Nevada Department of Transportation

Standard Plans for Road and Bridge Construction

NEVADA DOT

2017 EDITION

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Director
2017 ENGLISH STANDARD PLANS

FOREWORD

The Nevada Department of Transportation (NDOT) English Standard Plans are updated and republished when significant changes and additions warrant.

The 2017 revisions to the 2010 Standard Plans will be shown in “RED” and new 2017 plan sheets are shown entirely in “RED”.

An index of the changes and new plan sheet inclusions are shown at the back of the publication.

If you find an error/omission or want to make a comment, make a copy of that sheet marked with your comments. Email: jeiche@dot.nv.gov
Mail to:
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Roadway Design Division
1263 S. Stewart Street
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**RAILROAD CROSSING**

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**MEDIAN CROSSOVER AND PAVED CHAIN AREAS**

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**OVERHEAD SIGNS**

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### 2017 TRAFFIC DESIGN (CONTINUED)

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NOTES:

1. DESIGN SPECIFICATIONS: "AASHTO LRFD Bridge Design Specifications 2012".

2. CONSTRUCTION SPECIFICATIONS: State of Nevada Department of Transportation "Standard Specifications for Road and Bridge Construction, 2014".

3. LIVE LOADS:
   - HL-93 (Design Truck 132.0 KIP Axle)
   - HL-93 (Design Tandem Two 25.0 KIP Axles
   Spaced 4 feet Apart)
   (Live Load Impact Factor for Top Slab is .33 up to 2 feet of Cover)

   LATERAL LIVE LOAD PRESSURE:
   - Equivalent to 2 feet of Earth Surcharge Applied Horizontally = 240 PSI
   (No surcharge added to Headwalls Type I and II)

   DEAD LOADS: Solid Unit Weight = 100 PCF
   - Min Lateral Earth Pressure = 30 PCF
   - Max Lateral Earth Pressure = 60 PCF
   (Type I Headwalls Designed to 56 PCF)

4. REINFORCING STEEL: All reinforcing steel to be ASTM A615 grade 60 or A706.
   (Class D in Clark County)

5. FOUNDATION PRESSURE: The RCB culverts are designed to the following soil bearing pressures:

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<td>1.4</td>
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<td>8 ft</td>
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<td>14 ft</td>
<td>1.4</td>
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6. SPECIAL DESIGN: Culverts with conditions, loading, or sizes different to those given on these RCB culvert sheets may require a special design.

7. DESIGNATION: Box culverts are shown on plans as span times height times length (10' x 8' x 196' RCB).

8. ADDITIONAL LENGTH: Length of culvert shall be increased as follows:
   - Length of culvert shall be increased as follows:
   - Add 2 feet to each end when cover at shoulder is 0 feet to 5 feet.
   - Add an additional foot to each end for each succeeding 5 feet of cover or portion thereof.

9. HEADWALLS: All RCB culverts shall have Type I Headwalls unless otherwise noted on the plans.

10. QUANTITIES: Quantities do not include "d" bars, nor splices in bars, nor temperature bars for exposed top slab, nor concrete or reinforcement for parapets or paving bridges.

11. THREE OR MORE CELLS: For culverts with more than two cells, use dimensions and reinforcement for the "double box culvert" and adjust the quantities accordingly.
NOTES:

1. DESIGN SPECIFICATIONS: "AASHTO LRFD Bridge Design Specifications 2012"

2. CONSTRUCTION SPECIFICATIONS: "State of Nevada Department of Transportation Standard Specifications for Road and Bridge Construction 2014"

3. LIVE LOADS:
   - H-93 Design Truck (50.0 KIP Axle)
   - H-93 Design Tandem (Two 25.0 KIP Axles)
   - Spaced 4 Feet Apart
   - Live Load Impact Factor for Top Slab is 33% up to 2 Feet of Cover

   LATERAL LIVE LOAD PRESSURE
   - Equivalent to 2 Feet of Earth Surcharge Applied Horizontally = 240 PSF

   DEAD LOADS:
   - Soil Unit Weight = 120 PCF
   - Min Lateral Earth Pressure = 30 PCF
   - Max Lateral Earth Pressure = 60 PCF

4. CONCRETE: Class DA Modified (Major)
   - FC = 4,500 PSI @ 28 Days
   - Soil Unit Weight = 120 PCF

5. REINFORCING STEEL: All reinforcing steel to be ASTM A615 grade 60 or A706. Dimension relating to bar spacing are center to center.

