APPLICATION OF STANDARD PLANS

This book is a compilation of Standard Plans prepared by the Colorado Department of Transportation for use on CDOT construction projects. Others who use the CDOT Standard Plans do so at their own risk.

These Standard Plans are essential contract documents as described in subsection 105.09 of CDOT's Standard Specifications for Road and Bridge Construction.

Standard Plans that are applicable to a specific project will be identified on the project plans and will not be physically attached to those plans. The designer who specifies any of these Standard Plans for a specific project accepts the responsibility of determining their applicability. Additional information concerning the Standards Plans are available in the CDOT Standard Specifications for Road and Bridge Construction book.

Standard Plans adopted or revised subsequent to the adoption of this book will be listed on the index of the project plans and will be physically included in the plans. New and Revised Standards Plans may be accessed on the Colorado Department of Transportation website: www.coloradodot.info/business/designsupport

These Standard Plans are adopted for use as of July 4, 2012.

Composition and press work performed by CDOT Printing & Visual Communications Section / DoHRA.
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<th>Description</th>
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<td>Diameter of Groove</td>
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<td>DJT</td>
<td>Diameter of Joint Trench</td>
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<td>Opposite Hand</td>
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<td>Qualified Manufacturers List</td>
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<td>Portland Cement Association</td>
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<tr>
<td>PCRC</td>
<td>Portland Cement Concrete Pavement</td>
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<td>PCCF</td>
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<tr>
<td>PED</td>
<td>Plot Driving Analyzer</td>
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<td>Preliminary Engineering, or Professional Engineer</td>
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<td>Perman. Ent.</td>
<td>Permanent Element</td>
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<td>Plant Mix Slump</td>
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<td>Point of Reverse Curve</td>
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<tr>
<td>Prj</td>
<td>Project or Projection</td>
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<tr>
<td>pps</td>
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<tr>
<td>psi</td>
<td>Pounds per square inch</td>
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<tr>
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<td>Point of Vertical Tangency</td>
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<tr>
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**ACRONYMS AND ABBREVIATIONS**

- **SRW**: Segmental Reinforcing Wall
- **SS**: Steel Stringer-Steel Filled
- **SSE**: Steel Stringer-Earth Filled
- **SSW**: Steel Stringer-Steel Wall
- **SSMC**: Steel Stringer-Metal/Steel Wall Continuous
- **SSPC**: Society for Protective Coatings
- **SSS**: Steel Stringer-Timber Bead
- **ST**: Steel-Transit
- **SUSP**: Suspension Bridge
- **SY**: Square Yard
- **Sym**: Symmetrical

**Computer File Information**

- **Creation Date**: 07/04/12
- **File Name**: M020203034.dgn
- **Drawing File Name**: M020203034.dgn
- **Full Path**: C:sources\Projects\Design\civil\transit\m100-2\m100-2.dgn
- **Comments**: Sheet No. 3 of 4

**ACRONYMS AND ABBREVIATIONS**

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- **SUSP**: Suspension Bridge
- **SY**: Square Yard
- **Sym**: Symmetrical

**STANDARD PLAN NO.**

- **M-100-2**
### Superelevation Notes

1. This standard plan shows the required rates of superelevation for various values of width at different design speeds for the maximum superelevation rate of 8% alternative maximum rate of superelevation shall be used for reduced diameters when specified in this plan.

2. Values are for design elements related to design speed and reduced curvature for plane and plane-highways.

3. Number of lanes rotated:
   - One lane rotation is typical for a two-lane highway.
   - Two lanes rotation is typical for a four-lane highway.

4. Specials are recommended below the heavy line in the table. Specials are permissible but not recommended above the heavy line, typical lengths may be required to multiples of 50 feet for calculation convenience.

#### Table: Superelevation Rates

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<th>L (ft)</th>
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**Computer File Information**

**Creation Date:** 07/04/12  **Job #:** DD

**Last Modification Date:** 07/04/12  **Job #:** DD/LTA

**Drawing File Name:** 205002053.dwg

**Call View Information:** 03  Scale: Not to Scale Units: English

**Colorado Department of Transportation**

8200 East Arandel Avenue  
Denver, Colorado 80222  
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**Project Development Branch**  
**DD/LTA**

**Superelevation Crowned and Divided Highways**

**STANDARD PLAN NO.**  
M-203-11

**Sheet NO.** 1 of 3

**Date:** 07/04/12  **Comments:**
SUPERELEVATION DIAGRAMS FOR DIVIDED HIGHWAYS

**SHOULDER PIVOT**

- VC: Vertical Curve
- Vd: Assumed Design Speed
- L: Length of Superelevation
- NC: Normal Crown Section
- RC: Reverse Crown Section
- VC: Vertical Curve
- PT: Point of Tangent
- CS: Curve to Spiral
- SG: Spiral to Curve
- LN: Travel Line

**CENTRAL PIVOT**

- VC: Vertical Curve
- Vd: Assumed Design Speed
- L: Length of Superelevation
- NC: Normal Crown Section
- RC: Reverse Crown Section
- VC: Vertical Curve
- PT: Point of Tangent
- CS: Curve to Spiral
- SG: Spiral to Curve
- LN: Travel Line

**Diagrammatic Profile for Superelevation of Inside Lanes**

- VC: Vertical Curve
- Vd: Assumed Design Speed
- L: Length of Superelevation
- NC: Normal Crown Section
- RC: Reverse Crown Section
- VC: Vertical Curve
- PT: Point of Tangent
- CS: Curve to Spiral
- SG: Spiral to Curve
- LN: Travel Line

**Diagrammatic Profile for Superelevation of Outside Lanes**

- VC: Vertical Curve
- Vd: Assumed Design Speed
- L: Length of Superelevation
- NC: Normal Crown Section
- RC: Reverse Crown Section
- VC: Vertical Curve
- PT: Point of Tangent
- CS: Curve to Spiral
- SG: Spiral to Curve
- LN: Travel Line
STRUCTURE EXCAVATION MEASUREMENT FOR PIPE CULVERTS

PLAN

STRUCTURE EXCAVATION MEASUREMENT FOR CONCRETE BOX CULVERTS

PROFILE

W experimental width of structure

LENGTH OF STRUCTURE PLUS 3'

LEGEND

STRUCTURE EXCAVATION LIMITS
STRUCTURE BACKFILL LIMITS
CONCRETE

RETAINING WALL IN CUT & IN PARTIAL CUT

ALL ADDITIONAL EXCAVATION BEYOND THE LIMITS SHOWN SHALL BE FILLED WITH CLASS B SOILS, MATERIAL THE ADDITIONAL EXCAVATION AND BACKFILL SHALL NOT BE MEASURED AND PAID FOR.

EXCAVATION AND BACKFILL FOR STRUCTURES

STANDARD PLAN NO.

M-206-1

Sheet No. 2 of 2

Project Development Branch DD/LTA

Colorado Department of Transportation
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Issued By: Project Development Branch July 4, 2012

Drawn By: [Signature]
Reviewed By: [Signature]
**Temporary Erosion Control**

**Notes:**
1. Erosion rules may be used as an alternative for the worker.
2. A fence placed continuing to subsection 205.02 shall be installed around the concrete washout area except at the opening.
3. The concrete washout sign shall have letters at least 3 inches high and conform to subsection 501.02

**Concrete Washout Structure**

**Vehicle Tracking Pad**

**Section A-A**
- Existing ground
- Excavated area
- Temporary fence 20' (4.05)
- Concrete washout
- Existing ground
- 10' storage is 1/3 of volume area

**Section B-B**
- Existing ground
- 70' min
- Concrete erosion control (class 2)
- Erosion control (depth varies)

**Plan View**
- Existing pavement
- Aggregate
- Plan view
- Small extent full width of project and expressway

**Elevation Section**
- Existing ground
- 10' min
- Concrete erosion control (class 2)
- Erosion control (depth varies)
**SECTION A-A**

TYPICAL STAKE INSTALLATION

**SECTION B-B**

NOTES:
1. EROSION LOGS SHALL BE ENDED 2 INCHES INTO THE SOIL.
2. STAKES SHALL BE ENDED TO A MINIMUM DEPTH OF 12 INCHES.
3. EROSION LOGS SHALL BE TIGHTLY ARTICLED WITH NO GAPS.

**EROSION LOG DITCH INSTALLATION**

POINTS A SHALL BE HIGHER THAN POINT B.

POINTS A SHALL BE HIGHER THAN POINT B.

**EROSION LOG FILTER AT DROP INLET**

**EROSION LOG APPLICATIONS**
ISOMETRIC VIEW

SECTION A-A

5° TO 10°

STAKES APPROXIMATELY 50° TO EACH OTHER (1/8"

NOTES:
1. EROSION LOGS USED AT THE UF SLOPE SHALL BE PLACED 5 TO 20 FEET BEHIND THE UF SLOPE TO PROVIDE STORAGE CAPACITY.
2. EROSION LOGS SHALL BE PLACED ON THE CONTAINER, WITH ENDS PLACED UP UF SLOPE.

EROSION LOG TOE OF SLOPE PROTECTION

EROSION LOG APPLICATIONS

PLAN VIEW

SECTION B-B

EROSION LOG CULVERT INLET PROTECTION

EROSION LOG CULVERT OUTLET PROTECTION
TYPICAL STAPLE PATTERN FOR CHANNEL APPLICATION

SOIL FILLED TRM APPLICATION
1. PLACE 2" TOPSOIL OR SOIL MIXTURE WITH SOIL CONDITIONER
2. APPLY SEED AND BARE DRY SOIL
3. INSTALL TRM
4. PLACE 2" TO 4" TOPSOIL OR SOIL MIXTURE WITH SOIL CONDITIONER
5. APPLY SEED AND BARE DRY SOIL
6. INSTALL SOIL RETENTION BLANKET CLASS D.

SOIL RETENTION BLANKETS/TURF REINFORCEMENT MATS (TRM)

ANCHOR TRENCH
SECTION A
TO BE USED AT THE BEGINNING AND END OF THE CHANNEL ACROSS ITS ENTIRE WIDTH

CONSECUTIVE ROLL OVERLAP
SECTION B
TO BE USED WHERE THE ROLL OF BLANKET ENDS AND ANOTHER BEGINS WITH OVERLAP BLANKET PLACED ON TOP OF THE BLANKET ON THE DOWNSTREAM SIDE

SIDE SEAM OVERLAP
SECTION C
TO BE USED FOR OVERLAP WHEN A SEAM OF BLANKET ARE APPLIED SIDE BY SIDE WITH THE SMALL BLANKET PLACED ON TOP OF THE BLANKET ON THE DOWNSTREAM SIDE

CHANNEL CHECK SLOT
SECTION D
TO BE USED AT 30' INTERVALS IN CHANNEL FLOWLINE.
TYPICAL STAPLE PATTERN FOR SLOPE APPLICATION

ANCHOR TRENCH SECTION (A)
TO BE USED AT THE UPLINE AND DOWNSLOPE ENDS OF BLANKET ACROSS THE ENTIRE WIDTH OF SLOPE UNLESS SLOPE RUNS INTO RECEIVING WATER (SEE DOWNSLOPE END STAPLE CHECK).

DOWNSLOPE END STAPLE CHECK
TO BE USED WHEN SLOPE RUNS INTO A RECEIVING WATER AND CANNOT BE EXTENDED 3 FEET BEYOND SLOPE.

CONSECUTIVE ROLL OVERLAP SECTION (B)
TO BE USED WHEREVER THE ROLL OF BLANKET ENDS AND ANOTHER BEGINS WITH THE UPRIGHT BLANKET PLACED ON TOP OF THE BLANKET ON THE DOWNSLOPE SIDE.

SOIL RETENTION BLANKETS/TURF REINFORCEMENT MATS (TRM) SLOPE APPLICATION
IN ACCORDANCE WITH SECTION 366.

NOTES:
1. STAPLE CHECKS TO BE USED ON SLOPE EVERY 25 FEET MAXIMUM
2. STAPLE CHECK LOCATION SHOULD BE AT LEAST 10 FEET FROM THE BOTTOM OF SLOPE.
**TEMPORARY BERM**

NOTES:
1. BERM SHALL HAVE A HEIGHT OF 12 INCHES MINIMUM AND A WIDTH AT TOP OF 4 FEET.
2. BERM SHALL BE USED TO DIVERT AND REDUCE DRAINAGE TO A DESIGNATED OUTLET.
3. BERM SHALL NOT BE USED WHERE DRAINAGE AREA EXCEEDS 20 ACRES.

**TEMPORARY SLOPE DRAIN**

**RIPRAP OUTLET PROTECTION**

**TEMPORARY DIVERSION**

NOTES:
1. TEMPORARY DIVERSION DITCH SHALL BE CONSTRUCTED ACROSS THE SLOPE TO INTERCEPT RunOFF AND DIRECT IT TO A STABLE OUTLET OR DIVERTMENT TANK.
2. USE IMMEDIATELY ABOVE A NEW CUT OR FILL SLOPE OR AROUND THE PERIMETER OF A DISTURBED AREA.
3. GRADING ALONG THE FLOW PATH SHALL HAVE A POSITIVE GRADE TO ASSURE DRAINAGE, BUT SHALL NOT BE SO STEEP AS TO RESULT IN EROSION DUE TO FLOW VELOCITY.
NOTES
1. Silt fence shall have a maximum spacing area of one-quarter
   acre per 100 feet of silt fence length. Minimum slope length
   fence barrier is 100 feet. Gauge material beyond the barrier
   is 30 feet.
2. Silt fence used at toe of slope shall be placed 5 to 10 feet
   beyond toe of slope to provide storage capacity.
3. Silt fence shall be placed in the contour with ends placed
   up slope.

SILT FENCE
Silt fence shall be attached to wood posts with three or
more staples per post.
Staples shall be 1/2".
Wood post shall be 1 1/2" x 1 1/2" nominal.

END SECTION DETAIL (PLAN VIEW)
Silt fence shall be filled around two posts
(one full turn before silt fence to post
with three staples nominal.)

JOINING SECTION DETAIL (PLAN VIEW)
Field silt fence around each post one full
turn before silt fence to post with three
staples nominal.
Posts shall be tightly admixed with no
gaps to prevent potential flow-through
of sediment at costs.

SECTION A-A
TOE OF SLOPE PROTECTION

SILT FENCE APPLICATION

TEMPORARY
EROSION CONTROL

STANDARD PLAN NO.
M-208-1
Sheet No. 10 of 12
NOTES
1. THE MAXIMUM EROSION AREA IS 5 ACRES.
2. THE MAXIMUM STRUCTURE LIFE IS 2 YEARS.
3. THE STORAGE AREA IS 2500 CUBIC FEET PER ACRE.
4. THE MAXIMUM EROSION CONTROL HEIGHT SHALL BE 1 FT.
5. THE LENGTH/WEIR RATIO MAY BE ADJUSTED TO MEET SITE CONDITIONS WHEN APPROVED BY THE ENGINEER.
6. WIDTH OF EROSION CONTROL SHALL BE EQUALLY EQUIVALENT TO THE WIDTH OF EROSION CONTROL.
7. SEDIMENT TRAP DESIGN SHALL BE APPROVED BY THE ENGINEER.

SECTION A-A

SECTION B-B

SEDIMENT TRAP

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<th>DRAINAGE AREA (ACRES)</th>
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<td>4</td>
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WEIR LENGTH TABLE

TEMPORARY EROSION CONTROL

STANDARD PLAN NO. M-208-1

Sheet No. 11 of 12
**GENERAL NOTES**

1. When a mailbox post is required, the necessary pay quantities will be shown on the plans.

2. Single mailboxes shall be set in the final designated location. Support for new type of single mailbox support, as designated in Table 1, shall be set on one double or two single supports, as designated in Table 2.

3. Mailbox support shall be set on a solid surface. If a concrete slab is utilized, it shall be at least 12 inches thick.

4. Mailbox supports shall be set in accordance with the manufacturer's instructions.

5. Mailbox supports shall be set in accordance with the manufacturer's instructions.

6. Exact dimensions of angle plates, shelf brackets, hanger, and other supply components shall be specified on the plans to provide a complete description of the mailboxes and support systems.

7. Mailbox supports shall be set in accordance with the manufacturer's instructions.

**TYPICAL MAILBOXES**

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</tr>
<tr>
<td>Double</td>
<td>24&quot;</td>
<td>18&quot;</td>
<td>24&quot;</td>
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**SINGLE (TYPE 1) AND DOUBLE (TYPE 2) MAILBOX SUPPORTS**

Platform Bracket

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<tr>
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Shelf Bracket

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<tr>
<td>Double</td>
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**MAILBOX SUPPORTS**

Sheet No. 1 of 2

**STANDARD PLAN NO. M-210-1**
DECIDUOUS AND EVERGREEN TREE PLANTING AND GUING DETAIL

GUYING PATTERN FOR DECIDUOUS TREE PLANTING

- Use only dead or damaged wood; do not prune
- Faces off branches
- 12 ga galvanized steel guy wire
- Attaches to 22 ga wire steel
- Tied off in place
- Do not plant evergreens
- Do not pull twist
- Place guy wire:
  - 2" above final grade
  - 2' below final grade
  - 2' above final grade
- Use pvc around wire to avoid damage
- Prevents animals from dropping over wire
- Use backfill in accordance with section 214

GUYING PATTERN FOR EVERGREEN TREE PLANTING

- Place guys 48" apart
- Face off branches
- 12 ga galvanized steel guy wire
- Attaches to 22 ga wire steel
- Tied off in place
- Do not plant deciduous
- Do not pull twist
- Place guy wire:
  - 2" above final grade
  - 2' below final grade
  - 2' above final grade
- Use pvc around wire to avoid damage
- Prevents animals from dropping over wire
- Use backfill in accordance with section 214

SHRUB PLANTING DETAIL

- Place shrubs 48" apart
- Face off branches
- 12 ga galvanized steel guy wire
- Attaches to 22 ga wire steel
- Tied off in place
- Do not plant deciduous
- Do not pull twist
- Place guy wire:
  - 2" above final grade
  - 2' below final grade
  - 2' above final grade
- Use pvc around wire to avoid damage
- Prevents animals from dropping over wire
- Use backfill in accordance with section 214

Plant shrubs at 48" above final grade and cover with soil until final grade is reached.
RAMP "A" DOWEL BAR DETAIL FOR DC JOINT WITH A 12 FT. LANE

RAMP "B" DOWEL BAR DETAIL FOR DC JOINT WITH CENTER LONGITUDINAL SPLIT LANE

MULTI-LANE WITH ACCELERATION AND DECELERATION LANES AND CONCRETE SHOULDERS

OPTIONAL LONGITUDINAL JOINT IN CENTER FOR SINGLE LANE ACCELERATION AND DECELERATION LANE
MULTI-LANE INTERSECTION WITH SPEED CHANGE LANE AND CONCRETE SHOULders

NOTES
1. LONGITUDINAL JOINTS SHALL BE PLACED ADJACENT TO LANE MARGINS WHERE POSSIBLE, AND HAVE MAXIMUM SPACING OF 10 FT. OR LESS, AND PERPENDICULAR TO CURB AND GUTTER.
2. CONSTRUCT TRANSVERSE JOINTS PERPENDICULAR TO THE CENTERLINE OF PAVEMENT AND EXTEND THROUGH THE CURB OR CURB AND GUTTER.
3. PLACE 1/2 IN. DRAINAGE JOINT IN THE 1/2 IN. CURB JOINT AT INTERSECTION RETAIN BARRIER POINTS.
4. THE CONTRACTOR SHALL USE CONCRETE JOINTS ON THE PLAN, SELECT AND USE A BOND BREAKER AT INTERSECTIONS AND CIRCULAR SITE STRUCTURES. SMALLER STRUCTURES SUCH AS VALVES AND MONUMENTS SHALL NOT REQUIRE A BOND BREAKER.
5. WHERE A LONGITUDINAL JOINT三個 1/2 FT. FROM A CUSHION-PAVEMENT OR CIRCULAR SITE STRUCTURE, IT IS RECOMMENDED TO USE A BOND BREAKER, AS SHOWN IN THE DETAILS.
6. TRANSVERSE JOINTS SHALL INTERSECT THE CENTER OF CIRCULAR MARGINS AND ENDS OR BE AT LEAST 4 FT. AWAY FROM THE EDGE OF CIRCULAR MARGINS. SEE CURB DETAIL BELL JOINT ON SHEET 5.

CONCRETE PAVEMENT JOINTS

STANDARD PLAN NO.
M-412-1

Issued By: Project Development Branch on July 4, 2012
Sheet No. 4 of 5
Table 1 - 6 in. x 2 in. Corrugations Round Steel Pipe

**Steel Pipe-Arch**

- Pipe-arch is provided for use where minimum cover requirements for round pipe cannot be met. Use round pipe when H exceeds 15 ft.

