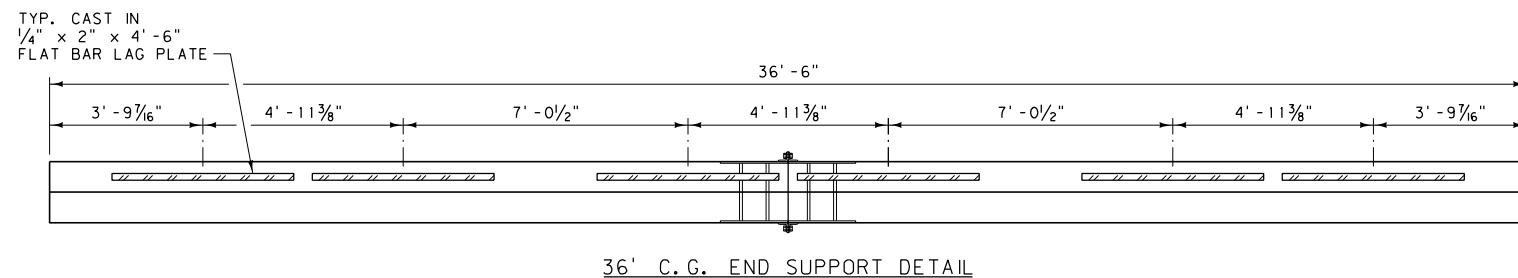
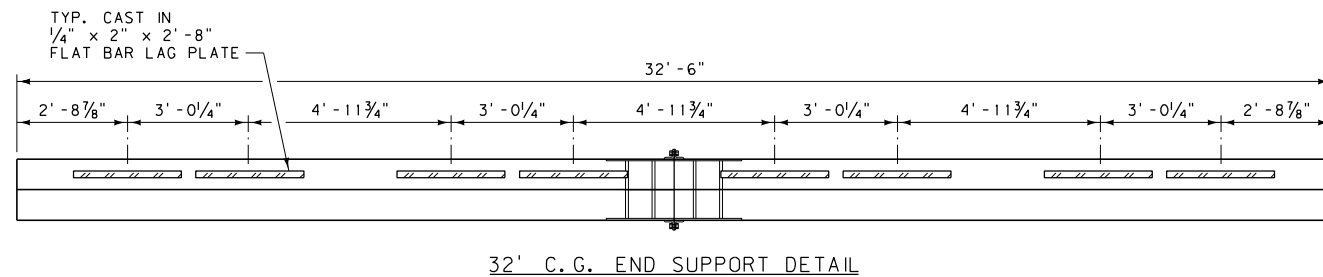
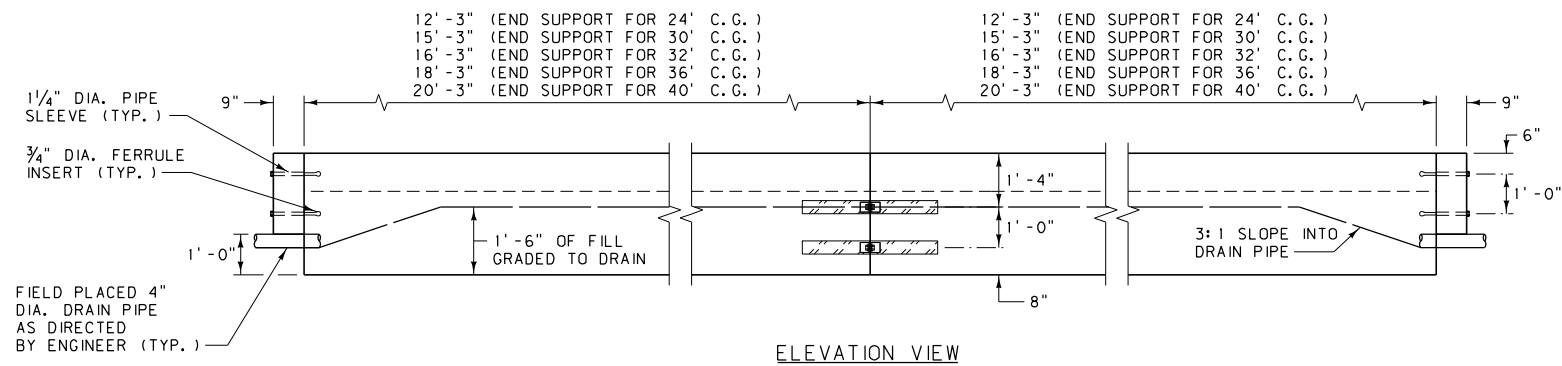
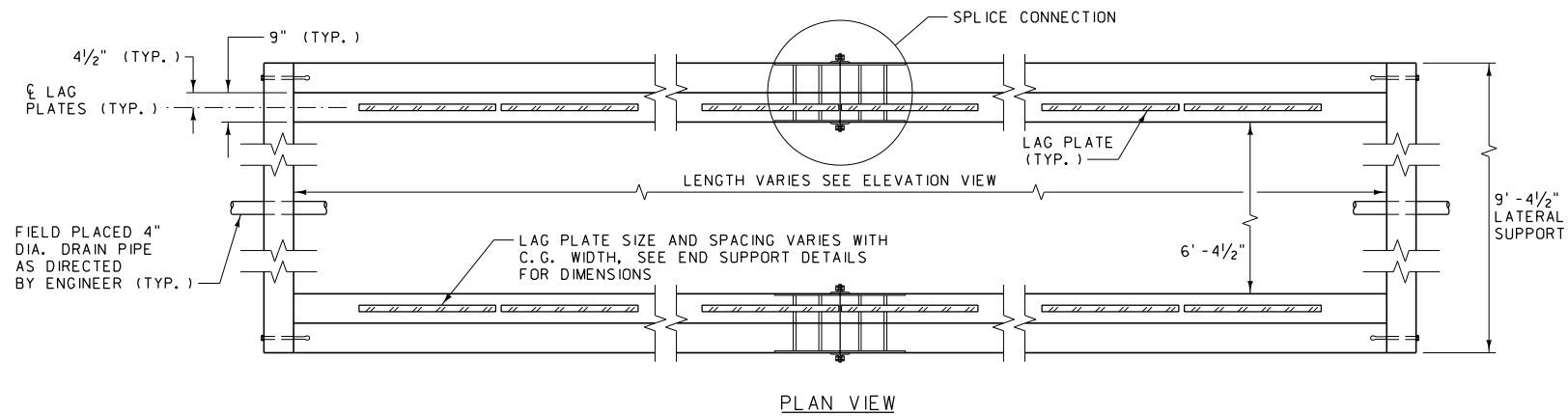
FOR DETAILS OF STEEL GRATES AND STEEL WINGS SEE DTL. DWG. NO. 611-00.

BILL OF REINFORCING STEEL *				
MARK	SIZE	NO.	TYPE	LENGTH
6'-0" SECTION - PANEL A				
B1	#4	4	STRAIGHT	5'-9"
B6	#3	7	2	3'-5"
ESTIMATED WT. = 24 LB.				
8'-0" SECTION - PANEL B				
B1	#4	2	STRAIGHT	7'-9"
B2	#4	2	STRAIGHT	5'-9"
B3	#4	4	STRAIGHT	2'-2"
B4	#3	7	1	3'-7"
B5	#3	4	3	2'-7"
ESTIMATED WT. = 37 LB.				
8'-6" SECTION - PANEL C				
B1	#4	2	STRAIGHT	8'-3"
B2	#4	2	STRAIGHT	6'-3"
B3	#4	4	STRAIGHT	2'-2"
B4	#3	8	1	3'-7"
B5	#3	4	3	2'-7"
ESTIMATED WT. = 40 LB.				
8'-6" SECTION - PANEL D				
B1	#4	4	STRAIGHT	7'-3"
B2	#4	4	STRAIGHT	2'-2"
B4	#3	8	1	3'-7"
B5	#3	4	3	2'-7"
ESTIMATED WT. = 40 LB.				
10'-6" SECTION - PANEL E				
B1	#4	2	STRAIGHT	10'-3"
B2	#4	2	STRAIGHT	8'-3"
B3	#4	4	STRAIGHT	2'-2"
B4	#3	10	1	3'-7"
B5	#3	4	3	2'-7"
ESTIMATED WT. = 48 LB.				
10'-6" SECTION - PANEL F				
B1	#4	4	STRAIGHT	9'-3"
B2	#4	4	STRAIGHT	2'-2"
B4	#3	10	1	3'-7"
B5	#3	4	3	2'-7"
ESTIMATED WT. = 48 LB.				
12'-6" SECTION - PANEL G				
B1	#4	2	STRAIGHT	12'-3"
B2	#4	2	STRAIGHT	10'-3"
B3	#4	4	STRAIGHT	2'-2"
B4	#3	12	1	3'-7"
B5	#3	4	3	2'-7"
ESTIMATED WT. = 56 LB.				
12'-6" SECTION - PANEL H				
B1	#4	4	STRAIGHT	11'-3"
B2	#4	4	STRAIGHT	2'-2"
B4	#3	12	1	3'-7"
B5	#3	4	3	2'-7"
ESTIMATED WT. = 56 LB.				

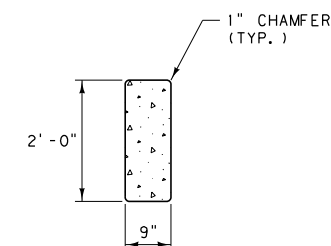
* FOR ONE PANEL ONLY

ESTIMATED CLASS "D" CONCRETE QUANTITIES	
6'-0" SECTION - PANEL A	= 0.20 C.Y.
8'-0" SECTION - PANEL B	= 0.26 C.Y.
8'-6" SECTION - PANEL C	= 0.28 C.Y.
8'-6" SECTION - PANEL D	= 0.28 C.Y.
10'-6" SECTION - PANEL E	= 0.35 C.Y.
10'-6" SECTION - PANEL F	= 0.35 C.Y.
12'-6" SECTION - PANEL G	= 0.43 C.Y.
12'-6" SECTION - PANEL H	= 0.43 C.Y.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 611	DWG. NO. 611-10
PRECAST CONCRETE BASE FOR CATTLE GUARD - APPROACHES	
EFFECTIVE: FEBRUARY 2005	
	MONTANA DEPARTMENT OF TRANSPORTATION



END SUPPORT SECTION VIEW



LATERAL SUPPORT SECTION VIEW

NOTES:

C.G. = CATTLE GUARD.

USE SPLICE CONNECTIONS WHEN A CROWNED INSTALLATION IS REQUIRED.

SEE DTL. DWG. NO. 611-20 FOR ADDITIONAL PRE-CAST CONCRETE CATTLE GUARD BASE AND MATERIAL QUANTITY DETAILS.

SEE DTL. DWG. NO. 611-00 FOR DETAILS OF STEEL GRATES AND STEEL WINGS.


INSTALLATION PROCEDURE:

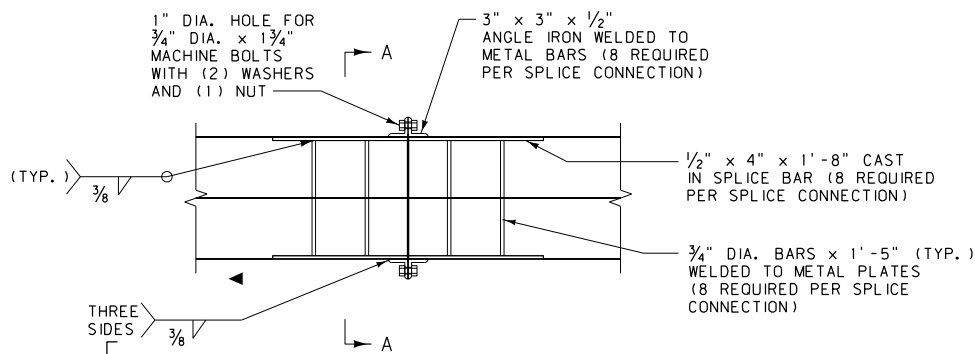
EXCAVATE 2' - 0" BELOW THE ELEVATION OF THE BOTTOM OF THE CATTLE GUARD BASE. EXTEND THE EXCAVATION HORIZONTALLY AT LEAST 1' - 0" IN ALL DIRECTIONS BEYOND THE CATTLE GUARD BASE'S EXTERIOR DIMENSION.

FILL THE EXCAVATION TO THE LEVEL OF THE BOTTOM OF THE CATTLE GUARD BASE WITH FILL MATERIAL OF AASHTO GRADE A-1-a OR BETTER, COMPACTED TO 95% OF PROCTOR DENSITY.

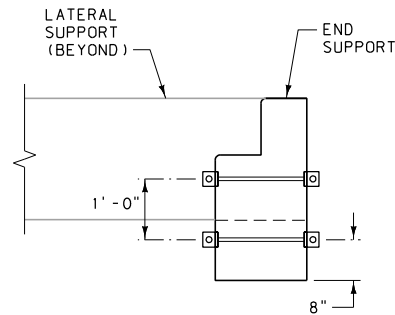
AFTER PLACING THE CATTLE GUARD, FILL THE EXTERIOR PORTION OF THE EXCAVATION TO GRADE WITH THE SAME MATERIAL.

FILL THE INTERIOR OF THE CATTLE GUARD BASE TO A DEPTH OF 1' - 6" WITH THE SIMILARLY COMPACTED MATERIAL.

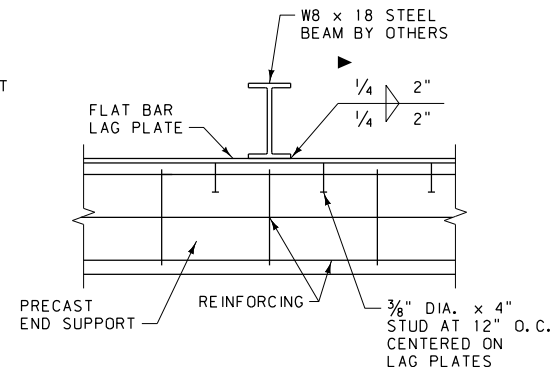
DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	611-15
SECTION 611	
PRECAST CONCRETE BASE FOR CATTLE GUARD	
EFFECTIVE: FEBRUARY 2005	
 serving you with pride	MONTANA DEPARTMENT OF TRANSPORTATION



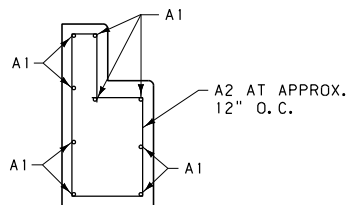
SPlice Connection Detail



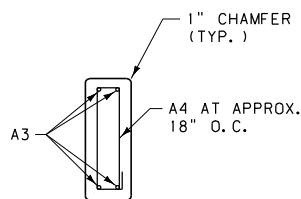
End Support Section A-A



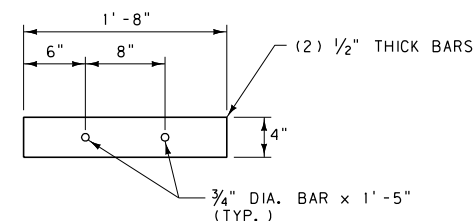
Lag Plate Connection Detail



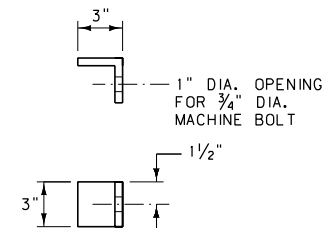
End Support Rebar Detail



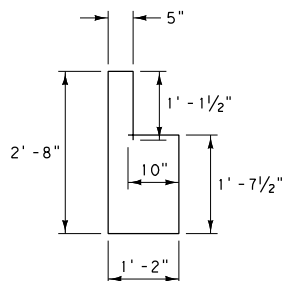
Lateral Support Rebar Detail



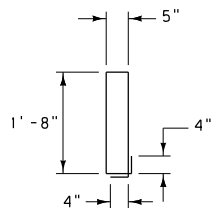
Splice Bar Detail



Angle Iron Detail



TYPE A2



TYPE A4

REINFORCING STEEL

NOTE: ALL REBAR DIMENSIONS ARE OUT TO OUT.

NOTES:

C.G. = CATTLE GUARD.

ALL HARDWARE IS TO BE PRIMER PAINTED.


ALL STEEL HARDWARE IS TO CONFORM TO AASHTO M270 GRADE 36.

ALL NUTS, BOLTS, AND WASHERS ARE TO CONFORM TO ASTM A307 AND BE GALVANIZED PER AASHTO M232.

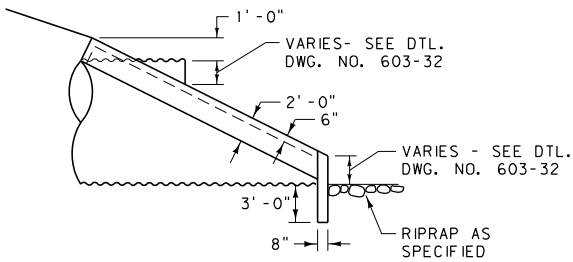
ESTIMATED CLASS "DD" CONCRETE QUANTITIES	
16'-0" C.G. =	5.68 C.Y.
20'-0" C.G. =	6.81 C.Y.
24'-0" C.G. =	7.93 C.Y.
* 24'-0" C.G. =	7.93 C.Y.
30'-0" C.G. =	9.62 C.Y.
32'-0" C.G. =	10.18 C.Y.
36'-0" C.G. =	11.31 C.Y.
40'-0" C.G. =	12.43 C.Y.

QUANTITIES AND DIMENSIONS ARE APPROXIMATE ONLY BASED ON ONE COMPLETE CATTLE GUARD.													
NOMINAL C.G. SIZE	REINFORCING STEEL (NO. 4 BARS / GRADE 60)								MISC. STEEL				ESTIMATED WT. LB.
	A1 REQUIRED	A1 LENGTH	A2 REQUIRED	A2 LENGTH	A3 REQUIRED	A3 LENGTH	A4 REQUIRED	A4 LENGTH	LAG PLATES REQUIRED	LAG PLATES LENGTH	SPlice CONNECTION	ESTIMATED WT. LB.	
16'-0"	18	16'-2"	36	7'-10"	8	9'-1 1/2"	14	4'-10"	8	2'-8"	NO	39	
20'-0"	18	20'-2"	44	7'-10"	8	9'-1 1/2"	14	4'-10"	8	3'-6"	NO	52	
24'-0"	18	24'-2"	52	7'-10"	8	9'-1 1/2"	14	4'-10"	8	4'-6"	NO	66	
* 24'-0"	36	11'-11"	52	7'-10"	8	9'-1 1/2"	14	4'-10"	8	4'-6"	YES	323	
30'-0"	36	14'-11"	64	7'-10"	8	9'-1 1/2"	14	4'-10"	12	3'-6"	YES	334	
32'-0"	36	15'-11"	68	7'-10"	8	9'-1 1/2"	14	4'-10"	16	2'-8"	YES	335	
36'-0"	36	17'-11"	76	7'-10"	8	9'-1 1/2"	14	4'-10"	12	4'-6"	YES	356	
40'-0"	36	19'-11"	84	7'-10"	8	9'-1 1/2"	14	4'-10"	16	3'-6"	YES	360	

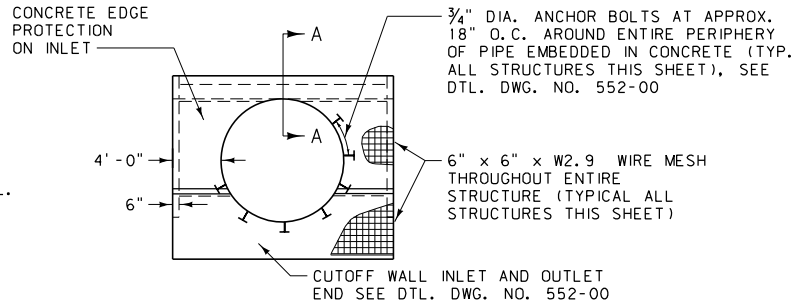
* 24'-0" CATTLE GUARD WITH OPTIONAL SPLICE

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 611	DWG. NO. 611-20
PRECAST CONCRETE CATTLE GUARD BASE DETAILS	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	

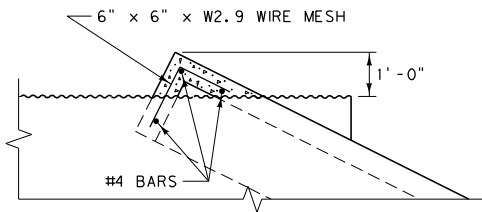
ROUND PIPE



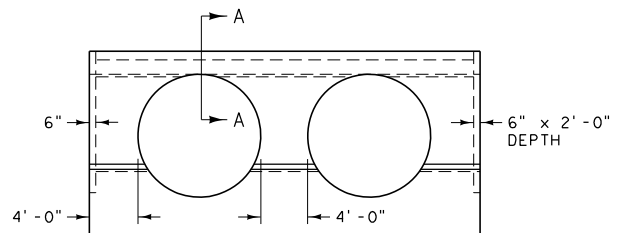
SIDE ELEVATION



FRONT ELEVATION

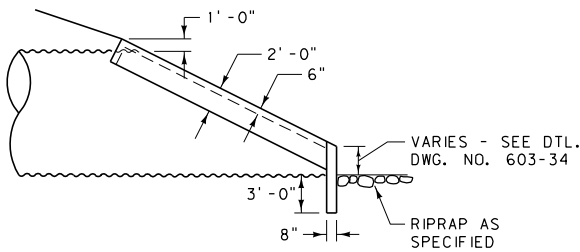


SECTION A-A

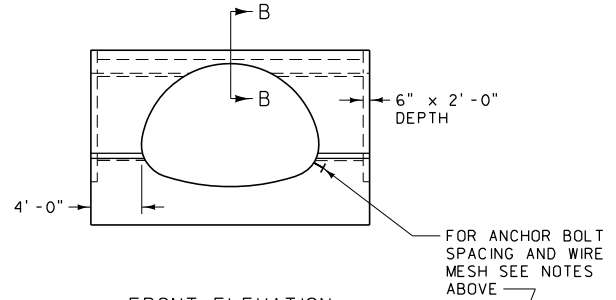


FRONT ELEVATION MULTIPLE PIPES

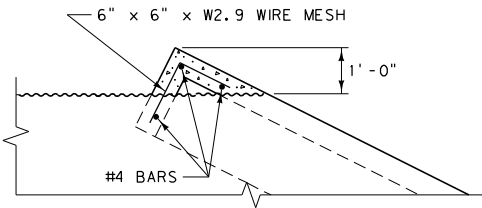
ARCH PIPE



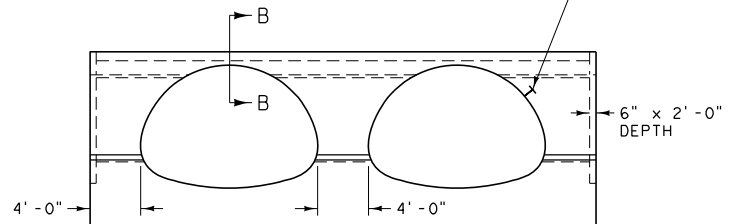
SIDE ELEVATION



FRONT ELEVATION




SECTION B-B

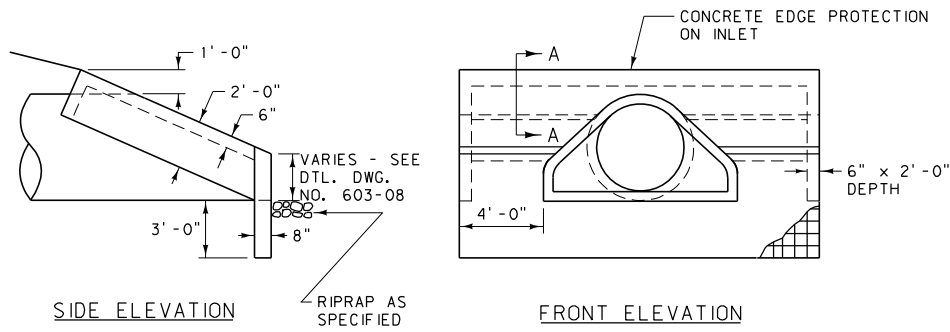


FRONT ELEVATION MULTIPLE PIPES

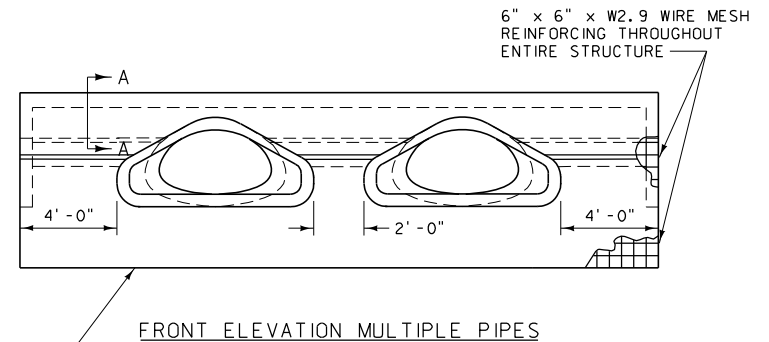
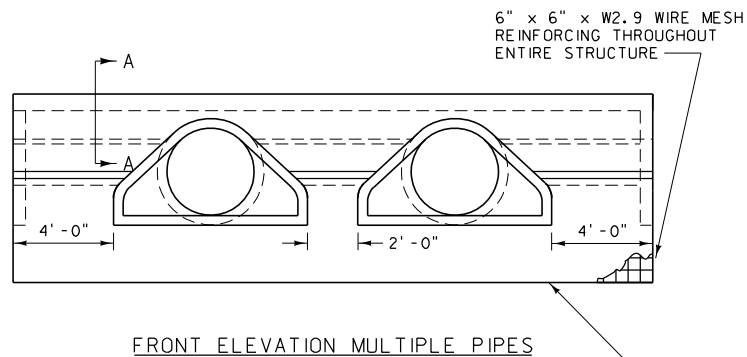
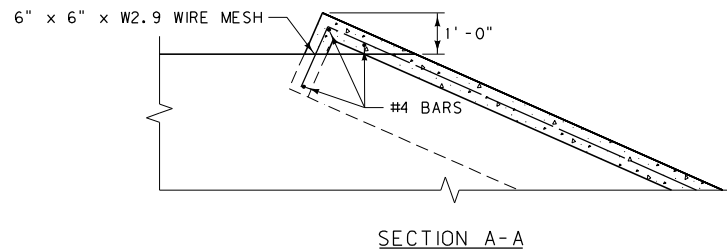
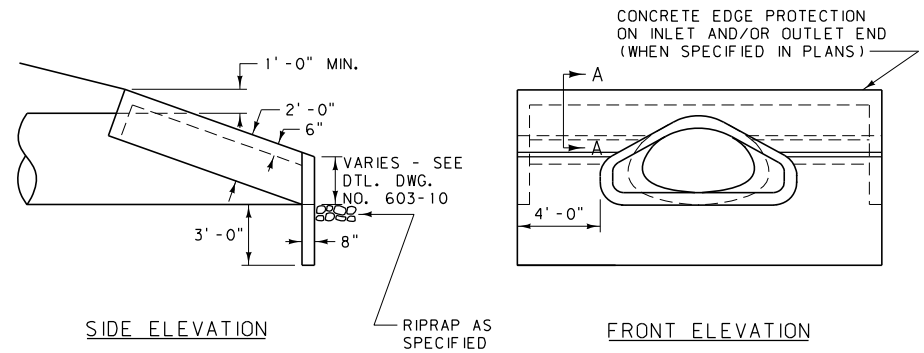
NOTES:
ALL CONCRETE IS CLASS
"DD" OR EQUAL.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 613	DWG. NO. 613-06
CONCRETE EDGE PROTECTION FOR METAL CULVERTS	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	

ROUND PIPE




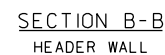
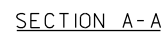
ARCH PIPE



CUTOFF WALL INLET AND OUTLET END SEE DTL. DWG. NO. 552-00 (WHEN SPECIFIED IN PLANS)

NOTES:
ALL CONCRETE IS CLASS
"DD" OR EQUAL.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	613-08
SECTION 603, 613	
CONCRETE EDGE PROTECTION FOR CONCRETE CULVERTS	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	



6' VERTICAL SPACING OR AS NOTED.
8' HORIZONTAL SPACING OR AS NOTED.
JOINTS MAY BE SAWED, MADE WITH
GROOVING TOOLS OR REMOVABLE
INSERTS OF AN APPROVED TYPE.

CAST-IN-PLACE CONCRETE:

LOCATE JOINTS AS INDICATED ON THE PLANS. IF CONSTRUCTION IS STOPPED FOR OVER TWO HOURS, CREATE A CONSTRUCTION JOINT. USE CLASS "D" CONCRETE FOR ALL CAST-IN-PLACE CONCRETE.

USE AN APPROVED 1/2" EXPANSION JOINT FILLER WHENEVER THE CAST-IN-PLACE CONCRETE ABUTS AGAINST ANY PART OF THE BRIDGE STRUCTURE.


CLEAR THE EMBANKMENT SLOPE OF ALL BRUSH, DEBRIS AND RUBBLE. A CUSHION IS NOT REQUIRED FOR GRAVEL EMBANKMENT SLOPES. FINISH ALL SLOPES TO A REASONABLY UNIFORM SURFACE OR TO THE SLOPE INDICATED IN THE BRIDGE PLANS. COMPACT ALL LOOSE MATERIAL TO THE SATISFACTION OF THE ENGINEER. LEAVE THE ADJACENT SLOPE AREA IN A SMOOTH, UNIFORM CONDITION.

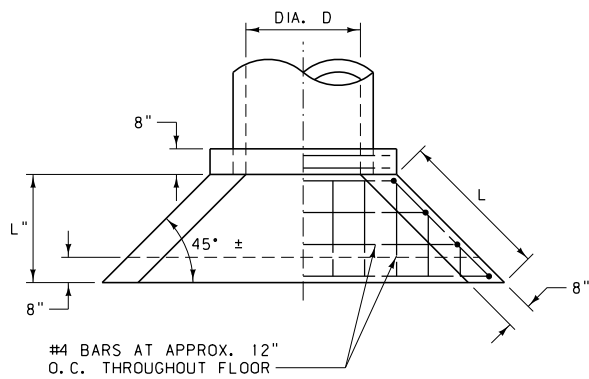
REINFORCING STEEL:

(MAY USE EITHER ALTERNATE LISTED BELOW)

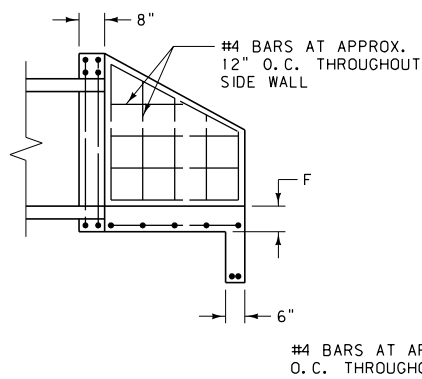
1. #3 BARS AT 10" O.C. (HORIZONTAL AND VERTICAL SPACING) MIN. COVER OF 2"
2. 6" x 6" x W2.9 WIRE MESH

12" OVERLAP REQUIRED AT CONSTRUCTION JOINTS FOR REINFORCING STEEL AND WIRE MESH.

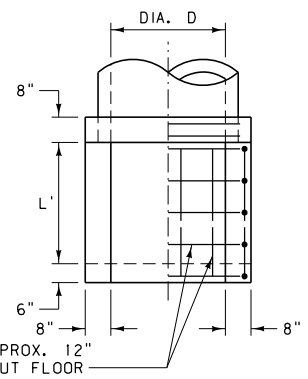
DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 613	DWG. NO. 613-10
CONCRETE SLOPE PROTECTION	
EFFECTIVE: FEBRUARY 2005	
 serving you with pride	MONTANA DEPARTMENT OF TRANSPORTATION



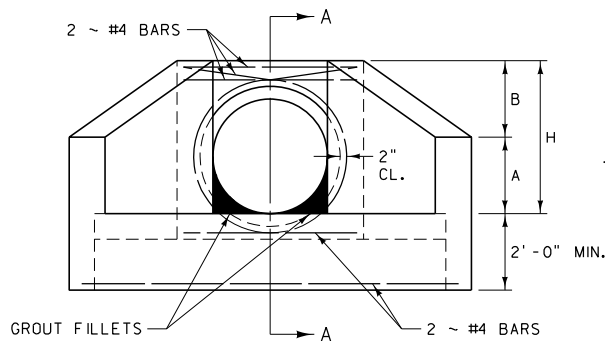
PLAN



SECTION B-B

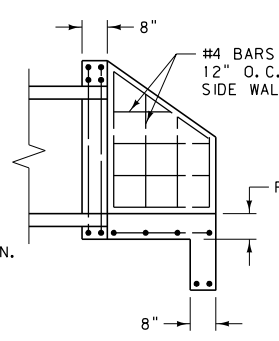


PLAN

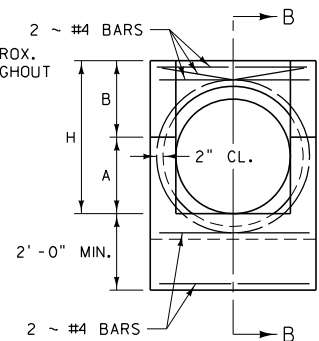


ELEVATION

INLET HEADWALL



SECTION A-A




ELEVATION

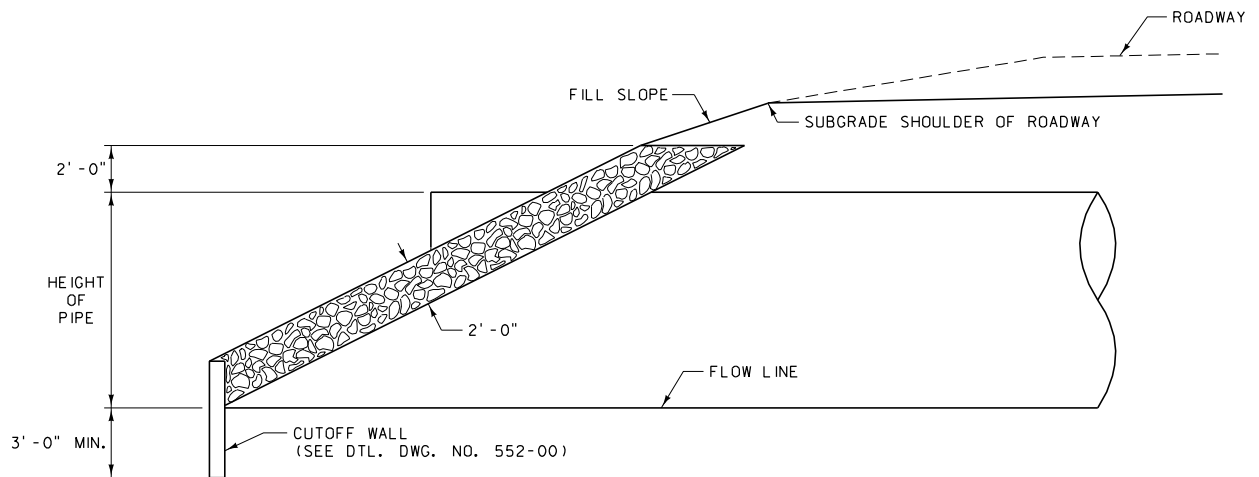
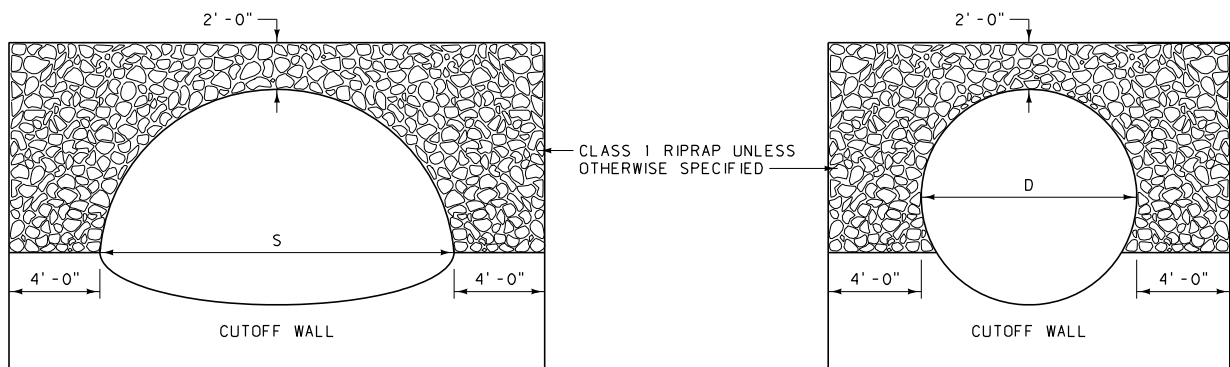
OUTLET HEADWALL

CHAMFER ALL EXPOSED CORNERS 1". REINFORCING STEEL TO BE NOT LESS THAN 1/2" TO NEAREST FACE OF CONCRETE.

INLET AND OUTLET HEADWALLS FOR RCP										
CULVERT		CL. "DD" CONC. OR EQUAL (C. Y.)		DIMENSION TABLE						
DIA. D	AREA (SQ. FT.)	INLET	OUTLET	A	B	H	L	L"	F	L'
18"	1.77	0.80	0.60	1' - 3"	1' - 3"	2' - 6"	2' - 6"	1' - 9"	6 1/2"	2' - 2"
24"	3.14	1.00	0.86	1' - 6"	1' - 6"	3' - 0"	3' - 0"	2' - 1"	7"	2' - 6"
30"	4.91	1.42	1.14	1' - 9"	1' - 9"	3' - 6"	3' - 6"	2' - 6"	7 1/2"	2' - 10"
36"	7.07	1.84	1.43	2' - 0"	2' - 0"	4' - 0"	4' - 0"	2' - 10"	8"	3' - 2"
42"	9.62	2.12	1.73	2' - 3"	2' - 3"	4' - 6"	4' - 6"	3' - 2"	8 1/2"	3' - 6"
48"	12.57	2.34	2.07	2' - 6"	2' - 6"	5' - 0"	5' - 0"	3' - 6"	9"	3' - 10"

INLET AND OUTLET HEADWALLS FOR CMP										
CULVERT		CL. "DD" CONC. OR EQUAL (C. Y.)		DIMENSION TABLE						
DIA. D	AREA (SQ. FT.)	INLET	OUTLET	A	B	H	L	L"	F	L'
18"	1.77	0.73	0.59	1' - 3"	1' - 3"	2' - 6"	2' - 6"	1' - 9"	6"	2' - 2"
24"	3.14	0.91	0.76	1' - 6"	1' - 6"	3' - 0"	3' - 0"	2' - 1"	6"	2' - 6"
30"	4.91	1.06	0.95	1' - 9"	1' - 9"	3' - 6"	3' - 6"	2' - 6"	6"	2' - 10"
36"	7.07	1.68	1.11	2' - 0"	2' - 0"	4' - 0"	4' - 0"	2' - 10"	6"	3' - 2"
42"	9.62	2.10	1.40	2' - 3"	2' - 3"	4' - 6"	4' - 6"	3' - 2"	6"	3' - 6"
48"	12.57	2.32	1.66	2' - 6"	2' - 6"	5' - 0"	5' - 0"	3' - 6"	6"	3' - 10"


DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 613	DWG. NO. 613-12
INLET AND OUTLET HEADWALLS FOR RCP AND CMP PIPES	
EFFECTIVE: FEBRUARY 2005	
 serving you with pride	MONTANA DEPARTMENT OF TRANSPORTATION

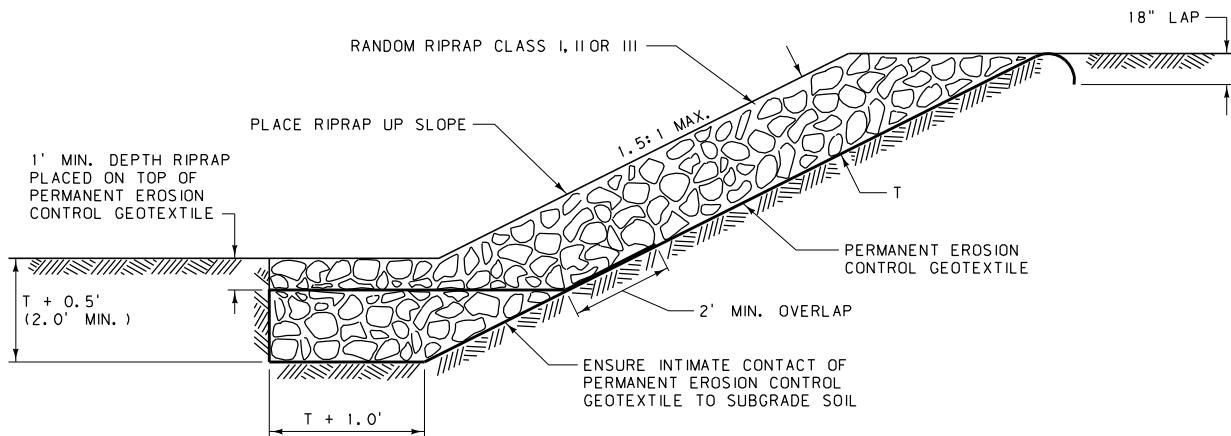


NOTES:

KEY ENDS OF RIPRAP WALLS INTO THE EMBANKMENT SLOPES A MINIMUM OF 2 FEET FROM OUTER FACE OF THE RIPRAP FOR THE FULL HEIGHT OF THE RIPRAP WALL.

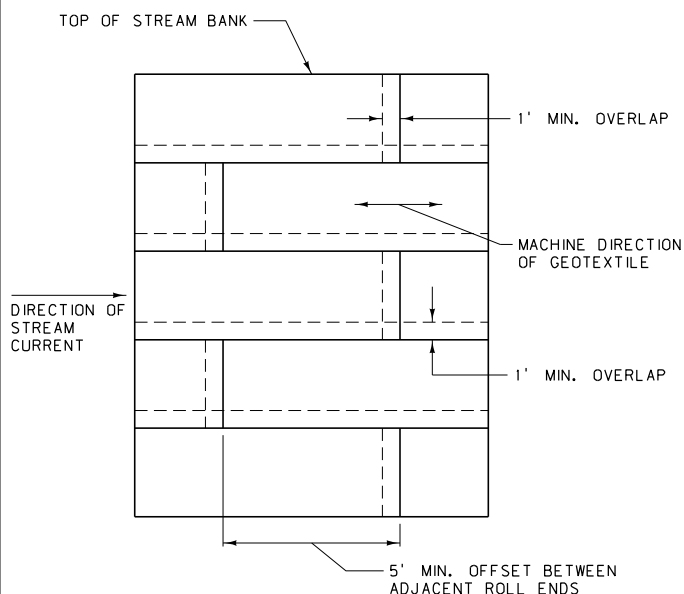
SEE SPECIFICATIONS FOR GRADATION, CLASS AND CONSTRUCTION METHODS.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	613-14
SECTION 613	
CULVERT RIPRAP	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION serving you with pride	



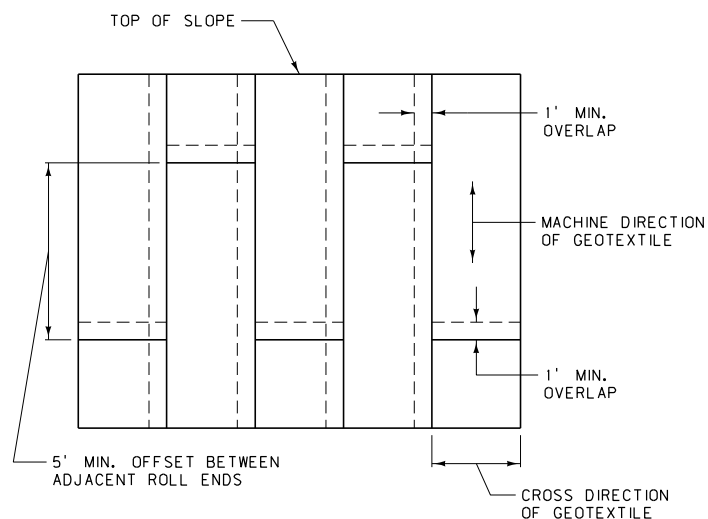
EMBANKMENT PROTECTION

MINIMUM T FOR:
 CLASS I RIPRAP = 1.5'
 CLASS II RIPRAP = 2.5'
 CLASS III RIPRAP = 3.0'



GEOTEXTILE PLACEMENT DETAIL

METHOD FOR PLACING PERMANENT
 EROSION CONTROL GEOTEXTILE FOR
 PROTECTION OF STREAM BANKS




GEOTEXTILE PLACEMENT DETAIL

METHOD FOR PLACING PERMANENT
 EROSION CONTROL GEOTEXTILE FOR
 PROTECTION OF CUT AND FILL SLOPES

NOTES:

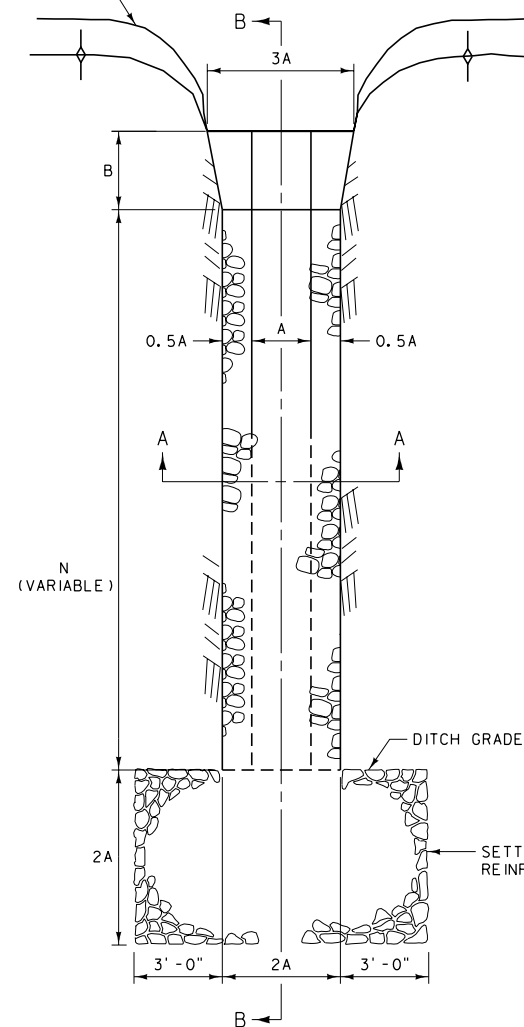
INSTALL PERMANENT EROSION CONTROL GEOTEXTILE
 IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS
 AND MDT STANDARD SPECIFICATIONS SECTION 622.

PROVIDE PERMANENT EROSION CONTROL GEOTEXTILE
 MEETING MDT STANDARD SPECIFICATIONS SECTION 716.

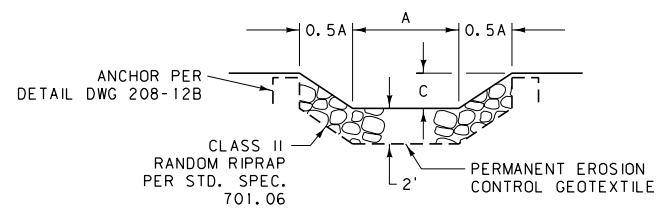
DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 613, 622	DWG. NO. 613-16
EMBANKMENT PROTECTION	
EFFECTIVE: APRIL 2006	
 MONTANA DEPARTMENT OF TRANSPORTATION	

SHOULDER BERM
AS REQUIRED TO
DIRECT DRAINAGE
INTO CHUTE

TURF REINFORCEMENT MAT & RIPRAP DRAINAGE CHUTE

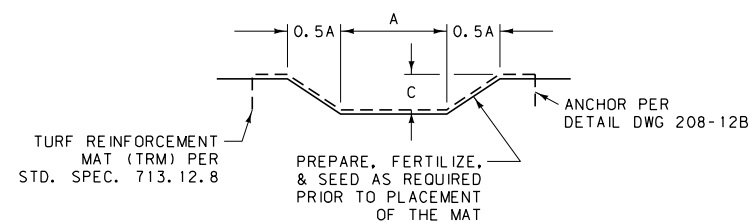


PLAN VIEW



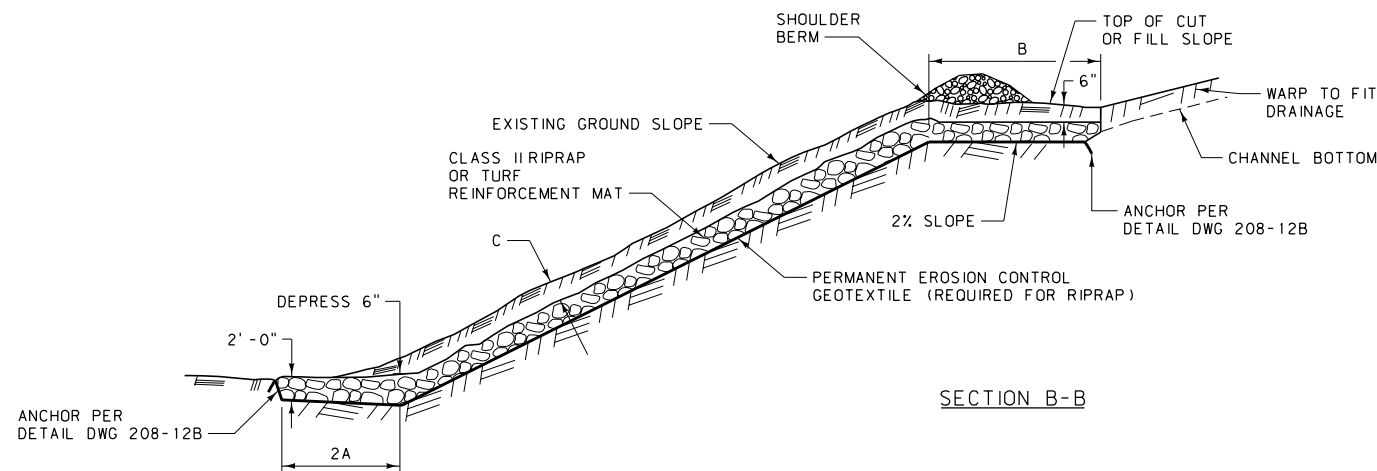
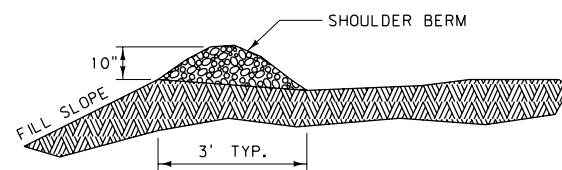
SECTION A-A

RIPRAP CHUTE



SECTION A-A

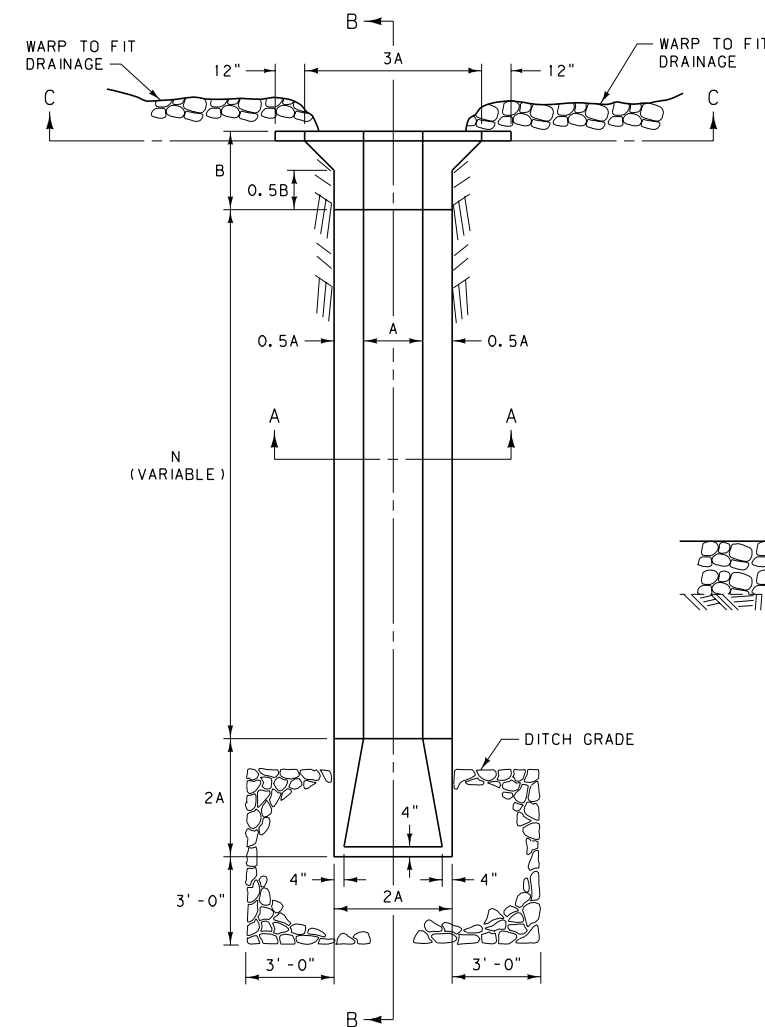
TURF REINFORCEMENT MAT CHUTE



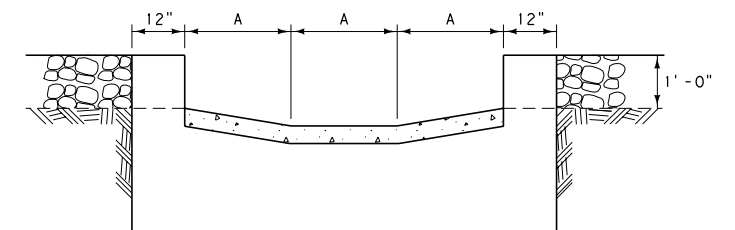
SECTION B-B

TYPE	DIMENSIONS			QUANTITIES	
	A	B	C	RIPRAP	TURF REINFORCEMENT MAT
1	2'-0"	4'-0"	0'-4"	4.44 C.Y. + (N x 0.296) C.Y./L.F.	6.70 S.Y. + (N x 0.457) S.Y./L.F.
2	2'-0"	4'-0"	1'-0"	4.44 C.Y. + (N x 0.296) C.Y./L.F.	6.96 S.Y. + (N x 0.537) S.Y./L.F.
3	4'-0"	8'-0"	1'-0"	14.22 C.Y. + (N x 0.593) C.Y./L.F.	21.65 S.Y. + (N x 0.941) S.Y./L.F.
4	4'-0"	8'-0"	1'-6"	14.22 C.Y. + (N x 0.593) C.Y./L.F.	22.02 S.Y. + (N x 1.000) S.Y./L.F.

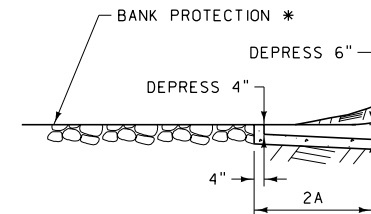
CONCRETE DRAINAGE CHUTE



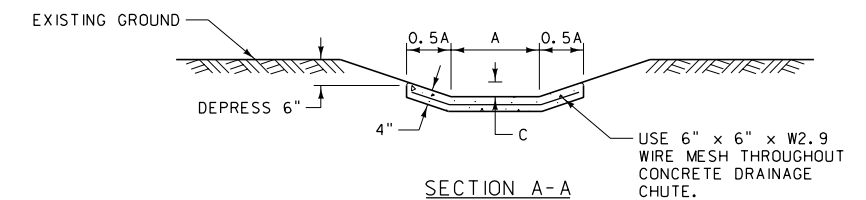
PLAN VIEW



SECTION C-C



SECTION B-B



SECTION A-A

CONCRETE:

USE CLASS "AC" OR "DC" CONCRETE UNLESS OTHERWISE NOTED, CONFORMING TO SECTION 551 OF THE STANDARD SPECIFICATIONS. CONCRETE MAY BE PNEUMATICALLY APPLIED.

* BANK PROTECTION:

USE TYPE III BANK PROTECTION, CONFORMING TO SUBSECTION 613.03.2 OF THE STANDARD SPECIFICATIONS. THICKNESS IS 12" MIN.

INLET CONDITIONS:

DEPRESS THE INLET BELOW THE NATURAL DRAINAGE BASIN TO PREVENT FLOW FROM BYPASSING THE DRAINAGE CHUTE.

TYPE	DIMENSIONS			QUANTITIES	
	A	B	C	CONCRETE	
1	2'-0"	4'-0"	0'-4"	0.7 C.Y. + (N x 0.051) C.Y./L.F.	
2	2'-0"	4'-0"	1'-0"	0.9 C.Y. + (N x 0.056) C.Y./L.F.	
3	4'-0"	8'-0"	1'-0"	2.2 C.Y. + (N x 0.105) C.Y./L.F.	
4	4'-0"	8'-0"	1'-6"	2.3 C.Y. + (N x 0.111) C.Y./L.F.	

DETAILED DRAWING

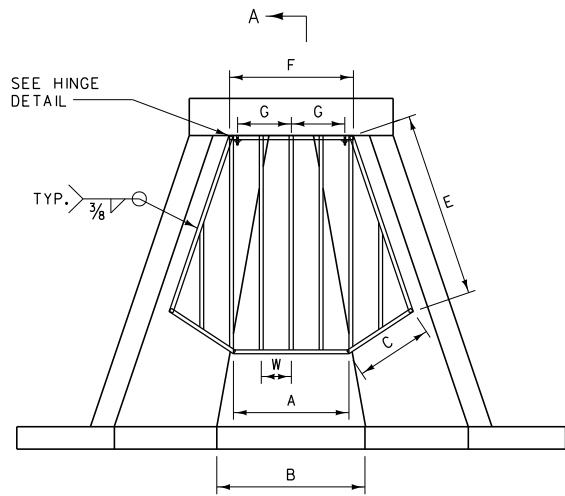
REFERENCE DWG. NO.
STANDARD SPEC. 613-18
SECTION 551.613

DRAINAGE CHUTES

--REVISED--
May 2009

EFFECTIVE: FEBRUARY 2005

MDT MONTANA DEPARTMENT
OF TRANSPORTATION
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PLAN VIEW

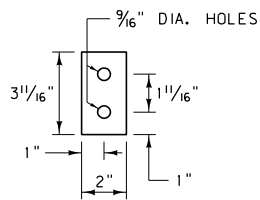
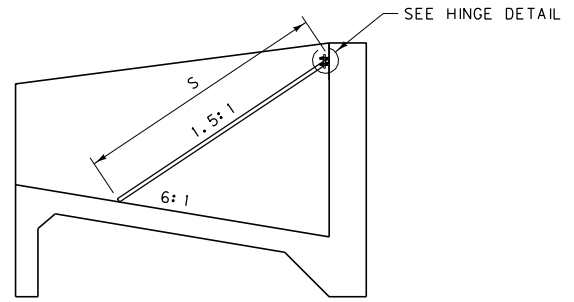
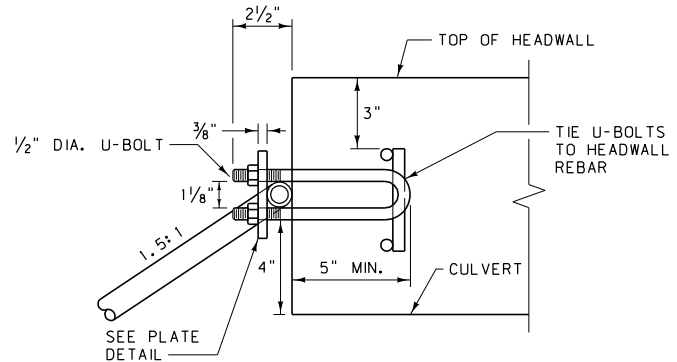


PLATE DETAIL



SECTION A-A



HINGE DETAIL

CSP									
CULVERT DIA. D	DIMENSIONS (FT.)								3/4" GSP *
	B	A	C	E	F	S	W	G	
18"	1.5	1.19	0.74	2.32	0.80	2.76	0.36	0.23	19.54'
18"	2.5	1.97	0.69	2.42	0.80	2.76	0.46	0.27	20.21'
18"	3.5	2.75	0.64	2.57	0.80	2.76	0.43	0.27	24.60'
24"	2.0	1.55	1.07	2.81	1.30	3.48	0.50	0.37	25.26'
24"	3.0	2.28	1.01	2.91	1.30	3.48	0.59	0.46	26.19'
24"	4.0	3.02	0.96	3.03	1.30	3.48	0.51	0.38	31.81'
30"	2.5	1.91	1.40	3.31	1.80	4.20	0.47	0.77	37.99'
30"	3.5	2.22	1.34	3.40	1.80	4.20	0.54	0.77	37.33'
30"	4.5	3.33	1.28	3.51	1.80	4.20	0.60	0.77	38.73'
36"	3.0	2.27	1.73	3.81	2.30	4.92	0.57	1.00	45.20'
36"	4.0	3.96	1.67	3.89	2.30	4.92	0.63	1.00	47.38'
36"	5.0	3.65	1.61	3.99	2.30	4.92	0.56	0.99	53.16'
42"	3.5	2.63	2.06	4.31	2.80	5.64	0.67	1.20	52.15'
42"	4.5	3.31	1.99	4.39	2.80	5.64	0.59	1.00	60.53'
42"	5.5	3.99	1.93	4.81	2.80	5.64	0.63	1.10	61.91'
48"	4.0	2.99	2.38	4.81	3.30	6.37	0.62	1.50	68.28'
48"	5.0	3.66	2.32	4.89	3.30	6.37	0.66	1.50	69.12'
48"	6.0	4.33	2.26	4.97	3.30	6.37	0.59	1.50	79.39'

RCP									
CULVERT DIA. D	DIMENSIONS (FT.)								3/4" GSP *
	B	A	C	E	F	S	W	G	
18"	1.5	1.27	0.80	2.58	0.80	3.06	0.39	0.26	21.38'
18"	2.5	2.14	0.74	2.70	0.80	3.06	0.50	0.27	22.03'
18"	3.5	3.00	0.69	2.87	0.80	3.06	0.46	0.27	27.05'
24"	2.0	1.62	1.14	3.13	1.30	3.84	0.53	0.40	27.50'
24"	3.0	2.46	1.08	3.24	1.30	3.84	0.47	0.34	33.81'
24"	4.0	3.27	1.02	3.38	1.30	3.84	0.55	0.42	34.65'
30"	2.5	2.03	1.48	3.68	1.80	4.62	0.50	0.77	40.94'
30"	3.5	2.81	1.41	3.79	1.80	4.62	0.57	0.77	41.30'
30"	4.5	3.59	1.36	3.91	1.80	4.62	0.52	0.77	48.45'
36"	3.0	2.41	1.82	4.24	2.30	5.41	0.60	1.00	48.83'
36"	4.0	3.16	1.75	4.34	2.30	5.41	0.54	0.95	57.02'
36"	5.0	3.92	1.69	4.44	2.30	5.41	0.60	1.00	57.31'
42"	3.5	2.79	2.16	4.79	2.80	6.19	0.57	1.00	64.85'
42"	4.5	3.53	2.09	4.88	2.80	6.19	0.62	1.10	65.70'
42"	5.5	4.27	2.03	4.99	2.80	6.19	0.67	1.20	66.59'
48"	4.0	3.17	2.49	5.35	3.30	6.97	0.65	1.50	73.74'
48"	5.0	3.90	2.43	5.44	3.30	6.97	0.58	1.50	85.36'
48"	6.0	4.63	2.36	5.53	3.30	6.97	0.63	1.50	85.17'

DIMENSIONS AND QUANTITIES ARE FOR ESTIMATING PURPOSES ONLY.


NOTES:

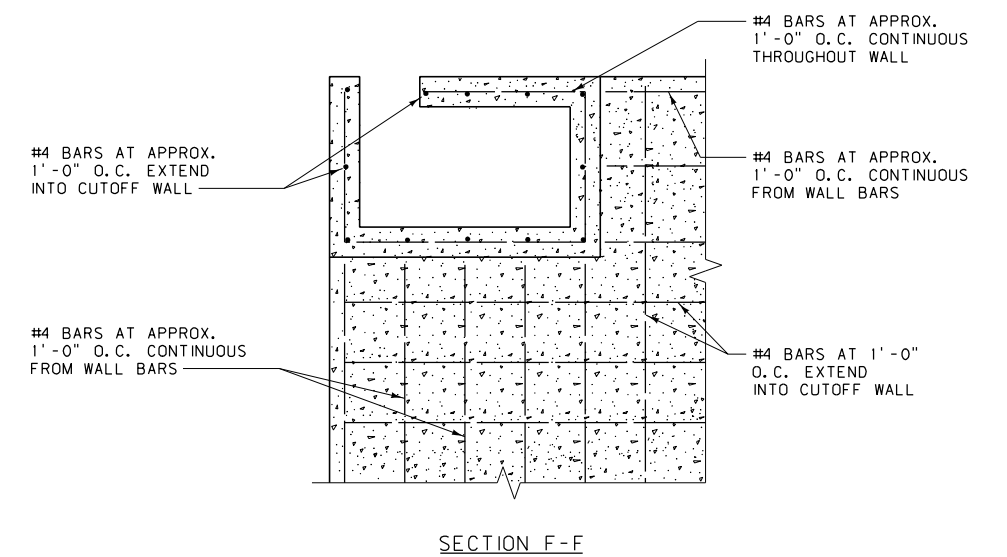
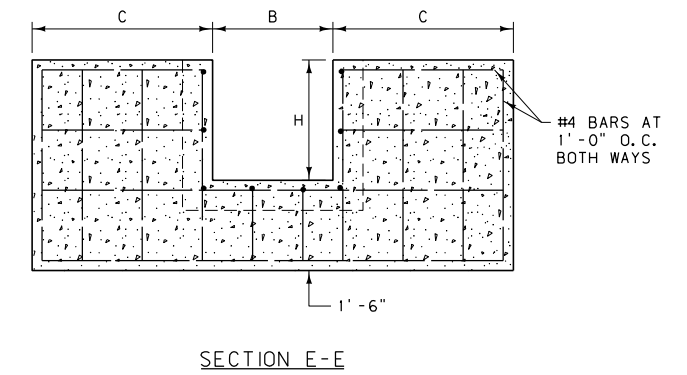
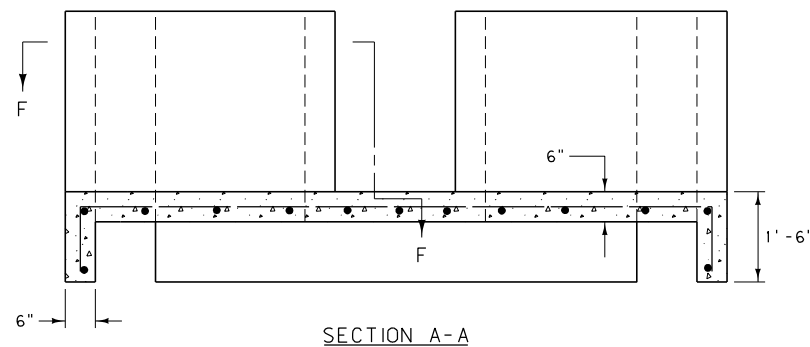
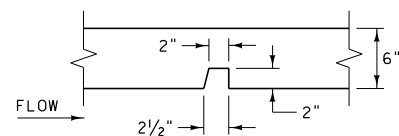
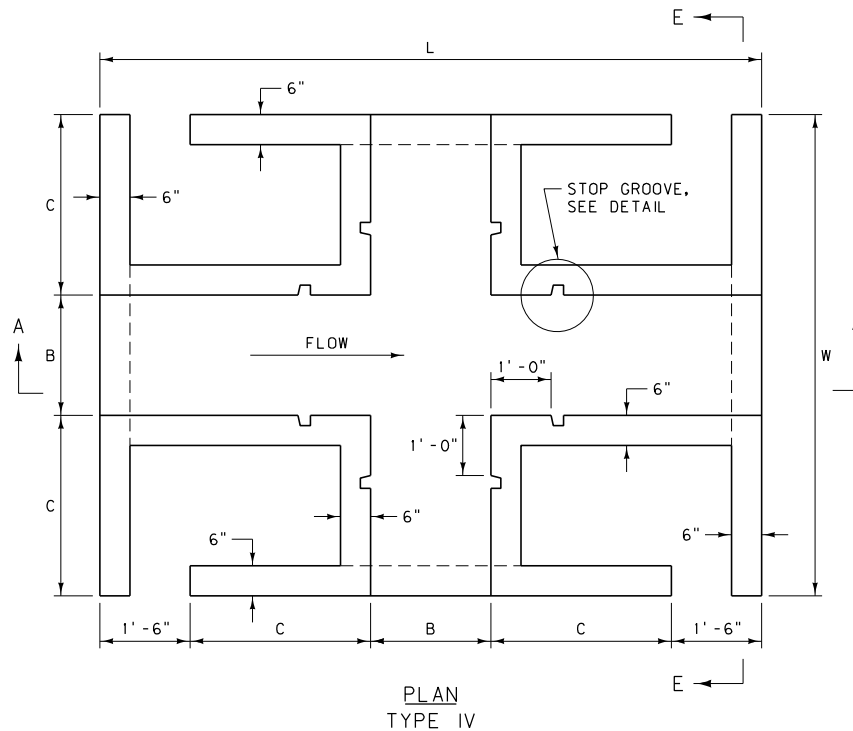
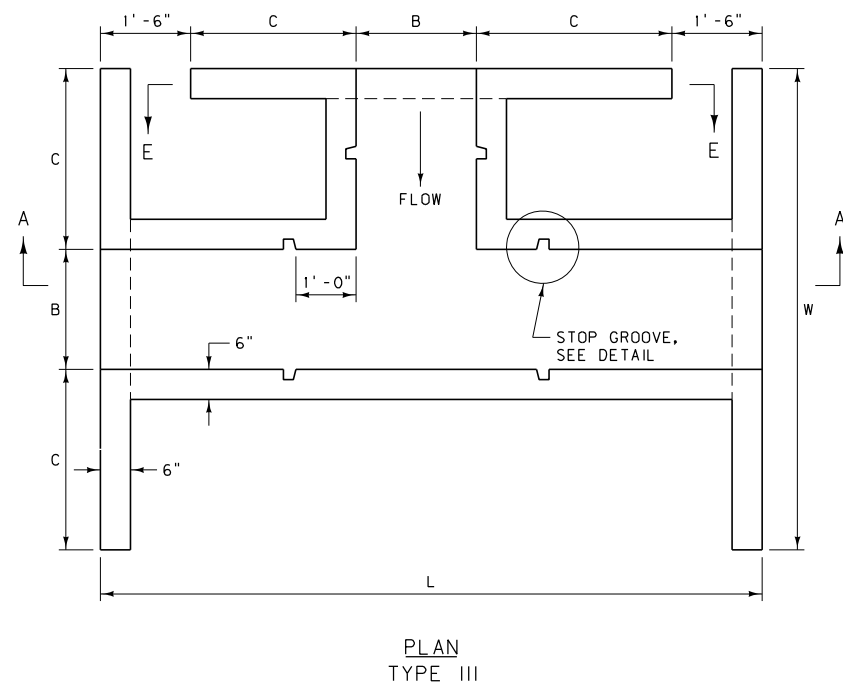
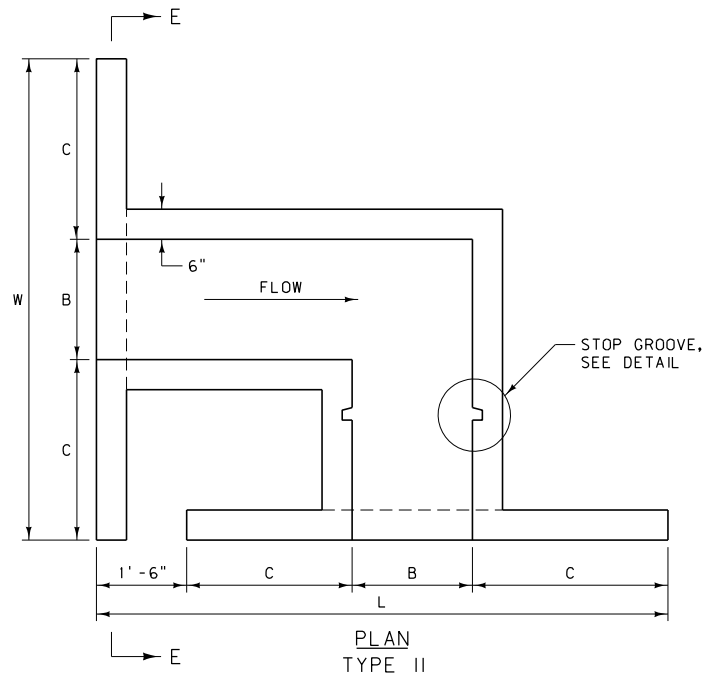
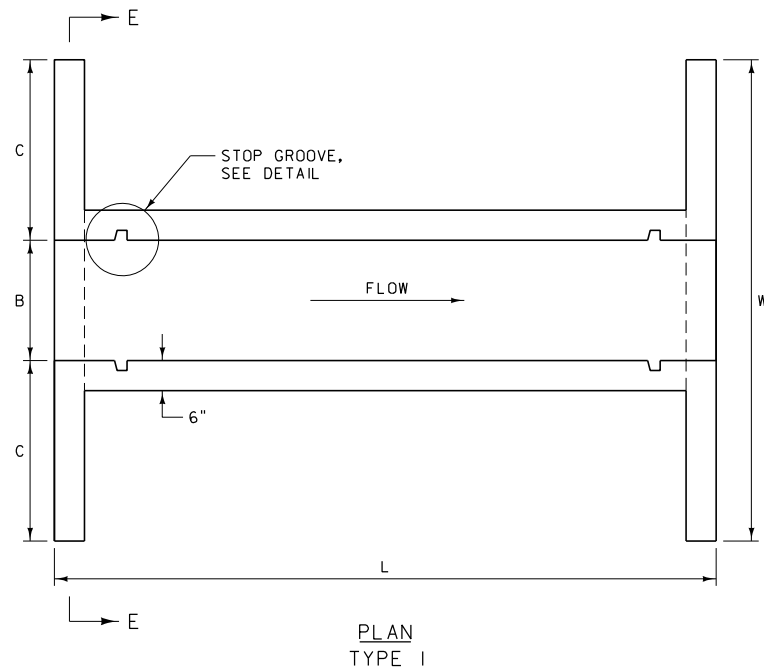
PAINT ALL WELDS AND OTHER NON-GALVANIZED PARTS IN ACCORDANCE WITH SECTION 710 OF THE STANDARD SPECIFICATIONS.

W = CENTER TO CENTER PIPE SPACING.

TWO 1/2" DIA. U-BOLT AND PLATE ASSEMBLIES NEEDED PER TRASHGUARD.

* 3/4" DIA. SCHEDULE 80 GALV. STEEL PIPE (GSP).

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	615-02
SECTION 615	
TRASHGUARD FOR CONCRETE IRRIGATION INLET AND OUTLET TRANSITION STRUCTURES	
EFFECTIVE: FEBRUARY 2005	
 serving you with pride	MONTANA DEPARTMENT OF TRANSPORTATION




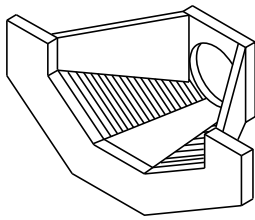
DIMENSIONS AND QUANTITIES							
	B	C	H	L	W	"DD" CONC. OR EQUAL (C.Y.)	REINFORCING STEEL (LB.)
TYPE I	2'-0"	3'-0"	2'-0"	6'-0"	8'-0"	1.5	114.0
	2'-6"	3'-6"	2'-0"	6'-0"	9'-6"	1.7	124.4
	3'-0"	4'-0"	2'-6"	6'-0"	11'-0"	2.2	129.0
TYPE II	2'-0"	3'-0"	2'-0"	9'-6"	8'-0"	2.0	152.0
	2'-6"	3'-6"	2'-0"	11'-0"	9'-6"	2.4	190.0
	3'-0"	4'-0"	2'-6"	12'-6"	11'-0"	3.3	250.8
TYPE III	2'-0"	3'-0"	2'-0"	11'-0"	8'-0"	2.8	212.8
	2'-6"	3'-6"	2'-0"	12'-6"	9'-6"	3.4	258.4
	3'-0"	4'-0"	2'-6"	14'-0"	11'-0"	4.6	349.6
TYPE IV	2'-0"	3'-0"	2'-0"	11'-0"	8'-0"	3.4	266.0
	2'-6"	3'-6"	2'-0"	12'-6"	9'-6"	4.2	319.2
	3'-0"	4'-0"	2'-6"	14'-0"	11'-0"	5.6	425.6

NOTES:

DIVISION BOX MAY BE MODIFIED IF DESIRED WITH DIMENSIONS SHOWN ON THE PLANS.

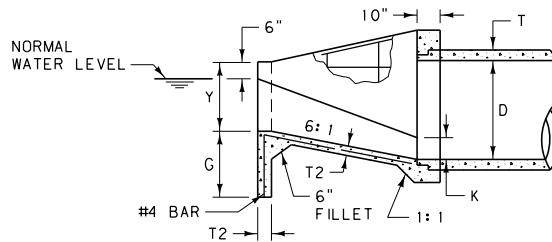
QUANTITIES ARE FOR ESTIMATING PURPOSES ONLY.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 552.615	DWG. NO. 615-04
STANDARD CONCRETE IRRIGATION DIVISION BOXES	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	



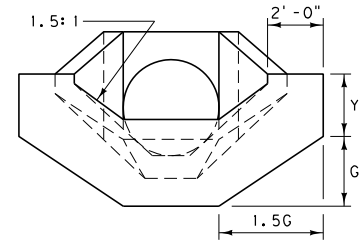
ISOMETRIC VIEW OF TRANSITION

PLACE REBAR IN CENTER OF WALLS, SLAB, ETC. UNLESS OTHERWISE SPECIFIED.