6. DESIGNATION: Box culverts are shown on plans as span times height times length (10' x 8' x 196' RCB).

7. Where traffic loads will be placed directly on the surface of the culvert, increase up to 2 feet of fill, increase top slab thickness by 1/2 inch and cover for top reinforcement from 2 inches to 2 1/2 inches. Provide epoxy coated reinforcement in top slab (except in Clark County). Decrease spacing of top slab bottom longitudinal bars from 6 to 6 1/2 inch spacing. Use EA Modified Major concrete (Class E in Clark County) in lieu of Class DA. Adjust quantities accordingly.

8. Provide 2 foot wide Type 1 or Type 2 drain backfill wrapped in Class 1 or Class 2 non-woven geotextile along full height of each culvert exterior wall face.

9. Provide paving notch when top slab is exposed and when pavement is concrete. Adjust quantities accordingly.

10. For additional notes, see sheet B=20.1.1
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* Quantity includes corner bars.
NOTES:
1. DESIGN SPECIFICATIONS: “AASHTO LRFD Bridge Design Specifications 2012”
2. CONSTRUCTION SPECIFICATIONS: “State of Nevada Department of Transportation Standard Specifications for Road and Bridge Construction 2014”
3. LIVE LOADS:
   - HL-93 Design Truck 132,000 lb Axle
   - HL-93 Design Tandem (Two 25,000 lb Axles Spaced 4 Feet Apart)
   - Live Load Impact Factor for Top Slab is 15% up to 2 Feet of Cover
   - LATERAL LIVE LOAD PRESSURE
     Equivalent to a Foot of Earth Surcharge Applied Horizontally = 240 PSF

4. CONCRETE: Class DA Modified (Major)
   - Max Lateral Earth Pressure = 60 PCF
   - Min Lateral Earth Pressure = 30 PCF
   - Soil Unit Weight = 120 PCF

5. REINFORCING STEEL: All reinforcing steel to be ASTM A615 grade 60 or A706. Dimension relating to bar spacing are center to center

6. DESIGNATION: Box culverts are shown on plans as span times height times length (10' x 8' x 196' RCB)

7. Where traffic loads will be placed directly on the top surface of the culvert, and/or up to 2 feet of fill, increase top slab thickness by 1/2 inch and cover for top reinforcement from 2 inches to 2 1/2 inches. Provide epoxy coated reinforcement in top slab (except in Clark County). Decrease spacing of top slab bottom longitudinal bars (1@ 6") to 6 inch spacing. Use EA Modified Major concrete (Class E in Clark County) in lieu of Class DA. Adjust quantities accordingly.

8. Provide 2 foot wide Type 1 or Type 2 drain backfill wrapped in Class 1 or Class 2 non-woven geotextile along full height of each culvert exterior wall face.

9. Provide paving notch when top slab is exposed and when pavement is concrete. Adjust quantities accordingly.

10. For additional notes, see sheet B-20.1.1

Culvert Per Plan

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### Diagram: Multiple Cell Culverts

1. **Notes:**
   1. Notes 1 thru 10 of "Double RCB Culverts" sheet shall apply.
   2. When the addition of cells causes the lengths of the "a" and "d" bars to exceed 60 feet, the bars will require splicing. Splices for the "a" bars shall not be centered about the centerline of the interior walls. Splices for the "d" bars shall not be done at within the middle third of a span. Splice lengths for the "a" and "d" bars shall be as follows:
      - No. 4 Bars = 21 inches
      - No. 5 Bars = 26 inches
      - No. 6 Bars = 31 inches
      - No. 7 Bars = 36 inches
      - No. 8 Bars = 41 inches
      - No. 9 Bars = 46 inches
   3. For dimensions, bar sizes, bar spacing, see detail on "Double RCB Culverts" sheet.
NOTES:
1. For additional notes see sheet B-20.1.1.