Table 2 - 6 in. x 2 in. Corrugations Round Steel Pipe

- H - Height of cover, layer maximum height in full over the top of the pipe to the bottom of the foundation. For H < 15 ft, use pipe-arch. For H > 15 ft, use round pipe.

Table 3 - 9 in. x 2 1/2 in. Corrugations Round Aluminum Pipe

**General Notes**

1. Pipe or pipe-arch with ribs cut to fit slope and deducted in accordance with accepted codes shall be permitted as shown in the plans.

2. Angle multiple pipes are used, they shall be spaced so that aggregate depth of the joints shall be at least 0.0625 diameters of the smallest pipe apart from center. Sufficient material exists that the clear distance between adjacent pipe shall not be less than 3 ft.

3. Minimum cover for structural plate pipe or pipe-arch is measured from the top of the pipe to the bottom of the foundation. In pipe or pipe-arch, the cover during construction shall be at least 3 ft.

**Table IV - 9 in. x 2 1/2 in. Corrugations Round Aluminum Pipe**

**Structural plate pipe H-20 loading**

**Standard Plan No.**

M-510-1

Sheet No. 1 of 1
## Single Concrete Box Culvert Dimensions & Quantities (Excluding Headwalls & Tiewalls)

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<th>NO.</th>
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### Headwall and Tiewall Quantities

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<th>Headwall/Skew Angle</th>
<th>0° to 30°</th>
<th>30° to 60°</th>
<th>60° to 90°</th>
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</tbody>
</table>

### Notes
1. Quantities are per linear foot of headwall for the headwall and tiewall and include all headwall and tiewall reinforcing steel quantities calculated per 1 ft strip. Sheet angle quantities include any cut or fill for as shown on the plan.
2. A skewed headwall is not recommended for these spans, a special design is required.
3. A skewed tiewall is not recommended for these spans, a special design is required.
4. When the full design is less than or equal to 2 ft 0 in., all reinforcing bars in the headwall are a minimum 1/2 in. diameter, and the # in the bars in the top row of the top slab shall be 3.75 in. centered.
5. Reinforcing quantities include both cut-out and uncut bars.
6. When an A R. is less than 6 ft 0 in., use the bar sizes and the slab and wall thicknesses for the 6 ft 0 in. bar size available in the table.
7. The size of A R. bars is 8 in. the number of bars required is listed.
## Double Concrete Box Culvert Dimensions & Quantities (Excluding Headwalls & Toewalls)

<table>
<thead>
<tr>
<th>Box Size</th>
<th># Head Walls</th>
<th>Head Wall</th>
<th>Toe Wall</th>
<th>Total Wall</th>
<th># Concrete</th>
<th>Total Concrete</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 ft</td>
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### Headwall & Toe Wall Quantities

<table>
<thead>
<tr>
<th>Span to S</th>
<th># Head</th>
<th># Toe</th>
<th>Total</th>
<th># Concrete</th>
<th>Total Concrete</th>
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<tbody>
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<td>2.0</td>
</tr>
</tbody>
</table>

### Notes
1. Quantities are per linear foot of headwall for one headwall and toe wall and include all headwall and toe wall reinforcing steel quantity. Included was calculated per ft cut edge hole. These quantities shall be bid for as shown on the plans.

2. A stepped headwall is not recommended for these spans; a special design is required.

3. For headwall and toe wall details see sheet 1.

4. When the fill height is less than or equal to 2 ft, the all reinforcing bars in the headwall and toe wall reinforcing bars designated by an asterisk (*) in the table in the top row for the top slab shall be entry column.

5. Reinforcing quantities include both epoxy-coated and uncoated bars.

6. When any of these less than 2 ft is required, use the top slab and toe slab and wall thickness for the 2 ft fill size available on the table.

7. The size of all bars is 1/4 in. The number of bars required is listed.
### Headwall and Toe Wall Quantities

<table>
<thead>
<tr>
<th>Headwall Slope Angle</th>
<th>60° to 75°</th>
<th>75° to 90°</th>
<th>90° to 120°</th>
<th>120° to 150°</th>
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<tbody>
<tr>
<td>FT</td>
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<td>100/LF</td>
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</table>

**Concrete Quantity:** 0.009 Cu Yd/100 LF

### Notes
1. Quantities are per linear foot of headwall for one headwall and toe wall and exclude all headwall and toe wall reinforcement steel quantity included and calculated per 1 ft. Headwall slope angle vary. Quantities shall be paid for as shown on the plan.
2. A Dover headwall is not recommended for these spans; a special design is required.
3. For headwall and toe wall details see sheet 2.
4. When full height is less than or equal to 2 ft-0 in., all reinforcing bars in the headwall are required. The area and the number of bars required for the 2 ft-0 in. headwall shall be determined.
5. Reinforcing quantities include both deformed and un-deformed bars.
6. When an area less than 4 ft-0 in. is required, select the bar sizes and the slab and wall thicknesses for the 4 ft-0 in. size available on the table.
7. The size of any bars in the number of bars required is listed.
### General Notes
1. Concrete shall be Class C.
2. Exposed concrete corners shall be chamfered at 45°.
3. If a precast headwall is used, a temporary centering shall be approved by the Engineer. The headwall shall be placed between pipe and headwall.
4. Headwall shall be perpendicular to the centerline of the pipe. Otherwise specified, headwall dimensions and quantities shall be adjusted for field installations.
5. Headwall anchor bolts shall be continuous from anchors to strut and shall be included in the cost of pipe.
6. Headwall anchor bolts shall be used only with flexible pipe, both round and oval.

### Flexible Single Pipe

- **Ba** = Length
- **Lm** = Length

### Flexible Double Pipe

- **Ba** = Length
- **Lm** = Length

### Rigid Single Pipe

- **Ba** = Length
- **Lm** = Length

### Rigid Double Pipe

- **Ba** = Length
- **Lm** = Length

### Headwall for Metal Pipe Arch (MPA)

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<th>Dia</th>
<th>HCP</th>
<th>Ba</th>
<th>Bc</th>
<th>k</th>
<th>Lm</th>
<th>Lc</th>
<th>B</th>
<th>Tm</th>
<th>Tc</th>
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### Headwall for Round Pipe

- **Ba** = Length
- **Lm** = Length

### Type "S" Saddle Headwalls for Pipe

- **Ba** = Length
- **Lm** = Length

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### TYPICAL GALVANIZED ANCHOR BOLTS

- **Ba** = Length
- **Lm** = Length

### Computer File Information

- Creation Date: 07/24/03
- Last Modification Date: 07/30/03
- Project Development Branch: DD/LTA
- Project: Colorado Department of Transportation
- Location: Denver, Colorado
- Phone: (303) 757-8920
- Issued: 07/30/03
- Sheet No: 1 of 1

### Standard Plan No.

- M-601-11
GENERAL NOTES
1. FOR SITE AND LOCATION OF PIPES, SEE THE PLANS.
2. ALL CONCRETE SHALL BE CLASS B.
3. RODS IN ROCK SHALL BE PLACED WITH 1" OF WASTE OR BARE AND
   NOT FORMED IN ACCORDANCE WITH SPECIFICATION (COLUMN).
4. EXPOSED ALUMINUM COVERS SHALL BE CHARGED TO C.
5. HEADWALL SHALL HAVE RODS RECEIVING STEEL PLACED IN
   PATTERN SIMILAR TO STANDARD PLAN M-501-12.
6. THE COST OF RECEIVING STEEL SHALL BE DETERMINED BY
   THE CONTRACTOR, THE STEEL CARRIERS FOR THE
   PURPOSE OF THE PLAN AND ARE MADE FOR THE
   PURPOSE OF THE PLAN.

CONCRETE HEADWALL INSTALLATIONS
SEE STANDARD PLAN M-501-12 FOR RECEIVING DETAILS.

<table>
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<tr>
<th>PIPE TYPE</th>
<th>MATERIAL</th>
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CONCRETE QUANTITIES FOR ONE CONCRETE HEADWALL (CUBIC YARDS)

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<td>264</td>
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PIPE OUTLET PAVING (CUBIC YARDS)
NOTE: VOLUME OCCUPIED BY PIPE HAS BEEN RECALCULATED.

A = PIPE DIAMETER (INCH)
H = H = 3" (IN)
W = 3D x 2.5 (IN)
T = 0.4H (IN)
B = 0.6D (IN)
L = W + B

TYPE OF PIPE | HEADWALL DIMENSIONS
CIRCULAR D = EQUIVALENT CIRCULAR DIAMETER (INCHES)
ARCH OR ELLIPTICAL L = HEADING (IN)

HEADWALLS AND PIPE OUTLET PAVING

STANDARD PLAN NO.
M-601-12

Sheet No. 1 of 1
### 1-1/2" X 1/4" ROUND CORRUGATED STEEL ROUND PIPE

<table>
<thead>
<tr>
<th>DIAMETER (IN.)</th>
<th>LOWEST COVER (IN.)</th>
<th>PIPE GAGE</th>
<th>MAXIMUM HEIGHT OF COVER (FT.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
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### 2-2/3" X 1/2" ROUND CORRUGATED STEEL PIPE

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<th>DIAMETER (IN.)</th>
<th>LOWEST COVER (IN.)</th>
<th>PIPE GAGE</th>
<th>MAXIMUM HEIGHT OF COVER (FT.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
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<tr>
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### 3" X 1" ROUND CORRUGATED STEEL ROUND PIPE

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<thead>
<tr>
<th>DIAMETER (IN.)</th>
<th>LOWEST COVER (IN.)</th>
<th>PIPE GAGE</th>
<th>MAXIMUM HEIGHT OF COVER (FT.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
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</table>

<table>
<thead>
<tr>
<th>SPAN (IN. X FT)</th>
<th>LOWEST COVER (IN.)</th>
<th>PIPE GAGE</th>
<th>MAXIMUM HEIGHT OF COVER (FT.)</th>
</tr>
</thead>
<tbody>
<tr>
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</table>

### 2-2/3" X 1/2" ROUND CORRUGATED STEEL PIPE ARCH*

<table>
<thead>
<tr>
<th>SPAN (IN. X FT)</th>
<th>LOWEST COVER (IN.)</th>
<th>PIPE GAGE</th>
<th>MAXIMUM COVER (FT.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 X 12</td>
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<td>12</td>
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</tr>
<tr>
<td>14 X 14</td>
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</table>

### 3" X 1" ROUND CORRUGATED STEEL PIPE ARCH*

<table>
<thead>
<tr>
<th>SPAN (IN. X FT)</th>
<th>LOWEST COVER (IN.)</th>
<th>PIPE GAGE</th>
<th>MAXIMUM COVER (FT.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 X 12</td>
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* Corner bearing pressure of 2 tons per sq ft.
### 2-2/3" x 1/2" Round Corrugated Aluminum Round Pipe

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<th>Diameter (In)</th>
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### 3/4" x 3/4" 7-1/2 Round Corrugated Aluminum Pipe

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### 3" x 1" Round Corrugated Aluminum Pipe Arch

**Corner Bearing Pressure of 2 Tons Per 50 Ft.**

### 2-2/3" x 1/2" Round Corrugated Aluminum Pipe Arch

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### 3/4" x 3/4" 7-1/2 Round Corrugated Aluminum Pipe Arch

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<th>Round Equivalent (In)</th>
<th>Minimum Cover (In)</th>
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**Computer File Information**

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**Colorado Department of Transportation**

4200 E. Arapahoe Avenue
Denver, Colorado 80222
Phone (303) 757-6060
Fax (303) 757-9820

**Project Development Branch**

DD/LTA

**STANDARD PLAN NO.**

M-603-1

**Sheet No.**

4 of 4

**Issued By:** Project Development Branch on July 4, 2012
REINFORCED CONCRETE PIPE

GENERAL NOTES

1. SPAN COVER SHALL BE PROVIDED TO PROTECT THE REINFORCED CONCRETE PIPE INSTALLATION FROM THE DATE OF THE CONSTRUCTION TO THE DATE OF THE LAST USE.

2. SPAN COVER SHALL BE PROVIDED TO PROTECT THE REINFORCED CONCRETE PIPE INSTALLATION FROM THE DATE OF THE CONSTRUCTION TO THE DATE OF THE LAST USE.

3. SPAN COVER SHALL BE PROVIDED TO PROTECT THE REINFORCED CONCRETE PIPE INSTALLATION FROM THE DATE OF THE CONSTRUCTION TO THE DATE OF THE LAST USE.

4. SPAN COVER SHALL BE PROVIDED TO PROTECT THE REINFORCED CONCRETE PIPE INSTALLATION FROM THE DATE OF THE CONSTRUCTION TO THE DATE OF THE LAST USE.

5. SPAN COVER SHALL BE PROVIDED TO PROTECT THE REINFORCED CONCRETE PIPE INSTALLATION FROM THE DATE OF THE CONSTRUCTION TO THE DATE OF THE LAST USE.

6. SPAN COVER SHALL BE PROVIDED TO PROTECT THE REINFORCED CONCRETE PIPE INSTALLATION FROM THE DATE OF THE CONSTRUCTION TO THE DATE OF THE LAST USE.

7. SPAN COVER SHALL BE PROVIDED TO PROTECT THE REINFORCED CONCRETE PIPE INSTALLATION FROM THE DATE OF THE CONSTRUCTION TO THE DATE OF THE LAST USE.

8. SPAN COVER SHALL BE PROVIDED TO PROTECT THE REINFORCED CONCRETE PIPE INSTALLATION FROM THE DATE OF THE CONSTRUCTION TO THE DATE OF THE LAST USE.

9. SPAN COVER SHALL BE PROVIDED TO PROTECT THE REINFORCED CONCRETE PIPE INSTALLATION FROM THE DATE OF THE CONSTRUCTION TO THE DATE OF THE LAST USE.

10. SPAN COVER SHALL BE PROVIDED TO PROTECT THE REINFORCED CONCRETE PIPE INSTALLATION FROM THE DATE OF THE CONSTRUCTION TO THE DATE OF THE LAST USE.

REINFORCED CONCRETE PIPE

DIMENSIONS FOR REINFORCED CONCRETE PIPE

H = MAXIMUM SPAN FOR MAXIMUM ALLOWABLE SPAN LENGTH.
L1 = LENGTH OF SPAN FOR MAXIMUM ALLOWABLE SPAN LENGTH.
L2 = SPAN FOR MAXIMUM ALLOWABLE SPAN LENGTH.

MINIMUM COVER FOR RIGID PIPE

WIDTH OF FILL

HEIGHT OF FILL OVER TOP OF PIPE, FT

ALLOWABLE RANGE OF HEIGHTS FOR FILL OVER REINFORCED CONCRETE PIPE

(ALL SIZES)
T-BASE MANHOLES NOTES

1. The T-base section shall be shop-fabricated for delivery to the construction site as a complete unit.

2. These details show only the conceptual and structural dimensional requirements for the T-base manholes. The contractor shall furnish detailed shop drawings for approval prior to fabrication. The details shown herein apply only to 48" and greater diameter pipes.

3. Except for class of pipe, specifications for the manhole shall be the same as those specified for the adjoining pipe.

4. The T-base section shall maintain its internal shape and flow area, grading or paving shall be applied so as to not disturb the normal flow or reduce the area.

SECTION F-F

ADJUST MANHOLE 20 IN. OR LESS

CONCRETE COLLAR OR FULL DEPTH MANHOLE SHALL BE IN ACCORDANCE WITH SECTIONS 403 OR 412

BRICK COURSES
2" MIN. A MAX. OF PRECAST CONCRETE GRADE RINGS OR ADJUSTABLE METAL RINGS

MORTAR THICKNESS MAY BE NONCONFORMAL TO WATCH CROSS SLOPE OF ROADWAY.

MORTAR

MAX PAVEMENT

SECTION F-F

MODIFY MANHOLE GREATER THAN 20 IN.

CONCRETE COLLAR OR FULL DEPTH MANHOLE

BRICK COURSES
2" MIN. A MAX. OF PRECAST CONCRETE GRADE RINGS

MAX PAVEMENT

PRECAST REINFORCED CONCRETE SEGMENT WILL NOT BE MEASURED AND PAID FOR SEPARATELY, BUT SHALL BE INCLUDED IN THE WORK.

CIRCULAR RIGID PIPE

LONGITUDINAL SECTION

MANHOLE T-BASE

CIRCULAR RIGID PIPE

TRANSVERSE SECTION

STANDARD PLAN NO.

M-604-20

MANHOLES

Issued By: Project Development Branch July 4, 2023

Computer File Information

Creation Date: 07/24/12
Last Modification Date: 07/04/12
Drawing File Name: 6043200333.dgn

Sheet Revisions

Date

07/24/12

Comments

Initial: DD

07/04/12

Initial: DD
GENERAL NOTES
1. FOR THE 30 INCH AND 35 INCH INSIDE DIAMETER INLETS, THE ALLOWABLE TIE ROD IS 12 INCHES OR LESS FOR THE 30 INCH INSIDE DIAMETER INLET, THE ALLOWABLE TIE ROD IS 16 INCHES OR LESS, OR A MAXIMUM OF 36 INCHES FOR A 35 INCH INLET.
2. ALL CONCRETE SHALL BE CLASS B.
3. INLET MAY BE CAST-IN-PLACE OR PRECAST.
4. REINFORCING BARS SHALL BE 8D UNLESS SHOWN OTHERWISE.
5. ALL REINFORCING BARS SHALL BE GRAY 40 AND ENSURE CORROSION REINFORCING BARS SHALL HAVE A MINIMUM CLEARANCE OF 1/2 IN.
6. ALL EDGE DISTANCES NOT MARKED "CLEAN" ARE TO THE CENTERLINE OF THE BARS.
7. CUT OFF REINFORCING BARS AROUND PIPES AS REQUIRED.
8. STEPS SHALL BE REQUIRED WHEN THE INLET DEPTH "W" IS EQUAL TO OR GREATER THAN 4 FT, AND SHALL BE CORRECT TO A DEPTH OF 6 FT.
9. THE SKIRT OF THE BOX SHALL BE SLIPPER TO ENSURE.
11. A 9 IN. RADIUS STAINLESS STEEL MALLEABLE WITH NO CAPPING BRANDING TO STAMP LETTERS WHERE THERE ARE PIPES, SHALL BE ATTACHED TO TOP OF THE SKEET BOX TO INDICATE THE DIRECTION OF FLOW. THE STAMPED ARROWS SHALL BE 3/8 IN. IN DIAMETER AND 3/8 IN. DEEP FOR PIPES.
12. CONCRETE SURFACE OR SURROUNDING CONCRETE Areas NO DRAINAGE MESSAGE SHALL BE ELIMINATED FOR INLETS LOCATED WITHIN THE LIMITS OF CONTROLLED ACCESSeways AS SPECIFIED IN THE PLANS.

LEGEND

\[ \text{GRAVE TO BE INSTALLED DURING CONSTRUCTION OF THE INLET WITH THE VANE GRAVE INSTALLED IN PLACE TO THE FRAME.} \]

\[ \text{TO FACILATE REMOVAL OF THE GRAVE PLACE FLAT} \]

\[ \text{3 IN, 5\% IN, AND A 6 IN, IN THE EDGE OF GRAVE AS SHOWN} \]

\[ \text{FLOW ARROW STAMP IN DIRECTION OF FLOW (TOP).} \]

\[ \text{FLOOW} \]

\[ \text{PLAN} \]

\[ \text{SECTION A-A} \]

\[ \text{SECTION B-B} \]
NOTES

1. The end anchorage nonflared shall either be the E-plus or manufactured by
   Thustry Industries Inc. (TEL: 505-644-9700) or the SPT guardrail as manufactured
   by EPS Systems Inc. (Tel: 916-542-2483). The end anchorage nonflared shall
   include all post,ural, and hardware items required for a complete unit. The end
   anchorage nonflared shall be installed conforming to the manufacturer's
   recommendations. The contractor shall provide a copy of the manufacturer's
   installation instructions and parts list to the engineer prior to the installation
   of the device.

2. Nodo posts shall be drilled for rebarary conforming to the manufacturer's instructions.

3. Rebar break away steel posts may be used conforming to the manufacturer's instructions.

4. Fender-ripler bars shall not be used on the last seven posts of the end anchorage nonflared.

5. Use manufacturer's specified steel foundation tube for posts 1 and 2 for E-plus
   and SPM end anchorage nonflared.

6. Driveways shall be applied to the end piece and shall not be paid for separately but
   shall be included in the cost of the work. See Standard Plan S-62-02.