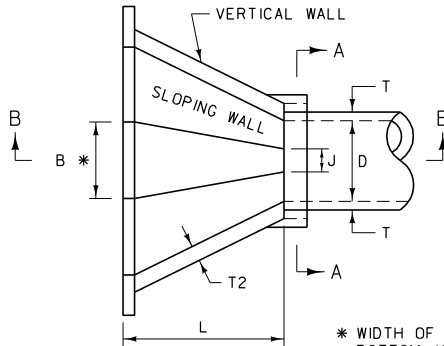


SECTION B-B

SPACE REINFORCING BARS APPROX. 12" EACH WAY THROUGHOUT STRUCTURE. USE CONTINUOUS BARS IN FLOORS AND WALLS WHENEVER POSSIBLE. WHEN SPLICES ARE MADE, LAP REINFORCING BAR 1'-6".

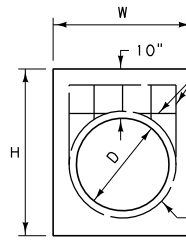


ELEVATION

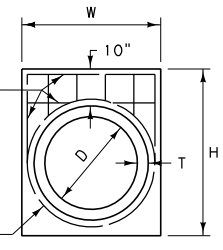


PLAN VIEW

* WIDTH OF CHANNEL BOTTOM (VARIABLE - SEE TABLE)



SECTION A-A FOR CSP



SECTION A-A FOR RCP

CHAMFER ALL EXPOSED CORNERS TO 1".

INLET AND OUTLET CONCRETE TRANSITIONS FOR CSP

CULVERT		DIMENSIONS								QUANTITIES									
										B = D			B = D + 1' - 0"			B = D + 2' - 0"			
DIA.	D	AREA (SQ. FT.)	J	H	L	T2	W	K	Y	G	B	CL"DD" CONC. (C. Y.)	#4 REBAR (LB.)	B	CL"DD" CONC. (C. Y.)	#4 REBAR (LB.)	B	CL"DD" CONC. (C. Y.)	#4 REBAR (LB.)
18"	1.77	0.45'	3' - 5"	3' - 0"	6"	2' - 9"	0.35'	1' - 3"	2' - 0"	1' - 6"	0.8	66	2' - 6"	0.9	73	3' - 6"	1.0	81	
24"	3.14	0.61'	4' - 0"	4' - 0"	6"	3' - 3"	0.46'	1' - 6"	2' - 0"	2' - 0"	1.2	94	3' - 0"	1.3	103	4' - 0"	1.4	112	
30"	4.91	0.76'	4' - 6"	5' - 0"	6"	3' - 9"	0.58'	1' - 9"	2' - 0"	2' - 6"	1.6	124	3' - 6"	1.7	134	4' - 6"	1.8	144	
36"	7.07	0.91'	5' - 1"	6' - 0"	6"	4' - 3"	0.70'	2' - 0"	2' - 6"	3' - 0"	2.1	162	4' - 0"	2.2	173	5' - 0"	2.3	184	
42"	9.62	1.10'	5' - 8"	7' - 0"	6"	4' - 9"	0.81'	2' - 3"	2' - 6"	3' - 6"	2.6	200	4' - 6"	2.7	212	5' - 6"	2.9	225	
48"	12.57	1.20'	6' - 3"	8' - 0"	8"	5' - 3"	0.93'	2' - 6"	2' - 6"	4' - 0"	4.1	245	5' - 0"	4.3	259	6' - 0"	4.4	272	

INLET AND OUTLET CONCRETE TRANSITIONS FOR RCP

CULVERT		DIMENSIONS									QUANTITIES									
											B = D			B = D + 1' -0"			B = D + 2' -0"			
DIA.	D	AREA (SQ. FT.)	J	H	L	T	T2	W	K	Y	G	B	CL"DD" CONC. (C. Y.)	#4 REBAR (LB.)	B	CL"DD" CONC. (C. Y.)	#4 REBAR (LB.)	B	CL"DD" CONC. (C. Y.)	#4 REBAR (LB.)
18"		1. 77	0.45'	3' -8"	3' -0"	2½"	6"	3' -2"	0.35'	1' -3"	2' -0"	1' -6"	0.9	68	2' -6"	1.0	76	3' -6"	1.0	83
24"		3. 14	0.61'	4' -3"	4' -0"	3"	6"	3' -9"	0.46'	1' -6"	2' -0"	2' -0"	1.2	98	3' -0"	1.3	107	4' -0"	1.4	116
30"		4. 91	0.76'	4' -10"	5' -0"	3½"	6"	4' -4"	0.58'	1' -9"	2' -0"	2' -6"	1.7	128	3' -6"	1.8	138	4' -6"	1.9	149
36"		7. 07	0.91'	5' -6"	6' -0"	4"	6"	4' -11"	0.70'	2' -0"	2' -6"	3' -0"	2.2	168	4' -0"	2.3	179	5' -0"	2.4	190
42"		9. 62	1.10'	6' -1"	7' -0"	4½"	6"	5' -6"	0.81'	2' -3"	2' -6"	3' -6"	2.7	212	4' -6"	2.8	224	5' -6"	2.9	237
48"		12. 57	1.20'	6' -8"	8' -0"	5"	8"	6' -1"	0.93'	2' -6"	2' -6"	4' -0"	4.2	254	5' -0"	4.3	267	6' -0"	4.6	287

NOTES:

INSTALL STRUCTURES OUTSIDE THE CLEAR ZONE.

PROVIDE TRASHRACKS WHEN REQUIRED. SEE DTL.
DWG. NO. 615-02.

DETAILED DRAWING

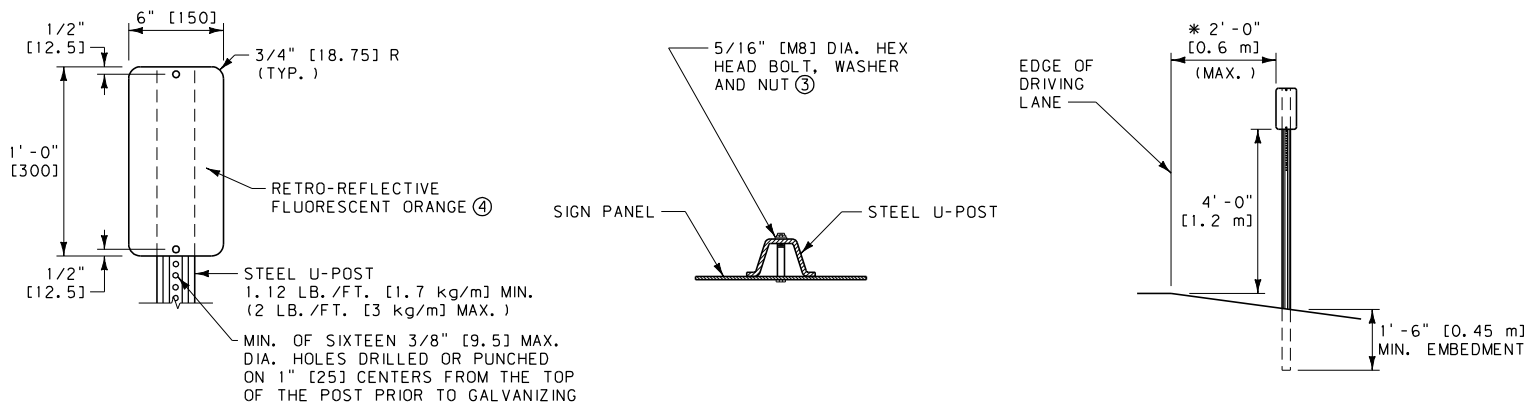
REFERENCE DWG. NO.
STANDARD SPEC. 615-06
SECTION 615

CONCRETE IRRIGATION INLET
AND OUTLET TRANSITION FOR
RCP AND CSP PIPES

-- REVISED --
January 2008

EFFECTIVE: FEBRUARY 2005

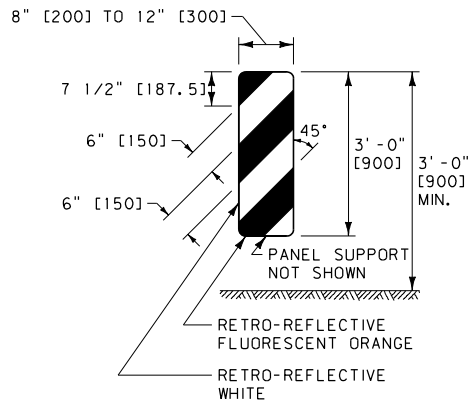
MDT MONTANA DEPARTMENT
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TYPE 2 OBJECT MARKER

TYPE 2 OBJECT MARKER NOTES:

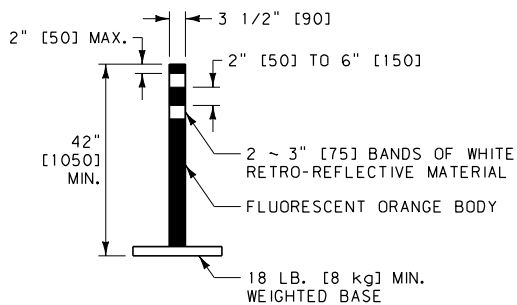
- ① USE TYPE 2 OBJECT MARKERS TO DELINEATE ROADSIDE CONSTRICTIONS OF THE CLEAR ZONE (I.e., DROP OFFS, OBSTACLES, ABRUPT CHANGES IN ROADWAY ALIGNMENT, ETC.)
 - ② DO NOT USE TYPE 2 OBJECT MARKERS AS CHANNELIZING DEVICES.
 - ③ ATTACH PANELS TO POSTS AT BOTH TOP AND BOTTOM HOLE LOCATIONS.
 - ④ USE RETRO-REFLECTIVE SHEETING AS PER THE CONTRACT.
- * REDUCE OR ELIMINATE THE 2' - 0" [0.6 m] DISTANCE WHEN OBSTACLE OR HAZARD IS LESS THAN 2' - 0" [0.6 m] FROM THE EDGE OF THE DRIVING LANE.



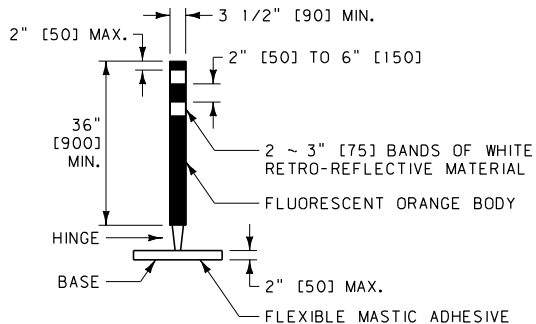
PORTABLE VERTICAL PANEL
(VP-1R SHOWN. REVERSE FOR VP-1L.)

PORTABLE VERTICAL PANEL NOTES:

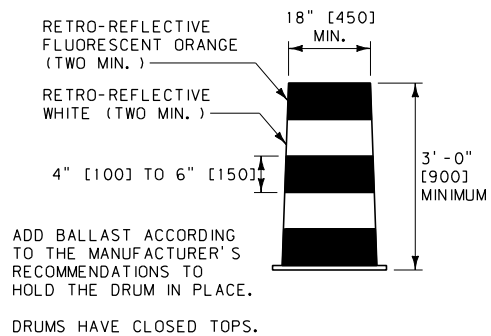
- ① USE PORTABLE VERTICAL PANELS AS CHANNELIZING DEVICES ONLY. DO NOT USE PORTABLE VERTICAL PANELS TO DELINEATE ROADSIDE CONSTRICTIONS OF THE CLEAR ZONE.
- ② VERTICAL PANELS DESIGNATED "R" ARE PLACED TO THE RIGHT SIDE OF APPROACHING TRAFFIC. THOSE DESIGNATED "L" ARE PLACED TO THE LEFT SIDE.
- ③ USE RETRO-REFLECTIVE SHEETING AS PER THE CONTRACT.



FLEXIBLE GUIDE POST
(TUBULAR MARKER)



HINGED FLEXIBLE GUIDE POST
(TUBULAR MARKER)
(SELF RIGHTING AFTER IMPACT)



PLASTIC DRUM

FLEXIBLE GUIDE POST AND PLASTIC DRUM NOTES:

- ① USE FLEXIBLE GUIDE POSTS AND PLASTIC DRUMS AS CHANNELIZING DEVICES.
- ② USE ASTM TYPE III RETRO-REFLECTIVE SHEETING ON ALL PLASTIC DRUMS AND FLEXIBLE GUIDE POSTS.

GENERAL NOTES:

- ① SEE THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) PART 6 FOR ADDITIONAL INFORMATION.

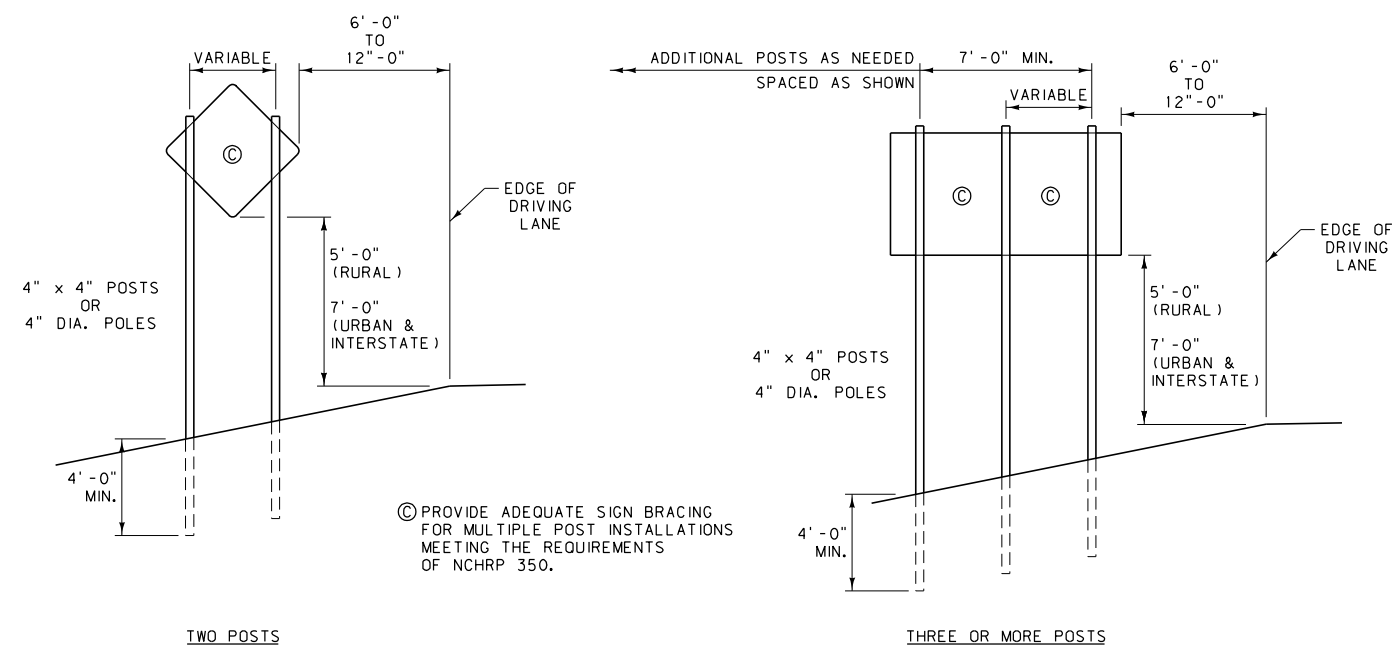
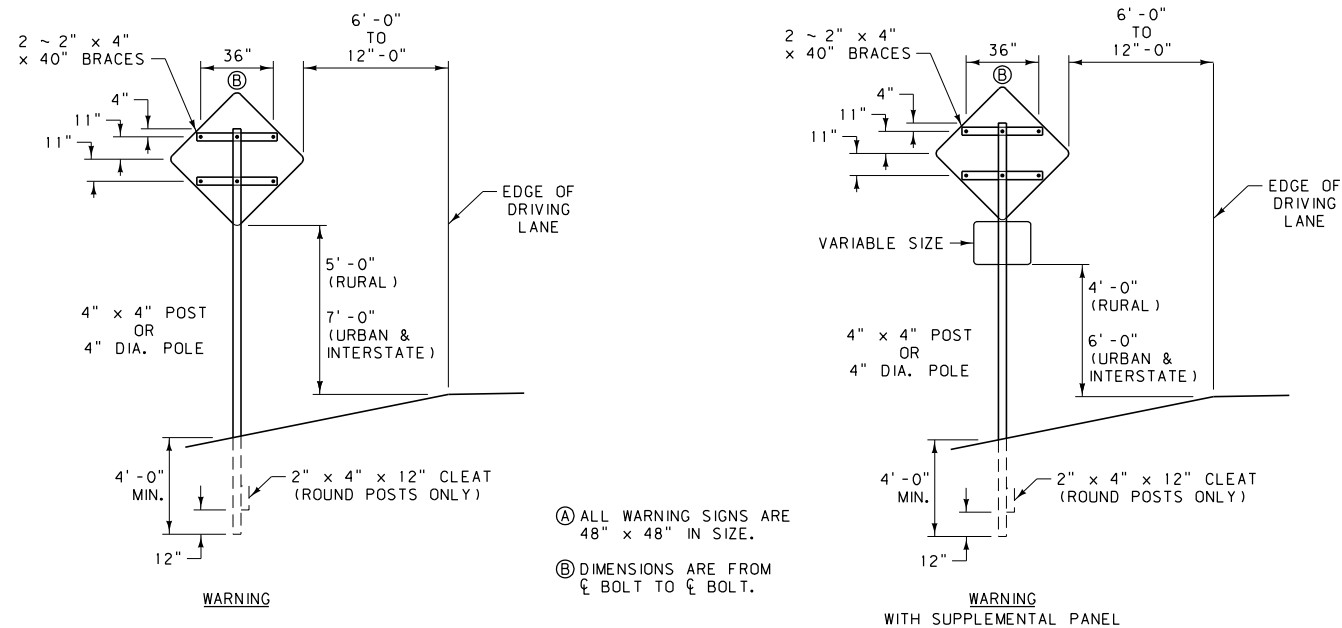
UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	618-00
SECTION 618	

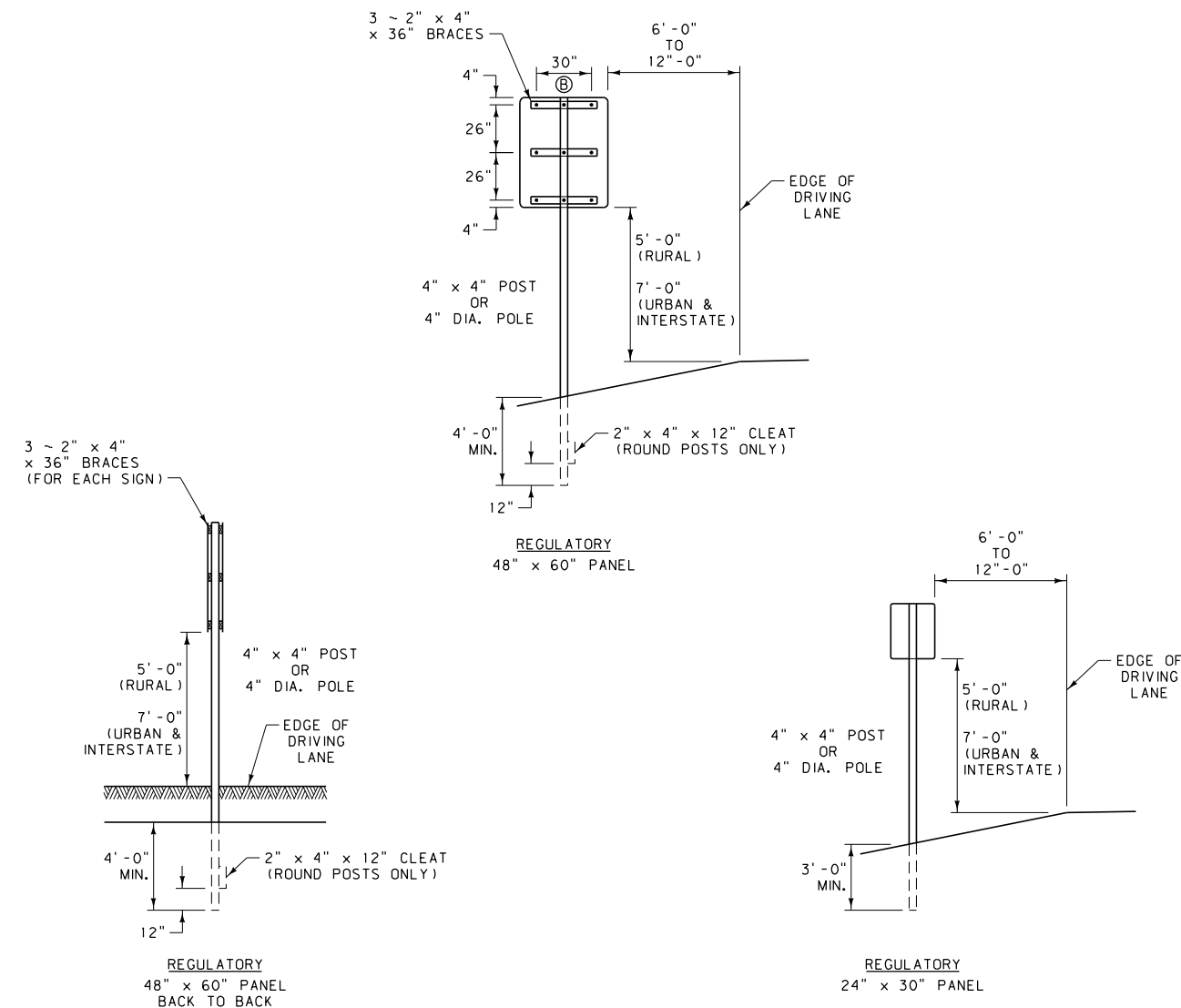
CHANNELIZING DEVICES
AND OBJECT MARKERS

--REVISED--	EFFECTIVE: APRIL 2006
September 2010	

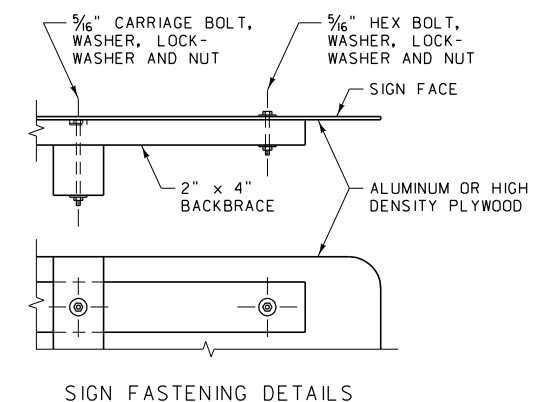
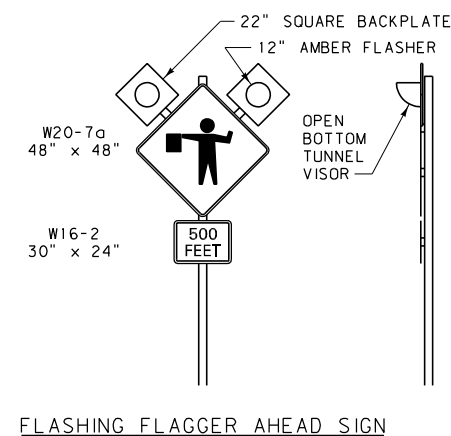
MDT MONTANA DEPARTMENT OF TRANSPORTATION



TYPICAL MULTIPLE POST INSTALLATIONS
(FOR CONSTRUCTION SIGNING ONLY)




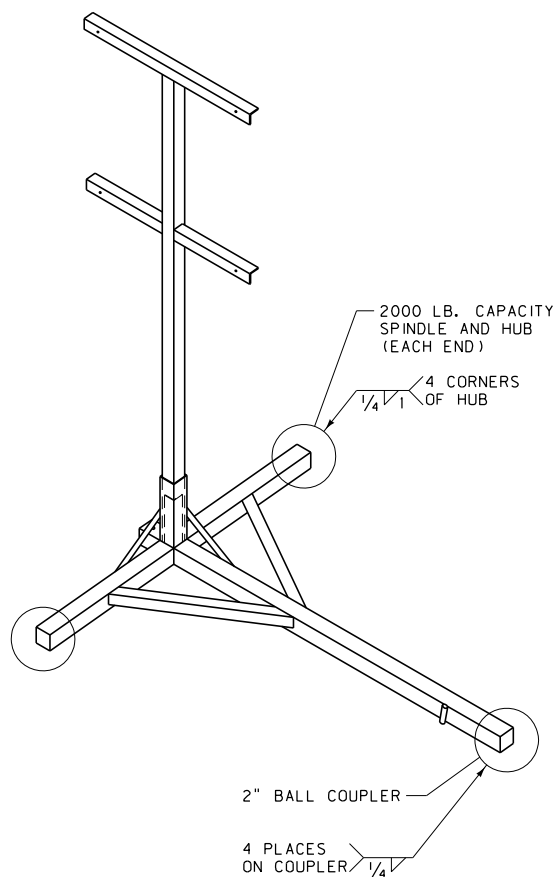
TYPICAL SIGN MOUNTINGS
(FOR CONSTRUCTION SIGNING ONLY)



NOTES:

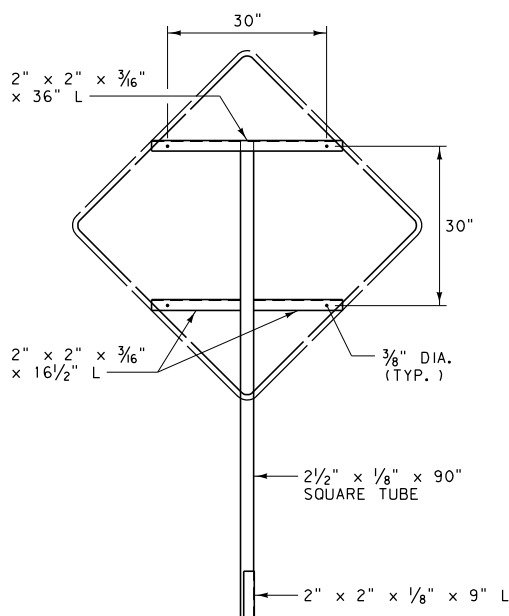
- FURNISH AND INSTALL POSTS OR POLES MEETING NCHRP 350 REQUIREMENTS.
- FURNISH POST OR POLE LENGTHS TO ACCOMMODATE THE FOUNDATION DEPTH, THE MOUNTING HEIGHT AND THE MOUNTINGS
- BACKFILL FOUNDATION HOLES IN 8" LIFTS, THOROUGHLY TAMPING EACH LIFT.
- IN HIGH WIND AREAS INSTALL LARGER POSTS OR POLES COMPLYING WITH THE FOUNDATION AND BREAKAWAY REQUIREMENTS OF DTL. DWG. NO. 619-20. THE MINIMUM POST SPACING FOR MULTIPLE POSTS LARGER THAN 4" IS 7'-0".
- VERTICAL ALIGNMENT OF SIGNS IS TO BE WITHIN 5° OF PLUMB (1" IN 1').
- USE THE URBAN MOUNTING HEIGHTS IN BUSINESS, COMMERCIAL, AND RESIDENTIAL DISTRICTS WHERE PARKING AND/OR PEDESTRIAN MOVEMENT IS LIKELY TO OCCUR, OR WHERE THERE ARE OTHER OBSTRUCTIONS TO VIEW. URBAN MOUNTING HEIGHTS MAY ALSO BE USED IN RURAL AREAS FOR INCREASED VISIBILITY.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 618	DWG. NO. 618-01
CONSTRUCTION SIGN DETAILS	
EFFECTIVE: FEBRUARY 2005	
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NOTES:

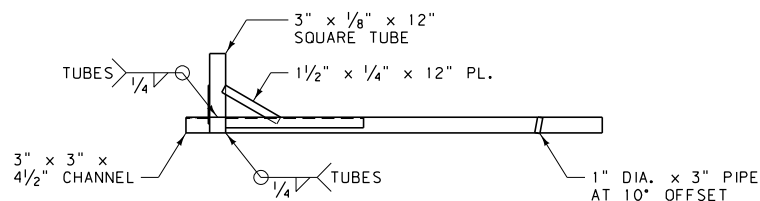
- ① THE MAXIMUM WEIGHT OF THE ASSEMBLY IS 250 POUNDS.
- ② USE A 14" WHEEL AND TIRE.
- ③ AUTOMOTIVE AND EQUIPMENT AXLE ASSEMBLIES MAY NOT BE USED FOR TRAILER-MOUNTED SIGN SUPPORTS.
- ④ OTHER NCHRP 350 CRASH TESTED ASSEMBLIES ARE ACCEPTABLE.



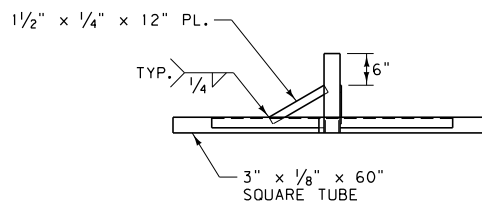
FRONT

RIGHT

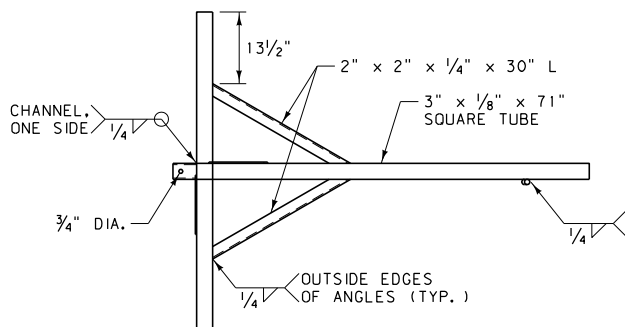
SIGN SUPPORT



FRONT




RIGHT

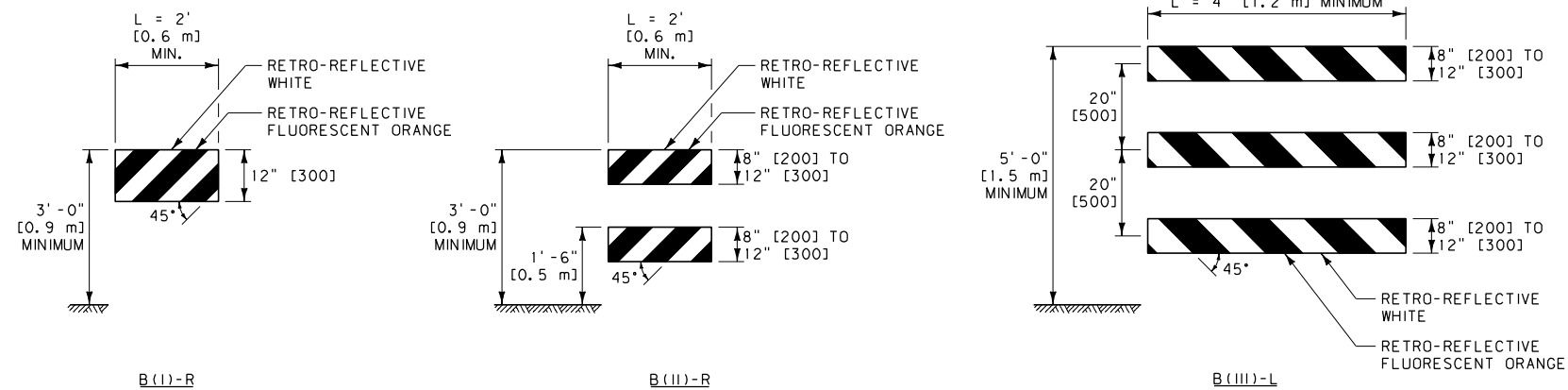


TOP

TRAILER

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	618-02
SECTION 618.715	
PORTABLE SIGN SUPPORT ASSEMBLY	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	

PORTABLE BARRICADES



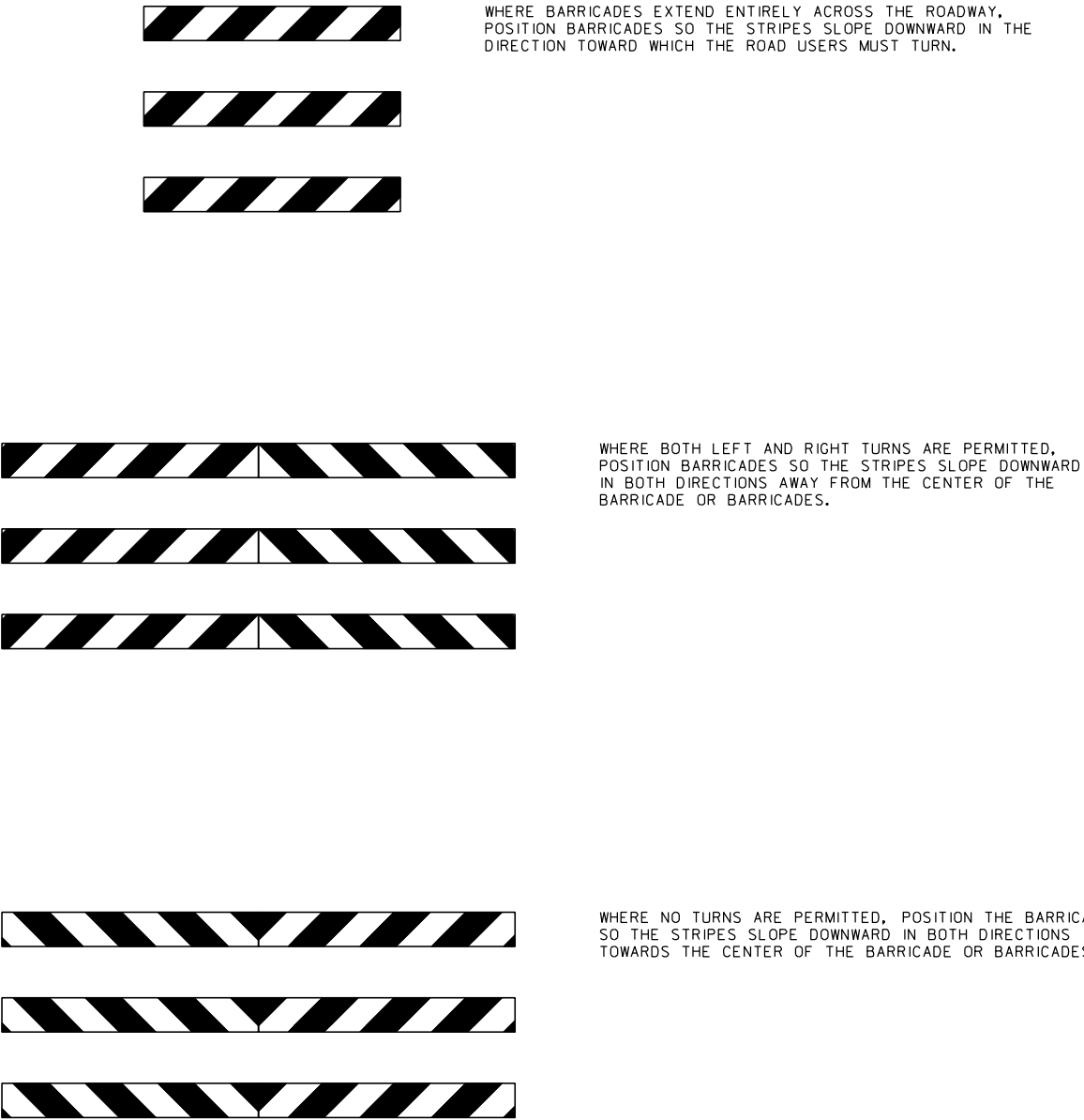
PORTABLE BARRICADE NOTES:

- RAIL STRIPES ARE 6" [150] IN WIDTH FOR BARRICADES 3' [0.9 m] OR GREATER IN LENGTH. FOR BARRICADES LESS THAN 3' [0.9 m] IN LENGTH, 4" [100] STRIPES MAY BE USED.
- THE PREDOMINANT COLOR FOR OTHER BARRICADE COMPONENTS IS WHITE, BUT UNPAINTED GALVANIZED METAL OR ALUMINUM COMPONENTS MAY BE USED.
- WHERE B(III) BARRICADES ARE TO FACE TRAFFIC FROM TWO DIRECTIONS, STRIPING ON BOTH THE FRONT AND REAR SIDES IS REQUIRED.
- USE MATERIALS FOR BARRICADE FRAMEWORK AND ASSEMBLY, INCLUDING ANY SIGNS AND MEANS OF ATTACHMENT, THAT MEET THE REQUIREMENTS FOR NCHRP 350 FOR WORK ZONE DEVICES. AS AN OPTION, SIGNS MAY BE MOUNTED DIRECTLY BEHIND BARRICADES ON SEPARATE SIGN SUPPORTS MEETING NCHRP 350 CRITERIA.
- USE SANDBAGS OF SUFFICIENT WEIGHT TO HOLD THE BARRICADES IN PLACE. WATERPROOF SANDBAGS DURING PERIODS OF FREEZING WEATHER.
- USE RETRO-REFLECTIVE SHEETING AS PER THE CONTRACT.

GENERAL NOTES:

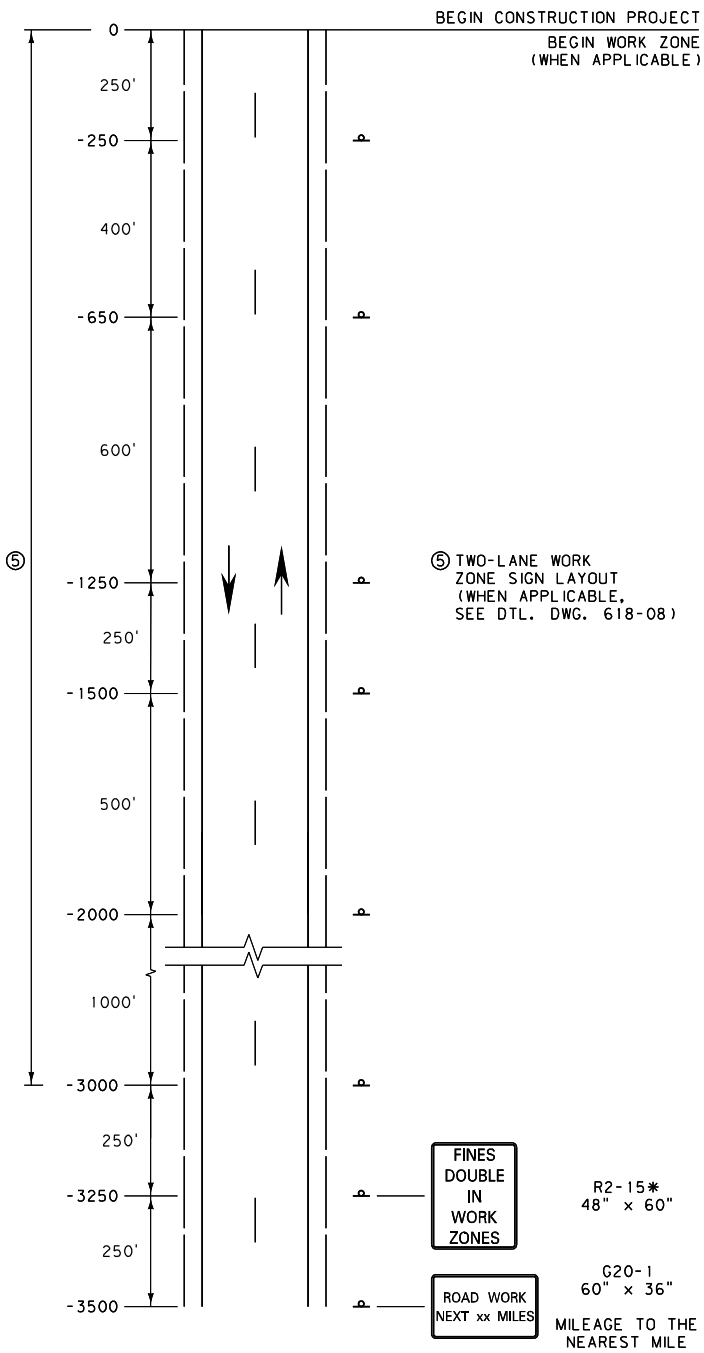
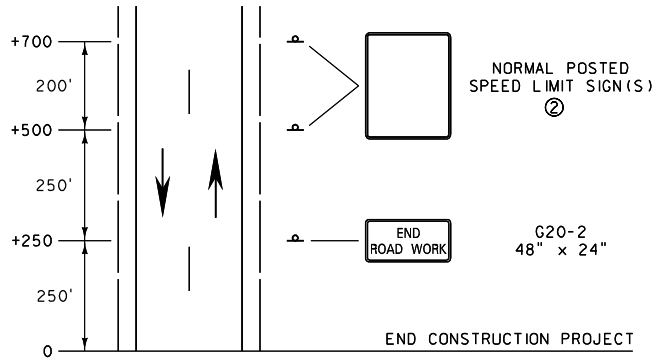
- SEE THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) PART 6 FOR ADDITIONAL INFORMATION.

RAIL STRIPES




UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

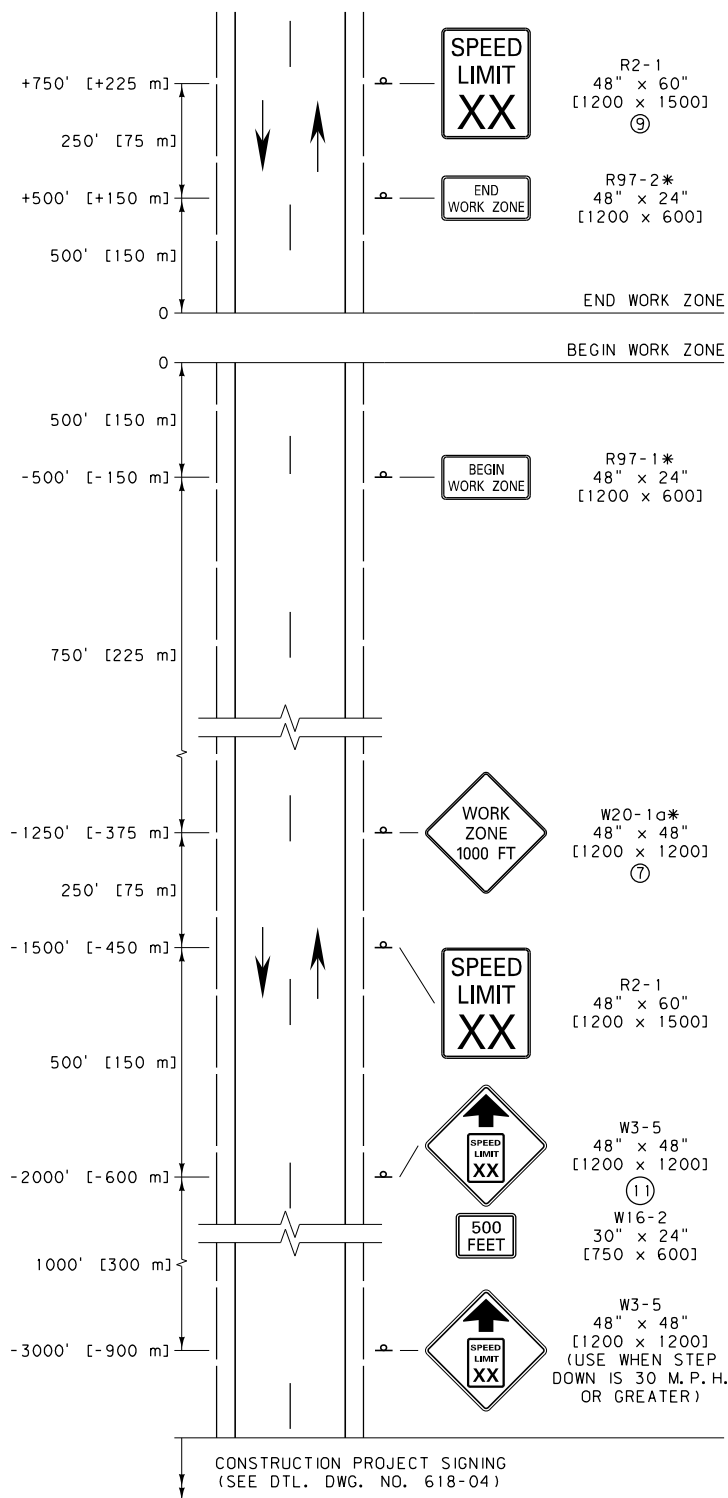
DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	618-03
SECTION 618	
BARRICADES	
EFFECTIVE: SEPTEMBER 2010	
MDT★ MONTANA DEPARTMENT OF TRANSPORTATION	



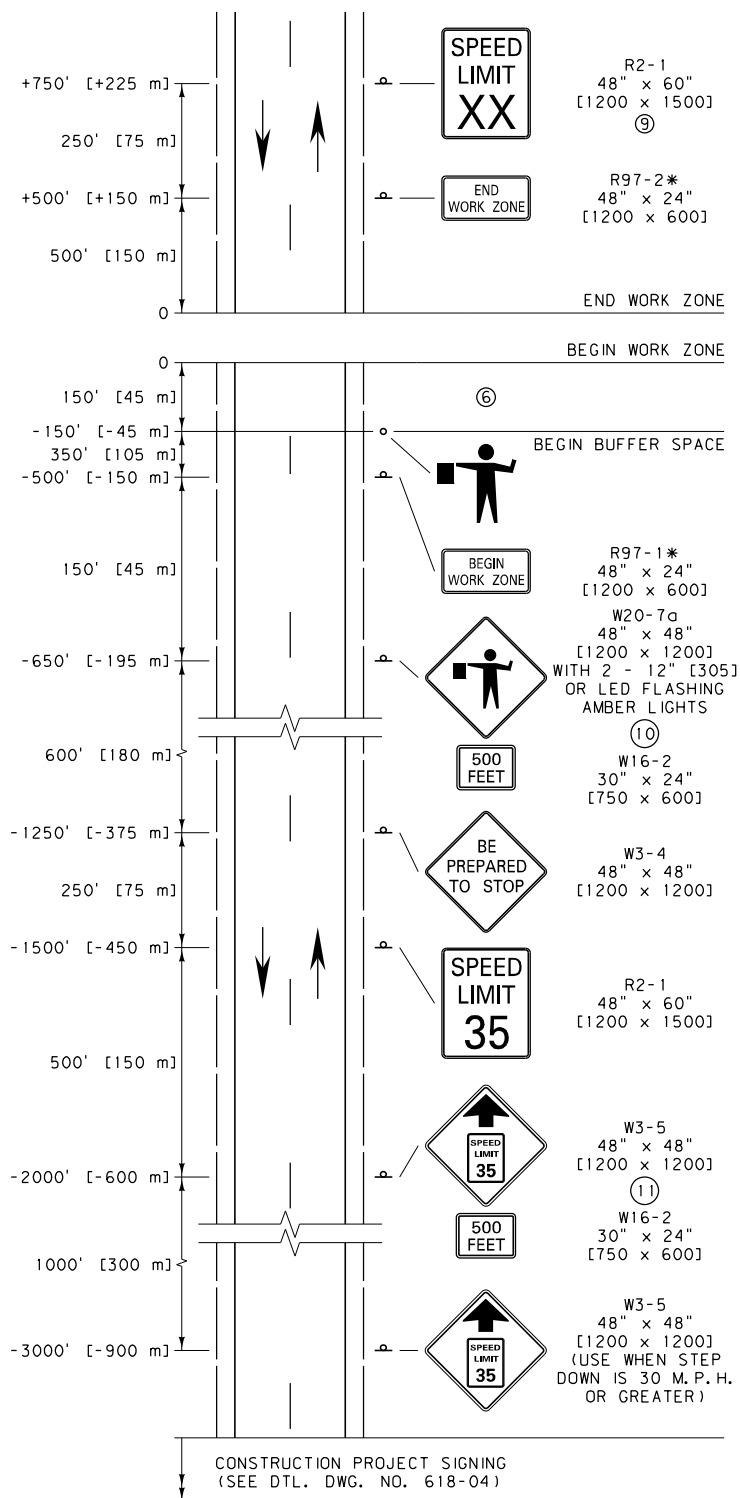
NOTES:

- ① THIS SIGN LAYOUT IS INTENDED TO BE A PERMANENT INSTALLATION FOR THE DURATION OF THE CONSTRUCTION PROJECT, AS APPROVED BY THE ENGINEER. COVER OR REMOVE ANY SIGNS WHEN NOT IN USE, INCLUDING SPEED LIMIT SIGNS NOT WARRANTED. REMOVE ANY SIGN SUPPORTS IF THEY WILL NOT BE NEEDED WITHIN 90 DAYS.
 - ② POST THE END OF CONSTRUCTION PROJECT SPEED LIMIT CONSISTING OF ONE SIGN WHEN THE NORMAL POSTED SPEED LIMIT FOR ALL VEHICLES IS THE SAME. USE TWO SIGNS WHEN CAR, TRUCK AND NIGHTTIME SPEED LIMITS ARE DIFFERENT.
 - ③ INCLUDE REGULATORY SIGNING ONLY IF THE CONSTRUCTION PROJECT CONTAINS A WORK ZONE OR HAS ROADWAY CONDITIONS THAT WARRANT SPEED RESTRICTIONS. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.
 - ④ THE WORK ZONE REFERS TO THE AREA WITHIN THE CONSTRUCTION PROJECT WHERE WORK IS ACTUALLY TAKING PLACE.
 - ⑤ IN ADDITION TO THE SIGNS SHOWN, INCLUDE THE APPROPRIATE TWO-LANE WORK ZONE SIGNS (DTL. DWG. NO. 618-08) WHEN A WORK ZONE IS LOCATED AT THE BEGINNING OR END OF THE CONSTRUCTION PROJECT.
 - ⑥ SET UP THIS SIGN LAYOUT IN EACH TRAFFIC DIRECTION.
- * DENOTES SIGNS THAT ARE UNIQUE TO MONTANA.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 618	DWG. NO. 618-04
TWO-LANE CONSTRUCTION PROJECT	
EFFECTIVE: APRIL 2006	
 MONTANA DEPARTMENT OF TRANSPORTATION serving you with pride	



WORK ZONE WITH NO FLAGGER



WORK ZONE WITH FLAGGER


NOTES:

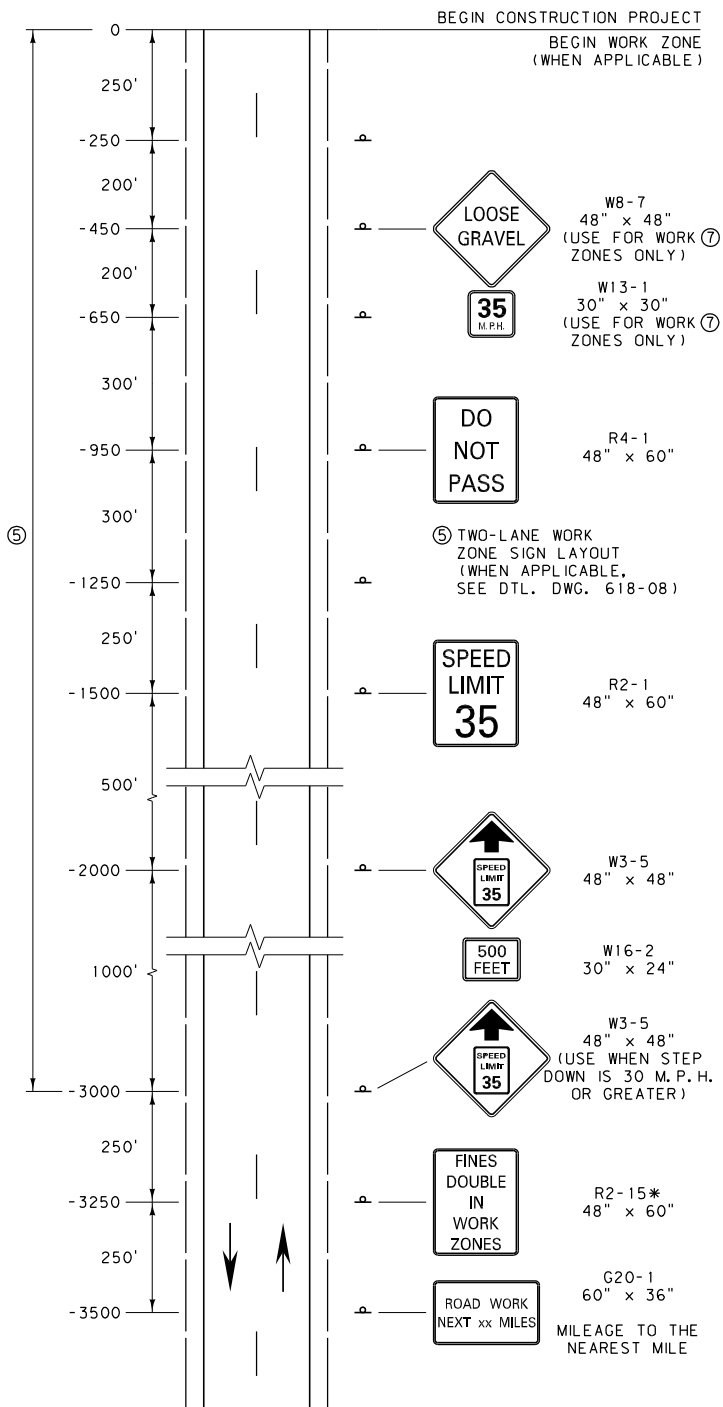
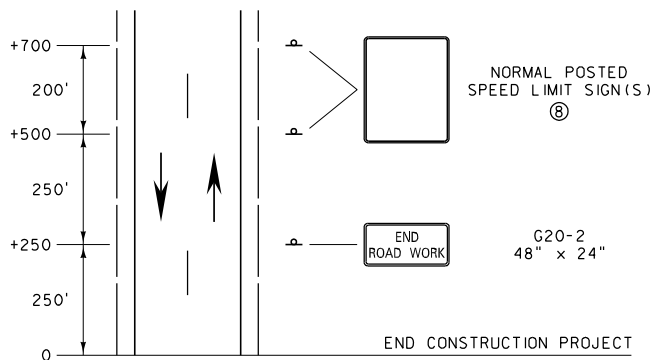
- ① THESE SIGN LAYOUTS ALSO WORK IN CONJUNCTION WITH THE PERMANENT LAYOUT ILLUSTRATED ON DTL. DWG. NO. 618-04 FOR WORK ZONES LOCATED AT THE BEGIN AND END OF THE CONSTRUCTION PROJECT.
- ② XX = SPEED DETERMINED BY THE PROJECT MANAGER
- ③ INCLUDE REGULATORY SIGNING ONLY IF THERE IS REASON TO RESTRICT SPEED WITHIN THE WORK ZONE. REMOVE OR COVER EXISTING REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.
- ④ SET UP THIS SIGN LAYOUT IN EACH TRAFFIC DIRECTION. COMBINE SUCCESSIVE WORK ZONES WHEN LESS THAN 1.0 MILE [1.6 km] APART.
- ⑤ THE WORK ZONE REFERS TO THE AREA WITHIN THE CONSTRUCTION PROJECT WHERE WORK IS ACTUALLY TAKING PLACE.
- ⑥ THE BUFFER SPACE MAY BE INCREASED FOR DOWNGRADES AND OTHER CONDITIONS THAT AFFECT STOPPING DISTANCE.

- ⑦ USE MORE SPECIFIC SIGNS, WHERE APPLICABLE, SUCH AS W8-3 "PAVEMENT ENDS."
- ⑧ PROVIDE A SECOND FLAGGER WHEN REQUIRED PER SECTION 618.
- ⑨ POST THE END OF WORK ZONE SPEED LIMIT APPROPRIATE FOR ALL VEHICLES FOR THE REMAINDER OF THE CONSTRUCTION PROJECT BEFORE RESUMING TO NORMAL POSTED SPEED LIMITS AT THE END OF THE CONSTRUCTION PROJECT.
- ⑩ INSURE THE 12" [305] AMBER FLASHERS AND THE AMBER LED FLASHERS MEET REQUIREMENTS OF STANDARD SPECIFICATION 715 AND DTL. DWG. NO. 618-01.
- ⑪ INCLUDE THESE SIGNS WITH ALL FLAGGERS. INCLUDE THESE SIGNS WITHIN CONSTRUCTION ZONES WHEN STEP DOWN IS 20 M.P.H. OR GREATER.

* DENOTES SIGNS THAT ARE UNIQUE TO MONTANA.

UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.


DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	618-08
SECTION 618, 715	
TWO-LANE CONSTRUCTION PROJECT WORK ZONES	
EFFECTIVE:	APRIL 2006
APRIL 2012	
 MONTANA DEPARTMENT OF TRANSPORTATION	

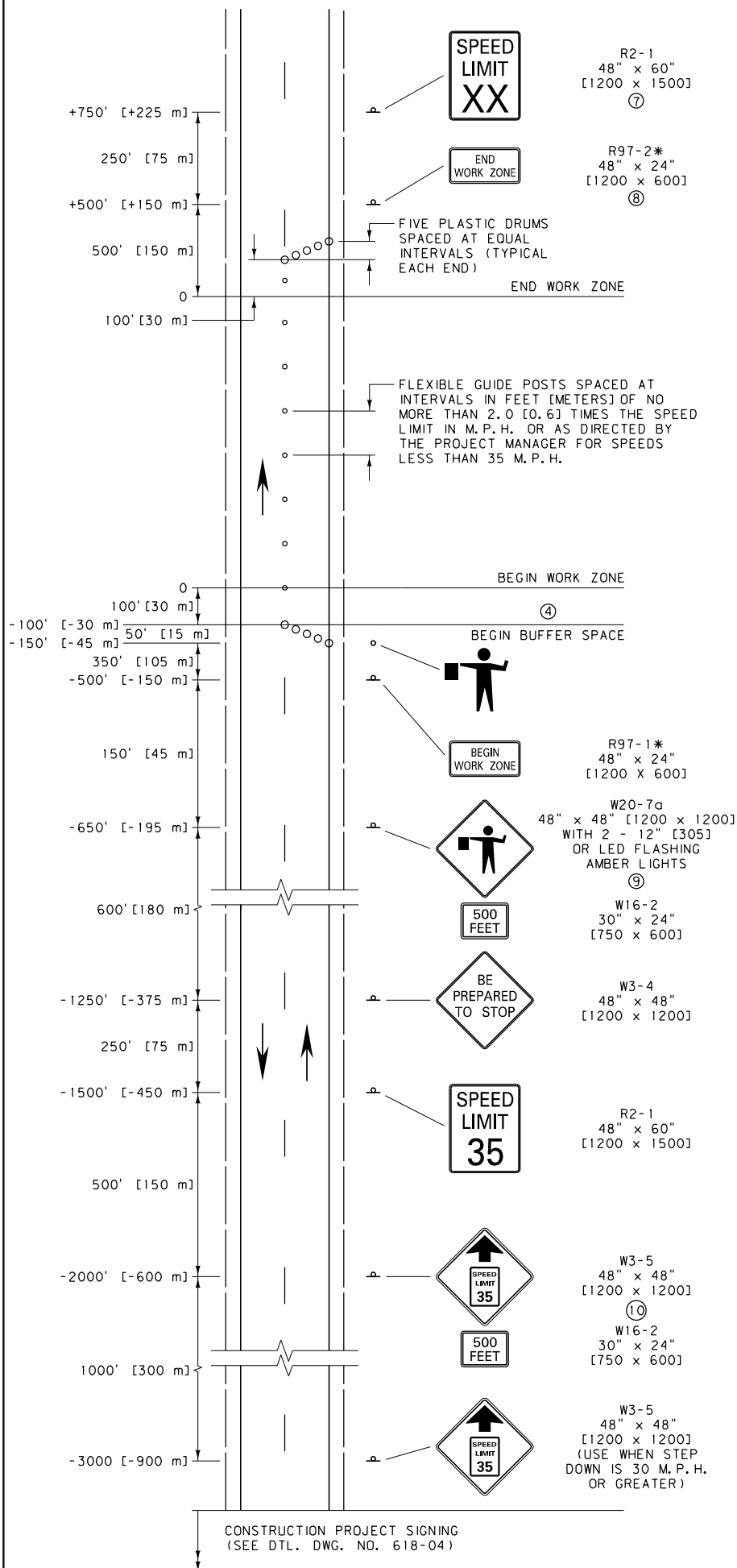


NOTES:

- ① THIS SIGN LAYOUT WORKS IN CONJUNCTION WITH THE PERMANENT LAYOUT ILLUSTRATED ON DTL. DWG. NO. 618-04. COVER OR REMOVE SIGNS WHEN NOT IN USE, INCLUDING SPEED LIMIT SIGNS NOT WARRANTED.
- ② INCLUDE REGULATORY SIGNING ONLY IF THERE IS REASON TO RESTRICT SPEED WITHIN THE CONSTRUCTION PROJECT. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.
- ③ THE WORK ZONE REFERS TO THE AREA WITHIN THE CONSTRUCTION PROJECT WHERE WORK IS ACTUALLY TAKING PLACE.
- ④ FOR SEAL COAT WORK ZONE ACTIVITIES, USE THE FLAGGER APPLICATION OF THE WORK ZONE LAYOUT FROM DTL. DWG. NO. 618-08.
- ⑤ IN ADDITION TO THE SIGNS SHOWN, INCLUDE THE APPROPRIATE TWO-LANE WORK ZONE SIGNS WHEN A WORK ZONE IS LOCATED AT THE BEGINNING OR END OF THE CONSTRUCTION PROJECT.
- ⑥ SET UP THIS SIGN LAYOUT IN EACH TRAFFIC DIRECTION.
- ⑦ PLACE THE W8-7 AND W13-1 SIGNS AT THE BEGINNING OF EACH WORK ZONE AND AT 2.0 MILE INTERVALS WITHIN THE WORK ZONES FOR EACH DIRECTION OF TRAVEL.
- ⑧ POST THE END OF CONSTRUCTION PROJECT SPEED LIMIT CONSISTING OF ONE SIGN WHEN THE NORMAL POSTED SPEED LIMIT FOR ALL VEHICLES IS THE SAME. USE TWO SIGNS WHEN CAR, TRUCK AND NIGHTTIME SPEED LIMITS ARE DIFFERENT.

* DENOTES SIGNS THAT ARE UNIQUE TO MONTANA.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 618	DWG. NO. 618-10
TWO-LANE CONSTRUCTION PROJECT SEAL COAT	
EFFECTIVE: APRIL 2006	
 MONTANA DEPARTMENT OF TRANSPORTATION serving you with pride	



NOTES:

- ① MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.
- ② SET UP THIS SIGN LAYOUT IN EACH TRAFFIC DIRECTION.
- ③ THE WORK ZONE REFERS TO THE AREA WITHIN THE CONSTRUCTION PROJECT WHERE WORK IS ACTUALLY TAKING PLACE.
- ④ THE BUFFER SPACE MAY BE INCREASED FOR DOWNGRADES AND OTHER CONDITIONS THAT AFFECT STOPPING DISTANCE.
- ⑤ PROVIDE A SECOND FLAGGER WHEN REQUIRED BY SECTION 618.
- ⑥ XX = SPEED DETERMINED BY THE PROJECT MANAGER.
- ⑦ POST THE END OF WORK ZONE SPEED LIMIT APPROPRIATE FOR ALL VEHICLES FOR THE REMAINDER OF THE CONSTRUCTION PROJECT BEFORE RESUMING TO NORMAL POSTED SPEED LIMITS AT THE END OF THE CONSTRUCTION PROJECT.
- ⑧ PROJECT MANAGER MAY PLACE R97-2 UP TO 500' [150 m] FROM END OF WORK ZONE IF CONDITIONS WARRANT.
- ⑨ INSURE THE 12" [305] AMBER FLASHERS AND THE AMBER LED FLASHERS MEET REQUIREMENTS OF STANDARD SPECIFICATION 715 AND DTL. DWG. NO. 618-01.
- ⑩ INCLUDE THESE SIGNS WITH ALL FLAGGERS. INCLUDE THESE SIGNS WITHIN CONSTRUCTION ZONES WHEN STEP DOWN IS 20 M.P.H. OR GREATER.

* DENOTES SIGNS THAT ARE UNIQUE TO MONTANA.

UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING

REFERENCE DWG. NO.
STANDARD SPEC. 618-12
SECTION 618, 715

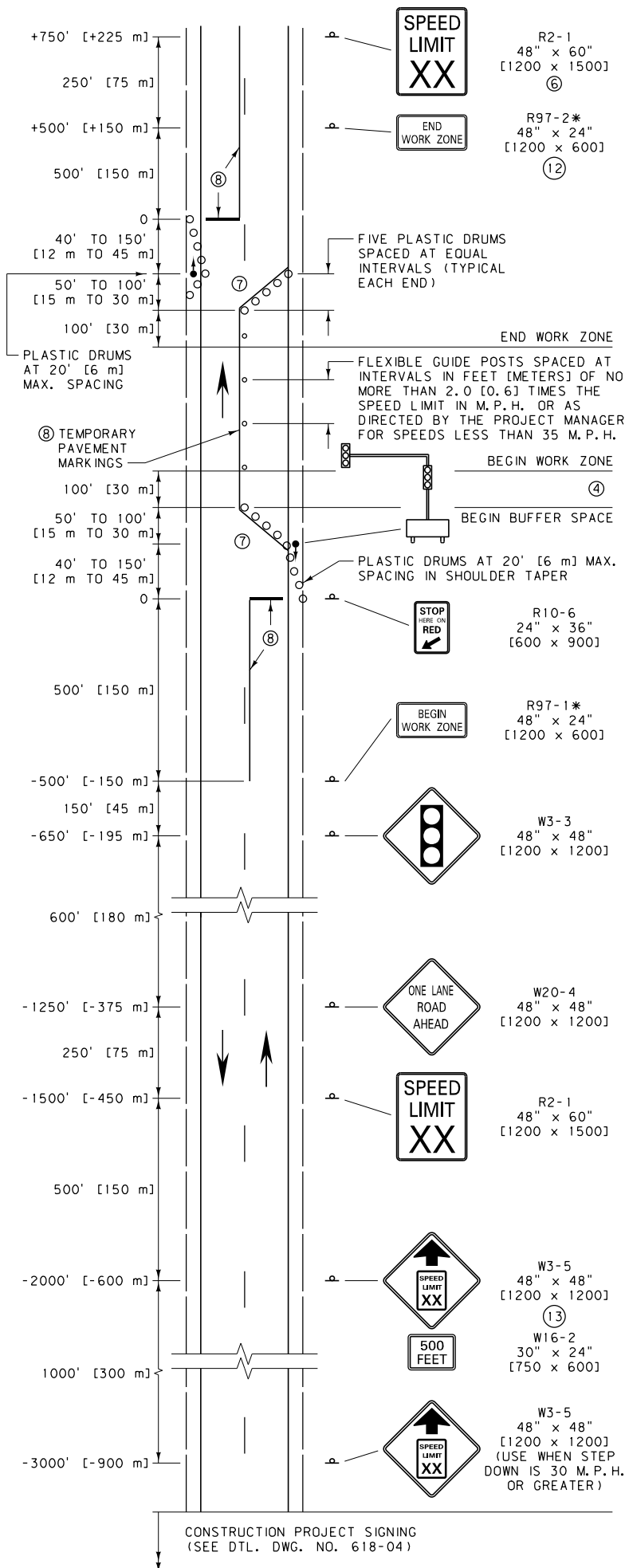
TWO-LANE CONSTRUCTION
PROJECT LANE CLOSURE-
FLAGGER CONTROLLED

--REVISED--
APRIL 2012

EFFECTIVE: APRIL 2006



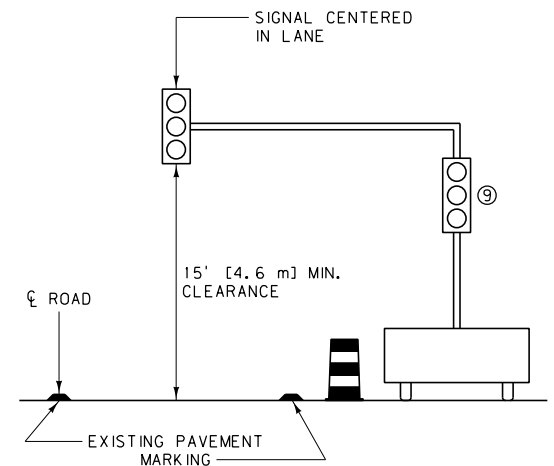
MONTANA DEPARTMENT
OF TRANSPORTATION



NOTES:

- MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.
- SET UP THIS SIGN LAYOUT IN EACH TRAFFIC DIRECTION.
- THE WORK ZONE REFERS TO THE AREA WITHIN THE CONSTRUCTION PROJECT WHERE WORK IS ACTUALLY TAKING PLACE.
- THE BUFFER SPACE MAY BE INCREASED FOR DOWNGRADES AND OTHER CONDITIONS THAT AFFECT STOPPING DISTANCE.
- XX = SPEED DETERMINED BY THE PROJECT MANAGER.
- POST THE END OF WORK ZONE SPEED LIMIT APPROPRIATE FOR ALL VEHICLES FOR THE REMAINDER OF THE CONSTRUCTION PROJECT BEFORE RESUMING TO NORMAL POSTED SPEED LIMITS AT THE END OF THE CONSTRUCTION PROJECT.
- REMOVE ANY CONFLICTING PAVEMENT MARKINGS BETWEEN THE STOP LINE AND WORK ZONE BOUNDARY.
- PLACE TEMPORARY PAVEMENT MARKINGS AS SHOWN WHEN ROADWAY SURFACE IS PAVED. (REMOVABLE PAVEMENT MARKINGS MAY BE USED.) UPON REMOVAL OF THE TEMPORARY TRAFFIC CONTROL SIGNALS, REMOVE ALL TEMPORARY PAVEMENT MARKINGS AND RESTORE PERMANENT OR INTERIM PAVEMENT MARKINGS.
- TEMPORARY TRAFFIC CONTROL SIGNALS ARE TO MEET THE PHYSICAL DISPLAY AND OPERATIONAL REQUIREMENTS OF PERMANENT TRAFFIC CONTROL SIGNALS.
- ESTABLISH TEMPORARY TRAFFIC CONTROL SIGNAL TIMING BY CONSULTING WITH AN AUTHORIZED TRAFFIC ENGINEER. ENSURE THAT THE DURATIONS OF RED CLEARANCE INTERVALS ARE ADEQUATE TO CLEAR THE ONE-LANE SECTION OF CONFLICTING VEHICLES. INCORPORATE SAFEGUARDS TO AVOID THE POSSIBILITY OF CONFLICTING SIGNAL INDICATIONS AT EACH END OF THE WORK ZONE.
- INCORPORATE ANY SIDE APPROACH TRAFFIC THAT OCCURS WITHIN THE WORK ZONE BOUNDARIES INTO THE MAINLINE SIGNAL CONTROLLED OPERATION VIA THE USE OF TEMPORARY TRAFFIC CONTROL SIGNS, DEVICES, ETC.
- PROJECT MANAGER MAY PLACE R97-2 UP TO 500' [500 m] FROM END OF WORK ZONE IF CONDITIONS WARRANT.
- INCLUDE THESE SIGNS WITH ALL FLAGGERS. INCLUDE THESE SIGNS WITHIN CONSTRUCTION ZONES WHEN STEP DOWN IS 20 M.P.H. OR GREATER.

* DENOTES SIGNS THAT ARE UNIQUE TO MONTANA.



TEMPORARY TRAFFIC CONTROL SIGNAL DETAIL

UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING

REFERENCE DWG. NO. STANDARD SPEC. 618-13 SECTION 618

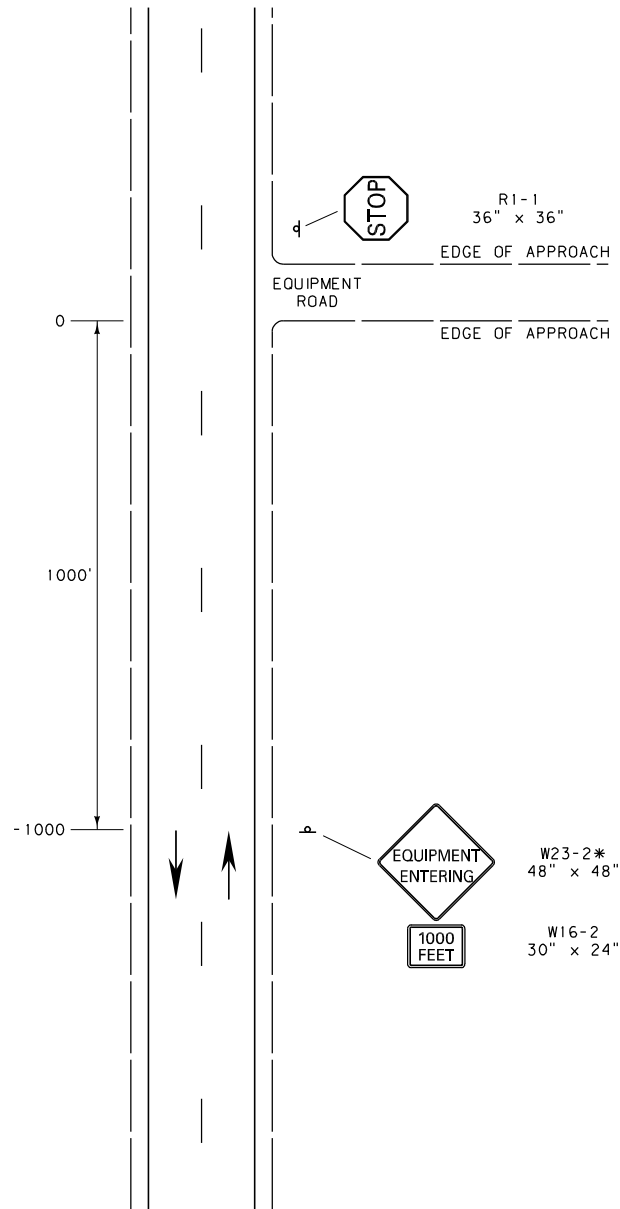
TWO-LANE CONSTRUCTION PROJECT LANE CLOSURE - SIGNAL CONTROLLED

--REVISED--
APRIL 2012

EFFECTIVE: APRIL 2006




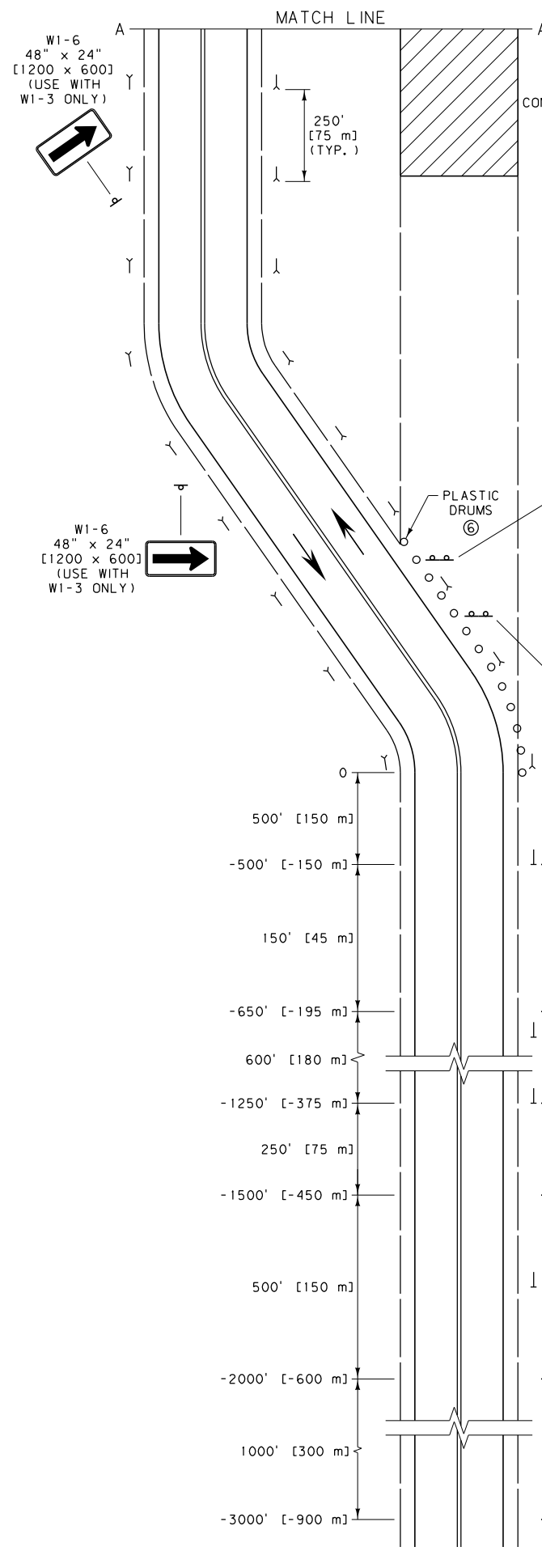
MONTANA DEPARTMENT OF TRANSPORTATION



NOTES:

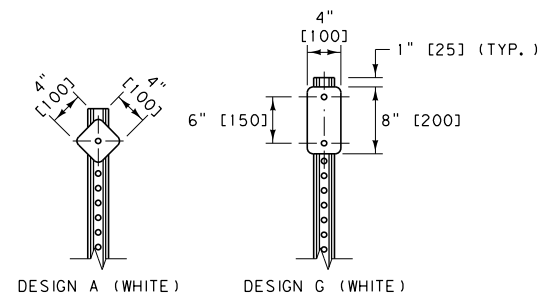
- ① USE THIS SIGN LAYOUT WHEN APPROPRIATE. OTHERWISE REFER TO DTL. DWG. NO. 618-16 WHEN A FLAGGER IS NEEDED.
 - ② SET UP THIS SIGN LAYOUT IN EACH TRAFFIC DIRECTION, AS NEEDED.
- * DENOTES SIGNS THAT ARE UNIQUE TO MONTANA.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	618-14
SECTION 618	
TWO-LANE EQUIPMENT ENTRANCES	
EFFECTIVE: FEBRUARY 2005	
 <i>serving you with pride</i>	MONTANA DEPARTMENT OF TRANSPORTATION

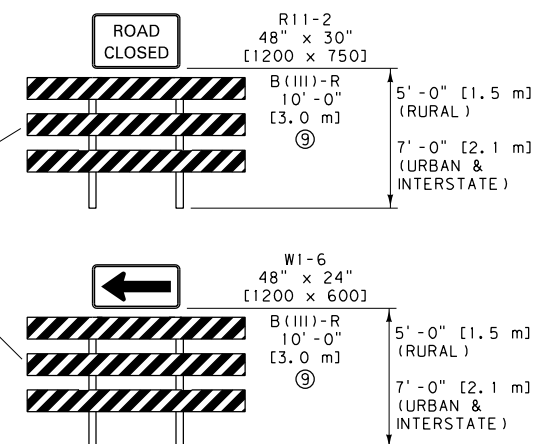


MATCH LINE

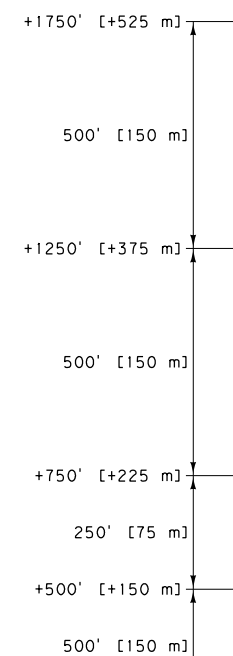
CONSTRUCTION WORK



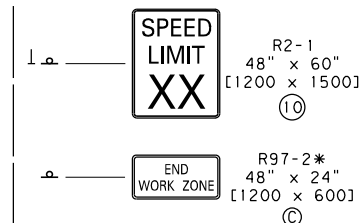
DELINEATOR LEGEND	
	DESIGN A
	DESIGN G



- ④ USE THE W1-4 OR W1-3 SIGNS WHEN THE TANGENT DISTANCE ALONG THE DIVERSION IS MORE THAN 600' [180 m].
- ⑤ USE W1-3 SIGNS ONLY WHEN THE DESIGN SPEED OF THE CURVES IS 30 M.P.H. [50 km/hr] OR LESS.
- ⑥ INCLUDE THE BEGIN AND END WORK ZONE SIGNS IF A WORK ZONE OCCURS EXCLUSIVELY ON THE DIVERSION.