SECTION OF WALLS A AND B

WALL A
WALL B

For Boxes With 0° Skew Both Wings Are As Shown For Wing A.

Bend Bars On Far Face 1'-6" Into Barrel.

No. 4 Bars @ 12" F.F. When Distance Between Last G Bar And Bend Line Of Horizontal Bars Is 18" Or More.

No. 4 Bars @ Approx. 2' 2" Or More Max.

No. 4 Bars @ 12" Max. F.F. When $H$ Is 8' Or More

Slang Alternate J Bars At This Point

"J" Bars

"K" Bars

For Boxes With 0° Skew Both Wings Are As Shown For Wing A.

Bend Bars On Far Face 1'-6" Into Barrel.

No. 4 Bars @ 12" F.F. When Distance Between Last G Bar And Bend Line Of Horizontal Bars Is 18" Or More.

No. 4 Bars @ Approx. 2' 2" Or More Max.

Slang Alternate J Bars At This Point

"J" Bars

"K" Bars

For Boxes With 0° Skew Both Wings Are As Shown For Wing A.

Bend Bars On Far Face 1'-6" Into Barrel.

No. 4 Bars @ 12" F.F. When Distance Between Last G Bar And Bend Line Of Horizontal Bars Is 18" Or More.

No. 4 Bars @ Approx. 2' 2" Or More Max.

Slang Alternate J Bars At This Point

"J" Bars

"K" Bars

For Boxes With 0° Skew Both Wings Are As Shown For Wing A.

Bend Bars On Far Face 1'-6" Into Barrel.

No. 4 Bars @ 12" F.F. When Distance Between Last G Bar And Bend Line Of Horizontal Bars Is 18" Or More.

No. 4 Bars @ Approx. 2' 2" Or More Max.

Slang Alternate J Bars At This Point

"J" Bars

"K" Bars

For Boxes With 0° Skew Both Wings Are As Shown For Wing A.

Bend Bars On Far Face 1'-6" Into Barrel.

No. 4 Bars @ 12" F.F. When Distance Between Last G Bar And Bend Line Of Horizontal Bars Is 18" Or More.

No. 4 Bars @ Approx. 2' 2" Or More Max.

Slang Alternate J Bars At This Point

"J" Bars

"K" Bars

For Boxes With 0° Skew Both Wings Are As Shown For Wing A.

Bend Bars On Far Face 1'-6" Into Barrel.

No. 4 Bars @ 12" F.F. When Distance Between Last G Bar And Bend Line Of Horizontal Bars Is 18" Or More.

No. 4 Bars @ Approx. 2' 2" Or More Max.

Slang Alternate J Bars At This Point

"J" Bars

"K" Bars
# TYPE I HEADWALL DIMENSIONS AND REINFORCING STEEL

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0 Degree Skew | 15 Degree Skew | 30 Degree Skew | 45 Degree Skew

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0 Degree Skew | 15 Degree Skew | 30 Degree Skew | 45 Degree Skew

| TYPE I HEADWALLS |

Department of Transportation
RCB Culverts

Sheet 2 of 2

Signed Original On File

CHIEF BRIDGE ENG.
### ESTIMATE OF QUANTITIES

**TYPE I HEADWALLS**

**NOTE:** Quantities shown are cubic yards of concrete and pounds of reinforcing steel for two headwalls at the inlet and outlet.

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**NOTE:**
- Quantities shown are cubic yards of concrete and pounds of reinforcing steel for two headwalls at the inlet and outlet.
- Conc. = Concrete
- Reinf. = Reinforcing Steel
- Height = Height
- Span = Span
- 0 Skew = 0 Skew
- 15 Skew = 15 Skew
- 30 Skew = 30 Skew
- 45 Skew = 45 Skew

**Signatures:**
- Signed: [Signature]
- Original On File: [Signature]
- Revised: [Signature]
- Adopted: [Signature]
NOTES:
1. For additional notes see sheet B-20.1.1.
2. For quantities see sheet B-20.1.6.1

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ELEVATION

WALL B
Show All K-Bars from Wingwall Footings

WALL A
No. 4 Bars @ Approx 2'-6" Max.