---

END ANCHORAGE (NONFLARED)
1. THE MEDIAN TERMINAL SHALL BE THE CAT 300 AS MANUFACTURED BY TERRY INDUSTRIES, INC., P.O. BOX 29445, RC 2400, OF THE MANUFACTURER AS MANUFACTURED BY ENSIGN SAFETY SYSTEMS, INC., AT 8200 E 10TH STREET, CUYAHOGA FALLS, OH 44223.

2. THE MEDIAN TERMINAL SHALL INCLUDE ALL POSTS, RAILS, AND HARDWARE ITEMS REQUIRED FOR A COMPLETE UNIT. THE CUSHION SHAL BE INSTALLED IN CONFORMANCE WITH THE MANUFACTURER'S INSTRUCTIONS. THE CONTRACTOR SHALL PROVIDE A COPY OF THE MANUFACTURER'S INSTALLATION INSTRUCTIONS AND PARTS LIST TO THE ENGINEER PRIOR TO THE INSTALLATION OF THE DEVICE.

3. UNLESS OTHERWISE SPECIFIED ON THE PLANS, THE MEDIAN TERMINAL SHALL BE INSTALLED FOR HORIZONTAL TRAFFIC APPLICATION.

4. MEDIAN GUARDRAIL POSTS MAY BE STEEL OR WOOD.

5. EACH INSTALLATION SHALL BE SUPERVISED AND CERTIFIED BY A REPRESENTATIVE OF THE DEVICE MANUFACTURER OR BY AN EMPLOYEE OF THE CONTRACTOR WHO IS A CERTIFIED INSTALLER. THE CERTIFIED INSTALLER SHALL COMPLETE PRE-INSTALLATION OBSERVATIONS AND SHALL BE CERTIFIED BY THE MANUFACTURER AS A CERTIFIED INSTALLER.


---

**GUARDRAIL TYPE 3**

**W-BEAM**

---

**STANDARD PLAN NO.**

M-606-1

Sheets: No. 9 of 19

Issued By: Project Development Branch July 4, 2012
GUARDRAIL FOR OBSTRUCTION IN MEDIANS WIDER THAN 30 FT.
NOTE: FOR OBSTRUCTIONS 30 FT. WIDER THAN 30 FT IN MEDIANS SEE SHEET 30.

GUARDRAIL TYPE 3
W-BEAM

STANDARD PLAN NO. M-606-1

Sheet No. 13 of 19
NOTES:

1. MEDIAN GUARDRAILS ADJACENT TO THE EMBANKMENT MAY BE USED WHERE THE SHOULDER SLIPPS IN THE MEDIAN ARE STEEP.

2. GUARDRAIL LENGTHS SHALL BE INCREASED TO ACCOUNT FOR STEEP EMBANKMENTS OR OTHER HAZARDS WITHIN CLOSE PROXIMITY TO HAZARDS.

\( \theta \) = DO NOT CONSTRUCT THE \( W \) AND GUARDRAIL ON THE PLAIN BEHIND THE OR SHORTER LENGTH OF MEDIAN GUARDRAIL.

\( N \) = DRAWN ON PLAIN LENGTH TO SHORTEN ALL GUARDRAILS TO THE LENGTH OF MEDIAN GUARDRAIL. LENGTH OF MEDIAN GUARDRAIL SHOULD BE\

**Total Length of Median Guardrail Will Include the Length of Transition, the Length of Rail, and Any Protective Length in the Fail End Treatment.**

\( W \) = \( \theta \) FT IN 50 FT FOR 35 AND 50.

\( A \) = EDGE OF 5 FT OR 10 FT SHOULDER.

\( B \) = EDGE OF 6 FT OR LESS SHOULDER.

\( * \) = THE INCREASE CAN BE PLACED OF NONPLANT.

MULTILANE DIVIDED HIGHWAYS FOR STEEP EMBANKMENTS IN MEDIAN

**GUARDRAIL TYPE 3 W-BEAM**

STANDARD PLAN NO. M-606-1

Sheet No. 14 of 19
NOTES
1. GUARDRAIL TRANSITIONS FROM PARALLEL TO HIGHWAYShould Be
   SLOPED TO 15° TAPER WITHIN 25'-0" BASED ON POST OFFSET
   DIMENSIONS SHOWN.
2. THE OPTION 1 LAYOUT SHALL BE USED WHEN **3** FEET OR
   LESS WHICH IS THE MINIMUM LENGTH OF MedIAN.
3. THE OPTION 2 LAYOUT SHALL BE USED WHEN **15** FEET OR
   LESS WHICH IS THE MINIMUM LENGTH OF MedIAN.
4. SEE SHEET 14 FOR RIGHT SHOULDER GUARDRAIL LAYOUT.

MULTILINE DIVIDED HIGHWAYS - (DEPRESSED MEDIANS, 21 - 59 FT. WITH OPEN HAZARDS OR OBSTRUCTIONS)
1. For one omitted post in the guardrail run, use a pipe collar with a minimum cover of 900 mm (36 in.) to the nearest side of the gap. The pipe collar shall be extended a minimum of 6 mm (0.25 in.) on either side of the gap. Using 12 ft-3 ft-6 in sections of rail, and depending on the splice location, one omitted post section requires either 25 ft or 37 ft - 6 in. of guardrail.

2. For two or three omitted posts, see the NESTED RAIL AT TWO OR THREE OMITTED POSTS section for the 25 ft-37 ft -6 in. section of guardrail.

3. The guardrail may be placed to facilitate constructability; however, only one rail splice may be placed in the omitted posts section, and only at the midpoint of the 25 ft length.

4. Post(s) required when two or more posts are omitted for the 18 ft-6 in. length.

5. Only timber posts and blocks are allowed for omitted posts 5 through 10.

NESTED RAIL AT TWO OR THREE OMITTED POSTS

NESTED RAIL AT ONE OMITTED POST

GUARDRAIL TYPE 3 W-BEAM

STANDARD PLAN NO. M-606-1

Sheet No. 18 of 19
NOTES

1. SEE SHEET 1 FOR REINFORCEMENT AND OTHER DETAILS NOT SHOWN HERE.

2. PINS SHALL BE HOT-DIPPED GALVANIZED AFTER FABRICATION.

3. FOR TYPICAL INSTALLATION OF PERMANENT INSTALLATION OF PRECAST TYPE 7 CONCRETE BARRIERS, SEE THE END ANCHORAGE DETAIL IN STANDARD PLAN M-606-C, SHEET 1.

4. AN OPTIONAL 3 IN. DIAMETER TAPERED END PIN MAY BE PROVIDED IN THE STABILIZATION PIN TO FACILITATE DRIVING.

ROAD SURFACE PIN LENGTH
CONCRETE 2 FT-6 IN.
MA 3 FT
SOIL 3 FT-6 IN.

ELEVATION VIEW WITH PINS

STABILIZATION PIN
(1.00 X 35 STEEL)

FORM HOLE FOR PIN WITH 2 3/4 IN. STRAIGHT PIPE (SHOULD BE LEFT IN PLACE)

STABILIZATION PIN THROUGH SURFACING INTO SUBGRADE FOR CONCRETE PAVEMENT. USE 2 PINS FOR EACH END, EACH DEPTH

FILL RECESS WITH GROUT AFTER PLACING PIN

STABILIZATION PIN

PLAN VIEW OF S BAR ENDS

1 1/2 IN. BAR AT EACH END

PROJECT DEVELOPMENT BRANCH
DD/LTA

DETAILS FOR STABILIZATION OF PERMANENT OR TEMPORARY PINNED PRECAST TYPE 7 CONCRETE BARRIER

STANDARD PLAN NO.
M-606-14

Sheet No. 3 of 3
### Ordinary Pipe

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<th>Full Circum.</th>
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<th>Weight (LB)</th>
<th>Length (FT)</th>
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<th>Wall Thickness</th>
<th>Weight (LB)</th>
<th>Length (FT)</th>
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### Roll-Formed Steel

- **Part:**
  - **Pipe:** 4.50 x 3.00
  - **Corner:** 4.50 x 3.00
  - **Line:** 4.50 x 3.00

### Gate Material

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**.chain link fence**

**STANDARD PLAN NO.**

**M-607-2**

**Sheet No. 2 of 3**
NOTES
1. LOCATIONS OF DEER FENCE IN THE CLEAR ZONE SHALL BE SHOWN IN THE PLANS. 
2. POSTS WITHIN THE CLEAR ZONE SHALL BE RIVETED. 
3. DRILL HOLES PERPENDICULAR TO THE ROADWAY. 
4. VIEW BRACE SHALL BE OMITTED FROM ANY END POST OR CORNER POST WITHIN THE CLEAR ZONE.

MODIFIED FOR PLACEMENT WITHIN ROADWAY CLEAR ZONE

END POST AND CORNER POST

SIDE VIEW

SIDE VIEW

5 IN. LINE POST

DEER FENCE AND GATES

STANDARD PLAN NO. M-607-4

Sheet No. 3 of 3

Issued By: Project Development Branch July 4, 2022

PROJECT DEVELOPMENT BRANCH DD/LTA

COLORADO DEPARTMENT OF TRANSPORTATION

765 EAST ARKANSAS AVE
DENVER, COLORADO 80222
PHONE: 303-757-0683
FAX: 303-757-3920
GENERAL NOTES

1. SPIALIZED PICKET FENCE CONTINUING TO 42" ENDS MAY BE SECURED TO THE FENCE AT 1" VERTICAL INTERVALS WITH 8 GAUGE GALVANIZED STEEL WIRE CLAMPS OR 1/4" GALVANIZED STEEL NAIL TIES.

2. PICKET POSTS COMPLETE WITH ANCHOR PLATE SHALL BE MINIMUM 1/4" THICK TO ADAPT TO 4-1/2" LINE POSTS WITHOUT ACCOMMODATION OF ANY POSTS. HOLES SHOULD BE AT LEAST 1-1/2" (LEFT) FOR HOLES IN ANCHOR PLATE. HOLES IN ANCHOR PLATE SHALL BE SECURELY FASTENED TO EACH LINE POST AND SHALL BE SECURELY fastened to each line post and shall be secure

3. IN GENERAL, PICKET FENCE SHALL BE PLACED TO ONTO THE DRIVER'S SIDE OF THE CENTERLINE. HOWEVER, THE SPECIFIC LOCATION ON EACH PROJECT WILL BE DETERMINED BY A ENGINEER.


5. PICKET POSTS SHALL BE SECURELY FASTENED AT EACH END PANEL WITH A REGULAR LINE POST AND A MINIMUM, WITH A DRY WALLING AT LEAST 8 GAUGE GALVANIZED STEEL WIRE CLAMPED OR TIED TO THE BASE OF THE PICKET POSTS.

6. LINE POSTS SHALL BE INSTALLED EVERY 48" ON CENTER, WHERE THE CENTERLINE IS CONTINUAL AND SHALL NOT BE PAIRED MOUTH TO MOUTH.

7. TWO HORIZONTAL WIRE (G) SHALL BE STAYED BEHIND THE PICKET FOR THE FULL LENGTH OF THE FENCE. EACH HORIZONTAL WIRE SHALL BE SECURED TO THE PICKETS. EACH HORIZONTAL WIRE SHALL BE SECURELY TIED TO EACH PICKET POST IN ANY GAUGE WIRE CLAMPS OR TIES.}

TYPICAL SECTIONS THROUGH SNOW FENCE POST AND PICKETS

NOTE: OTHER SECTIONS OF STEEL POSTS HAVING EQUAL INTERVALS AND EQUIVALENT STRENGTHS MAY BE USED IN LIEU OF EITHER OF THESE SECTIONS SHOWN.
GENERAL NOTES

1. Steel light standards shall have an 8 in outside diameter at the base with a 1 in. high friction wall thickness. A 3 1/2 in. wide reflective strip shall be bonded to the outside of the lamp socket. Any other type of reflector light standards shall be sized of twelve or more steel, and fabricated in accordance with Sections 453 and 725.

2. A certificate of compliance (CO) shall be submitted to the engineer after fabrication of the light standards. The CO shall be submitted in accordance with subsection 12100.

3. The gate arm shall be fabricated from high-strength rectangular fiberglass-reinforced plastics (FRP) or composite rectangular aluminum tubing. The maximum arm length shall be 45 ft. The fiberglass-reinforced plastics arm shall be supplied by Safeguard, and electronically, or an approved equivalent.

4. The contractor shall survey the cross section of the roadway, determine each gate arm location and submit the information to the engineer. The engineer shall inspect and approve the location of the gate arms and post the intersection map of the gate arms. Each gate arm shall be verified by the contractor and submitted to the engineer.

5. A back-up sheet for future use is required for the lighted high-intensity light standards. The arm and the high-intensity light standards shall be fabricated at a height of 50 ft. The arm shall be fabricated at a height of 45 ft. The arm shall be fabricated at a height of 40 ft.

6. The height of the gate arms shall be determined for a 20 ft. tall traffic light standard with a base diameter of 8 in. and a top diameter of 12 in. A locating light standard, having the height of the gate arm, shall be fabricated at a height of 45 ft. from the bottom of the arm to the roadway.

7. The gate arm which is fabricated at a height of 50 ft. shall be fabricated at a height of 40 ft. The gate arm shall be fabricated at a height of 30 ft. from the bottom of the arm to the roadway.

8. When the gate is fully raised, the nut and washer shall fit snugly against the outside of the head. The maximum arm shall be fabricated at a height of 50 ft. The head shall be fabricated at a height of 45 ft. The head shall be fabricated at a height of 40 ft. The head shall be fabricated at a height of 30 ft. from the bottom of the arm to the roadway.

9. Electrical connection to the power source shown on the plans shall be provided by power company. If no power source is available, one or more solar panels shall be installed for the energy requirements. The energy requirements shall be provided by the engineer and solar panels shall be sized as approved by the engineer.

10. The gate arm shall be fabricated from high-intensity light standards. The arm shall be fabricated at a height of 50 ft. The arm shall be fabricated at a height of 45 ft. The arm shall be fabricated at a height of 40 ft. The arm shall be fabricated at a height of 30 ft. from the bottom of the arm to the roadway.

11. The gate arm shall be fabricated from high-intensity light standards. The arm shall be fabricated at a height of 50 ft. The arm shall be fabricated at a height of 45 ft. The arm shall be fabricated at a height of 40 ft. The arm shall be fabricated at a height of 30 ft. from the bottom of the arm to the roadway.

12. The gate arm shall be fabricated from high-intensity light standards. The arm shall be fabricated at a height of 50 ft. The arm shall be fabricated at a height of 45 ft. The arm shall be fabricated at a height of 40 ft. The arm shall be fabricated at a height of 30 ft. from the bottom of the arm to the roadway.

13. The gate arm shall be fabricated from high-intensity light standards. The arm shall be fabricated at a height of 50 ft. The arm shall be fabricated at a height of 45 ft. The arm shall be fabricated at a height of 40 ft. The arm shall be fabricated at a height of 30 ft. from the bottom of the arm to the roadway.
HIGH WIND STOWING PROCEDURE

If arm cannot be brought back to the upright position because of high winds, the following procedure can be used:
1. With arm in down position, remove two 3/8" x 3/4" eye bolts from shear pin base (see the shear pin base detail).
2. Swing arm using the 5/8" x 8" I-beam bolt as a pivot.
3. Swing arm clear of roadway, and secure to a cleat or cleat post.
4. Reset arm to upright position when weather permits.

Note: See details below.

GATE ARM PROFILE

DETAILED FOR HIGH WIND STOW POSITION

DETAILED TO SECURE GATE IN HIGH WIND

ROAD CLOSURE GATE

STANDARD PLAN NO.
M-607-15
Sheet No. 8 of 9
**NOTES**

1. **PILE BASE PLATE** shall conform to ASTM A 572, Grade 42.
2. **Bottom plate of slip base assembly** shall conform to ASTM A 572, Grade 50.
3. **All structural steel shall be galvanized after fabrication**
   in accordance with ASTM A 533. All contact areas of the structural steel shall be free of galvanizing heads
   and rings.
4. **Slip base connecting hardware shall conform to**
   ASTM A 572, and shall be electroplated chromate in accordance with ASTM B 776 Type NS.
5. **Keeper plate shall conform to** ASTM A 572, Grade 50, and coating is NS.

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**LIGHT STANDARD BASE PLATE**

**28 GRADE KEEPER PLATE**

**SLIP BASE ASSEMBLY**

**BREAK-AWAY BASE**

(FOR INFORMATION ONLY)

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**OPTIONAL BREAK-AWAY TYPE BASE**

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**ROAD CLOSURE GATE**

STANDARD PLAN NO. M-607-15

Sheet No. 9 of 9
GENERAL NOTES
1. The detectable warnings shall be installed at 9 in. to 15 in. intervals. They shall have a textured or braille surface. The cones shall be 4 in. in a square grid pattern.
2. All detectable warning areas shall start a minimum of 4 ft from the edge line of the curb and not more than a maximum of 6 ft from any point on the edge line of the curb. All detectable warning areas shall be 2 ft in length and cover the complete width of the ramp area only.
3. Curbs shall be 2 1/2 in. or 3 in. thick. The detectable warning cones shall be 2 in. or 3 in. thick.
4. Minimum sidewalk width is 4 ft.
5. Do not install drainage structures, traffic signal equipment, pavement finishing machines, or other obstructions in front of the ramp access area.
6. Construction of the concrete curb adjacent to the ramp area shall be included in the bid price of the concrete curb ramp.
7. Detectable warnings shall meet Section 750 of the VDOS standards for transportation facilities.
PARALLEL SIDEWALK RAMP

SECTION A-A

TOP OF PAVEMENT
6" NON-SLIP CURB

- 10" INCLINED CURB
- 4" WIDE MONOLITHIC CURB
- BALLASTED SURFACE

+ INCREASES TO 10" FOR DEER PATHS.

PEDESTRIAN ACCESS RAMP WITHIN SIDEWALK

SECTION B-B

TOP OF PAVEMENT
6" WIDE MONOLITHIC CURB

- 6" WIDE MONOLITHIC CURB
- BALLASTED SURFACE

+ INCREASES TO 6" FOR DEER PATHS.

PERPENDICULAR PEDESTRIAN RAMP WITHIN SIDEWALK

SECTION C-C

TOP OF PAVEMENT
6" WIDE MONOLITHIC CURB

- 6" WIDE MONOLITHIC CURB
- BALLASTED SURFACE

+ INCREASES TO 6" FOR DEER PATHS.

NOTES
1. PERPENDICULAR AND PARALLEL PEDESTRIAN RAMPS SHOWN ON THIS DRAWING ARE ACCEPTABLE FOR USE AT 45°-DEGREE INSTALLATIONS.
2. SITE CONDITIONS WILL VARY CONSIDERABLY. RAMP LAYOUTS AND TRANSITIONS MAY BE CHANGED BUT THEY MUST MEET THE DIMENSIONS AND SPECIFICATIONS SHOWN HERE. THE USE OF PLANTERS, CURBWALLS, ETC. ARE AT THE DISCRETION OF THE CONTRACTOR.
3. PROVIDE DETECTABLE WARNING SURFACE FOR FULL WIDTH OF CURB Cut See Plan View of Detectable Warning Surface Details on Sheet 5 for Detectable Warning Surface Dimensions.
4. LOCATE CURB CUT WAY FROM CURB RAMP.
5. RAMPS SHOWN MUST BE PERPENDICULAR TO THE RAMP SLOPE.
DETAIL FOR TYPES 1 AND 3 CURB RAMPS
A PERMANENT JOINT WITH PROBABLE DEFORMATION NO. 4 BY 55 IN BARS
CONTINUOUS TO 1/4" AT 36 IN SPACING.

SIDE CROSS SECTION VIEW OF DETECTABLE WARNING, CURB, AND GUTTER

DETAIL FOR TYPE 2 CURB RAMP

PLAN VIEW OF DETECTABLE WARNING

ELEVATION VIEW OF DETECTABLE WARNING PLATE

FRONT SECTION VIEW OF DETECTABLE WARNING, CURB, AND GUTTER

CURB RAMP WITH A TRUNCATED DOME SURFACE PLATE
**DETAIL FOR TYPES 1 AND 3 CURB RAMPS**

PL - Permeable Joint with Density-Coated Refractory No. 4 by 18 in. bars conforming to ASTM C 618 at 42 in. spacing.

**SIDE CROSS SECTION VIEW OF DETECTABLE WARNING, WELL, CURB, AND GUTTER**

**DETAIL FOR TYPE 2 CURB RAMP**

**ELEVATION VIEW OF SINGLE DOME**

**PLAN VIEW OF DETECTABLE WARNING AND WELL**

**NOTES:**
1. The detectable warnings shall be formed of pavers with a truncated dome surface.
2. The top of the warning dome shall be located at the extreme point of the detectable warning well.
3. Padded slabs shall be 1/2 in. or slotted the detectable warning and well area slotted shall be 1/2 in. or slotted.