CONSTRUCTION WORK



NOTES:

- ① INCLUDE SPEED LIMIT SIGNING ONLY IF THERE IS REASON TO RESTRICT SPEED. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.
- ② SET UP THIS SIGN LAYOUT IN EACH TRAFFIC DIRECTION.
- ③ PAVED DETOURS 24 FEET [7.2 m] WIDE OR GREATER HAVE 4 INCH [100] WHITE SHOULDER STRIPES AND APPROPRIATE CENTERLINE STRIPES.
- ④ UNPAVED DETOURS MAY REQUIRE ADDITIONAL DELINEATION.
- ⑤ USE ONLY POST MOUNTED SIGNS. DO NOT USE PORTABLE SIGN MOUNTS.
- ⑥ PLACE PLASTIC DRUMS AT INTERVALS IN FEET [METERS] OF NO MORE THAN ONE [0.3] TIMES THE SPEED LIMIT IN M.P.H. OR AS DIRECTED BY THE PROJECT MANAGER FOR SPEEDS LESS THAN 35 M.P.H.
- ⑦ XX = SPEED DETERMINED BY THE DETOUR DESIGN SPEED OR THE PROJECT MANAGER.
- ⑧ THE WORK ZONE REFERS TO THE AREA WITHIN THE CONSTRUCTION PROJECT WHERE WORK IS ACTUALLY TAKING PLACE.
- ⑨ USE MATERIALS FOR BARRICADE FRAMEWORK AND ASSEMBLY, INCLUDING ANY SIGNS AND MEANS OF ATTACHMENT, THAT MEET THE REQUIREMENTS FOR NCHRP 350 FOR WORK ZONE DEVICES. AS AN OPTION, SIGNS MAY BE MOUNTED DIRECTLY BEHIND BARRICADES ON SEPARATE SIGN SUPPORTS MEETING NCHRP 350 CRITERIA.
- ⑩ POST THE END OF WORK ZONE SPEED LIMIT APPROPRIATE FOR ALL VEHICLES FOR THE REMAINDER OF THE CONSTRUCTION PROJECT BEFORE RESUMING TO NORMAL POSTED SPEED LIMITS AT THE END OF THE CONSTRUCTION PROJECT.
- ⑪ INCLUDE THESE SIGNS WITH ALL FLAGGERS. INCLUDE THESE SIGNS WITHIN CONSTRUCTION ZONES WHEN STEP DOWN IS 20 M.P.H. OR GREATER.

* DENOTES SIGNS THAT ARE UNIQUE TO MONTANA.

UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

--REVISED--
APRIL 2012

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	618-18
TWO-LANE CONSTRUCTION PROJECT DIVERSION	
EFFECTIVE:	APRIL 2006

R2-1
48" x 60"
[1200 x 1500]
②



G20-2
48" x 24"
[1200 x 600]



END CONSTRUCTION PROJECT

BEGIN CONSTRUCTION PROJECT

+500' [+150 m]
250' [75 m]
+250' [+75 m]
250' [75 m]
0

0
500' [150 m]
-500' [-150 m]
750' [225 m]
-1250' [-375 m]
500' [150 m]
-1750' [-525 m]
250' [75 m]
-2000' [-600 m]

2150' [645 m]

-4150' [-1245 m]
500' [150 m]
-4650' [-1395 m]

1000' [300 m]

-5650' [-1695 m]

1880' [565 m]

-7550' [-2265 m]
500' [150 m]
-8030' [-2410 m]

500' [150 m]

-8530' [-2560 m]

NOTES:

- ① THIS SIGN LAYOUT IS INTENDED TO BE A PERMANENT INSTALLATION FOR THE DURATION OF THE CONSTRUCTION PROJECT, AS APPROVED BY THE PROJECT MANAGER. COVER OR REMOVE SIGNS WHEN NOT IN USE, INCLUDING SPEED LIMIT SIGNS NOT WARRANTED. REMOVE ANY SIGN SUPPORTS IF THEY WILL NOT BE NEEDED WITHIN 90 DAYS.
- ② POST THE END OF CONSTRUCTION PROJECT SPEED LIMIT CONSISTING OF ONE LIMIT WHEN THE NORMAL POSTED SPEED LIMIT FOR ALL VEHICLES IS THE SAME. WHEN CAR AND TRUCK SPEED LIMITS DIFFER, POST BOTH LIMITS ON A SINGLE SIGN.
- ③ INCLUDE REGULATORY SIGNING ONLY IF THE CONSTRUCTION PROJECT CONTAINS A WORK ZONE OR HAS ROADWAY CONDITIONS THAT WARRANT SPEED RESTRICTIONS. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.
- ④ THE WORK ZONE REFERS TO THE AREA WITHIN THE CONSTRUCTION PROJECT WHERE WORK IS ACTUALLY TAKING PLACE.
- ⑤ SET UP THIS SIGN LAYOUT IN EACH TRAFFIC DIRECTION.
- ⑥ IN ADDITION TO THE SIGNS SHOWN, INCLUDE THE APPROPRIATE FOUR-LANE WORK ZONE SIGNS (DTL. DWG. NO. 618-24) WHEN A WORK ZONE FALLS AT THE BEGIN OR END OF THE CONSTRUCTION PROJECT.
- ⑦ DIVIDED FOUR-LANE IS SHOWN. FOR UN-DIVIDED FOUR-LANE, PLACE SIGNS ON RIGHT SIDE ONLY.

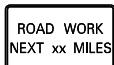
* DENOTES SIGNS THAT ARE UNIQUE TO MONTANA.

FOUR-LANE WORK
ZONE SIGN LAYOUT
(WHEN APPLICABLE,
SEE DTL. DWG. 618-24) ⑥

(2) R2-15*
48" x 60"
[1200 x 1500]



(2) G20-1
60" x 36"
[1500 x 900]



MILEAGE TO THE
NEAREST MILE

OR

(2) W20-1
48" x 48"
[1200 x 1200]
(USE WHEN
LESS THAN
2 MILES [3.2 km])



UNITS SHOWN IN BRACKETS [] ARE
METRIC AND ARE IN MILLIMETERS (mm)
UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING

REFERENCE DWG. NO.
STANDARD SPEC. 618-20
SECTION 618

DIVIDED FOUR-LANE
CONSTRUCTION PROJECT

--REVISED--
APRIL 2012

EFFECTIVE: APRIL 2006



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OF TRANSPORTATION

LEGEND

- S— OBLITERATE CONFLICTING PAVEMENT MARKINGS AND FILL ANY EXISTING RUMBLE STRIPS WITH PMS
- PLASTIC DRUMS (SEE NOTES FOR SPACING)
- - - - - RAISED RIGID PAVEMENT MARKERS TYPE I (WHITE) OR TYPE II (YELLOW) AT 5' [1.5 m] SPACING
- ===== DOUBLE YELLOW PAINT OR DOUBLE PLASTIC PAVEMENT MARKING TABS AT 5' [1.5 m] SPACING
- FLEXIBLE GLUE-DOWN GUIDE POSTS ON TWO-LANE (SEE NOTES FOR SPACING EXCEPT AS SHOWN)

E5-1
60" x 48"
[1500 x 1200]



R3-2
36" x 36"
[900 x 900]



FLEXIBLE GLUE
DOWN GUIDE
POSTS SPACED
AT HALF NORMAL
SPACING

W6-3
48" x 48"
[1200 x 1200]



E7-1
72" x 36"
[1800 x 900]



YELLOW

3'
[0.9 m]

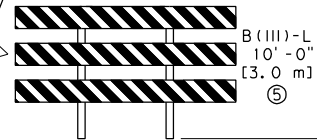
WHITE

3'
[0.9 m]

2650'
[800 m]

ROAD
CLOSED

R11-2
48" x 30"
[1200 x 750]



5'-0" [1.5 m]
(RURAL)
7'-0" [2.1 m]
(URBAN & INTERSTATE)

14'
[4.2 m]

12:1
TAPER

ADDITIONAL PLANT MIX SURFACING
TO ALLOW FOR SAFE TURNING
MOVEMENTS (SEE DTL. DWG.
NO. 618-32 FOR DIMENSIONS)

NOTES:

- ① SPACE CHANNELIZING DEVICES ON TANGENTS AT INTERVALS IN FEET [METERS] OF NO MORE THAN 2 [0.6] TIMES THE SPEED LIMIT IN M.P.H. AND ON ALL TAPER SECTIONS AT INTERVALS IN FEET [METERS] OF NO MORE THAN 1 [0.3] TIMES THE SPEED LIMIT IN M.P.H. FOR SPEED LIMITS LESS THAN 35 M.P.H. SPACE CHANNELIZING DEVICES AS DIRECTED BY THE PROJECT MANAGER.
- ② OBLITERATE ALL PAVEMENT MARKINGS THAT CONFLICT AT ANY TIME DURING OR AFTER MEDIAN CROSSOVER USE.
- ③ INDICATED SPACINGS ARE INTENDED TO BE A MAXIMUM AND MAY BE REDUCED IF CONDITIONS WARRANT.
- ④ PROVIDE ADDITIONAL SIGNING FOR EXIT DESTINATION WHEN EXIT DELINEATION IS NOT VISIBLE.
- ⑤ SEE DETAILED DRAWING 618-03.

DETAILED DRAWING

REFERENCE DWG. NO.
STANDARD SPEC. 618-22
SECTION 618

TEMPORARY
EXIT RAMP
MEDIAN CROSSOVER

EFFECTIVE: APRIL 2006

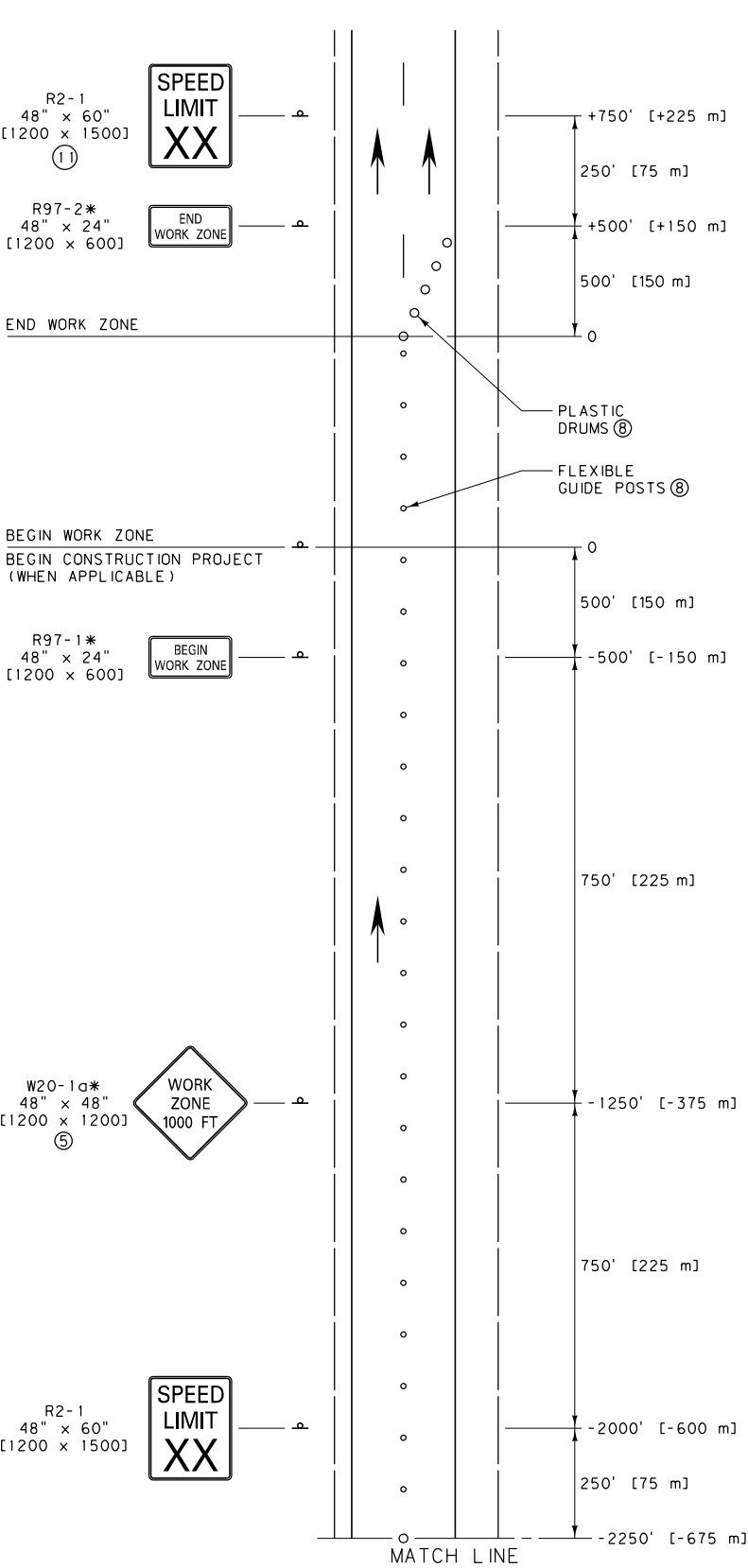
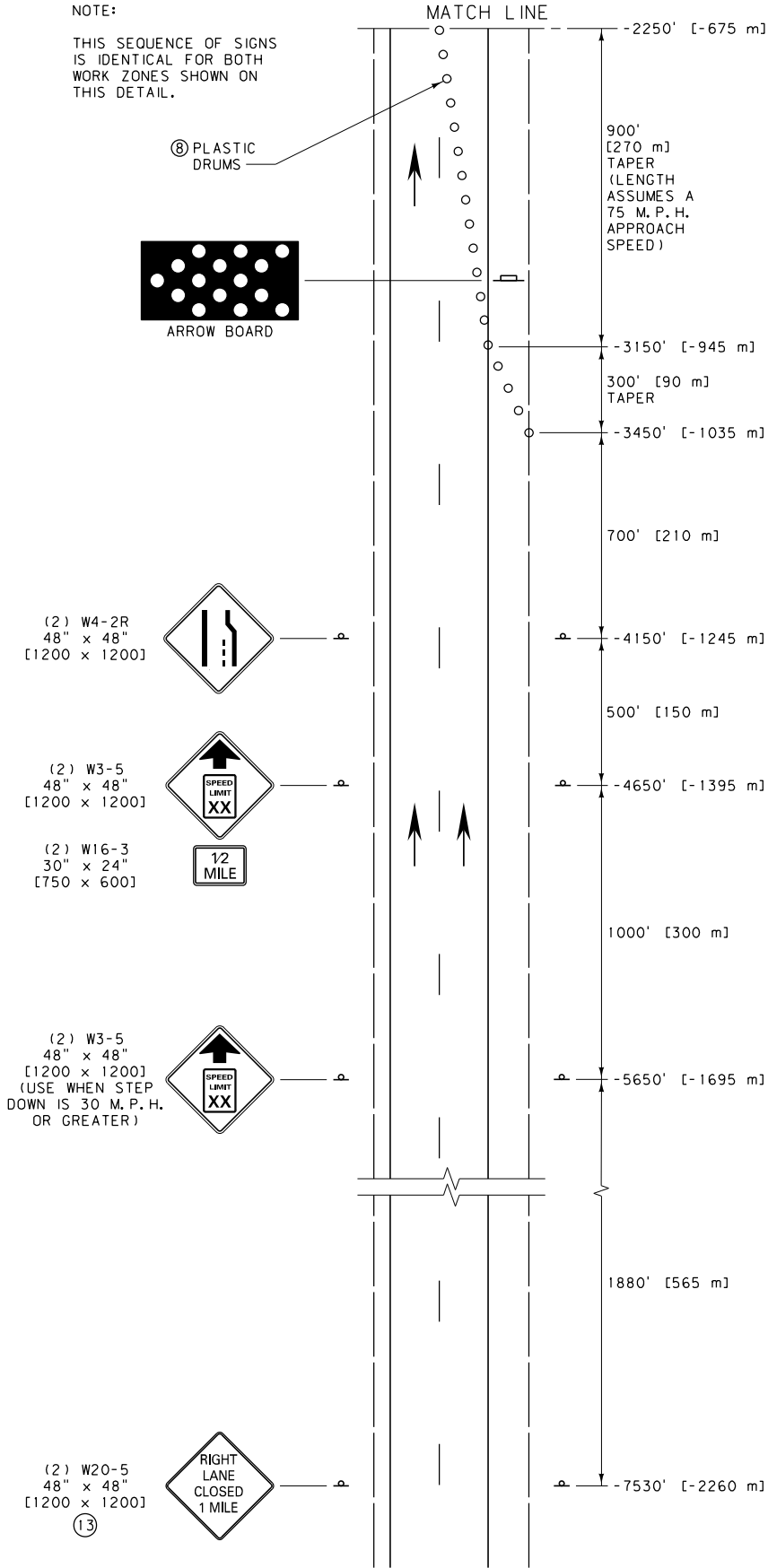
--REVISED--
September 2010

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OF TRANSPORTATION

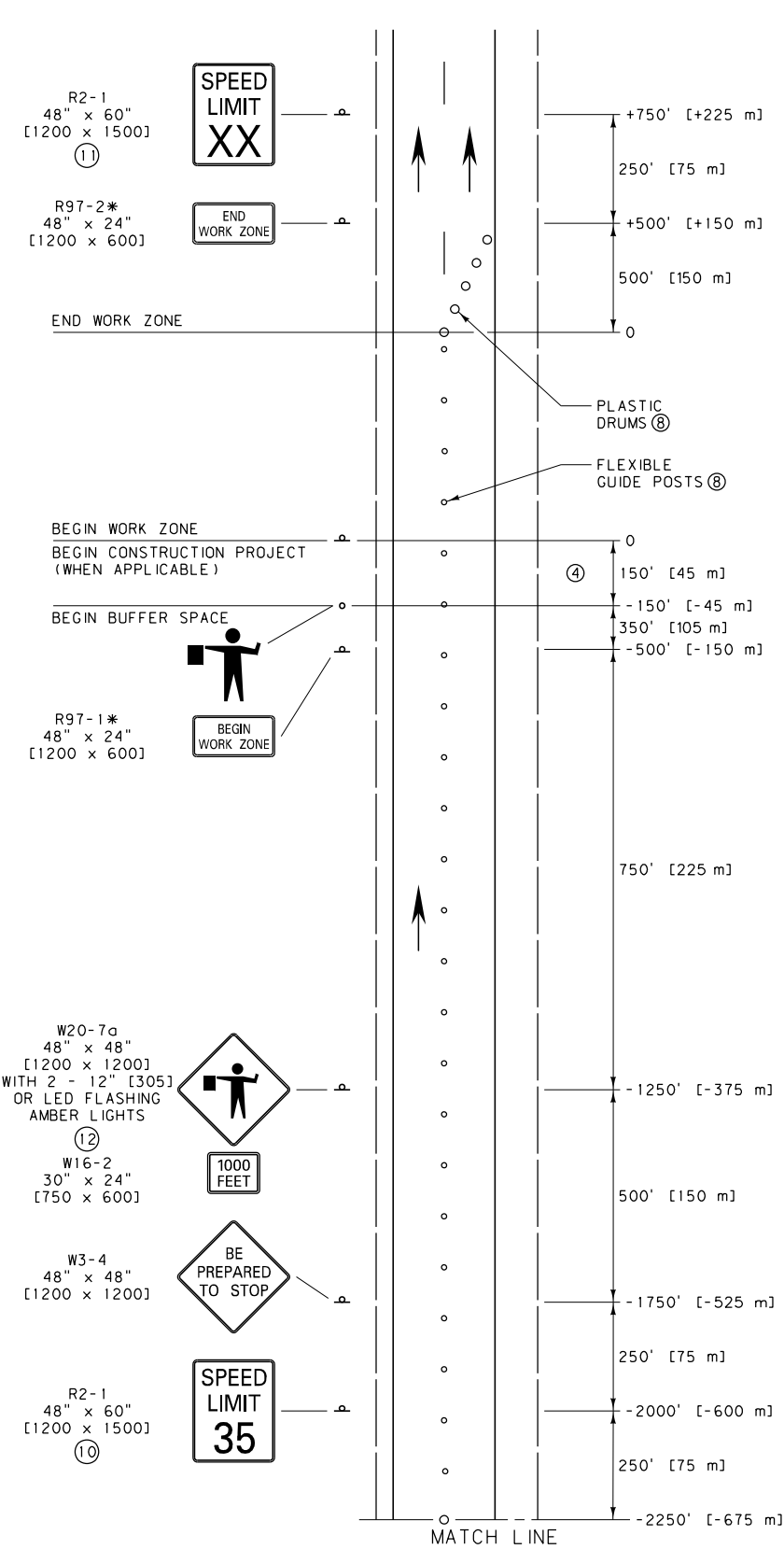
UNITS SHOWN IN BRACKETS [] ARE
METRIC AND ARE IN MILLIMETERS (mm)
UNLESS OTHER UNITS ARE SHOWN.

NOTE:

THIS SEQUENCE OF SIGNS IS IDENTICAL FOR BOTH WORK ZONES SHOWN ON THIS DETAIL.



WORK ZONE WITH NO FLAGGER



WORK ZONE WITH FLAGGER

NOTES:

- THESE SIGN LAYOUTS WORK IN CONJUNCTION WITH THE PERMANENT LAYOUT ILLUSTRATED ON DTL. DWG. NO. 618-20 FOR WORK ZONES LOCATED AT THE BEGIN AND END OF THE CONSTRUCTION PROJECT.
- INCLUDE REGULATORY SIGNING ONLY IF THERE IS REASON TO RESTRICT SPEED WITHIN THE WORK ZONE. MODIFY REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.
- THE WORK ZONE REFERS TO THE AREA WITHIN THE CONSTRUCTION PROJECT WHERE WORK IS ACTUALLY TAKING PLACE.
- THE BUFFER SPACE MAY BE INCREASED FOR DOWNGRADES AND OTHER CONDITIONS THAT AFFECT STOPPING DISTANCE.
- USE MORE SPECIFIC SIGNS, WHERE APPLICABLE, SUCH AS W8-3 "PAVEMENT ENDS."
- XX = SPEED DETERMINED BY THE PROJECT MANAGER.
- PROVIDE A SECOND FLAGGER WHEN REQUIRED BY STANDARD SPECIFICATIONS, SECTION 618.
- SPACE FLEXIBLE GUIDE POSTS ON TANGENTS AT INTERVALS IN FEET [METERS] OF NO MORE THAN TWO [0.6] TIMES THE SPEED LIMIT IN M.P.H. SPACE PLASTIC DRUMS IN ALL TAPER SECTIONS AT INTERVALS IN FEET [METERS] OF NO MORE THAN ONE [0.3] TIMES THE SPEED LIMIT IN M.P.H. FOR SPEED LIMITS LESS THAN 35 M.P.H., SPACE CHANNELIZING DEVICES AS DIRECTED BY THE PROJECT MANAGER.
- WHEN PORTABLE SIGNS ARE USED, PLACE AS DIRECTED BY THE PROJECT MANAGER.
- IF FLAGGER IS MORE THAN ONE MILE [1.6 km] FROM THE LANE CLOSURE, INCLUDE W3-5 SIGNS, AS REQUIRED.
- POST THE END OF WORK ZONE SPEED LIMIT APPROPRIATE FOR ALL VEHICLES FOR THE REMAINDER OF THE CONSTRUCTION PROJECT BEFORE RESUMING TO NORMAL POSTED SPEED LIMITS AT THE END OF THE CONSTRUCTION PROJECT.
- INSURE THE 12" [305] AMBER FLASHERS AND THE AMBER LED FLASHERS LIGHTS MEET REQUIREMENTS OF STANDARD SPECIFICATION 715 AND DTL. DWG. NO. 618-01.
- POST THE W20-5 AFTER THE W20-1 OR G20-1 AND THE R2-15 IF THE MERGING TAPER OCCURS AT THE BEGINNING OF THE CONSTRUCTION PROJECT.

* DENOTES SIGNS THAT ARE UNIQUE TO MONTANA.

UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	618-24
SECTION 618, 715	

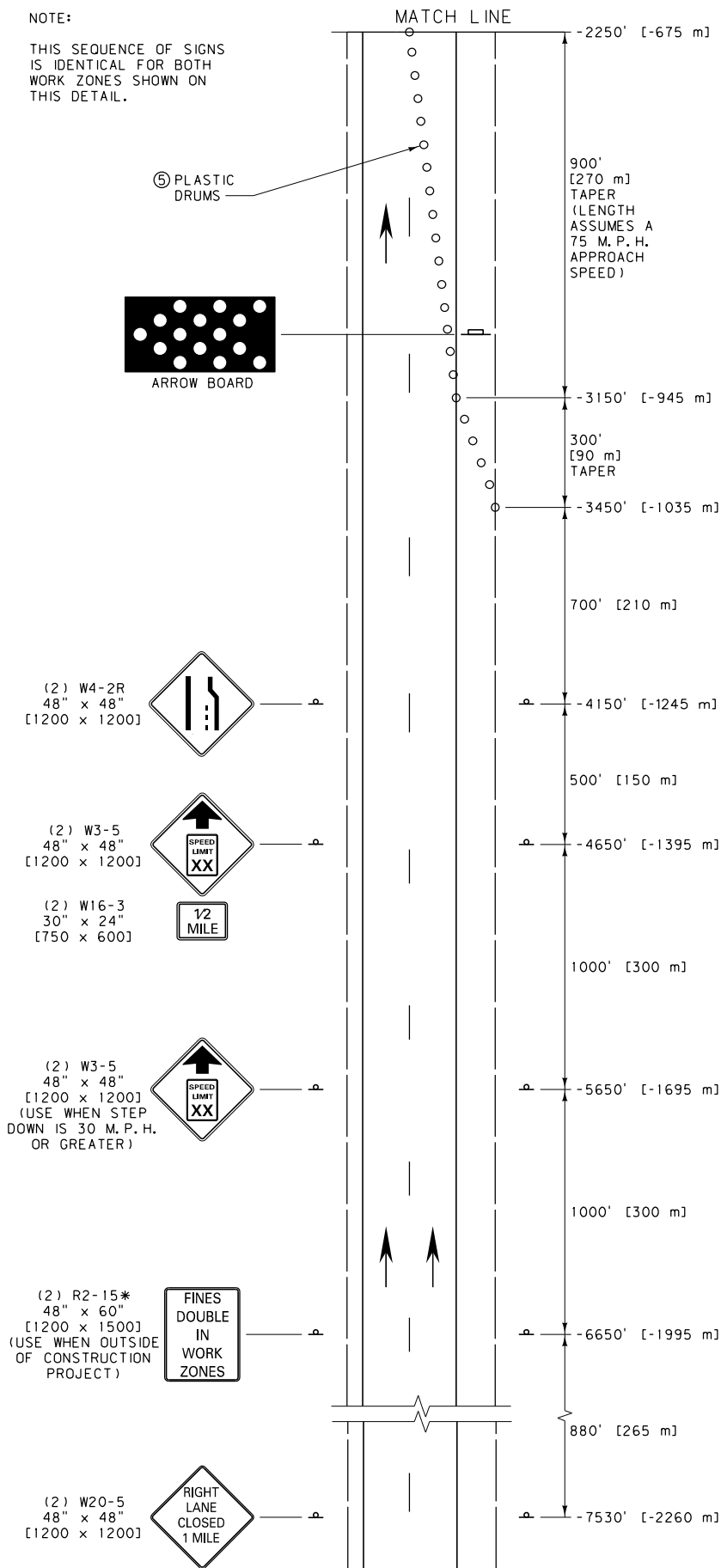
DIVIDED FOUR-LANE CONSTRUCTION PROJECT WORK ZONES	
EFFECTIVE:	APRIL 2006

--REVISED--	
APRIL 2012	

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NOTE:

THIS SEQUENCE OF SIGNS IS IDENTICAL FOR BOTH WORK ZONES SHOWN ON THIS DETAIL.



EXISTING NORMAL POSTED SPEED LIMIT (S)

OR R2-1 48" x 60" [1200 x 1500]

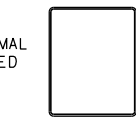
R97-2* 48" x 24" [1200 x 600]

R97-1* 48" x 24" [1200 x 600]

W23-2* 48" x 48" [1200 x 1200]

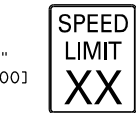
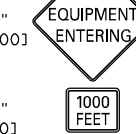
W16-2 30" x 24" [750 x 600]

R2-1 48" x 60" [1200 x 1500]



5 FLEXIBLE GUIDE POSTS SPACED AT HALF NORMAL SPACING

5 FLEXIBLE GUIDE POSTS



EQUIPMENT ENTRANCE WITH NO FLAGGER

MATCH LINE

EXISTING NORMAL POSTED SPEED LIMIT (S)

OR R2-1 48" x 60" [1200 x 1500]

R97-2* 48" x 24" [1200 x 600]

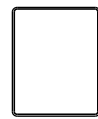
R97-1* 48" x 24" [1200 x 600]

W20-7a 48" x 48" [1200 x 1200] WITH 2 - 12" [305] OR LED FLASHING AMBER LIGHTS

W16-2 30" x 24" [750 x 600]

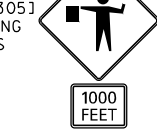
W3-4 48" x 48" [1200 x 1200]

R2-1 48" x 60" [1200 x 1500]



5 FLEXIBLE GUIDE POSTS

5 FLEXIBLE GUIDE POSTS



EQUIPMENT ENTRANCE WITH FLAGGER

MATCH LINE

NOTES:

- 1 INCLUDE SPEED LIMIT SIGNING ONLY IF THERE IS REASON TO RESTRICT SPEED WITHIN THE WORK ZONE. REMOVE OR COVER REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.
- 2 THE BUFFER SPACE MAY BE INCREASED FOR DOWNGRADES AND OTHER CONDITIONS THAT AFFECT STOPPING DISTANCE.
- 3 XX = SPEED DETERMINED BY THE PROJECT MANAGER.
- 4 THE WORK ZONE REFERS TO THE AREA WHERE WORK IS ACTUALLY TAKING PLACE. WHEN THIS OCCURS OUTSIDE OF A CONSTRUCTION PROJECT, INCLUDE THE W20-1 AND R2-15* SIGNS.
- 5 SPACE FLEXIBLE GUIDE POSTS ON TANGENTS AT INTERVALS IN FEET [METERS] OF NO MORE THAN TWO [0.6] TIMES THE SPEED LIMIT IN M.P.H. SPACE PLASTIC DRUMS IN ALL TAPER SECTIONS AT INTERVALS IN FEET [METERS] OF NO MORE THAN ONE [0.3] TIMES THE SPEED LIMIT IN M.P.H. FOR SPEED LIMITS LESS THAN 35 M.P.H., SPACE CHANNELIZING DEVICES AS DIRECTED BY THE PROJECT MANAGER.
- 6 IF FLAGGER IS MORE THAN ONE MILE [1.6 km] FROM THE LANE CLOSURE, INCLUDE W3-5 SIGNS, AS REQUIRED.
- 7 POST THE END OF WORK ZONE SPEED LIMIT APPROPRIATE FOR ALL VEHICLES FOR THE REMAINDER OF THE CONSTRUCTION PROJECT BEFORE RESUMING TO NORMAL POSTED SPEED LIMITS AT THE END OF THE CONSTRUCTION PROJECT.
- 8 WHEN OUTSIDE OF A CONSTRUCTION PROJECT, POST THE SPEED LIMIT CONSISTING OF ONE LIMIT WHEN THE NORMAL POSTED SPEED LIMIT FOR ALL VEHICLES IS THE SAME. WHEN CAR AND TRUCK SPEED LIMITS DIFFER, POST BOTH LIMITS ON A SINGLE SIGN.
- 9 INSURE THE 12" [305] AMBER FLASHERS AND THE AMBER LED FLASHERS MEET REQUIREMENTS OF SECTION 715 AND DTL. DWG. NO. 618-01.
- 10 POST THE W20-5 AFTER THE W20-1 OR THE G20-1 AND THE R2-15 IF THE MERGING TAPER OCCURS AT THE BEGINNING OF THE CONSTRUCTION PROJECT

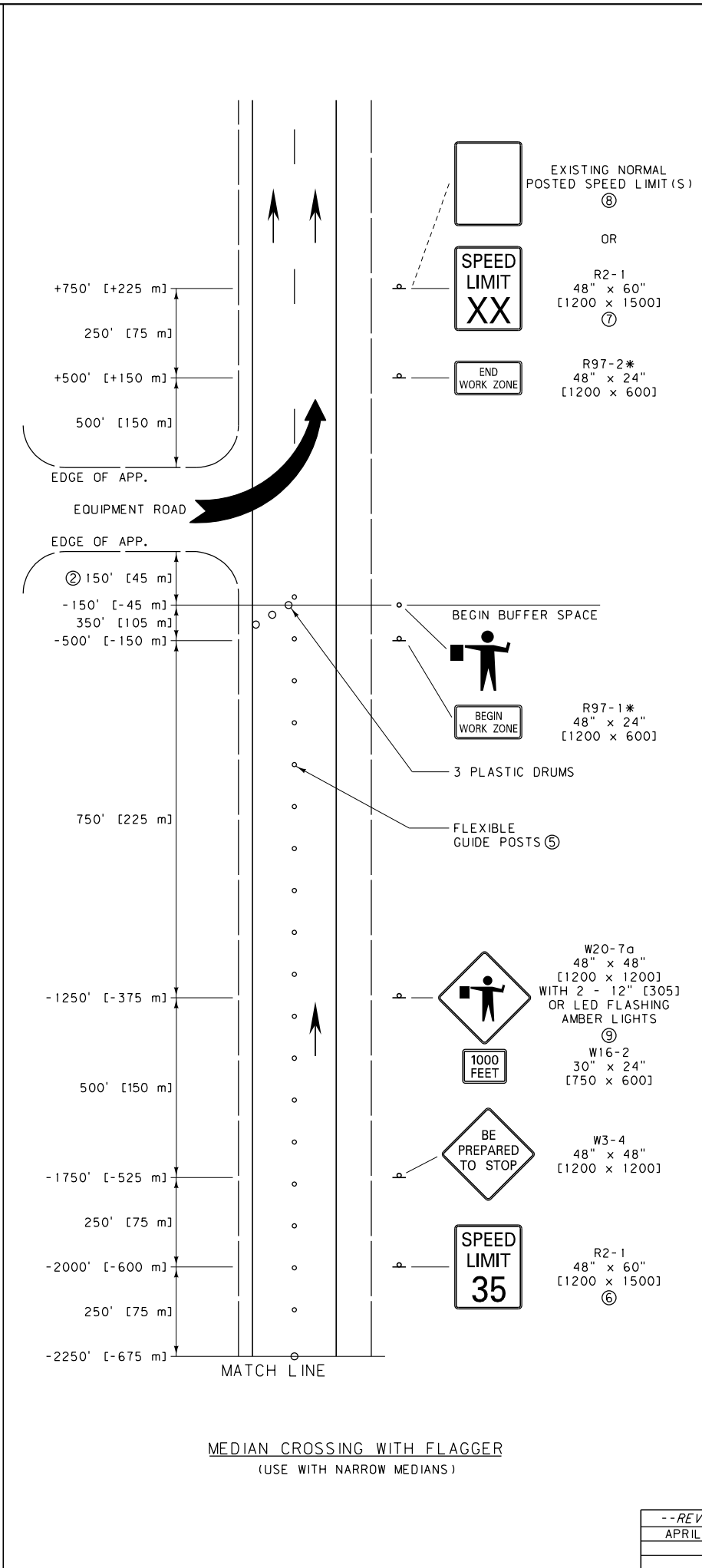
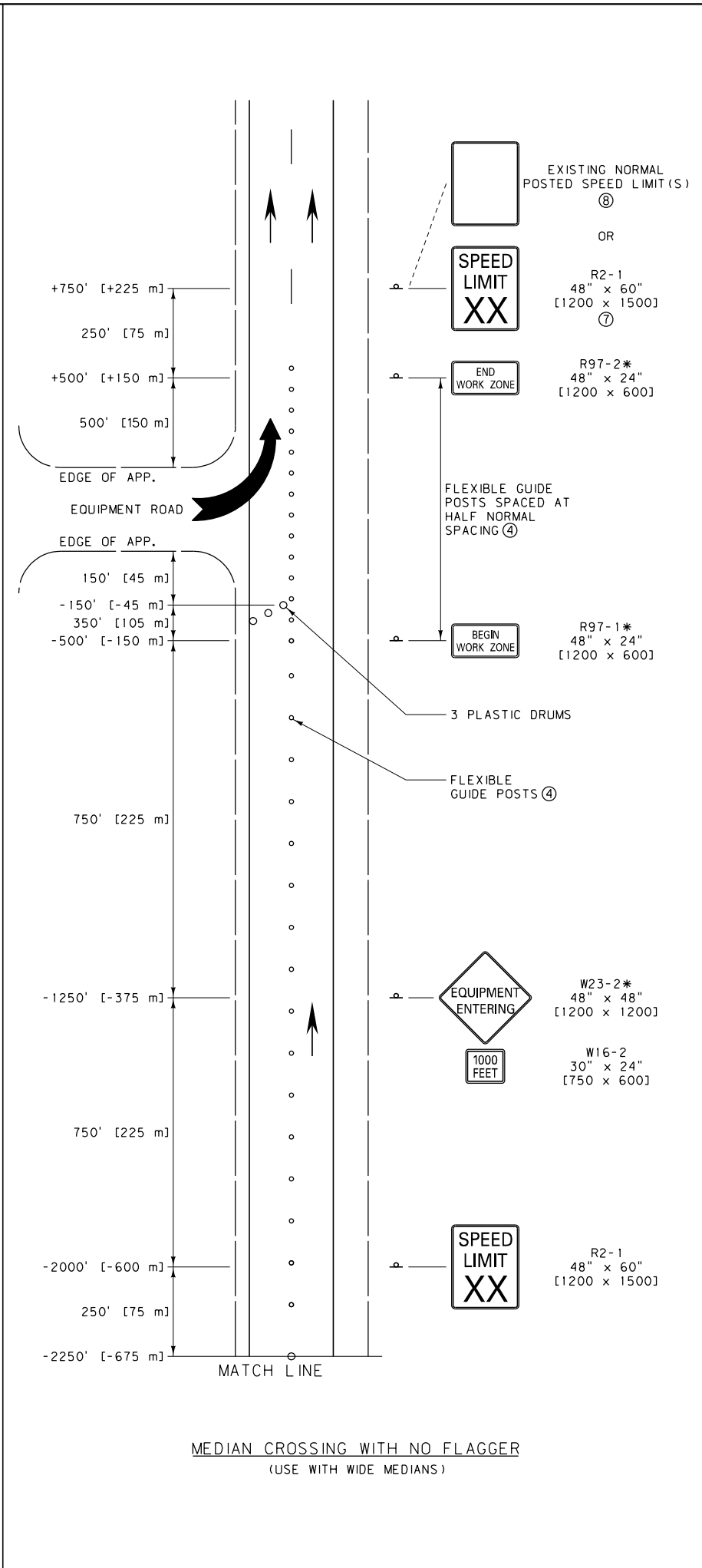
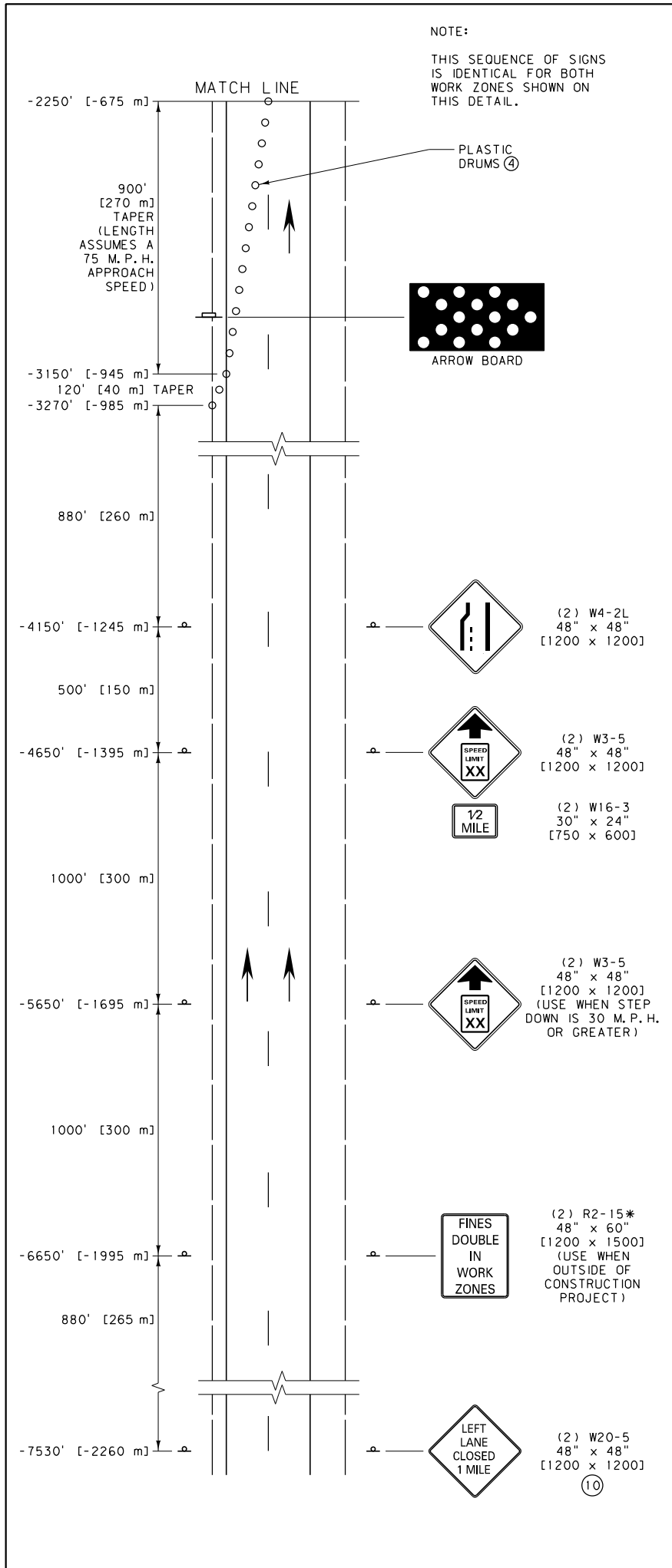
* DENOTES SIGNS THAT ARE UNIQUE TO MONTANA.

UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING	
REFERENCE DWG. NO.	618-27
STANDARD SPEC.	
SECTION 618	
DIVIDED FOUR-LANE EQUIPMENT ENTRANCE	


--REVISED--	EFFECTIVE: APRIL 2006
APRIL 2012	

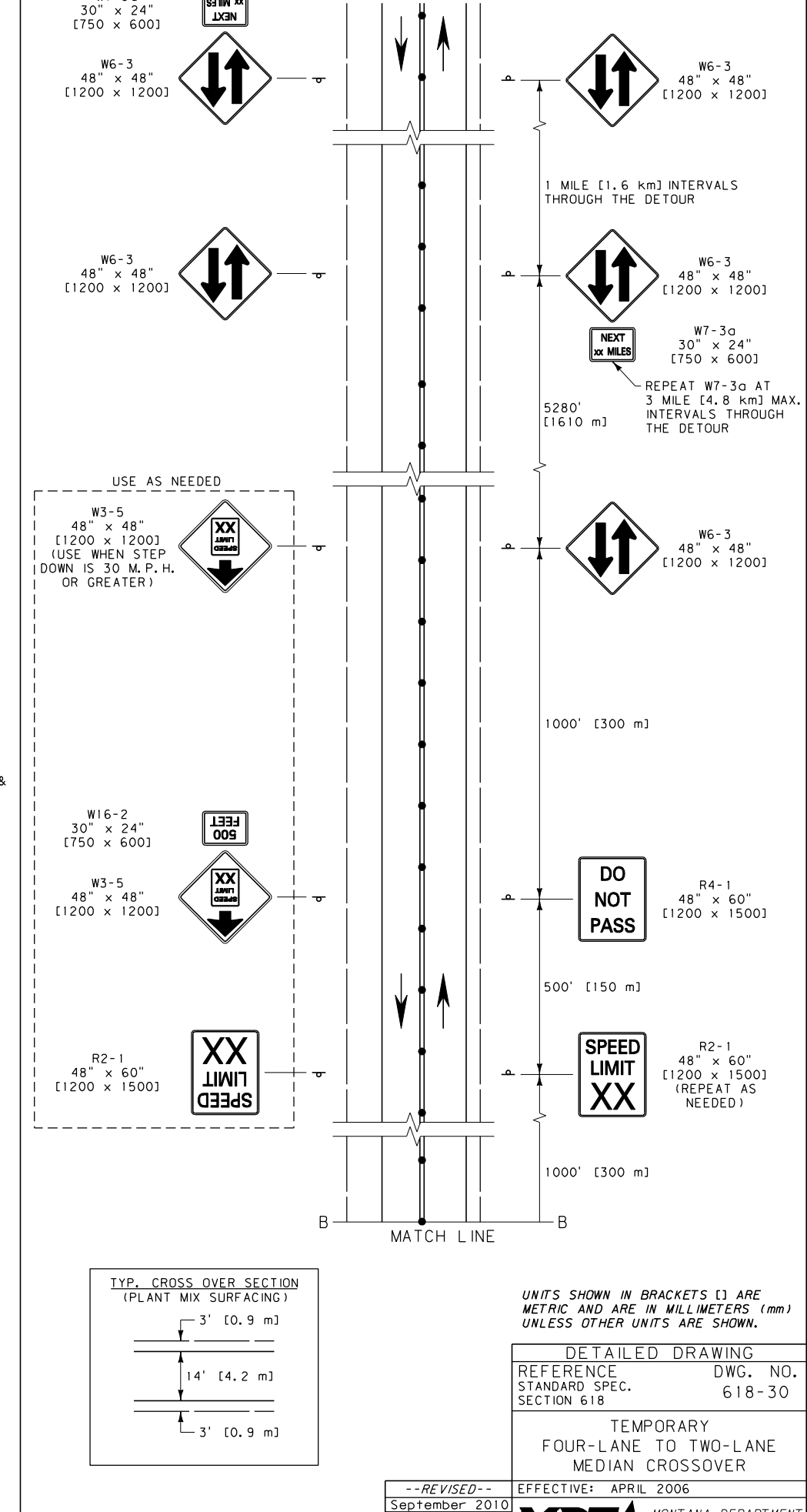
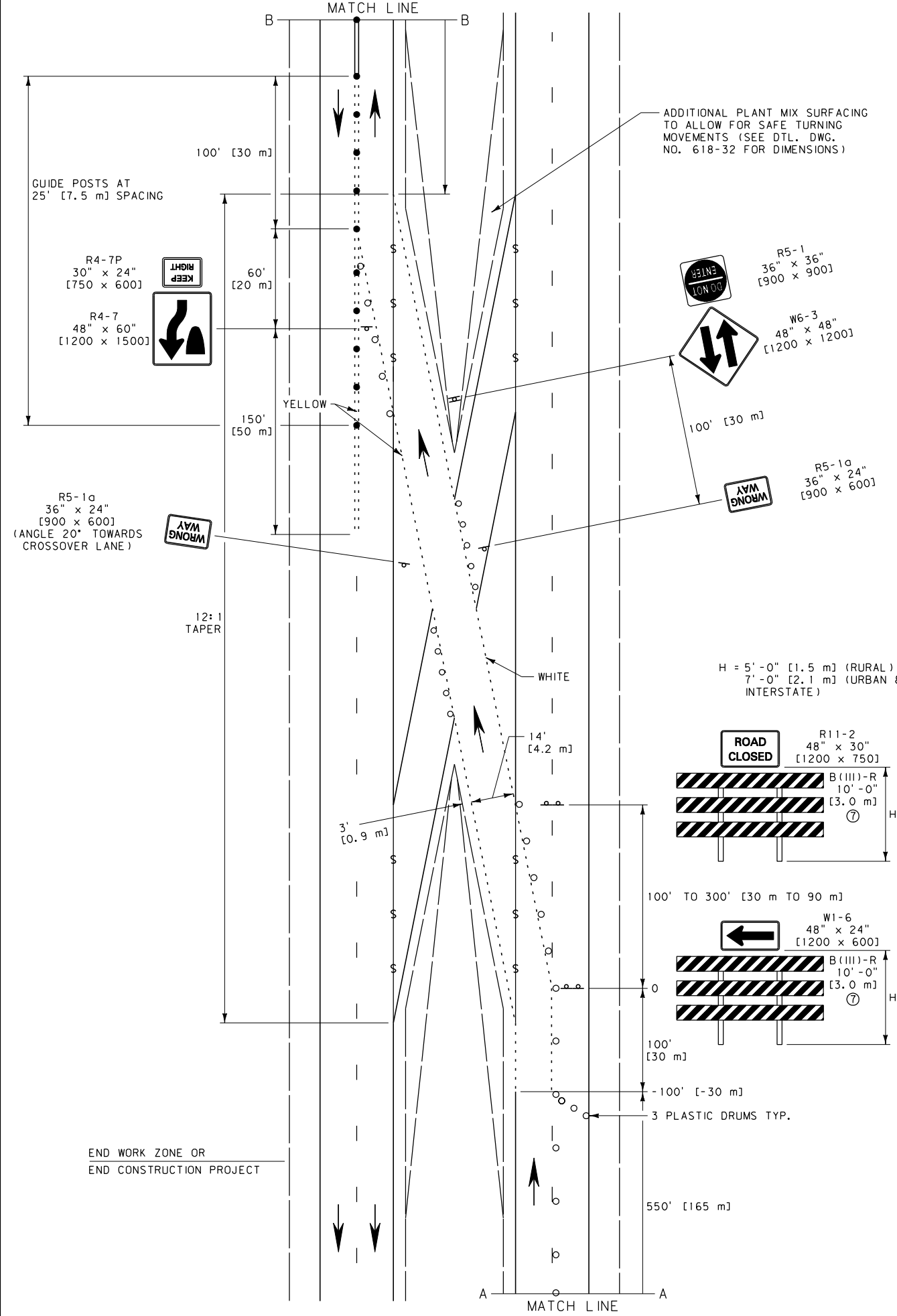


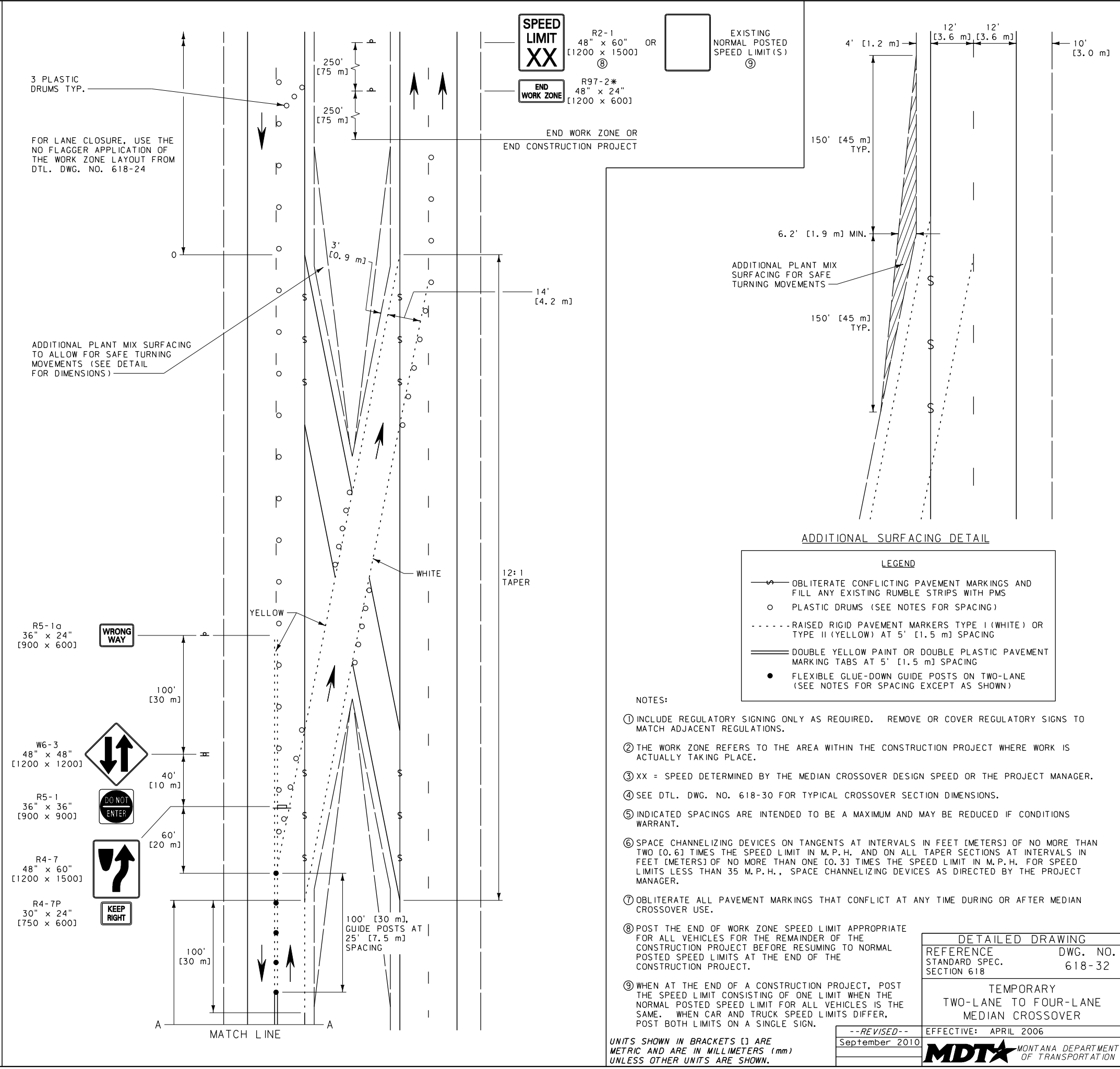
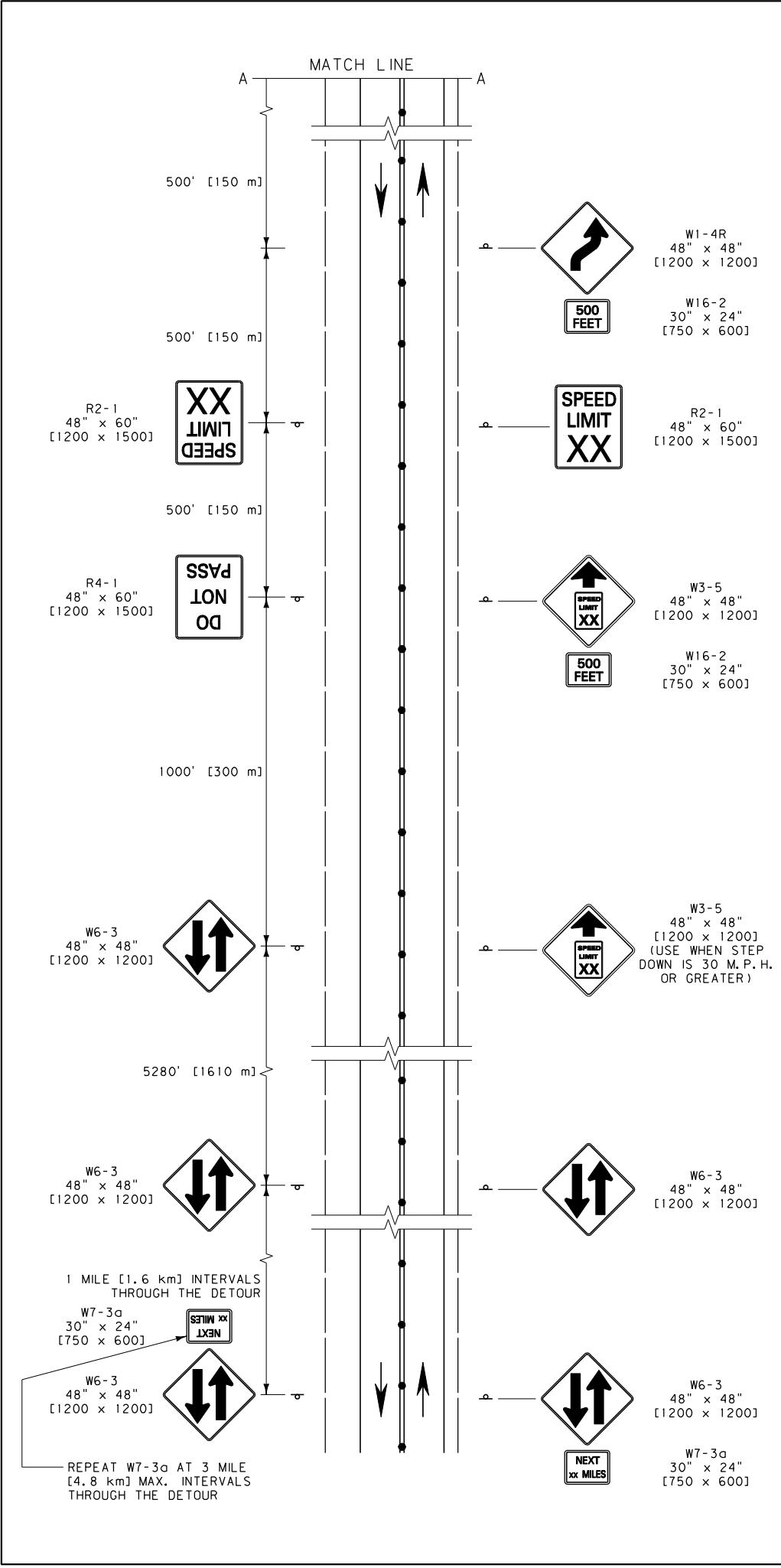


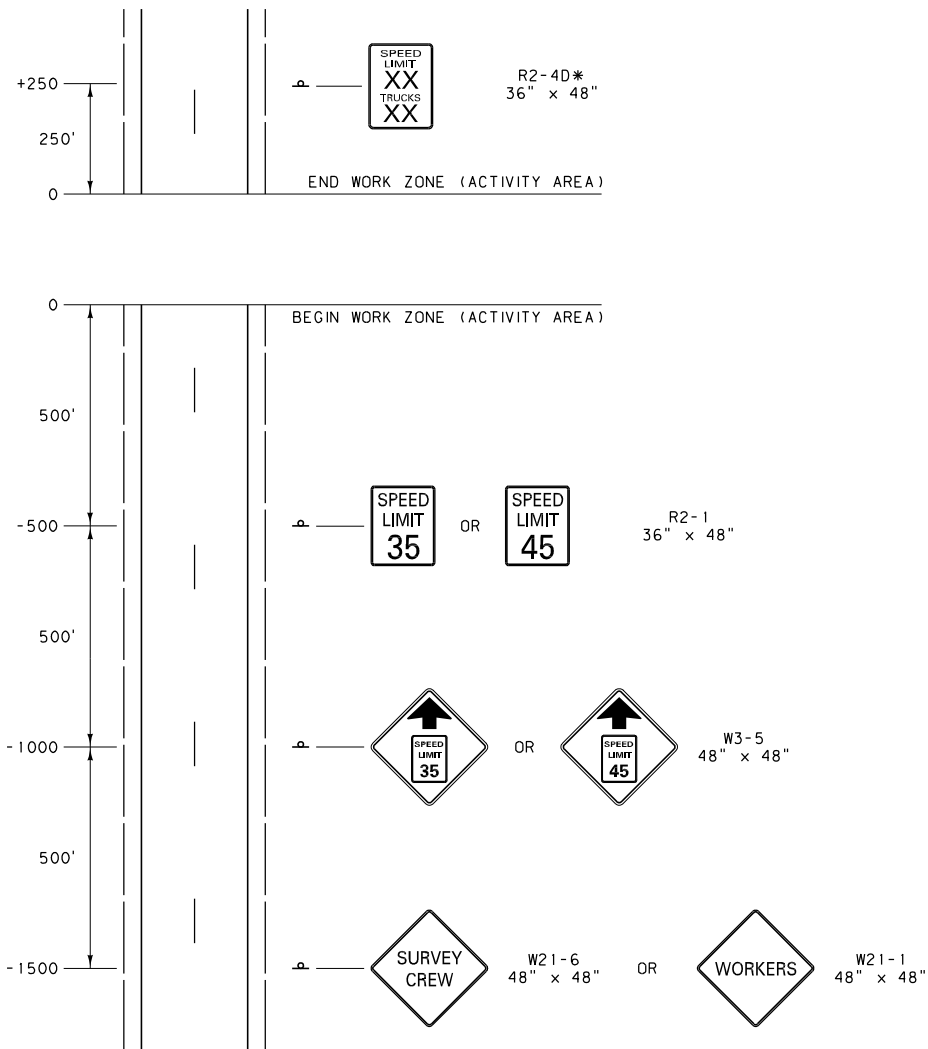
- NOTES:
- ① INCLUDE SPEED LIMIT SIGNING ONLY IF THERE IS REASON TO RESTRICT SPEED WITHIN THE WORK ZONE. REMOVE OR COVER REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.
 - ② THE BUFFER SPACE MAY BE INCREASED FOR DOWNGRADES AND OTHER CONDITIONS THAT AFFECT STOPPING DISTANCE.
 - ③ XX = SPEED DETERMINED BY THE PROJECT MANAGER.
 - ④ THE WORK ZONE REFERS TO THE AREA WHERE WORK IS ACTUALLY TAKING PLACE. WHEN THIS OCCURS OUTSIDE OF A CONSTRUCTION PROJECT, INCLUDE THE W20-1 AND R2-15* SIGNS.
 - ⑤ SPACE FLEXIBLE GUIDE POSTS ON TANGENTS AT INTERVALS IN FEET [METERS] OF NO MORE THAN TWO [0.6] TIMES THE SPEED LIMIT IN M.P.H. SPACE PLASTIC DRUMS IN ALL TAPER SECTIONS AT INTERVALS IN FEET [METERS] OF NO MORE THAN ONE [0.3] TIMES THE SPEED LIMIT IN M.P.H. FOR SPEED LIMITS LESS THAN 35 M.P.H., SPACE CHANNELIZING DEVICES AS DIRECTED BY THE PROJECT MANAGER.
 - ⑥ IF FLAGGER IS MORE THAN ONE MILE [1.6 km] FROM THE LANE CLOSURE, INCLUDE W3-5 SIGNS, AS REQUIRED.
 - ⑦ POST THE END OF WORK ZONE SPEED LIMIT APPROPRIATE FOR ALL VEHICLES FOR THE REMAINDER OF THE CONSTRUCTION PROJECT BEFORE RESUMING TO NORMAL POSTED SPEED LIMITS AT THE END OF THE CONSTRUCTION PROJECT.
 - ⑧ WHEN OUTSIDE OF A CONSTRUCTION PROJECT, POST THE SPEED LIMIT CONSISTING OF ONE LIMIT WHEN THE NORMAL POSTED SPEED LIMIT FOR ALL VEHICLES IS THE SAME. WHEN CAR AND TRUCK SPEED LIMITS DIFFER, POST BOTH LIMITS ON A SINGLE SIGN.
 - ⑨ INSURE THE 12" [305] AMBER FLASHERS AND THE AMBER LED FLASHERS MEET REQUIREMENTS OF SECTION 715 AND DTL. DWG. NO. 618-01.
 - ⑩ POST THE W20-5 AFTER THE W20-1 OR G20-1 AND THE R2-15 IF THE MERGING TAPER OCCURS AT THE BEGINNING OF THE CONSTRUCTION PROJECT.
- * DENOTES SIGNS THAT ARE UNIQUE TO MONTANA.

UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	618-28
SECTION 618	
DIVIDED FOUR-LANE MEDIAN CROSSING	
--REVISED--	EFFECTIVE: APRIL 2006
APRIL 2012	
 MONTANA DEPARTMENT OF TRANSPORTATION serving you with pride	






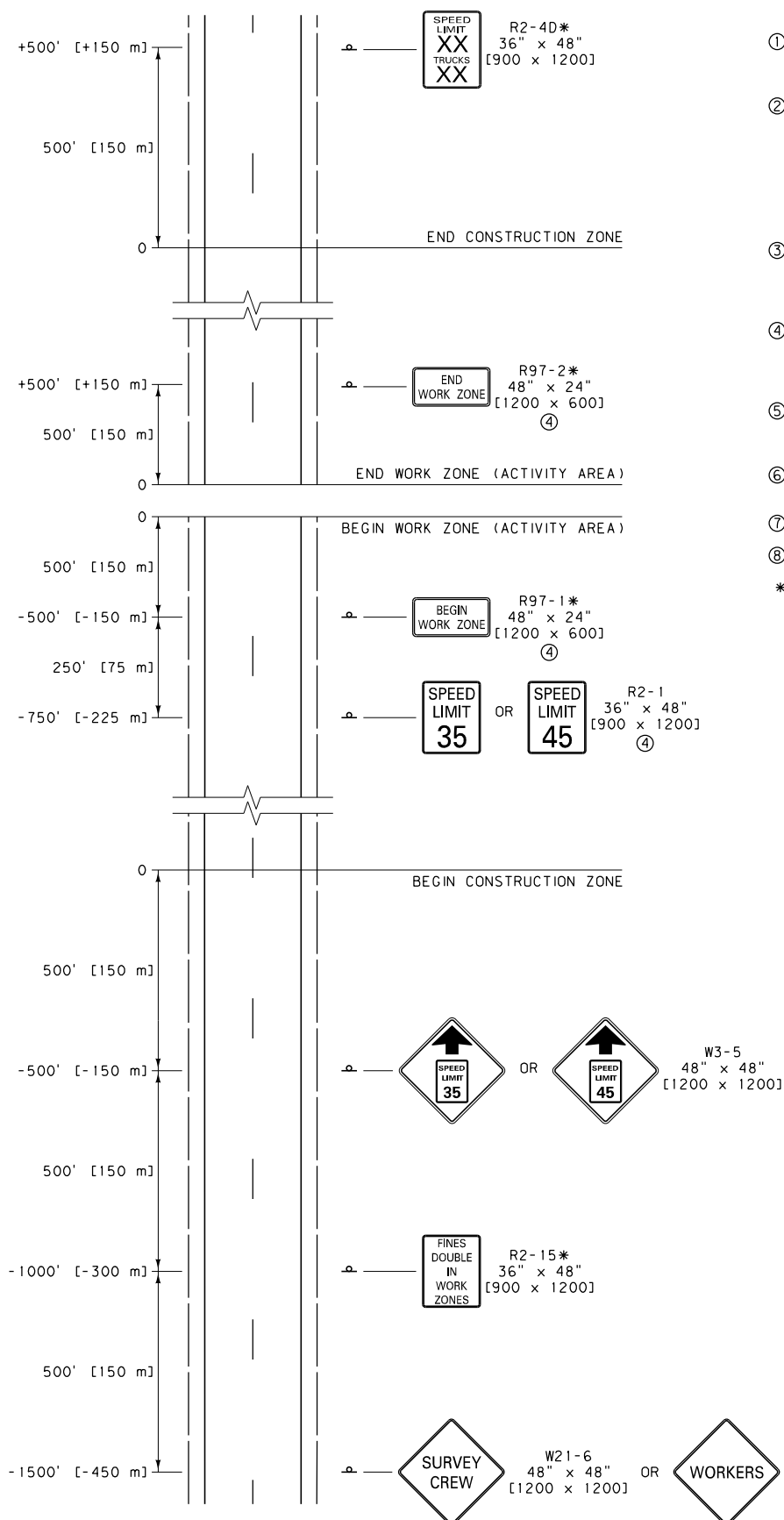


NOTES:

- ① SHORT DURATION ACTIVITIES ARE DEFINED AS THOSE LASTING UP TO ONE HOUR.
- ② USE THIS SIGN LAYOUT WHEN WORK IS TO TAKE PLACE ON THE TRAVELED WAY. SIGNING FOR WORK ON OR NEAR THE SHOULDER MAY BE LIMITED TO THE USE OF ONE 48" WARNING SIGN FOR EACH TRAVEL DIRECTION. SIGNING FOR WORK OUTSIDE THE SHOULDER MAY BE LIMITED TO THE USE OF ONE 48" WARNING SIGN FOR THE TRAVEL DIRECTION ADJACENT TO THE WORK.
- ③ SIGN BOTH TRAVEL DIRECTIONS ON TWO-LANE, TWO-WAY ROADWAYS OR BOTH SHOULDERS ON TWO-LANE, ONE-WAY ROADWAYS.
- ④ PROVIDE AT LEAST THE DISTANCE SHOWN FOR DELINEATOR MOUNTED SIGNS.
- ⑤ SEE DTL. DWG. NO. 618-36 "SHORT-TERM STATIONARY CREW SIGNING" IF THE DOUBLE PENALTY REGULATION IS TO BE UTILIZED.
- ⑥ XX = NORMAL POSTED SPEED LIMIT(S).

* DENOTES SIGNS THAT ARE UNIQUE TO MONTANA.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	618-34
SECTION 618	
SHORT DURATION CREW SIGNING	
EFFECTIVE: APRIL 2006	
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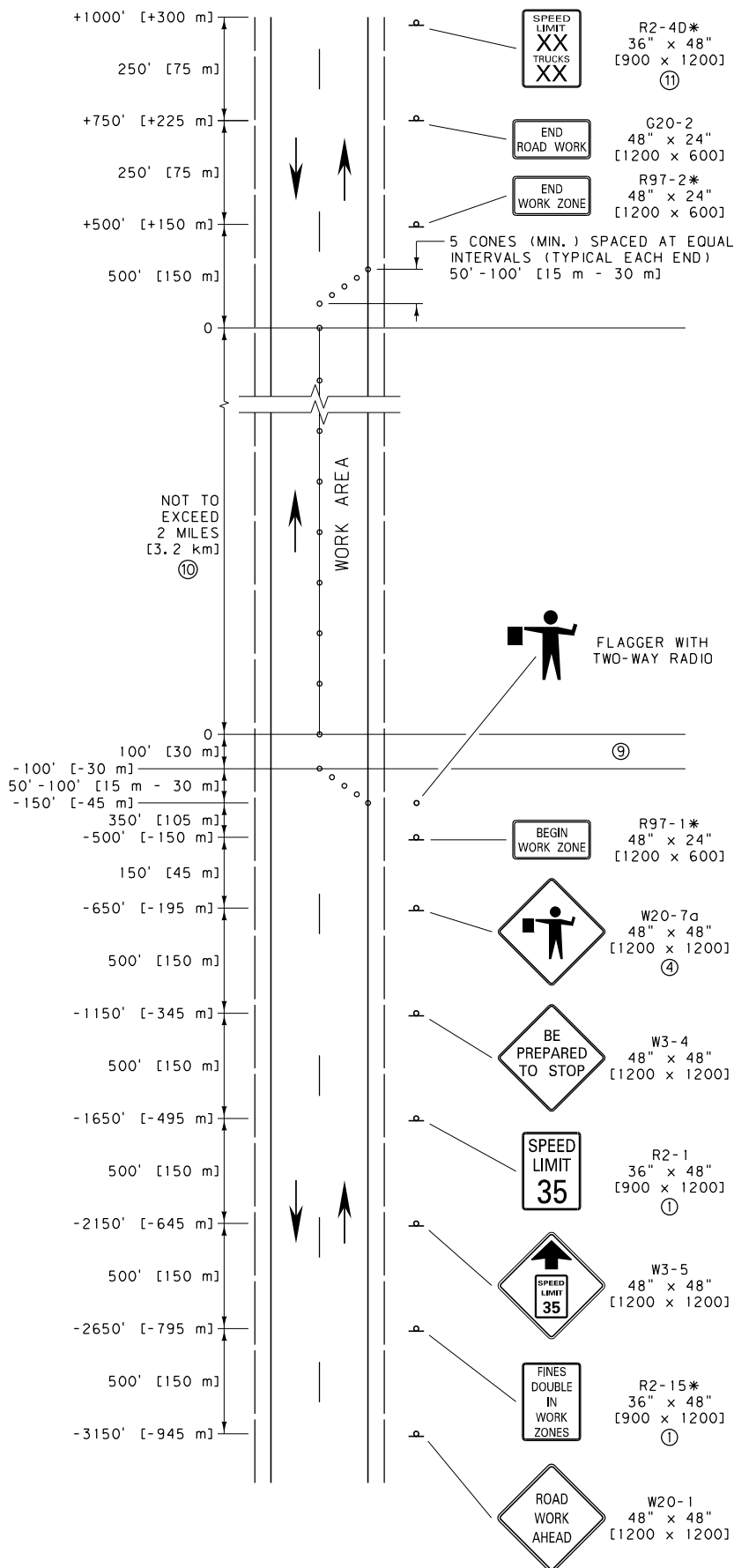
NOTES:

- ① SHORT-TERM STATIONARY ACTIVITIES ARE DEFINED AS THOSE LASTING GREATER THAN ONE HOUR, UP TO A FULL SHIFT.
- ② USE THIS SIGN LAYOUT WHEN WORK IS TO TAKE PLACE ON THE TRAVELED WAY. SIGNING FOR WORK ON OR NEAR THE SHOULDER MAY BE LIMITED TO THE USE OF ONE 48" [1200 mm] WARNING SIGN FOR EACH TRAVEL DIRECTION. SIGNING FOR WORK OUTSIDE THE SHOULDER MAY BE LIMITED TO THE USE OF ONE 48" [1200 mm] WARNING SIGN FOR THE TRAVEL DIRECTION ADJACENT TO THE WORK.
- ③ THE CONSTRUCTION ZONE REFERS TO THE GENERAL AREA THAT REQUIRES TEMPORARY WORK ZONE TRAFFIC CONTROL. IT SHOULD NOT EXCEED 3 MILES [4.8 km] IN LENGTH.
- ④ THE TWO SIGNS MARKING THE WORK ZONE BOUNDARIES AND THE REGULATORY SPEED SIGN MUST MOVE AS NEEDED WITHIN THE CONSTRUCTION ZONE TO REMAIN WITHIN 500 FEET [150 m] OF THE WORK ACTIVITY.
- ⑤ SIGN BOTH TRAVEL DIRECTIONS ON TWO-LANE, TWO-WAY ROADWAYS OR BOTH SHOULDERS ON TWO-LANE, ONE-WAY ROADWAYS.
- ⑥ PROVIDE AT LEAST THE DISTANCE SHOWN FOR DELINEATOR MOUNTED SIGNS.
- ⑦ USE REFLECTIVE DEVICES.
- ⑧ XX = NORMAL POSTED SPEED LIMIT(S).

* DENOTES SIGNS THAT ARE UNIQUE TO MONTANA.

UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.


DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 618	DWG. NO. 618-36
SHORT-TERM STATIONARY CREW SIGNING	
--REVISED-- APRIL 2012	EFFECTIVE: APRIL 2006
 MONTANA DEPARTMENT OF TRANSPORTATION	

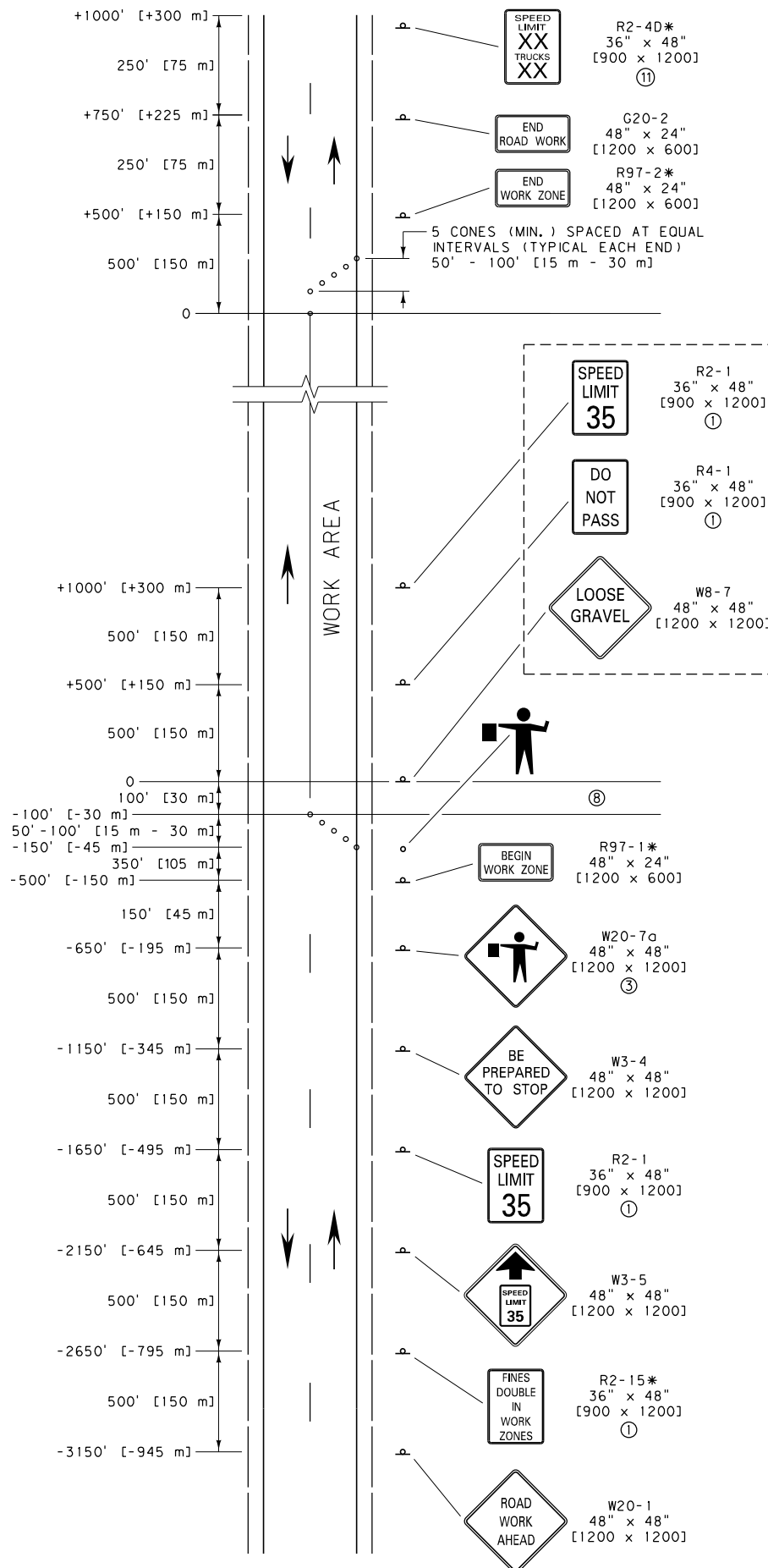


NOTES:

- ① MINIMUM REGULATORY SIGN SIZE IS 24" X 30" [600 X 750] ON TWO-LANE ROADS.
 - ② ON ROADWAYS WITH HIGH TRAFFIC VOLUMES OR VISIBILITY RESTRICTIONS, A 500' [150 m] SPACING FOR ALL SIGNS IS RECOMMENDED.
 - ③ SPACE CHANNELIZING DEVICES AT INTERVALS IN FEET (METERS) EQUAL TO TWICE [0.6 TIMES] THE SPEED LIMIT IN M.P.H. THROUGH THE BUFFER AND WORK AREA.
 - ④ IF A NEED ARISES TO INCREASE VEHICLE STORAGE, ADD AN ADDITIONAL W20-7a "FLAGGER AHEAD" SIGN BETWEEN THE R2-1 AND W3-4 SIGNS AND/OR CONSIDER AN ADDITIONAL ADVANCE FLAGGER.
 - ⑤ A MIRROR IMAGE OF THIS SIGN SEQUENCE IS REQUIRED FOR THE TRAFFIC FROM THE OPPOSITE DIRECTION.
 - ⑥ FOR MORE INFORMATION OR CLARIFICATION CONTACT THE DISTRICT TRAFFIC ENGINEER. FOR EXAMPLE, IF WORK ZONE IS CLOSE TO A HORIZONTAL CURVE, A VERTICAL CURVE, A BRIDGE, INTERCHANGE, POOR SIGHT DISTANCE, OR OTHER SPECIAL CONDITION.
 - ⑦ COVER ANY CONFLICTING SIGNS IN THE WORK ZONE.
 - ⑧ SHORT-TERM WORK ZONE SIGNING IS NOT REQUIRED TO BE POST MOUNTED.
 - ⑨ THE BUFFER SPACE CAN BE LATERAL AND LONGITUDINAL AND MAY BE INCREASED FOR DOWNGRADES AND OTHER CONDITIONS THAT AFFECT STOPPING DISTANCE.
 - ⑩ TYPICALLY 2 MILES [3.2 km] IS THE MAX. WORK AREA. HOWEVER, WHEN SIGHT DISTANCE, BUFFER ZONES OR ACCOMPLISHMENT RATES FOR EQUIPMENT ARE CONSIDERED, SOME MINOR ADJUSTMENTS TO THIS MAX. MAY BE CONSIDERED.
 - ⑪ XX = NORMAL POSTED SPEED LIMIT(S).
- * DENOTES SIGNS THAT ARE UNIQUE TO MONTANA.

UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	618-M1
SECTION 618	
MAINTENANCE GUIDELINE FOR SHORT-TERM TWO-LANE CRACK SEALING WORK ZONE	
---REVISED---	EFFECTIVE: APRIL 2006
APRIL 2012	
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NOTE:

TO BE POSTED AT THE START OF THE WORK AND REPEATED AT TWO-MILE [3.2 km] INTERVALS UNTIL THE SURFACE IS SWEEPED AND STRIPED.

NOTES:

- ① MINIMUM REGULATORY SIGN SIZE IS 24" x 30" [600 x 750] ON TWO-LANE ROADS.
- ② ON ROADWAYS WITH HIGH TRAFFIC VOLUMES OR VISIBILITY RESTRICTIONS, A 500' [150 m] SPACING FOR ALL SIGNS IS RECOMMENDED.
- ③ IF A NEED ARISES TO INCREASE VEHICLE STORAGE, ADD AN ADDITIONAL W20-7a "FLAGGER AHEAD" SIGN BETWEEN THE R2-1 AND W3-4 SIGNS AND/OR CONSIDER AN ADDITIONAL ADVANCE FLAGGER.
- ④ A MIRROR IMAGE OF THIS SIGN SEQUENCE IS REQUIRED FOR THE TRAFFIC FROM THE OPPOSITE DIRECTION.
- ⑤ FOR MORE INFORMATION OR CLARIFICATION CONTACT THE DISTRICT TRAFFIC ENGINEER. FOR EXAMPLE, IF WORK ZONE IS CLOSE TO A HORIZONTAL CURVE, A VERTICAL CURVE, A BRIDGE, INTERCHANGE, POOR SIGHT DISTANCE OR OTHER SPECIAL CONDITION.
- ⑥ COVER ANY CONFLICTING SIGNS IN THE WORK ZONE.
- ⑦ SHORT-TERM WORK ZONE SIGNING IS NOT REQUIRED TO BE POST MOUNTED.
- ⑧ THE BUFFER SPACE CAN BE LATERAL AND LONGITUDINAL AND MAY BE INCREASED FOR DOWNGRADES AND OTHER CONDITIONS THAT AFFECT STOPPING DISTANCE.
- ⑨ XX = NORMAL POSTED SPEED LIMIT(S).

* DENOTES SIGNS THAT ARE UNIQUE TO MONTANA.

UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING

REFERENCE DWG. NO.
STANDARD SPEC. 618-M2
SECTION 618

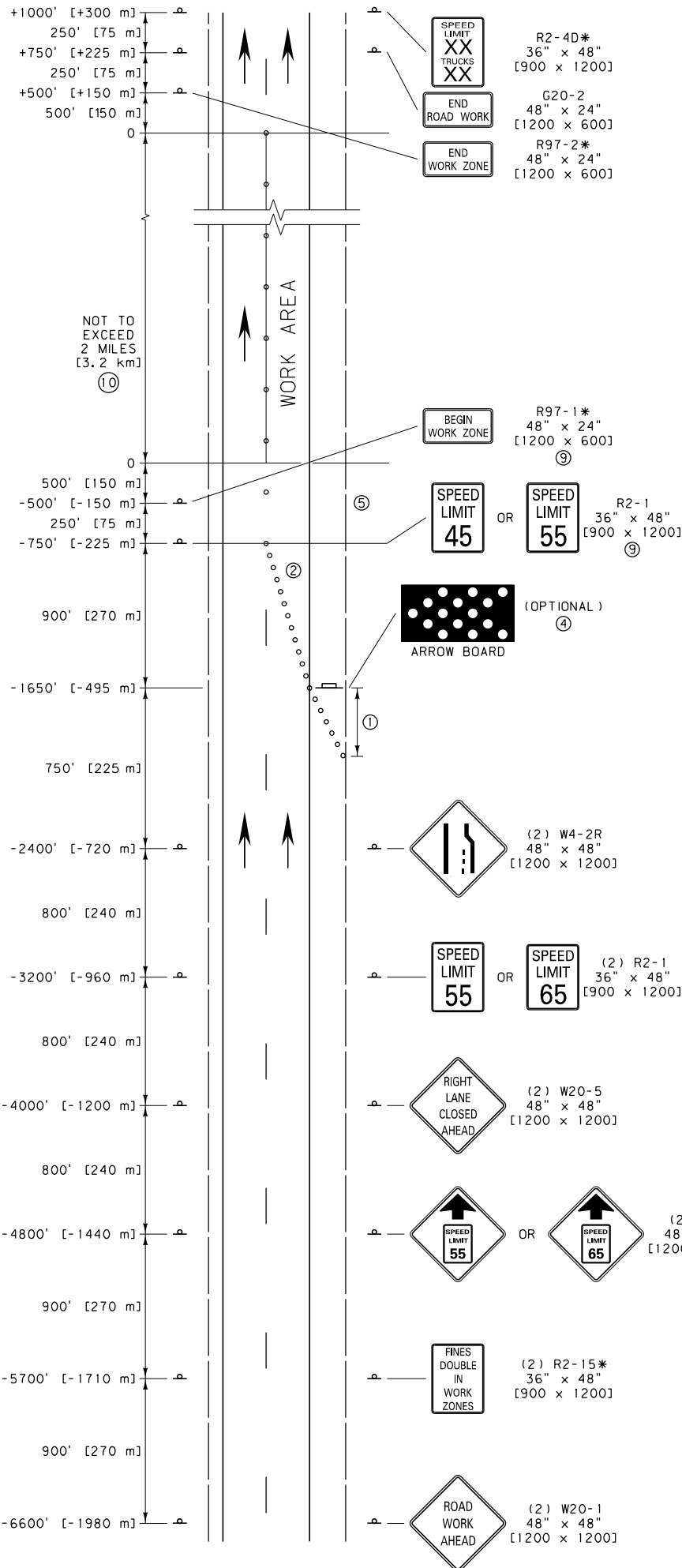
MAINT. GUIDELINE FOR SHORT-TERM TWO-LANE CHIP SEAL & OVERLAY (PILOTTED TRAFFIC)

--REVISED--
APRIL 2012

EFFECTIVE: APRIL 2006

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NOTES:

- USE A MINIMUM 300' [90 m] SHOULDER TAPER.
 - USE THIRTEEN APPROVED CHANNELIZING DEVICES FOR A 12' [3.6 m] LANE CLOSURE TAPER (75 M.P.H. SPACED AT 75' [22.5 m].) ASSURE THAT THE TAPER IS A MINIMUM LENGTH OF 900' [270 m].
 - SPACE CHANNELIZING DEVICES AT INTERVALS IN FEET [METERS] EQUAL TO TWICE [0.6 TIMES] THE SPEED LIMIT IN M.P.H. THROUGH THE BUFFER AND WORK AREA.
 - PLACE THE ARROW BOARD (IF USED) ON THE SHOULDER AT THE START OF THE TRAVEL LANE CLOSURE TAPER.
 - THE BUFFER SPACE CAN BE LATERAL AND LONGITUDINAL. KEEP THE BUFFER SPACE CLEAR OF EQUIPMENT AND PERSONNEL.
 - FOR MORE INFORMATION OR CLARIFICATION CONTACT THE DISTRICT TRAFFIC ENGINEER. FOR EXAMPLE, IF WORK AREA IS CLOSE TO A HORIZONTAL CURVE, A VERTICAL CURVE, A BRIDGE, INTERCHANGE, POOR SIGHT DISTANCE OR OTHER SPECIAL CONDITION.
 - COVER ANY CONFLICTING SIGNS IN THE WORK AREA.
 - SHORT-TERM WORK ZONE SIGNING IS NOT REQUIRED TO BE POST MOUNTED.
 - WHEN THE WORK ZONE CHANGES WITHIN THE CONSTRUCTION ZONE, THESE SIGNS SHOULD BE MOVED TO REFLECT THE ACTUAL WORK ZONE.
 - TYPICALLY 2 MILES [3.2 km] IS THE MAX. WORK AREA. HOWEVER, WHEN SIGHT DISTANCE, BUFFER ZONES OR ACCOMPLISHMENT RATES FOR EQUIPMENT ARE CONSIDERED, SOME MINOR ADJUSTMENTS TO THIS MAX. MAY BE CONSIDERED.
 - XX = NORMAL POSTED SPEED LIMIT(S).
- * DENOTES SIGNS THAT ARE UNIQUE TO MONTANA.

UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	618-M3
SECTION 618	

MAINTENANCE GUIDELINE FOR SHORT-TERM LANE CLOSURE ON INTERSTATE

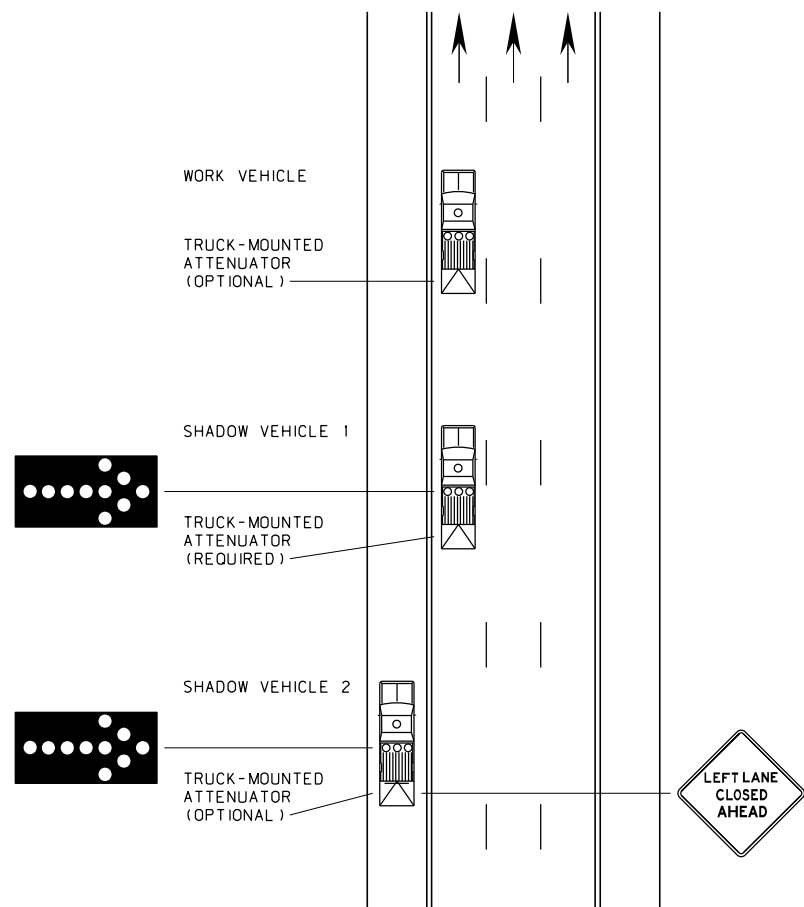
--REVISED--
APRIL 2012

EFFECTIVE: APRIL 2006



MONTANA DEPARTMENT
OF TRANSPORTATION

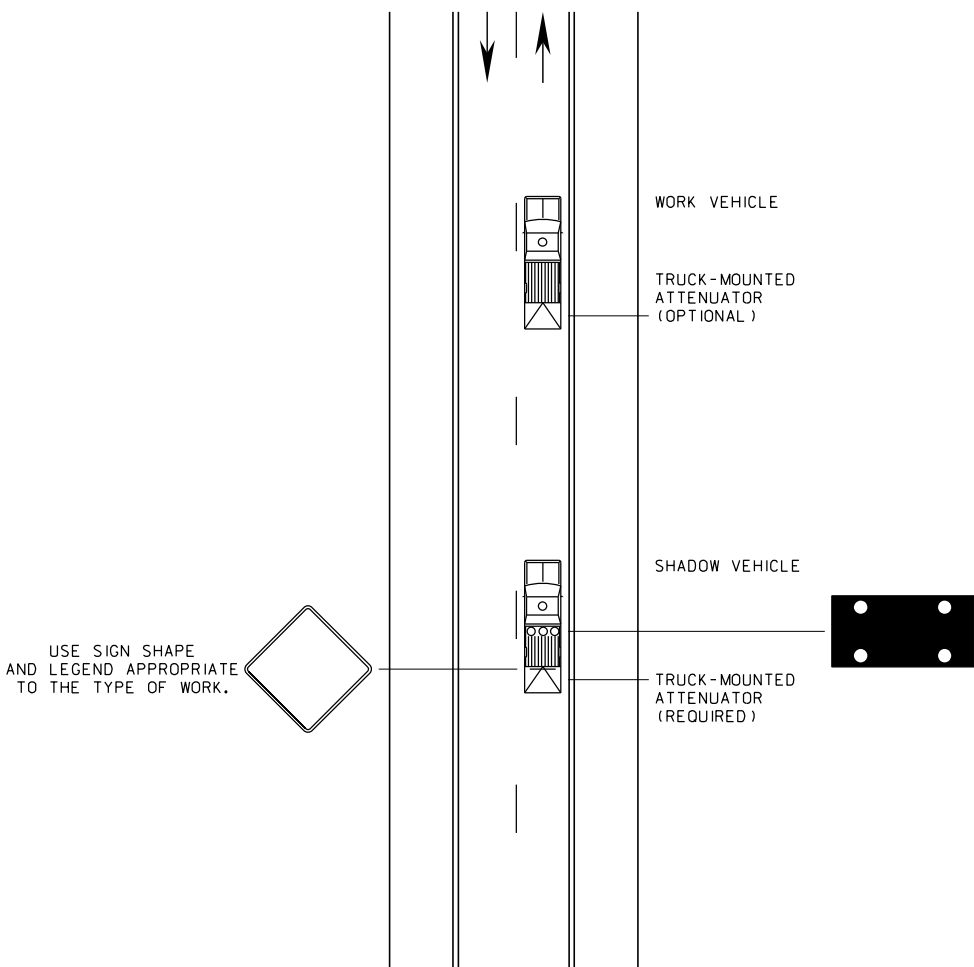
MOBILE OPERATIONS ON MULTILANE ROAD



NOTES:

- ① PLACE APPROPRIATE LANE CLOSURE SIGN ON SHADOW VEHICLE 2 SO AS NOT TO OBSCURE THE ARROW BOARD.
- ② FOLLOW THE WORK OPERATION WITH SHADOW VEHICLE 2 SO AS TO PROVIDE ADEQUATE SIGHT DISTANCE FOR VEHICULAR TRAFFIC APPROACHING FROM THE REAR.
- ③ COVER OR TURN THE SIGN LEGENDS ON VEHICLE-MOUNTED SIGNS FROM VIEW WHEN WORK IS NOT IN PROGRESS.
- ④ WHEN THE WORK VEHICLE OCCUPIES AN INTERIOR LANE OF A DIRECTIONAL ROADWAY HAVING A RIGHT SHOULDER 10 FEET [3 m] OR MORE IN WIDTH, DRIVE SHADOW VEHICLE 2 ALONG THE RIGHT-HAND SHOULDER WITH A SIGN INDICATING WORK IS TAKING PLACE IN THE INTERIOR LANE.
- ⑤ ON HIGH-SPEED ROADWAYS, A THIRD SHADOW VEHICLE MAY BE USED WITH SHADOW VEHICLE 1 IN THE CLOSED LANE, SHADOW VEHICLE 2 STRADDLING THE EDGE LINE, AND SHADOW VEHICLE 3 ON THE SHOULDER. WHERE ADEQUATE SHOULDER WIDTH IS NOT AVAILABLE, SHADOW VEHICLE 3 MAY ALSO STRADDLE THE EDGE LINE.
- ⑥ THE MINIMUM ARROW BOARD SIZE IS TYPE B, 60 INCHES X 30 INCHES [1500 X 750].
- ⑦ VARY THE DISTANCE BETWEEN THE WORK LOCATION AND SHADOW VEHICLE 2 TO PROVIDE ADEQUATE SIGHT DISTANCE FOR VEHICULAR TRAFFIC APPROACHING FROM THE REAR.
- ⑧ MAINTAIN A MINIMUM SPACING BETWEEN THE WORK VEHICLE AND SHADOW VEHICLES, AND BETWEEN EACH SHADOW VEHICLE TO DETER ROAD USERS FROM DRIVING IN BETWEEN.


MOBILE OPERATIONS ON TWO-LANE ROAD



NOTES:

- ① TRUCK-MOUNTED ATTENUATOR IS REQUIRED FOR SHADOW VEHICLE.
- ② EQUIP SHADOW VEHICLE WITH VEHICLE-MOUNTED SIGN. USE SIGN SHAPE AND LEGEND APPROPRIATE TO THE TYPE OF WORK.
- ③ MOUNT VEHICLE-MOUNTED SIGN IN A MANNER SO EQUIPMENT OR SUPPLIES DO NOT OBSCURE THE SIGN.
- ④ COVER OR TURN THE SIGN LEGENDS ON VEHICLE-MOUNTED SIGNS FROM VIEW WHEN WORK IS NOT IN PROGRESS.
- ⑤ WHENEVER ADEQUATE STOPPING SIGHT DISTANCE EXISTS TO THE REAR, MAINTAIN A MINIMUM DISTANCE FROM THE WORK VEHICLE WITH THE SHADOW VEHICLE AND PROCEED AT THE SAME SPEED.
- ⑥ SLOW DOWN THE SHADOW VEHICLE IN ADVANCE OF VERTICAL OR HORIZONTAL CURVES THAT RESTRICT SIGHT DISTANCE.

UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	618-M4
SECTION 618	
MOBILE OPERATIONS	
EFFECTIVE: DECEMBER 2011	
	MONTANA DEPARTMENT OF TRANSPORTATION

POSTED SPEED LIMIT FOR WORK ZONE	SIGN SPACING (A)	SPACING OF CHANNELIZING DEVICES (MAX.) (G) **	BUFFER SPACE ④ (B)
(M. P. H.)	FEET	FEET	FEET
25	100	25	50
35	100	35	100

** SPACE ALL CHANNELIZING DEVICES AT "G" UNLESS OTHERWISE NOTED.

SIGN LAYOUT
IDENTICAL TO
OPPOSING
TRAFFIC SIGN
LAYOUT

R2-15*
24" x 30" ⑧



R97-1*
36" x 18" ②



100'



B

END ROAD WORK
G20-2
36" x 18" ⑦

VARIES

END WORK ZONE
R97-2*
36" x 18" ②

SPEED
LIMIT
XX
R2-1
24" x 30" ⑨

50' (12.5' SPACING)

IF PEDESTRIAN
TRAFFIC IS IMPACTED,
SEE NOTE ⑤

WORK ZONE

2G

R2-1
24" x 30" ⑨



R97-2*
36" x 18" ②



VARIES

END ROAD WORK
G20-2
36" x 18" ⑦

BEGIN WORK ZONE
R97-1*
36" x 18" ②

FINES
DOUBLE
IN
WORK
ZONES
R2-15*
24" x 30" ⑧

50' (12.5' SPACING)

100'

A

A

A

A

A

A

SPEED
LIMIT
XX
R2-1
24" x 30" ⑨



W20-7a
36" x 36"
WITH 2 - 12"
FLASHING
AMBER LIGHTS



W20-4
36" x 36"



W20-1
36" x 36"

NOTES:

- USE THIS SIGN LAYOUT IN URBAN APPLICATIONS ONLY. USE THE RURAL, OPEN ROADWAY SIGNING DETAILS WHEN HIGHER SPEED LIMITS ARE USED.
- THE WORK ZONE REFERS TO THE AREA WHERE WORK IS ACTUALLY TAKING PLACE. KEEP THE BEGIN AND END WORK ZONE SIGNS WITHIN 500' OF THE WORK ZONE BOUNDARY. INCLUDE THE BEGIN AND END WORK ZONE SIGNS WHEN WORK IS IN PROGRESS OR WHEN CONDITIONS WARRANT.
- INCLUDE SPEED LIMIT SIGNS ONLY IF THERE IS A REASON TO RESTRICT SPEED. COVER CONFLICTING EXISTING SPEED LIMIT SIGNS.
- THE BUFFER SPACE MAY BE INCREASED FOR DOWNGRADES AND OTHER CONDITIONS THAT AFFECT STOPPING DISTANCE.
- IF PEDESTRIAN TRAFFIC IS IMPACTED SEE DTL. DWG. NO. 618-U05.
- LARGER SIGN SIZES MAY BE APPROVED BY THE ENGINEER.
- PLACE END ROADWORK SIGN AT END OF PROJECT LIMITS.
- IN LIEU OF TWO SIGNS, THE FINES DOUBLE AND BEGIN WORK ZONE SIGNS CAN BE COMBINED ON ONE SIGN FACE.
- POST EXISTING SPEED LIMIT IF CHANGED BY WORKZONE.

LEGEND

- - FLEXIBLE GUIDE POSTS
- - PLASTIC DRUMS
- * - DENOTES SIGNS THAT ARE UNIQUE TO MONTANA.
- XX - SPEED DETERMINED BY THE ENGINEER. (25 M. P. H. OR 35 M. P. H.)

DETAILED DRAWING

REFERENCE DWG. NO.
STANDARD SPEC. 618-U01
SECTION 618

LANE CLOSURE-FLAGGER
CONTROLLED (URBAN TWO
LANE, TWO WAY ROAD)

EFFECTIVE: MAY 2009

MDT MONTANA DEPARTMENT
OF TRANSPORTATION
serving you with pride

POSTED SPEED LIMIT FOR WORK ZONE (M. P. H.)	SIGN SPACING (A)	TAPER LENGTH (L)	SPACING OF CHANNELIZING DEVICES (MAX.) (G) **	BUFFER SPACE ④ (B)
25	100	125	25	50
35	100	245	35	100

** SPACE ALL CHANNELIZING DEVICES AT "G" UNLESS OTHERWISE NOTED.

NOTES:

- ① USE THIS SIGN LAYOUT IN URBAN APPLICATIONS ONLY. USE THE RURAL, OPEN ROADWAY SIGNING DETAILS WHEN HIGHER SPEED LIMITS ARE USED.
- ② THE WORK ZONE REFERS TO THE AREA WHERE WORK IS ACTUALLY TAKING PLACE. KEEP THE BEGIN AND END WORK ZONE SIGNS WITHIN 500' OF THE WORK ZONE BOUNDARY. INCLUDE THE BEGIN AND END WORK ZONE SIGNS WHEN WORK IS IN PROGRESS OR WHEN CONDITIONS WARRANT.
- ③ INCLUDE SPEED LIMIT SIGNS ONLY IF THERE IS A REASON TO RESTRICT SPEED. COVER CONFLICTING EXISTING SPEED LIMIT SIGNS.
- ④ THE BUFFER SPACE MAY BE INCREASED FOR DOWNGRADES AND OTHER CONDITIONS THAT AFFECT STOPPING DISTANCE.
- ⑤ THIS LAYOUT SHOULD ONLY BE USED WHEN THERE IS AT LEAST 10' IN WIDTH BETWEEN THE CHANNELIZING DEVICES AND THE EDGE OF PAVEMENT.
- ⑥ IF PEDESTRIAN TRAFFIC IS IMPACTED SEE DTL. DWG. NO. 618-U05.
- ⑦ LARGER SIGN SIZES MAY BE APPROVED BY THE ENGINEER.
- ⑧ PLACE END ROAD WORK SIGNS AT END OF PROJECT LIMITS.
- ⑨ POST EXISTING SPEED LIMIT IF CHANGED BY WORK ZONE.
- ⑩ IN LIEU OF TWO SIGNS, THE FINES DOUBLE AND BEGIN WORK ZONE SIGNS CAN BE COMBINED ON ONE SIGN FACE.

LEGEND

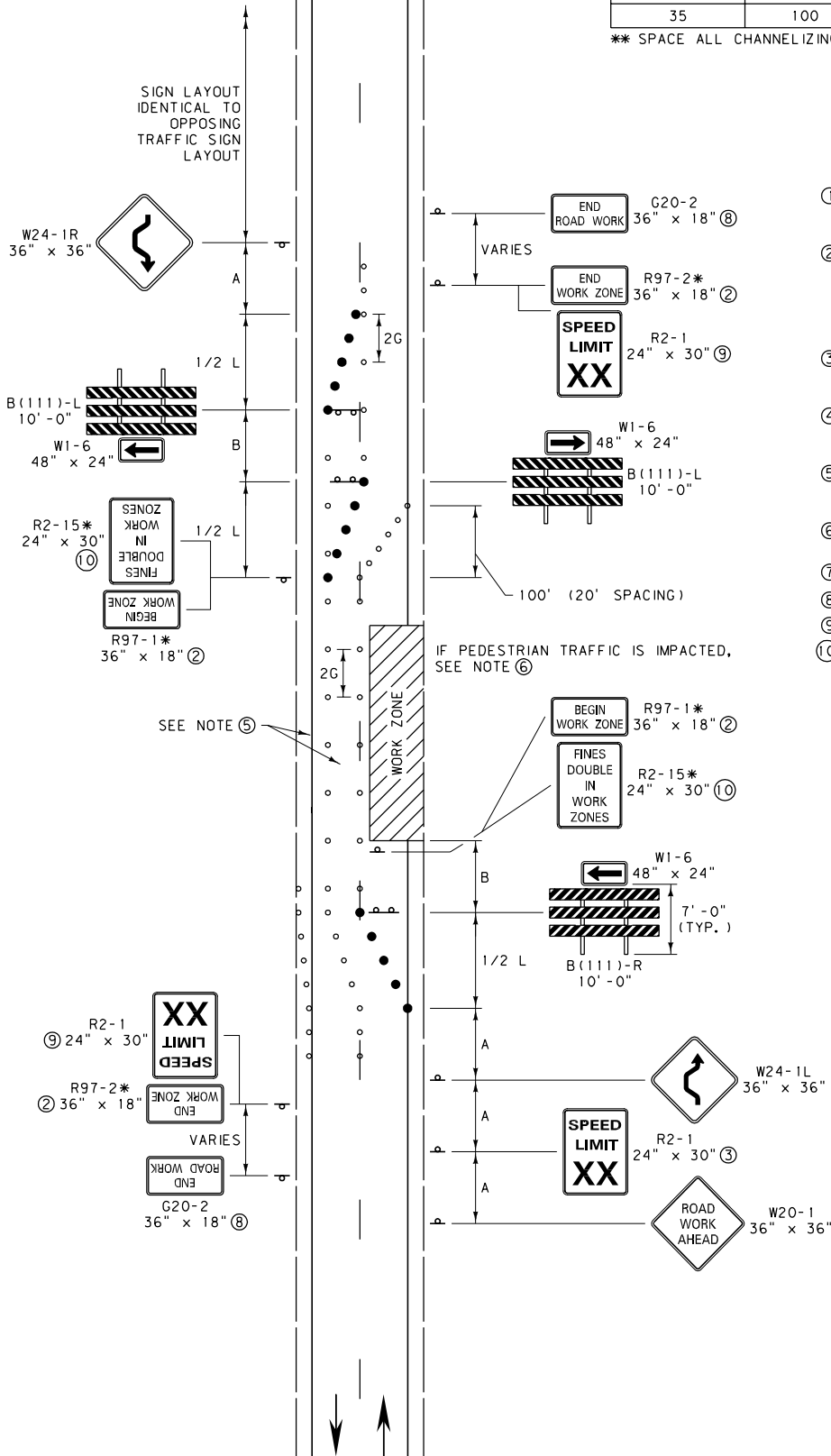
- - FLEXIBLE GUIDE POSTS
- - PLASTIC DRUMS
- * - DENOTES SIGNS THAT ARE UNIQUE TO MONTANA.
- XX - SPEED DETERMINED BY THE ENGINEER.
(25 M. P. H. OR 35 M. P. H.)

DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 618	DWG. NO. 618-U02
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WORK ZONE OCCUPIES ONE HALF OF ROAD (LOW SPEED URBAN TWO-LANE, TWO-WAY ROAD)

EFFECTIVE: MAY 2009

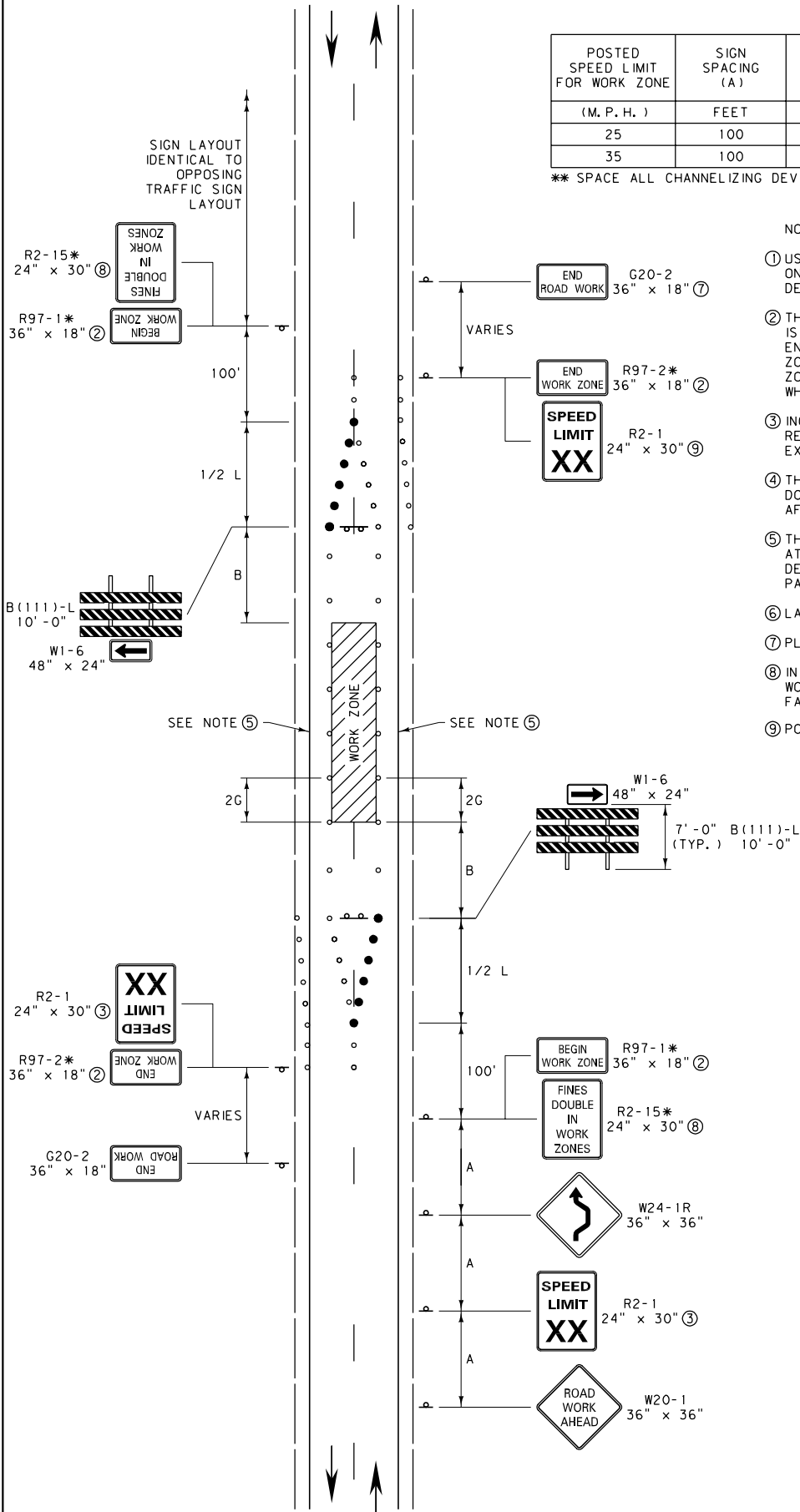


POSTED SPEED LIMIT FOR WORK ZONE	SIGN SPACING (A)	TAPER LENGTH (L)	SPACING OF CHANNELIZING DEVICES (MAX.) (G) **	BUFFER SPACE ④ (B)
(M. P. H.)	FEET	FEET	FEET	FEET
25	100	125	25	50
35	100	245	35	100

** SPACE ALL CHANNELIZING DEVICES AT "G" UNLESS OTHERWISE NOTED.

NOTES:

- ① USE THIS SIGN LAYOUT IN URBAN APPLICATIONS ONLY. USE THE RURAL, OPEN ROADWAY SIGNING DETAILS WHEN HIGHER SPEED LIMITS ARE USED.
- ② THE WORK ZONE REFERS TO THE AREA WHERE WORK IS ACTUALLY TAKING PLACE. KEEP THE BEGIN AND END WORK ZONE SIGNS WITHIN 500' OF THE WORK ZONE BOUNDARY. INCLUDE THE BEGIN AND END WORK ZONE SIGNS WHEN WORK IS IN PROGRESS OR WHEN CONDITIONS WARRANT.
- ③ INCLUDE SPEED LIMIT SIGNS ONLY IF THERE IS A REASON TO RESTRICT SPEED. COVER CONFLICTING EXISTING SPEED LIMIT SIGNS.
- ④ THE BUFFER SPACE MAY BE INCREASED FOR DOWNGRADES AND OTHER CONDITIONS THAT AFFECT STOPPING DISTANCE.
- ⑤ THIS LAYOUT SHOULD ONLY BE USED WHEN THERE IS AT LEAST 10' IN WIDTH BETWEEN THE CHANNELIZING DEVICES AND THE EDGE OF PAVEMENT. PROVIDE NO PARKING SIGNS WHEN APPROPRIATE.
- ⑥ LARGER SIGNS MAY BE APPROVED BY THE ENGINEER.
- ⑦ PLACE END ROAD WORK SIGNS AT END OF PROJECT LIMITS.
- ⑧ IN LIEU OF TWO SIGNS, THE FINES DOUBLE AND BEGIN WORK ZONE SIGNS CAN BE COMBINED ON ONE SIGN FACE.
- ⑨ POST EXISTING SPEED LIMIT IF CHANGED BY WORK ZONE.



LEGEND

- - FLEXIBLE GUIDE POSTS
- - PLASTIC DRUMS
- * - DENOTES SIGNS THAT ARE UNIQUE TO MONTANA.
- XX - SPEED DETERMINED BY THE ENGINEER. (25 M. P. H. OR 35 M. P. H.)

DETAILED DRAWING

REFERENCE DWG. NO.
STANDARD SPEC. 618-U03
SECTION 618

WORK ZONE IN CENTER
OF ROAD (URBAN TWO-
LANE, TWO-WAY ROAD)

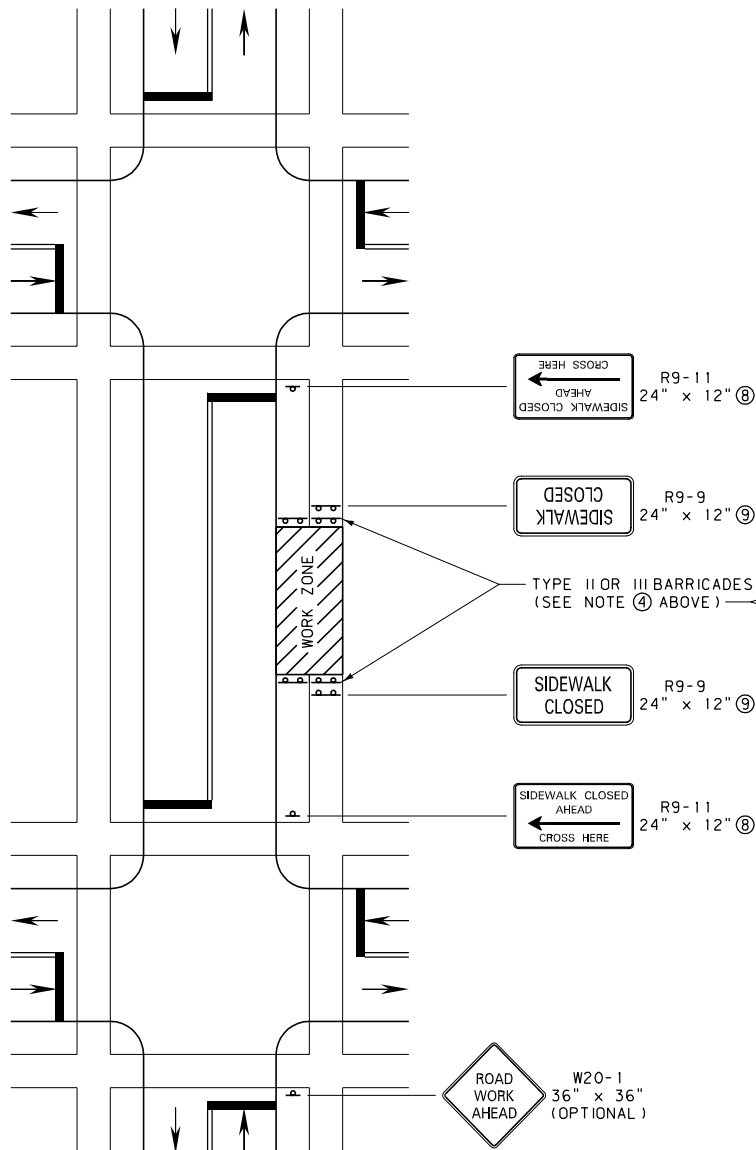
EFFECTIVE: MAY 2009

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OF TRANSPORTATION
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NOTES:

- ① MINIMAL TRAFFIC CONTROL DEVICES CONTROLLING PEDESTRIAN FLOWS ARE SHOWN. OTHER DEVICES MAY BE NEEDED TO CONTROL TRAFFIC ON THE STREETS. USE THE APPROPRIATE PARKING LANE CLOSURE WHEN NEEDED.
- ② DO NOT DIRECT PEDESTRIANS INTO A LANE OF MOVING TRAFFIC.
- ③ WHERE SPEEDS EXCEED 25 M.P.H., PHYSICAL BARRIERS SHOULD BE USED TO SEPARATE THE TEMPORARY WALKWAY FROM VEHICULAR TRAFFIC. FLEXIBLE GUIDE POSTS WITH DETECTABLE EDGING IS THE MINIMUM REQUIREMENT FOR SEPARATION. PROVIDE LARGER PHYSICAL BARRIERS, AS DETERMINED BY THE ENGINEER, ON A CASE BY CASE BASIS.
- ④ BARRICADES SHOULD BE INSTALLED AS DETAILED IN THE MUTCD. INSTALL AN APPROPRIATE NUMBER OF TYPE II OR III BARRICADES TO CLOSE OFF EACH END OF THE AREA THAT IS UNDER CONSTRUCTION.
- ⑤ PROVIDE A PHYSICAL BARRIER, WITH A MINIMUM 6 INCH HEIGHT DETECTABLE EDGING, BETWEEN THE PEDESTRIAN DETOUR WALKWAY AND THE WORK ZONE. PROVIDE LARGER PHYSICAL BARRIERS TO PROTECT PEDESTRIANS FROM HAZARDS IN THE WORK ZONE, AS DETERMINED BY THE ENGINEER.
- ⑥ ENSURE THAT ENTIRE WALKWAY MEETS ADA REQUIREMENTS. PROVIDE A MINIMUM WALKWAY WIDTH OF 5 FEET AND A FIRM, STABLE, SLIP RESISTANT WALKING SURFACE ALONG ENTIRE WALKWAY.
- ⑦ PROVIDE TEMPORARY RAMPS AND DETECTABLE EDGING (MINIMUM 6 INCH HEIGHT ON BOTH SIDES OF WALKWAY) ALONG TEMPORARY PEDESTRIAN DETOUR ROUTE. SEE SECTION 6D OF MUTCD FOR ADDITIONAL GUIDANCE.
- ⑧ PLACE R9-11 ON SIGN POSTS (AS SHOWN BELOW) IF BUSINESS ACCESS IS REQUIRED. PLACE TYPE I BARRICADE ON SIDEWALK WITH R9-11 SIGN IF BUSINESS ACCESS IS NOT REQUIRED.
- ⑨ PLACE TYPE I BARRICADE ON SIDEWALK WITH R9-9 SIGN.

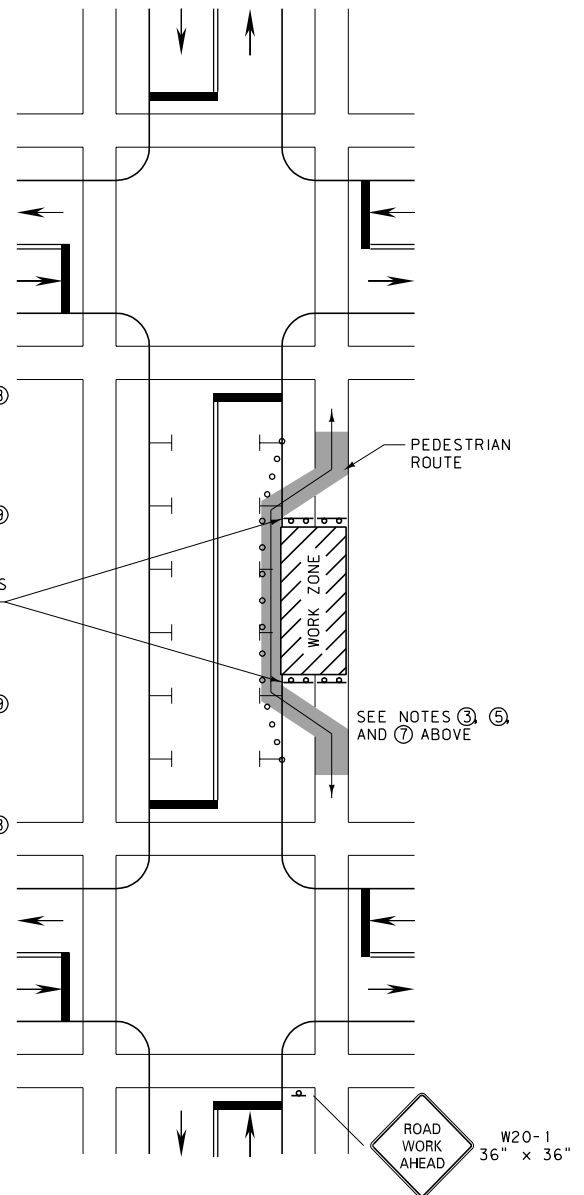
PEDESTRIAN DETOUR



LEGEND

o - FLEXIBLE GUIDE POSTS

BYPASS WALKWAY PROVIDED THROUGH WORK ZONE ⑥



DETAILED DRAWING

REFERENCE DWG. NO.
STANDARD SPEC. 618-U05
SECTION 618

SIDEWALK CLOSURES
AND BYPASS WALKWAY

EFFECTIVE: MAY 2009

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OF TRANSPORTATION
serving you with pride

① COVER PEDESTRIAN TRAFFIC SIGNAL DISPLAYS CONTROLLING CLOSED CROSSWALKS.

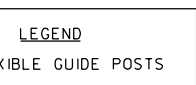
③ INSTALL BARRICADES AS DETAILED IN THE MUTCD. INSTALL AN APPROPRIATE NUMBER OF TYPE II OR TYPE III BARRICADES TO CLOSE OFF EACH END OF THE AREA THAT IS UNDER CONSTRUCTION.


④ WHEN POSSIBLE, USE THE EXISTING INTERSECTION CROSSWALKS FOR PEDESTRIAN DETOURS. AS A LAST OPTION, USE THE MID-BLOCK TEMPORARY PEDESTRIAN CROSSING SHOWN BELOW. FOR LONG-TERM STATIONARY WORK, THE DOUBLE YELLOW CENTERLINE AND/OR LANE LINES ARE REMOVED BETWEEN CROSSWALK LINES. PROVIDE A MINIMUM WALKWAY WIDTH OF 5 FEET AND A FIRM, STABLE, SLIP RESISTANT WALKING SURFACE ACROSS BOULEVARDS AND OTHER AREAS ALONG THE TEMPORARY PEDESTRIAN WALKWAY. PROVIDE YIELD PAVEMENT MARKINGS AS SHOWN BELOW.

⑤ PLACE R9-9 AND R9-10 SIGNS ON TYPE I BARRICADES ON SIDEWALK.

⑥ PROVIDE TEMPORARY RAMPS FOR PEDESTRIAN CROSSWALKS WHEN REQUIRED.

⑦ PLACE R9-11 AND R9-11a ON SIGN POSTS (AS SHOWN BELOW) IF BUSINESS ACCESS IS REQUIRED. PLACE TYPE 1 BARRICADE ON SIDEWALK WITH R9-11 OR R9-11a SIGN IF BUSINESS ACCESS IS NOT REQUIRED.



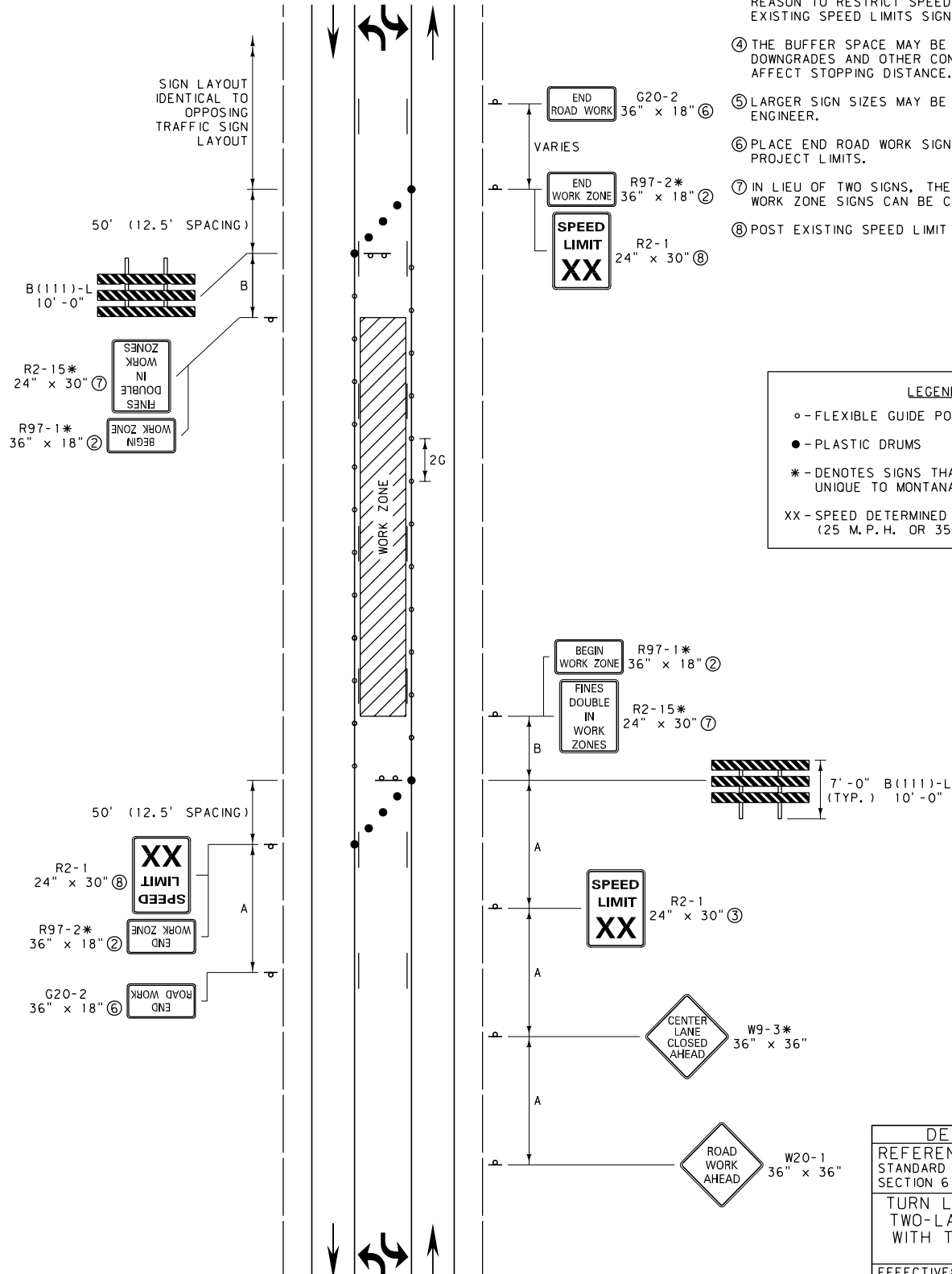
DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 618	DWG. NO. 618-U10
CROSSWALK CLOSURES AND PEDESTRIAN DETOURS	
EFFECTIVE: MAY 2009	
 serving you with pride	MONTANA DEPARTMENT OF TRANSPORTATION


POSTED SPEED LIMIT FOR WORK ZONE	SIGN SPACING (A)	TAPER LENGTH (L)	SPACING OF CHANNELIZING DEVICES (MAX.) (G) **	BUFFER SPACE ④ (B)
(M. P. H.)	FEET	FEET	FEET	FEET
25	100	125	25	50
35	100	245	35	100

** SPACE ALL CHANNELIZING DEVICES AT "G" UNLESS OTHERWISE NOTED.

NOTES:

- ① USE THIS SIGN LAYOUT IN URBAN APPLICATIONS ONLY. USE THE RURAL, OPEN ROADWAY SIGNING DETAILS WHEN HIGHER SPEED LIMITS ARE USED.
- ② THE WORK ZONE REFERS TO THE AREA WHERE WORK IS ACTUALLY TAKING PLACE. KEEP THE BEGIN AND END WORK ZONE SIGNS WITHIN 500' OF THE WORK ZONE BOUNDARY. INCLUDE THE BEGIN AND END WORK ZONE SIGNS WHEN WORK IS IN PROGRESS OR WHEN CONDITIONS WARRANT.
- ③ INCLUDE SPEED LIMIT SIGNS ONLY IF THERE IS A REASON TO RESTRICT SPEED. COVER CONFLICTING EXISTING SPEED LIMITS SIGNS.
- ④ THE BUFFER SPACE MAY BE INCREASED FOR DOWNGRADES AND OTHER CONDITIONS THAT AFFECT STOPPING DISTANCE.
- ⑤ LARGER SIGN SIZES MAY BE APPROVED BY THE ENGINEER.
- ⑥ PLACE END ROAD WORK SIGNS AT END OF PROJECT LIMITS.
- ⑦ IN LIEU OF TWO SIGNS, THE FINES DOUBLE AND BEGIN WORK ZONE SIGNS CAN BE COMBINED ON ONE SIGN FACE.
- ⑧ POST EXISTING SPEED LIMIT IF CHANGED BY WORK ZONE.



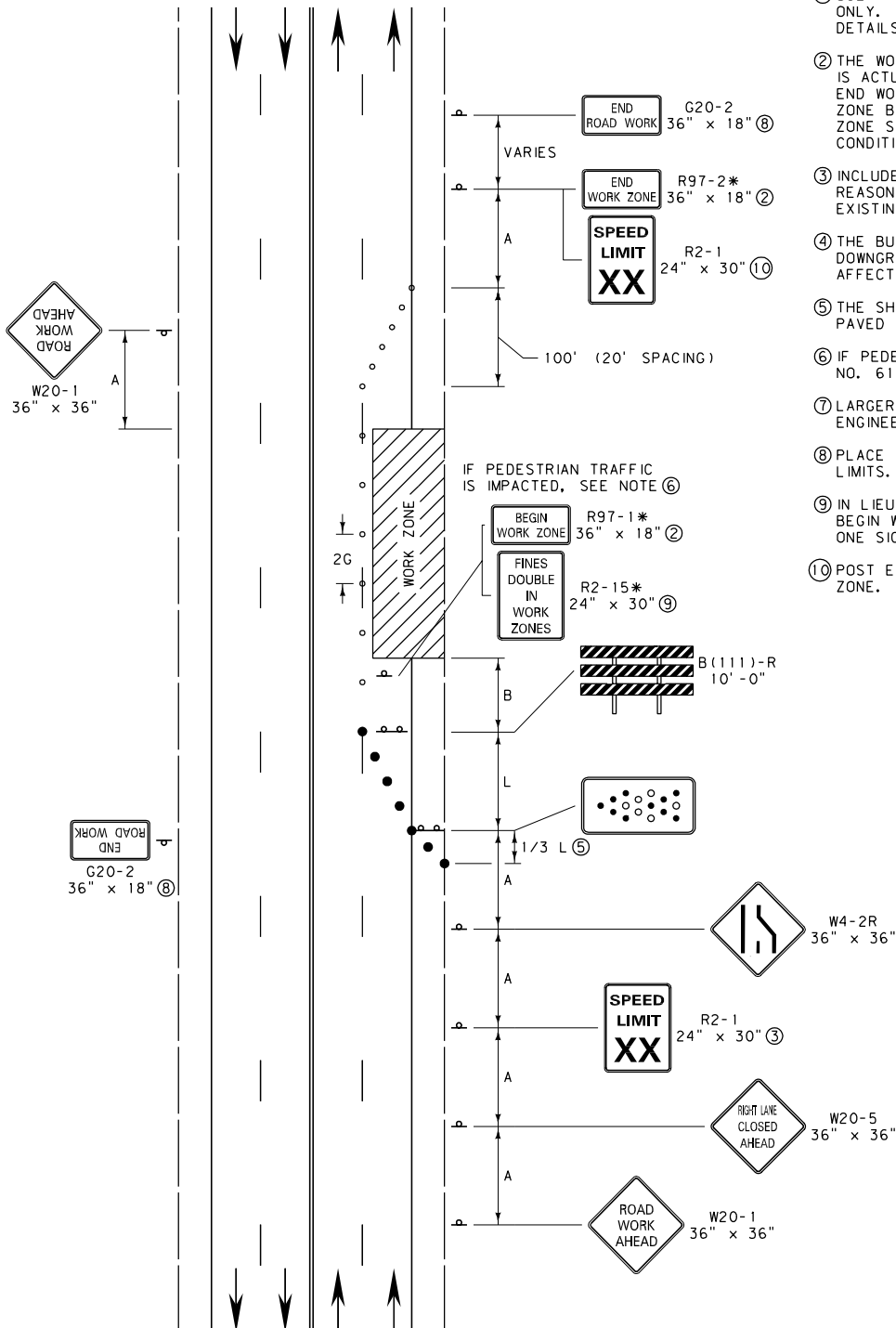
DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 618	DWG. NO. 618-U16
TURN LANE CLOSURE (URBAN TWO-LANE, TWO-WAY ROAD WITH TWO-WAY LEFT TURN LANE)	
EFFECTIVE: MAY 2009	
 MONTANA DEPARTMENT OF TRANSPORTATION serving you with pride	

POSTED SPEED LIMIT FOR WORK ZONE (M. P. H.)	SIGN SPACING (A)	TAPER LENGTH (L)	SPACING OF CHANNELIZING DEVICES (MAX.) (G) **	BUFFER SPACE ④ (B)
25	100	125	25	50
35	100	245	35	100


** SPACE ALL CHANNELIZING DEVICES AT "G" UNLESS OTHERWISE NOTED.

NOTES:

- ① USE THIS SIGN LAYOUT IN URBAN APPLICATIONS ONLY. USE THE RURAL, OPEN ROADWAY SIGNING DETAILS WHEN HIGHER SPEED LIMITS ARE USED.
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- ④ THE BUFFER SPACE MAY BE INCREASED FOR DOWNGRADES AND OTHER CONDITIONS THAT AFFECT STOPPING DISTANCE.
- ⑤ THE SHOULDER TAPER MAY BE OMITTED WHEN PAVED SHOULDER IS LESS THAN 8' IN WIDTH.
- ⑥ IF PEDESTRIAN TRAFFIC IS IMPACTED SEE. DTL. DWG. NO. 618-U05.
- ⑦ LARGER SIGN SIZES MAY BE APPROVED BY THE ENGINEER.
- ⑧ PLACE END ROAD WORK SIGNS AT END OF PROJECT LIMITS.
- ⑨ IN LIEU OF TWO SIGNS, THE FINES DOUBLE AND BEGIN WORK ZONE SIGNS CAN BE COMBINED ON ONE SIGN FACE.
- ⑩ POST EXISTING SPEED LIMIT IF CHANGED BY WORK ZONE.



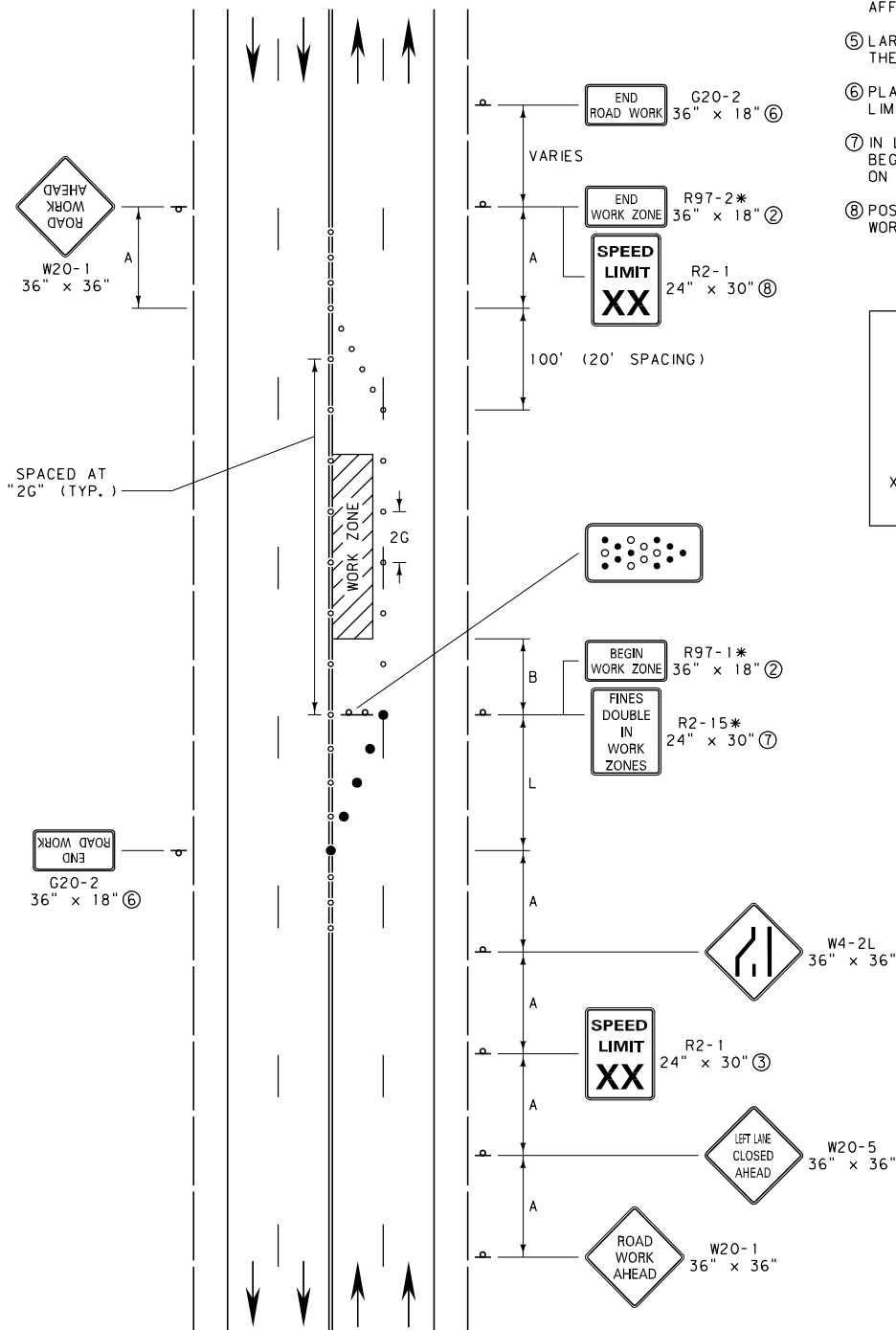
LEGEND	
○	- FLEXIBLE GUIDE POSTS
●	- PLASTIC DRUMS
*	- DENOTES SIGNS THAT ARE UNIQUE TO MONTANA.
XX	- SPEED DETERMINED BY THE ENGINEER. (25 M. P. H. OR 35 M. P. H.)

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 618	DWG. NO. 618-U20
RIGHT LANE CLOSURE (URBAN MULTI-LANE, UNDIVIDED ROAD)	
EFFECTIVE: MAY 2009	
 MONTANA DEPARTMENT OF TRANSPORTATION	

** SPACE ALL CHANNELIZING DEVICES AT "G" UNLESS OTHERWISE NOTED.

- ① USE THIS SIGN LAYOUT IN URBAN APPLICATIONS ONLY. USE THE RURAL, OPEN ROADWAY SIGNING DETAILS WHEN HIGHER SPEED LIMITS ARE USED.
- ② THE WORK ZONE REFERS TO THE AREA WHERE WORK IS ACTUALLY TAKING PLACE. KEEP THE BEGIN AND END WORK ZONE SIGNS WITHIN 500' OF THE WORK ZONE BOUNDARY. INCLUDE THE BEGIN AND END WORK ZONE SIGNS WHEN WORK IS IN PROGRESS OR WHEN CONDITIONS WARRANT.
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- ⑤ LARGER SIGN SIZES MAY BE APPROVED BY THE ENGINEER.
- ⑥ PLACE END ROAD WORK SIGN AT END OF PROJECT LIMITS.
- ⑦ IN LIEU OF TWO SIGNS, THE FINES DOUBLE AND BEGIN WORK ZONE SIGNS CAN BE COMBINED ON ONE SIGN FACE.
- ⑧ POST EXISTING SPEED LIMIT IF CHANGED BY WORK ZONE.

- - FLEXIBLE GUIDE POSTS
 - - PLASTIC DRUMS
 - * - DENOTES SIGNS THAT ARE UNIQUE TO MONTANA.
- XX - SPEED DETERMINED BY THE ENGINEER.
(25 M. P. H. OR 35 M. P. H.)



REFERENCE	DWG. NO.
STANDARD SPEC.	618-U25
SECTION 618	

LEFT LANE CLOSURE
(LOW SPEED URBAN
MULTI-LANE, UNDIVIDED ROAD)

EFFECTIVE: MAY 2009

MONTANA DEPARTMENT
OF TRANSPORTATION

POSTED SPEED LIMIT FOR WORK ZONE	SIGN SPACING (A)	TAPER LENGTH (L)	SPACING OF CHANNELIZING DEVICES (MAX.) (G) **	BUFFER SPACE ④ (B)
(M. P. H.)	FEET	FEET	FEET	FEET
25	100	125	25	50
35	100	245	35	100

** SPACE ALL CHANNELIZING DEVICES AT "G" UNLESS OTHERWISE NOTED.

NOTES:

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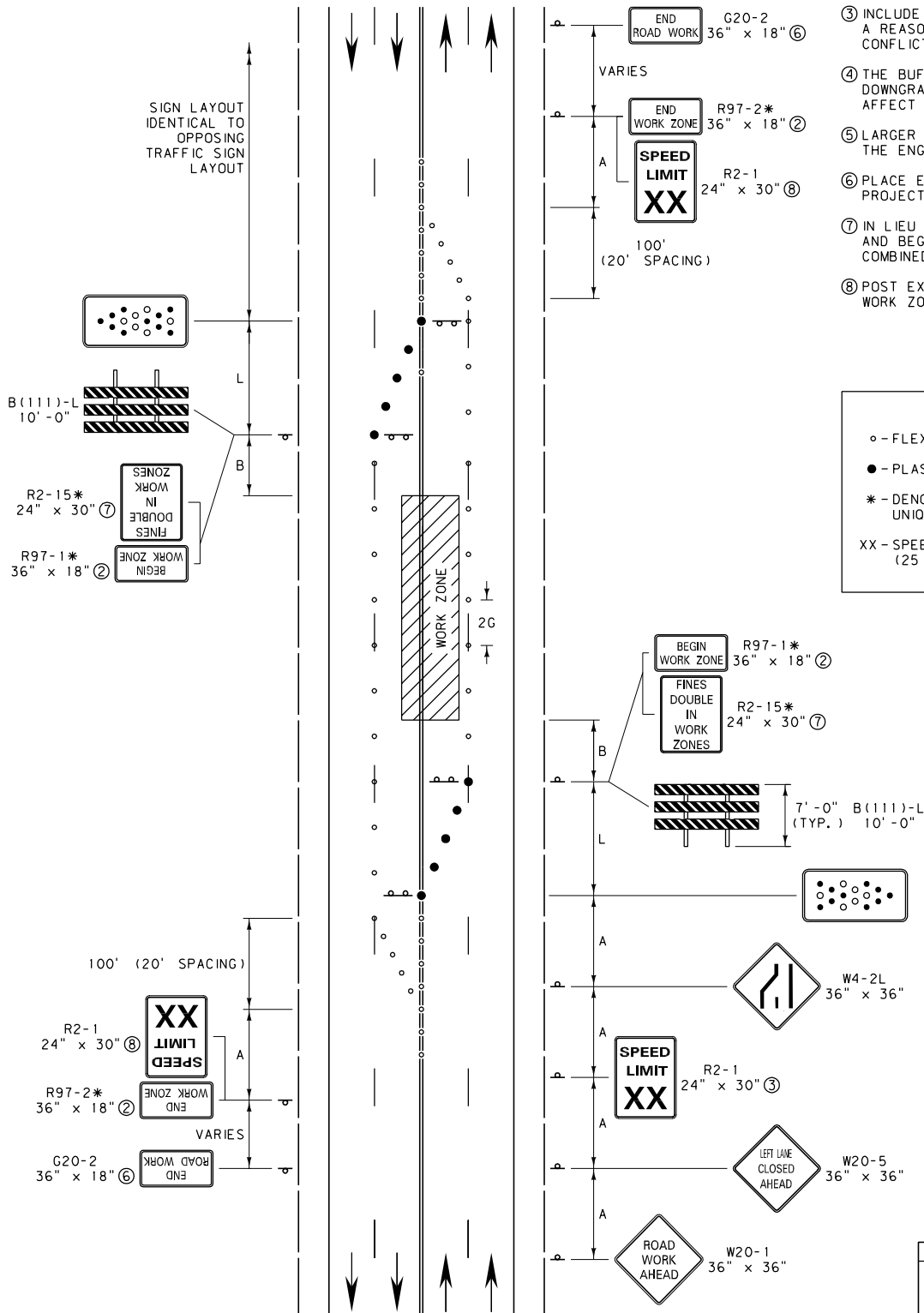
LEGEND

○ - FLEXIBLE GUIDE POSTS

● - PLASTIC DRUMS

* - DENOTES SIGNS THAT ARE UNIQUE TO MONTANA.

XX - SPEED DETERMINED BY THE ENGINEER.
(25 M. P. H. OR 35 M. P. H.)



DETAILED DRAWING

REFERENCE DWG. NO.
STANDARD SPEC. 618-U30
SECTION 618

LEFT LANE CLOSURES
(LOW SPEED URBAN
MULTI-LANE, UNDIVIDED ROAD)

EFFECTIVE: MAY 2009

MDT MONTANA DEPARTMENT
OF TRANSPORTATION
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POSTED SPEED LIMIT FOR WORK ZONE	SIGN SPACING (A)	TAPER LENGTH (L)	SPACING OF CHANNELIZING DEVICES (MAX.) (G) **	BUFFER SPACE ④ (B)
(M. P. H.)	FEET	FEET	FEET	FEET
25	100	125	25	50
35	100	245	35	100

** SPACE ALL CHANNELIZING DEVICES AT "G" UNLESS OTHERWISE NOTED.

NOTES:

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- INCLUDE SPEED LIMIT SIGNS ONLY IF THERE IS A REASON TO RESTRICT SPEED. COVER CONFLICTING EXISTING SPEED LIMIT SIGNS.
- THE BUFFER SPACE MAY BE INCREASED FOR DOWNGRADES AND OTHER CONDITIONS THAT AFFECT STOPPING DISTANCE.
- THE SHOULDER TAPER MAY BE OMITTED WHEN THE PAVED SHOULDER IS LESS THAN 8' IN WIDTH.
- IF PEDESTRIAN TRAFFIC IS IMPACTED SEE DTL. DWG. NO. 618-U05.
- LARGER SIGN SIZES MAY BE APPROVED BY THE ENGINEER.
- PLACE END ROAD WORK SIGNS AT END OF PROJECT LIMITS.
- IN LIEU OF TWO SIGNS, THE FINES DOUBLE AND BEGIN WORK ZONE SIGNS CAN BE COMBINED ON ONE SIGN FACE.
- POST EXISTING SPEED LIMIT IF CHANGED BY WORK ZONE.

LEGEND

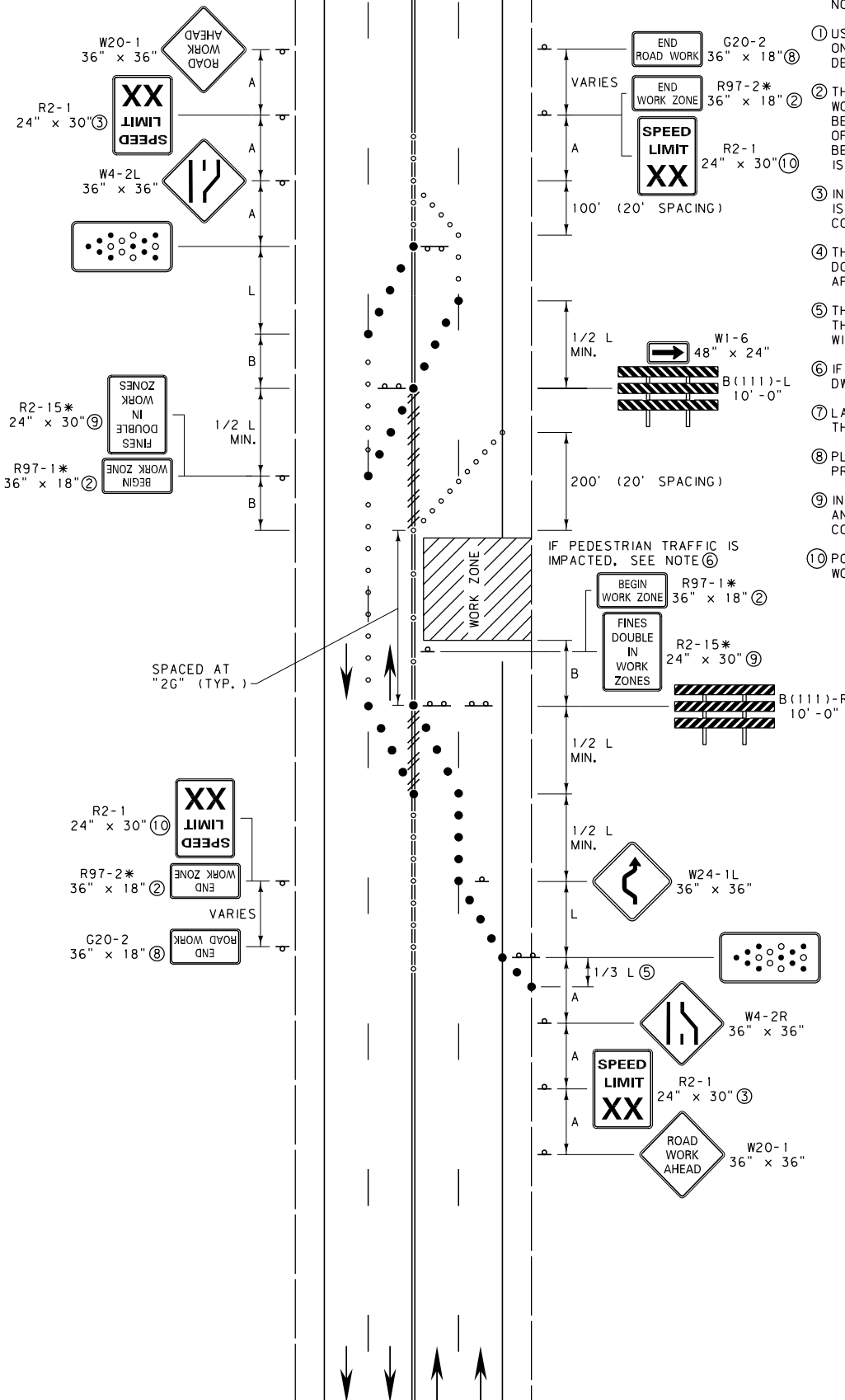
○ - FLEXIBLE GUIDE POSTS


● - PLASTIC DRUMS

* - DENOTES SIGNS THAT ARE UNIQUE TO MONTANA.

XX - SPEED DETERMINED BY THE ENGINEER. (25 M.P.H. OR 35 M.P.H.)