SECTION A-A
(T = Minimum 9"

SECTION B-B
No. 4 Bars @ Approx 2'-0" Max.

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**Quantities for Additional Cells**

Concrete for two Type II headwalls (for each additional cell) (cubic yards) (Add the difference between the triple box and double box quantities for each additional box)

Reinforcing for two Type II headwalls (for each additional cell) (pounds) (Add the difference between the triple box and double box quantities for each additional box)
NOTES:
1. For additional notes see sheet B-20.11.
2. Dowel holes shall be drilled 12” into existing concrete. Diameter of hole shall be 1/2” inch larger than diameter of bar. Hole may be inclined no more than 5° off the horizontal. Dowels shall be epoxied into clean holes. Epoxy shall conform to the requirement of Section 726.

** = 3” To Center Of Hole.

Width And Height Varies

METHOD OF PLUGGING RCB
NOTES:

1. Concrete shall be as specified in AASHTO M259 or M273 (ASTM C1577), as modified in subsection 502.03.24. All precast concrete box culverts shall comply with ASTM C1577 – design according to AASHTO LRFD.

2. Reinforcing steel shall be ASHTO M31 (ASTM A615) grade 60. Welded wire fabric shall be ASHTO M55 (ASTM A655) smooth wire, or ASHTO M22 (ASTM A497) deformed wire. Reinforcing steel in the top slab shall have an epoxy coating conforming to ASHTO M284 (ASTM D3963) when there is 6 inches or less of cover on the RCB (Clark County excluded).

3. Bedding material shall be granular backfill or type 2 class B aggregate meeting the gradation requirements and for granular backfill. Bedding material shall be paid for as granular backfill.

4. Headwall details shall be as shown in the standard plans. Exposed reinforcements to be cast-in-place headwall to precast box shall consist of either No. 4 bars, 0.75t, Max. gap at each joint, or 2" Min. for spans over 6’ in the precast box section. The No. 4 bars shall be a minimum of 0.75t. Each box section with the appropriate NDOT contract number.

5. Joint material shall be a preformed joint material meeting Section 707 of the NDOT Standard Plans. The material shall be installed in accordance with the manufacturer’s recommendations. A single continuous application of joint material shall be applied to the tongue of each joint. Minimum size of joint material shall be 1 1/2" inch. Any joint material extruding from the interior of the joint shall be removed flush with the headwall face.

6. In addition to the markings required by the AASHTO and ASTM specifications, mark each box section with the appropriate NDOT contract number.

7. Reinforcing steel shall extend full width of concrete pavement and shall have a minimum clearance of 3 inches on the bottom. In areas of the state where road salts are used, the reinforcing shall be epoxy coated. Reinforcing is to be placed parallel to the centerline of road for longitudinal reinforcement and parallel to the precast box for transverse reinforcement.

8. Length of culvert shall be increased as follows: Add 2 feet to each end when cover at shoulder is 0 feet to 5 feet, add an additional 1 foot to each end for each succeeding 5 feet of cover or portion thereof.

9. Fill cylindrical lifting holes (located by manufacturer) with an approved epoxy non-shrink grout. Use an approved circular shape for the bottom. 3 inches may be filled with a concrete grout composed of one part by volume of Portland cement to two parts by volume of sand with enough water to permit placing and tamping. An approved custom plug may be used. An optional method of lifting may be used with approval.

10. Concrete shall be as specified in AASHTO M259 or M273 (ASTM C1577), as modified in subsection 502.03.24. All precast concrete box culverts shall comply with ASTM C1577 – design according to AASHTO LRFD.
NOTES:
1. Railing assembly except chain link fabric, to be galvanized after fabrication.
2. Railing shall conform to horizontal and vertical alignments. Posts shall be vertical. Top, intermediate and bottom pipes shall be bent if the radius is 150 feet or less. May be on 6 foot chords if radius is over 100 feet.
3. Space posts to clear expansion joints by 6 inches min. to center line posts.
4. All exposed corners to be smooth.
5. Peen all ¾ inch bolts.
6. When fence is on slope the fabric shall be placed parallel to the slope.
7. Alternative details may be submitted by the contractor for the Engineer's approval.