**CURB RAMP WITH DOME PAVER OPTION**

**SHEET REVISIONS**

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**COLORADO DEPARTMENT OF TRANSPORTATION**

**STANDARD PLAN NO.**

M-608-1

**Sheet No. 6 of 6**
CURB AND GUTTER TYPE 2 (SECTION IB)
(6 IN. BARRIER - 2 FT. GUTTER)

CURB AND GUTTER TYPE 2 (SECTION IB)
(6 IN. BARRIER - 1 FT. GUTTER)

CURB AND GUTTER TYPE 2
(SECTION IM)
(6 IN. MOUNTABLE - 2 FT. GUTTER)

CURB AND GUTTER TYPE 2
(SECTION IM)
(6 IN. MOUNTABLE - 1 FT. GUTTER)

CURB AND GUTTER TYPE 2
(SECTION MS)
(4 IN. MOUNTABLE WITH SIDEWALK)

GENERAL NOTES
1. In roadway curves with a radius of 300 ft. or less, curbs and gutters are to be placed on the arc of the curve unless otherwise specified on the plans. A maximum clear length of 15 ft. may be used when the curve radius is greater than 300 ft.
2. Concrete shall be Class B.
3. Profile grade of curbs and gutters shall be located at the flow line.
4. Curbs may be lowered by means of curbs and gutters in the waterline by 0.3 ft. unless otherwise specified on the plans.
5. Gutter cross slopes shall be adjusted to facilitate drainage for profile grades as shown on the plans.
6. Thickness of curb and gutter section shall be based on 4-in. curb and gutter thickness. Curbs and gutters shall be Class 1 concrete if placed nonsynchronously with concrete pavement.
7. Increase sidewalk thickness to 6 in. at locations shown on the plans.
8. Minimum sidewalk width is 4 ft.

A. Expansion joints shall be installed when heating existing concrete or structural elements. Expansion joint material shall be 1/2 in. in thick and shall extend the full depth of the contact surface.
B. Gutter cross slopes shall be 1/4 in. per ft. when grading away from curb and 1/2 in. per ft. when grading toward curb.
C. When ties are required, the gutter thickness shall be increased to the payment thickness ties shall be installed 4 ft. on center starting 20 ft. from the start of the ties and spaced at 3 ft. intervals. They shall be inserted 1/2 in. and led length into the gutter.

LEGEND FOR RADIO
A = 400 FT. TO 1,000 FT.
B = 1,000 FT. TO 2,000 FT.
C = 2,000 FT. TO 2,000 FT.
D = 0 TO 200 FT.

CONSTRUCTION OF CONCRETE GUTTERS AT INTERSECTION

CURB, GUTTERS, AND SIDEWALKS

STANDARD PLAN NO.
M-609-1
Sheet No. 1 of 4
Issued By: Project Development Branch on July 4, 2019
CURB TYPE 2
(SECTION B)
6 IN. BARRIER
6 IN. MOUNTABLE

CURB TYPE 6
(SECTION M)
4 IN. MOUNTABLE
NOTE:BITUMINOUS OR CONCRETE, UNLESS OTHERWISE SPECIFIED ON THE PLANS.
* KEY-WAY MAY BE SPLIT AND PLUGGED UNDER GUIDANCE.

CURB TYPE 4
(SECTION B)
6 IN. BARRIER
6 IN. MOUNTABLE

CURB TYPE 4
(SECTION M)
6 IN. BARRIER
6 IN. MOUNTABLE

LEGEND
FOR RADIUS
A=πR
R=πA
C=12π
CR/R TO 2CR

CONCRETE PAVEMENT (DRIVEWAYS)
CURB, GUTTERS, AND SIDEWALKS

STANDARD PLAN NO.
M-609-1

Sheet No. 2 of 4
NOTES
1. DRAINAGE STRUCTURES, TRAFFIC CONTROL EQUIPMENT, AND OTHER BARRIERS SHOULD NOT BE PLACED IN FRONT OF THE DRIVEWAY RAMPS ACCESS AREAS.
2. FOR THE CURB AND GUTTER, SEE PLANS FOR CURB TYPE
3. RAMPS SLOPES SHALL BE 1:20 OR FLATTER.

CONCRETE DRIVEWAY ENTRANCE TYPE 3

SECTION A-A

SECTION B-B

TYPE 3 ISOMETRIC VIEW

CURB, GUTTERS,
AND SIDEWALKS

STANDARD PLAN NO. M-609-1

Sheet No. 4 of 4
TYPICAL BREAK-AWAY TYPE TRANSFORMER BASE DETAIL

NOTES:
1. HARDWARE SHALL CONFORM TO MANUFACTURER'S REQUIREMENTS.
2. A HARD MEAL IS NOT REQUIRED IN POLE IF A BREAK-AWAY TRANSFORMER BASE IS USED.

TYPICAL NON-BREAK-AWAY BASE DETAIL

FOR USE ONLY OUTSIDE CLEAR ZONE OR IN PROTECTED INSTALLATIONS.
NOTES
1. ENSURING FOR THE TRANSFORMER BASE, ANCHOR BASE AND ANCHOR BOLTS ARE
   VARIOUS FOR THE HEIGHT OF THE LIGHT STANDARD OR THE MOST AWAY CONFIGURATION.
   ALL COMPONENTS SHALL BE ACCORDING TO THE REQUIREMENTS OF THE LIGHT
   STANDARD SUPPLIED.
2. FOUNDATION SHALL BE 7 FT THRU 40 FT. FOR LIGHT STANDARDS LESS THAN 75 FT.
   FOR LIGHT STANDARDS LESS THAN 10 FT.
3. LIGHT STANDARD FOUNDATION DEPTH IS BASED ON A MAXIMUM POLE HEIGHT OF 40 FT
   EN STIFF CLAY WITH q > 25 AND MEET WITH q > 25 AS DETERMINED BY
   ACW 6-13 LIGHT STANDARD PIERCING TEST.

4. CONCRETE SHALL BE CLASS B.
5. FOUNDATION FOR LIGHT STANDARDS LESS THAN 40 FT IN LIGHT STANDARDS WITH
   MULTIPLE EXCAVATIONS OF BURIAL OR VARYING SOIL IN THE CONDITION, SHALL BE
   DESIGNED BY THE CONTRACTOR'S ENGINEER AND SHOWN ON THE PLANS.
6. WHERE FOUNDATION IS LOCATED IN THE SHELTER, THE TOP OF THE FOUNDATION SHALL
   BE FLUSH WITH THE TOP OF THE SHELTER CONTINUING TO ALL REQUIREMENTS.

TYPICAL FOUNDATION SECTION

ALTERNATIVE CONCRETE LIGHT STANDARD FOUNDATION
WITH SPLICE BOX
GENERAL NOTES

1. Rumble strips shall be omitted at turn and auxiliary lanes, rear approaches, rest areas, 200 ft before grade intersections, and other interruptions as directed by the Engineer.
2. Rumble strips may be installed by weaving, rolling, or forming on concrete pavements, and by weaving only on HMA pavements. Rumble strip width shall be 12 in for HMA and 20 in for concrete pavements.
3. Measure the distance between rumble strip and edge line on concrete pavements with 20 ft rule glass.
4. Rumble strips shall be omitted on the outside edge of the travel lane edge line.
5. Do not install rumble strips on shoulders less than 6 ft wide.
6. Install rumble strips along the edge of the shoulder up to 20 ft.
7. Apply the 20 ft pattern when rumble strips (grade-in) are installed in concrete pavement.

TYPICAL SECTION C-C

TYPICAL SECTIONS A-A AND B-B
FOR GRADE-IN RUMBLE STRIP
ON EXISTING HMA OR CONCRETE PAVEMENT

TYPICAL SECTION B-B
FOR FORMED OR ROLLED ON CONCRETE PAVEMENTS ONLY
TWO LANE HIGHWAY (HMA AND CONCRETE)
CONTINUOUS CENTER LINE RUMBLE STRIPS

FOUR LANE UNDIVIDED HIGHWAY (HMA AND CONCRETE)
CONTINUOUS CENTER LINE RUMBLE STRIPS

DETAILS FOR CENTER LINE RUMBLE STRIPS

NOTES
1. Rumble strip width shall be 12 in. for stone-in, formed or rolled.
2. Centerline rumble strips may be continuous through passing zones as determined by the Engineer and shown on the plans.

TYPICAL SECTIONS A-A AND B-B
FOR STONE-IN RUMBLE STRIP
ON EXISTING ASPHALT OR CONCRETE PAVEMENT

TYPICAL SECTION B-B
FOR FORMED OR ROLLED ON CONCRETE PAVEMENTS ONLY
GENERAL NOTES

1. SAND SHALL BE MIXED WITH SALT BY VOLUME.
2. WHEN ARRAYS ARE PLACED ON STRUCTURES WHERE THE VARIATIONS FROM MESH TRAFFIC MAY CAUSE THE MODULES TO SHIFT, STEEL OR FRAMED-ON-PLACE WASH PENETRATIONS MAY BE PLACED ON THE DOWNSIDE OF THE MODULES TO PREVENT HORIZONTAL MOVEMENT OR EJECTS MAY BE PLACED THROUGH THE BOTTOM OF THE OUTER CONTAINER TO THE GROUND TO PREVENT VERTICAL MOVEMENT.
3. OFFSET THE ARRAY TO AVOID IMPACT TO THE REAR MODULE FROM MOTORWAY VEHICLES.
4. ARRAYS SHALL NOT BE PLACED ON SLOPES WITH LATERAL OR HORIZONTAL GRADES OF 15% OR GREATER.
5. CURVES AND RAPID JUMPS SHALL BE NO MORE THAN 4 IN 100.
6. FOUNDATION PILES SHALL BE PLAT AND MADE OF 3/8 IN THICK CONCRETE OR STEEL.
7. INTERMITTENT OF DIFFERENT TYPES OF MODULES ARE ACCEPTABLE IF THE MODULES ARE QUALITY-APPROVED, AND THE ARRAY MEETS THE DESIGN CRITERIA.
8. ARRAY CONFIGURATION MAY VARY TO SUIT DESIGN AND納料 (Texture) REQUIREMENTS. THEY MUST COMPLY TO MANUFACTURER SPECIFICATIONS.

UNIDIRECTIONAL

BIDIRECTIONAL

WIDE HAZARD PROTECTION

ANGLED ARRAY
NOTES
1. SANE WEIGHT (lbs) IN MODULES IS DESIGNATED BY THE NUMBERS IN THE ARRAY DETAILS.
2. ARRAY CONFIGURATION MAY VARY IN LAYOUT AND SANE WEIGHT (lbs)
   PROVIDED THEY COMPLY TO MANUFACTURER'S DETAILS.
GENERAL NOTES

1. If the embankment protector is located in the bottom of a vertical curve, plan the curve on each side of the inlet to allow for flow from both directions.

2. Details of guard rail installation are shown in Standard Plan M-604-A.

3. The end sections of pipe for guard rail installations shall be in accordance with the typd 1 typical connection details in Standard Plan M-604-B. The type 1 pipe joints shall be connected directly to a section of pipe between the guard rail and the end sections. The end sections shall be in accordance with Section 103. Connections for flexible pipe shall provide a pipe joint connection similar to the type 1 pipe end sections and are not allowed. All plastic pipe joints shall be as recommended by the pipe manufacturer and approved by the Engineer.

4. Flexible pipe shall conform to ASTM D 3047 Type B.

5. Details of continuous curbs are shown in Standard Plan M-604-D.

6. Structure guard material shall not be used with the embankment protector. Type 3 embankment material shall be used with construction requirements in accordance with Section 103. Payment for this embankment material shall be included in the job item for embankment protector type 3.

PAYMENT FOR THE QUANTITIES SHOWN ON THE PLANS FOR THE WORK SHOWN:"

EIGHTY FIVE PERCENT (
"S" OF "S") PAY ITEMS AS SPECIFIED ON THE PLANS.

503 - CURVE TYPE 4 OR TYPE C (SECTION A-A) LINEAR FT.

625 - EMBANKMENT PROTECTOR TYPE 3 PAY ITEMS (EXCEPT THE TRASH GUARD SHOWN ON THE PLANS). The trash guard shown on the plans is a connection structure element. The trash guard material may be extra work required to modify other pipe sections.

500 - 12 IN. TO 18 IN. PIPE LINEAR FT.

END SECTION OF STUB (SEE STANDARD M-604-B, SHEET 2 OF 2 FOR DIMENSIONS)
GENERAL NOTES

1. If the embankment protection is located in the bottom of a 500 vertical curve, place the curb on each side of the outlet to allow for flow from both directions.

2. Details of curbing are shown in standard plan M-392G.

3. Structure backfill material shall not be used in the work. Embankment material shall be used with construction requirements in accordance with section 223. Embankment material will not be paid for separately but shall be included in the pay item for embankment protector (type 5).

4. Payment for the quantities shown on the plans for this work shall be as follows:
   507 - Extensions slope and ditch paving (per spot) 100
   507 - Concrete slope and ditch paving 100
   603 - Chair type 4 of type 6 section 600
   625 - Embankment protector type 5 600

   - Notes to be paid include the structure excavation, any other excavation, and any extra work required to modify other pay items.

Computer File Information

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STANDARD PLAN NO.
1. Class Field Laboratories shall consist of a weatherproof, insulated, temperature controlled, and structural reinforced concrete building designed to contain all field laboratory equipment. Each laboratory building shall be designed to meet all applicable building codes specified with floor plan and equipment layout similar to the following design. The laboratory building shall be designed and constructed to meet the following requirements:

- Minimum area of 4,000 square feet
- Adequate electrical and plumbing connections
- Fire protection systems
- Access to utilities

2. Dimensions: 60 feet x 70 feet, 8 foot ceiling height.

3. Windows: A minimum of 4,000 square feet for natural ventilation and lighting.

4. Doors: Equipped with weatherstripping, 36 inches x 80 inches, with an insulated steel door that is self-closing. All doors shall provide weatherstripping and shall be equipped with a deadbolt lock. The door shall be designed to accommodate the use of wheelchairs.

5. Flooring: A concrete slab on grade shall be used, and the floor shall be constructed to accommodate heavy equipment.

6. Heating: Furnace, 40,000 BTU, forced air type.

7. Air Conditioning: A 5-ton, 14 SEER air conditioner.

8. Electrical: 220 volt, 3-phase, 20 amp service. A dedicated electrical service shall be provided to each laboratory building.

9. Plumbing: A 3-inch, 150 psi service line shall be provided to each laboratory building.

10. Water Supply: A separate water supply shall be provided for each laboratory building.

11. Fire Extinguisher: One fire extinguisher shall be provided for each laboratory building.

12. Fire Protection: A fire alarm system shall be provided for each laboratory building.

13. Security: A security system shall be provided for each laboratory building.

14. Lighting: A minimum of 50 footcandles shall be provided throughout the laboratory building.

15. Ventilation: A minimum of 2,500 cubic feet per minute shall be provided for each laboratory building.

16. Sanitation: A minimum of 2,000 square feet of washable floor space shall be provided for each laboratory building.

17. Storage: A minimum of 2,000 square feet of storage space shall be provided for each laboratory building.

18. Equipment: All laboratory equipment shall be designed and constructed to meet all applicable codes and specifications.

19. Access: All laboratory buildings shall be designed to accommodate the use of wheelchairs.

20. Safety: All laboratory buildings shall be designed to meet all applicable safety codes and specifications.

21. Compliance: All laboratory buildings shall be designed to meet all applicable environmental regulations.

22. Field Laboratory: This section shall be used to describe the specific field laboratory requirements.

FIELD LABORATORY
CLASS 1

STANDARD PLAN NO. M-620-1
Sheet No. 1 of 1

Issued By: Project Development Branch July 4, 2012

Colorado Department of Transportation
2500 East Arkansas Avenue
Denver, Colorado 80222
Phone: (303) 757-6000
Fax: (303) 757-6820

Project Development Branch
DD/LTA
27. Forced-air connection oven required on projects with 5,000 or more tons of mix or when specified in the plans. The forced air oven replaces the range. The oven shall be rated to at least 500 watts including:
   1. At least one blower to circulate air inside without disturbing fine grained sides placed in the oven.
   2. A minimum interior capacity of 4 cubic feet.
   3. An exhaust channeled adapted to connect to a 3 inch pipe which shall be vented to the outside.
   4. At least two adjustable shelves.
   5. An over-temperature protection device.
   6. An electronic control system with digital temperature read-out and digital temperature set points to precisely heat and set the oven temperature.

   The oven shall have a temperature range from 50°F to 600°F and have a uniform temperature of ± 3°F at 200°F.

   The oven shall be capable of maintaining a constant temperature ±5°F throughout its temperature range.

   The oven heating elements shall not be allowed to operate without the blower.

   The field laboratory shall be equipped with a separate electrical circuit to supply power to the forced air oven.

   In addition to the above forced air connection oven, a hot plate conforming to the following shall be provided:
   1. Two burner, portable, electrical, 1,500 watt, or radiant type.
   2. At least one burner shall be rated a minimum of 500 watts.
   3. Each hot plate shall be equipped with an on-off indicator light.

28. Composting will be used. A single capacity with a circulating pump with a 120 gpm rating tank capacity will increase for large concrete projects when specified in the plans.
**TYPE 1 MONUMENT**

- Aluminum or brass cap
- Ground surface
- Tape magnet to rod
- 3/4" dia. aluminum frame rod

**TYPE 1A MONUMENT**

- Cast iron access cover with survey embroidery
- Aluminum or brass cap
- Tape magnet to rod
- 3/4" dia. x 20' PVC pipe
- Coarse sand or pea gravel

**TYPE 3 MONUMENT**

- Includes monument box
- Locking cast iron access cover
- Copper pipe

**TYPE 5 MONUMENT**

- Aluminum cap and type 205 details shown on sheet 2
- Placement is necessary between the aluminum monument box and the pavement.

**TYPE 6 MONUMENT**

- Type 2A includes monument box

**PLAN VIEW**

- Flange inside of monument box
- Top side of monument box

**SECTION A-A**

- 10" x 4" max.
- 2 1/8" db.
- Tape magnet to rod
- 4" dia. x 20' PVC pipe

**SECTION B-B**

- 35" extension
- 1/8" dia. x 20' PVC pipe

**DELINEATOR POST**

- Section C-C
- 9" x 12"

**WITNESS POSTS**

- 1/8" dia. x 20' PVC pipe
- Aluminum frame rod
- Top section

**SURVEY MONUMENTS**

Colorado Department of Transportation
1420 East Alameda Avenue
Denver, Colorado 80222
Phone: (303) 757-8800
Fax: (303) 757-8820

Project Development Branch
DD/LTA

STANDARD PLAN NO.
M-629-1

Sheet No. 1 of 2
S STANDARDS
TYPICAL STRIP DELINEATOR INSTALLATION

1. This device shall be installed per manufacturer’s recommendations. It is the responsibility of the installer to contact the manufacturer representative whenever there is a question regarding application procedures or environmental conditions.

2. The color of the reflective surface shall match the color of the adjacent roadway edge line.

3. At time of installation, contacting surface shall be dry and moisture-free.

4. After delineator installation, surfaces shall stay dry without rain in the forecast for at least 8 hours.

5. Surface preparation, brackets and glue or equivalent shall be included in the cost of each delineator strip.

CONCRETE BARRIER REFLECTOR NOTES

1. Concrete surface preparation, adhesive, and method of application shall be as recommended by the reflector manufacturer.

2. To assure a straight line, apply a chalk line across the barrier.

3. For mounting the strip reflectors to concrete barriers, including the brackets, use a high-temperature super fast cure adhesive or equivalent applied at 50 degrees Fahrenheit in dry areas. It is recommended this product is available in standard coating formulation and should be applied to the brackets and panels with a construction style coating gun, and the use of 5/16" stainless steel anchors with 7/16" holes, as specified in 3m Product Bulletin 540.

4. Unless otherwise noted in the plans or specified by the Engineer, a 200-foot maximum tangent and curve spacing applies to barrier reflectors along the top of the barrier.

W-BEAM GUARDRAIL NOTES

1. The different types of delineator mounting brackets are available. There is one type for the 4" delineator and another for the 3" delineator. The brackets must be installed for the exact 4" or 3" width delineator panel. Use of the elongated panels shall be specified in the plans.

2. In rounded areas, use the 4" panels that will recess into the W-beam guardrail, which protects it from the snowplow damage.

3. Metal guardrail shall be pre-washed/soaked, then cleaned with denatured alcohol where the brackets will adhere to the guardrail.