// - OBLITERATE CONFLICTING PAVEMENT MARKINGS WHEN WORK OPERATION IS LONGER THAN 3 DAYS. (DO NOT REMOVE THERMOPLASTIC)



DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 618	DWG. NO. 618-U35
DOUBLE LANE CLOSURE (URBAN MULTI-LANE, UNDIVIDED ROAD)	
EFFECTIVE: MAY 2009	
 MONTANA DEPARTMENT OF TRANSPORTATION	

POSTED SPEED LIMIT FOR WORK ZONE	SIGN SPACING (A)	TAPER LENGTH (L)	SPACING OF CHANNELIZING DEVICES (MAX.) (G) **	BUFFER SPACE ④ (B)
(M. P. H.)	FEET	FEET	FEET	FEET
25	100	125	25	50
35	100	245	35	100

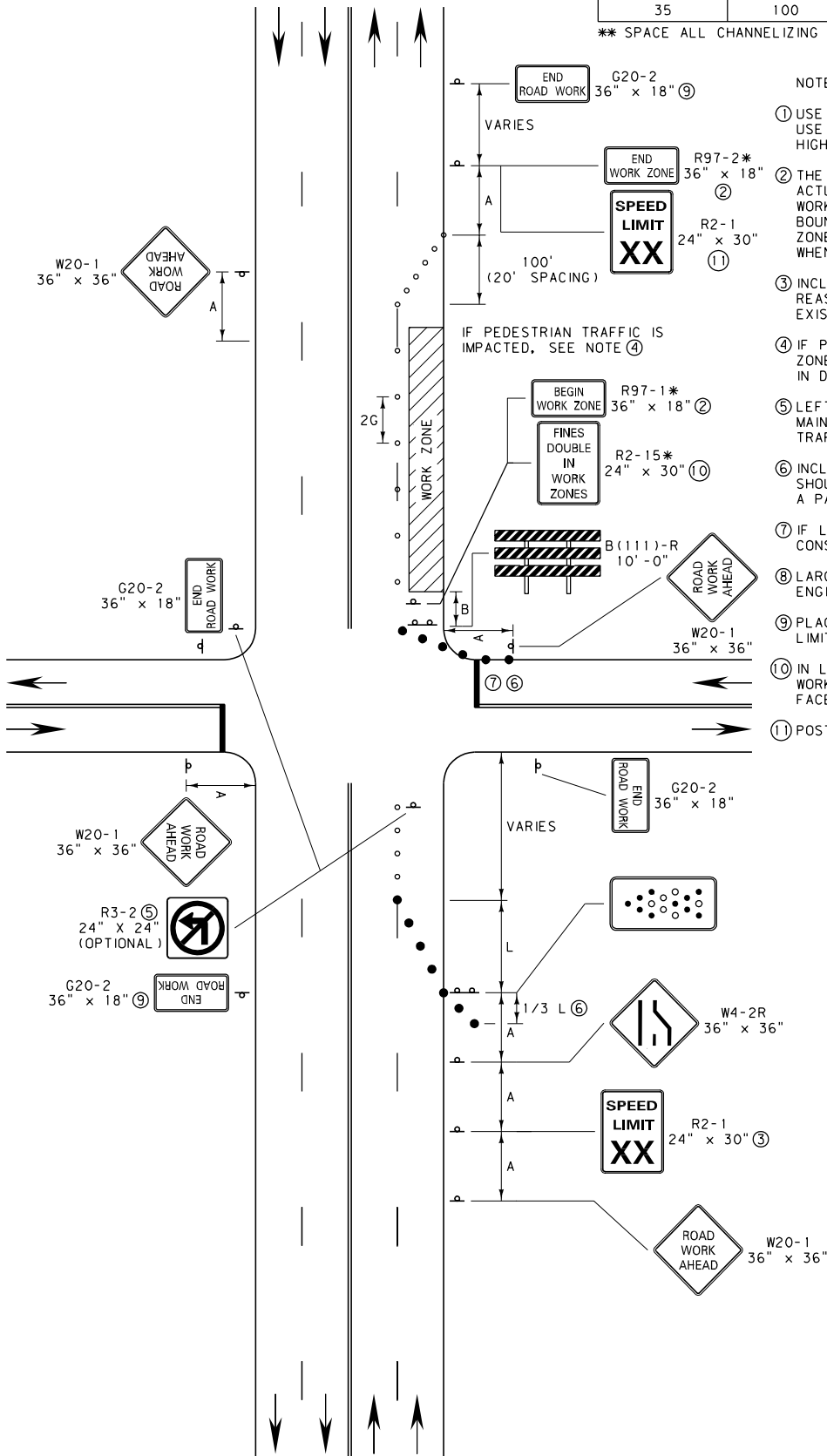
** SPACE ALL CHANNELIZING DEVICES AT "G" UNLESS OTHERWISE NOTED.

NOTES:

- ① USE THIS SIGN LAYOUT IN URBAN APPLICATIONS ONLY. USE THE RURAL, OPEN ROADWAY SIGNING DETAILS WHEN HIGHER SPEED LIMITS ARE USED.
- ② THE WORK ZONE REFERS TO THE AREA WHERE WORK IS ACTUALLY TAKING PLACE. KEEP THE BEGIN AND END WORK ZONE SIGNS WITHIN 500' OF THE WORK ZONE BOUNDARY. INCLUDE THE BEGIN AND END WORK ZONE SIGNS WHEN WORK IS IN PROGRESS OR WHEN CONDITIONS WARRANT.
- ③ INCLUDE SPEED LIMIT SIGNS ONLY IF THERE IS A REASON TO RESTRICT SPEED. COVER CONFLICTING EXISTING SPEED LIMIT SIGNS.
- ④ IF PEDESTRIAN TRAFFIC IS IMPACTED BY THE WORK ZONE, USE THE INFORMATION AND DEVICES SHOWN IN DTL. DWG. NO. 618-U05 AND 618-U10.
- ⑤ LEFT TURNING MOVEMENTS MAY BE PROHIBITED TO MAINTAIN CAPACITY FOR THROUGH VEHICULAR TRAFFIC (UNLESS CONTROLLED BY TRAFFIC SIGNAL).
- ⑥ INCLUDE A SHOULDER TAPER WHEN PAVED SHOULDER IS 8' OR GREATER IN WIDTH OR WHEN A PARKING LANE IS PRESENT.
- ⑦ IF LIMITED SIGHT DISTANCE FROM THIS APPROACH, CONSIDER RIGHT TURN ONLY OR CLOSING THE APPROACH.
- ⑧ LARGER SIGN SIZES MAY BE APPROVED BY THE ENGINEER.
- ⑨ PLACE END ROAD WORK SIGNS AT END OF PROJECT LIMITS.
- ⑩ IN LIEU OF TWO SIGNS, THE FINES DOUBLE AND BEGIN WORK ZONE SIGNS CAN BE COMBINED ON ONE SIGN FACE.
- ⑪ POST EXISTING SPEED LIMIT IF CHANGED BY WORK ZONE.

LEGEND

- - FLEXIBLE GUIDE POSTS
- - PLASTIC DRUMS
- * - DENOTES SIGNS THAT ARE UNIQUE TO MONTANA.
- XX - SPEED DETERMINED BY THE ENGINEER. (25 M. P. H. OR 35 M. P. H.)



DETAILED DRAWING

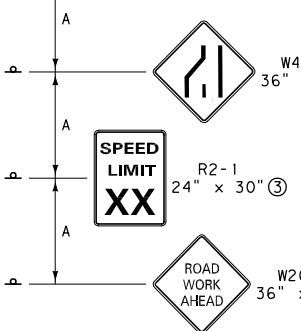
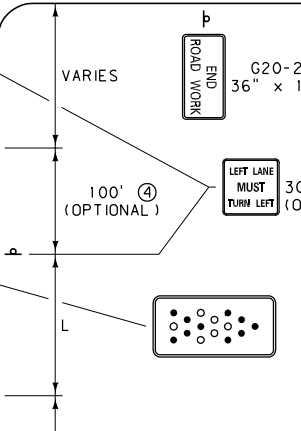
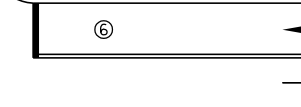
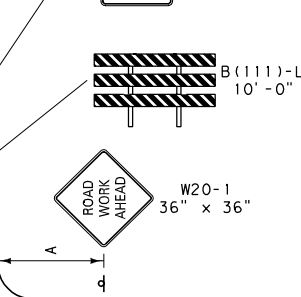
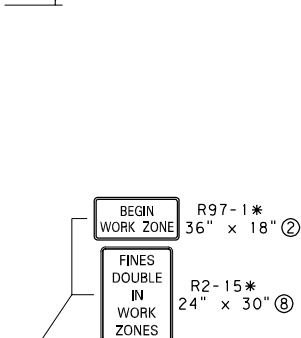
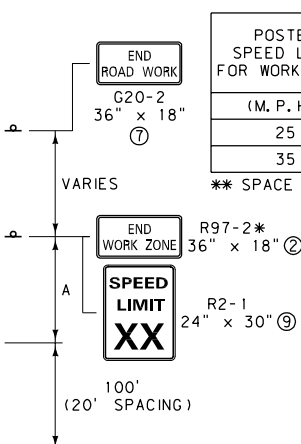
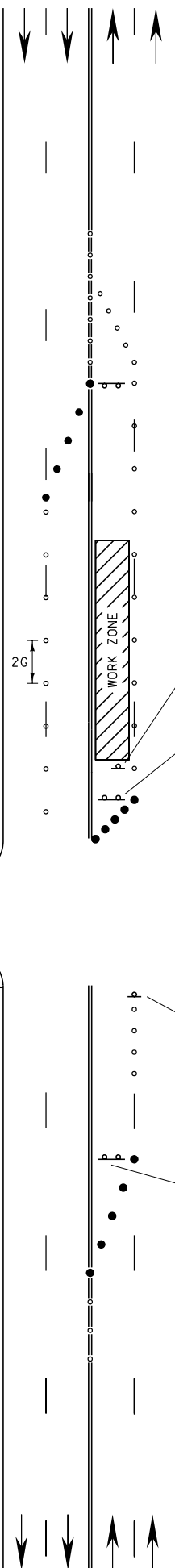
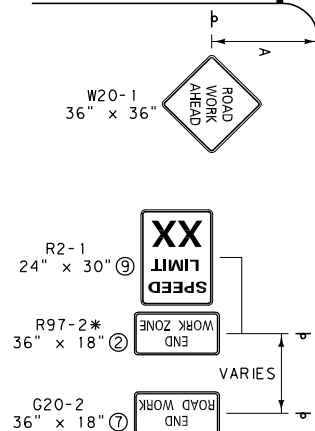
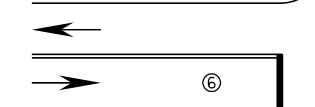
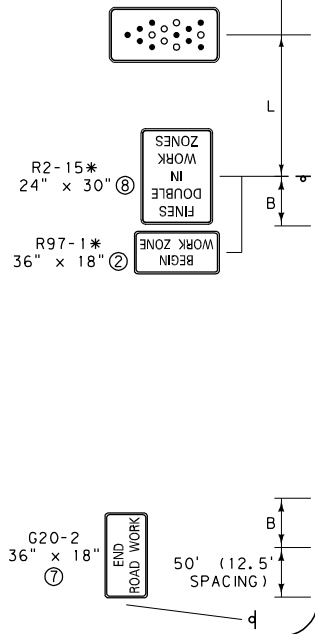
REFERENCE	DWG. NO.
STANDARD SPEC.	618-U40
SECTION 618	

RIGHT LANE CLOSURE-WORK
BEYOND INTERSECTION (URBAN
MULTI-LANE, UNDIVIDED ROAD)

EFFECTIVE: MAY 2009

LANE CLOSURE IS OPTIONAL WHEN THE CREW IS NOT AT THE WORK SITE.

SIGN LAYOUT IDENTICAL TO OPPOSING TRAFFIC SIGN LAYOUT



POSTED SPEED LIMIT FOR WORK ZONE (M. P. H.)	SIGN SPACING (A)	TAPER LENGTH (L)	SPACING OF CHANNELIZING DEVICES (MAX.) (G) **	BUFFER SPACE (B)
25	100	125	25	50
35	100	245	35	100

** SPACE ALL CHANNELIZING DEVICES AT "G" UNLESS OTHERWISE NOTED.

NOTES:

- USE THIS SIGN LAYOUT IN URBAN APPLICATIONS ONLY. USE THE RURAL, OPEN ROADWAY SIGNING DETAILS WHEN HIGHER SPEED LIMITS ARE USED.
- THE WORK ZONE REFERS TO THE AREA WHERE WORK IS ACTUALLY TAKING PLACE. KEEP THE BEGIN AND END WORK ZONE SIGNS WITHIN 500' OF THE WORK ZONE BOUNDARY. INCLUDE THE BEGIN AND END WORK ZONE SIGNS WHEN WORK IS IN PROGRESS OR WHEN CONDITIONS WARRANT.
- INCLUDE SPEED LIMIT SIGNS ONLY IF THERE IS A REASON TO RESTRICT SPEED. COVER CONFLICTING EXISTING SPEED LIMIT SIGNS.
- NORMAL PROCEDURE IS TO COMPLETELY CLOSE THE LEFT LANE, BUT IF THE LEFT LANE HAS SIGNIFICANT LEFT-TURNING TRAFFIC, THE OPTION SHOWN MAY BE USED. ADJUST FLEXIBLE GUIDE POSTS TO ALLOW THE TURNING MOVEMENTS.
- LARGER SIGN SIZES MAY BE APPROVED BY THE ENGINEER.
- IF LIMITED SIGHT DISTANCE FROM EITHER APPROACH, CONSIDER RIGHT TURNS ONLY OR CLOSING EACH APPROACH WHEN CONDITIONS WARRANT.
- PLACE END ROAD WORK SIGNS AT END OF PROJECT LIMITS.
- IN LIEU OF TWO SIGNS, THE FINES DOUBLE AND BEGIN WORK ZONE SIGNS CAN BE COMBINED ON ONE SIGN FACE.
- POST EXISTING SPEED LIMIT IF CHANGED BY WORK ZONE.

LEGEND

○ - FLEXIBLE GUIDE POSTS

● - PLASTIC DRUMS

* - DENOTES SIGNS THAT ARE UNIQUE TO MONTANA.

XX - SPEED DETERMINED BY THE ENGINEER.
(25 M. P. H. OR 35 M. P. H.)



FOR INTERSECTION APPROACHES REDUCED TO A SINGLE LANE, LEFT TURNS MAY BE PROHIBITED TO MAINTAIN CAPACITY FOR THROUGH TRAFFIC. WHEN PROHIBITING A TURN, TWO TURN PROHIBITION SIGNS SHOULD BE USED, ONE ON THE NEAR SIDE AND, SPACE PERMITTING, ONE ON THE FAR SIDE OF THE INTERSECTION.

DETAILED DRAWING

REFERENCE DWG. NO.
STANDARD SPEC. 618-U45
SECTION 618

LEFT LANE CLOSURE-WORK
BEYOND INTERSECTION (URBAN
MULTI-LANE, UNDIVIDED ROAD)

EFFECTIVE: MAY 2009

MONTANA DEPARTMENT OF TRANSPORTATION
serving you with pride

POSTED SPEED LIMIT FOR WORK ZONE	SIGN SPACING (A)	TAPER LENGTH (L)	SPACING OF CHANNELIZING DEVICES (MAX.) (G) **	BUFFER SPACE (B)
(M. P. H.)	FEET	FEET	FEET	FEET
25	100	125	25	50
35	100	245	35	100

** SPACE ALL CHANNELIZING DEVICES AT "G" UNLESS OTHERWISE NOTED.

NOTES:

- USE THIS SIGN LAYOUT IN URBAN APPLICATIONS ONLY. USE THE RURAL, OPEN ROADWAY SIGNING DETAILS WHEN HIGHER SPEED LIMITS ARE USED.
- THE WORK ZONE REFERS TO THE AREA WHERE WORK IS ACTUALLY TAKING PLACE. KEEP THE BEGIN AND END WORK ZONE SIGNS WITHIN 500' OF THE WORK ZONE BOUNDARY. INCLUDE THE BEGIN AND END WORK ZONE SIGNS WHEN WORK IS IN PROGRESS OR WHEN CONDITIONS WARRANT.
- INCLUDE SPEED LIMIT SIGNS ONLY IF THERE IS A REASON TO RESTRICT SPEED. COVER CONFLICTING EXISTING SPEED LIMIT SIGNS.
- THE BUFFER SPACE MAY BE INCREASED FOR DOWNGRADES AND OTHER CONDITIONS THAT AFFECT STOPPING DISTANCE.
- IF PEDESTRIAN TRAFFIC IS IMPACTED BY THE WORK ZONE, USE THE INFORMATION AND DEVICES SHOWN IN DTL. DWG. NO. 618-U5 AND 618-U10.
- INCLUDE A SHOULDER TAPER WHEN PAVED SHOULDER IS 8' OR GREATER IN WIDTH OR WHEN A PARKING LANE IS PRESENT.
- KEEP RIGHT SIGNS MAY BE OMITTED IF THERE IS INSUFFICIENT SPACE TO PLACE THE BACK-TO-BACK KEEP RIGHT SIGN AND NO LEFT TURN SYMBOL SIGNS.
- IF LIMITED SIGHT DISTANCE FROM THIS APPROACH, CONSIDER RIGHT TURN ONLY OR CLOSING THE APPROACH.
- LARGER SIGN SIZES MAY BE APPROVED BY THE ENGINEER.
- PLACE END ROAD WORK SIGNS AT END OF PROJECT LIMITS.
- IN LIEU OF TWO SIGNS, THE FINES DOUBLE AND BEGIN WORK ZONE SIGNS CAN BE COMBINED ON ONE SIGN FACE.
- POST EXISTING SPEED LIMIT IF CHANGED BY WORK ZONE.

LEGEND

○--FLEXIBLE GUIDE POSTS

●--PLASTIC DRUMS

*--DENOTES SIGNS THAT ARE UNIQUE TO MONTANA.

XX--SPEED DETERMINED BY THE ENGINEER. (25 M.P.H. OR 35 M.P.H.)

//--OBLITERATE CONFLICTING PAVEMENT MARKINGS WHEN WORK OPERATION IS LONGER THAN 3 DAYS. (DO NOT REMOVE THERMOPLASTIC)



R3-2
24" x 24" ⑦
(OPTIONAL)


FOR INTERSECTION APPROACHES REDUCED TO A SINGLE LANE, LEFT TURNS MAY BE PROHIBITED TO MAINTAIN CAPACITY FOR THROUGH TRAFFIC. WHEN PROHIBITING A TURN, TWO TURN PROHIBITION SIGNS SHOULD BE USED, ONE ON THE NEAR SIDE AND, SPACE PERMITTING, ONE ON THE FAR SIDE OF THE INTERSECTION.

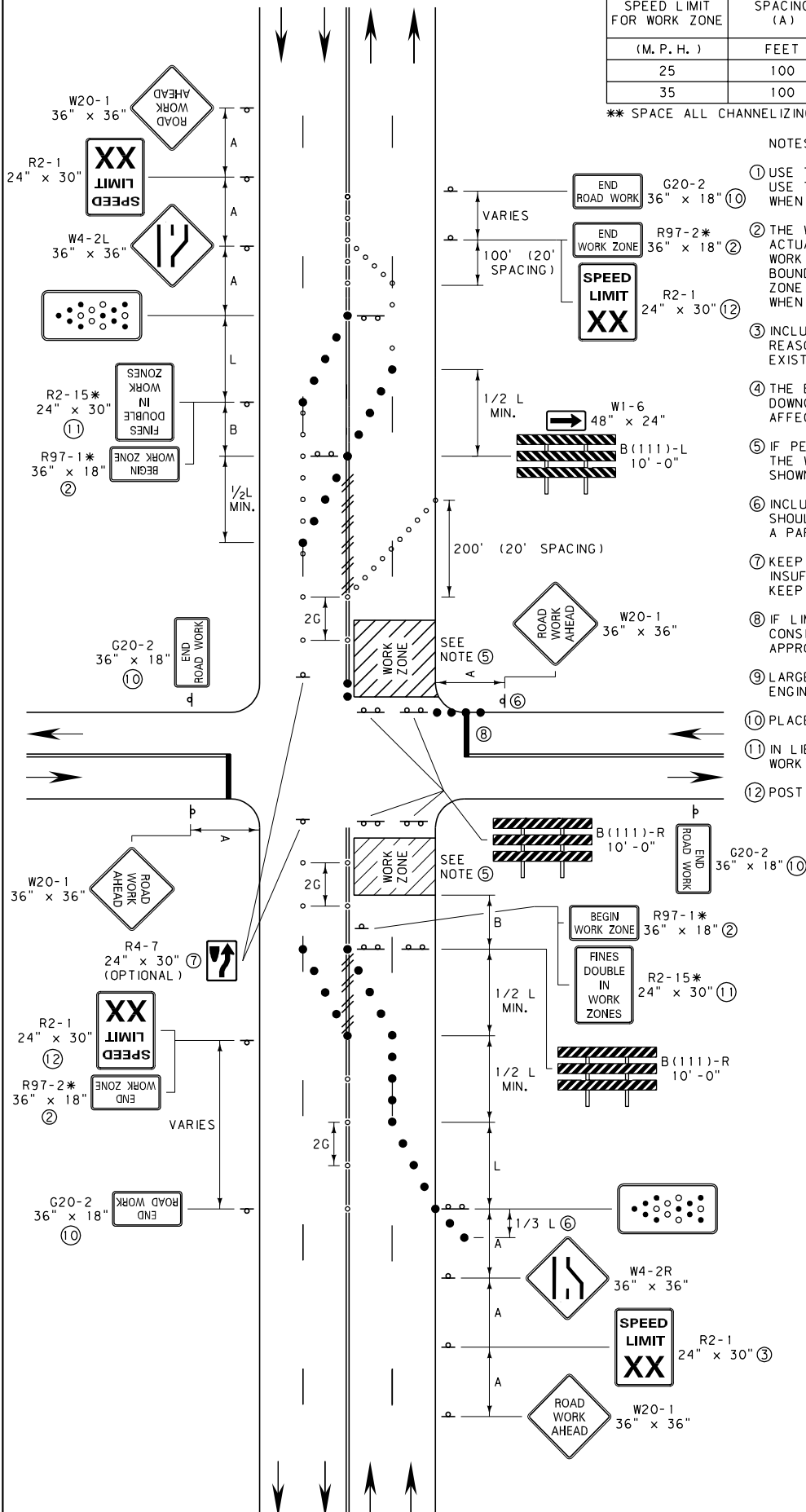
DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 618	DWG. NO. 618-U50
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DOUBLE LANE CLOSURE
AT INTERSECTION (URBAN
MULTI-LANE, UNDIVIDED ROAD)

EFFECTIVE: MAY 2009

 MONTANA DEPARTMENT OF TRANSPORTATION
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POSTED SPEED LIMIT FOR WORK ZONE	SIGN SPACING (A)	TAPER LENGTH (L)	SPACING OF CHANNELIZING DEVICES (MAX.) (G) **	BUFFER SPACE ④ (B)
(M. P. H.)	FEET	FEET	FEET	FEET
25	100	125	25	50
35	100	245	35	100

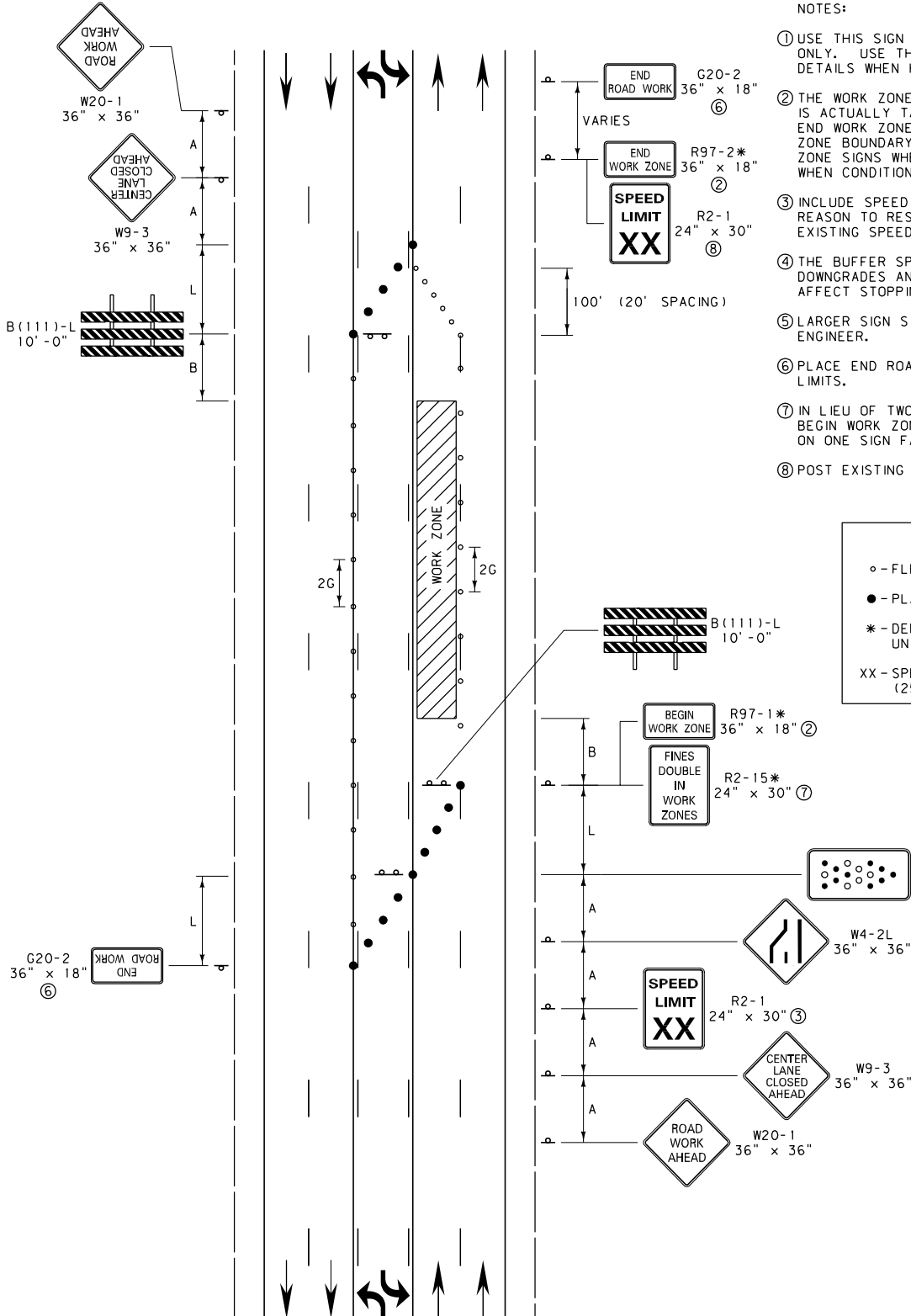
** SPACE ALL CHANNELIZING DEVICES AT "G" UNLESS OTHERWISE NOTED.

NOTES:

- ① USE THIS SIGN LAYOUT IN URBAN APPLICATIONS ONLY. USE THE RURAL, OPEN ROADWAY SIGNING DETAILS WHEN HIGHER SPEED LIMITS ARE USED.
- ② THE WORK ZONE REFERS TO THE AREA WHERE WORK IS ACTUALLY TAKING PLACE. KEEP THE BEGIN AND END WORK ZONE SIGNS WITHIN 500' OF THE WORK ZONE BOUNDARY. INCLUDE THE BEGIN AND END WORK ZONE SIGNS WHEN WORK IS IN PROGRESS OR WHEN CONDITIONS WARRANT.
- ③ INCLUDE SPEED LIMIT SIGNS ONLY IF THERE IS A REASON TO RESTRICT SPEED. COVER CONFLICTING EXISTING SPEED LIMIT SIGNS.
- ④ THE BUFFER SPACE MAY BE INCREASED FOR DOWNGRADES AND OTHER CONDITIONS THAT AFFECT STOPPING DISTANCE.
- ⑤ LARGER SIGN SIZES MAY BE APPROVED BY THE ENGINEER.
- ⑥ PLACE END ROAD WORK SIGNS AT END OF PROJECT LIMITS.
- ⑦ IN LIEU OF TWO SIGNS, THE FINES DOUBLE AND BEGIN WORK ZONE SIGNS CAN BE COMBINED ON ONE SIGN FACE.
- ⑧ POST EXISTING SPEED LIMIT IF CHANGED BY WORK ZONE.

LEGEND

- - FLEXIBLE GUIDE POSTS
- - PLASTIC DRUMS
- * - DENOTES SIGNS THAT ARE UNIQUE TO MONTANA.
- XX - SPEED DETERMINED BY THE ENGINEER. (25 M. P. H. OR 35 M. P. H.)



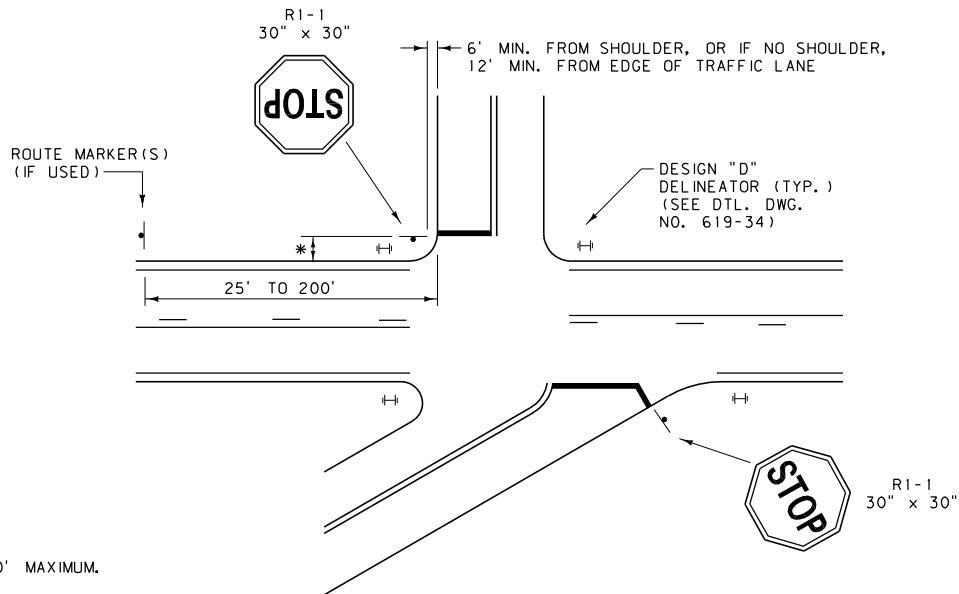
DETAILED DRAWING

REFERENCE DWG. NO.
STANDARD SPEC. 618-U60
SECTION 618

LEFT LANE CLOSURE (URBAN
LOW SPEED, MULTI-LANE, UNDIVIDED
ROAD WITH TWO-WAY LEFT TURN LANE)

EFFECTIVE: MAY 2009

MDT MONTANA DEPARTMENT
OF TRANSPORTATION
serving you with pride

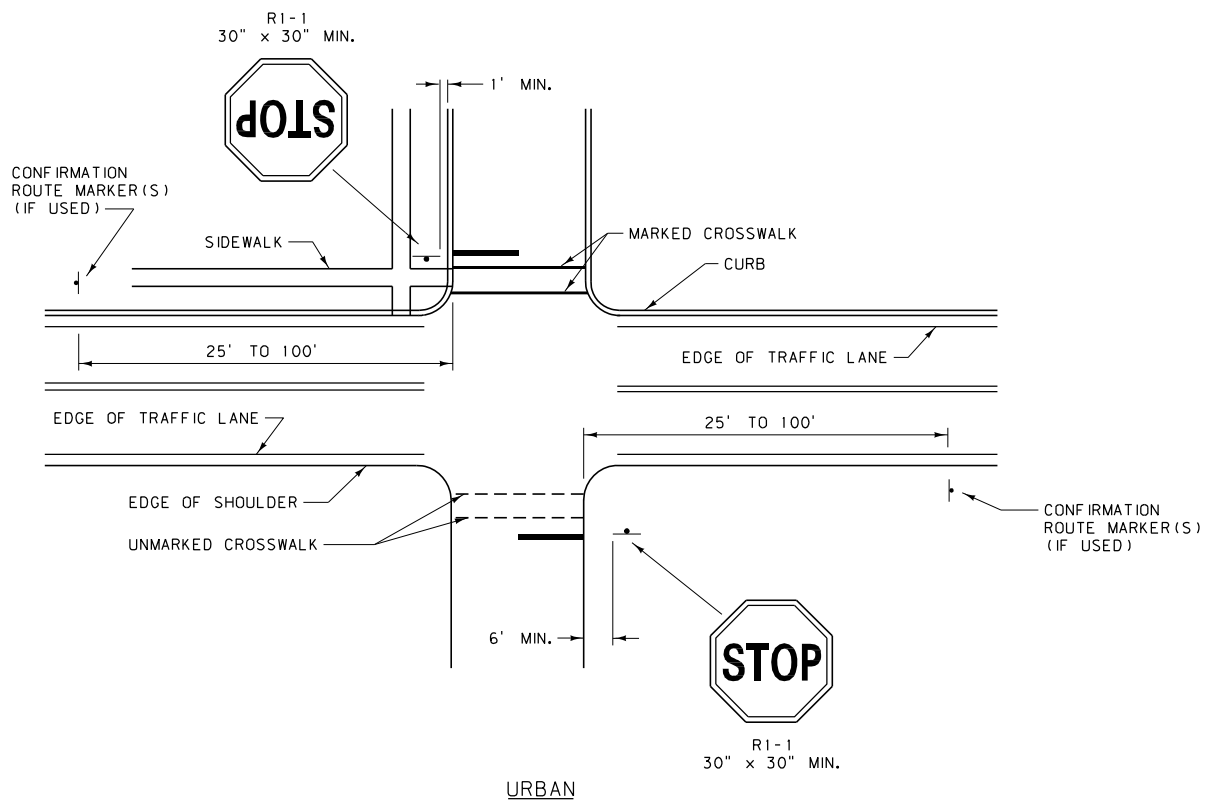



NOTES:

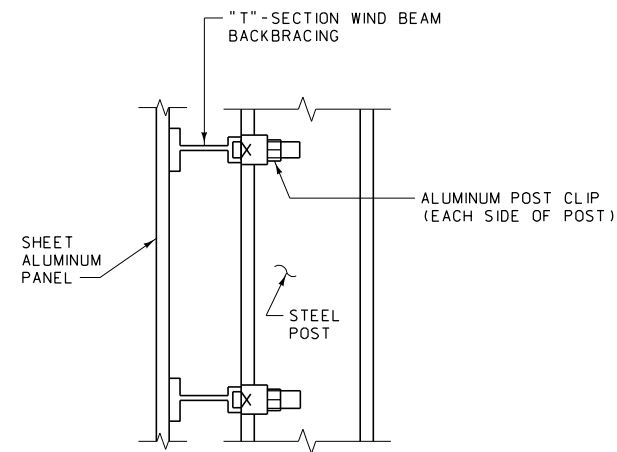
* 6' MINIMUM; 50' MAXIMUM.

PLACE R1-1 SIGN AT THE BEGINNING OF CURB RADIUS OR SHOULDER RADIUS, OR 4 FEET MIN. IN ADVANCE OF THE MARKED OR UNMARKED CROSSWALK.

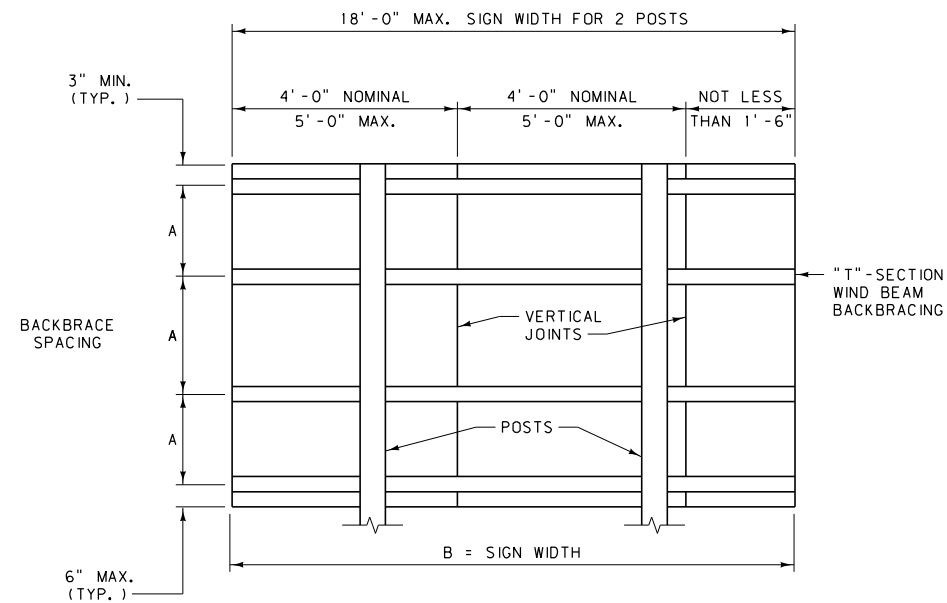
SEE PLANS FOR FINAL SIGNING AND PAVEMENT MARKING LOCATIONS.



DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	619-02
SECTION 619	
TYPICAL RURAL AND URBAN APPROACHES	
EFFECTIVE: FEBRUARY 2005	
 serving you with pride	MONTANA DEPARTMENT OF TRANSPORTATION

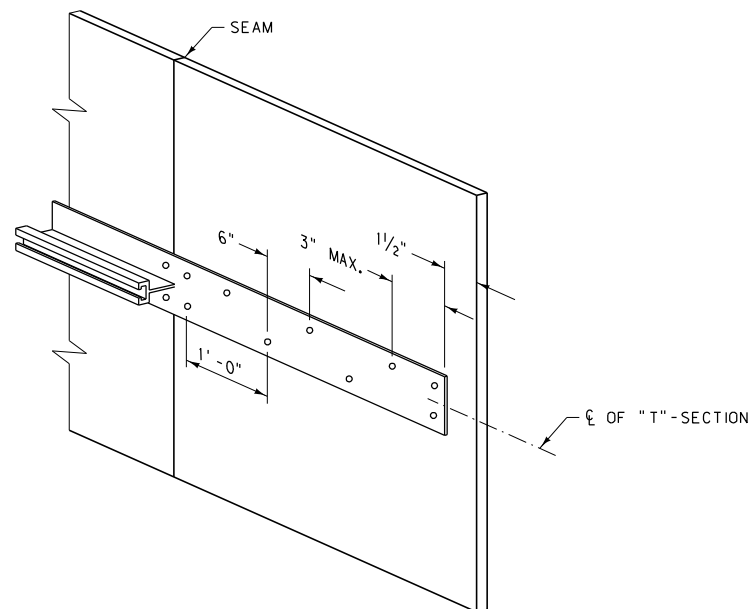


BACKBRACE DETAIL



BACKBRACING TABLE - ALUMINUM SIGNS		
MAXIMUM BACKBRACE SPACING "A"	MAXIMUM WIDTH "B"	
	2 POST	3 POST
1' - 8"	18' - 0"	27' - 0"
1' - 10"	17' - 0"	25' - 8"
2' - 0"	16' - 6"	24' - 8"
2' - 6"	14' - 9"	22' - 0"
3' - 0"	13' - 6"	20' - 0"
3' - 6"	12' - 6"	18' - 6"

FOR ALUMINUM PLATE THICKNESS INFORMATION SEE SECTION 704.01 OF THE STANDARD SPECIFICATIONS.

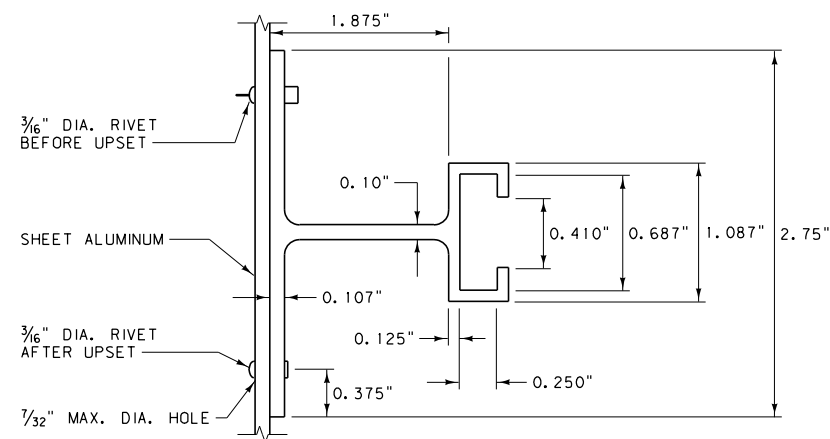


RIVET SPACING DETAIL

LOCATE RIVETS AT 6" ALTERNATE CENTERS ON HORIZONTAL EXTRUDED "T"-SECTION.

DOUBLE RIVETS (TOP AND BOTTOM OR LEFT AND RIGHT OF EXTRUDED "T"-SECTION) AT HORIZONTAL AND VERTICAL JOINTS IN SHEET ALUMINUM FACE AND AT ENDS OF EXTRUDED "T"-SECTION.

COLOR RIVET HEADS TO MATCH ADJACENT SHEETING.



EXTRUDED "T"-SECTION BACKBRACE

NOTES:

CONFORM ALL ALUMINUM SIGNS TO SECTIONS 619, 704.01.1 AND 704.01.2 OF THE STANDARD SPECIFICATIONS.

FOR SIGNS 4'-0" HIGH BY 6'-0" LONG OR LESS USE A SINGLE SHEET OF ALUMINUM.

DO NOT USE HORIZONTAL JOINTS ON SIGNS 6'-0" IN HEIGHT AND SMALLER. THE MINIMUM SHEET WIDTH IS 1'-6".

SIGNS OVER 6'-0" HIGH MAY HAVE HORIZONTAL AND VERTICAL JOINTS. THE MINIMUM SHEET SIZE IS 1'-6" WIDE BY 1'-6" HIGH.

CLEAN AND DRY POST CLIP NUTS, THEN TORQUE TO 225 INCH POUNDS.

LOCATE ALL HORIZONTAL JOINTS AT A "T"-SECTION.


NO SPLICES ARE ALLOWED IN EXTRUDED "T"-SECTIONS.

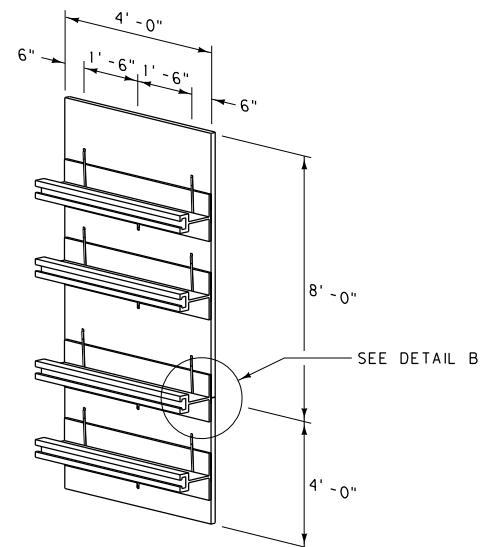
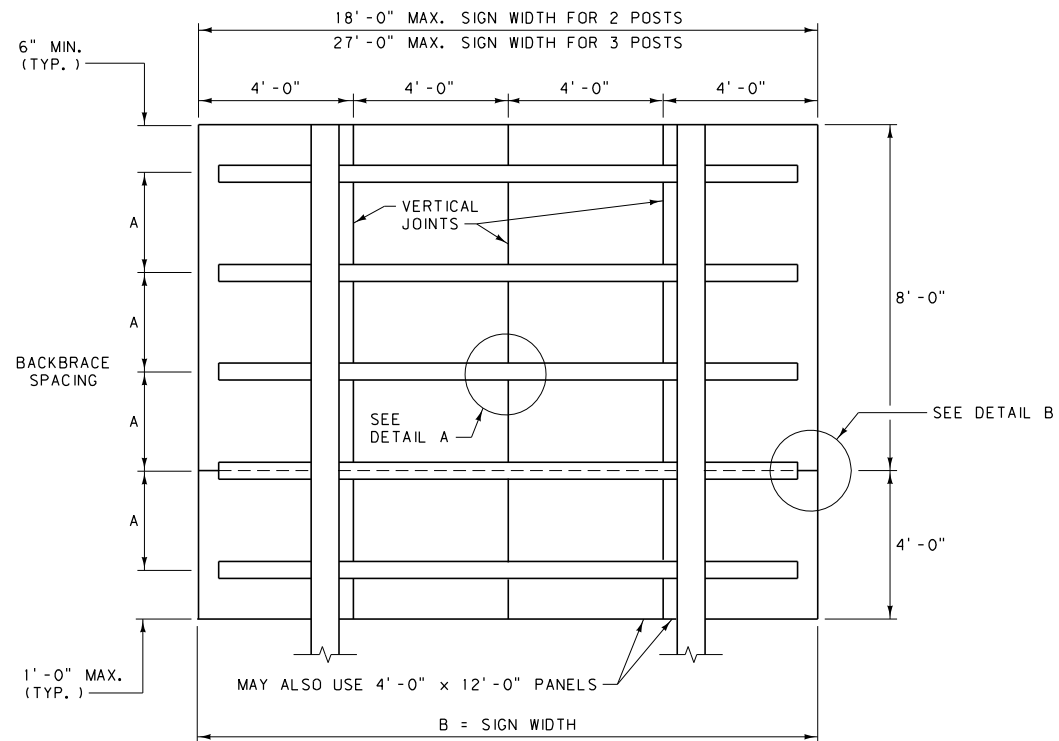
USE SCREWS, BOLTS AND LOCKWASHERS THAT ARE ALUMINUM ALLOY MEETING ASTM B 211 FOR ALLOY 2024-T4, STAINLESS STEEL, OR CADMIUM PLATED STEEL MEETING ASTM B 766.

USE ONLY ALUMINUM RIVETS.

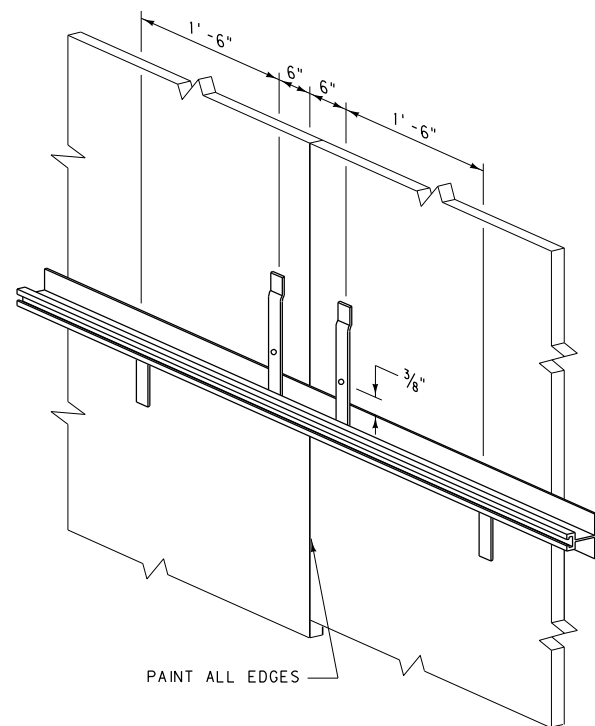
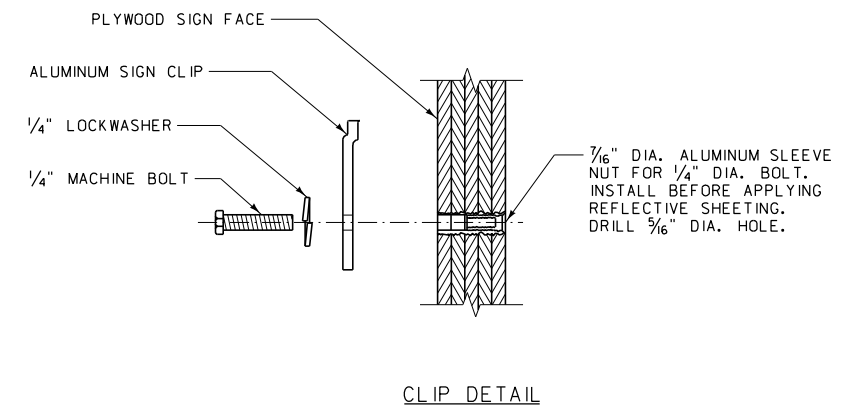
THE MAXIMUM GAP BETWEEN INDIVIDUAL SIGN PANELS AT JOINTS IS 1/16" AT ANY POINT.

THE ENGINEER MAY APPROVE ADDITIONAL METHODS TO PREVENT LIGHT LEAKAGE THROUGH SIGN PANEL SEAMS.

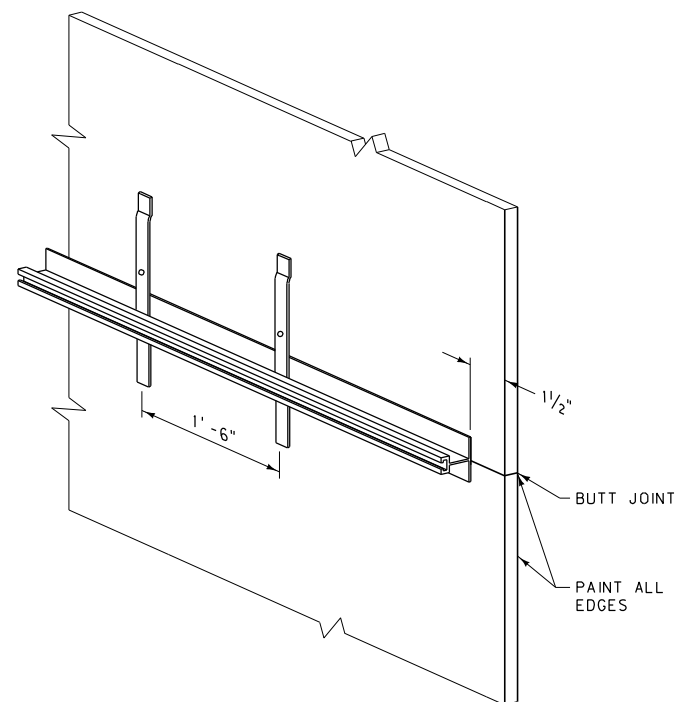
DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 619, 704	DWG. NO. 619-04
ALUMINUM SHEET INCREMENT SIGN CONSTRUCTION DETAILS	
EFFECTIVE: FEBRUARY 2005	
 serving you with pride	MONTANA DEPARTMENT OF TRANSPORTATION



ALUMINUM CLIP PLACEMENT



DETAIL A
VERTICAL JOINT



DETAIL B
HORIZONTAL JOINT

BACKBRACING TABLE - PLYWOOD SIGNS		
MAXIMUM BACKBRACE SPACING "A"	MAXIMUM WIDTH "B"	
	2 POST	3 POST
1' - 8"	18' - 0"	27' - 0"
1' - 10"	17' - 0"	25' - 8"
2' - 0"	16' - 6"	24' - 8"
2' - 6"	14' - 9"	22' - 0"
3' - 0"	13' - 6"	20' - 0"
3' - 6"	12' - 6"	18' - 6"

NOTES:

CONFORM ALL PLYWOOD SIGNS TO SECTIONS 619, 704.01.3 AND 704.02.2 OF THE STANDARD SPECIFICATIONS.

ON SIGNS 4'-0" HIGH AND GREATER, DO NOT USE ANY PANELS LESS THAN 4'-0" IN HEIGHT.


DO NOT USE HORIZONTAL JOINTS ON SIGNS LESS THAN 4'-0" IN HEIGHT.

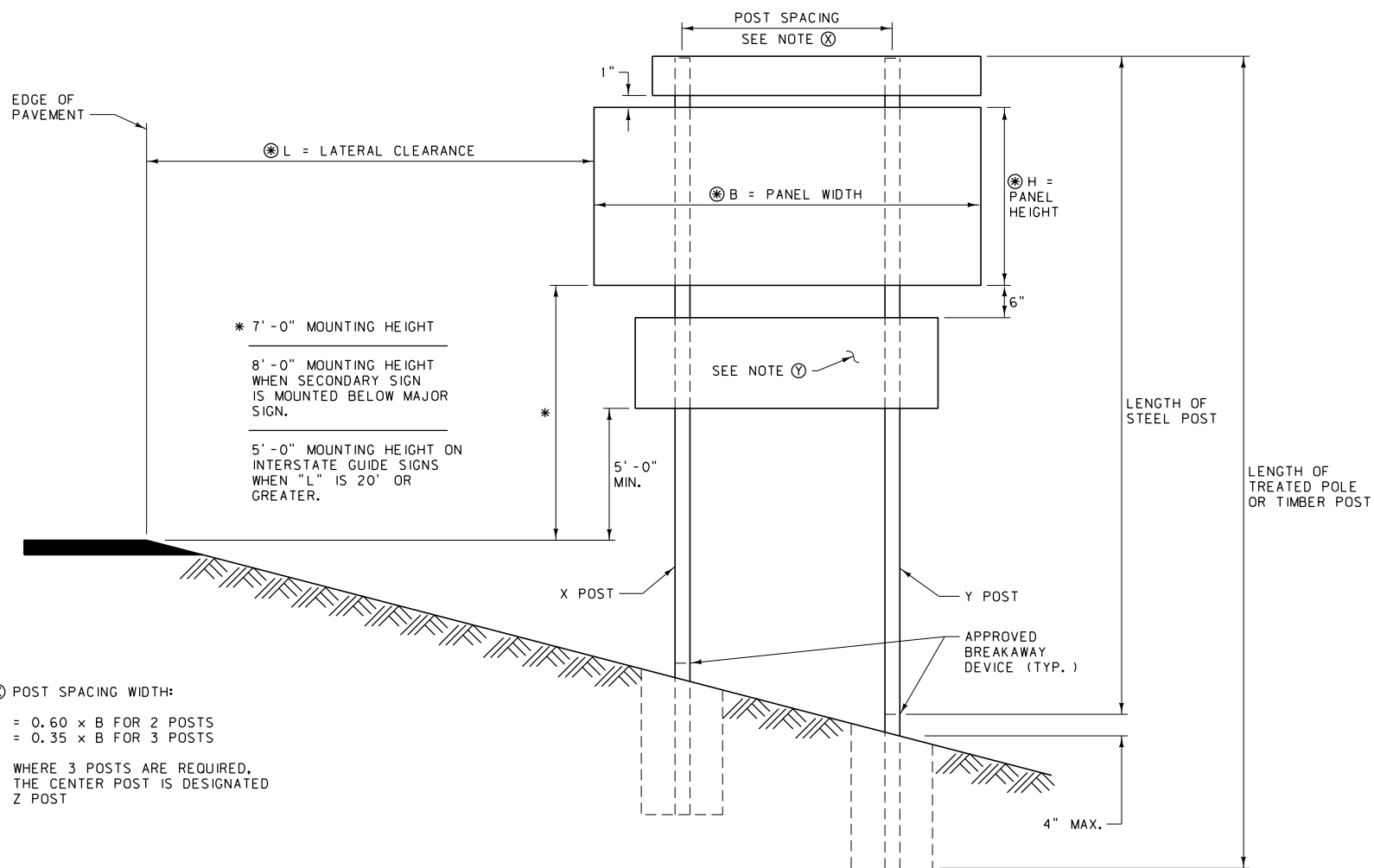
FOR SIGNS WITH WIDTHS THAT ARE NOT IN MULTIPLES OF 4'-0", PLACE THE ODD LENGTH PANEL ON THE INSIDE EDGE.

FOR SIGNS OVER 10'-0" IN HEIGHT, THE FULL HEIGHT MAY BE OBTAINED WITH PANELS HAVING A FACTORY SCARFED JOINT IN LIEU OF USING STANDARD LENGTH PANEL AS SHOWN.

THE MINIMUM SIZE PANEL IS 1'-6" WIDE BY 4'-0" HIGH.

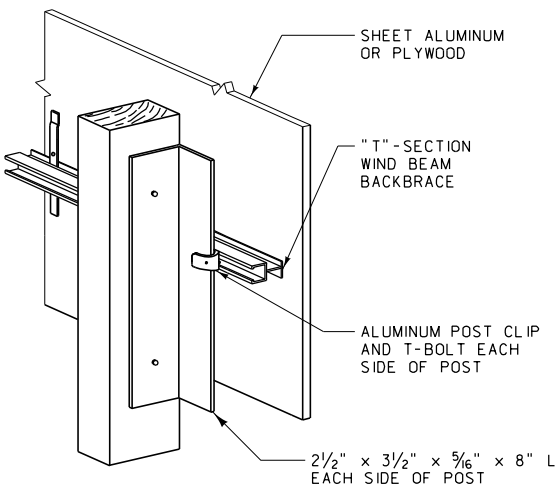
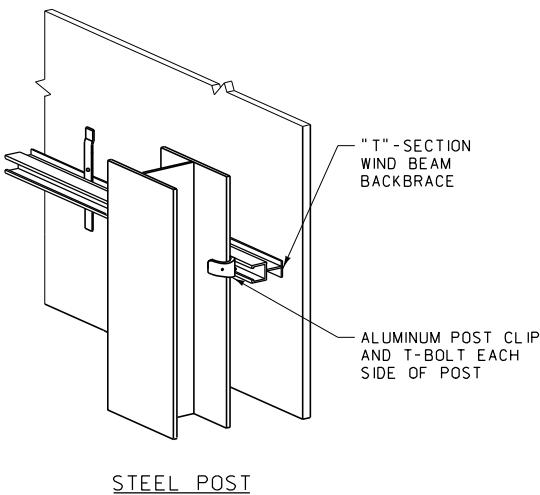
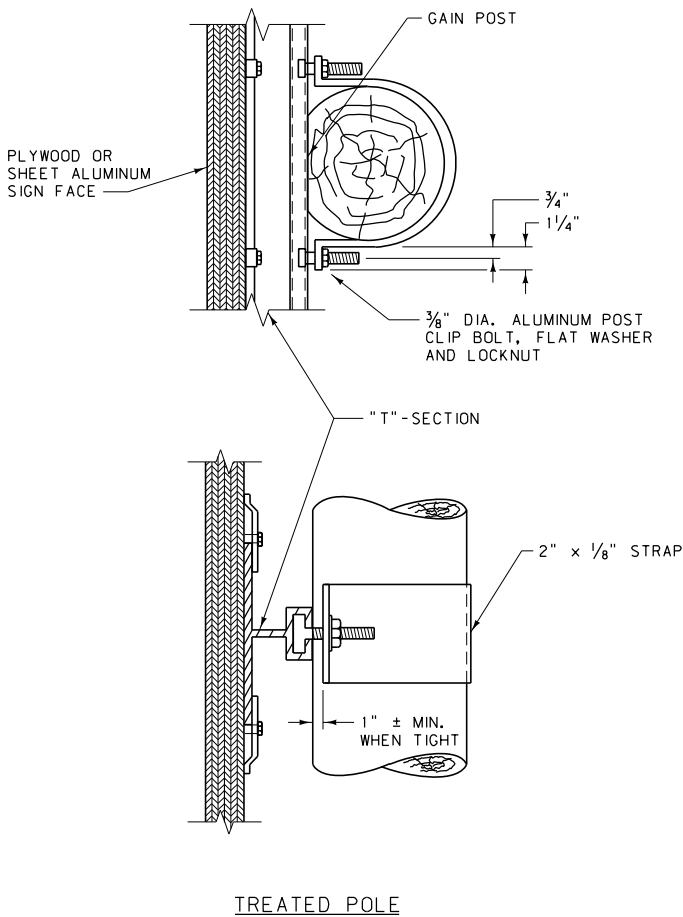
CONSTRUCT PLYWOOD SIGNS OF ONE PIECE OF PLYWOOD UNLESS THE PLANS SPECIFY OTHERWISE FOR SPECIAL DESIGN SIGNS.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 619, 704	DWG. NO. 619-06
PLYWOOD SHEET INCREMENT GUIDE SIGN CONSTRUCTION DETAILS	
EFFECTIVE: FEBRUARY 2005	
 serving you with pride	MONTANA DEPARTMENT OF TRANSPORTATION



⑧ POST SPACING WIDTH:
 = $0.60 \times B$ FOR 2 POSTS
 = $0.35 \times B$ FOR 3 POSTS
 WHERE 3 POSTS ARE REQUIRED,
 THE CENTER POST IS DESIGNATED
 Z POST

MOUNTING DETAILS



NOTES:

MOUNTING SYSTEMS SHOWN ARE TYPICAL. OTHER SYSTEMS MAY BE APPROVED BY THE ENGINEER.

ALL STEEL HARDWARE MUST BE GALVANIZED, STAINLESS, OR CADMIUM PLATED.

GAIN THE TOP HALF OF WOOD POLES ACCORDING TO THE TABLE ON DTL. DWG. NO. 619-20.

SEE THE SIGNING QUANTITIES FOR THE TYPES OF POSTS AND FOUNDATIONS.

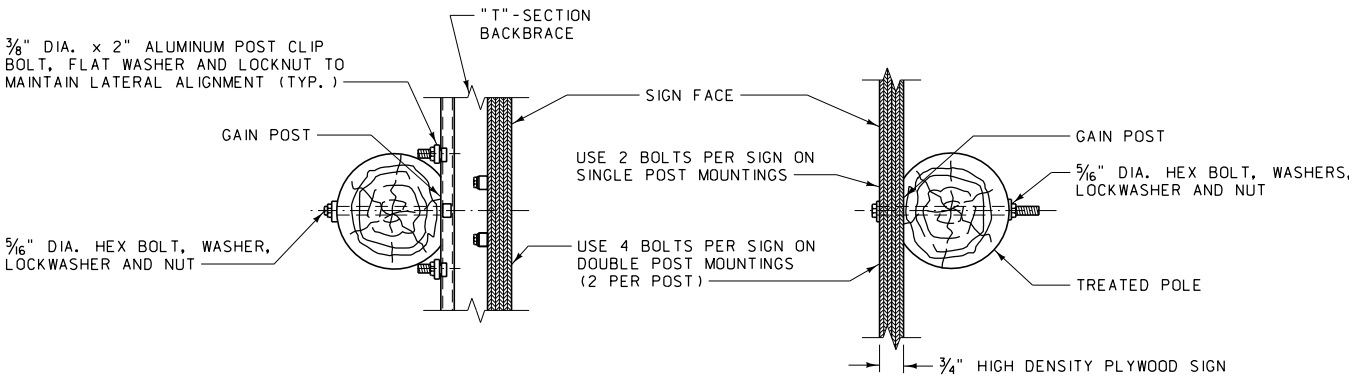
MOUNT ONE-PANEL PLYWOOD SIGNS DIRECTLY TO WOOD POLES OR POSTS, WHEN SPECIFIED IN THE PLANS, BY BOLTING THROUGH THE SIGN PLATE AND THE POLE WITH CADMIUM PLATED BOLTS AS REQUIRED BY THE DETAILED DRAWINGS, SPECIFICATIONS AND DESIGN. USE "T"-SECTION WIND BEAMS WHEN REQUIRED BY DTL. DWG. NO. 619-06.

⑦ SUSPEND LARGE SUPPLEMENTAL SIGNS, ADDED AFTER INITIAL SIGN INSTALLATION, FROM MAJOR SIGN PANEL OR BACKBRACING. ATTACHMENT TO MULTIPLE POSTS/POLES IS NOT ALLOWED.

USE POST SPACING, POST SIZE AND BREAKAWAY DEVICES SPECIFIED IN THE PLANS AND IN THE SPECIFICATIONS. FOR INFORMATION REGARDING APPROPRIATE BREAKAWAY DEVICES FOR NEW INSTALLATIONS NOT SUPPORTED BY THE PLANS, CONTACT THE TRAFFIC UNIT.

IN LOCATING SIGNS, AVOID PLACING POSTS IN DITCH BOTTOMS WHERE THEY WOULD IMPEDE DRAINAGE.


⑧ DIMENSIONS ARE SPECIFIED IN THE SIGNING PLANS.

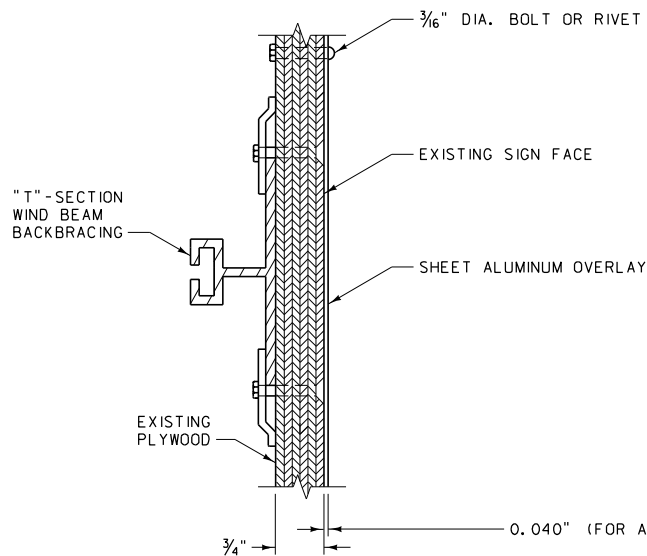


DOUBLE POLE MOUNT

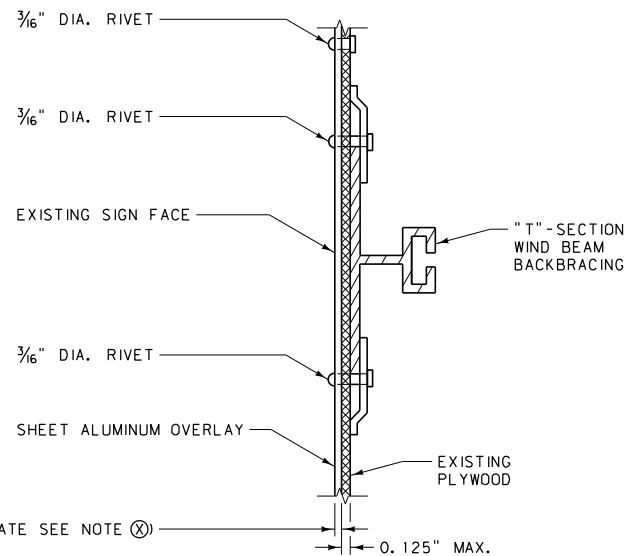
TREATED POLE
SINGLE OR DOUBLE

(USED WHEN "T"-BAR WIND BEAMS NOT REQUIRED)

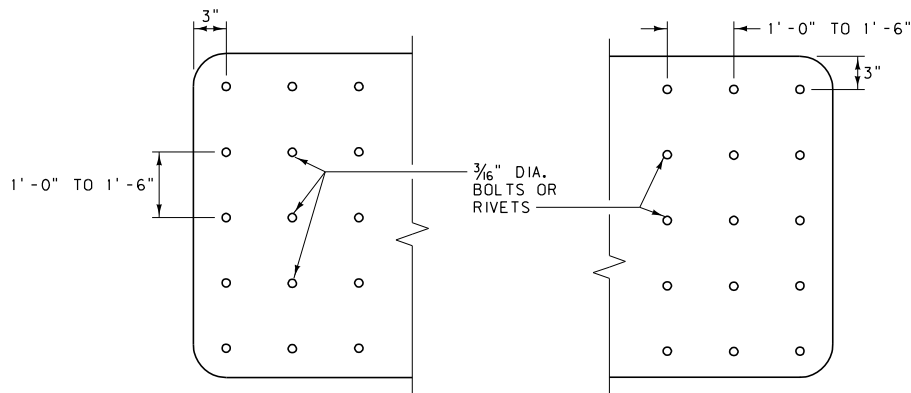
DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	619-08
SECTION 619, 704	
GUIDE SIGN CLEARANCE AND MOUNTING DETAILS	
EFFECTIVE: FEBRUARY 2005	
 serving you with pride	MONTANA DEPARTMENT OF TRANSPORTATION



EXISTING PLYWOOD SIGNS



EXISTING ALUMINUM SIGNS



FASTENER PATTERN

NOTES:

REMOVE ALL RAISED LETTERS, NUMERALS, SYMBOLS, BORDERS AND PREVIOUS SIGN OVERLAYS TO BE REPLACED, AND CLEAN SIGN FACE TO A SMOOTH SURFACE BEFORE OVERLAYING.

ALL LETTERS, NUMERALS, SYMBOLS AND BORDERS ARE TYPE "C" CUTOUT UNLESS OTHERWISE SPECIFIED, AND APPLIED TO THE BACKGROUND SHEETING PRIOR TO FIELD APPLICATION OF THE SIGN.

THE SIZE OF ALL GUIDE SIGN OVERLAYS AND LEGENDS MUST BE VERIFIED BY THE ENGINEER PRIOR TO FABRICATION.

- ⊗ AN ADHESIVE-BACKED SHEETING MAY BE USED AS AN ALTERNATIVE ON SIGN WIDTHS OF 6'-0" OR LESS IF IT IS PREFABRICATED TO A MINIMUM THICKNESS OF 0.005 INCHES AND CONSTRUCTED OF PREAPPLIED REFLECTIVE SHEETING ON ADHESIVE-BACKED ALUMINUM. APPLY ADHESIVE-BACKED OVERLAY SHEETING WHEN AIR AND SURFACE TEMPERATURES ARE ABOVE 50°F (10°C). DO NOT USE THIS TYPE OF OVERLAY MATERIAL ON OVERHEAD SIGNS.

PROVIDE A MINIMUM REFLECTIVE SHEETING INTENSITY OF ENGINEERING GRADE, MEETING THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS, UNLESS SPECIFIED OTHERWISE.


APPLY ALL MATERIALS IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS AND RECOMMENDATIONS.

SEE THE STANDARD SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

USE ALUMINUM ALLOY TYPE 6061-T6 OR AA5052-H38. CONVERSION COAT ALL ALUMINUM WITH A PROCESS SUCH AS ALODINE 1200 (OR EQUAL), AND RINSE AND DRY THOROUGHLY. PROTECT IT FROM SOIL BY ACCEPTABLE METHODS.

SIGN OVERLAYS MAY REQUIRE REMOVAL OF THE SIGN FROM THE POSTS TO AVOID PROJECTING BOLT HEADS. DO NOT LEAVE WARNING AND REGULATORY SIGNS TO BE OVERLAYED UNDISPLAYED FOR MORE THAN ONE (1) HOUR DURING DAYLIGHT. DO NOT LEAVE GUIDE SIGNS UNDISPLAYED FOR MORE THAN TEN (10) HOURS DURING DAYLIGHT. INSURE SIGNS TO BE OVERLAYED ARE OPERATIONAL PRIOR TO DARKNESS.

OVERLAY SIGNS SMALLER THAN 4'-0" x 6'-0" WITH ONE PANEL OF MATERIAL. FOR SEAMS IN LARGE OVERLAYS, USE RIVETS OR BOLTS SPACED AS SHOWN ON THIS DRAWING AND PLACE PARALLEL TO AND NO MORE THAN 3" Laterally FROM THE SEAM.

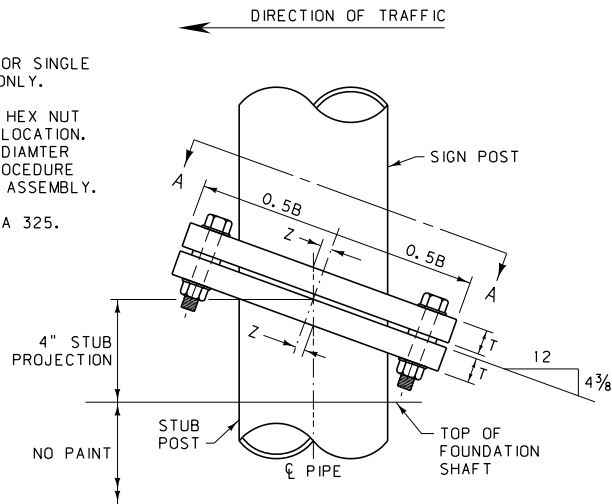
DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 619	DWG. NO. 619-10
SHEET ALUMINUM OVERLAY	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION serving you with pride	

NOTES:

USE TUBULAR POSTS FOR SINGLE POST MOUNTED SIGNS ONLY.

BOLT WITH HEX HEAD, HEX NUT AND 3 WASHERS EACH LOCATION. SEE TABLE FOR BOLT DIAMETER AND TORQUE. SEE PROCEDURE FOR BASE CONNECTION ASSEMBLY.

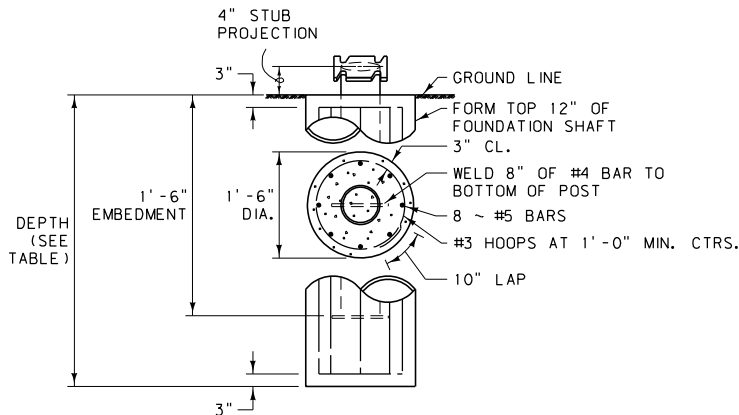
ALL BOLTS ARE ASTM A 325.



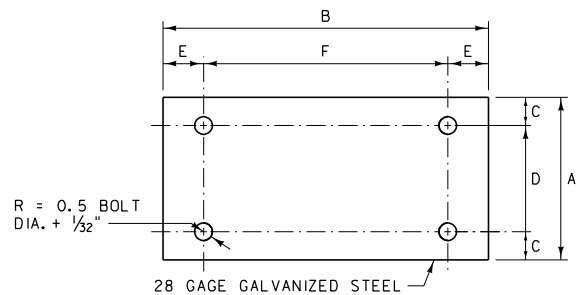
SIGN POST AND STUB POST DETAILS

PROCEDURE FOR BASE CONNECTION ASSEMBLY

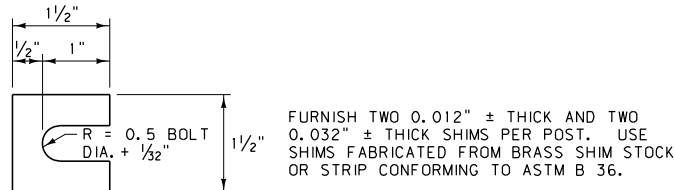
1. ASSEMBLE POST TO STUB WITH BOLTS AND ONE FLAT WASHER BETWEEN PLATES.
2. SHIM AS REQUIRED TO PLUMB POST.
3. TIGHTEN BOLTS IN A SYSTEMATIC ORDER TO THE PRESCRIBED TORQUE (SEE TABLE BELOW).
4. LOOSEN EACH BOLT AND RETIGHTEN TO PRESCRIBED TORQUE IN THE SAME ORDER AS ORIGINAL TIGHTENING. DO NOT OVERTIGHTEN.
5. BURR THREADS AT JUNCTION WITH NUT USING A CENTER PUNCH TO PREVENT NUT LOOSENING.



FOUNDATION SHAFT DETAIL

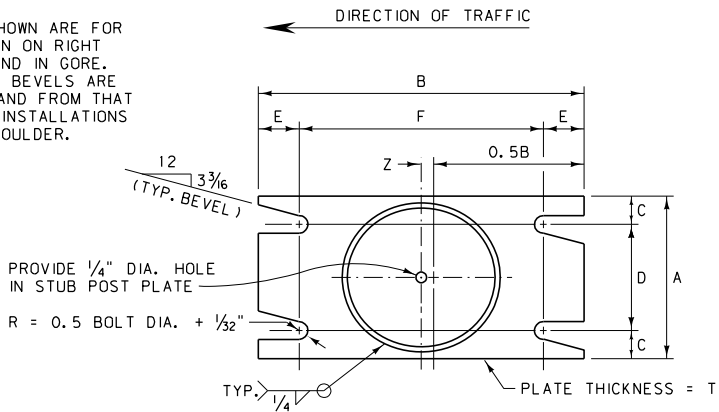


KEEPER PLATE DETAIL

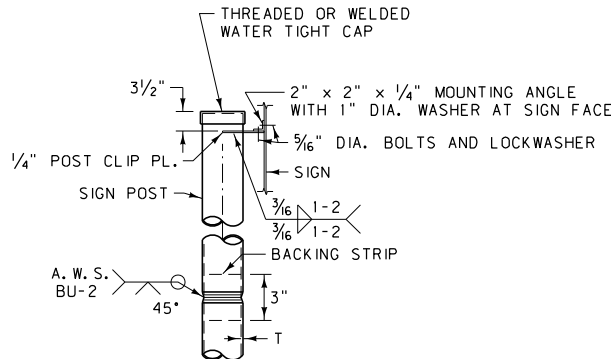


SHIM DETAIL

SECTIONS SHOWN ARE FOR INSTALLATION ON RIGHT SHOULDER AND IN GORE. PLATE SLOT BEVELS ARE OPPOSITE HAND FROM THAT SHOWN FOR INSTALLATIONS ON LEFT SHOULDER.