INTERIOR PANELS

ALTERNATE FOR

MODIFIED

BASE PLATE

ANCHORAGE DETAILS

STATE OF NEVADA  DEPARTMENT OF TRANSPORTATION

PEDESTRIAN RAIL  TYPE M

B-25.1.4  (506)  Signed Original On File

CHIEF BRIDGE ENGR.
NOTES:
1. All steel railing assembly shall be galvanized after fabrication.
2. All exposed surfaces of steel railing assembly shall be painted white.
3. Not intended to be used as handrail.

LEGEND:
1. Where rail ends at post, drill post one side only and end rail within post.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

PEDESTRIAN RAIL
TYPE R

TYPICAL RAIL AND POST CONNECTION
STEEL

TYPICAL RAIL AND POST CONNECTION
ALUMINUM

TYPICAL SECTION

BOTTOM PLATE DETAILS

TOP POST PLATE DETAILS

SLIP JOINT DETAILS

NOTES:
1. All steel railing assembly shall be galvanized after fabrication.
2. All exposed surfaces of steel railing assembly shall be painted white.
3. Not intended to be used as handrail.

LEGEND:
1. Where rail ends at post, drill post one side only and end rail within post.
NOTES:
1. All steel railing assembly shall be galvanized after fabrication.
2. All exposed surfaces of steel railing assembly shall be painted white.
3. Not intended to be used as handrail.

LEGEND:
* - WHERE RAIL ENDS AT POST DRILL POST ONE SIDE ONLY AND END RAIL WITHIN POST

To Be Used With Aluminum Rail Only
Stainless Steel U-Bolts, Nuts And Washers — ONLY AND END RAIL WITHIN POST

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

B-25.1.6
10/15
REVISED
12/06
ADOPTED

CHIEF BRIDGE ENGR.
Signed Original On File
TYPICAL INTERIOR PANEL

ANCHORAGE DETAILS

END POST

TYPICAL INTERIOR PANEL

AT EXPANSION JOINT

Expansion Joint Same Dimension as Expansion Joint in Deck. Increase Sleeve Length Correspondingly.

NOTES:
1. Railing assembly, except chain link fabric, to be galvanized after fabrication.
2. Railing shall conform to horizontal and vertical alignments. Posts shall be vertical. Top, intermediate and bottom pipes shall be bent if the radius is 100 feet or less. May be on 8 foot chords if radius is over 150 feet.
3. All exposed corners to be smooth.
4. Peen all 3/8 inch bolts.
5. When fence is on slope the fabric shall be placed parallel to the slope.
6. Alternative details may be submitted by the contractor for the Engineer's approval.
7. Steel base plates shall be grade ASTM A36 steel.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

PEDESTRIAN RAIL
TYPE V

ALTERNATE FOR INTERIOR POSTS

ANCHORAGE DETAILS

TYPICAL CONNECTION DETAILS

SECTION
1. Slope paving is to be divided into equally spaced panels; the width of each panel is to be as nearly 10 feet as site dimensions will permit.

2. These details will not apply in total to any one site, but are intended to be general enough to cover all possibilities. To obtain limits of slope paving for a specific site, consult the plan sheets.

3. Concrete shall be class A or AA with fiber reinforcing.

**LEGEND:**
- A: Slope shall be 50:1 min. or roadway grade max.
- B: Unless shown otherwise in plans.
- C: End redwood strips at top of radial section when their intermediate distance from each other reaches 3 feet.