4. For mounting the strip delineators to guardrail, including the brackets, the use of a high-temperature super fast cure adhesive or equivalent applied at 50 degrees Fahrenheit in dry areas is recommended. This product is available in standard coating formulation and should be applied to the brackets and panels with a construction style coating gun, as specified in 3m Product Bulletin 540.

5. Must use minimum three brackets per panel corresponding to the pre-engaged delineator holes.
BUFFER TERMINALS (BT)

BUFFER PANEL ATTACHMENT DETAILS

SUPPLEMENTAL DELINEATION DETAILS

SUPPLEMENTAL PANEL NOTES

1. ALL SUPPLEMENTAL DELINEATION PANELS SHALL BE SINGLE SHEET ALUMINUM, 24 IN X 48 IN.
2. ALL PANELS SHALL BE FASTENED DIRECTLY TO THE BUFFER TERMINAL WITH 2 OR 4 #10 EXPANSION KITS.
3. EXPANSION KITS SHALL BE SINGLE SHEET ALUMINUM WITH ALUMINUM BREAK-IN WRENCH KIT.
4. ALL PANELS SHALL HAVE A BACK-UP WASHER WHEN USED WITH ALUMINUM BACK-UP WASHER.
5. ALL PANELS SHALL BE ATTACHED TO THE BUFFER TERMINAL WITH #10 BOLTS AND WASHERS.
6. SUPPLEMENTAL PANELS SHALL BE ATTACHED TO THE BUFFER TERMINAL WITH #10 BOLTS AND WASHERS.
7. ALL PANELS SHALL BE ATTACHED TO THE BUFFER TERMINAL WITH #10 BOLTS AND WASHERS.
8. ALL PANELS SHALL BE ATTACHED TO THE BUFFER TERMINAL WITH #10 BOLTS AND WASHERS.
9. ALL PANELS SHALL BE ATTACHED TO THE BUFFER TERMINAL WITH #10 BOLTS AND WASHERS.
10. ALL PANELS SHALL BE ATTACHED TO THE BUFFER TERMINAL WITH #10 BOLTS AND WASHERS.

SUPPLEMENTAL DELINEATION DETAIL FOR GUARD RAIL BUFFER TERMINALS AND IMPACT ATTENUATORS

DELINATOR INSTALLATIONS

STANDARD PLAN NO.
S-612-1
Sheet No. 6 of 7
1. Flexible posts impact necessary, delineator posts, components of rubber composite, including 20% by volume, post container recycled HDPE, with a bright white, peel-off, U.V. resistant, co-extruded HDPE shell.

2. The top of tubular posts shall be permanently closed to prevent moisture or debris from entering.

3. The side of the post facing traffic, upon which the delineator is to be mounted, shall have a flat surface with minimum dimensions of 400 square inches in width by 20 inches in length. The surface of the post shall be smooth, and suitable for the adherence of reflective sheeting without preparation. (other than Johns with a clean cloth.” Furthermore, with normal subject to removal cohesive contaminants.

4. The bottom of the post shall have a minimum of 2.5 inch length flat mounting surface with minimum dimension of 1/4 inch in width.

5. The width of the post at any point excluding the base, it shall be a maximum of 4% inches.

6. The outside diameter of the tubular post shall be a maximum of 2.5 inches.

**General Notes**

**Delineator Installations**

**Standard Plan No. S-612-1**

**Sheet No. 7 of 7**
CLASS III SIGNS, PANEL GROUND CLEARANCE

GENERAL NOTES
1. The engineer will establish grades and locations for all sign posts in accordance with details shown on the plans.
2. Special care shall be taken in sign location to ensure an unobstructed view of each sign.
3. Minimum post embedment shall be 3 ft for 4x4 posts and 4 ft in 6x6 posts, 6 ft for 8x8 posts for signs resting on the surface per the applicable standard.
4. Minimum lateral clearance is measured from face of curb or from any surface prepared for normal or emergency travel of vehicles.
5. Normal lateral clearance is measured from the edge of travel lane.
6. In urban areas, a normal clearance of 5 ft from the curb face is permissible where median width is limited or where existing poles are close to the curb.
7. 1.7 ft minimum post length shall be measured from bottom of sign panel to the ground or the top of the posts.
8. Typical post mounting heights from ground to bottom of sign panel are 3.0 or 3.9 ft.
9. Post embedment shall be required when signs are mounted on steerable full or half posts.
10. The lateral clearance specified will be considered when determining vertical clearance.

PLACEMENT TABLES

<table>
<thead>
<tr>
<th>LATERAL PLACEMENT</th>
<th>VERTICAL PLACEMENT</th>
<th>SIGN TYPE (MM)</th>
<th>FREQUENCIES</th>
<th>CONVENTIONAL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>TOTAL</strong></td>
<td><strong>MINIMUM</strong></td>
<td><strong>NORMAL</strong></td>
<td><strong>MAXIMUM</strong></td>
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<tr>
<td><strong>ALL CLASSES OF STREETS AND HIGHWAYS</strong></td>
<td><strong>ALL CLASSES OF STREETS AND HIGHWAYS</strong></td>
<td><strong>ABOUT 1/2</strong></td>
<td><strong>ABOUT 1/2</strong></td>
<td><strong>ABOUT 1/2</strong></td>
</tr>
<tr>
<td><strong>A</strong></td>
<td><strong>B</strong></td>
<td><strong>C</strong></td>
<td><strong>D</strong></td>
<td><strong>E</strong></td>
</tr>
</tbody>
</table>

ROUTE MARKER ASSEMBLY PLACEMENT

REGULATORY, RECREATIONAL AND CULTURAL INFORMATION SIGN PLACEMENT

CLASS III SIGN PLACEMENT

NOTE: Mile markers shall be located in line with designation posts.
TYPICAL LOCATIONS-STOP SIGNS AND YIELD SIGNS

PLACEMENT TABLES

<table>
<thead>
<tr>
<th>LATERAL PLACEMENT</th>
<th>VERTICAL PLACEMENT (WARNING - PHASE-1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>KEY</td>
<td>MATERIALS AND DESIGNATIONS</td>
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<tr>
<td></td>
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<td>PERIPHERAL</td>
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<tr>
<td></td>
<td></td>
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<tr>
<td></td>
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</tr>
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</table>

ANGULAR PLACEMENT

NORMAL ANGULAR PLACEMENT IS 0°. SIGNS CLOSER THAN 30 FT SHOULD BE TURNED SLIGHTLY AWAY TO MINIMIZE STIRPING REFLECTION. SIGNS PLACED 30 FT OR MORE SHOULD GENERALLY BE TURNED TOWARDS THE ROAD.
TYPICAL EXIT PANEL INSTALLATION FOR GROUND SIGNS

EXIT PANEL NOTES

1. The exit panel shall be mounted with the support, right hand edge located 6" from the edge of the exit panel. The exit panel shall be mounted 6" from the left edge of the exit panel to be spaced even with the left edge of the panel to be spaced.

2. The support shall be carbon steel tubing having a minimum inside diameter of 1-3/4" and 1-1/2" in. the exit panel to be spaced even with the left edge of the panel to be spaced.

3. The support shall be fastened to the backing tee using 2 nuts.

4. The exit panel support may be moved up to 1'-6" if it conflicts with the panelion support.

5. Exit panel mounting shall be fastened to a minimum of three backing tees.

6. Exit panel supports shall be attached to a minimum of three backing tees.

CLASS III SIGNS

GENERAL NOTES

1. CLASS III SIGNS are all those signs with a single panel requiring 6 sides erecting, there will be only sign faces and sign faces that are part of the sign to be assembled at exit panels. All exit panels shall be in accordance with sheet aluminum.

2. See appropriate standards for sign placement, backing holes and supports, and sign spacing tables.

3. A 1/4" knockout at base and top of panel shall be used to fasten the panel to the backing tee. A 1/4" knockout at top of panel shall be used to fasten the backing tee to a post or to a tree post.

4. A flat washer shall be placed between the bolt head and the flat plate. A 1/4" nut shall be used on the bolt head. A 1/4" flat washer shall be placed under the bolt head on a third post.

5. All exit panel supports, sign panel supports, and all vertical sections shall be cut to size of the sign panel, an additional closure tee closure shall be removed to allow for fabrication holes.

6. Section illustrated shall be used on all other supports that shall use an adjustable bracket for attachment in number of sections.

7. All signs shall be fabricated using lightweight, see Appendix for details, as shown in the drawing specifications.
CLASS I SIGN COMBINATIONS (DIRECT ATTACHMENT)

**SEE NOTE 8 ON SHEET 4**

CLASS I SIGN COMBINATIONS USING U-BRACKETS

TUBULAR STEEL SIGN SUPPORT DETAILS

STANDARD PLAN NO.
S-614-8

Sheet No. 3 of 5
CLASS II SIGN COMBINATIONS USING U-BRACKETS

SEE NOTE 4 ON SHEET 4

CLASS II SIGN COMBINATIONS USING TWO POSTS

NOTE: THIS CONFIGURATION IS PREFERABLE TO USING TWO SEPARATE SIGNS.
GENERAL NOTES

1. POLE AND PEDESTAL MUST BE DESIGNED TO MEET THE REQUIREMENTS OUTLINED IN THE STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORT FOR HIGHWAY SIGNS, LANDMARKS AND TRAFFIC SIGNALS, PUBLISHED BY AASHTO FOR A WIND SPEED OF 30 MPH. THE CONSTRUCTION SHALL SATISFY THE TESTS OF WORKING DRAWINGS, PLANS AND SPECS SET BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF COLORADO, IN ACCORDANCE WITH SECTION 105.02 OF THE STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION.

DESIGN DATA

- THE DESIGN ASSUMES THAT FLASHING BEACONS ARE INSTALLED ADJACENT TO THE HIGHWAY, USING THE FOLLOWING SOIL PARAMETERS:
  - SOIL DENSITY = 140 lb/ft³
  - SOIL CONSISTENCY = 700 lb/ft³
  - FRIP = 100 ft² for normal load, 200 ft² for wind load, 300 ft² for seismic load, 400 ft² for seismic load if ≤ 3.0 for flexural resistance.

- CONTACT THE ENGINEER IF THE FLASHING BEACON IS NOT INSTALLED ADJACENT TO THE HIGHWAY, OR IF ANY OF THE FOLLOWING SOIL CONDITIONS ARE ENCOUNTERED DURING INSTALLATION:
  - HIGH SOIL DENSITY
  - THE SITE NOT SUFFICIENTLY DRIED TO INSTALL
  - THE FOUNDATION SOILS ARE NOT EVADEABLE
  - ROCKY FORMATION ENCOUNTERED
  - A HIGH-GRADE HOURS IS ENCOUNTERED
  - LARGE ROCKS ARE ENCOUNTERED.

FOOTING DESIGN IS BASED ON 200 MPH WIND LOAD ON A 2 x 1 x 1 IN HIGHWAY SIGN PANEL. FOOTING MUST BE ABOVE THE GROUND, WITH A 24 IN X 24 IN SQUARE FOUNDATION AND A FLASHING BEACON INSTALLATION WHERE A STEEL CIRCUMFERENCE IS ENCOURAGED THAT EXCEEDS 1000 LBS. THE FOOTING DESIGN MUST BE ENGINEERED AND DRAWN AND SIGNED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF COLORADO.

FOOTING NOTES

1. NUTS
2. SQUARE NUTS
3. HAND WHEEL SHALL BE PROVIDED:
4. A 4 IN DIA NON-SHATTERABLE PLASTIC CAGE OVER FOUNDATION:
5. INSTALL ANCHOR BOLTS (PURCHASED WITH PILED WITH MANUFACTURER’S TEMPLATE PRINT (PURCHASED WITH SPEED):
6. MINIMUM OVERLAP OF 12 IN:
7. 1/4 IN CLEARANCE FOR HOLES
8. FULL BOX

CAUTION: ALL TIGHTENING DEVICES MUST BE TIGHTENED TO BE FITTED IN THE REQUIRED LOCATION. IF THE HOLES CANNOT BE FITTED IN THE REQUIRED LOCATION, THE CAUTION DESIGN SHALL BE MODIFIED AS DETERMINED BY THE ENGINEER.
TYPICAL POLE MOUNT INSTALLATION
FOR CLASS II MARKER ASSEMBLY

FABRICATION NOTES:
1. Horizontal and vertical members to be the same material as the top panel.
2. Vertical member to be 3 in x 6.40 lbs.
3. Horizontal member to be 3 in x 6.40 lbs. in 2.25 in radius; fastened to vertical member with 1 in machine bolts with hex nut.
4. Sign panels to be fastened to horizontal member with 1 in countersunk, locking fasteners.
5. Vertical spacing between groups of panels in one marker assembly shall be 4 in.

GENERAL NOTES:
1. Signs shall be located in accordance with the plans and specifications. Signs shall be fixed to the outside of each sign panel.
2. Brackets shall be attachment hardware and backing material to be approved by the engineer.
3. For signs panel fabrication, mounting height, and hole spacing for attaching shall be selected from approved standards.
4. All bolts, nuts, and metal washers unless noted shall be made of stainless steel and shall be galvanized or chromate plated.
5. All signs shall be shielded or finished.
6. Railing shall be 1 in. in a 600 lb./in. ultimate bending strength of 10000 ksi. There shall be a minimum of two rails per panel, or assembly, except where a single railing is used.
7. Panels of 30 in or greater width must have backing members in addition to brackets. Class I panels of less than 30 in. and Class II panels of greater than 24 in. shall have the pre-threaded brackets similar to alternate section C-C.

STANDARD PLAN NO.
S-614-20
Sheet No. 1 of 1

TYPICAL POLE MOUNT SIGN INSTALLATION

FABRICATION NOTES:
1. Signs other than the brackets or backing shall be made of stainless steel and shall be galvanized or chromate plated.
2. Maximum spacing between panels in one assembly shall be 36 in.
3. Panels may be installed back-to-back on the same panel.
4. In no case shall bolts or self-tapping screws be used for any portion of the assembly.
5. Only tool washers may be used on the face of the sign panel.
GENERAL NOTES

1. REFER TO SHEET DATA FOR THE ACTUAL CONFIGURATION AND LOCATION OF TRAFFIC SIGNAL HEADS AND SIGNS MARKED WITH A.

2. ALL PLATES AND ARMS SHALL BE FABRICATED WITH ASTM A572 GRADE 50 STEEL. LUMINAIRE ARMS MAY BE FABRICATED WITH ASTM A572 GRADE 50 STEEL. ALL AREAS TO BE BACKFILLED WITH FLOW-FILL AND REDRILLED AFTER A THREE DAY CURING PERIOD WITHOUT THE USE OF A HARDENED WASHERS CONFORM TO ASTM F436.

3. U-BOLTS AND ANCHOR BOLTS SHALL BE FABRICATED WITH AASHTO M314-90 GRADE 55 STEEL.

4. CAST PILE END CAP TO BE SECURED IN PLACE WITH 3 SET SCREWS.

5. ALL POLES AND ARMS SHALL BE ROUND OR DODECAGONAL TUBES WITH A 0.14 IN/FT TAPER.

6. ALL POLES AND ARMS SHALL BE GRADE 60.

7. ALL ELECTRICAL CONNECTIONS TO THE SIGNALS SHALL BE GROUNDED IN ACCORDANCE WITH APPLICABLE設計.

8. CASTING DATA:

- SINGLE MAST ARM CONNECTION SHOWN BELOW
- TWIN MAST ARM CONNECTION SHOWN BELOW
- ELECTRICAL WIRING.

- PUSH BUTTON
- PEDESTRIAN

9. THE DESIGN LENGTH "L" FOR EACH SERIES IS SHOWN IN FIGURE 1.

10. FOR THE TWIN MAST ARM CONNECTION THE SECOND ARM IS ASSUMED TO BE LOADED WITH THE PRIMARY ARM AND IS ASSUMED TO BE LOADED WITH THE PRIMARY ARM.

11. THE CASTING "L" TO TOP OF PULL BUTTON MEANS TO ACCOMMODATE THE CASTING "L" TO TOP OF PULL BUTTON MEANS TO ACCOMMODATE.

12. CASTING "L" TO TOP OF PULL BUTTON MEANS TO ACCOMMODATE THE CASTING "L" TO TOP OF PULL BUTTON MEANS TO ACCOMMODATE.

13. BASE SECTION BY ATTACHING THE COME-ALONGS TO OPPOSING ACCESS HOLES IN THE BUILT-UP BOX WITH THE "S" SHAPED HOOKS AND PULLING AGAINST THE CHAIN WHICH IS STRUNG UNDERNEATH THE POLE BASE PLATE. APPLY ENOUGH FORCE TO ALIGN THE WIRE ACCESS HOLES AND TO SEAT THE SLIP SPLICE WITHIN 4" OF THE SPECIFIED LENGTH.

14. ALL PLATES AND ARMS SHALL BE FABRICATED WITH ASTM A572 GRADE 50 STEEL. LUMINAIRE ARMS MAY BE FABRICATED WITH ASTM A572 GRADE 50 STEEL.

15. ALL AREAS TO BE BACKFILLED WITH FLOW-FILL AND REDRILLED AFTER A THREE DAY CURING PERIOD WITHOUT THE USE OF A HARDENED WASHERS CONFORM TO ASTM F436.

16. ALL POLES AND ARMS SHALL BE ROUND OR DODECAGONAL TUBES WITH A 0.14 IN/FT TAPER.

17. ALL POLES AND ARMS SHALL BE ROUND OR DODECAGONAL TUBES WITH A 0.14 IN/FT TAPER.

18. ALL POLES AND ARMS SHALL BE ROUND OR DODECAGONAL TUBES WITH A 0.14 IN/FT TAPER.

19. ALL POLES AND ARMS SHALL BE ROUND OR DODECAGONAL TUBES WITH A 0.14 IN/FT TAPER.

20. ALL POLES AND ARMS SHALL BE ROUND OR DODECAGONAL TUBES WITH A 0.14 IN/FT TAPER.

21. ALL PLATES AND ARMS SHALL BE FABRICATED WITH ASTM A572 GRADE 50 STEEL. LUMINAIRE ARMS MAY BE FABRICATED WITH ASTM A572 GRADE 50 STEEL.

22. ALL AREAS TO BE BACKFILLED WITH FLOW-FILL AND REDRILLED AFTER A THREE DAY CURING PERIOD WITHOUT THE USE OF A HARDENED WASHERS CONFORM TO ASTM F436.

23. ALL POLES AND ARMS SHALL BE ROUND OR DODECAGONAL TUBES WITH A 0.14 IN/FT TAPER.

24. ALL POLES AND ARMS SHALL BE ROUND OR DODECAGONAL TUBES WITH A 0.14 IN/FT TAPER.

25. ALL AREAS TO BE BACKFILLED WITH FLOW-FILL AND REDRILLED AFTER A THREE DAY CURING PERIOD WITHOUT THE USE OF A HARDENED WASHERS CONFORM TO ASTM F436.
### General Notes
1. Refer to the roadway plans for the actual configuration and location of traffic signal heads and signs marked with a **W**.
2. All poles shall be fabricated with ASTM A500 Grade 50 steel.
3. All heads shall be fabricated with ASTM A36 steel or ASTM A500 Grade 50 steel.
4. All poles and heads shall comply with the dimensional tolerances specified in ASTM A36, ASTM A307, and ASTM A500 Grade 50 steel.
5. All poles and heads shall be round or rounded tubes with a 0.25% diemeter.
6. Installation details are to be provided per ASTMA.500 Grade 50 steel.
7. Pole and mast arm splice shall be welded and outside after fabrication comply with ASTM A36. Unless, it is painted, it shall be thoroughly cleaned.
8. Pole and mast arm splice shall be welded and inside after fabrication complying with ASTM A36. Unless it is painted, it shall be thoroughly cleaned.