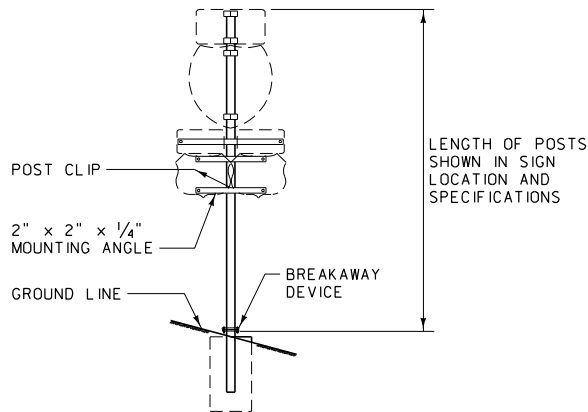


SECTION A-A
BASE PLATE DETAIL

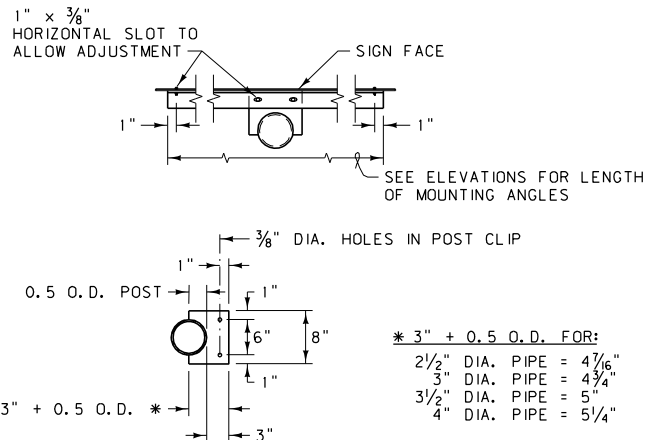


TYPICAL SPLICE

BACKING STRIP THICKNESS = T OR 5/16" MAX. LOCATE SPLICE IN TOP ONE-HALF OF POST.



TYPICAL SIGN ELEVATION
FOR DETAILS OF MOUNTING ANGLES SEE DETAILED DRAWING NUMBER 619-16 AND BELOW.



POST CLIP DETAILS

BASE CONNECTION DATA											FOUNDATION	
NOMINAL PIPE DIA.	BOLT SIZE	BOLT TORQUE	A	B	C	D	E	F	T	Z	FOOTING DIAMETER	FOOTING DEPTH
3"	1/2" DIA. x 2 1/2"	240 IN. LB.	4 1/2"	7 1/2"	1"	2 1/2"	3/4"	6"	3/4"	5/16"	1' - 6"	3' - 0"
3 1/2" & 4"	1/2" DIA. x 2 1/2"	240 IN. LB.	5 1/2"	8 1/2"	1"	3 1/2"	3/4"	7"	3/4"	5/16"	1' - 6"	3' - 0"
5"	5/8" DIA. x 3 1/4"	480 IN. LB.	6 1/2"	9 3/4"	1 1/4"	4"	7/8"	8"	1"	3/8"	1' - 6"	4' - 0"
6"	3/4" DIA. x 3 1/2"	780 IN. LB.	7 1/2"	11 1/4"	1 1/4"	5"	1"	9 1/4"	1"	3/8"	1' - 6"	4' - 6"

NOTES:

USE STEEL PIPE CONFORMING TO THE REQUIREMENTS OF ASTM A 53, TYPE E OR S, GRADE B OR A 500, GRADE B.

USE CLASS "A" OR "D" CONCRETE WITH A WOOD FLOAT FINISH ON TOP. FORM TOP TWELVE INCHES OF FOUNDATION.

SEE THE STANDARD SPECIFICATIONS FOR REQUIREMENTS GOVERNING STRUCTURAL STEELS AND THEIR FABRICATION.

SUBMIT SHOP PLANS FOR APPROVAL PRIOR TO FABRICATION.


FOR SIGN PLACEMENT AND DETAILS SEE THE SIGNING DETAILED DRAWINGS.

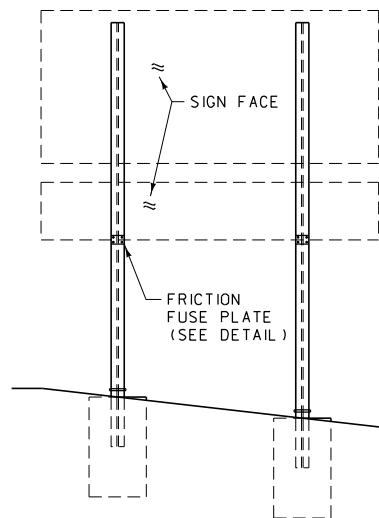
GALVANIZE PIPE AS PER AASHTO M 111.

EXCEPT AS OTHERWISE APPROVED BY THE ENGINEER, PAINT STRUCTURAL STEEL WITH ONE SHOP COAT AND ONE FIELD COAT OF ZINC RICH BASED PAINT AND ONE FIELD COAT OF ALUMINUM PAINT AS SPECIFIED IN THE STANDARD SPECIFICATIONS, ON ALL SURFACES NOT IN CONTACT WITH THE CONCRETE.

FRANGIBLE BOLT BREAKAWAY SYSTEMS APPROVED BY FHWA ARE ALLOWED TO BE USED IN PLACE OF THE DESIGN SHOWN HERE AS AN EQUAL OPTION (PER ENGINEER'S APPROVAL).

TABLE OF WEIGHTS		
NOMINAL PIPE DIA.	NOMINAL WEIGHT (LB. /FT.) OF PIPE	WEIGHT OF EACH BREAKAWAY DEVICE & STUB POST (LB.)
3"	7.58	28.03
3 1/2"	9.11	35.85
4"	10.79	38.44
5"	14.62	61.51
6"	18.97	81.54

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 556, 619, 704	DWG. NO. 619-12
TUBULAR SIGN POST DETAILS	
EFFECTIVE: FEBRUARY 2005	
 serving you with pride	MONTANA DEPARTMENT OF TRANSPORTATION



TYPICAL SIGN ELEVATION

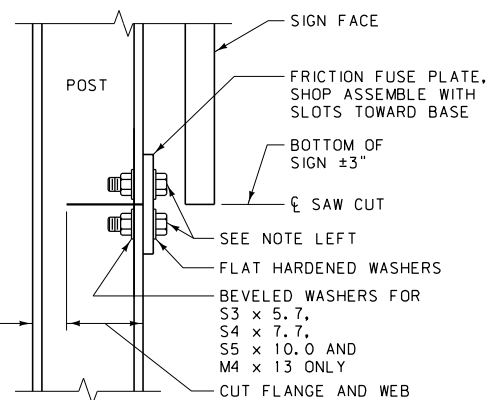
BASE CONNECTION DATA											FUSE PLATE DATA										FOUNDATION DATA				
POST SIZE	BOLT SIZE	BOLT TORQUE	DIMENSIONS							BREAKAWAY DEVICE (LB.)	DIMENSIONS								BOLT DIA.	FUSE DEVICE (LB.)	FTG. DEPTH	STUB LENGTH	FTG. DIA.	BAR C SIZE	STUB POST (LB.)
			A	B	C	D	E	t ₁	W		F	G	H	J	K	L	N	t ₃							
W4 x 13 M4 x 13	5/8" DIA. x 2 3/4"	40 FT. LB.	8 1/2"	5"	3/4"	2 3/4"	1 1/8"	3/4"	5/16"	21.58	3 3/4"	2"	1 1/8"	4"	2 1/4"	7/8"	5/8"	3/8"	5/8"	1.60	3' - 6"	2' - 0"	1' - 6"	#5	26.00
W8 x 18			12 1/2"	6 1/4"	3/4"	4"	1 1/8"	3/4"	5/16"	37.00	4 1/2"	2 1/2"	1 1/4"	5 1/4"	2 3/4"	1 1/4"	3/4"	1/2"	3/4"	3.27	5' - 6"	2' - 6"	2' - 0"	#7	45.00
W8 x 24	3/4" DIA. x 3 1/2"	65 FT. LB.	13"	7 1/2"	3/4"	5"	1 1/4"	1"	5/16"	60.86	4 3/4"	2 1/2"	1 1/2"	6"	3 1/2"	1 1/4"	3/4"	5/16"	3/4"	4.66	7' - 0"	3' - 0"	2' - 0"	#9	72.00
W12 x 30			17"	7 1/2"	7/8"	5"	1 1/4"	1"	5/16"	78.54	5 3/8"	3"	1 1/2"	6 1/2"	3 1/2"	1 1/2"	7/8"	5/16"	7/8"	5.42	8' - 0"	3' - 0"	2' - 6"	#9	90.00
S3 x 5.7	1/2" DIA. x 2 1/2"	20 FT. LB.	8"	3"	3/4"	1 1/2"	3/4"	5/8"	1/4"	10.37	3 1/8"	1 1/2"	1 1/8"	2 5/8"	1 1/2"	5/16"	1/2"	1/4"	1/2"	0.64	3' - 6"	1' - 6"	1' - 6"	#4	8.55
S4 x 7.7			8"	3"	3/4"	1 1/2"	3/4"	5/8"	1/4"	10.45	3 1/8"	1 1/2"	1 1/8"	2 5/8"	1 1/2"	5/16"	1/2"	1/4"	1/2"	0.64	3' - 6"	1' - 6"	1' - 6"	#4	11.55
S5 x 10.0	5/8" DIA. x 2 3/4"	40 FT. LB.	9 1/2"	4"	3/4"	2"	1"	3/4"	1/4"	19.08	3 1/8"	1 1/2"	1 1/8"	3"	1 7/8"	5/16"	1/2"	1/4"	1/2"	0.66	3' - 6"	1' - 6"	1' - 6"	#5	15.00

PROCEDURE FOR BASE CONNECTION ASSEMBLY

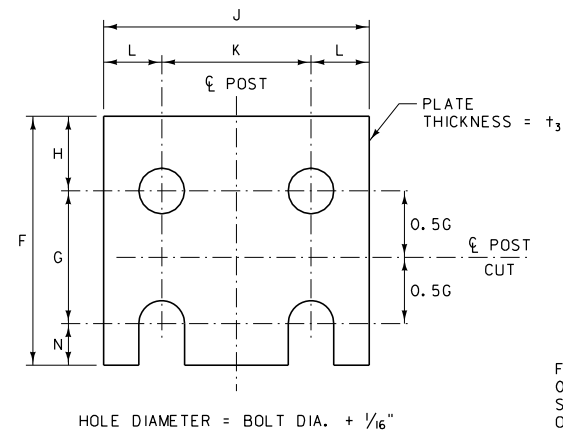
1. ASSEMBLE POST TO STUB WITH BOLTS AND ONE FLAT WASHER BETWEEN PLATES.
2. SHIM AS REQUIRED TO PLUMB POST.
3. TIGHTEN BOLTS IN A SYSTEMATIC ORDER TO THE PRESCRIBED TORQUE (SEE TABLE).

4. LOOSEN EACH BOLT AND RETIGHTEN TO PRESCRIBED TORQUE IN THE SAME ORDER AS ORIGINAL TIGHTENING. DO NOT OVERTIGHTEN.
5. BURR THREADS AT JUNCTION WITH NUT USING A CENTER PUNCH TO PREVENT NUT LOOSENING.

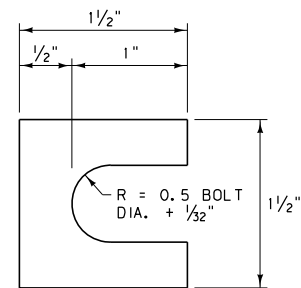
NOTE:
ALL BOLTS MUST BE ASTM A 325 AND BE TIGHTENED BY USE OF A DIRECT TENSION INDICATING DEVICE (LOAD INDICATING WASHER) IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS.



FRICION FUSE PLATE DETAIL
DO NOT USE ON SINGLE POST SIGNS

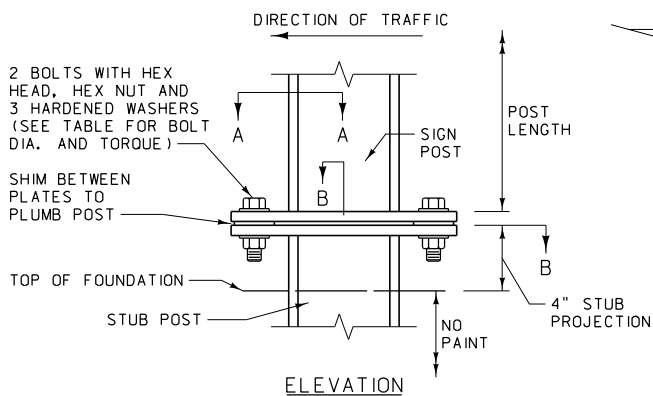


FRICION FUSE PLATE DETAIL

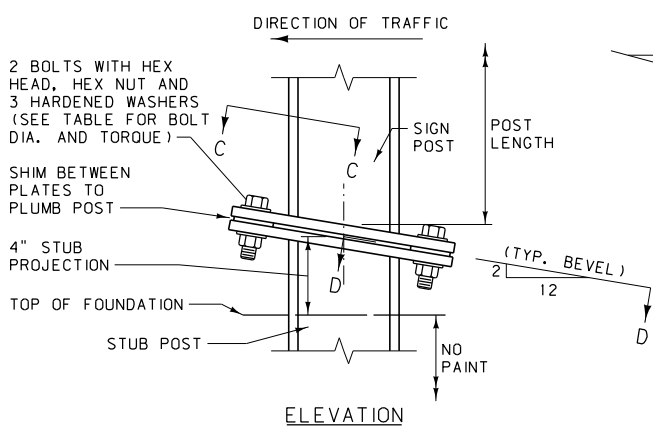
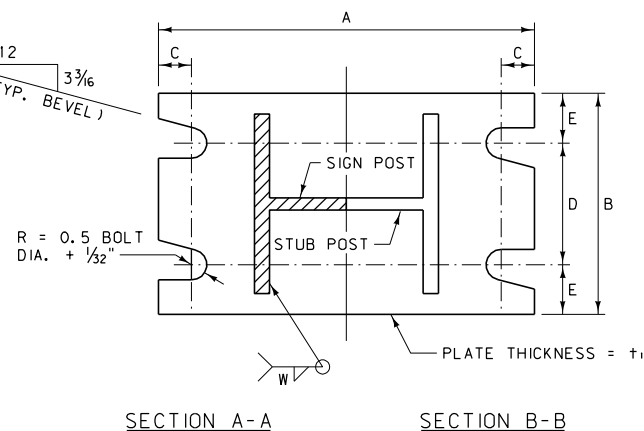


FURNISH TWO 0.012" ± THICK AND TWO 0.032" ± THICK SHIMS PER POST. USE SHIMS FABRICATED FROM BRASS SHIM STOCK OR STRIP CONFORMING TO ASTM B 36.

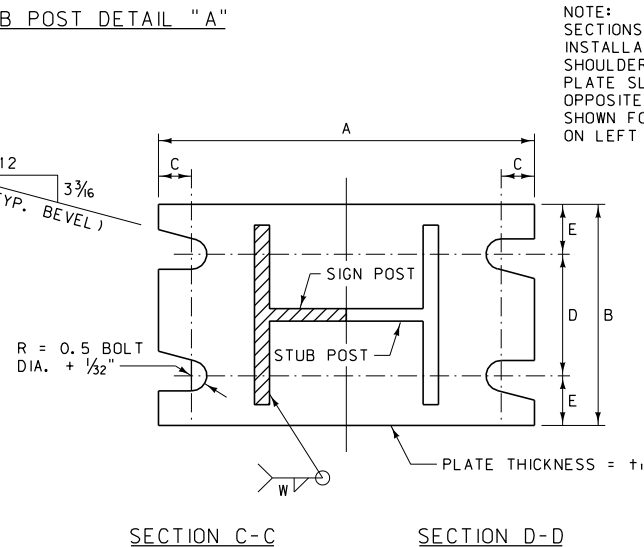
SHIM DETAIL



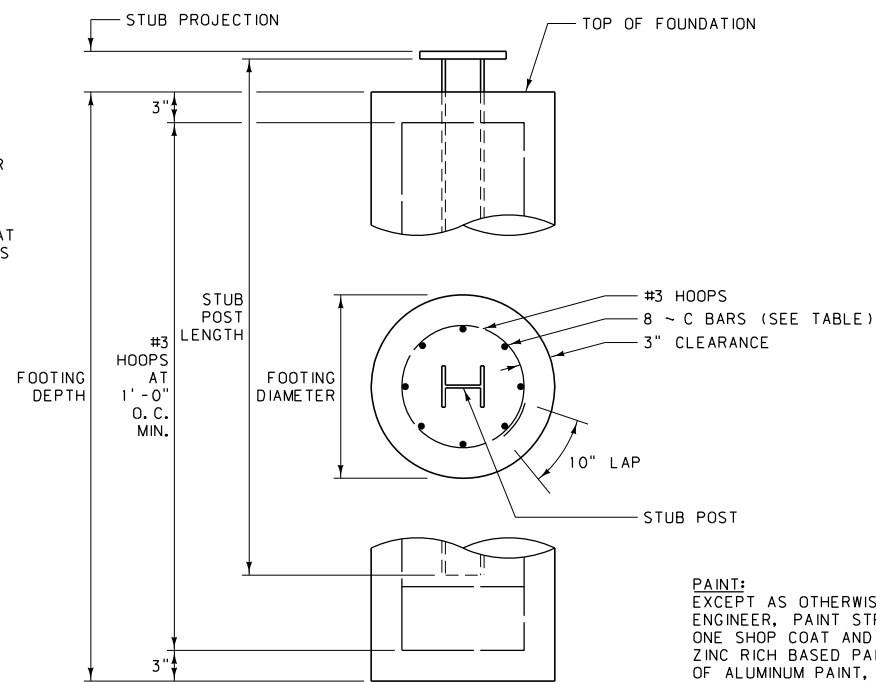
SIGN POST AND STUB POST DETAIL "A"



SIGN POST AND STUB POST DETAIL "B"
USE ONLY WITH SINGLE POST SIGNS



NOTE:
SECTIONS SHOWN ARE FOR INSTALLATIONS ON RIGHT SHOULDER AND IN GORE. PLATE SLOT BEVELS ARE OPPOSITE HAND FROM THAT SHOWN FOR INSTALLATIONS ON LEFT SHOULDER.



FOUNDATION DETAIL

NOTES:

USE CLASS "A" OR "D" CONCRETE WITH A WOOD FLOAT FINISH ON TOP. FORM TOP 12 INCHES OF FOUNDATION.

SEE THE STANDARD SPECIFICATIONS FOR REQUIREMENTS GOVERNING STRUCTURAL STEELS AND THEIR FABRICATIONS. TO AVOID OVERSIGHT, NOTE THESE REQUIREMENTS ON THE SHOP DRAWINGS.


SUBMIT SHOP PLANS FOR APPROVAL BEFORE FABRICATION IS BEGUN.

THE WEIGHT OF STEEL POSTS IS COMPUTED BY TAKING THE LENGTH OF THE POST TIMES THE NOMINAL WEIGHT PER FOOT PLUS THE WEIGHT OF THE BREAKAWAY DEVICE, FUSE DEVICE AND STUB POST AS SHOWN IN THE TABLE.

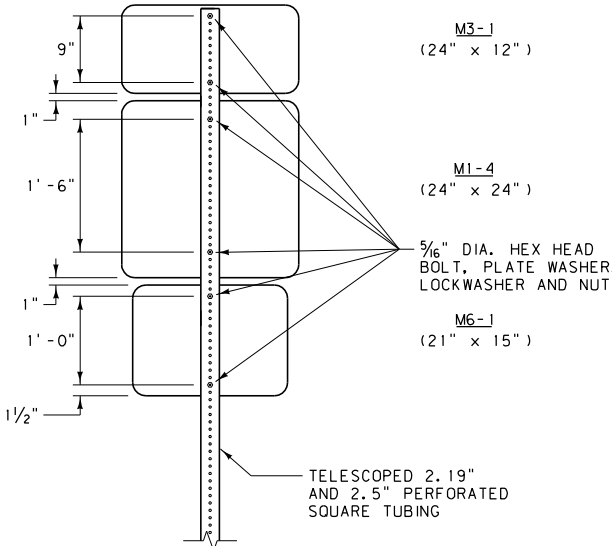
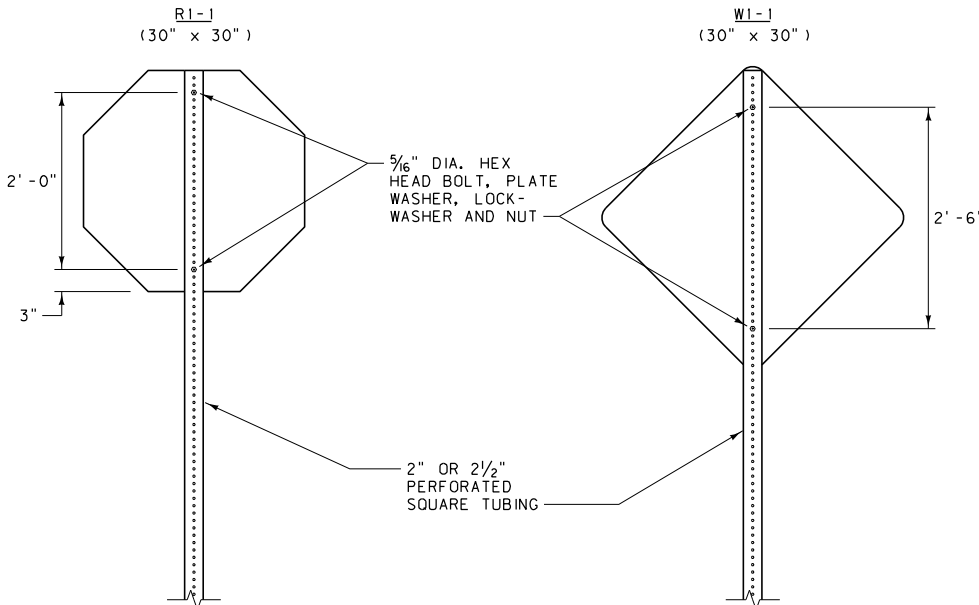
FOR GUIDE SIGN PLACEMENT AND DETAILS, SEE SIGNING DTL. DWG. NO. 619-08.

FRANGIBLE BOLT BREAKAWAY SYSTEMS APPROVED BY FHWA ARE ALLOWED TO BE USED IN PLACE OF THE DESIGN SHOWN HERE AS AN EQUAL OPTION (PER ENGINEER'S APPROVAL).

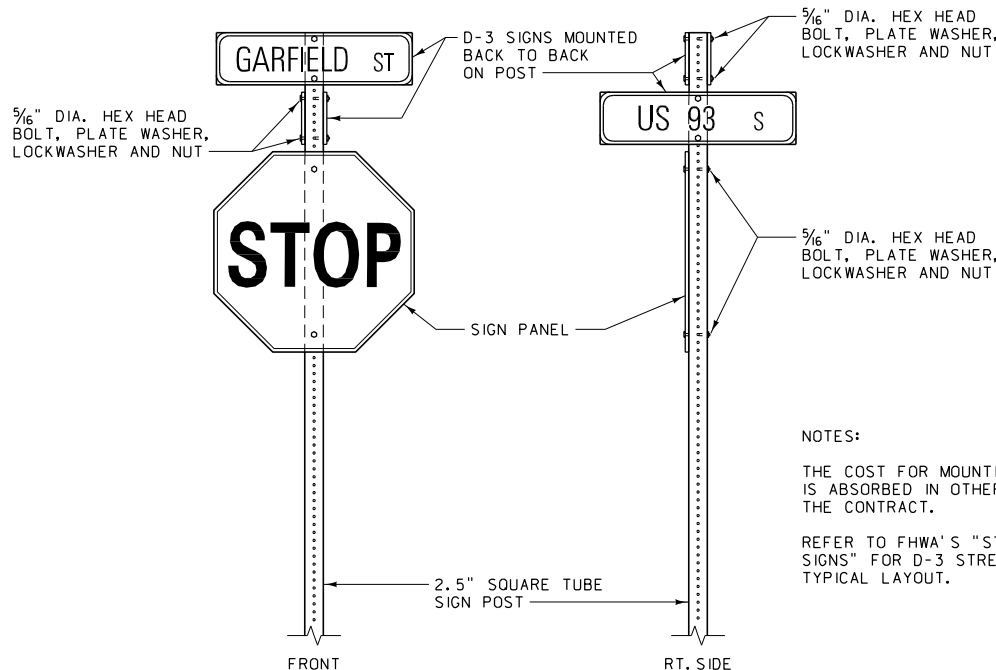
PAINT:
EXCEPT AS OTHERWISE APPROVED BY THE ENGINEER, PAINT STRUCTURAL STEEL WITH ONE SHOP COAT AND ONE FIELD COAT OF ZINC RICH BASED PAINT AND ONE FIELD COAT OF ALUMINUM PAINT, AS SPECIFIED IN THE STANDARD SPECIFICATIONS, ON ALL SURFACES NOT IN CONTACT WITH CONCRETE.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	619-13
SECTION 619	
BREAKAWAY AND FOUNDATION DETAILS FOR MULTIPLE GUIDE SIGN SUPPORTS	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	

SIGNS WITHOUT BACKBRACING
(SEE PLANS FOR BACKBRACING REQUIREMENTS)



STREET NAME SIGN INSTALLATION

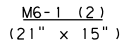
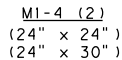
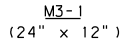
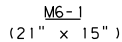
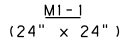
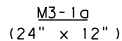
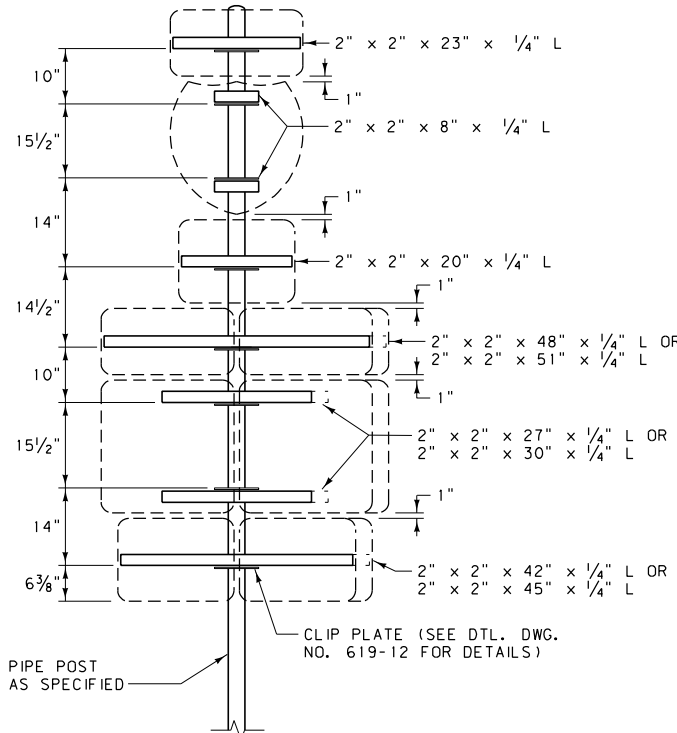
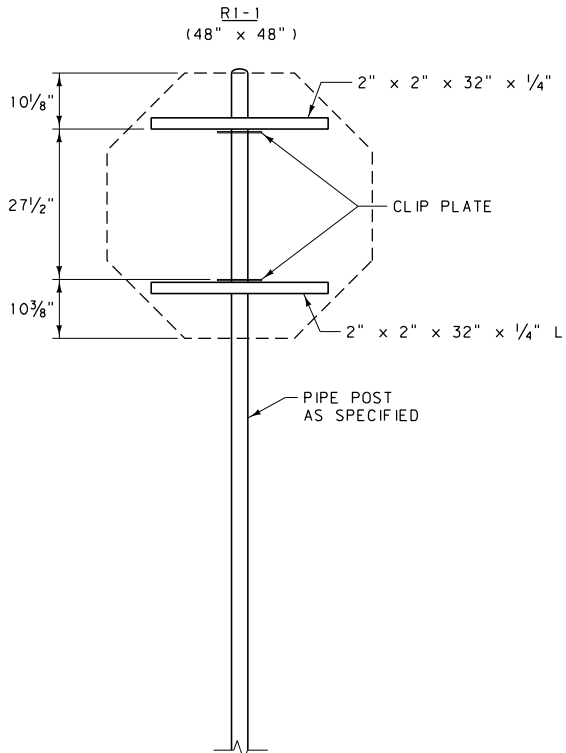


NOTES:

THE COST FOR MOUNTING D-3 SIGNS
IS ABSORBED IN OTHER BID ITEMS OF
THE CONTRACT.

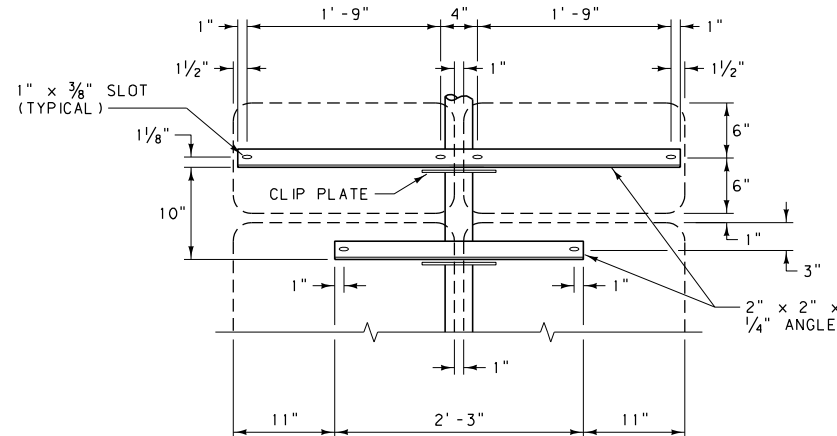
REFER TO FHWA'S "STANDARD HIGHWAY
SIGNS" FOR D-3 STREET NAME SIGN
TYPICAL LAYOUT.

SIGNS WITH BACKBRACING
(SEE PLANS FOR BACKBRACING REQUIREMENTS)

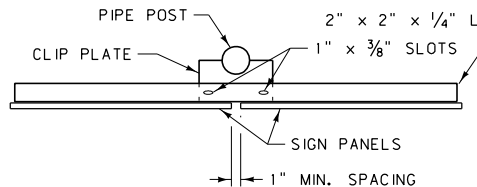


TYPICAL MOUNTING DETAIL:
(FOR 3" DIA. AND LARGER PIPE)

ELEVATION



PLAN VIEW



NOTES:


VERTICAL DIMENSIONS SHOWN ARE FROM TOP TO TOP
OF ALL POST CLIP PLATES.

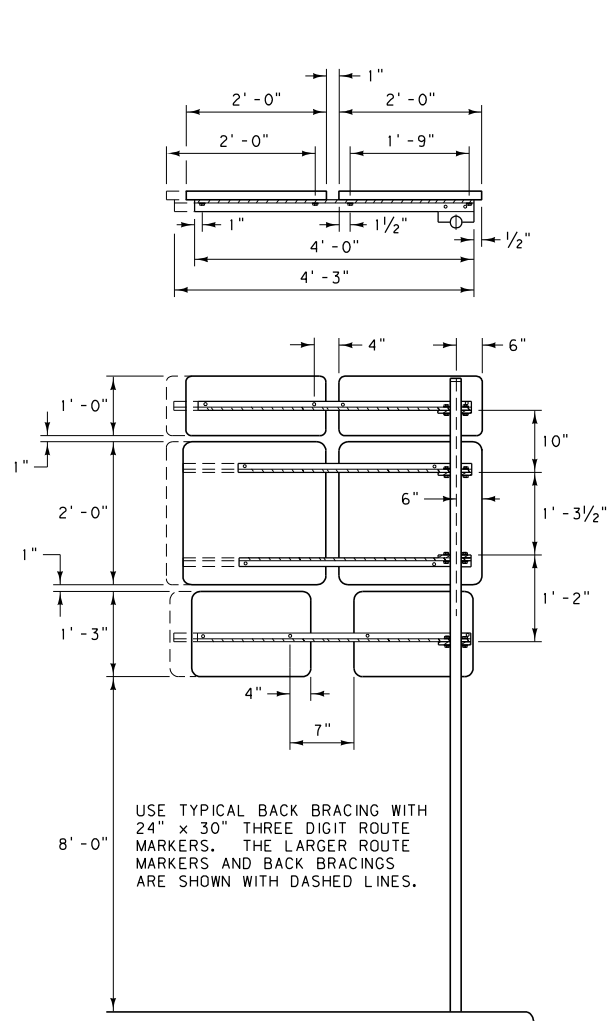
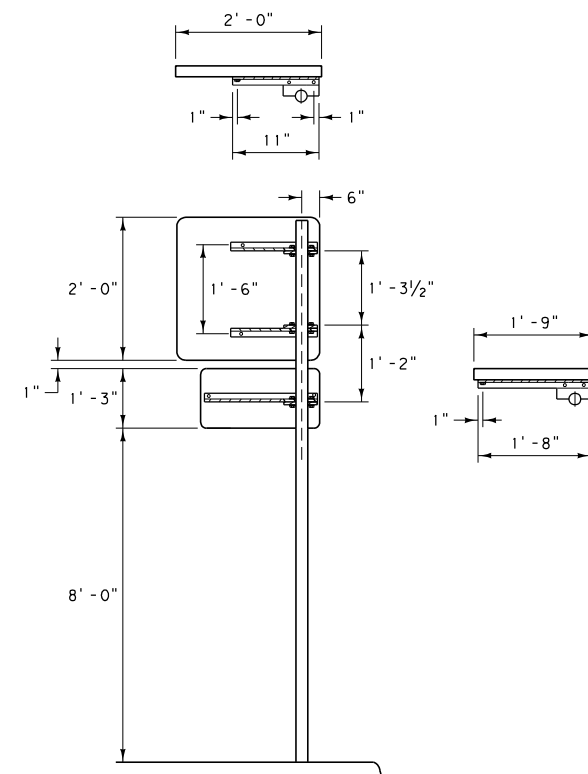
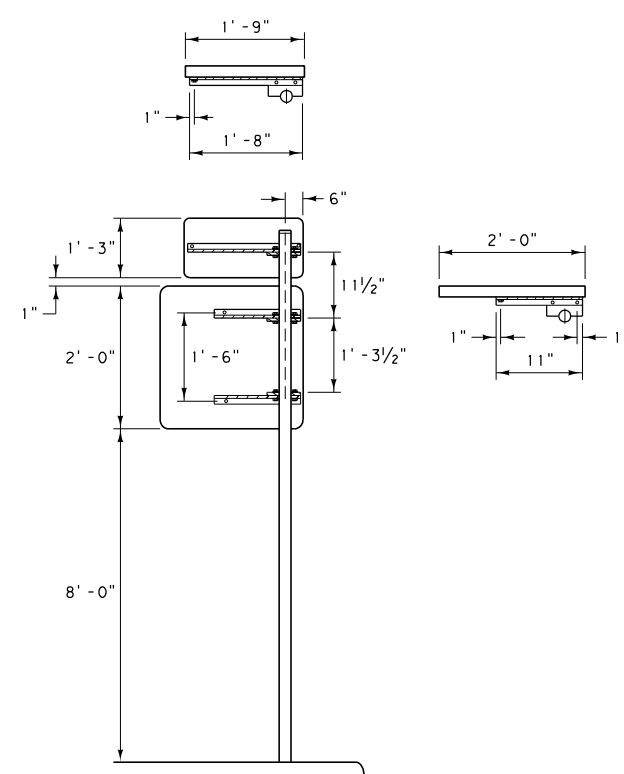
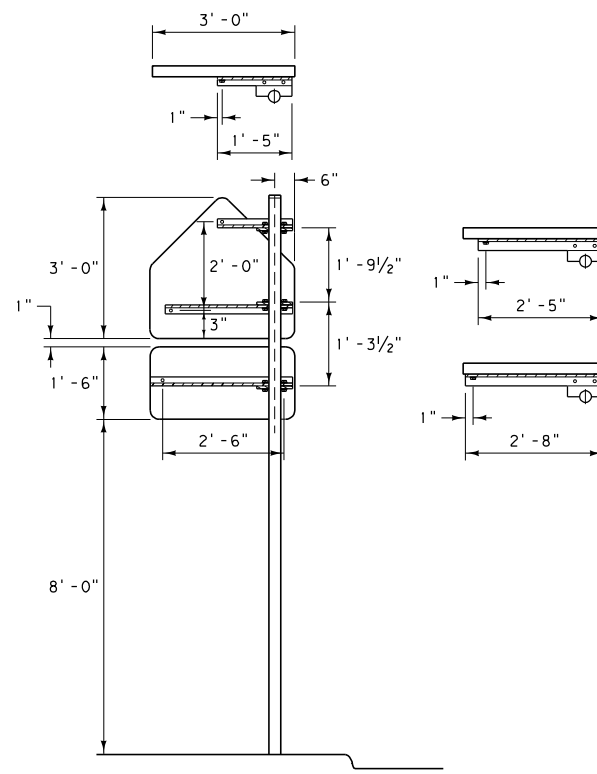
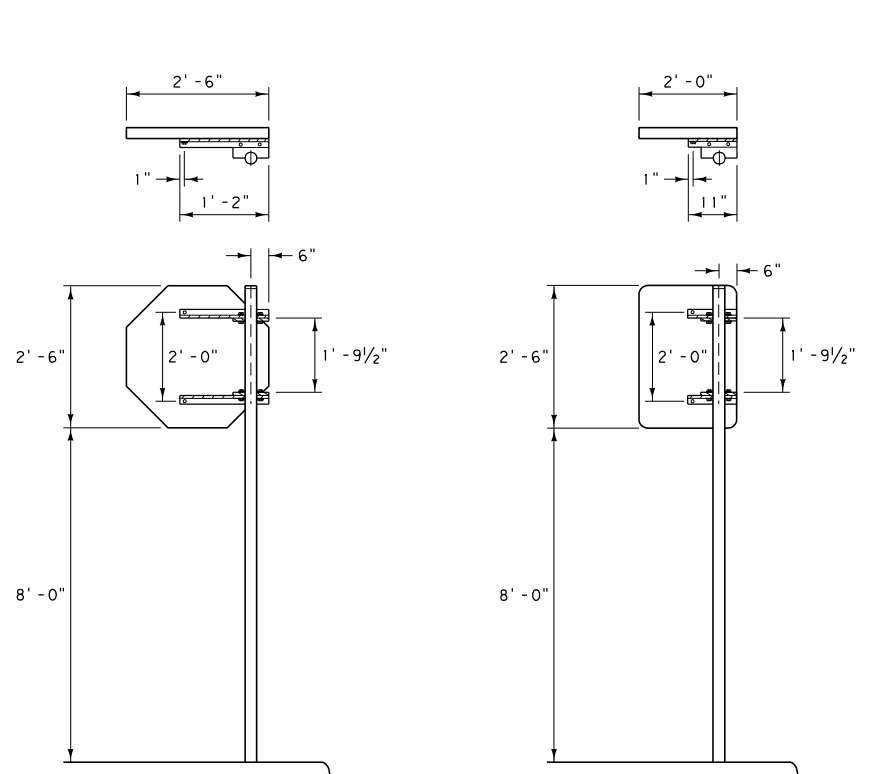
PLACE A SUITABLE WATERTIGHT CAP ON TOP OF ALL PIPE POSTS.

CONFORM MATERIAL USED IN FABRICATION OF POST CLIPS AND ANGLE BRACKETS TO SECTION 556 OF THE STANDARD SPECIFICATIONS.

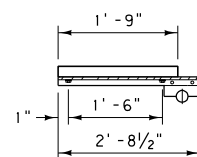
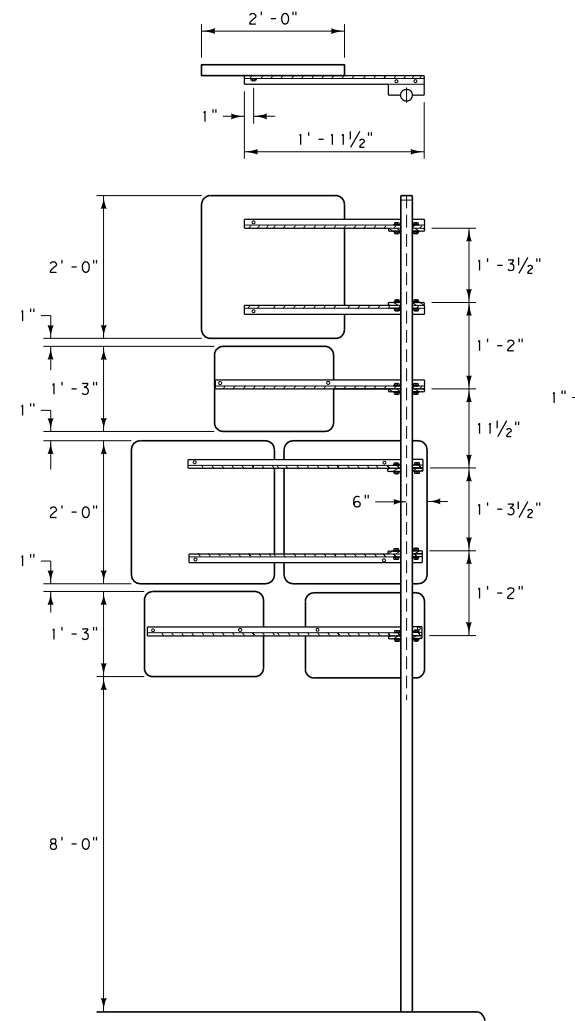
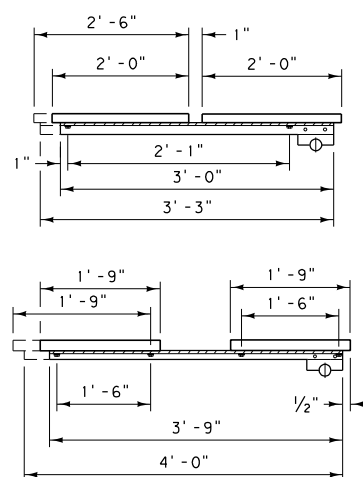
THE LENGTH OF EACH ANGLE BRACKET DEPENDS ON THE MOUNTING ASSEMBLY AND HOLE SPACING OF EACH SIGN. THE ASSEMBLIES SHOWN ARE TYPICAL INSTALLATIONS. ERECT SIMILAR ASSEMBLIES IN A LIKE MANNER.

REFER TO FHWA'S "STANDARD HIGHWAY SIGNS" FOR
STANDARD HOLE SPACING IN SIGNS.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 556, 619, 704	DWG. NO 619-16
TYPICAL STEEL POST MOUNTING DETAILS	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	



NOTE:
ALTERNATE MOUNTING MUST BE
APPROVED BY THE ENGINEER.



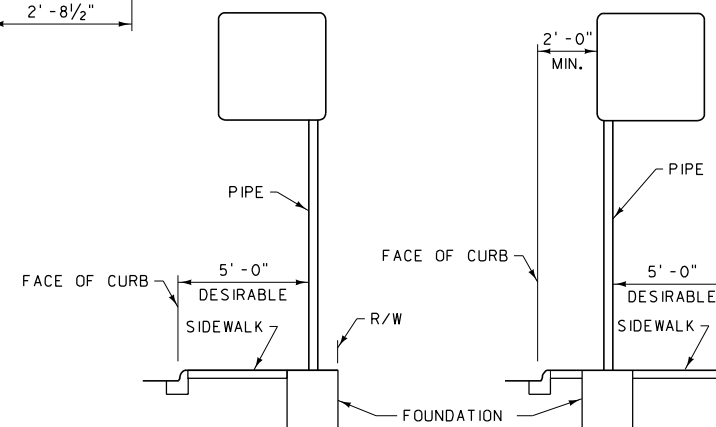
NOTES:

REFER TO FHWA'S MANUAL "STANDARD HIGHWAY
SIGNS" FOR STANDARD HOLE SPACING IN SIGNS.

USE POST CLIPS AS SHOWN IN SIGNING DETAILED
DRAWING NO. 619-12 WHEN CANTILEVER MOUNTING
IS NECESSARY.

USE POSTS ONE SIZE LARGER THAN THOSE
REQUIRED FOR STANDARD MOUNTINGS.

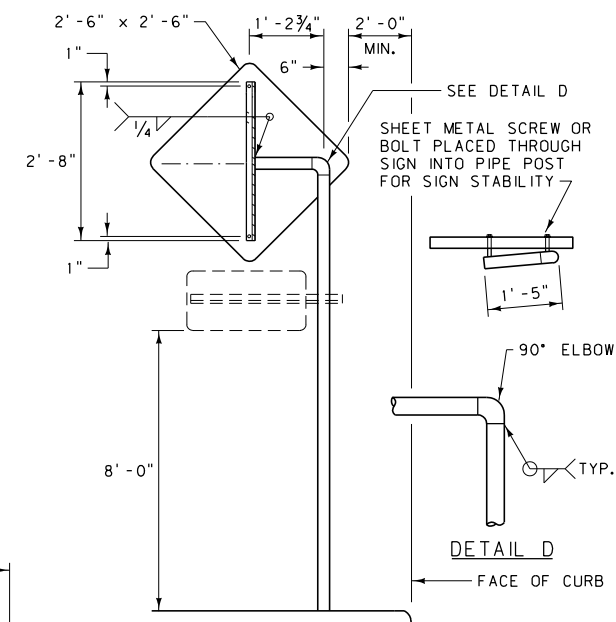
DIMENSIONS FOR POST CLIP SPACING ARE SHOWN
TO THE TOP OF EACH CLIP.




ALTERNATE A

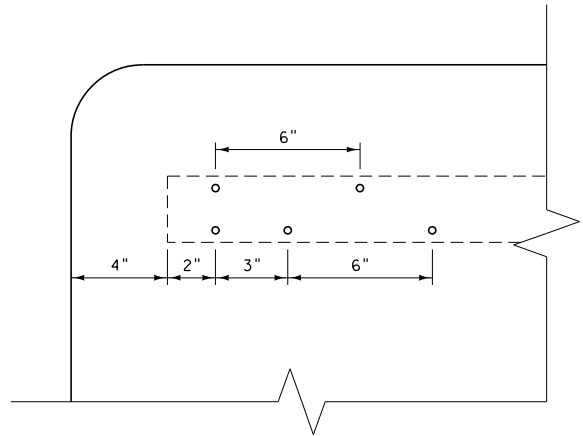
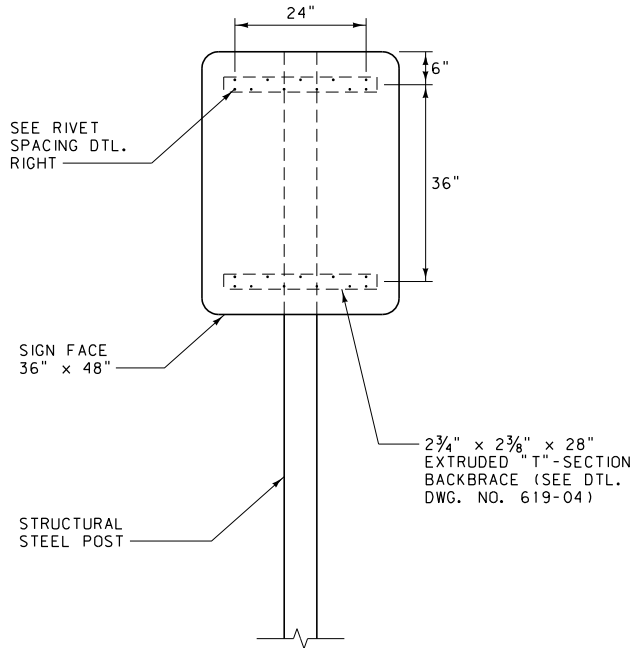
USE THE STANDARD TYPE MOUNTING BEHIND SIDEWALKS IF R/W LIMITS
PERMIT. IF R/W DOES NOT PERMIT, THEN ALTERNATE A SHOULD BE
USED BEHIND SIDEWALKS OR IN THE SIDEWALK NEXT TO A BUILDING.
IF CONDITIONS ARE SUCH THAT THE SIGN CANNOT BE MOUNTED ON THE
BACKSIDE OF THE SIDEWALK THEN USE ALTERNATE B.

ALTERNATE B

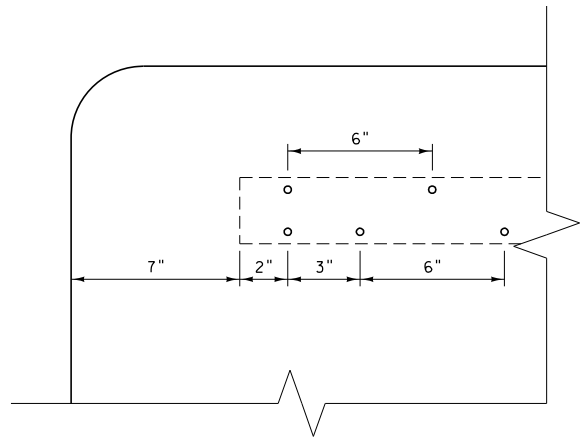
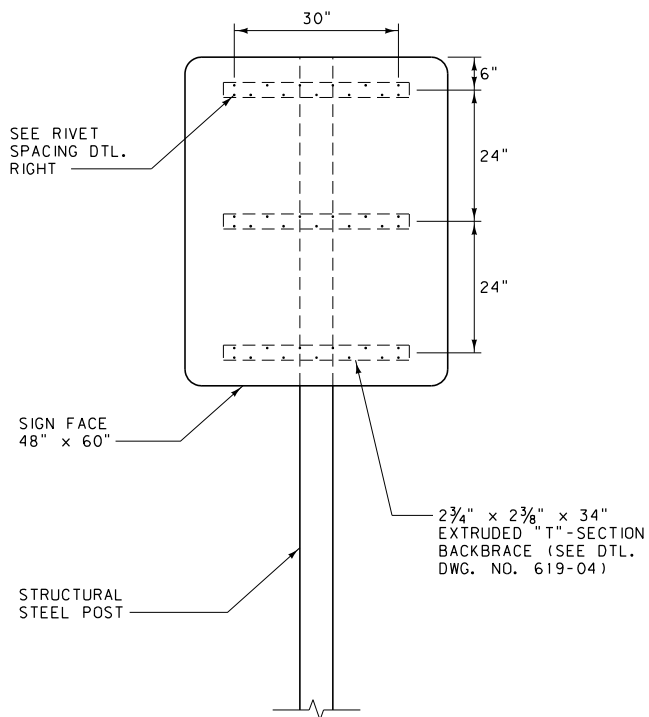


DETAIL C

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	619-18
SECTION 556, 619, 704	
CANTILEVER TYPE SIGN SUPPORT DETAILS FOR SIDEWALK AREAS	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	




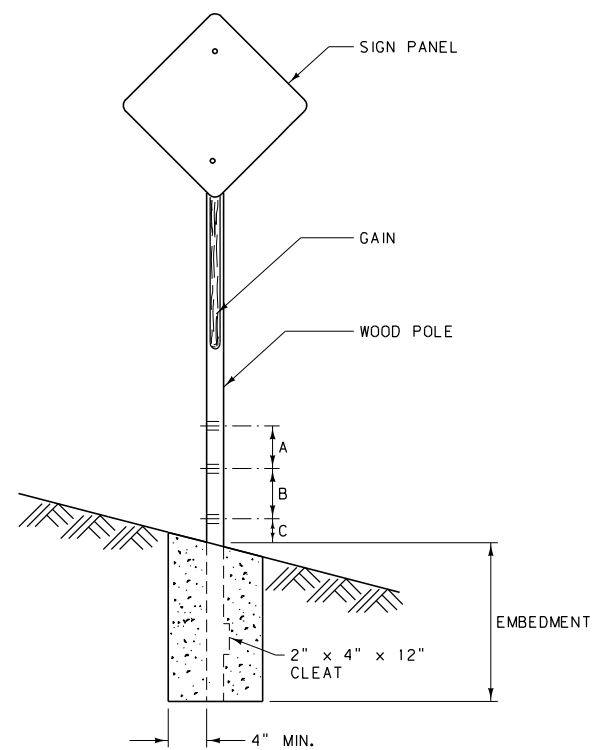
RIVET SPACING



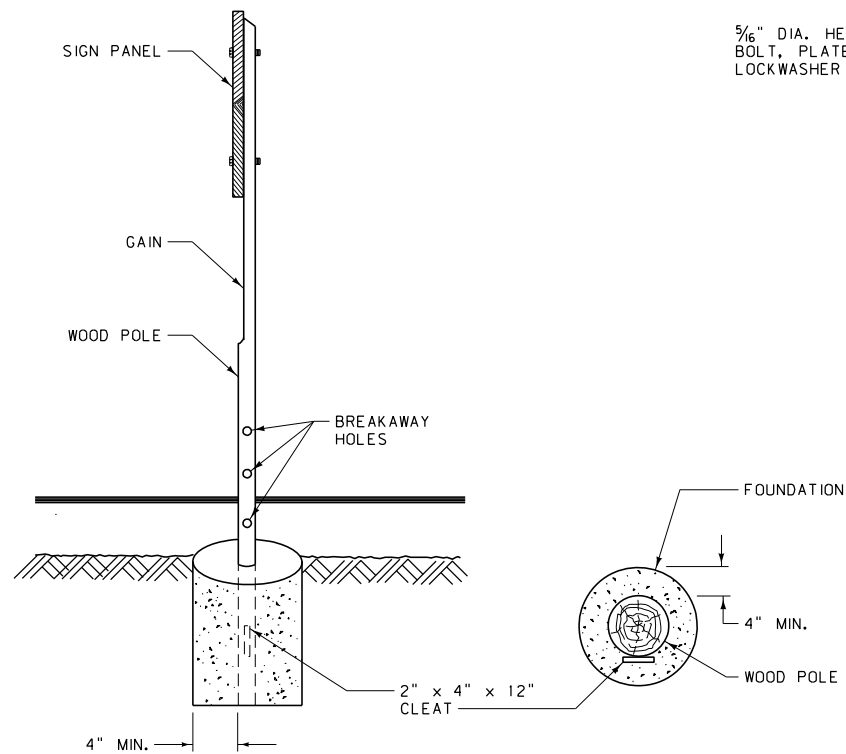
RIVET SPACING

NOTE:
SEE THE PLANS
FOR BACKBRACING
REQUIREMENTS.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	619-19
SECTION 619, 704	
STRUCTURAL STEEL POST SIGN MOUNTING DETAILS	
EFFECTIVE: FEBRUARY 2005	
 <i>serving you with pride</i>	MONTANA DEPARTMENT OF TRANSPORTATION



BREAKAWAY AND FOOTING DETAILS



5/16" DIA. HEX HEAD BOLT, PLATE WASHER, LOCKWASHER AND NUT

5/16" DIA. HEX HEAD BOLT, PLATE WASHER, LOCKWASHER AND NUT

5/16" DIA. HEX HEAD BOLT, PLATE WASHER, LOCKWASHER AND NUT

SIGN FACE 36" x 36" MAX. SIZE

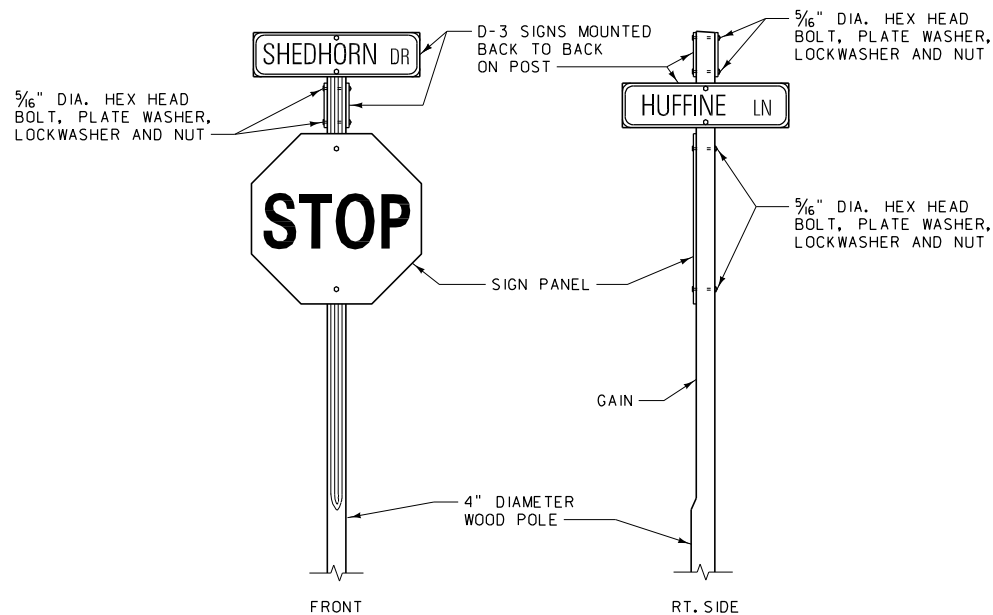
SIGN FACE 30" x 36" MAX. SIZE

SIGN FACE 36" x 36" MAX. SIZE

REGULATORY SIGNS

WARNING SIGNS

TYPICAL SIGN MOUNTINGS
(NO BACKBRACING)

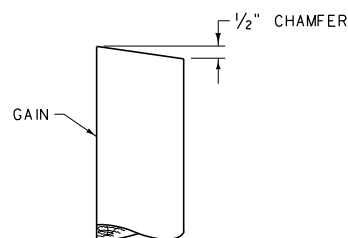


NOTES:

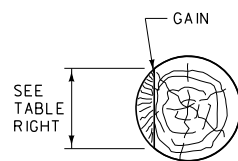
THE COST FOR MOUNTING D-3 SIGNS IS ABSORBED IN OTHER BID ITEMS OF THE CONTRACT.

REFER TO FHWA'S "STANDARD HIGHWAY SIGNS" FOR D-3 STREET NAME SIGN TYPICAL LAYOUT.

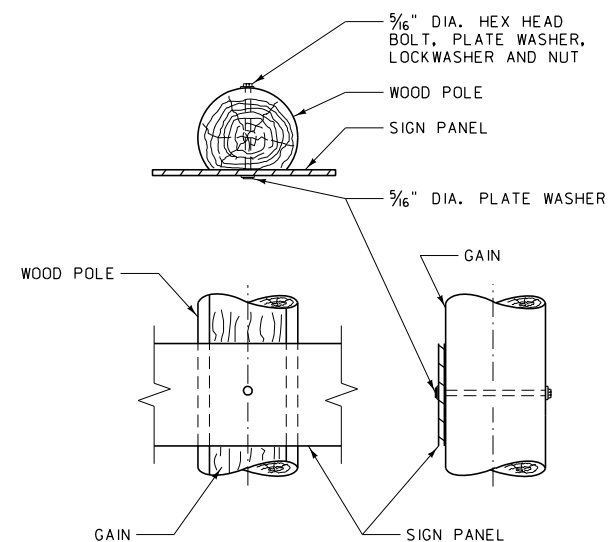
STREET NAME SIGN INSTALLATION



TOP END TREATMENT



GAIN DETAIL



SIGN MOUNTING DETAIL

NOTES:

CONFORM ALL WOOD POLES TO THE REQUIREMENTS OF SECTION 704 OF THE STANDARD SPECIFICATIONS.

GAIN ALL POLES ON THE SIGN SIDE THE MINIMUM WIDTH SHOWN IN THE TABLE, FOR HALF THE LENGTH OF EACH POLE.

BREAKAWAY DETAILS ARE STANDARD FOR ALL WOOD POLES LISTED IN THE TABLE, ON SINGLE AND MULTIPLE SIGN SUPPORTS.

ALL BOLTS, NUTS AND WASHERS MUST CONSIST OF ALUMINUM, STAINLESS STEEL OR CADMIUM PLATED STEEL MATERIAL.

ATTACH A 2" x 4" x 12" BOARD 12" FROM THE BOTTOM OF THE POLE TO PREVENT SPINNING. ATTACH THIS CLEAT BY DRIVING TWO 16d NAILS THROUGH THE CLEAT AND INTO THE POLE. TREAT THE 2" x 4" CLEAT ACCORDING TO THE STANDARD SPECIFICATIONS.


⊗ THE MAXIMUM CROSS-SECTIONAL AREA AT A POINT 4" ABOVE GROUND LEVEL MAY NOT EXCEED 24 SQUARE INCHES EXCLUSIVE OF DRILLED BREAKAWAY HOLES FOR UNPROTECTED POST INSTALLATIONS. THE HOLE DIAMETER MAY BE ENLARGED IF NECESSARY TO INSURE THIS REQUIREMENT IS MET.

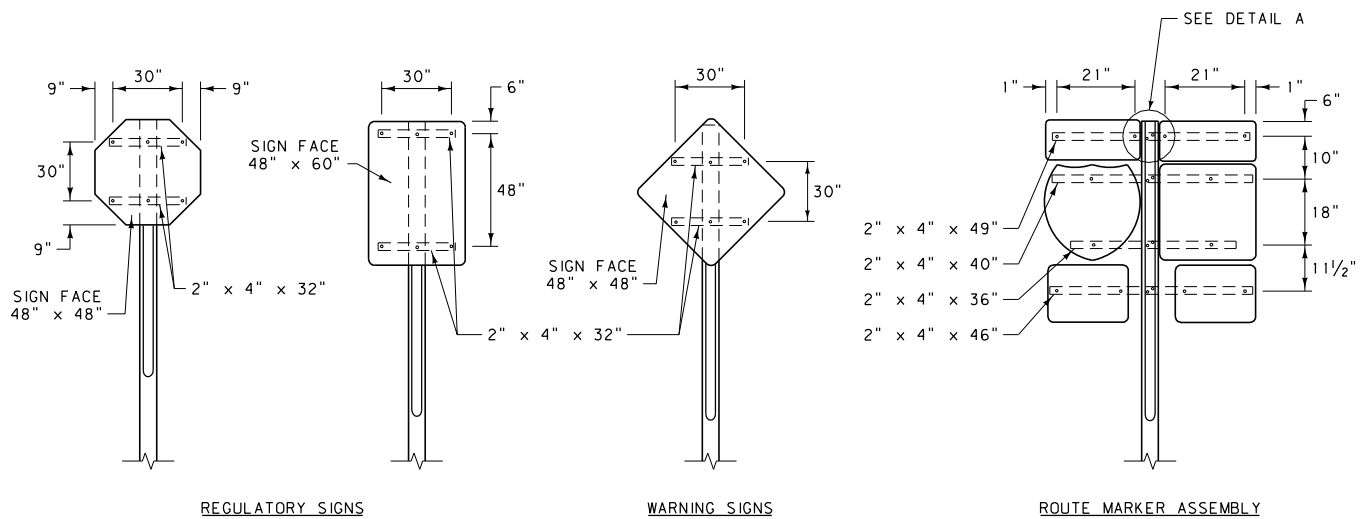
USE SOIL CEMENT FOR THE FOUNDATION - SEE SECTION 619.03.3 OF THE STANDARD SPECIFICATIONS.

FOR SIGNS REQUIRING BACKBRACING, CONSULT DTL. DWG. NO. 619-21 AND 619-22 FOR BACKBRACING OPTIONS AND DETAILS.

POLE SIZE	A	B	C	HOLE DIA. (SEE NOTE ⊗)	EMBEDMENT	GAIN
3" TOP DIA.	~	~	~	~	3' - 0"	2 3/4"
4" TOP DIA.	~	~	~	~	3' - 0"	3 1/2"
5" TOP DIA.	~	12"	4"	2"	3' - 6"	4"
6" TOP DIA.	~	12"	4"	2 1/2"	4' - 6"	4"
CLASS 4	~	12"	4"	2"	5' - 0"	4"
CLASS 3	~	12"	4"	2 1/2"	5' - 6"	4"
CLASS 2	6"	6"	4"	2"	6' - 0"	4"
CLASS 1	6"	6"	4"	2 1/2"	6' - 6"	4"

MUST BE PROTECTED OR OUT OF CLEAR ZONE

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 619, 704	DWG. NO. 619-20
TREATED WOOD POLE SIGN MOUNTING AND SUPPORT DETAILS	
EFFECTIVE: FEBRUARY 2005	
 serving you with pride	MONTANA DEPARTMENT OF TRANSPORTATION

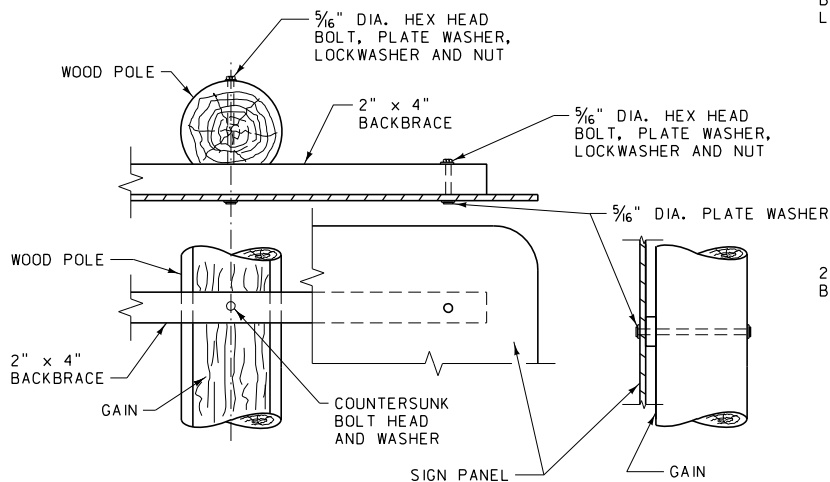


NOTE:

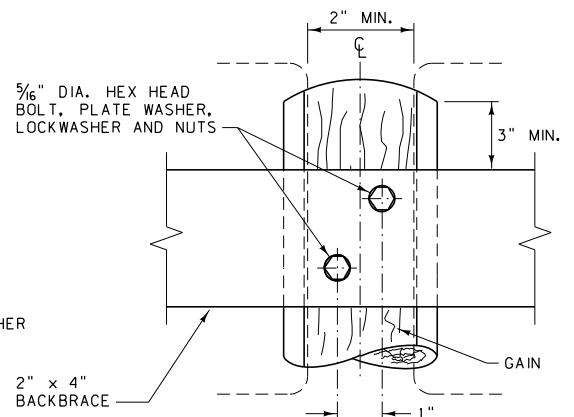
SIGNS OF THESE SIZES AND LARGER REQUIRE WOOD BACKBRACING.

SMALLER SIGNS MAY REQUIRE BACKBRACING IF THE CONDITIONS WARRANT (SEE SIGNING PLANS). IN THIS CASE, THE CONTRACTOR HAS THE OPTION OF USING WOOD OR STEEL BACKBRACING (SEE DTL. DWG. NO. 619-22).

WOOD BACKBRACE INSTALLATIONS



SIGN MOUNTING DETAIL



**DETAIL A
(BACKBRACE)**

NOTES:

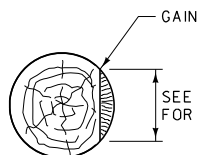
CONFORM ALL WOOD POLES TO THE REQUIREMENTS OF SECTION 704 OF THE STANDARD SPECIFICATIONS.

GAIN ALL POLES ON THE SIGN SIDE THE MINIMUM WIDTH SHOWN IN THE TABLE ON DTL. DWG. NO. 619-20, FOR HALF THE LENGTH OF EACH POLE.

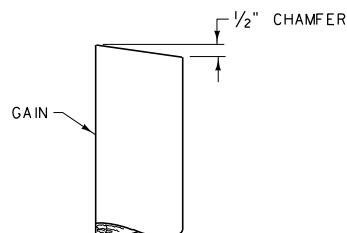
USE 2" x 4" S4S LUMBER FOR ALL WOOD BACKBRACING, CONFORMING TO THE REQUIREMENTS OF SECTION 704 OF THE STANDARD SPECIFICATIONS.

ALL BOLTS, NUTS AND WASHERS MUST CONSIST OF ALUMINUM, STAINLESS STEEL OR CADMIUM PLATED STEEL MATERIAL.


SEE DTL. DWG. NO. 619-20 FOR BREAKAWAY AND SUPPORT DETAILS.

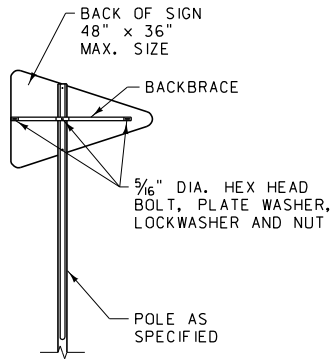


GAIN DETAIL

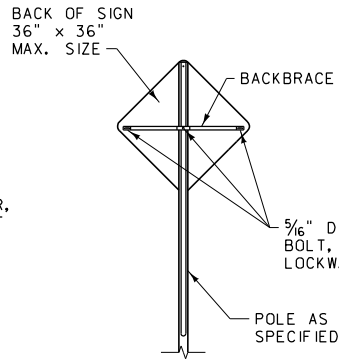


TOP END TREATMENT

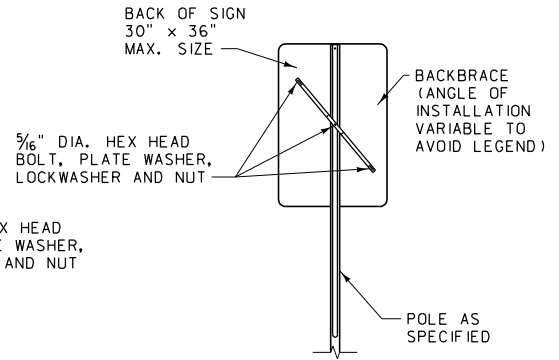
DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	619-21
SECTION 619, 704	
TREATED WOOD POLE SIGN MOUNTING DETAILS	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	



NO PASSING PENNANTS

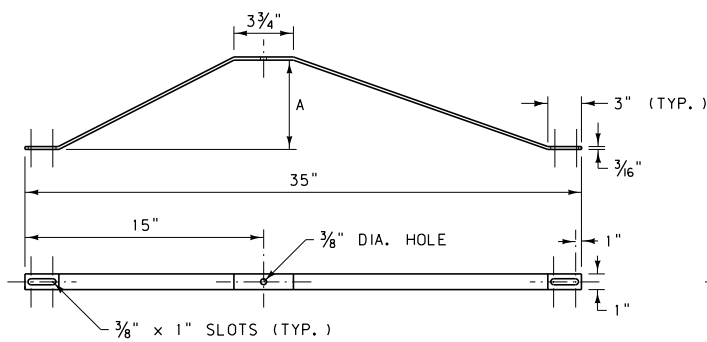


WARNING SIGNS

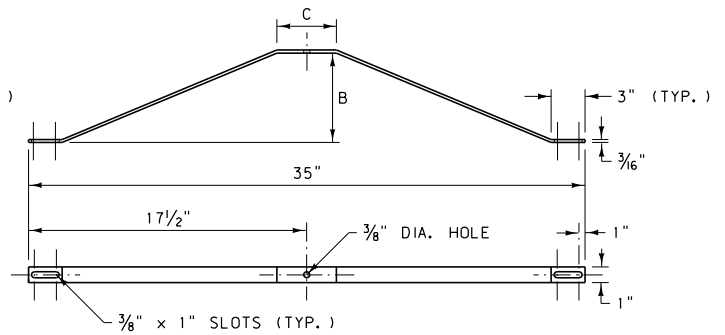


REGULATORY SIGNS

STEEL BACKBRACE INSTALLATIONS



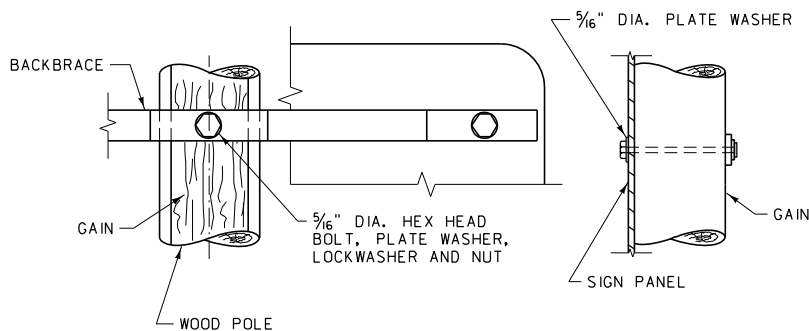
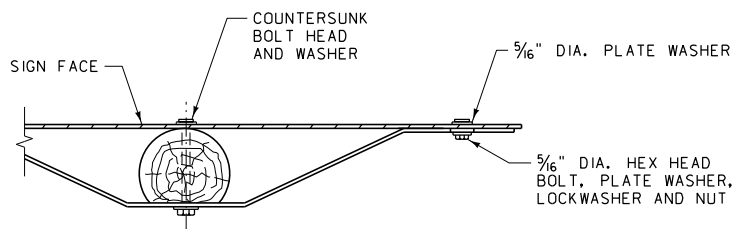
NO PASSING PENNANTS



REGULATORY AND WARNING SIGNS

STEEL BACKBRACE DETAILS

POLE DIA.	A	B	C
3"	2 1/8"	2 1/8"	3 3/4"
4"	3"	3"	3 3/4"
5"	~	4"	4 1/4"
6"	~	5 1/4"	4 1/4"




SIGN MOUNTING DETAIL

NOTES:

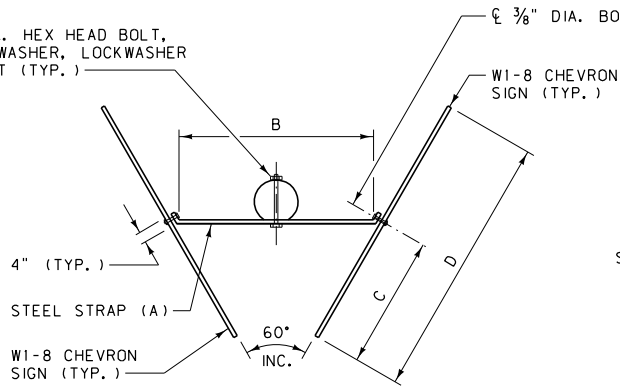
USE COMMERCIAL QUALITY, MILD STEEL, HOT-DIPPED AFTER FABRICATION. GALVANIZE ACCORDING TO THE SPECIFICATIONS OF AASHTO M 111.

SEE DTL. DWG. NO. 619-21 FOR APPLICATIONS OF THIS TYPE OF BRACE AND ADDITIONAL SIGN MOUNTING REQUIREMENTS.

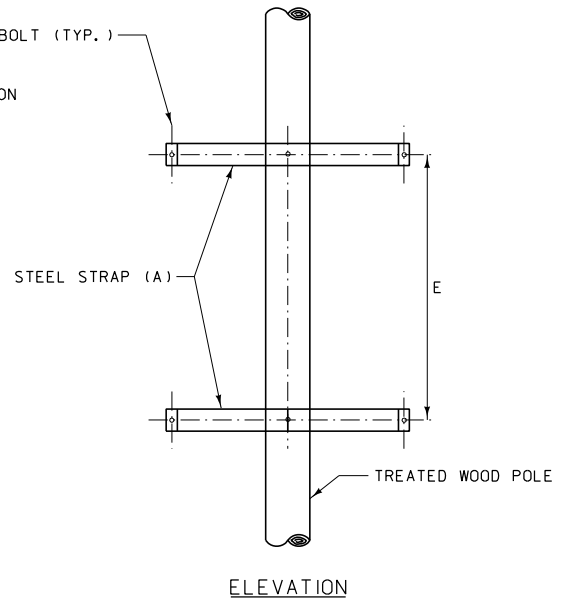
SEE DTL. DWG. NO. 619-20 FOR BREAKAWAY AND SUPPORT DETAILS.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 619	DWG. NO. 619-22
TREATED WOOD POLE OPTIONAL BACKBRACE	
EFFECTIVE: FEBRUARY 2005	
 serving you with pride	MONTANA DEPARTMENT OF TRANSPORTATION

5/16" DIA. HEX HEAD BOLT,
PLATE WASHER, LOCKWASHER
AND NUT (TYP.)



PLAN VIEW

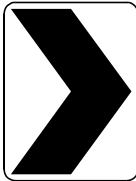


ELEVATION

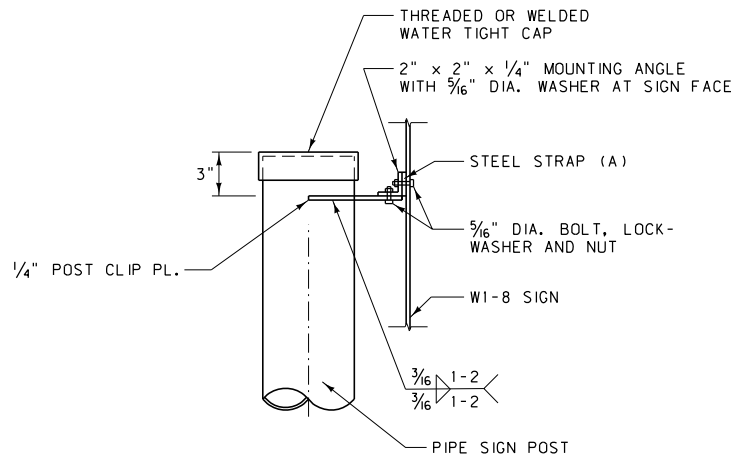
SIGN SIZE	DIMENSIONS				
	A	B	C	D	E
18" x 24"	1/4" x 2" x 1'-11"	15"	9"	18"	18"
24" x 30"	1/4" x 2" x 2'-2"	18"	12"	24"	24"
30" x 36"	1/4" x 2" x 2'-5"	21"	15"	30"	30"
36" x 48"	1/4" x 2" x 2'-8"	24"	18"	36"	36"

WOOD POST MOUNTING

MOUNT 2 CHEVRON SIGNS ON EACH POST WITH EACH
PANEL ADJUSTED TO APPROXIMATE RIGHT ANGLE TO
ROADWAY CENTERLINE. EXACT LOCATION AND ANGLE
TO BE DETERMINED BY ENGINEER.



W1-8 CHEVRON ALIGNMENT SIGNS
MAY BE USED AS AN ALTERNATE OR
AS A SUPPLEMENT TO DELINEATION
TO PROVIDE ADDITIONAL EMPHASIS
AND GUIDANCE WHEN A CHANGE IN
HORIZONTAL ALIGNMENT EXISTS IN
THE ROADWAY.