### Drawing File Information
- **Creation Date:** 07-04-12
- **Last Modification Date:** 07-04-12
- **Drawing File Name:** Sheet_S-614-40A_1of5.dgn
- **Sheet No.:** 1
- **Drawn To:** Not To Scale

### Design Data
1. **drawing head, signal head, and mast length may have fewer heads.**
2. **The design length parameters are presented in the diagram above.**
3. **The sections provide assistance with the structural design and analysis.**
4. **The design length parameters for each series are as follows:**
5. **The sections provide assistance with the structural design and analysis.**
6. **The design length parameters for each series are presented in the diagram above.**

### Pole Data

<table>
<thead>
<tr>
<th>Base Section</th>
<th>End Section</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Length (Ft.)</strong></td>
<td><strong>Top (D)</strong></td>
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<tr>
<td><strong>Mast Arm Length</strong></td>
<td></td>
</tr>
<tr>
<td>24.47</td>
<td>11.57</td>
</tr>
</tbody>
</table>

### Traffic Signal Structure

1. **Traffic signal structures have been designed in accordance with the loadings and forces resulting from the design parameters.**
2. **The signal head is located at the intersection of the appropriate path.**

### Standard Plan No.

**S-614-40A**

### Installation Details

#### Alternative Traffic Signal
- **Installation Details:**
  - **Base Section Length:**
    - **Exclude:**
      - **spacing length:**
        - **as per the mast arm spacing detail on Sheet 2**
  - **See general note 26**

#### Standard Plan No.
- **Safety & Traffic Engineering Branch**
- **KOM/RLO**
- **Issued By:** Safety & Traffic Engineering Branch July 4, 2012
- **Sheet No.:** 1/4
**GALLOPING DEFLECTION LIMITS**

*BASE SECTION LENGTH INCLUDES THE SPLICE LENGTH AS PER THE "MAST ARM SLIP SPLICE DETAIL" BELOW.*

- **GENERAL NOTE 28 ON SHEET 1 OF 4.**
- **DEFLECTION TOO SMALL TO MEASURE.**

**BASE SECTION LENGTH**

<table>
<thead>
<tr>
<th>Length (ft)</th>
<th>Tip E (in)</th>
<th>Thrust (in)</th>
<th>TM (in)</th>
<th>Base Section Length (in)</th>
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<tr>
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<td>45</td>
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<td>12.25</td>
<td>0.220</td>
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<td>45</td>
<td>7.50</td>
<td>12.25</td>
<td>0.220</td>
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<td>45</td>
<td>8.60</td>
<td>12.25</td>
<td>0.220</td>
<td>10.28</td>
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</table>

**END SECTION**

*STOP ALL WELDS "SHORT OF PLATE EDGES"*

**BASE SECTION**

- **POLE WALL**
- **ACCESS HOLE**
- **PLATE AND BOTTOM PLATE**

**LUMINAIRE ARM NOTES**

1. **SIMPLEX PLATE WALL THICKNESS:** 0.1793" LINEAR TAPER = 0.14 IN./FT.; DIAMETER AT ARM SIMPLEX PLATE = 4.679".

2. **SIMPLEX ARM WALL THICKNESS:** 0.1793" LINEAR TAPER = 0.4 IN./FT.; DIAMETER AT ARM SIMPLEX PLATE = 4.066".

**C HOOK DETAIL**

- **ACCESS HOLE**
- **PLATE AND ACCESS HOLE**

**MAST ARM SLIP SPLICE DETAIL**

- **BASE SECTION**
- **WITH 3/4" #12 BOLTS**
- **WITH EXPANDED THREADS AFTER ASSEMBLY**

**END CAP DETAIL**

- **HEX NUT**
- **WASHER (TYP.)**
- **1"  H.S. BOLTS**
- **1" HOLE FOR BACKING RING WELD DETAIL**

**SECTION**

- **POLE WALL**
- **ACCESS HOLE**
- **PLATE AND BOTTOM PLATE**

**MAST ARM DATA**

<table>
<thead>
<tr>
<th>MAST ARM</th>
<th>BASE SECTION</th>
<th>END SECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>LENGTH</td>
<td>LENGTH</td>
<td>TM</td>
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<td>(FT.)</td>
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<td>(IN.)</td>
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</tr>
<tr>
<td>45</td>
<td>8.60</td>
<td>12.25</td>
</tr>
</tbody>
</table>

**OPTIONAL MULTI-SIDED POLE**

- **POLE WALL**
- **BASE SECTION**
- **TRUNK ß BASE PLATE**
- **POLE WALL**
- **ACCESS HOLE**
- **PLATE AND BOTTOM PLATE**

**INSTALLATION DETAILS**

1. **SIMPLEX PLATE WALL THICKNESS:** 0.1793" LINEAR TAPER = 0.14 IN./FT.; DIAMETER AT ARM SIMPLEX PLATE = 4.679".
2. **SIMPLEX ARM WALL THICKNESS:** 0.1793" LINEAR TAPER = 0.4 IN./FT.; DIAMETER AT ARM SIMPLEX PLATE = 4.066".

**IMPACT OF A SOUND TUBE**

1. **PERPENDICULAR DISTANCE BETWEEN PLATE:**
   - **Y AND Z ARE OUTSIDE DIAMETER DIMENSIONS.**
   - **Z/Y RATIO MUST BE .98 MINIMUM.**

**Alternate Traffic Signal Installations Details**

- **POLE WALL**
- **BASE SECTION**
- **TRUNK ß BASE PLATE**
- **POLE WALL**
- **ACCESS HOLE**
- **PLATE AND BOTTOM PLATE**

**STANDARD PLAN NO.**

S-614-40A

**Issued By:** Safety & Traffic Engineering Branch July 4, 2012

**Computer File Information**

- **Creation Date:** 07-04-12
- **Comments:** Initial Law
- **Last Modification Date:** 07-04-12
- **Initial Law:**
- **MicroStation V8**
- **Drawing File Name:** Sheet_5614-40A_12.pdf
- **View:** Sheet 2 of 4
**ELEVATION**

**SECTION**

- **SIDE PLATE TO FACEPLATE WELD**
- **TOP SADDLE**
- **BOTTOM SADDLE**
- **FACEPLATE**
- **SIDE PLATE**

**DETAIL**

- **TAPERED WASHER DETAILS**
- **SIDE PLATE**
- **TOP SADDLE**
- **FACEPLATE**
- **SIDE PLATE TO FACEPLATE WELD**

**INSTALLATION DETAILS**

- **FOR U-BOLTS**
- **FOR U-BOLTS**
- **TAPERED WASHER DETAILS**
- **FACEPLATE**
- **SIDE PLATE**

**STANDARD PLAN NO.**

S-614-40A

**ALTERNATE TRAFFIC SIGNAL**

**ISSUED BY:** Safety & Traffic Engineering Branch July 4, 2012

**SHEET NO. 3 OF 4**
FROM TOP OF POLE TO CENTER OF LUMINAIRE.
HEIGHT, WITH MAX. PERMISSIBLE MAST ARM RISE OF 5 FEET
SHALL BE AT SUFFICIENT LENGTH TO OBTAIN MOUNTING
TO THE CENTER OF THE LUMINAIRE. POLE ASSEMBLY
ON THE PLANS. THE 40 FT. MOUNTING HEIGHT IS
DIMENSIONS ARE AS SHOWN UNLESS OTHERWISE STATED
WHEN IT IS NECESSARY TO ADD AN
EXTENSION TO THE POLE TO OBTAIN
WHEN SIGNAL HEADS ARE INSTALLED.
1. PLACE TRAFFIC SIGNALS AS SHOWN ON THIS SHEET SHALL BE DESIGNED TO MEET
THE REQUIREMENTS STATED IN THE STANDARD SPECIFICATIONS FOR
STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS,
PUBLISHED BY AASHTO, FOR A WIND VELOCITY OF 150 MPH THE CONTRACTOR
SHALL SUBMIT THE SHEET OF WORKING DRAWINGS LINED AND SEALLED BY A
PROFESSIONAL ENGINEER LICENSED IN THE STATE OF COLORADO, IN
ACCORDANCE WITH SECTION 205.02 OF THE STANDARD SPECIFICATIONS FOR ROAD
AND BRIDGE CONSTRUCTION.
2. SPAN WIRE POLES SHALL BE FABRICATED OF STEEL WITH A MINIMUM DIAMETER
OF 12 IN. A MINIMUM YIELD STRENGTH OF 35 KSI AND A MINIMUM WEIGHT PER
LINEAR FOOT OF 49.56 LBS. POLES SHALL BE INSTALLED SO THAT THEY WILL BE
PLUMB WHEN DEFLECTED BY THE INSTALLED LOAD.
3. ALL STEEL PIVOT MOUNTING BRACKETS SHALL BE CIPED GALVANIZED BOTH
SIDE AND OUTSIDE ACCORDING TO AASHTO, UNLESS PRINTING IS CALLED FOR ON
THE PLANS. PIVOT MOUNTING BRACKETS SHALL BE OF STEEL, SPAN WIRE POLES SHALL BE PAINTED AS DIRECTED.
4. SPAN WIRE POLES SHALL BE STRUNG SO AS NO MORE THAN 5% SAG IS ENCOUNTERED
WHEN SIGNAL HEADS ARE INSTALLED.
5. THE ITEM TRAFFIC SIGNAL-SPAN WIRE POLE SHALL INCLUDE THE
EXTENSION OF THE POLE AND THE ARM FOR THE MOUNTING OF THE LUMINAIRE.
6. SIGNAL FACES SUSPENDED OVER ROADWAY SHOULD BE APPROXIMATELY THE SAME
EXTENSION OF THE POLE AND THE ARM FOR THE MOUNTING OF THE LUMINAIRE.
7. MOUNTING HARDWARE FOR EACH TRAFFIC SIGNAL SHALL BE FURNISHED BY
THE MANUFACTURER, INCLUDING POLE PLATES FOR SIDE POLE MOUNTING.
8. SERVICE ENTRANCE FITTINGS SHALL BE 3 IN. GALVANIZED, THREADED NO. WRG.
9. LUMINAIRE ARMS SHALL BE EQUIPPED WITH A STANDARD 2 IN. SLIPFITTER.
10. PEDESTAL POLES FOR TOP MOUNTED SIGNAL OR CONTROL CABINET SHALL
BE 13' - 0" HEIGHT.
11. ALL POLES, PEDESTALS AND CABINETS SHALL BE PLACED A MINIMUM OF 2 FEET
OF 12 IN. A MINIMUM YIELD STRENGTH OF 35 KSI AND A MINIMUM WEIGHT PER
LINEAR FOOT OF 49.56 LBS. POLES SHALL BE INSTALLED SO THAT THEY WILL BE
PLUMB WHEN DEFLECTED BY THE INSTALLED LOAD.
12. CONCRETE POLES SHALL BE 3 IN. DIAMETER
13. USE 7 FOOT POLE ON INSTALLATIONS WITHOUT SIGNAL HEADS. SEAL TOP OF
CONCRETE POLES WITH CAST END CAP SECURED IN PLACE WITH 3 SET SCREWS.

GENERAL NOTES

PEDESTAL POLE INSTALLATION

SPAN WIRE POLE DETAIL

FOOTING NOTES

01. HEX NUTS
02. INSTALL ANCHOR BOLTS FURNISHED
03. WITH POLE PER MANUFACTURER'S
04. TEMPLATE PRINT (FURNISHED
05. WITH POLE) PER MANUFACTURER'S
06. INSTALLATION (FURNISHED
07. WITH POLE) PER MANUFACTURER'S
08. CAISSON DESIGN SHALL BE MODIFIED
09. BY VISUAL INSPECTION OF THE HOLE,
10. WHEN SIGNAL HEADS ARE INSTALLED.
11. SIGNAL HEADS SUSPENDED OVER ROADWAY SHOULD BE APPROXIMATELY THE SAME
13. MOUNTING HARDWARE FOR EACH TRAFFIC SIGNAL SHALL BE FURNISHED BY
14. THE MANUFACTURER, INCLUDING POLE PLATES FOR SIDE POLE MOUNTING.
15. SERVICE ENTRANCE FITTINGS SHALL BE 3 IN. GALVANIZED, THREADED NO. WRG.
16. LUMINAIRE ARMS SHALL BE EQUIPPED WITH A STANDARD 2 IN. SLIPFITTER.
17. PEDESTAL POLES FOR TOP MOUNTED SIGNAL OR CONTROL CABINET SHALL
BE 13' - 0" HEIGHT.
18. ALL POLES, PEDESTALS AND CABINETS SHALL BE PLACED A MINIMUM OF 2 FEET
OF 12 IN. A MINIMUM YIELD STRENGTH OF 35 KSI AND A MINIMUM WEIGHT PER
LINEAR FOOT OF 49.56 LBS. POLES SHALL BE INSTALLED SO THAT THEY WILL BE
PLUMB WHEN DEFLECTED BY THE INSTALLED LOAD.
CONCRETE PAD NOTES

1. CONTRACTOR SHALL INSTALL PRE-FABRICATED OR CAST-IN-PLACE FIBERGLASS CONCRETE PAD. SEE SPECIFICATION FOR MORE INFORMATION ON THE CONCRETE MATERIAL.

2. CONTRACTOR SHALL PLACE A MARKER ON CONCRETE PAD (CAST-IN-PLACE OR PRE-FABRICATED), AS INDICATED IN THE PLANS OR AS DIRECTED BY THE ENGINEER. THE CONCRETE PAD SHALL SLOPE AWAY FROM THE FIBERGLASS BASE AT A MAXIMUM OF 1/8".

3. THE CONCRETE PAD SURROUNDING THE CABINET BASE SHALL BE CLASS II MIX. GLASS FIBER STRENGTHS SHALL BE INCREASING OVER THE CONCRETE PAD. THE CONCRETE PAD SHALL BE CAST IN PLACE OR PREFABRICATED AS INDICATED BY THE ENGINEER. THE CONCRETE PAD OF THE CABINET BASE OF CONCRETE Pad shall be the design code recognized by the manufacturer of the CONCRETE Pad. All work involving the contraction of the CONCRETE Pad of the FIBERGLASS BASE shall not be paid for separately, but shall be included in the cost of the CONCRETE Pad.

4. FIBERGLASS BASE DIMENSIONS SHOWN VARY PER MANUFACTURER'S SPECIFICATIONS.

5. PRE-FABRICATED CONCRETE BASE DIMENSIONS SHOWN VARY PER MANUFACTURER'S SPECIFICATIONS.

6. PRE-FABRICATED CONCRETE BASE MANUFACTURER SHALL PROVIDE CONNECTION POINTS IN THE BASE FOR THE SPECIFIC CONTROLLED CABINET SPECIFIED IN THE PLANS.

PRE-FABRICATED FIBERGLASS FOUNDATION
CONCRETE PAD NOTES

1. CONTRACTOR SHALL PRE-FABRICATE OR CAST-IN-PLACE CONCRETE PAD SEE SPECIFICATION FOR MORE INFORMATION ON THE CONCRETE MATERIAL.

2. CONTRACTOR SHALL PLACE A 30'-HIGH TRUCK CONCRETE PAD (CAST-IN-PLACE OR PRE-FABRICATED) AS DIRECTED IN THE DETAILS. IF AS DIRECTED BY THE ENGINEER THE CONCRETE PAD SHALL SLOPE AWAY FROM THE FIBERGLASS BASE AT A MINIMUM 2% SLOPE.


4. FOUNDATIONS SHALL BE LOCATED TO PROVIDE MINIMUM CLEARANCE BETWEEN FIBERGLASS AND ANY PORTION OF THE CONTROLLED CABINET.

5. IN UNPLANNED AREAS, THE TOP FOUNDATION FOR MODELS 332 - 334 CONTROLLER CABINETS SHALL BE THREE (3) INCHES ABOVE SURROUNDING GRADE.

6. FIBERGLASS BASE DIMENSIONS SHOWN VARY PER MANUFACTURER'S SPECIFICATIONS.

SECTION A-A

FOUNDATION DETAILS
FOR MODEL 332 THROUGH 334 CONTROLLER CABINETS
TYPE 2 STOP LINE LOOPS

SECTION C-C

2" LONG RIGID TRAP BENT E60 X 2" CUSH

LOOP WIRE

SECTION D-D

2" WIRE E60 X 5' CUSH

LOOP SEALANT

2.5" WIDE SAND

TYPE 2 ADVANCE LOOPS

PULL BOX PLACEMENT DETAIL

FULL BOX PLACEMENT DETAIL

NOTE

ALL OF THE LOOP LEAD-IN WIRES SHALL RETURN TO THE FULL BOX.

TYPE 2 INDUCTION LOOPS (FOR CONVENTIONAL HIGHWAYS)
NOTES

1. ALL OF THE LOOP LEAD-IN WIRES SHALL RETURN TO THE FULL BOX.
2. FOR LOOP NUMBERING/LAYOUT DETAILS, SEE SHEET 7.

SECTION C-C

SECTION D-D

PULL BOX PLACEMENT

TYPE 3 INDUCTION LOOP (FOR CONVENTIONAL HIGHWAYS)

COLORADO DEPARTMENT OF TRANSPORTATION
8200 East Arkansas Avenue
Denver, Colorado 80222
Phone: (303) 757-5043
Fax: (303) 757-9219

SAFETY & TRAFFIC ENGINEERING BRANCH
KCM/KEN

TRAFFIC LOOP AND MISCELLANEOUS SIGNAL DETAILS

STANDARD PLAN NO.
S-614-43

Sheet No. 5 of 10
TYPE 3 STOP LINE LOOP WIRING DIAGRAM

TYPE 3 ADVANCE LOOP WIRING DIAGRAM

TYPE 3 sampling LOOP WIRING DIAGRAM

NOTES
1. LOOP NUMBERING LAYOUT WILL BE CHANGED TO LOOP NUMBERING LAYOUT DETAIL SEE SHEET 9
2. FOR WORKING AND CONSTRUCT LAYOUT SEE CONSTRUCT SUBMIT PLACEMENT DETAIL IN THE PLAN.
NOTES

1. Pull boxes, pull box covers, and dimensions shall be made of fireproof reinforced fiber-reinforced concrete or a composite material having a minimum fire rating of 1 hour as specified in the latest edition of the Uniform Building Code for underground enclosure integrity. Derating and verification documents shall be submitted with the submittal. The pull box shall have a knockout cover with a slip-resistant surface and have the words " Mao Box" or " Knockout Cover" on the cover. The pull boxes shall be mounted on the inside of the cut-out box and be spaced at a center to center of 24". The cover shall be attached to the cover box by a non-sagging metal cover lock. The pull box shall have two lifting bolts and shall have two lift suits to aid in the removal of the box.

2. Pull boxes shall be made for a minimum pull of 5,000 pounds.

3. Type 1 and 5 pull box covers shall be a two-piece cover.

4. Magnetic clutch tests should be performed in accordance with the latest edition of the Uniform Building Code for underground enclosure integrity, Type 2 rating.

TABLE OF DIMENSIONS (MINIMUMS)

<table>
<thead>
<tr>
<th>TYPE</th>
<th>DESCRIPTION</th>
<th>DIMENSIONS (IN)</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Pull Box - 12&quot; x 24&quot; x 12&quot;</td>
<td>A: 12 B: 24 C: 12 D: 12 E: 12 F: 12 G: 12 H: 12</td>
</tr>
<tr>
<td>2</td>
<td>Pull Box - 12&quot; x 24&quot; x 12&quot;</td>
<td>A: 12 B: 24 C: 12 D: 12 E: 12 F: 12 G: 12 H: 12</td>
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<tr>
<td>3</td>
<td>Pull Box - 12&quot; x 30&quot; x 12&quot;</td>
<td>A: 12 B: 30 C: 12 D: 12 E: 12 F: 12 G: 12 H: 12</td>
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<tr>
<td>4</td>
<td>Pull Box - 12&quot; x 24&quot; x 12&quot;</td>
<td>A: 12 B: 24 C: 12 D: 12 E: 12 F: 12 G: 12 H: 12</td>
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</table>

STANDARD PULL BOXES

Computer File Information

Creation Date: 07/04/12
Description: KEN

Last Modification Date: 07/04/12
Description: KEN

File Path: C:\143143\K:\143143\K:\143143\K:

Drawing File Name: S-614-43_Bolts

Call: Dolson, Dolson, Dolson

Traffic Loop and Miscellaneous Signal Details

Colorado Department of Transportation
4245 East Arapahoe Avenue
Littleton, Colorado 80122
Phone: (303) 757-8219
Fax: (303) 757-8210

Safety & Traffic Engineering Branch

KCM/KEN

Traffic Loop and Miscellaneous Signal Details

Issued By: Safety & Traffic Engineering Branch

STANDARD PLAN NO.

S-614-43

Sheet No. 8 of 10

July 4, 2012
NOTES

1. Signal head configurations shall be as shown on plans.

2. Install mounting brackets according to the manufacturer's instructions.

3. For mounting chemically bonded except for limited street signs on mast arms, see standard plan S-614-43. See I-10 free standing.

4. Limited street name signs shall utilize astro-type mounting brackets designed for the required design loading and be free-spanning to reduce wind loading effect.

ASTRO-TYPE MOUNTING BRACKET

MAST-ARM MOUNTING BRACKETS
SPAN WIRE MOUNTING BRACKET DETAILS

ITEM DESCRIPTION FOR ASSEMBLY DETAIL

1. Tether Wire - 3/16" black plastic self-locking strap
2. Wire - 3/16" black plastic self-locking strap
3. Nut - hex steel
4. Bolt - hex steel
5. Washer - stainless steel
6. Washer - black plastic self-locking strap
7. Bracket - steel
8. Nut - hex steel
9. Washer - black plastic self-locking strap
10. Bolt - hex steel

Legend:
- Top bracket center hole shall be a minimum 3/8" in diameter and 3 inches deep. The equal length steel bracket cast in black, mixed or galvanized, dependents shall be thread.
- Wires length depends on span height.
- Span support bracket assembly shall utilize span wire clamp adjustment and be adjustable to accommodate varying span lengths. The support rod shall be attached to the sides using a minimum of two (2) No. 8 bolts, spaced a minimum of 9 inches apart.
- Apply soldering compound or baking soda between brackets and mounting points.
- All thread.
- Inspection should be done by all fittings.
- Install stainless steel washers on both sides of the cutter pin. The pin and washer shall be on the slide if the bracket stay from the original cable.

SPRING WIRE MOUNTING DETAIL
FOR EMERGENCY VEHICLE PRE-EMPTION DEVICE

TRAFFIC LOOP AND MISCELLANEOUS SIGNAL DETAILS

S-614-43
Sheet No. 10 of 10

STANDARD PLAN NO.
GENERAL NOTES (CONTINUED)

20. Welding of steel shall conform to the requirements of AWS E 70; all areas to be welded shall be cleaned to base metal, all putty welds shall be completed, and welding and rework testing shall be completed before any material is returned.

ENHANCED METAL PARTICLE TESTING SHALL BE PERFORMED ON AREAS EXPOSED IN ANY E 70 OR ASH E 8. ALL ENHANCED METAL PARTICLE TESTING SHALL BE CONDUCTED IN ACCORDANCE WITH ASH E 70 if ANY AREA IS AFFECTED. ENHANCED METAL PARTICLE TESTING ON AREAS CONFORMING TO THE REQUIREMENTS OF ASH E 70 IS REQUIRED. ASH E 8 TYPE 2 SHALL BE APPLIED TO THE TEST SURFACE PRIOR TO TESTING.

The welds shall be in the proper position when testing the welds or base metal. They shall be positioned normal and parallel with respect to the weld face and welding direction of the base metal.

ENHANCED METAL PARTICLE TESTS SHALL BE CONDUCTED AT THE FOLLOWING LOCATIONS:

1. Base metal: All areas contacted by the carbon arc welding electrode, the welding electrode, and the welding electrode all three conditions are arc strikes.
2. Field welds; each welder shall use two (2) to two (2) inches of welder materials. All welds shall be field welded at the design location, and shall be a minimum of two (2) to two (2) inches from the design location and welder materials. Welds shall be field welded at the design location, and shall be a minimum of two (2) to two (2) inches from the design location and welder materials. Welds shall be field welded at the design location, and shall be a minimum of two (2) to two (2) inches from the design location and welder materials.
3. Groove welds: All through thickness edges on transverse butt welds in tension areas.
4. Groove welds: All through thickness edges on transverse butt welds in tension areas.

21. All cross-butt welds and all longitudinal pipe seam welds within 2" of full penetration circumferential groove welds shall be full penetration groove welds and shall be registered as specified herein. The acceptable groove welds are defined in Exhibit X.

MATERIALS

<table>
<thead>
<tr>
<th>MATERIALS</th>
<th>SPECIFICATION</th>
</tr>
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<tbody>
<tr>
<td>POSTS, FAST ENDS</td>
<td>103</td>
</tr>
<tr>
<td>BARS, PLATES, AND SHAPES</td>
<td>A793 M-270</td>
</tr>
<tr>
<td>HOLLOW STRUCTURAL SECTIONS</td>
<td>1000</td>
</tr>
<tr>
<td>HIGH-STRENGTH BOLTS (HS BOLTS)</td>
<td>A325 M-8</td>
</tr>
<tr>
<td>HIGH-STRENGTH BOLTS (HS NUTS)</td>
<td>A490 M-29</td>
</tr>
<tr>
<td>HIGH-STRENGTH WASHERS</td>
<td>A46</td>
</tr>
<tr>
<td>KEYPLATES (HS)</td>
<td>F355 M-854 GRADE 55 STEEL</td>
</tr>
<tr>
<td>NUT RIVETS</td>
<td>F355 M-854 GRADE 55 STEEL</td>
</tr>
<tr>
<td>PIPE SHALL BE WELDED ON ALL STEEL PIPE CONFORMING TO THE SPECIFICATIONS OF ASTM A358, ASTM A450, AND ASTM A490.</td>
<td></td>
</tr>
<tr>
<td>GRADE 76 OR 77 STEEL ASTM A182 MAY BE SUBSTITUTED.</td>
<td></td>
</tr>
</tbody>
</table>
| HOLLOW STRUCTURAL SECTION SPECIFICATIONS APPLY TO THE STRUCTURAL TIERING SPECIFICATIONS AS USED IN THE STRUCTURAL DESIGN SPECIFICATIONS.
| TENSION CONTROL (TC) BOLTS CONFORMING TO ASTM F573 MAY BE SUBSTITUTED FOR ASTM A325 BOLTS. ALL OTHER BOLTS AND NUTS SHALL CONFORM TO THE SPECIFICATIONS OF ASTM A325.
| ALL FASTENERS WITH COMPRESSIBLE WASHER-TYPE TENSION INDICATORS MAY BE SUBSTITUTED FOR ASTM A325 WASHER-TYPE HIGH-STRENGTH CONNECTORS. |

OVERHEAD SIGN X-SECTION SHEET(S) SHALL SHOW:

1. SIGN STRUCTURE LOCATION ORIENTATION, STATION AND ELEVATION
2. LENGTH OF STRUCTURE BEAM
3. PANEL SIZE AND LOCATION ON STRUCTURE
4. OFFSET FROM SHRINKLE
5. FASTENERS FROM TOP OF CASSETTE TO WASH ARM
6. CASSETTE CAMBER AND VIRTUAL ELEVATION
7. TOP OF CASSETTE ELEVATION
8. CASSETTE CAMBER
9. STATIONING AND OFFSETS TO CASSETTE
10. CASSETTE PROTECTION LIMITS
11. CASSETTE LIMITS
12. CASSETTE LIMITS
13. CASSETTE LIMITS

Computer File Information

Sheet Revisions

COLORADO DEPARTMENT OF TRANSPORTATION

S-614-50

S-614-50

Sheet No. 2 of 12

STATIC SIGN MONOTUBE STRUCTURES

S-614-50

S-614-50

Sheet No. 2 of 12
CANTILEVER NOTES

1. The maximum sign panel overlap onto elbow shall not exceed 3/8" from the field splice.

2. All posts between base plate and field splice shall have a tube wall thickness of 1/8". All back and caps shall have a tube wall thickness of 3/16".

3. See sheet 7 for field splice details.

PIPE SIZES

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<th>Pipe ID</th>
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<tr>
<td>14</td>
<td>8</td>
</tr>
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<td>18</td>
<td>8</td>
</tr>
<tr>
<td>20</td>
<td>8</td>
</tr>
<tr>
<td>24</td>
<td>10</td>
</tr>
</tbody>
</table>
-POST AND ARM DETAILS-

HANDHOLE AND COVER DETAILS

NOTES:
1. STIFFENERS ARE TO BE PlACED AT THE BASE OF ALL POSTS. SEE SHEET 6 FOR THE LOCATION OF STIFFENERS. STIFFENERS ARE NOT SHOWN ELSEWHERE IN THESE SHEETS FOR CLARITY.

2. TEMPERATE WELD ½" SHORT OF THE TOP OF THE STIFFENER PLATE AT THE FIRST 3 WELDS TERMINATING ON THESE 3 TYPICAL VERTICAL STEPS. WELD ½" SHORT OF THE END OF THE PLATE.

STIFFENER DETAILS
(ATTACH BASE- SEE SHEET 7)

PHOTOELECTRIC CONTROL DETAILS
SEE "PHOTO" SHEET FOR LOCATION WHEN REQUIRED

LIFTING EYE DETAIL

POST BASE ELEVATION
(ATTACH BASE- SEE SHEET 7)

MAST ARM END DETAIL
(ATTACH COVER ARM)

PHOTOELECTRIC CONTROL DETAIL

4-½" FEED HOLE PLUGS FOR CALIBRATION PURPOSES AS SHOWN. INSTALL ALUMINUM TAPERED VENT HOLE PLUGS AFTER CALIBRATION.
**TYPICAL VERTICAL POST SIGN BRIDGE**

**STRUCTURE SELECTION PROCEDURE FOR SIGN BRIDGES**

**A.** Design is based on a span design of 20-wind of the span length covered by until the capacity of the largest pole shown is reached before that point the coverage percentage decreases.

**B.** The maximum primary panel height is 1/4 the area of all other panels to the area of all primary panels to check against maximum sign panel area.

**C.** Obtain the design wind speed from the overhead sign section sheets in the roadway plans.

**D.** Pipe posts #2 and split #1 from the appropriate chart, include the area of all sign panels shown in the overhead sign section sheets, which can potentially be placed in the sign in the future.

**E.** If no pipe post area is shown for a certain span that indicates that the span panel height combination exceeds the limits of this standard.

**F.** The overhead sign section sheets indicate the height #2, the span and the sign panel size.

---

### 80 MPH WIND

<table>
<thead>
<tr>
<th>SPAN (FT)</th>
<th>MAXIMUM SIGN PANEL AREA (SQ. FT)</th>
<th># PIPE POST</th>
<th>FIRE BREAK (IN)</th>
<th>SPLIT (IN)</th>
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<tr>
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<tr>
<td>120</td>
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<tr>
<td>150</td>
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### 90 MPH WIND

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### 100 MPH WIND

<table>
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<th>SPAN (FT)</th>
<th>MAXIMUM SIGN PANEL AREA (SQ. FT)</th>
<th># PIPE POST</th>
<th>FIRE BREAK (IN)</th>
<th>SPLIT (IN)</th>
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<tbody>
<tr>
<td>50</td>
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<tr>
<td>150</td>
<td>1250</td>
<td>24</td>
<td>5</td>
<td></td>
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</tbody>
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**PROCEDURE TO DETERMINE THE DESIGN WIND SPEED**

80 MPH is the standard design wind speed for the states of Colorado. The standard design wind speed of 80 MPH is to be used at all locations except the following:

1. Use the 80 MPH wind speed for locations within 4 miles of either side of the bridge along the footpath of the bridge.

2. Use the 20 MPH wind speed for locations in Boulder County.

If there are questions concerning the proper design wind speed contact the Static Bridge Branch.

*Waste area dimension same as post.*

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Last Modification Date: 07-04-12
Initials: JLM

**Sheet Revisions**

Date: Comments

**Colorado Department of Transportation**

8420 East Arkansas Avenue
Denver, Colorado 80222
Phone: (303) 757-6843
Fax: (303) 757-9219

Safety & Traffic Engineering Branch

**STATIC SIGN MONOTUBE STRUCTURES**

**STANDARD PLAN NO.**

S-614-50

Sheet No. 11 of 12

Issued By: Safety & Traffic Engineering Branch on July 4, 2012
ANCHORAGE NOTES

1. AN OSHA COMPLIANT ANCHORAGE DEVICE SHALL BE MOUNTED TO THE OUTWARD LIMITS OF THE ANGLE AS DIRECTED BY THE ENGINEER. ANCHORAGE DEVICES SHALL NOT BE INSTALLED WHERE VERTICAL FALL PROTECTION REQUIREMENTS APPLY. THE SIGN ANCHOR UNIT MUST BE PROPERLY INSTALLED AND SHOWN IN A MINIMUM CLEAR DISTANCE OF 12 FEET BELOW THE SIGN CABINET. A MINIMUM PROTECTION CLEARANCE OF 12 FEET BETWEEN THE CABINET AND THE SNEEZE PLATE IS REQUIRED FOR THE INSTALLATION.

2. ANCHORAGE DEVICE SHOULD BE MOUNTED WITH A MINIMUM OF TWO 1/2" DIAMETER STAINLESS STEEL BOLTS.

3. STAINLESS STEEL BOLTS AND CONNECTIONS SHALL COMPLY WITH ANSI A300. STAINLESS STEEL NUTS AND BOLTS SHALL COMPLY WITH ANSI A300. STAINLESS STEEL NUTS AND BOLTS SHALL COMPLY WITH ANSI A300. A WASHING METAL MATERIAL SHALL BE PROVIDED UNDER THE NUT.

4. ALUMINUM ANGLE SHALL COMPLY WITH ANSI A300.

5. VERTICAL FRAME MEMBER SHALL BE A PRIMARY FRAMING MEMBER, ALIGNED TO THE EXTERIOR AND ON THE SUPPORT FACE OF THE CABINET.

DYNAMIC SIGN MONOTUBE STRUCTURES

COLORADO DEPARTMENT OF TRANSPORTATION

S-614-60

 issuued by Safety & Traffic Engineering Branch on July 4, 2012

Sheet No. 3 of 14
-CANTILEVER POST AND ARM DETAILS-

POST BASE ELEVATION

VIEW

POST & CASSET

Remote Access Cabinet

REMOTE ACCESS - CABINET

4" O.D. PIPE (5 1/2"

1/2" COVER PL

1 1/2" MOUNTING BRACKET

LIFTING EYE - SEE DETAIL

4-1/2" TAPERED HOLE PLUGS AFTER GALVANIZING

MAST ARM END DETAIL

HANDBOLE AND COVER DETAILS

HANDHOLE = 0 PIPE

Conduit penetration details

- Plug with recessed fire plugs
- Disconnect cabinet for the power supply shall be located outside of the clear-zone.
CANTILEVER BASE PLATE DETAILS

POST BASE ELEVATION

STIFFENER DETAILS

BASE PLATE DETAILS

NOTES:
1. STIFFENERS ARE NOT SHOWN ELSEWHERE IN THESE SHEETS FOR CLARITY.
2. TERMINATE BOLTS 5" SHOWN OF THE TOP OF THE STIFFENER PLATE AT THE OTHER 5" CANNOT TERMINATE IN THESE. TWO 5" BOLTS SHALL STOP THE BOLTS 5" SHOWN OF THE END EDGE OF THE PLATE.
-FOUNDATION & ANCHOR BOLT DETAILS-

CAISSON DRILLING AND INSTALLATION NOTES

1. Caissons shall be placed against a shored-up caisson wall or driven piles shall be installed with full fall and riser pipe. A three-day curing period is required after the use of a caisson.

2. The design herein assumed that foundation supports are installed within the roadway prism using the following load parameters:
   - Soil Density: 2,000 lb/ft³
   - Soil Cohesion: 750 lb/ft²
   - Wet density: 60% of maximum dry density soil
   - Angle of shearing resistance: 20°
   - Water table: 2.0 for regional resistance.

3. Contact the engineer if any of the following soil conditions are encountered during drilling:
   - Hard surface will not be installed within the roadway prism.
   - Hard surface is encountered in the soil.
   - The site work support the weight of the drilling rig.
   - The foundation wall is not continuous.
   - Rock hardness is encountered.
   - Large boulders are encountered.

4. The contractor shall provide a survey of the foundation to verify placement and position of the foundation. A survey is to be completed before construction. The survey shall show the location of each foundation. The survey shall include:
   - The location of each foundation.
   - The elevation of the crown of the roadway.
   - The elevation of the shoulder.
   - The location of the shoulder and the crown of the roadway.

5. The foundation shall be constructed using a steel template until the concrete is cured at least 14 days.

6. Anchor bolts shall be installed in the existing foundations.

7. The anchor bolts shall be provided using the turn-out method. The bolts shall be turned out from the template, which is defined as the template that exists when the upper and lower nuts are in firm contact with the base plate. The nuts may be free to rotate. The upper and lower nuts are each turned an additional 1/16th turn (± 0.030"") using a slogging wrench.

ROADSIDE SHOULDER INSTALLATION

CAISSON FOUNDATION DETAILS

CAISSON DRILLING AND INSTALLATION NOTES

1. Caissons shall be placed against a shored-up caisson wall or driven piles shall be installed with full fall and riser pipe. A three-day curing period is required after the use of a caisson.

2. The design herein assumed that foundation supports are installed within the roadway prism using the following load parameters:
   - Soil Density: 2,000 lb/ft³
   - Soil Cohesion: 750 lb/ft²
   - Wet density: 60% of maximum dry density soil
   - Angle of shearing resistance: 20°
   - Water table: 2.0 for regional resistance.

3. Contact the engineer if any of the following soil conditions are encountered during drilling:
   - Hard surface will not be installed within the roadway prism.
   - Hard surface is encountered in the soil.
   - The site work support the weight of the drilling rig.
   - The foundation wall is not continuous.
   - Rock hardness is encountered.
   - Large boulders are encountered.

4. The contractor shall provide a survey of the foundation to verify placement and position of the foundation. A survey is to be completed before construction. The survey shall show the location of each foundation. The survey shall include:
   - The location of each foundation.
   - The elevation of the crown of the roadway.
   - The elevation of the shoulder.
   - The location of the shoulder and the crown of the roadway.

5. The foundation shall be constructed using a steel template until the concrete is cured at least 14 days.

6. Anchor bolts shall be installed in the existing foundations.

7. The anchor bolts shall be provided using the turn-out method. The bolts shall be turned out from the template, which is defined as the template that exists when the upper and lower nuts are in firm contact with the base plate. The nuts may be free to rotate. The upper and lower nuts are each turned an additional 1/16th turn (± 0.030"") using a slogging wrench.

DYNAMIC SIGN MONOTUBE STRUCTURES

STANDARD PLAN NO.

S-614-60

Sheet No. 14 of 14
GENERAL NOTES

1. CENTER LINES
   - Solid yellow, 4 in. wide - 20 ft. segments with 30 ft. gaps
   - Solid yellow, 4 in. wide
   - These lines separate adjacent-in-function traffic lanes. All lines shall be spaced 4 ft. apart.

2. LANE LINES
   - Solid white, 4 in. wide - 20 ft. segments with 40 ft. gaps
   - Solid white, 4 in. wide
   - These lines separate opposite-direction traffic lanes. A solid line may be used to enclose lane markings. Where the parallel solid white lines are required to prevent lane crossings.

3. EDGE LINES
   - Solid white or yellow edge lines shall be 4 in. wide
   - Yellow edge lines shall be used on the left side of a road where the edge line is subject to excessive wear (e.g., on a divided highway or a downtown road). This edge line is not intended to be used as a physical barrier or to guide vehicles.

4. YOU-ONLY LINES
   - Solid white or yellow edge lines shall be 4 in. wide
   - These lines are intended to mark a specific lane or area and are not to be used as a general traffic control device. You-only lines may be used to guide vehicles in specific situations or to mark a specific area.

5. CROSS-WALKING LINES
   - Solid yellow, 4 in. wide
   - Cross-walking lines may be used to mark pedestrian crossing points.

6. COMBINATION ACCEL-DECCEL LANE
   - Solid white, 4 in. wide
   - These lines are used with 20 ft. segment lengths and are placed at intervals of 20 ft. to 200 ft.

7. PARKING LINES
   - Solid white, 3 in. wide
   - These lines are used to mark parking spaces.

8. TEMPORARY LINES
   - Solid white, 3 in. wide
   - These lines may be used to mark temporary parking areas or other temporary markings.

9. LANE DROP MARKINGS
   - Solid white, 3 in. wide
   - These lines may be used to mark lane drops or other temporary markings.

TYPICAL ENTRANCE AND EXIT RAMP MARKINGS

(continued on Sheet No. 2)

PAVEMENT MARKINGS

STANDARD PLAN NO.
S-627-1

Sheet No. 1 of 5

Computer File Information

Creation Date: 07/04/12
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Colorado Department of Transportation
4200 East 46th Avenue
Denver, Colorado 80222
Phone: 303-757-6043
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Safety & Traffic Engineering Branch
KCM/SCL
Issued By: Safety & Traffic Engineering Branch July 4, 2012
TYPICAL SPEED MEASUREMENT MARKING

TYPICAL DOUBLE LEFT TURN MARKINGS

TYPICAL STOP BAR PLACEMENT
GENERAL NOTES

1. ALL CONSTRUCTION ZONE TRAFFIC CONTROL DEVICES, INCLUDING ANY LIGHTS, SIGNALS, SEMAPHORES, FLASHING BEACONS, PORCUPINES, AND CHANNELIZING DEVICES, SHALL BE PLACED AND MAINTAINED IN ACCORDANCE WITH THE REQUIREMENTS OF THIS MANUAL. CONSTRUCTION ZONE TRAFFIC CONTROL DEVICES SHALL BE PLACED FROM THE CONSTRUCTION WORK AREA AND SHALL BE DEFINED FOR THE PURPOSES OF THIS MANUAL AS ANY ITEM THAT IS PLACED TO REDUCE THE PROBABILITY OF COLLISIONS OR INJURIES TO MOTORISTS OR PEDESTRIANS. CONSTRUCTION ZONE TRAFFIC CONTROL DEVICES MAY INCLUDE BUT NOT BE LIMITED TO WARNING SIGNS, REFLECTIVE SIGNS, FLASHING LIGHTS, ROAD CLOSURE SIGNS, CHANNELIZATION DEVICES, AND OTHER ITEMS USED TO MAINTAIN THE WORK AREA IN SAFE AND REASONABLE CONDITIONS.