STEEL PIPE MOUNTING

NOTES:

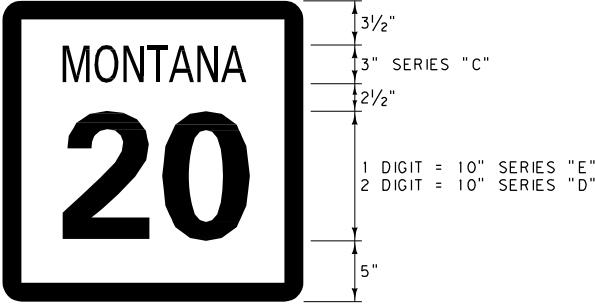
INSTALL CHEVRONS WITH A MINIMUM 10'-0" HORIZONTAL
CLEARANCE AND A 5'-0" VERTICAL MOUNTING HEIGHT.

SPACING FOR DESIGN PURPOSES IS DOUBLE THE SPACING
SHOWN IN THE TABLE ON DTL. DWG. NO. 619-36, UP
TO A MAXIMUM CHEVRON SPACING OF 200'. A MINIMUM
OF 3 VISIBLE CHEVRONS ARE REQUIRED THROUGH A CURVE.

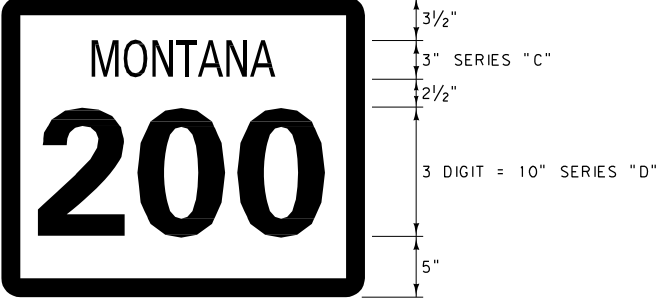
FIELD INSPECT THE CHEVRONS AT NIGHT AND ADJUST
THEIR LOCATIONS TO ACHIEVE 500' OF VISIBILITY.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 619	DWG. NO. 619-24
CHEVRON MOUNTING DETAILS	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	

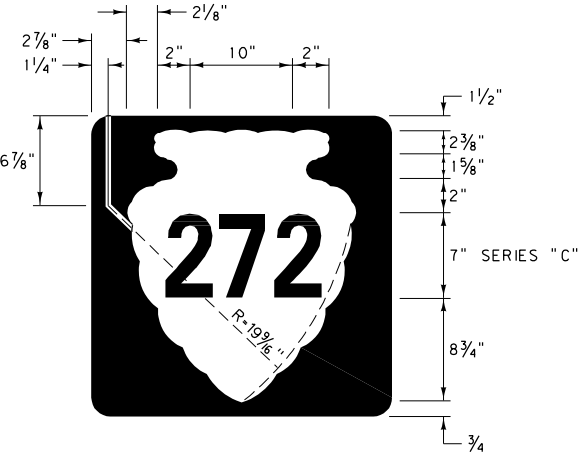
PANELS
FOR USE ON ROUTE MARKER ASSEMBLIES



M1-5
24" x 24"
MARGIN = NONE
BORDER = 1/2"
CORNER RADIUS = 1/2"
BLACK LEGEND AND BORDER ON
A RETRO-REFLECTORIZED WHITE
BACKGROUND.

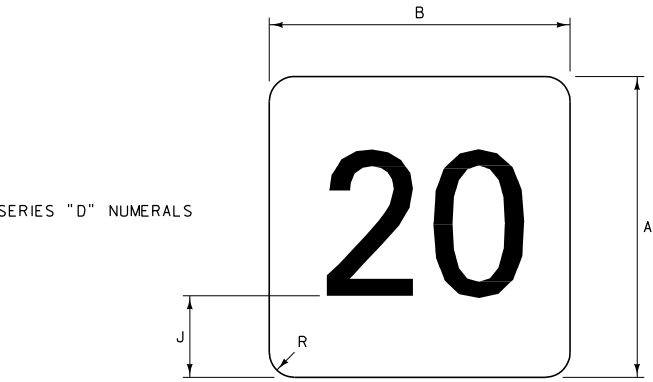


M1-5
30" x 24"
MARGIN = NONE
BORDER = 1/2"
CORNER RADIUS = 1/2"
BLACK LEGEND AND BORDER ON
A RETRO-REFLECTORIZED WHITE
BACKGROUND.



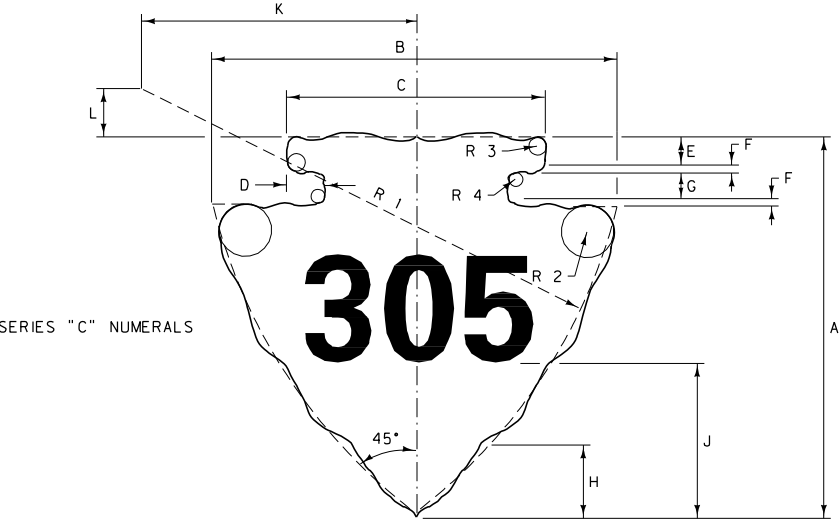
M1-10
24" x 24"
MARGIN = NONE
BORDER = SEE DESIGN ABOVE
CORNER RADIUS = 1/2"
BLACK LEGEND AND BORDER ON
A RETRO-REFLECTORIZED WHITE
BACKGROUND.

SHIELDS
FOR USE ON GUIDE SIGNS



	10" NUMERALS		12" NUMERALS		18" NUMERALS	
	2 DIGIT	3 DIGIT	2 DIGIT	3 DIGIT	2 DIGIT	3 DIGIT
A	21"	21"	24"	24"	36"	36"
B	24"	30"	24"	30"	36"	45"
J	6"	6"	6 1/2"	6 1/2"	9 1/2"	9 1/2"
R	1 1/2"	1 1/2"	2"	2"	2 1/2"	2 1/2"

BLACK LEGEND ON A RETRO-REFLECTORIZED
WHITE BACKGROUND WITH NO BORDER.

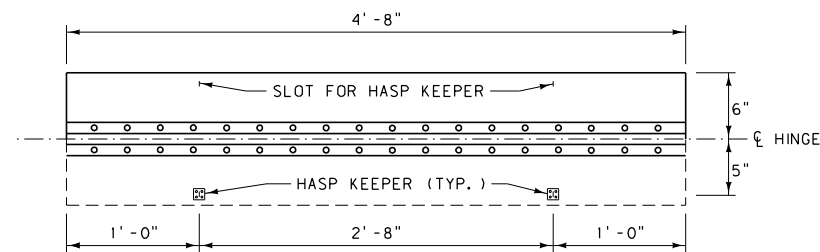
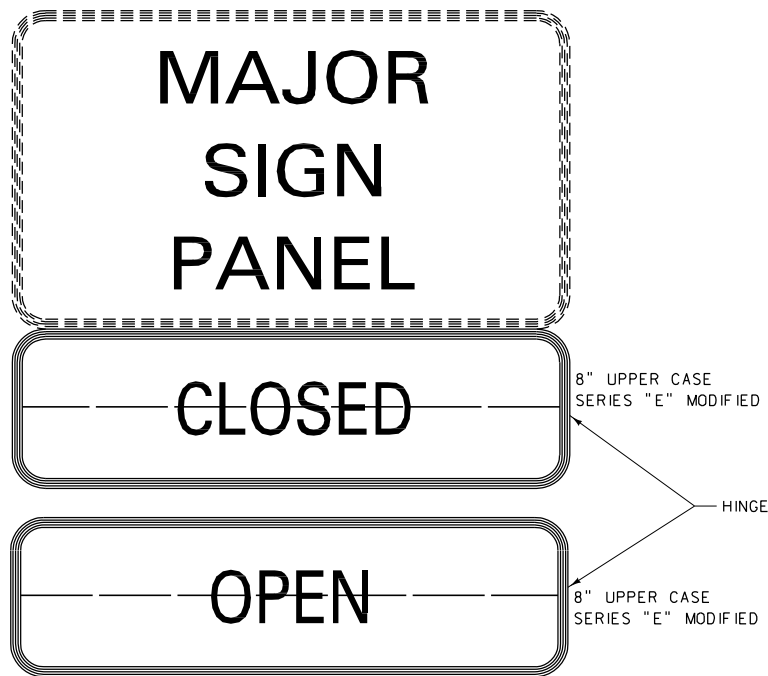


		RADII										
		A	B	C	D	E	F	G	H	J	K	L
*	8" NUMERALS	26"	28"	18 1/2"	2 5/8"	3"	5/16"	2"	5 1/2"	11"	17"	2 1/4"
**	10" NUMERALS	32"	34"	22 1/2"	3 1/4"	3 5/8"	3/8"	2 1/2"	6 3/4"	13 3/4"	20 1/2"	2"
***	12" NUMERALS	40"	42"	28"	4"	4 1/2"	1/2"	3"	8 7/16"	17"	25"	2 7/8"

BLACK LEGEND ON A RETRO-REFLECTORIZED WHITE BACKGROUND.

- * USE WITH STANDARD 24" U.S. SHIELD.
- ** USE WITH STANDARD 30" AND 36" U.S. SHIELD.
- *** USE WITH STANDARD 42" U.S. SHIELD AND ALL INDEPENDENT USE.

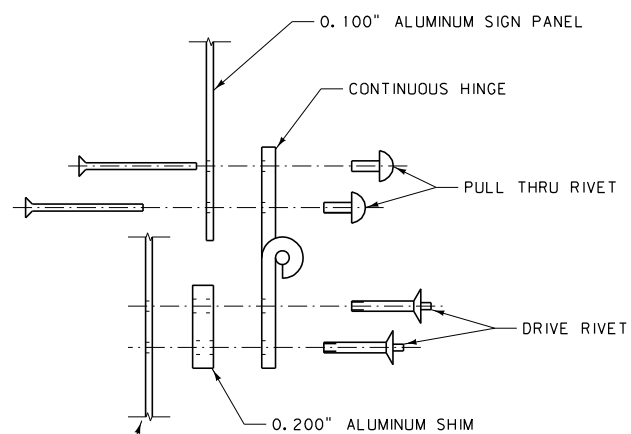
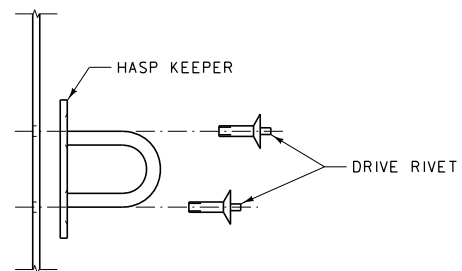
NOTES:
CENTER ALL NUMERALS USED ON PANELS AND
SHIELDS OPTICALLY ABOUT VERTICAL CENTERLINE.
SEE SIGNS AND SIGNING MATERIALS CATALOG
FOR COMPLETE LISTING OF SIGNS AND SIGN SIZES.
DESIGNS ARE AVAILABLE FROM THE TRAFFIC UNIT
FOR SIGNS UNIQUE TO MONTANA.



HINGE DETAIL
EXAMPLE

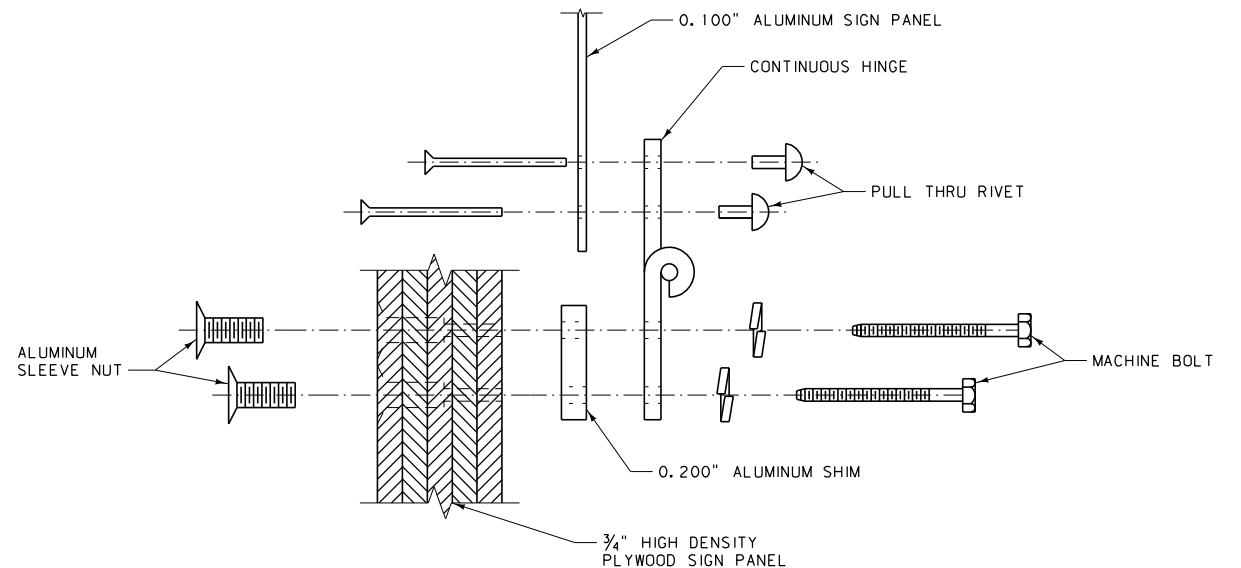
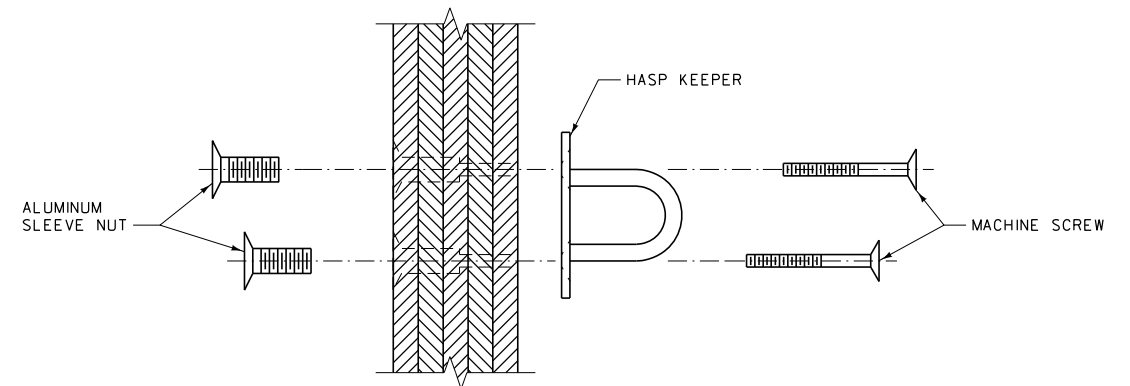
(5' - 6" x 4' - 0" D8-2A WEIGH STATION SIGN SHOWN)

ALUMINUM SHEET MOUNTING



0.125" ALUMINUM SHT.
INC. SIGN PANEL

PLYWOOD MOUNTING



NOTES:

SEE SIGNS AND SIGNING MATERIALS CATALOG FOR COMPLETE LISTING OF SIGNS AND SIGN SIZES. DESIGNS ARE AVAILABLE FROM THE TRAFFIC UNIT FOR SIGNS UNIQUE TO MONTANA.


THE SIGN PANEL CONSISTS OF 3/4" HIGH DENSITY PLYWOOD OR 0.125" ALUMINUM SHEET INCREMENT AS SPECIFIED ON THE PLANS. THE HINGED PANEL CONSISTS OF 0.100" SHEET ALUMINUM.

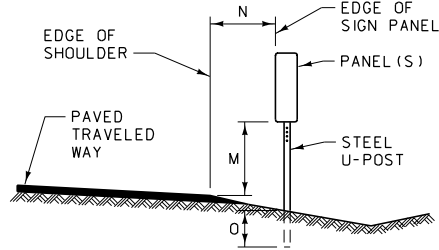
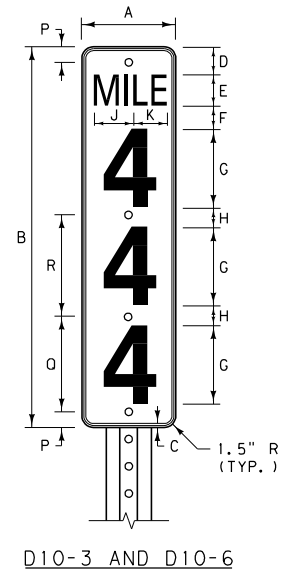
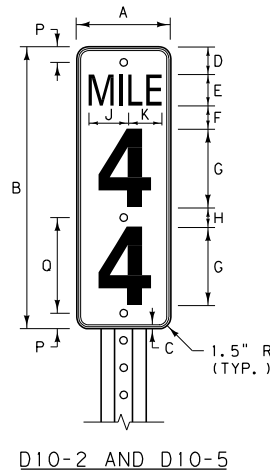
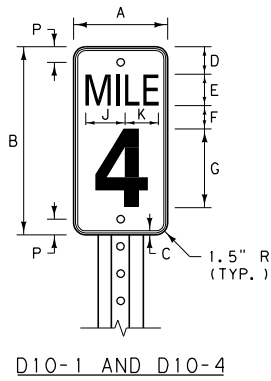
PAINT ALL HARDWARE VISIBLE ON THE SIGN FACE OR COVER WITH RETRO-REFLECTIVE SHEETING, THE SAME COLOR AS THE SIGN.

SUBMIT SHOP DRAWINGS FOR APPROVAL PRIOR TO FABRICATION.

SUPPLEMENTAL SIGN PANEL BELOW MAJOR SIGN PANEL MUST HAVE RETRO-REFLECTORIZED LEGEND AND BACKGROUND MATCHING COLORS OF MAJOR PANEL.

THE MINIMUM MOUNTING HEIGHT TO THE BOTTOM OF THE SECONDARY PANEL IS 5' - 0".

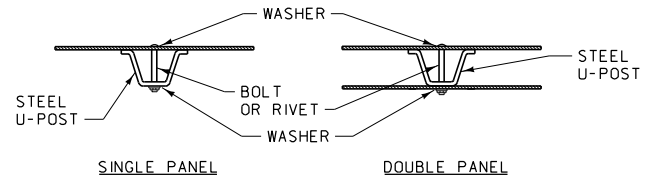
DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 619, 704	DWG. NO. 619-30
SIGN HINGE DETAILS	
EFFECTIVE: FEBRUARY 2005	
 <i>serving you with pride</i>	MONTANA DEPARTMENT OF TRANSPORTATION



DIMENSION	INTERSTATE	NON-INTERSTATE
M	4'	4'
N	6'	2' TO 6' *
O	3' MIN.	3' MIN.

* NORMALLY IN LINE WITH DELINEATORS

TYPICAL PLACEMENT



TYPICAL PANEL MOUNTING

PANEL DIMENSION INFORMATION

INTERSTATE			
DIMENSION	D10-4 (1 DIGIT)	D10-5 (2 DIGIT)	D10-6 (3 DIGIT)
A	12.0"	12.0"	12.0"
B	24.0"	36.0"	48.0"
C	0.5"	0.5"	0.5"
D	3.5"	3.0"	3.0"
E	4.0" SERIES "C"	4.0" SERIES "C"	4.0" SERIES "C"
F	3.0"	3.0"	3.0"
G	10.0" SERIES "C"	10.0" SERIES "C"	10.0" SERIES "C"
H	~	3.0"	2.5"
J	4.6"	4.6"	4.6"
K	4.8"	4.8"	4.8"
P	2.0"	2.0"	2.0"
Q	~	13.0"	12.0"
R	~	~	13.0"

NON-INTERSTATE			
DIMENSION	D10-1 (1 DIGIT)	D10-2 (2 DIGIT)	D10-3 (3 DIGIT)
A	10.0"	10.0"	10.0"
B	18.0"	27.0"	36.0"
C	0.5"	0.5"	0.5"
D	2.0"	2.0"	2.0"
E	4.0" SERIES "B"	4.0" SERIES "B"	4.0" SERIES "B"
F	2.0"	2.0"	2.0"
G	6.0" SERIES "C"	6.0" SERIES "C"	6.0" SERIES "C"
H	~	3.0"	3.0"
J	3.6"	3.6"	3.6"
K	3.8"	3.8"	3.8"
P	1.5"	1.5"	1.5"
Q	~	10.0"	10.0"
R	~	~	9.0"

⊗ OPTICALLY CENTER DIGITS ON VERTICAL C OF PANEL.


NOTES:

MILEPOST PANELS CONSIST OF A RETRO-REFLECTORIZED WHITE LEGEND AND BORDER ON A RETRO-REFLECTORIZED GREEN BACKGROUND.

MOUNT ALL MILEPOSTS ON STEEL U-POSTS (MIN. 2 LB./FT.) EXCEPT THE D10-6, WHICH IS MOUNTED ON A STEEL U-POST (MIN. 3 LB./FT.) AS NOTED IN THE SIGNING PLANS.

USE GALVANIZED OR CADMIUM PLATED 5/16" DIA. BOLT, NUT AND WASHER, AND JAM THREADS AFTER TIGHTENING. USE 5/16" DIA. ALUMINUM OR CADMIUM PLATED BOLT RIVETS OR PAINT RIVET HEADS WITH BRILLIANT GREEN SIGN ENAMEL.

DO NOT RELOCATE OR MOVE A MILEPOST ONCE IT HAS BEEN PROPERLY PLACED.

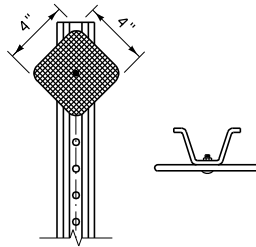
DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 619	DWG. NO. 619-32
MILEPOST DETAILS	
EFFECTIVE: APRIL 2006	
 serving you with pride	MONTANA DEPARTMENT OF TRANSPORTATION

DESIGN A USAGE:

USE FOR CONTINUOUS
DELINEATION AND RT.
SHOULDER OF ALL
ROUTES.

DESIGN H USAGE:

USE ON LT. SHOULDER
OF INTERSTATE ROUTES.



DESIGN A (WHITE)
DESIGN H (YELLOW)

DESIGN B USAGE:

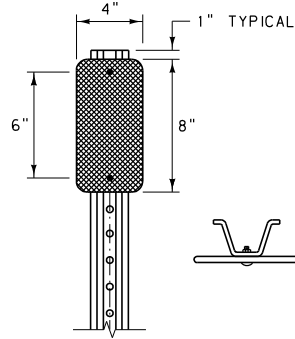
USE ON LT. SHOULDER
OF INTERSTATE RAMPS.

DESIGN G USAGE:

USE ON RT. SHOULDER
OF INTERSTATE RAMPS.

DESIGN J USAGE:

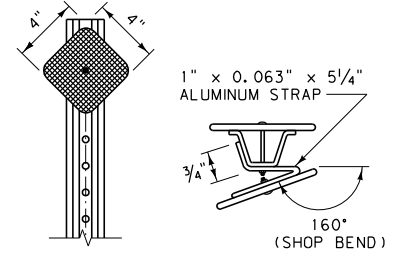
USE FOR TRUCK ESCAPE
RAMPS ONLY.



DESIGN B (YELLOW)
DESIGN G (WHITE)
DESIGN J (RED)

DESIGN C USAGE:

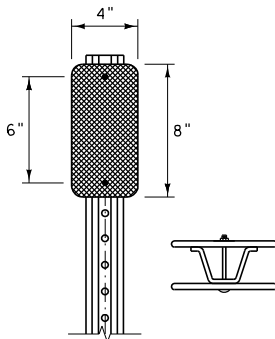
USE FOR CURVES WITH
RADIUS 573' OR LESS,
BOTH OUTSIDE AND
INSIDE OF CURVE.



DESIGN C (WHITE)

DESIGN D USAGE:

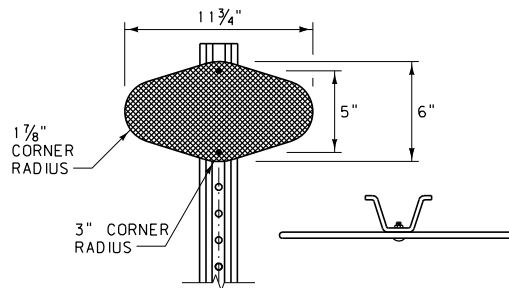
NON-INTERSTATE ROUTES:
USE AT APPROACHES WITH
STOP OR YIELD SIGNS.
INTERSTATE ROUTES:
USE FOR RAMP TERMINATION
AT CROSS ROAD.



DESIGN D (YELLOW)

DESIGN E USAGE:

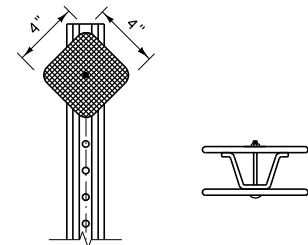
SPECIAL USE ONLY.
FORMERLY USED AT GORES
AND ISLAND NOSES.



DESIGN E (YELLOW)

DESIGN F USAGE:

USE FOR CURVES WITH
RADIUS GREATER THAN 573';
1433' TO 765' RADIUS:
OUTSIDE ONLY
764' TO 573' RADIUS:
OUTSIDE AND INSIDE OF
CURVE



DESIGN F (WHITE)

DELINEATOR LEGEND

DESIGN "A"	—
DESIGN "B"	—
DESIGN "C"	— —
DESIGN "D"	— —
DESIGN "E"	— —
DESIGN "F"	— —
DESIGN "G"	— —
DESIGN "H"	— —
DESIGN "J"	— —

NOTE:
SOME TYPICAL USES ARE SHOWN
FOR EACH DESIGN. REFER TO THE
MUTCD FOR SPECIFIC GUIDANCE.


DETAILED DRAWING

REFERENCE DWG. NO.
STANDARD SPEC. 619-34
SECTION 619

DELINEATOR DETAILS

-- REVISED --
January 2008

EFFECTIVE: APRIL 2006

 MONTANA DEPARTMENT
OF TRANSPORTATION
serving you with pride

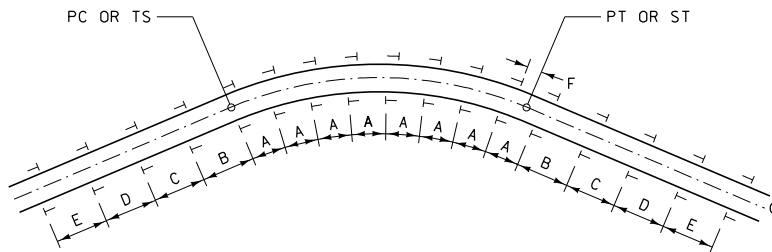


FIGURE A
SEE TABLE BELOW FOR SPACING VALUES

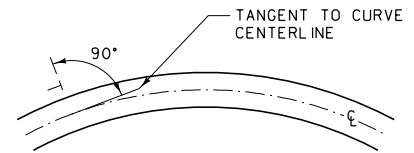


FIGURE B

HORIZONTAL CURVE SPACING TABLE					
RADIUS	SPACING ON CURVE	SPACING ON BOTH APPROACH TANGENTS			
	A	B	C	D	E
5730' & UP	300'	400'	400'	400'	400'
2865' - 5729'	225'	400'	400'	400'	400'
1910' - 2864'	160'	320'	400'	400'	400'
1433' - 1909'	130'	260'	400'	400'	400'
955' - 1432'	110'	220'	330'	400'	400'
716' - 954'	90'	185'	275'	400'	400'
478' - 715'	75'	150'	230'	300'	400'
287' - 477'	60'	125'	185'	300'	400'
0' - 286'	45'	90'	140'	275'	400'

NOTES:

FURNISH RETRO-REFLECTIVE SHEETING ACCORDING TO THE STANDARD SPECIFICATIONS FOR RETRO-REFLECTIVE SHEETING B (HIGH INTENSITY). POSITION DELINEATOR FACES PERPENDICULAR TO THE TANGENT TO CURVE CENTERLINE AS SHOWN IN FIGURE B.

MOUNT DELINEATORS ON METAL U-POSTS (1.12 LB./FT. MIN. AND 2 LB./FT. MAX.) WITH $\frac{3}{16}$ " DIA. CADMIUM PLATED BOLT(S). DRILL OR PUNCH A MINIMUM OF TWELVE $\frac{3}{8}$ " MAXIMUM DIAMETER HOLES ON 1 INCH CENTERS FROM THE TOP OF THE POST. $\frac{1}{4}$ " SQUARE HOLES MAY BE USED. IF SQUARE HOLES ARE USED, USE A LARGE HEADED BOLT OR AN APPROPRIATE WASHER. JAM THREADS AFTER TIGHTENING THE NUT TO PREVENT REMOVAL.

PLACE DELINEATORS AT A CONSTANT CLEARANCE DISTANCE FROM THE EDGE OF THE PAVEMENT EXCEPT WHERE GUARDRAIL OR OTHER OBSTRUCTIONS INTERFERE. ALIGN THE DELINEATORS WITH THE INSIDE EDGE OF THE OBSTRUCTION. CLEARANCE FOR DELINEATORS IS 6'-0" ON INTERSTATE HIGHWAYS, 2'-0" TO 6'-0" ON PRIMARY AND SECONDARY HIGHWAYS OR AS DETERMINED BY THE ENGINEER. THE STANDARD MOUNTING HEIGHT IS 4'-0" TO THE TOP OF THE POST. SUPPLY POST LENGTHS TO MAINTAIN THE PROPER MOUNTING HEIGHT AND A MINIMUM OF 18" EMBEDMENT.


SPACE DELINEATORS ACCORDING TO THE DISTANCES FOUND IN THE TABLE ABOVE OR AS SPECIFIED IN THE PLANS. IN FIGURE A, IF "F" IS GREATER THAN 20' ADD ONE REGULAR DELINEATOR IN AT "A" SPACING. UNDER NORMAL SPACING, SHOULD A DELINEATOR FALL WITHIN A CROSSROAD OR APPROACH, IT MAY BE MOVED IN EITHER DIRECTION A DISTANCE NOT TO EXCEED ONE QUARTER OF THE NORMAL SPACING. ELIMINATE DELINEATORS STILL FALLING IN SUCH AREAS.

ALL DELINEATOR REFLECTORS HAVE $\frac{3}{4}$ " CORNER RADIUS EXCEPT DESIGN "E".

MOUNT THE DELINEATOR REFLECTOR 1" BELOW THE TOP OF THE METAL U-POST.

WHEN THE ROADWAY ADT IS LESS THAN 900, DELINEATE ALL CURVES WITH 1433' RADIUS OR LESS.

CONTINUOUSLY DELINEATE ROADWAYS WHEN THE ADT IS 900 AND GREATER, OR BY ENGINEERING JUDGEMENT.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	619-36
SECTION 619.704	
DELINEATOR PLACEMENT DETAILS	
-- REVISED --	EFFECTIVE: APRIL 2006
January 2008	
 MONTANA DEPARTMENT OF TRANSPORTATION serving you with pride	

9 ~ 3" DIA. REFLECTORS

SEE NOTE FOR COLORS

10 1/2"

1 1/2" R (TYP.)

3 3/4"

5 1/4"

1'-6"

3 3/4"

5 1/4"

1'-6"

3 3/4"

Technical drawing of a traffic sign assembly. The main view shows a rectangular sign panel with a yellow background (non-reflective) and three circular yellow reflectors arranged vertically. The sign panel is mounted on a steel U-post. Dimensions are provided for the sign panel and the mounting hardware.

Dimensions and components shown:

- Sign panel width: 6"
- Sign panel height: 1'-0"
- Top mounting hole offset: 1/2"
- Distance between reflectors: 2"
- Distance from bottom reflector to bottom mounting hole: 2 1/2"
- Radius of top corners: 3/4" R (TYP.)
- Reflectors: 3 ~ 3" DIA. YELLOW REFLECTORS
- Mounting hardware: 5/16" DIA. CADMIUM PLATED HEX HEAD BOLT, WASHER, LOCKWASHER AND NUT
- Post: STEEL U-POST, 7' IN LENGTH (1.12 LB./FT. MIN. AND 2 LB./FT. MAX.) WITH A MINIMUM OF SIXTEEN 3/8" MAX. DIA. HOLES DRILLED OR PUNCHED ON 1" CENTERS FROM THE TOP OF THE POST PRIOR TO GALVANIZING

DITCH

EDGE OF SHOULDER

EDGE OF PAVEMENT

EDGE OF SHOULDER

CULVERT UNDER ROADWAY

IRR.

SPLIT

TWO X3-3 PANELS MOUNTED BACK TO BACK ON STEEL U-POST


3" 1'-0" 1 1/2" R (TYP.) 3 5/8" 3 5/8" 3'-0" 5/8" 5/8" 3"

5/16" DIA. CADMIUM PLATED HEX HEAD BOLT, WASHER, LOCKWASHER AND NUT

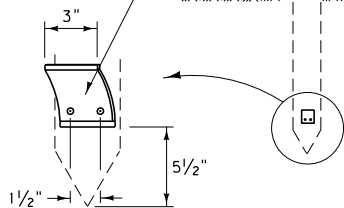
STEEL U-POST

SIGN PANEL

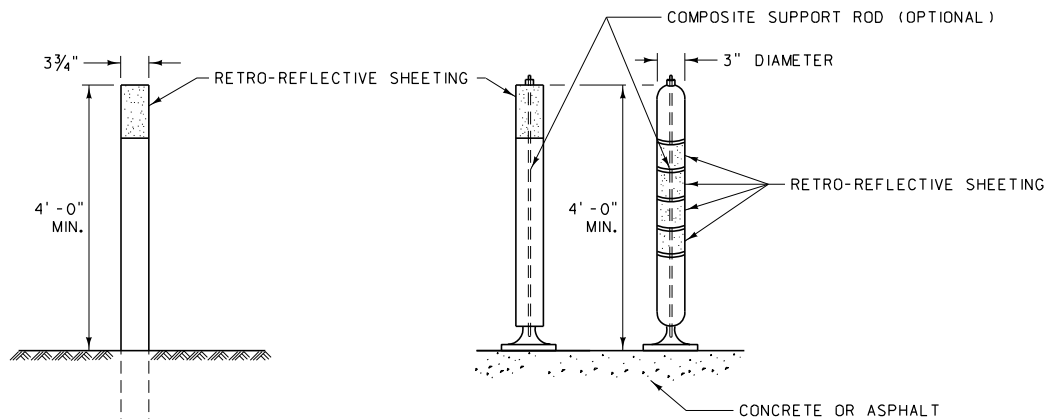
STEEL U-POST, 10' IN LENGTH (MIN. OF 2.0 LB./FT.) WITH A MINIMUM OF FORTY-TWO 3/8" MAX. DIA. HOLES DRILLED OR PUNCHED ON 1" CENTERS FROM THE TOP OF THE POST PRIOR TO GALVANIZING

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 619	DWG. NO. 619-38
OBJECT MARKER DESIGN AND PLACEMENT DETAILS FOR OBSTRUCTIONS ADJACENT TO OR WITHIN HIGHWAYS	
EFFECTIVE: APRIL 2006	
 <i>serving you with pride</i>	MONTANA DEPARTMENT OF TRANSPORTATION

ANCHOR BARB (FOR PERMANENT ANCHORING OF FLEXIBLE DRIVEABLE DELINEATORS IN LOOSE, SANDY OR MARSHY SOIL)



FLEXIBLE DRIVEABLE
DELINEATORS



DETAILS ARE REPRESENTATIVE ONLY.
ACTUAL DESIGN USED/SPECIFIED MAY
VARY (SEE PLANS).

FLEXIBLE SURFACE-MOUNTED
DELINEATORS

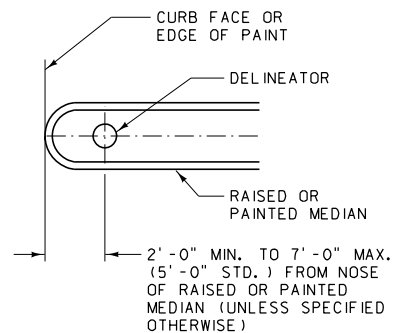
NOTES:

USE FLEXIBLE DELINEATORS SIMILAR TO THE DESIGN AND SPECIFICATIONS SHOWN ON THIS SHEET OR IN THE SIGNING PLANS OF THE CONTRACT.


MOUNT OR EMBED FLEXIBLE DELINEATORS TO THE MANUFACTURER'S SPECIFICATIONS.

RETRO-REFLECTORIZE FLEXIBLE DELINEATORS, IF REQUIRED IN PLAN SPECIFICATIONS, BY THE ADDITION OF DELINEATOR CRYSTALS, EITHER 1 1/2" x 7" OR 3" DIAMETER, OR BY ADDING TWO 3" MINIMUM WIDTH BANDS OF RETRO-REFLECTIVE SHEETING TYPE HI, 360° AROUND THE TOP OF THE DELINEATOR. USE THE COLOR OF THE DELINEATOR CRYSTALS OR RETRO-REFLECTORIZED MATERIAL AS SHOWN IN THE SIGNING PLANS OF THE CONTRACT OR THE MUTCD.

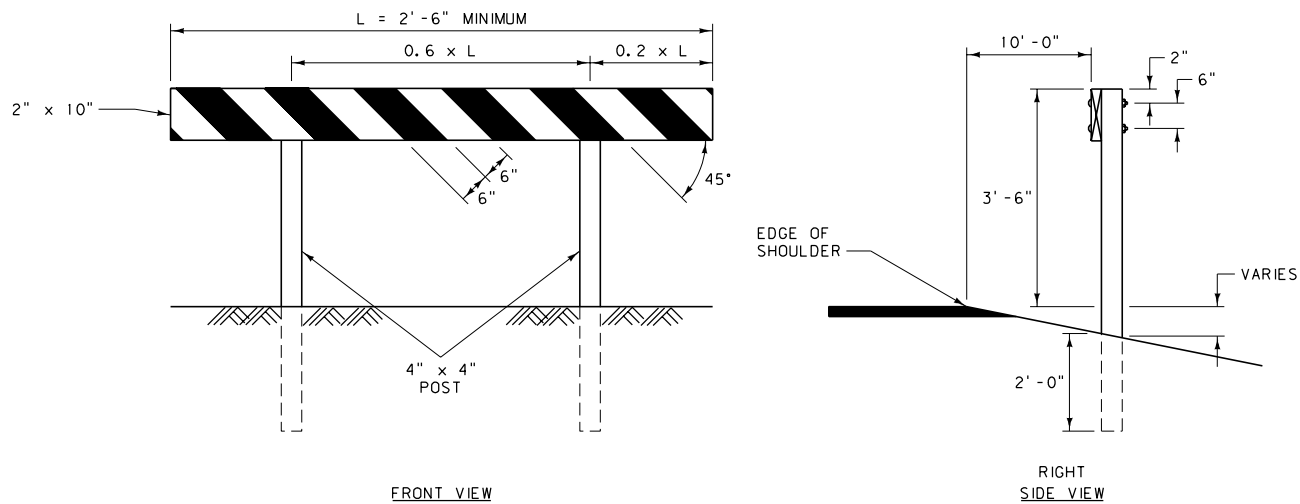
THE EXACT LOCATION AND PLACEMENT OF THE FLEXIBLE DELINEATORS ARE SHOWN IN THE SIGNING PLANS.



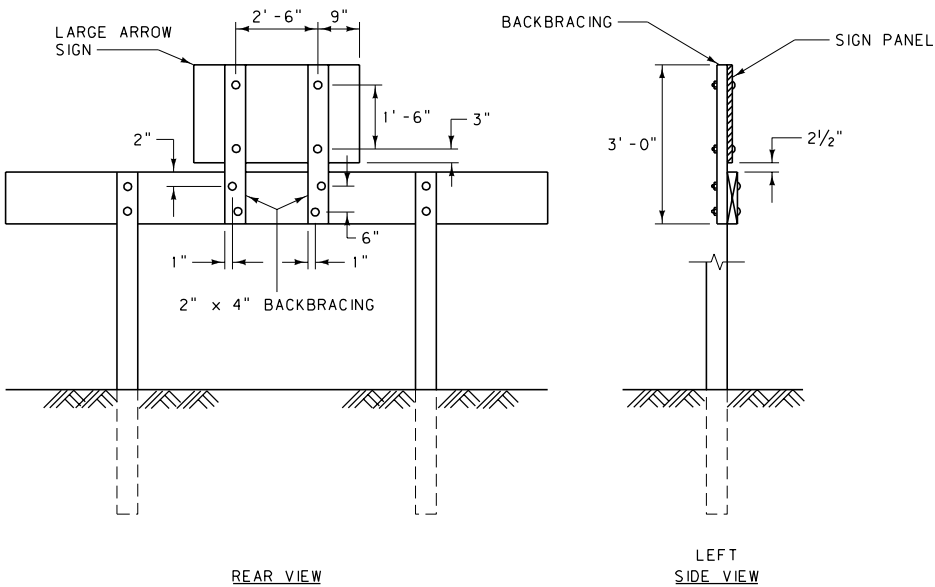
TYPICAL USE AND PLACEMENT

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 619	DWG. NO. 619-40
FLEXIBLE DELINEATORS	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	

BI BARRICADE
B (1)-L SHOWN



BARRICADE DETAILS



SIGN MOUNTING DETAILS

NOTES:

CONSTRUCT ALL BARRICADES OF COMMERCIAL GRADE S4S LUMBER. USE $\frac{3}{8}"$ DIA. GALVANIZED CARRIAGE OR CADMIUM PLATED BOLTS, WASHERS AND NUTS FOR ALL CONNECTIONS.

PAINT ALL BARRICADES WITH TWO COATS OF WHITE PAINT IN ACCORDANCE WITH SECTION 710 OF THE STANDARD SPECIFICATIONS.

ALL BARRICADES HAVE ALTERNATING RETRO-REFLECTIVE RED AND WHITE STRIPES, $6"$ IN WIDTH AT AN ANGLE OF 45° TO THE VERTICAL, SLANTING DOWNWARD TOWARD THE SIDE OR SIDES ON WHICH TRAFFIC IS TO FLOW. NOMINAL DIMENSIONS OF ROLL MATERIAL FOR STRIPES IS ACCEPTABLE.

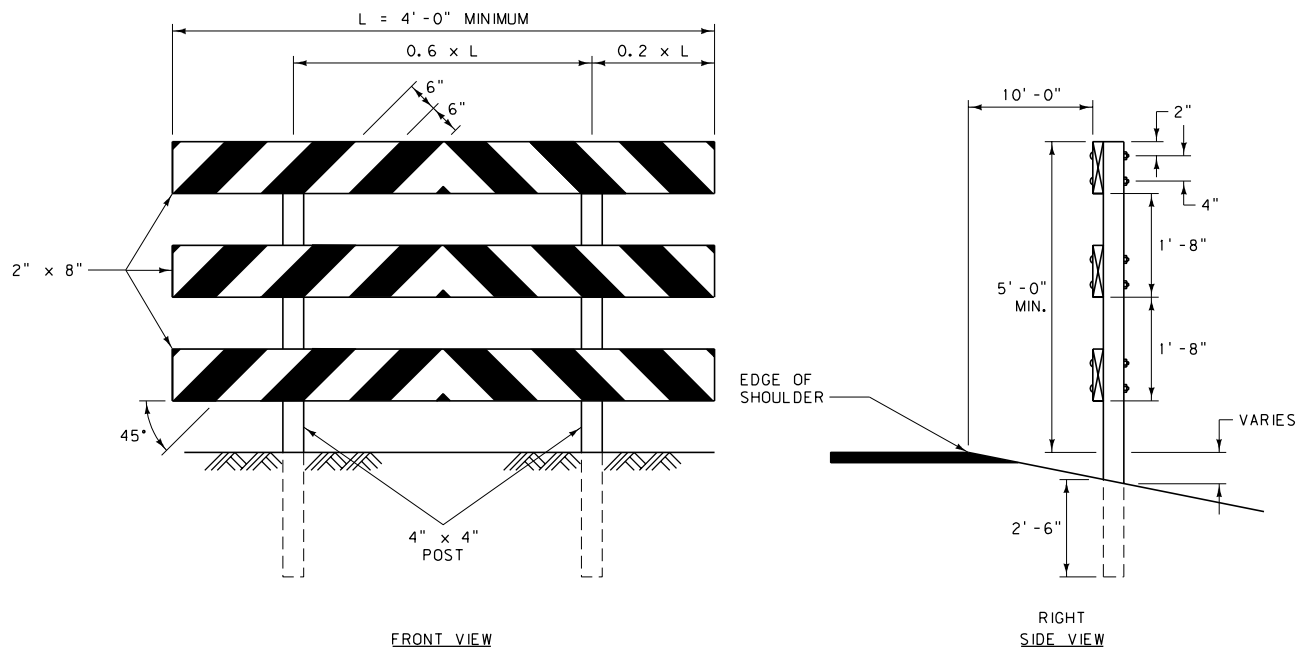
BARRICADES DESIGNATED "L" ARE PLACED ON THE LEFT SIDE OF APPROACHING TRAFFIC. BARRICADES DESIGNATED "R" ARE PLACED ON THE RIGHT SIDE OF APPROACHING TRAFFIC.

RETRO-REFLECTORIZE ALL BARRICADES WITH THE SHEETING MOUNTED ON A SHEET ALUMINUM BACKING AT LEAST $0.019"$ THICK. USE ALUMINUM ALLOY 6061-T6 OR AA5052-H38 CONFORMING TO ASTM DESIGNATION B 209. SECURE RETRO-REFLECTIVE ALUMINUM SHEETING WITH ALUMINUM NAILS.

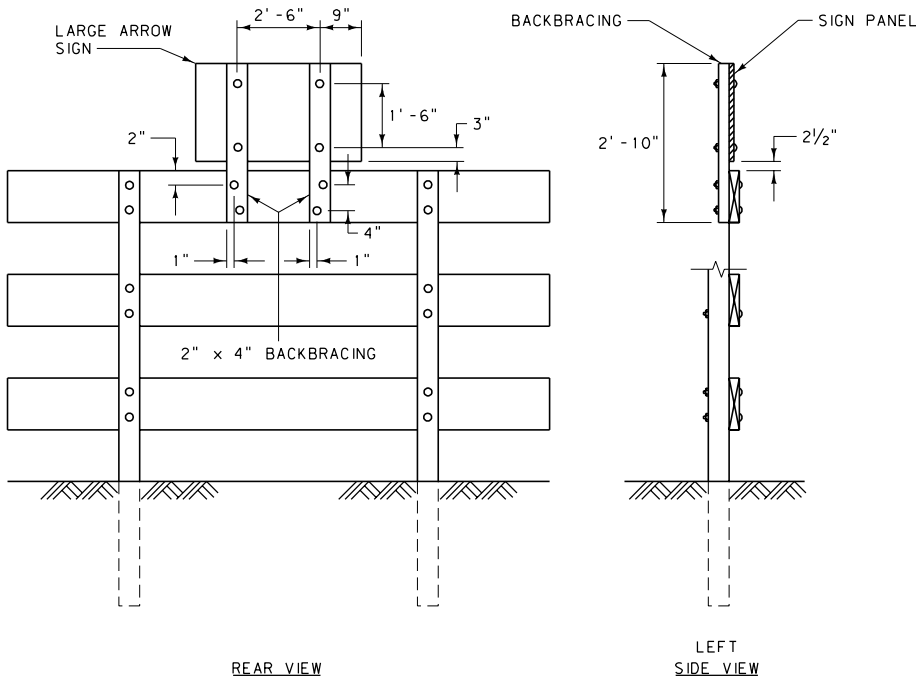
DETERMINE THE POST LENGTHS IN THE FIELD, COMPLYING WITH THE MOUNTING HEIGHTS AND FOUNDATION DEPTHS LISTED ON THIS SHEET.

USE MATERIALS FOR BARRICADE FRAMEWORK AND ASSEMBLY, INCLUDING ANY SIGNS AND MEANS OF ATTACHMENT, THAT MEET THE REQUIREMENTS FOR NCHRP 350 FOR WORK ZONE DEVICES. ALTERNATIVELY, SIGNS AND BARRICADES MAY BE MOUNTED DIRECTLY BEHIND BARRICADES ON SEPARATE SIGN SUPPORTS.

BIII BARRICADE

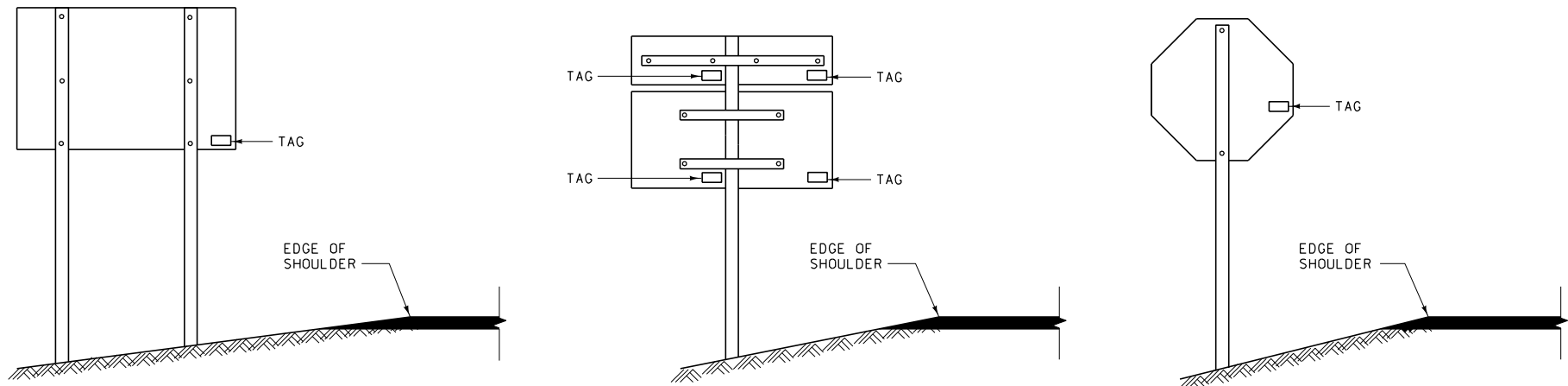


BARRICADE DETAILS

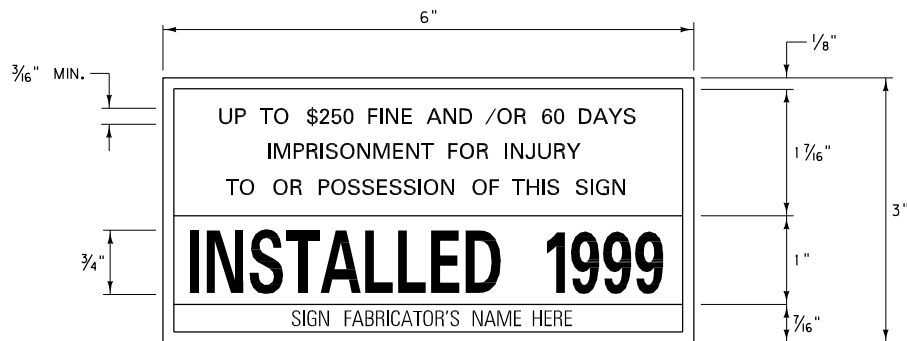


SIGN MOUNTING DETAILS

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	619-42
SECTION 619	
PERMANENT BARRICADE DESIGN DETAILS	



PLACEMENT DETAILS



DATE TAG DETAIL

NOTES:

FURNISH AND PLACE INSTALLATION DATE TAGS ON ALL SIGNS PRIOR TO FINAL ACCEPTANCE OF THE PROJECT.

THE TAGS DISPLAY THE YEARS IN WHICH THE SIGNS WERE INSTALLED. SEE THE COLOR SEQUENCE TABLE SHOWN ON THIS DRAWING FOR THE APPROPRIATE COLORS. DATE TAGS ARE TO BE RETRO-REFLECTIVE.

PLACE A TAG ON THE BACK OF EACH SIGN, LOCATED NEAR THE LOWER CORNER OF THE SIGN NEAREST THE EDGE OF ROADWAY, TO BE VISIBLE FROM THE ROADWAY AS SHOWN IN THE EXAMPLES ABOVE.

PLACE TAGS ON ANY NEW SIGN INSTALLED IN THE FIELD AS ROUTINE MAINTENANCE BY MDT FORCES. MAINTENANCE DESIGN DATE TAGS CAN BE ORDERED FROM THE SIGN SHOP IN HELENA.

DATE TAG COLOR SEQUENCE

DATE TAG COLOR CORRESPONDS TO THE LAST DIGIT OF THE INSTALLATION YEAR AS FOLLOWS:

- | | |
|-----------------|------------|
| 0 - YELLOW | 5 - RED |
| 1 - WHITE | 6 - PURPLE |
| 2 - LIGHT BLUE | 7 - ORANGE |
| 3 - GOLD | 8 - BLUE |
| 4 - LIGHT GREEN | 9 - GREEN |

DETAILED DRAWING

REFERENCE	DWG. NO.
STANDARD SPEC.	619-44
SECTION 619	

INSTALLATION
DATE TAGS

EFFECTIVE: FEBRUARY 2005

MDT
serving you with pride

MONTANA DEPARTMENT
OF TRANSPORTATION

A

B

C

D

E

F

G

H

I

J

K

L

M

N

O

P

Q

R

S

T

1' - 4" (TYP. LETTER WIDTH)

8' - 4" (TYP. LETTER HEIGHT)

U

V

W

X

Y

Z

NOTES:

EACH SQUARE EQUALS 4 INCHES.

ALL PAVEMENT MARKINGS ARE TO CONFORM TO THE REQUIREMENTS OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" AND "STANDARD HIGHWAY SIGNS" PUBLICATIONS, FROM THE FEDERAL HIGHWAY ADMINISTRATION.

ALL LETTERS ARE TO BE WHITE.

USE THE SIZES OF LETTERS SHOWN UNLESS SMALLER OR LARGER SIZES ARE NEEDED. THE SIZE OF LETTERS MAY BE SCALED PROPORTIONATELY DOWN BY APPROXIMATELY ONE-THIRD FOR LOW-SPEED, URBAN CONDITIONS. THE MINIMUM HEIGHT OF ANY LETTER IS 6.0 FEET. LARGER SIZES MAY BE USED FOR ABOVE AVERAGE SPEEDS AND OTHER CRITICAL LOCATIONS.

DO NOT EXCEED MORE THAN ONE LANE IN WIDTH FOR ANY PAVEMENT MARKINGS EXCEPT IN THE CASE OF THE WORD "SCHOOL". SEE DTL. DWG. NO. 620-10 FOR MORE INFORMATION.

FOR MULTIPLE LINES OF INFORMATION, PLACE THE INFORMATION SO IT READS IN THE DIRECTION OF TRAVEL. DO NOT EXCEED THREE LINES OF INFORMATION AT ANY LOCATION.

WHEN WORDS AND SYMBOLS ARE USED IN COMBINATION, SPACE THEM AT LEAST FOUR TIMES THE HEIGHT OF CHARACTERS FOR LOW-SPEED ROADS, BUT NOT MORE THAN TEN TIMES THE HEIGHT OF THE CHARACTERS UNDER ANY CONDITION.

ON NARROW, LOW-SPEED BICYCLE PATHS, SIZES OF LETTERS MAY BE SMALLER THAN SUGGESTED, BUT TO THE RELATIVE SCALE.

QUANTITIES ARE BASED ON THE SIZES OF PAVEMENT MARKINGS SHOWN AND ARE FOR ESTIMATING PURPOSES ONLY.

PAINT VOLUMES ASSUME A 15 MIL THICKNESS.
EPOXY VOLUMES ASSUME A 20 MIL THICKNESS.


QUANTITIES			
LETTER	AREA (FT²)	PAINT (GAL.)	EPOXY (GAL.)
A	5.72	0.05	0.07
B	7.56	0.07	0.09
C	5.22	0.05	0.07
D	6.61	0.06	0.08
E	6.78	0.06	0.08
F	5.00	0.05	0.06
G	6.06	0.06	0.08
H	6.44	0.06	0.08
I	2.78	0.03	0.03
J	3.87	0.04	0.05
K	6.58	0.06	0.08
L	4.11	0.04	0.05
M	7.84	0.07	0.10
N	7.33	0.07	0.09
O	6.28	0.06	0.08
P	5.70	0.05	0.07
Q	6.42	0.06	0.08
R	6.66	0.06	0.08
S	6.68	0.06	0.08
T	4.11	0.04	0.05
U	5.88	0.05	0.07
V	5.06	0.05	0.06
W	7.38	0.07	0.09
X	4.99	0.05	0.06
Y	4.17	0.04	0.05
Z	5.44	0.05	0.07

DETAILED DRAWING

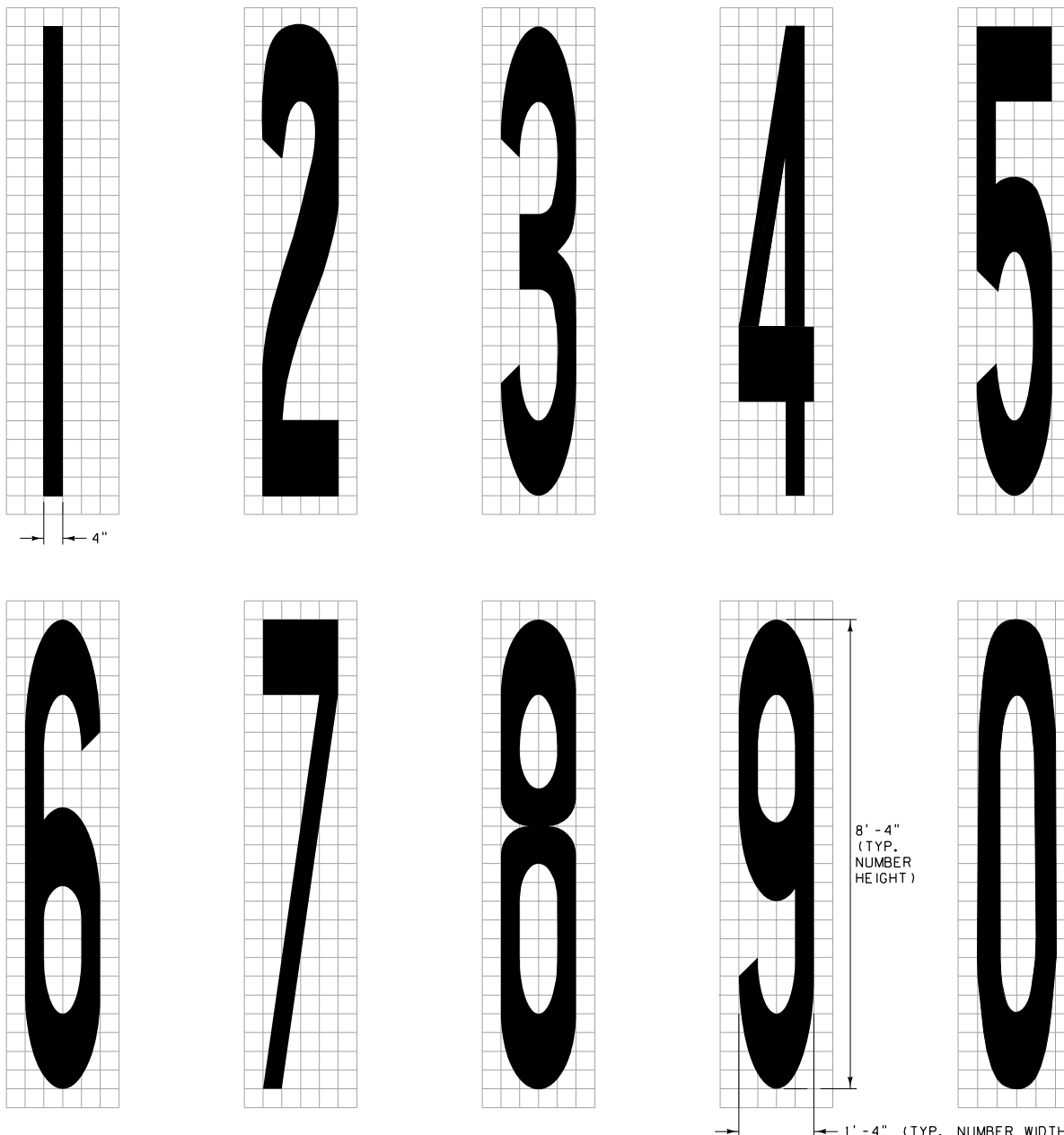
REFERENCE DWG. NO.
STANDARD SPEC. 620-00
SECTION 620

PAVEMENT MARKINGS
(LETTERS)

EFFECTIVE: FEBRUARY 2005

 MDT
serving you with pride

MONTANA DEPARTMENT
OF TRANSPORTATION



NOTES:

EACH SQUARE EQUALS 4 INCHES.

ALL PAVEMENT MARKINGS ARE TO CONFORM TO THE REQUIREMENTS OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" AND "STANDARD HIGHWAY SIGNS" PUBLICATIONS, FROM THE FEDERAL HIGHWAY ADMINISTRATION.

ALL NUMBERS ARE TO BE WHITE.

USE THE SIZES OF NUMBERS SHOWN UNLESS SMALLER OR LARGER SIZES ARE NEEDED. THE SIZE OF NUMBERS MAY BE SCALED PROPORTIONATELY DOWN BY APPROXIMATELY ONE-THIRD FOR LOW-SPEED, URBAN CONDITIONS. THE MINIMUM HEIGHT OF ANY NUMBER IS 6 FEET. LARGER SIZES MAY BE USED FOR ABOVE AVERAGE SPEEDS AND OTHER CRITICAL LOCATIONS.

DO NOT EXCEED MORE THAN ONE LANE IN WIDTH FOR ANY PAVEMENT MARKINGS EXCEPT IN THE CASE OF THE WORD "SCHOOL". SEE DTL. DWG. NO. 620-10 FOR MORE INFORMATION.

FOR MULTIPLE LINES OF INFORMATION, PLACE THE INFORMATION SO IT READS IN THE DIRECTION OF TRAVEL. DO NOT EXCEED THREE LINES OF INFORMATION AT ANY LOCATION.

WHEN WORDS AND SYMBOLS ARE USED IN COMBINATION, SPACE THEM AT LEAST FOUR TIMES THE HEIGHT OF CHARACTERS FOR LOW-SPEED ROADS, BUT NOT MORE THAN TEN TIMES THE HEIGHT OF THE CHARACTERS UNDER ANY CONDITION.

ON NARROW, LOW-SPEED BICYCLE PATHS, SIZES OF NUMBERS MAY BE SMALLER THAN SUGGESTED, BUT TO THE RELATIVE SCALE.

QUANTITIES ARE BASED ON THE SIZES OF PAVEMENT MARKINGS SHOWN AND ARE FOR ESTIMATING PURPOSES ONLY.

PAINT VOLUMES ASSUME A 15 MIL THICKNESS.
EPOXY VOLUMES ASSUME A 20 MIL THICKNESS.

QUANTITIES

#	AREA (FT ²)	PAINT (GAL.)	EPOXY (GAL.)
1	2.78	0.03	0.03
2	6.76	0.06	0.08
3	5.97	0.06	0.07
4	5.54	0.05	0.07
5	6.86	0.06	0.09
6	6.94	0.06	0.09
7	4.11	0.04	0.05
8	7.74	0.07	0.10
9	6.94	0.06	0.09
0	7.11	0.07	0.09

DETAILED DRAWING

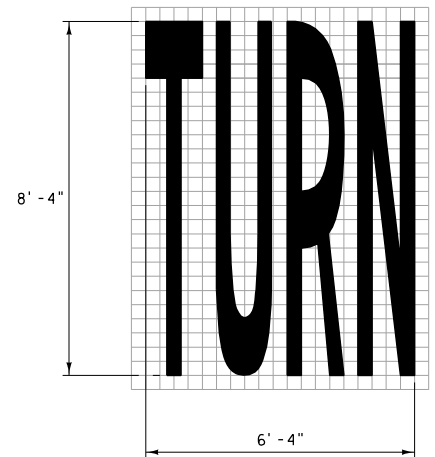
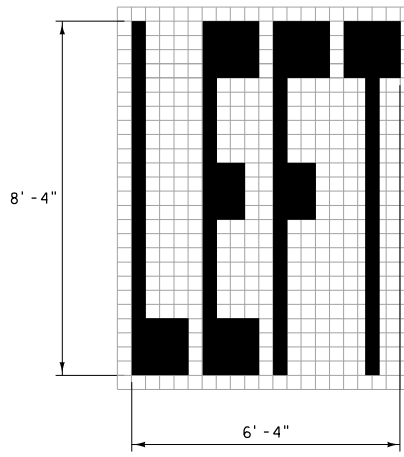
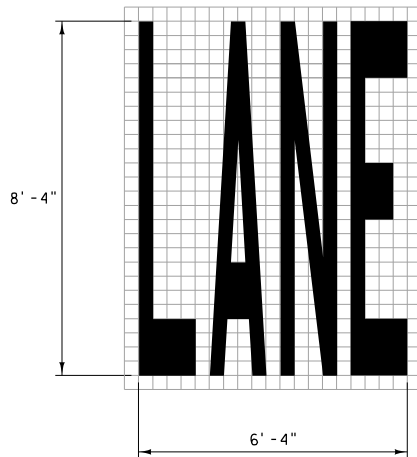
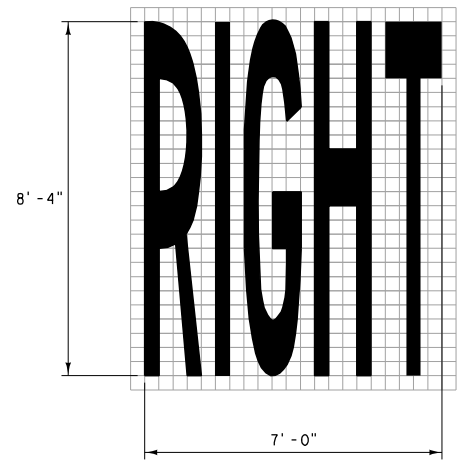
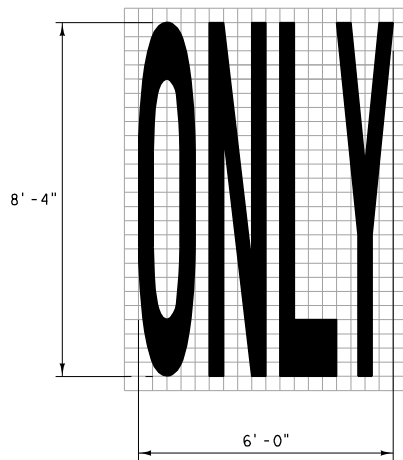
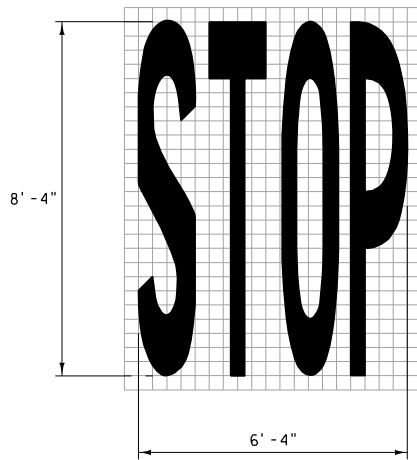
REFERENCE DWG. NO.
STANDARD SPEC. 620-05
SECTION 620

PAVEMENT MARKINGS (NUMBERS)

EFFECTIVE: FEBRUARY 2005



MONTANA DEPARTMENT
OF TRANSPORTATION



NOTES:

UNLESS OTHERWISE NOTED EACH SQUARE EQUALS 4 INCHES.

ALL PAVEMENT MARKINGS ARE TO CONFORM TO THE REQUIREMENTS OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" AND "STANDARD HIGHWAY SIGNS" PUBLICATIONS, FROM THE FEDERAL HIGHWAY ADMINISTRATION.

ALL WORDS ARE TO BE WHITE.

USE THE SIZES OF WORDS SHOWN UNLESS SMALLER OR LARGER SIZES ARE NEEDED. THE SIZE OF WORDS MAY BE SCALED PROPORTIONATELY DOWN BY APPROXIMATELY ONE-THIRD FOR LOW-SPEED, URBAN CONDITIONS. THE MINIMUM HEIGHT OF ANY WORD IS 6 FEET. LARGER SIZES MAY BE USED FOR ABOVE AVERAGE SPEEDS AND OTHER CRITICAL LOCATIONS.

DO NOT EXCEED MORE THAN ONE LANE IN WIDTH FOR ANY PAVEMENT MARKINGS, EXCEPT IN THE CASE OF THE WORD "SCHOOL". WHEN "SCHOOL" IS EXTENDED TO THE WIDTH OF TWO LANES, SCALE THE WORD UP PROPORTIONATELY TO FIT THE APPLICATION WIDTH.

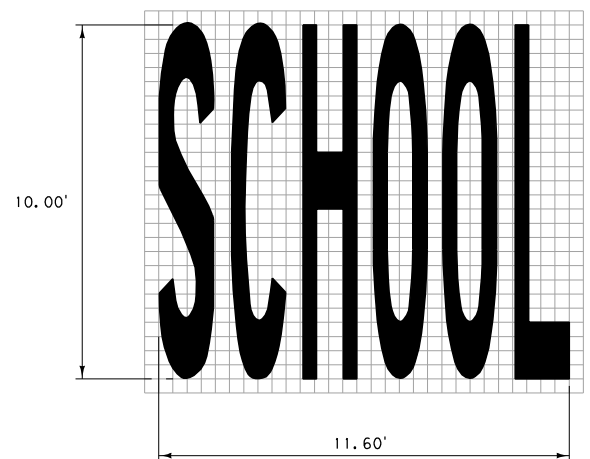
FOR MULTIPLE LINES OF INFORMATION, PLACE THE INFORMATION SO IT READS IN THE DIRECTION OF TRAVEL. DO NOT EXCEED THREE LINES OF INFORMATION AT ANY LOCATION.

WHEN WORDS AND SYMBOLS ARE USED IN COMBINATION, SPACE THEM AT LEAST FOUR TIMES THE HEIGHT OF CHARACTERS FOR LOW-SPEED ROADS, BUT NOT MORE THAN TEN TIMES THE HEIGHT OF THE CHARACTERS UNDER ANY CONDITION.

ON NARROW, LOW-SPEED BICYCLE PATHS, SIZES OF LETTERS MAY BE SMALLER THAN SUGGESTED, BUT TO THE RELATIVE SCALE.

QUANTITIES ARE BASED ON THE SIZES OF PAVEMENT MARKINGS SHOWN AND ARE FOR ESTIMATING PURPOSES ONLY.

PAINT VOLUMES ASSUME A 15 MIL THICKNESS.
EPOXY VOLUMES ASSUME A 20 MIL THICKNESS.



NOTE: EACH SQUARE EQUALS 0.40'

QUANTITIES

WORD	AREA (FT ²)	PAINT (GAL.)	EPOXY (GAL.)
STOP	22.77	0.21	0.28
ONLY	21.89	0.20	0.27
RIGHT	26.05	0.24	0.33
LANE	23.94	0.22	0.30
LEFT	20.00	0.19	0.25
TURN	23.98	0.22	0.30
SCHOOL	48.14	0.45	0.60

DETAILED DRAWING

REFERENCE DWG. NO.
STANDARD SPEC. 620-10
SECTION 620

PAVEMENT MARKINGS (WORDS)

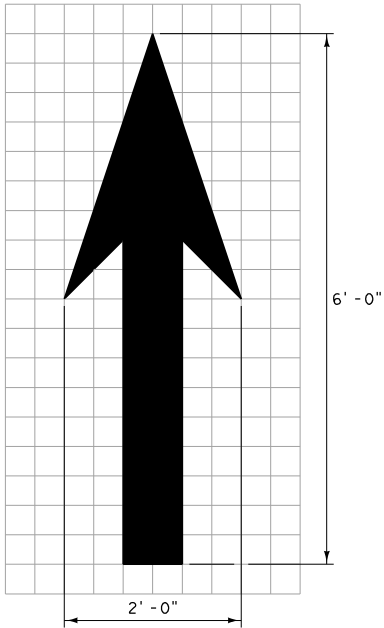
EFFECTIVE: FEBRUARY 2005



MONTANA DEPARTMENT
OF TRANSPORTATION

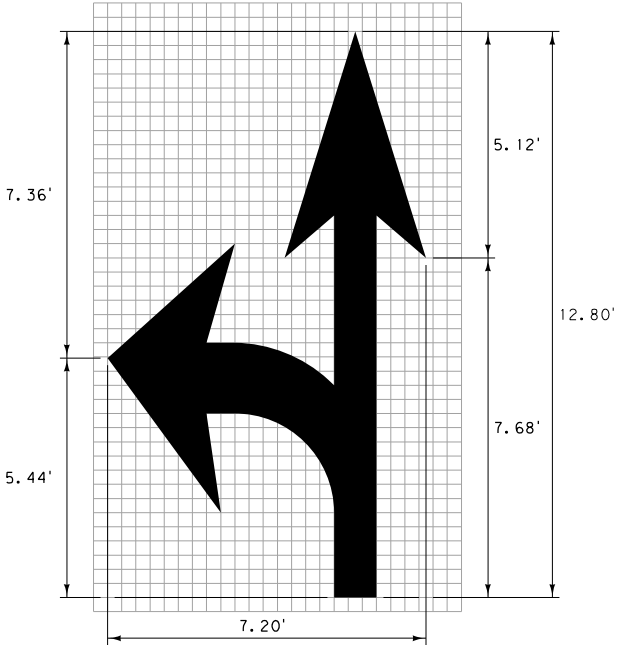
DIRECTIONAL ARROW FOR BIKE LANE

AREA = 4.56 FT²
P = 0.04 GAL.
E = 0.06 GAL.
(1 SQUARE = 4")



COMBINED ARROW

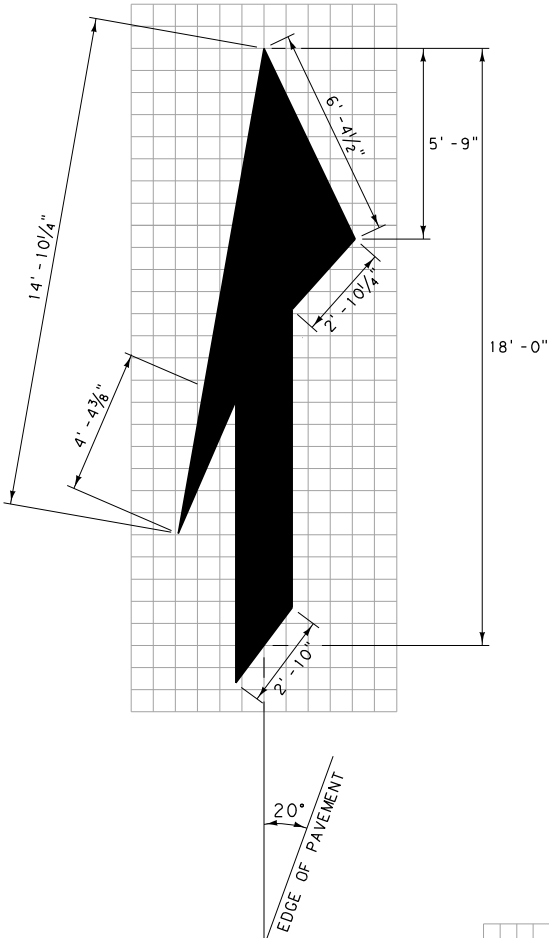
AREA = 25.99 FT²
P = 0.24 GAL.
E = 0.32 GAL.
(1 SQUARE = 0.32')



NOTE: REFER TO STRAIGHT & TURN ARROWS FOR MORE DETAIL.