2. WORK IN THE PROJECT SHALL NOT BE STARTED UNTIL ALL REQUIRED TRAFFIC CONTROL DEVICES ARE IN PLACE AND APPROVED BY THE ENGINEER.

3. WHEN SPEED LIMIT RESTRICTIONS ARE APPLIED, ALL SPEED LIMIT SIGNS SHALL BE IN ACCORDANCE WITH THE MANUAL FOR THE APPLICATION AND INSTALLATION OF TEMPORARY SPEED LIMITS.

4. ANY TRAFFIC CONTROL DEVICE THAT IS DAMAGED, WEATHERED, WORN, OR OTHERWISE HAZARDOUS OR UNUSABLE BY THE ENGINEER SHALL BE IMPOSSIBLE.

5. THE CONTRACTOR IS RESPONSIBLE FOR THE MAINTENANCE OF ALL TRAFFIC CONTROL DEVICES IN THE WORK ZONE. ANY TRAFFIC CONTROL DEVICES THAT ARE DAMAGED, WEATHERED, WORN, OR OTHERWISE HAZARDOUS OR UNUSABLE BY THE CONTRACTOR SHALL BE REPLACED.

6. CONSTRUCTION TRAFFIC SIGNS SHALL BE SHOWN IN THE FOLLOWING SIZES AND DESCRIPTIONS:
   - PANELS A: 1.5 x 1.5 x 1.5 (including type 1, standard 2)
   - PANELS B: 0.75 x 0.75 x 0.75 (including type 3, standard 4)
   - PANELS C: 0.5 x 0.5 x 0.5 (including type 5, standard 6)

7. CONSTRUCTION TRAFFIC SIGNS 18 INCHES WILL BE RESERVED FOR PROJECT WORK ZONES.

8. ::: COLORADO DEPARTMENT OF TRANSPORTATION

9. BASE LIGHTS SHALL BE PLACED ON THE WORK AREA AT THE PERIPHERY TO ALERT NEIGHBORS TO THE WORK ZONE. THE BASE LIGHTS SHALL BE OF THE TYPE SPECIFIED IN THE MANUAL FOR THE APPLICATION OF BASE LIGHTS. THE BASE LIGHTS SHALL BE PLACED IN A POSITION THAT IS GROUNDED FOR USE IN THE WORK ZONE.

10. CONSTRUCTION TRAFFIC CONTROL DEVICES SHALL BE PLACED ON THE WORK AREA AT THE PERIPHERY TO ALERT NEIGHBORS TO THE WORK ZONE. THE BASE LIGHTS SHALL BE OF THE TYPE SPECIFIED IN THE MANUAL FOR THE APPLICATION OF BASE LIGHTS. THE BASE LIGHTS SHALL BE PLACED IN A POSITION THAT IS GROUNDED FOR USE IN THE WORK ZONE.

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CASE NO. 18
TYPICAL APPLICATION
TRAFFIC CONTROL AROUND A WORK AREA NEAR AN INTERSECTION, ONE LANE CLOSED

NOTES:
1. SIGN PLACEMENT SHOWN ON CASE 15 APPLIES TO CASE 18, EXCEPT FOR CASES WHERE A WORK AREA OCCURS IN A BOX.
2. TRUCK-MOUNTED ATTACHMENTS MIGHT BE NECESSARY FOR TRADES AS DETERMINED BY THE ENGINEER.

CASE NO. 19
TYPICAL APPLICATION OF TRAFFIC CONTROL AROUND A WORK AREA NEAR AN INTERSECTION

CASE NO. 20
TYPICAL SIGNING FOR ROAD CLOSURE

KEY TO ADVANCE SIGNING DISTANCES

STANDARD PLAN NO.
S-630-1
Sheet No. 10 of 20
CASE NO. 24
TYPICAL APPLICATION
"FINES DOUBLE IN WORK ZONE" SIGNING (WITH SPEED REDUCTION)

FINES DOUBLE SIGNING NOTES:

1. SIGNS SHALL NOT BE PLACED MORE THAN FOUR MOWERS BEHIND WORK ZONE TO Begin AND SHALL BE REMOVED AS SOON AS BOTH ACTIVITIES ARE COMPLETED, UNLESS POTENTIAL HAZARDS EXISTED AS A RESULT OF THE WORK ARE STILL PRESENT AT THE END OF THE MOWING SEQUENCE. SIGNS ARE LEFT IN PLACE AFTER BOTH ACTIVITIES. THE TRAFFIC CONTROL SUPERVISOR SHALL MAKE AN ENTRY IN THEIR daily REPORT THAT INDICATES THEIR USE.

2. SIGNS SHALL Be PLACED WHERE HAZARDS ARE PRESENT IN THE ROADWAY OR WORK ZONE OR ARE AT HIGH OR WHERE THERE ARE SIGNS IN THE TRAFFIC CONTROL ZONE OR CLEAR ZONE.

3. SIGNS SHOULD Be PLACED SO THAT HAZARDS ARE ACCESSED DURING THE WORK ZONE OR ACTIVITY. SIGNS SHOULD BE MOVED ACCORDINGLY.

4. SIGNS SHOWN IS REQUIRED TO ENHANCE DOUBLE FINES IN A WORK ZONE AND AREN'T REQUIRED FOR THE PARTICULAR WORK ZONE PLACEMENT OF "FINES DOUBLE IN WORK ZONE" SIGNING. SIGNS MAY BE ADDED AS NEEDED TO PROVIDE A Minimum 200' SPACING BETWEEN OTHER SIGNING REQUIRED FOR THE SPECIFIC WORK ZONE SET.
TYPICAL CONSTRUCTION ZONE SIGNS

THese SIGNS NOtes ARE INTENDED AS A qUICK REFERENCE
FOR TYPICAL SIGNS USE AND PLACEMENT IN CONSTRUCTION ZONES.

**WJ-3** — "WIDE LOAD IN TRANSIT" — THIS SIGN PLACED BETWEEN 301 AND 303 SIMULTANEOUSLY ACROSS THE ROAD IN A CONSTRUCTION SITE. THE WIDE LOAD IS INDICATED BY THE SYMBOL "WIDE LOAD." THIS SIGN IS USED TO ADVISE VEHICLES TO BE ON THE LOOKOUT FOR WIDE LOADS IN TRANSIT, AND TO MODERATE THEIR SPEED TO PREVENT ACCIDENTS. THE SIGN SHOULD BE PLACED AT THE START OF THE CONSTRUCTION ZONE.

**WJ-4** — "WIDE LOAD IN TRANSIT" — THIS SIGN PLACED BETWEEN 302 AND 303 SIMULTANEOUSLY ACROSS THE ROAD IN A CONSTRUCTION SITE. THE WIDE LOAD IS INDICATED BY THE SYMBOL "WIDE LOAD." THIS SIGN IS USED TO ADVISE VEHICLES TO BE ON THE LOOKOUT FOR WIDE LOADS IN TRANSIT, AND TO MODERATE THEIR SPEED TO PREVENT ACCIDENTS. THE SIGN SHOULD BE PLACED AT THE END OF THE CONSTRUCTION ZONE.

**WJ-5** — "WIDE LOAD IN TRANSIT" — THIS SIGN PLACED BETWEEN 301 AND 303 SIMULTANEOUSLY ACROSS THE ROAD IN A CONSTRUCTION SITE. THE WIDE LOAD IS INDICATED BY THE SYMBOL "WIDE LOAD." THIS SIGN IS USED TO ADVISE VEHICLES TO BE ON THE LOOKOUT FOR WIDE LOADS IN TRANSIT, AND TO MODERATE THEIR SPEED TO PREVENT ACCIDENTS. THE SIGN SHOULD BE PLACED AT THE MIDDLE OF THE CONSTRUCTION ZONE.

**WJ-6** — "WIDE LOAD IN TRANSIT" — THIS SIGN PLACED BETWEEN 301 AND 303 SIMULTANEOUSLY ACROSS THE ROAD IN A CONSTRUCTION SITE. THE WIDE LOAD IS INDICATED BY THE SYMBOL "WIDE LOAD." THIS SIGN IS USED TO ADVISE VEHICLES TO BE ON THE LOOKOUT FOR WIDE LOADS IN TRANSIT, AND TO MODERATE THEIR SPEED TO PREVENT ACCIDENTS. THE SIGN SHOULD BE PLACED AT THE END OF THE CONSTRUCTION ZONE.

**WJ-7** — "WIDE LOAD IN TRANSIT" — THIS SIGN PLACED BETWEEN 301 AND 303 SIMULTANEOUSLY ACROSS THE ROAD IN A CONSTRUCTION SITE. THE WIDE LOAD IS INDICATED BY THE SYMBOL "WIDE LOAD." THIS SIGN IS USED TO ADVISE VEHICLES TO BE ON THE LOOKOUT FOR WIDE LOADS IN TRANSIT, AND TO MODERATE THEIR SPEED TO PREVENT ACCIDENTS. THE SIGN SHOULD BE PLACED AT THE MIDDLE OF THE CONSTRUCTION ZONE.

ADVANCE PLACEMENT OF WARNING SIGNS

**AW-6** — "ADVANCE WARNING SIGN" — THIS SIGN USED TO ADVISE VEHICLES OF A CONSTRUCTION ZONE IN ADVANCE. THE SIGN IS PLACED AT A DISTANCE FROM THE CONSTRUCTION ZONE TO ALLOW VEHICLES TO PREPARE THEMSELVES FOR THE CHANGE IN ROAD CONDITIONS. THE SIGN SHOULD BE PLACED AT LEAST 200 FEET FROM THE END OF THE CONSTRUCTION ZONE.

**AW-7** — "ADVANCE WARNING SIGN" — THIS SIGN USED TO ADVISE VEHICLES OF A CONSTRUCTION ZONE IN ADVANCE. THE SIGN IS PLACED AT A DISTANCE FROM THE CONSTRUCTION ZONE TO ALLOW VEHICLES TO PREPARE THEMSELVES FOR THE CHANGE IN ROAD CONDITIONS. THE SIGN SHOULD BE PLACED AT LEAST 200 FEET FROM THE END OF THE CONSTRUCTION ZONE.

**AW-8** — "ADVANCE WARNING SIGN" — THIS SIGN USED TO ADVISE VEHICLES OF A CONSTRUCTION ZONE IN ADVANCE. THE SIGN IS PLACED AT A DISTANCE FROM THE CONSTRUCTION ZONE TO ALLOW VEHICLES TO PREPARE THEMSELVES FOR THE CHANGE IN ROAD CONDITIONS. THE SIGN SHOULD BE PLACED AT LEAST 200 FEET FROM THE END OF THE CONSTRUCTION ZONE.

**AW-9** — "ADVANCE WARNING SIGN" — THIS SIGN USED TO ADVISE VEHICLES OF A CONSTRUCTION ZONE IN ADVANCE. THE SIGN IS PLACED AT A DISTANCE FROM THE CONSTRUCTION ZONE TO ALLOW VEHICLES TO PREPARE THEMSELVES FOR THE CHANGE IN ROAD CONDITIONS. THE SIGN SHOULD BE PLACED AT LEAST 200 FEET FROM THE END OF THE CONSTRUCTION ZONE.

COLORADO DEPARTMENT OF TRANSPORTATION

TRAFFIC CONTROLS FOR HIGHWAY CONSTRUCTION

STANDARD PLAN NO.

S-630-1

Sheet No. 20 of 20
TEMPORARY PORTABLE RUMBLE STRIP ARRAYS

CASE NO. 1
TYPICAL APPLICATION
TWO-LANE UNDIVIDED HIGHWAY

GENERAL NOTES

1. TEMPORARY PORTABLE RUMBLE STRIP ARRAYS SHALL BE PLACED IN ADVANCE OF EACH PLACING STATION WHEN CALLER FOR IN THE PLANS.
2. TEMPORARY PORTABLE RUMBLE STRIP ARRAYS ARE USED TO SUPPORT A SYSTEM OF ADVANCED WARNING SIGNS AND SHALL BE INSTALLED AND REMOVED WHEN THE SIGNS ARE INSTALLED AND REMOVED.
3. REMOVE THE TEMPORARY PORTABLE RUMBLE STRIPS PRIOR TO REMOVING THE ADVANCED WARNING SIGNS.
4. LINE VERNIES SHALL NOT BE MOUNTED THROUGH WORK ZONE TRAVEL LAKES OR AREAS WHERE PRACTICAL.
5. DO NOT USE TEMPORARY PORTABLE RUMBLE STRIPS ON SLIPPERY SURFACES, SUCH AS WET OR SLICK PATTERNS.
6. DO NOT USE TEMPORARY PORTABLE RUMBLE STRIPS ON HORIZONTAL CURVES.
7. USE TEMPORARY PORTABLE RUMBLE STRIPS IN FORWARD VIEW PATTERN OR HOOD AND PEDALIST CONTACT THE TEMPORARY PORTABLE RUMBLE STRIP MANUFACTURER.
8. FOR THE LOWEST-OF-THE-TWO CONDITIONS TO APPLY THE TEMPORARY PORTABLE RUMBLE STRIP. FOR MORE INFORMATION, CONTACT THE TEMPORARY PORTABLE RUMBLE STRIP MANUFACTURER.
9. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.

LEGEND

T = TEMPORARY TRAFFIC CONTROL DEVICES INCLUDED IN PLANS
S = WORK ZONE TRAFFIC SIGN
H = WORK ZONE TRAFFIC SIGN
H = WORK ZONE TRAFFIC SIGN
L = WORK ZONE TRAFFIC SIGN
N = WORK ZONE TRAFFIC SIGN
** = FOR RUMBLE STRIP SPACING DISTANCE, USE MANUFACTURER'S RECOMMENDATIONS.
CASE NO. 2
TYPICAL APPLICATION
MULTI-LANE DIVIDED HIGHWAY WITH RIGHT LANE CLOSED

GENERAL NOTES
1. TEMPORARY PORTABLE RUMBLE STRIP ARRAYS ARE USED TO SUPPLEMENT A VARIETY OF ADVANCED WARNING SIGNS AND SHALL BE INSTALLED AND REMOVED WHEN THE SIGNS ARE INSTALLED AND REMOVED.
2. REMOVE THE TEMPORARY PORTABLE RUMBLE STRIPS PRIOR TO REMOVING THE ADVANCED WARNING SIGNS.
3. LANE MARKINGS SHOULD BE MAINTAINED THROUGH WORK ZONE TRAFFIC LINES UNLESS PRACTICAL.
4. DO NOT USE TEMPORARY PORTABLE RUMBLE STRIPS ON SURFACES, SUCH AS PAVEMENT OR LIBRARY RAPID.
5. DO NOT USE TEMPORARY PORTABLE RUMBLE STRIPS ON HORIZONTAL CURVES.
6. USE TEMPORARY PORTABLE RUMBLE STRIPS ON RADARAYS WITH POSTED WORK ZONE SPEED LIMITS OF 40 MPH OR LESS.
7. FOR THE LENGTH OF TIME TO APPLY THE TEMPORARY PORTABLE RUMBLE STRIPS ON ROAD ENGINES, CONTACT THE TEMPORARY PORTABLE RUMBLE STRIP MANUFACTURER.
8. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.

DETAIL - TEMPORARY PORTABLE RUMBLE STRIP ARRAY

LEGEND
- WORK AREA

ROAD TYPE
- T = TERMINATION THICK = 209
- S = WORK ZONE SPEED LIMIT
- L = WORK ZONE
- W = WORK ZONE
- M = WORK ZONE
- K = WORK ZONE
- N = NUMBER OF DEVICES (0.5 ≤ 1)

ROADWAY SPACING DISTANCE
<table>
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<th>ROAD TYPE</th>
<th>SPACING BETWEEN LANE (Ft)</th>
<th>A</th>
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<td>200</td>
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<td>URBAN 5, 45 MPH</td>
<td>250</td>
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FOR RUMBLE STRIP SPACING DISTANCE, USE MANUFACTURER'S RECOMMENDATIONS.

PORTABLE RUMBLE STRIPS (TEMPORARY)

STANDARD PLAN NO.
S-630-5

Sheet No. 2 of 2
**Symbols**

- Portable Variable Message Sign (PMS)
- Law Enforcement Vehicle with Flashing Red and Blue Lights
- Direction of Travel
- Cabling Device for Type of Device to be Used; See Schedule of Traffic Control Devices Included in the Plans
- Work Area

**TYPICAL PLACEMENT OF VMS**

**General Notes**

1. Rolling roadblock is a traffic control technique to slow down or redirect traffic to facilitate short duration work operations without an elaborate and typically detailed traffic control plan. The placement of the roadblock is to be determined in accordance with the plan. The motorist is to be kept aware of the roadblock location and its purpose.

2. On the back of the rolling roadblock operation, the variable message signs shall be used to indicate the purpose, the time of day, and the rolling roadblock operation begins with a traffic control device. The device at the work site initiates the rolling operation in accordance with the details shown on the plan. The intent is to keep traffic moving, unless there is an emergency.

3. Truck-mounted attenuators with VMS shall be used to protect construction workers and equipment positioned in a travel lane at the work area during the rolling roadblock operation. An emergency vehicle or as many emergency vehicles as possible shall be positioned at the work area. Truck-mounted attenuators shall not be used.

4. When more than one rolling roadblock operation is required in one work zone, the contractor should allow sufficient time between rolling roadblock operations to permit traffic to return to normal speeds and flow. Additional time may be required between rolling roadblock operations to allow traffic to return to normal speeds and flow. The amount of time required by the work area is determined by the engineer of the design team.
TYPICAL APPLICATIONS
ROLLING ROADBLOCK - RAMP CLOSURE DETAILS

RAMP CLOSURE NOTES:

1. Once notified by the Traffic Control Supervisor to begin the rolling roadblock operation, each
   low law enforcement vehicle must be advanced two or three vehicles (approximately 300 feet)
   behind the work area. The vehicles should travel at a speed of approximately 20 to 30 miles
   per hour and the rolling roadblock will be continued in a manner that will prevent traffic from
   entering the work zone.

2. Once the rolling roadblock operation is complete, the low law enforcement vehicles shall
   commence their advance to the work zone. The vehicles shall travel in a manner that will
   prevent traffic from entering the work zone.

GENERAL NOTES:

Each low law enforcement vehicle shall have a marked vehicle with flashing orange lights for the rolling
roadblock operation. The headlight and taillight of the work area shall face the proper direction.

TYPICAL APPLICATIONS
ROLLING ROADBLOCK - MULTI-LANE MAINLINE PACING DETAILS

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ROLLING ROADBLOCKS
FOR TRAFFIC CONTROL

STANDARD PLAN NO. S-630-7

Issued By: Safety & Traffic Engineering Branch July 4, 2012
Sheet No. 2 of 3
**DESIGN NOTES:**

1. The design shall evaluate and determine the actual distance required for the rolling roadblock operation based on the specific features such as existing road networks, facing speeds, regulatory speed, information, and the availability of law enforcement officers, traffic control, and other related elements.

2. The starting point of a rolling roadblock operation shall consider the following factors: the speed of the rolling roadblock vehicles, the location of existing traffic, intersections, and vehicle alignment of the facility.

3. In some instances, it may be necessary to move a work site to position a control and the materials to be lifted.

4. All materials to be installed shall be on-site before the rolling roadblock operation begins.

5. It is necessary to install temporary barriers walls to protect the construction and assembled materials in an orderly way.

6. The minimum speed allowed for a rolling operation is 20 mph.

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**PACING DISTANCES, L (MILES)**

<table>
<thead>
<tr>
<th>T = 50</th>
<th>20</th>
<th>25</th>
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*T = REGULATORY SPEED, MPH

**PACING DISTANCES NOTES:**

T is the total time allowed for work activity, including the time required to move the rolling roadblock vehicles. This time may be reduced or increased by the rolling roadblock vehicles to maintain the work area.

**PACING DISTANCES NOTES FOR TRAFFIC CONTROL:**

Traffic control can be obtained from the design slides. If the project is expected to impact traffic, traffic volumes must be considered to follow any溥升 the following conditions:

- Traffic volume may exceed 500 cars per hour.
- No of lanes less.
- Heavy vehicle factor

**ROLLING ROADBLOCKS FOR TRAFFIC CONTROL**

**STANDARD PLAN NO. S-630-7**

Sheet No. 3 of 3