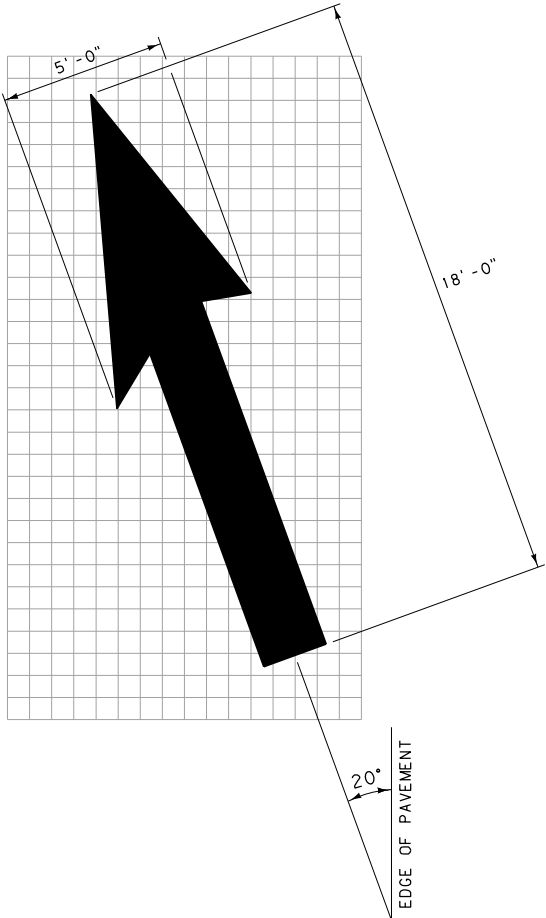
18 ft LANE DROP ARROW (RIGHT)
(FOR LEFT LANE, USE MIRROR IMAGE)

AREA = 38.63 FT²
P = 0.36 GAL.
E = 0.48 GAL.
(1 SQUARE = 8")



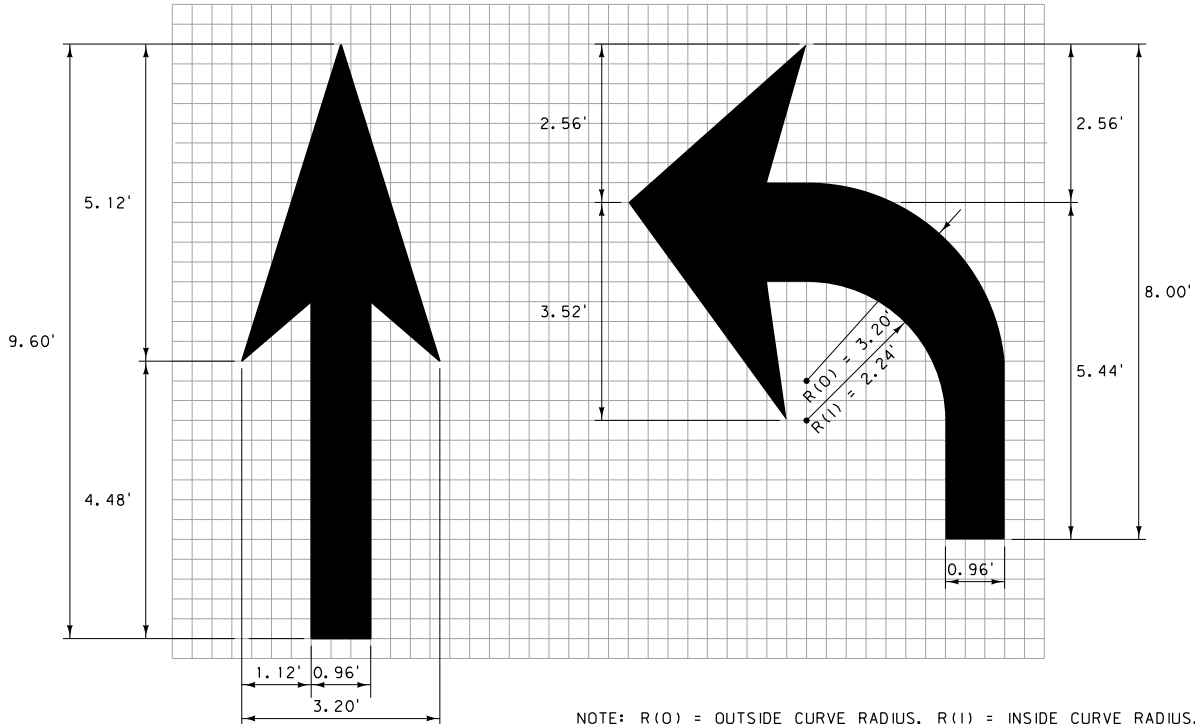
LANE-REDUCTION ARROW

AREA = 38.99 FT²
P = 0.36 GAL.
E = 0.49 GAL.
(1 SQUARE = 8")



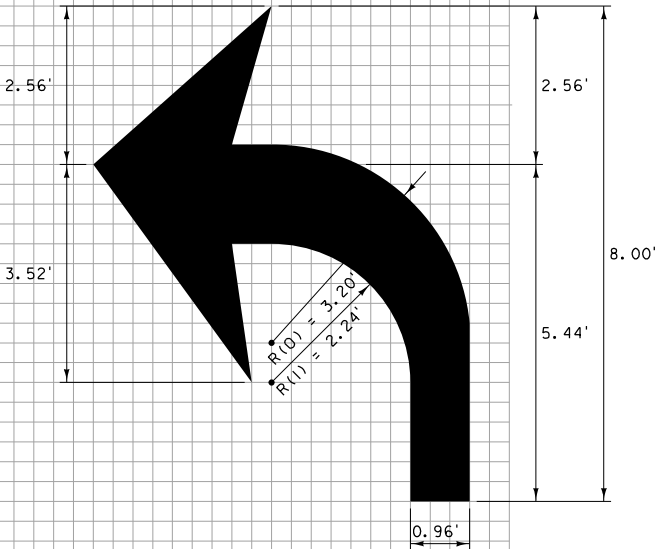
STRAIGHT ARROW

AREA = 11.42 FT²
P = 0.11 GAL.
E = 0.14 GAL.
(1 SQUARE = 0.32')



TURN ARROW

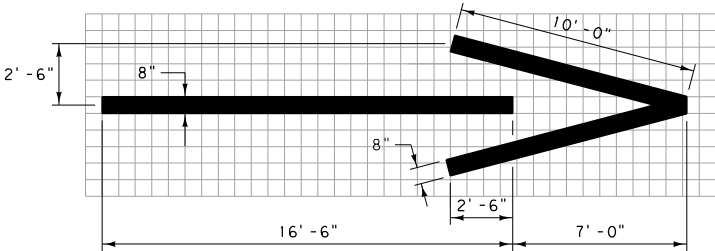
AREA = 15.57 FT²
P = 0.15 GAL.
E = 0.19 GAL.
(1 SQUARE = 0.32')



NOTE: R(O) = OUTSIDE CURVE RADIUS, R(I) = INSIDE CURVE RADIUS.

FREEWAY AND RAMP ARROW

AREA = 23.64 FT²
P = 0.22 GAL.
E = 0.30 GAL.
(1 SQUARE = 8")



NOTES:

ALL PAVEMENT MARKINGS ARE TO CONFORM TO THE REQUIREMENTS OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" AND "STANDARD HIGHWAY SIGNS" PUBLICATIONS, FROM THE FEDERAL HIGHWAY ADMINISTRATION.

ALL ARROWS ARE TO BE WHITE.


USE THE SIZES OF ARROWS SHOWN UNLESS SMALLER OR LARGER SIZES ARE NEEDED. THE SIZE OF ARROWS MAY BE SCALED PROPORTIONATELY DOWN BY APPROXIMATELY ONE-THIRD FOR LOW-SPEED, URBAN CONDITIONS. LARGER SIZES MAY BE USED FOR ABOVE AVERAGE SPEEDS AND OTHER CRITICAL LOCATIONS.

DO NOT EXCEED MORE THAN ONE LANE IN WIDTH FOR ANY PAVEMENT MARKINGS EXCEPT IN THE CASE OF THE WORD "SCHOOL". SEE DTL. DWG. NO. 620-10 FOR MORE INFORMATION.

WHEN WORDS AND SYMBOLS ARE USED IN COMBINATION, SPACE THEM AT LEAST FOUR TIMES THE HEIGHT OF CHARACTERS FOR LOW-SPEED ROADS, BUT NOT MORE THAN TEN TIMES THE HEIGHT OF THE CHARACTERS UNDER ANY CONDITION.

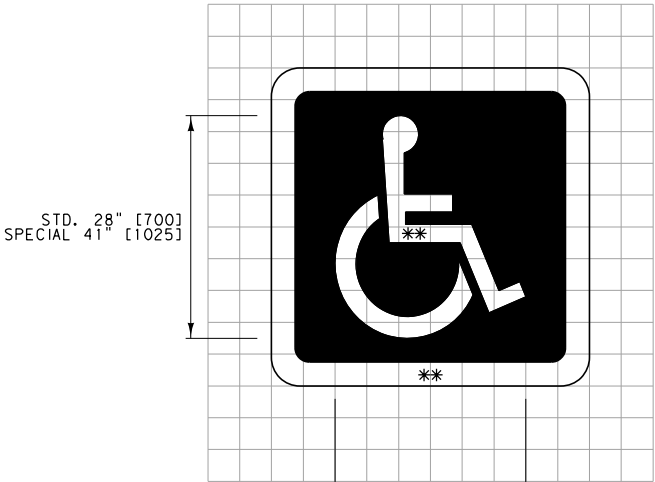
QUANTITIES ARE BASED ON THE SIZES OF PAVEMENT MARKINGS SHOWN AND ARE FOR ESTIMATING PURPOSES ONLY.

(P) - PAINT VOLUMES ASSUME A 15 MIL THICKNESS.
(E) - EPOXY VOLUMES ASSUME A 20 MIL THICKNESS.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 620	DWG. NO. 620-15
PAVEMENT MARKINGS (ARROWS)	
EFFECTIVE: FEBRUARY 2005	
	MONTANA DEPARTMENT OF TRANSPORTATION

ACCESSIBILITY PARKING SPACE SYMBOL

AREA = 11.04 FT² [0.99 m²]
P = 0.10 GAL. [0.38 L]
E = 0.14 GAL. [0.50 L]
(1 SQUARE = 4" [100])



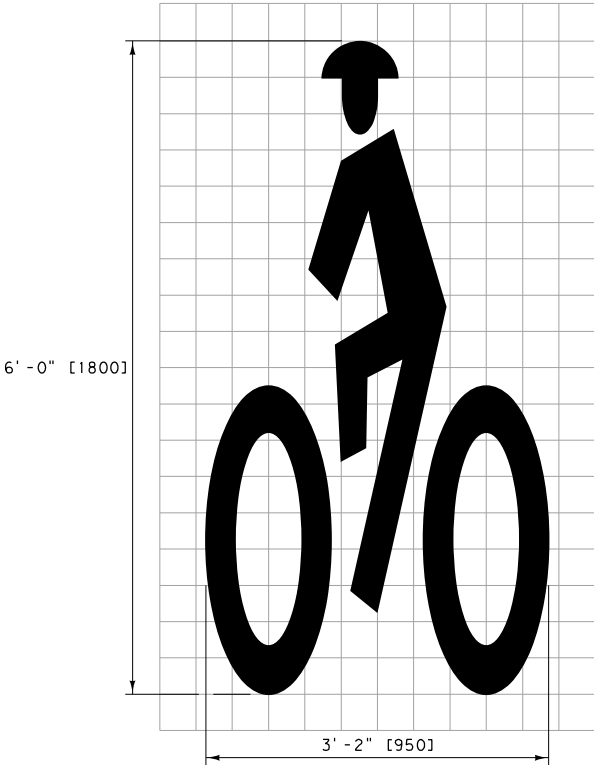
STD. 24" [600]
SPECIAL 36" [900]

NOTE: CENTER SYMBOL IN PARKING STALL

** STROKE WIDTH:
STD. 3" [75]
SPECIAL 4" [100]

BIKE LANE SYMBOL

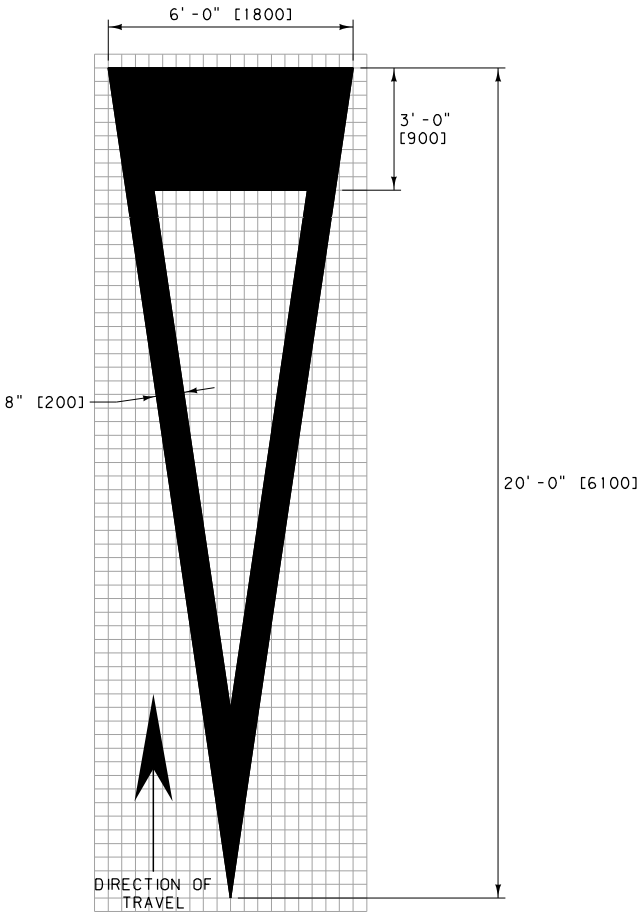
AREA = 5.95 FT² [0.54 m²]
P = 0.06 GAL. [0.21 L]
E = 0.07 GAL. [0.27 L]
(1 SQUARE = 4" [100])



YIELD AHEAD TRIANGLE

(HIGH SPEED)

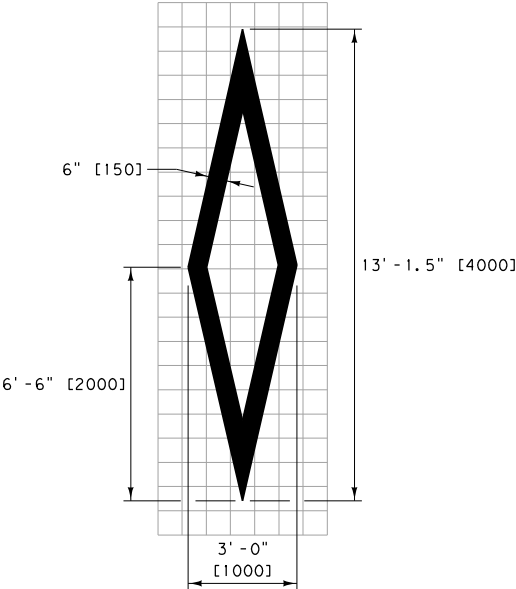
AREA = 36.54 FT² [3.33 m²]
P = 0.34 GAL. [1.27 L]
E = 0.46 GAL. [1.69 L]
(1 SQUARE = 4" [100])



NOTE: FOR LOW SPEED INSTALLATIONS, THE 3'-0" [900] AND 20'-0" [6100] DIMENSIONS MAY BE REDUCED TO 2'-6" [750] AND 13'-0" [4000] RESPECTIVELY.

PREFERENTIAL LANE SYMBOL

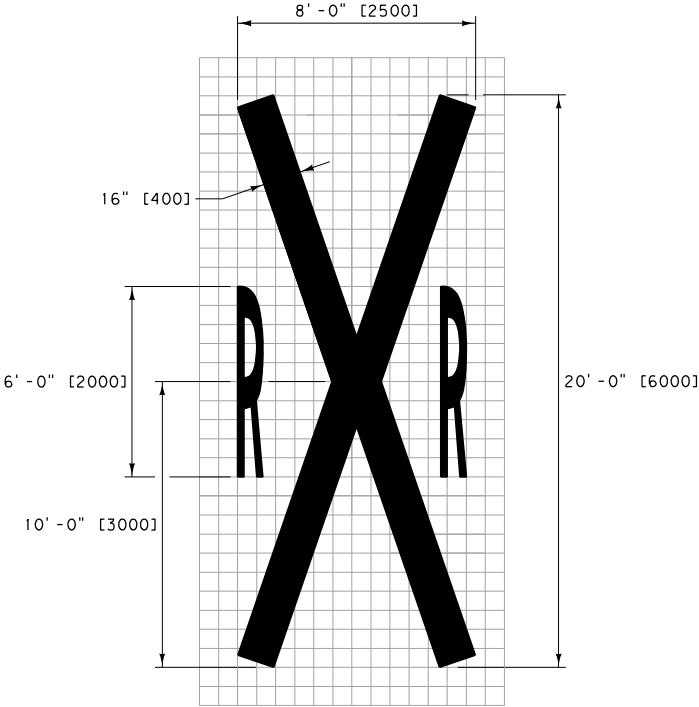
AREA = 11.16 FT² [1.05 m²]
P = 0.10 GAL. [0.40 L]
E = 0.14 GAL. [0.53 L]
(1 SQUARE = 0.65' [200])



RAILROAD CROSSING SYMBOL

AREA = 58.10 FT² [5.42 m²]
P = 0.54 GAL. [2.07 L]
E = 0.73 GAL. [2.75 L]
(1 SQUARE = 8" [200])

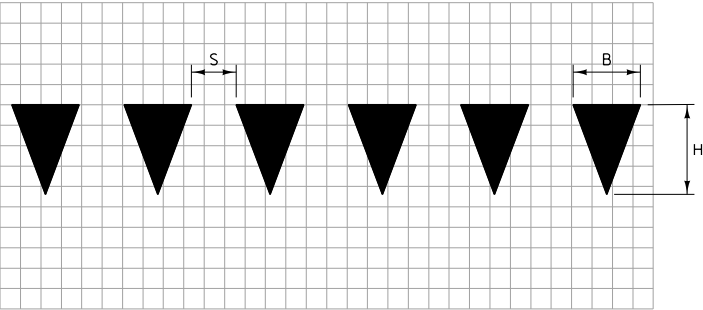
MAY VARY ACCORDING TO LANE WIDTH
8'-0" [2500]



YIELD LINE LAYOUT

(QUANTITIES PER TRIANGLE)

(B = 2'-0" [600])
AREA = 3.00 FT² [0.27 m²]
P = 0.03 GAL. [0.10 L]
E = 0.04 GAL. [0.14 L]



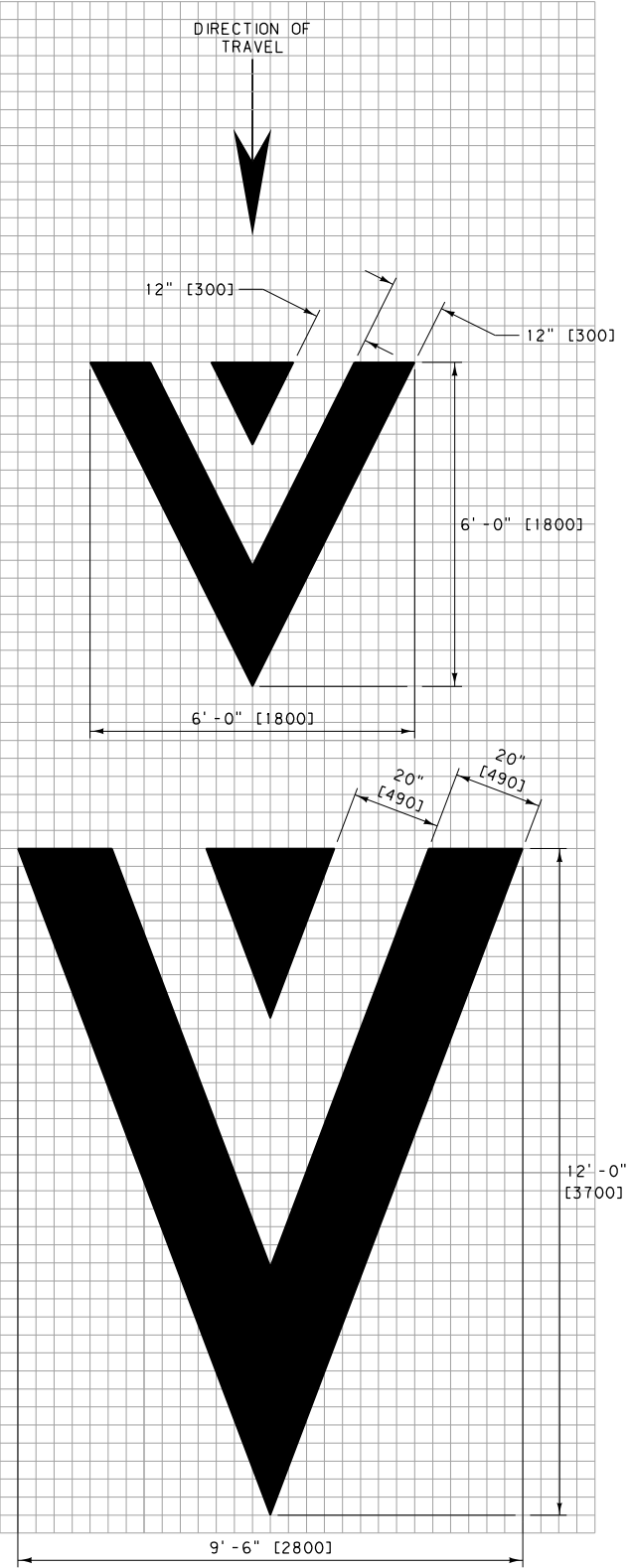
B = 2'-0" [600]
H = 3'-0" [900]
S = 12" [300]

NOTES:

- ALL PAVEMENT MARKINGS ARE TO CONFORM TO THE REQUIREMENTS OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" AND "STANDARD HIGHWAY SIGNS" PUBLICATIONS, FROM THE FEDERAL HIGHWAY ADMINISTRATION.
- ALL SYMBOLS ARE TO BE WHITE EXCEPT FOR THE ACCESSIBILITY PARKING SPACE SYMBOL WHICH HAS A BLUE BACKGROUND AND WHITE BORDER OPTIONS.
- DO NOT EXCEED MORE THAN ONE LANE IN WIDTH FOR ANY PAVEMENT MARKINGS EXCEPT IN THE CASE OF THE WORD "SCHOOL". SEE DTL. DWG. NO. 620-10 FOR MORE INFORMATION.
- WHEN WORDS AND SYMBOLS ARE USED IN COMBINATION, SPACE THEM AT LEAST FOUR TIMES THE HEIGHT OF CHARACTERS FOR LOW-SPEED ROADS, BUT NOT MORE THAN TEN TIMES THE HEIGHT OF THE CHARACTERS UNDER ANY CONDITION.
- QUANTITIES ARE BASED ON THE SIZES OF PAVEMENT MARKINGS SHOWN AND ARE FOR ESTIMATING PURPOSES ONLY.
- (P) - PAINT VOLUMES ASSUME A 15 MIL [0.381] THICKNESS.
(E) - EPOXY VOLUMES ASSUME A 20 MIL [0.508] THICKNESS.

SPEED HUMP MARKINGS

AREA = 50.42 FT² [4.56 m²]
P = 0.47 GAL. [1.74 L]
E = 0.63 GAL. [2.32 L]
(1 SQUARE = 4" [100])



DETAILED DRAWING

REFERENCE DWG. NO.
STANDARD SPEC. 620-20
SECTION 620

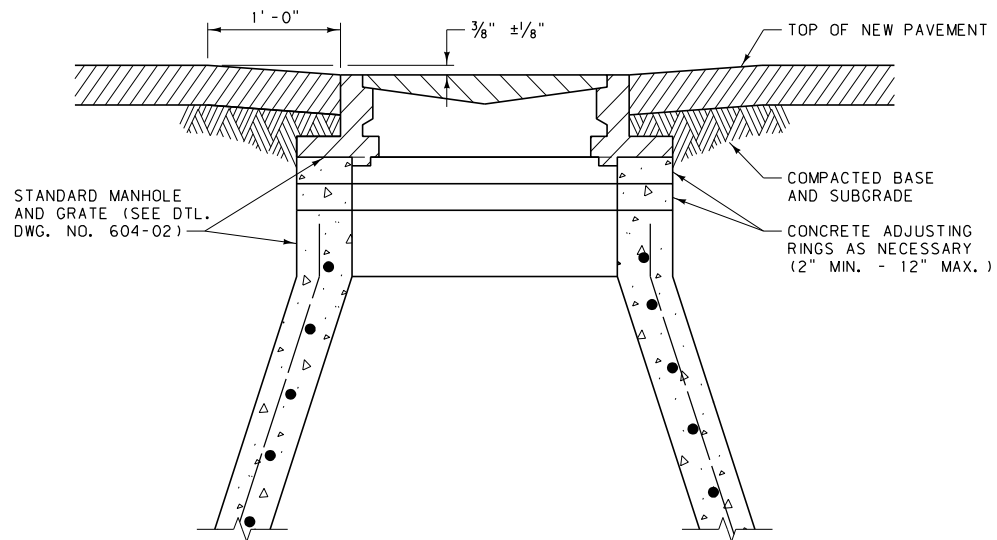
PAVEMENT MARKINGS
(SYMBOLS)

EFFECTIVE: FEBRUARY 2005

MDT MONTANA DEPARTMENT
OF TRANSPORTATION
serving you with pride

UNITS SHOWN IN BRACKETS [] ARE
METRIC AND ARE IN MILLIMETERS (mm)
UNLESS OTHER UNITS ARE SHOWN.

--REVISED--
APRIL 2012



NOTES:

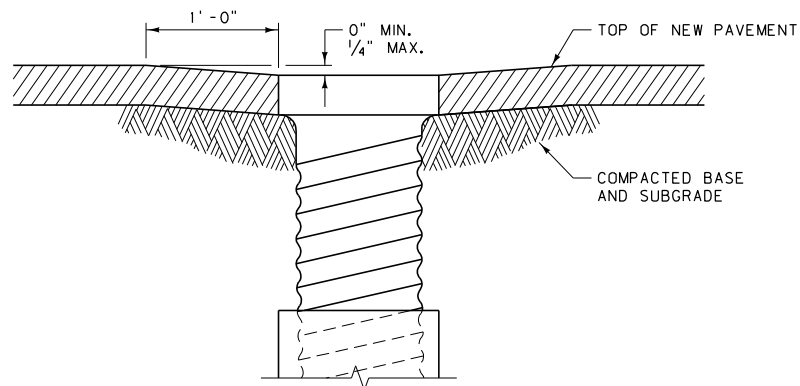
ADJUST MANHOLES UPWARD WITH ADJUSTING RINGS UNDER FRAME.

ADJUST MANHOLES DOWNWARD BY REMOVING CONE AND BARREL SECTIONS AS NECESSARY AND REPLACING WITH SECTIONS OF LENGTH REQUIRED TO MATCH GRADE.

SLOPE MANHOLE FRAME AS REQUIRED TO MATCH SLOPE OF STREET.

MAKE FINAL MANHOLE ADJUSTMENTS BEFORE PAVING.

MANHOLE ADJUSTMENT DETAIL




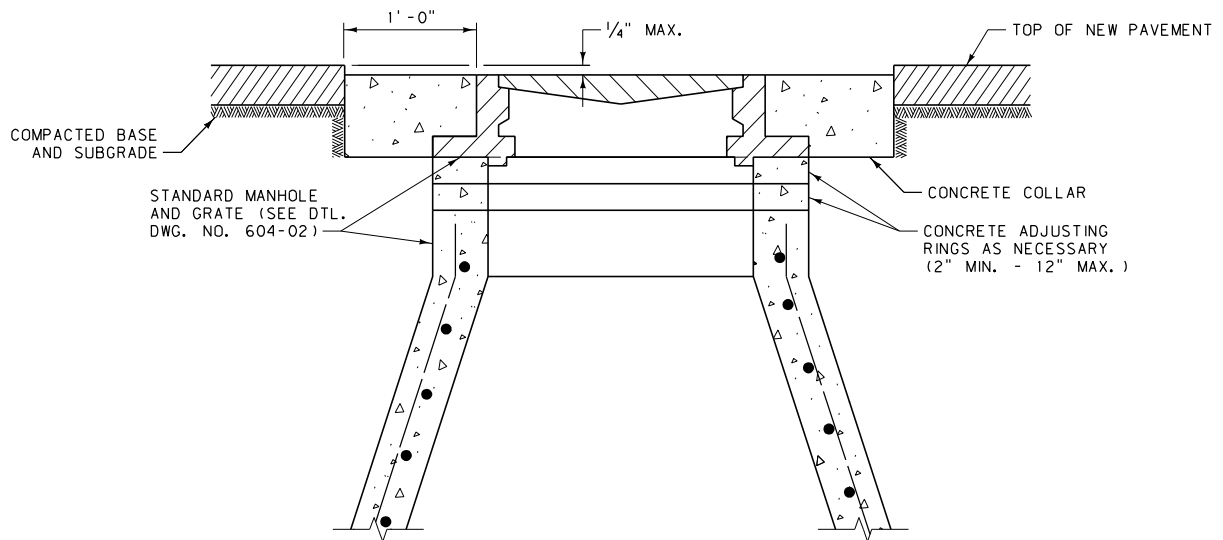
NOTES:

ADJUST WATER VALVES UPWARD OR DOWNWARD AS REQUIRED.

MAKE FINAL ADJUSTMENT BEFORE PAVING.

VALVE BOX ADJUSTMENT DETAIL

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	621-00
SECTION 604, 621	
MANHOLE AND VALVE BOX ADJUSTMENT DETAILS	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	



NOTES:

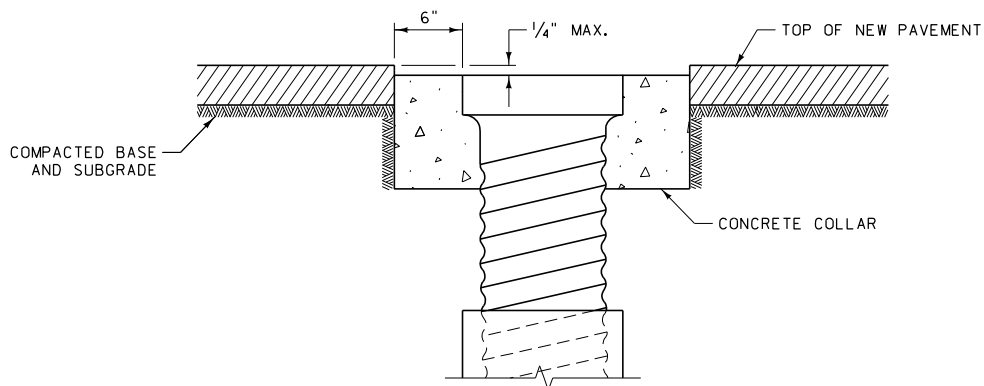
ADJUST MANHOLES UPWARD WITH ADJUSTING RINGS UNDER FRAME.

ADJUST MANHOLES DOWNWARD BY REMOVING CONE AND BARREL SECTIONS AS NECESSARY AND REPLACING WITH SECTIONS OF LENGTH REQUIRED TO MATCH GRADE.

SLOPE MANHOLE FRAME AS REQUIRED TO MATCH SLOPE OF STREET.

MAKE FINAL MANHOLE ADJUSTMENTS BEFORE PAVING.

MANHOLE ADJUSTMENT DETAIL




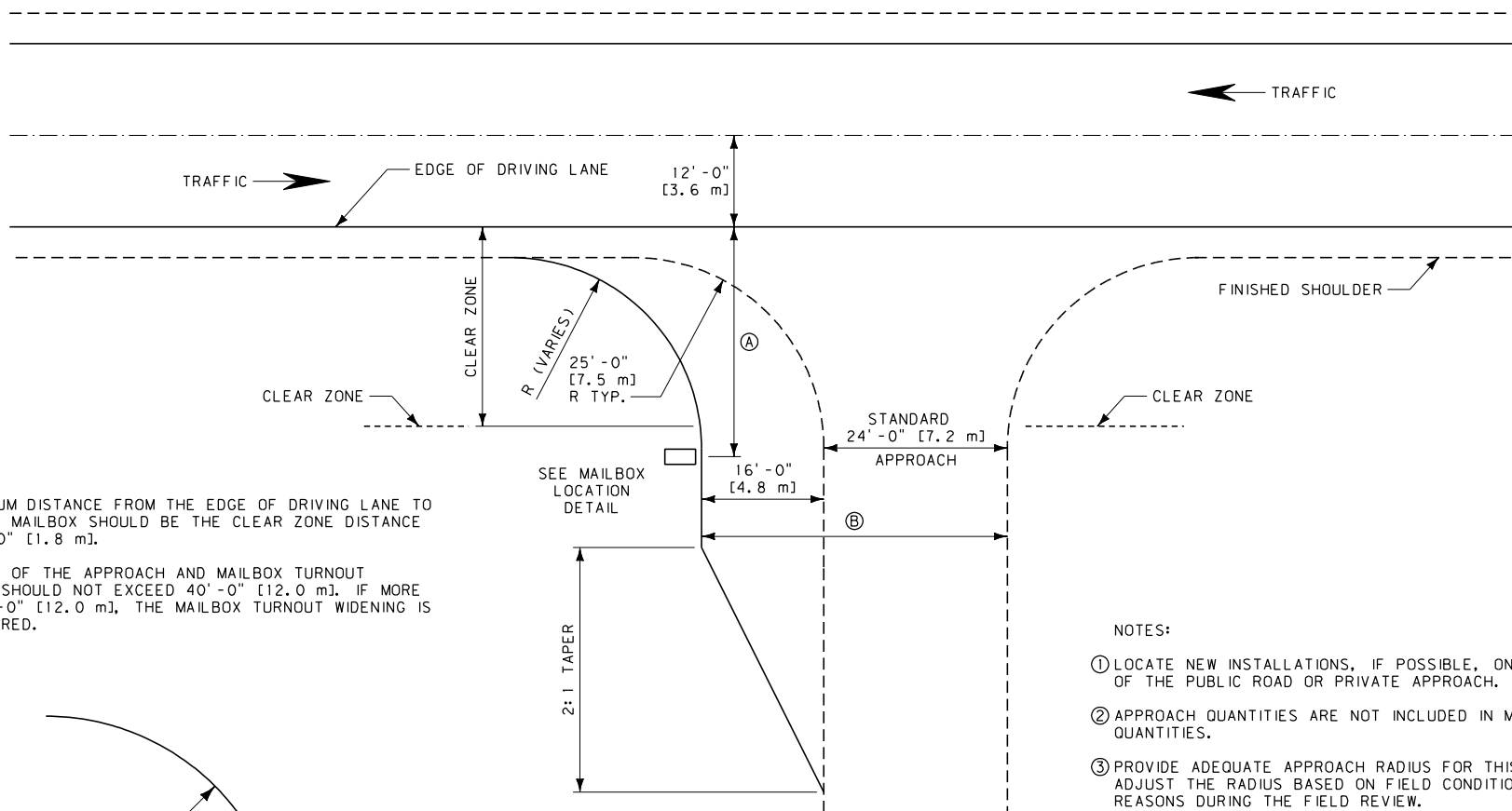
NOTES:

ADJUST WATER VALVES UPWARD OR DOWNWARD AS REQUIRED.

MAKE FINAL ADJUSTMENT BEFORE PAVING.

VALVE BOX ADJUSTMENT DETAIL

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	621-05
SECTION 604, 621	
OPTIONAL MANHOLE AND VALVE BOX ADJUSTMENT DETAILS	
EFFECTIVE: FEBRUARY 2005	
 <i>serving you with pride</i>	MONTANA DEPARTMENT OF TRANSPORTATION

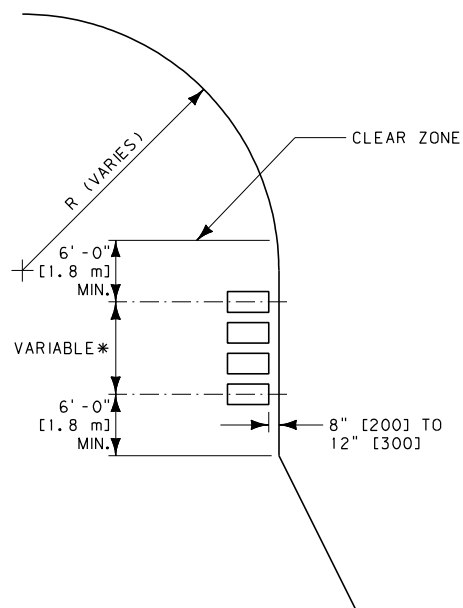


NOTES:

- Ⓐ THE MINIMUM DISTANCE FROM THE EDGE OF DRIVING LANE TO THE FIRST MAILBOX SHOULD BE THE CLEAR ZONE DISTANCE PLUS 6'-0" [1.8 m].
- Ⓑ THE WIDTH OF THE APPROACH AND MAILBOX TURNOUT COMBINED SHOULD NOT EXCEED 40'-0" [12.0 m]. IF MORE THAN 40'-0" [12.0 m], THE MAILBOX TURNOUT WIDENING IS NOT REQUIRED.

NOTES:

- ① LOCATE NEW INSTALLATIONS, IF POSSIBLE, ON THE RIGHT SIDE OF THE PUBLIC ROAD OR PRIVATE APPROACH.
- ② APPROACH QUANTITIES ARE NOT INCLUDED IN MAILBOX TURNOUT QUANTITIES.
- ③ PROVIDE ADEQUATE APPROACH RADIUS FOR THIS TURNOUT. ADJUST THE RADIUS BASED ON FIELD CONDITIONS AND DOCUMENT REASONS DURING THE FIELD REVIEW.
- ④ SEE DETAILED DRAWING NUMBER 203-05 FOR ADDITIONAL GUIDANCE.




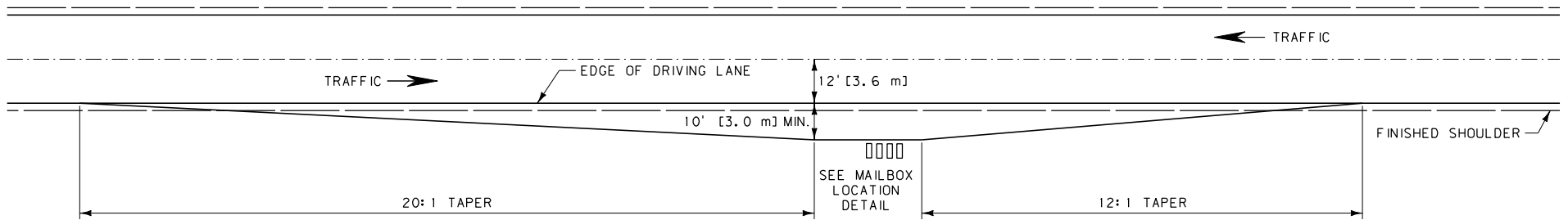
NOTE:

* THE MINIMUM SPACING BETWEEN MAILBOXES IS EQUAL TO THREE-FOURTHS OF THEIR HEIGHT ABOVE THE GROUND. SEE DTL. DWG. NO. 623-20 AND 623-25 FOR MAILBOX DETAILS.

MAILBOX LOCATION DETAIL

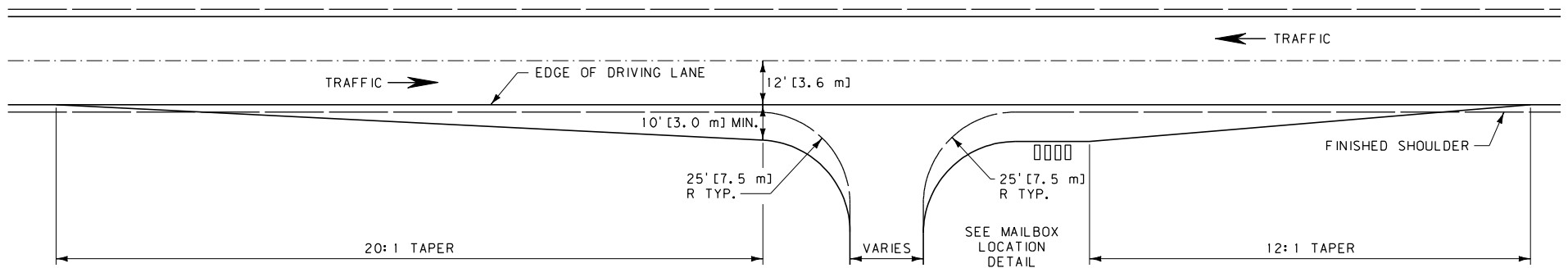
UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	623-10
SECTION 623	
APPROACH MAILBOX TURNOUT	
EFFECTIVE: MAY 2011	
 MONTANA DEPARTMENT OF TRANSPORTATION	



TURNOUT WITHOUT APPROACH

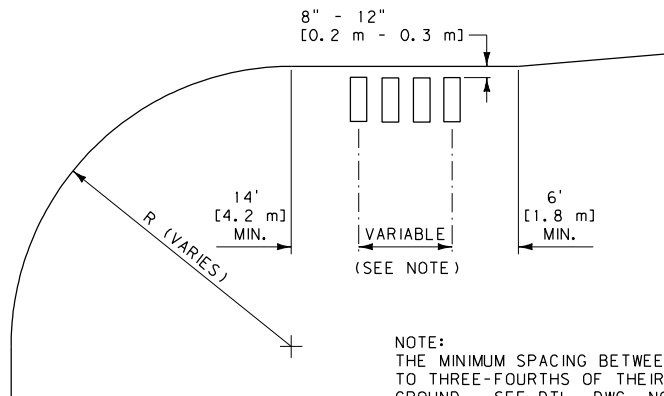
NOTE:
ACTUAL SIZE AND LOCATION TO BE DETERMINED BY
THE PROJECT MANAGER.



TURNOUT WITH APPROACH

NOTES:

- ① LOCATE NEW INSTALLATIONS, IF POSSIBLE, ON THE FAR RIGHT SIDE OF AN INTERSECTION WITH A PUBLIC ROAD OR PRIVATE DRIVEWAY.
- ② APPROACH QUANTITIES ARE NOT INCLUDED IN TURNOUT QUANTITIES.



MAILBOX LOCATION DETAIL

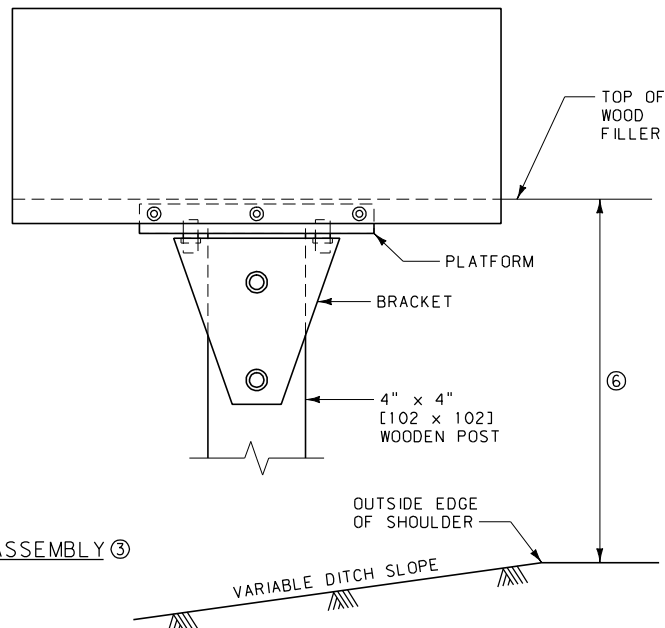
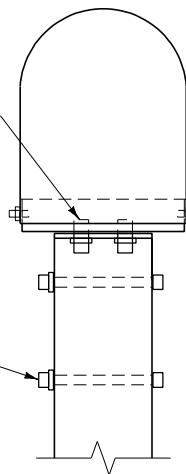
UNITS SHOWN IN BRACKETS [] ARE
METRIC AND ARE IN MILLIMETERS (mm)
UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	623-15
SECTION 623	
MAILBOX TURNOUT	
EFFECTIVE: MAY 2011	
MDTA MONTANA DEPARTMENT OF TRANSPORTATION	

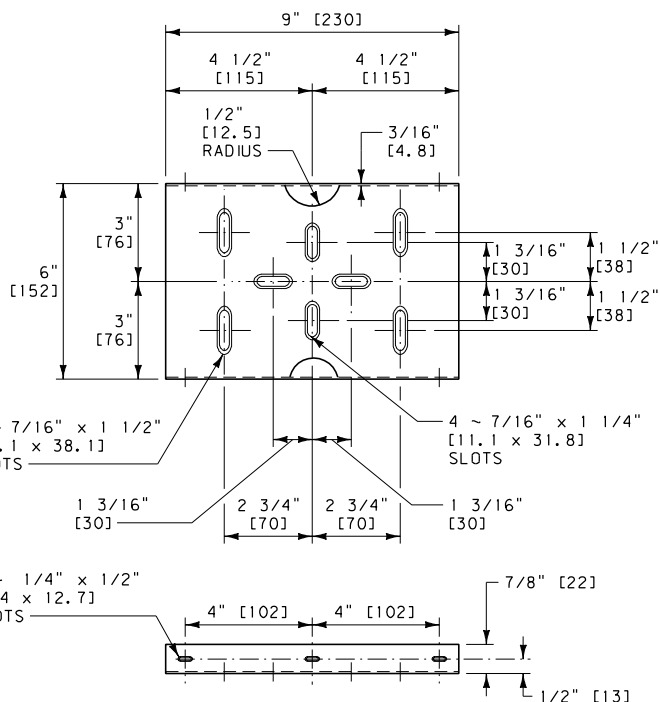
3/8" - 16 x 3/4"
[M10 x 19]
HEX BOLT,
2 WASHERS,
1 LOCKWASHER,
1 NUT

3/8" - 16 x 4 1/2"
[M10 x 114]
HEX BOLT,
2 WASHERS,
1 LOCKWASHER,
1 NUT

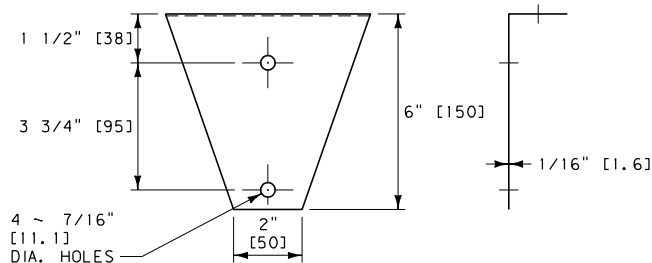
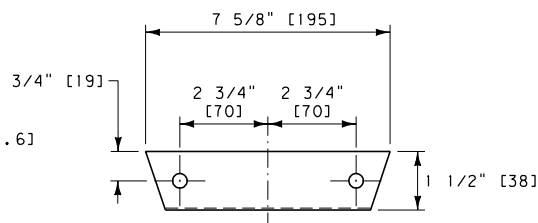
8 - 32 x 3/4"
[4 DIA. (# 8) x 19]
SLOTTED ROUND HEAD
BOLT (STOVE BOLT),
2 WASHERS,
1 LOCKWASHER,
1 NUT



SINGLE MAILBOX ASSEMBLY ③



PLATFORM




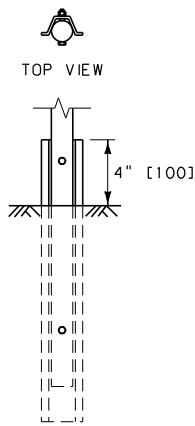
BRACKET

NOTES:

- ① GALVANIZE ALL MATERIALS MEETING SECTION 711.
- ② STAKE MAILBOX LOCATIONS BEFORE INSTALLATION FOR PROPER HEIGHT AND DISTANCE FROM THE ROADWAY. ONCE STAKED, NOTIFY THE PROJECT MANAGER AND THE POST OFFICE. THE PROJECT MANAGER AND POSTMASTER/MAILCARRIER ARE ALLOWED 48 HOURS TO REVIEW AND MODIFY THE STAKED LOCATIONS PRIOR TO FINAL INSTALLATION.
- ③ OTHER NCHRP 350 OR MASH CRASH TESTED MAILBOX SUPPORTS AND ASSEMBLIES MAY ALSO BE USED.
- ④ LOCATE THE MAILBOX 8" [0.2 m] TO 12" [0.3 m] OUTSIDE THE EDGE OF THE SHOULDER OR 6" [0.15 m] TO 12" [0.31 m] FROM THE FACE OF CURB.
- ⑤ FOR MULTIPLE MAILBOX INSTALLATIONS, SPACE THE MAILBOX SUPPORTS A MINIMUM DISTANCE OF 42" [1.05 m] APART.
- ⑥ FOR RURAL LOCATIONS USE A 38" TO 42" [965 TO 1065] MOUNTING HEIGHT. FOR URBAN LOCATIONS USE A 45" TO 48" [1145 TO 1220] MOUNTING HEIGHT.
- ⑦ SEE "A GUIDE TO MAILBOX SAFETY IN MONTANA" FOR ADDITIONAL INFORMATION.

UNITS SHOWN IN BRACKETS [] ARE
METRIC AND ARE IN MILLIMETERS (mm)
UNLESS OTHER UNITS ARE SHOWN.

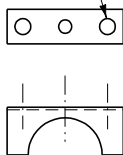
DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 623	DWG. NO. 623-20
MAILBOX DETAIL	
EFFECTIVE: MAY 2011	
 MONTANA DEPARTMENT OF TRANSPORTATION	



PIPE/POST
CONNECTION
ROADWAY VIEW

38" TO 42" [965 TO 1065] RURAL
45" TO 48" [1145 TO 1220] URBAN

DRILL 5/16" [7.9] DIA.
HOLES FOR 1/4" DIA. [M6]
CARRIAGE BOLTS



TAIL PIPE CLAMP

NO. 10 x 1" [5 DIA. (#10) x 25]
SHEET METAL SCREWS
(9 REQUIRED)

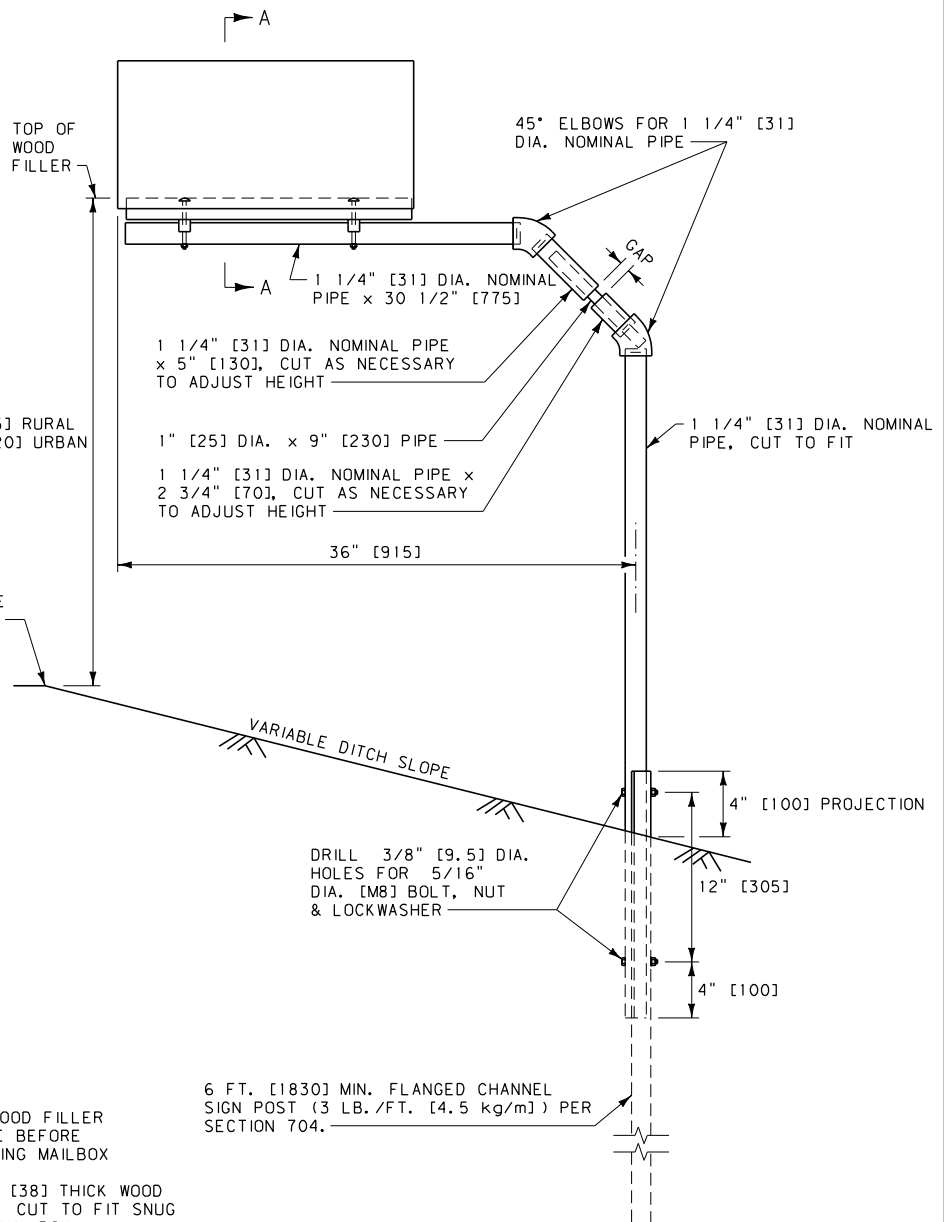
1 1/2" [38.1]
TAIL PIPE CLAMP
(AVAILABLE WHERE
AUTOMOBILE TAIL PIPE
FITTINGS ARE SOLD)

BOLT WOOD FILLER
TO PIPE BEFORE
ATTACHING MAILBOX

1 1/2" [38] THICK WOOD
FILLER, CUT TO FIT SNUG
UNDER MAILBOX

1/4" DIA. x 4" [M6 x 102]
CARRIAGE BOLTS AND NUTS

SECTION A-A




MAILBOX SUPPORT

STEEL PIPE WITH FITTINGS AND STEEL FENCE POST

NOTES:

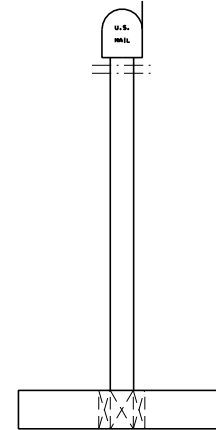
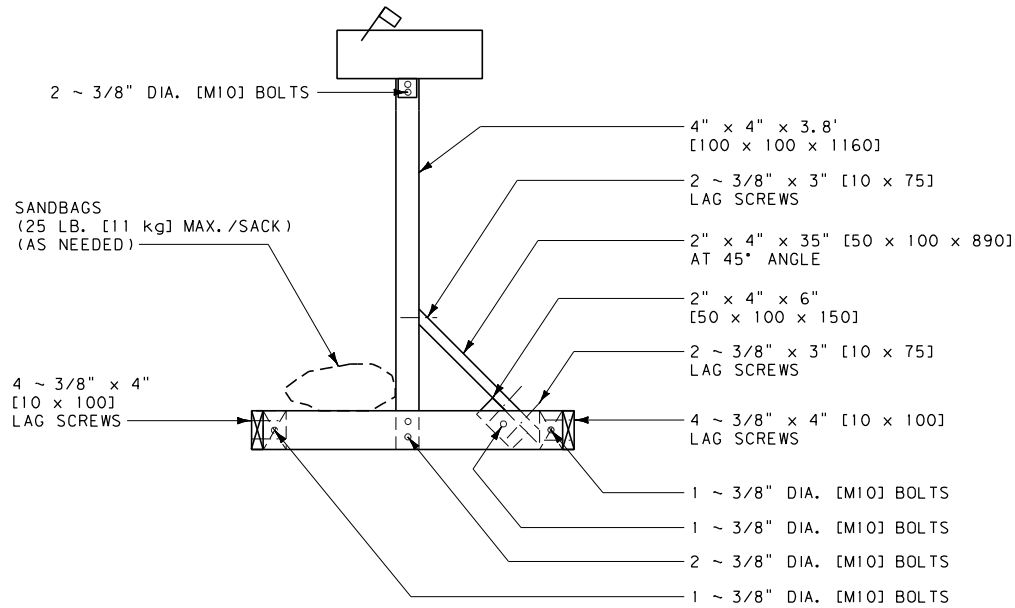
- ① GALVANIZE ALL MATERIALS MEETING SECTION 711.
- ② STAKE MAILBOX LOCATIONS BEFORE INSTALLATION FOR PROPER HEIGHT AND DISTANCE FROM THE ROADWAY. ONCE STAKED, NOTIFY THE PROJECT MANAGER AND THE POST OFFICE. THE PROJECT MANAGER AND POSTMASTER/MAIL CARRIER ARE ALLOWED 48 HOURS TO REVIEW AND MODIFY THE STAKED LOCATIONS PRIOR TO FINAL INSTALLATION.
- ③ OTHER NCHRP 350 OR MASH CRASH TESTED MAILBOX SUPPORTS AND ASSEMBLIES MAY ALSO BE USED.
- ④ LOCATE THE MAILBOX 8" TO 12" [0.2 TO 0.3 METERS] OUTSIDE THE EDGE OF THE SHOULDER OR 6" TO 12" [0.15 TO 0.3 METERS] FROM THE FACE OF CURB.
- ⑤ SEE "A GUIDE TO MAILBOX SAFETY IN MONTANA", FOR ADDITIONAL INFORMATION.

UNITS SHOWN IN BRACKETS [] ARE
METRIC AND ARE IN MILLIMETERS (mm)
UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	623-25
SECTION 623	
OPTIONAL MAILBOX DETAIL	
EFFECTIVE: MAY 2011	
 MONTANA DEPARTMENT OF TRANSPORTATION	

ELEVATION VIEW

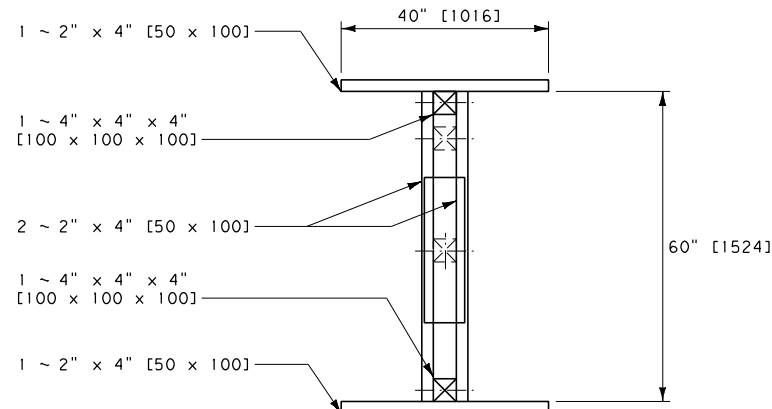
FRONT VIEW



NOTES:

- ① THIS MOUNTING DEVICE IS INTENDED FOR USE IN CONSTRUCTION ZONES.
- ② BOLT PLACEMENT IS SYMMETRICAL THROUGHOUT MOUNTING BRACKET.
- ③ ALL BOLT CONNECTIONS ARE FINISHED WITH A WASHER AND NUT.
- ④ FOR THE POST USE EITHER DOUGLAS FIR OR HEM FIR, WHICH IS SURFACED FOUR SIDES (S4S) AND FREE OF HEART CENTER (FOHC).

PLAN VIEW



UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

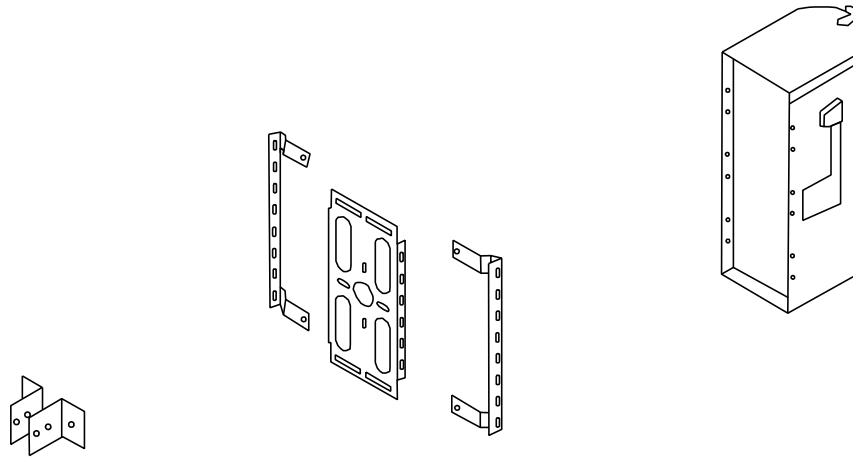
DETAILED DRAWING

REFERENCE	DWG. NO.
STANDARD SPEC.	623-30
SECTION 623	

TEMPORARY MAILBOX
SUPPORT

EFFECTIVE: MAY 2011

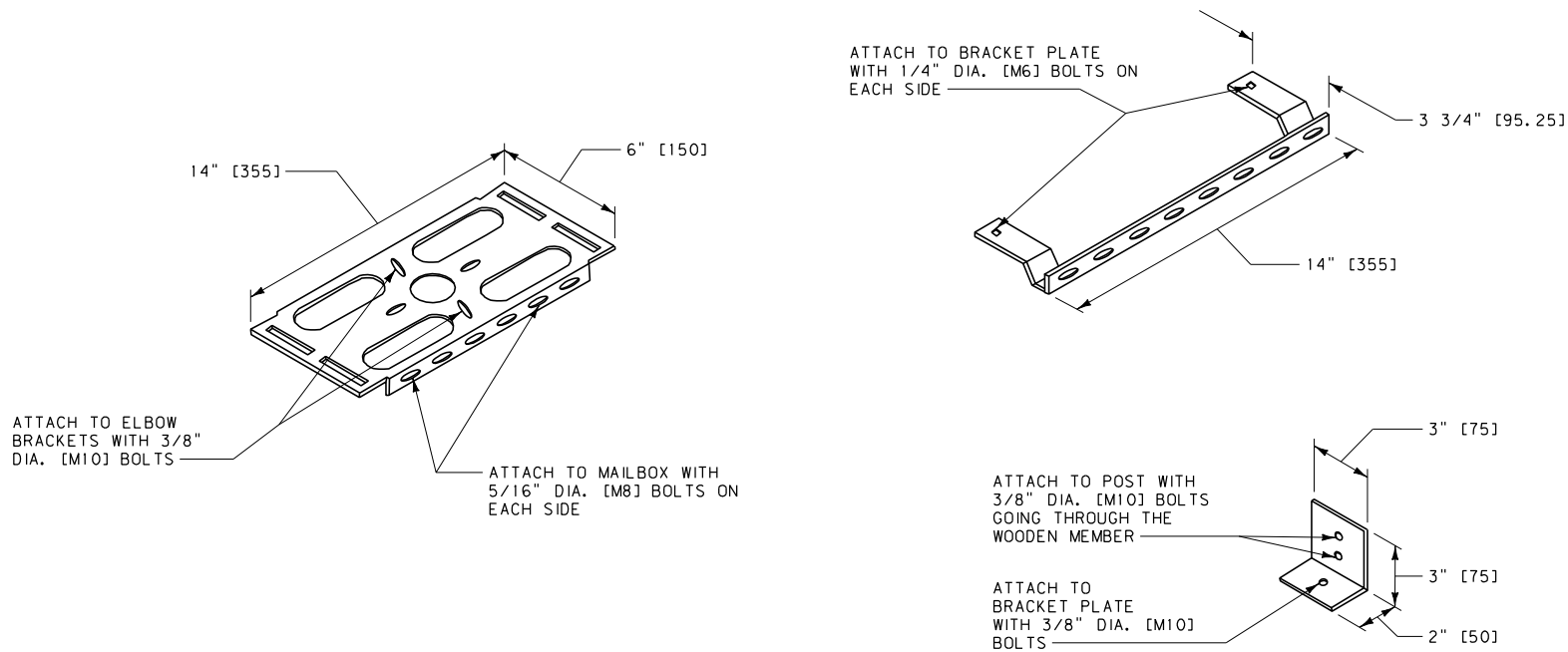
MOUNTING SYSTEM




NOTES:

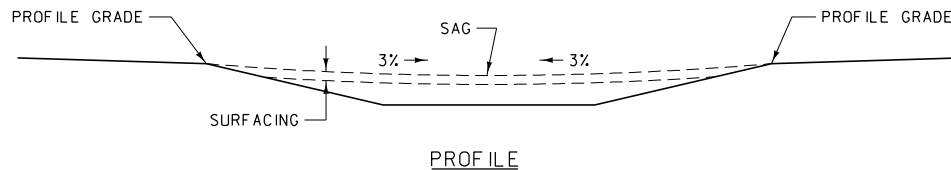
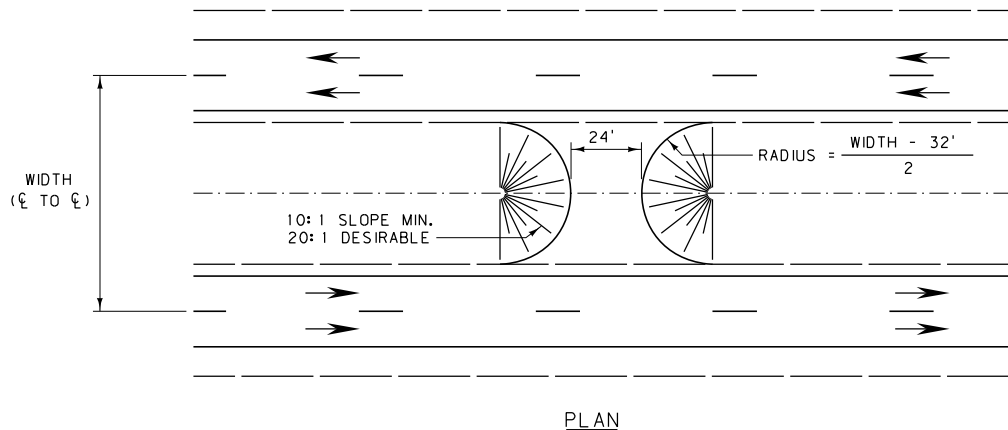
- ① THIS MOUNTING DEVICE IS INTENDED FOR USE IN CONSTRUCTION ZONES.
- ② BOLT PLACEMENT IS SYMMETRICAL THROUGHOUT MOUNTING BRACKET.
- ③ ALL BOLT CONNECTIONS ARE FINISHED WITH A WASHER AND NUT.

ATTACHMENT DETAILS



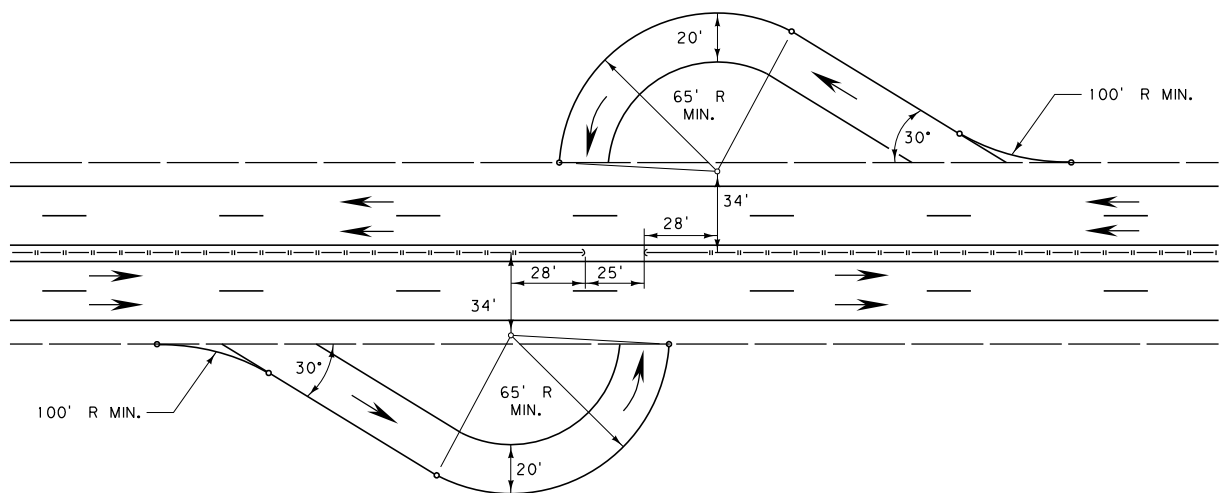
UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	623-35
SECTION 623	
TEMPORARY MAILBOX SUPPORT BRACKET DETAILS	
EFFECTIVE: MAY 2011	
 MONTANA DEPARTMENT OF TRANSPORTATION	



MEDIAN WIDTHS 36' TO 76'

LOCATE AND CONSTRUCT TURNOUTS ABOVE IN CONJUNCTION WITH DITCH BLOCKS IF AT ALL POSSIBLE. PROVIDE DRAINAGE WHEN NECESSARY.




NOTES:

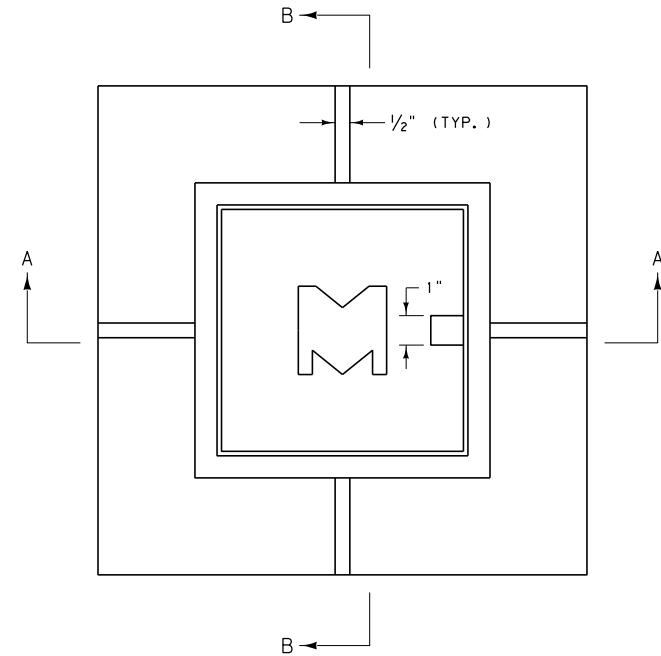
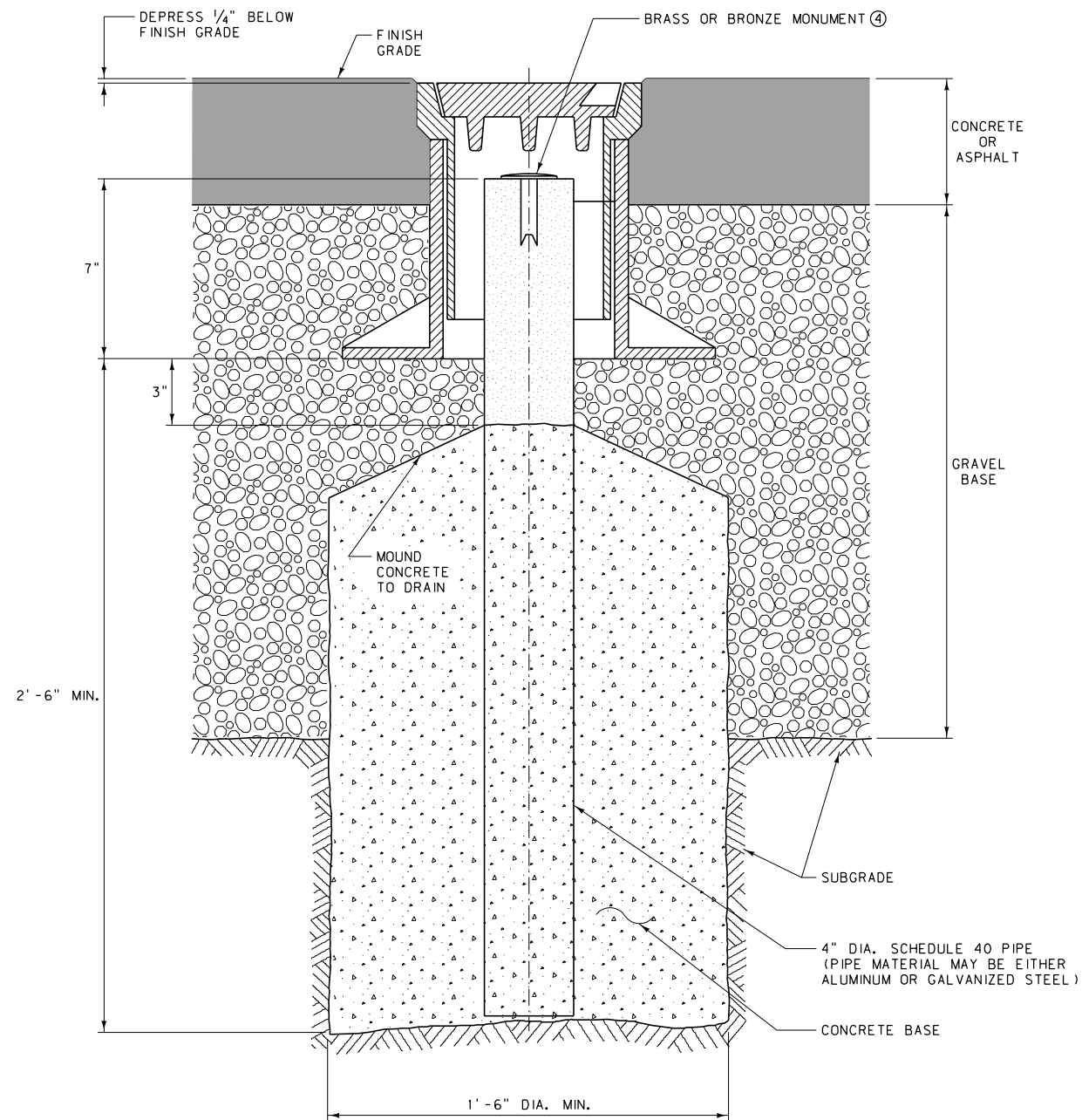
NARROW MEDIANS, MEDIAN WIDTHS GREATER THAN 76 FT. AND INDEPENDENT ROADWAYS REQUIRE SPECIAL DESIGN.

GRADES: UNIFORM BETWEEN INSIDE SHOULDERS OF MAIN TRAVELED WAY EXCEPT FOR SPECIAL DESIGN.

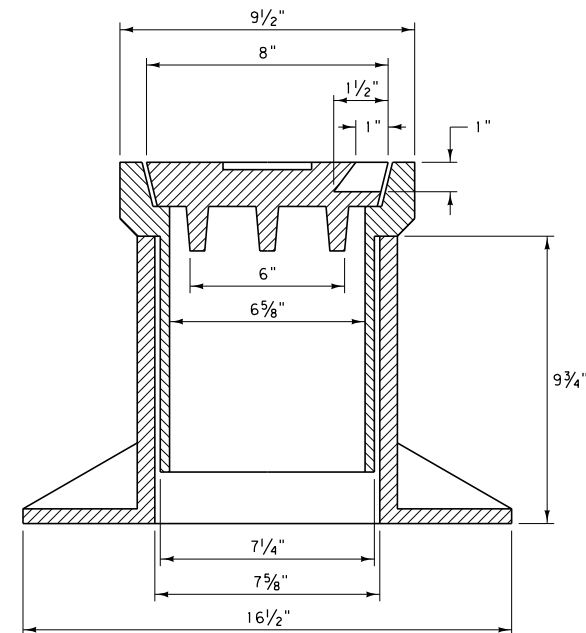
SURFACING: SEE PLANS FOR QUANTITIES.

DRAINAGE: USE 18" OR 24" CULVERTS IF REQUIRED.

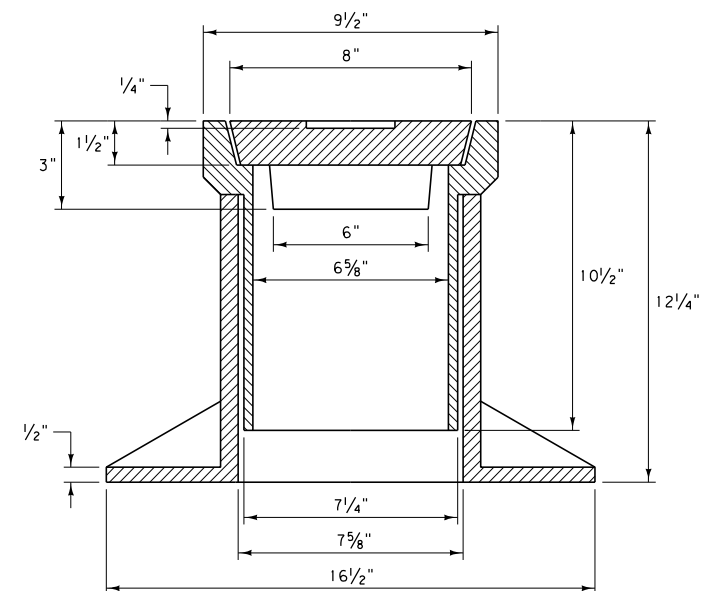
DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	900-00
SECTION	
U-TURN MEDIAN OPENINGS ON CONTROLLED ACCESS HIGHWAYS	
EFFECTIVE: FEBRUARY 2005	
 MONTANA DEPARTMENT OF TRANSPORTATION	



PLAN
NEENAH FOUNDRY R-1968 TYPE 36-B ADJUSTABLE
MONUMENT BOX (HEAVY DUTY) OR APPROVED EQUAL




SECTION A-A



SECTION B-B

NOTES:

- ① INSTALL THE 4" DIA. PIPE, CONCRETE BASE AND ADJUSTABLE MONUMENT BOX AS DETAIL. PLACE CONCRETE IN THE PIPE UP TO 10" BELOW THE TOP OF THE PIPE (DO NOT FILL COMPLETELY.)
- ② POSITION THE CENTER OF THE PIPE TO WITHIN 1/2" HORIZONTALLY OF THE DESIRED COORDINATES AND CENTER THE MONUMENT BOX OVER THE PIPE.
- ③ DEPENDING ON CONTRACT REQUIREMENTS, EITHER MDT FORCES UNDER THE DIRECTION OF A MONTANA PROFESSIONAL LAND SURVEYOR OR CONTRACTOR FORCES UNDER THE DIRECTION OF A MONTANA PROFESSIONAL LAND SURVEYOR WILL BE REQUIRED TO SET AND MARK THE BRASS OR BRONZE MONUMENT WITHIN THE BOX AFTER CONSTRUCTION. THE MONTANA PROFESSIONAL LAND SURVEYOR WILL BE REQUIRED TO PREPARE AND FILE CORNER RECORDATIONS IN ACCORDANCE WITH STATE STATUTES, ADMINISTRATIVE RULES OF MONTANA AND PROVISIONS OF THE MDT SURVEY MANUAL. PROVIDE COPIES OF FILED CORNER RECORDATIONS TO THE MDT ENGINEERING PROJECT MANAGER.
- ④ AN ACCEPTABLE BRONZE MONUMENT IS THE "BERNTSEN C25DB" OR APPROVED EQUAL. AN ACCEPTABLE BRASS MONUMENT IS THE "SURV-KAP M/M-BCS-2 1/2D" OR APPROVED EQUAL.
- ⑤ ALL CONCRETE IS CLASS DD OR APPROVED EQUAL.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	900-15
SECTION	
ADJUSTABLE MONUMENT BOX	
EFFECTIVE: APRIL 2006	
 serving you with pride	MONTANA DEPARTMENT OF TRANSPORTATION