**NOTES:**
- **WITH SIDEWALK**
- **SECTION A-A**
- **WITH DITCH**
- **SECTION A-A**
- **TOE OF SLOPE**
- **SECTION A-A**
- **AT PIER**
- **SECTION C-C**
- **AT ABUTMENT**
- **SECTION D-D**
- **AT WINGWALL**
- **SECTION E-E**
- **EDGE OF SLOPE**
- **SECTION F-F**

**STATE OF NEVADA**
DEPARTMENT OF TRANSPORTATION
DETAILS
CONCRETE SLOPE PAVING
2/05
REVISED
11/78
ADOPTED

CHIEF BRIDGE ENGR.
Signed Original On File
**STIRRUP REINFORCEMENT AT FLARE OF GIRDER STEM**

Concrete cap for anchorage to provide a minimum of 2" of cover over stressing heads.

**DISTRIBUTION OF PRESTRESSING FORCE**

- Bars marked thusly are to be included in the cost of prestressing cast-in-place concrete.
- Concrete used in the bearing seats is to be included in the cost of prestressing cast-in-place concrete.
- Add additional No. 4 stirrup bars, in pairs, as necessary to maintain a 12 inch stirrup spacing. See plans for stirrup bending dimensions and epoxy coating requirements. Additional No. 4 stirrup bars to be included in cost of prestressing.

**STRESSING SEQUENCE**

1. Duct patterns shown are for 12 inch wide girder stem, for other widths the minimum clearances must be maintained.
2. Approval of the engineer is required for deviations.

**CLEARANCE REQUIREMENTS FOR DUCTS**

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CAST-IN-PLACE PRESTRESSED GIRDER DETAILS

B-28.1.1  (S03)  Signed Original On File
ADOPTED  3/85
REVIEWED  9/85
CHIEF BRIDGE ENGR.
1. The concrete shall be "EA" f'c=4500 psi, or "A" f'c=4000 psi, as indicated in the plans. When "E" concrete is required, the reinforcing steel shall have an epoxy coating. All reinforcing steel shall be ASTM A615 grade 60 or A706.

2. A. The contact joint between the concrete pavement and the approach slab shall parallel the back face of the structure for skews at 20° or less for skews greater than 20° the contact joint shall be normal to the roadway alignment control lines. Joints shall be staggered on line lines for skewed structures. Stagger lines shall be at each line line for skews of 45° or more.

B. The contact joint between asphalt pavement and approach slab shall parallel the back face of the structure.

3. For skews greater than 20° the distance measured normal to and from the back face of the structure to the end of the approach slab shall be a minimum of 15 feet.

4. Longitudinal construction joints in the approach slab may be located on line lines when permitted by the engineer.

5. Place 1/2 inch expansion joint material between the concrete pavement and the longitudinal face of the approach slab. The expansion joint material is to be recessed 1/2 inch from the surface of the joint sealed at the "longitudinal weakened plane joint" on sheet R-10.11.

6. The length of the maus should be 15 feet or incremental intervals of 15 feet to maintain a 15 foot spacing of the transverse weakened plane joints in the concrete pavement. See section 409.03.09 of the specifications and sheet R-10.1.2 for saw-cutting details.

7. Fill material under approach slabs shall be a 12 inch layer of granular backfill compacted to not less that 95% of the maximum density in accordance with subsection 207.03.01 of the standard specifications.

8. See plans for expansion joint details.

9. Galvanize assembly after fabrication or use A588 steel. Assemblies to extend full width or to the face of any bridge or barrier rails: Full penetration butt weld any field splices.

10. The contact joint between the concrete pavement and the approach slab shall parallel the back face of the structure.

11. The contact joint between the concrete pavement and the approach slab shall parallel the back face of the structure for skews of 20° or less; for skews of 45° or less; for skews of 20° or less; for skews of 45° or more.

12. The contact joint between the concrete pavement and the approach slab shall parallel the back face of the structure for skews of 20° or less; for skews of 45° or more.
<table>
<thead>
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**Typ.**

**Slope 2:1 @ 0.15g**

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**Concrete ft^2/ft**

| 8.5 | 13.0 | 17.5 | 26.1 | 34.3 | 39.8 | 52.5 | 65.8 | 84.9 | 113.0 | 139.7 | 176.2 | 217.6 | 275.5 |

**Concrete ft^3/ft**

| 3.5 | 4.7 | 7.0 | 10.4 | 15.9 | 22.2 | 33.5 | 42.2 | 52.0 | 62.5 | 79.0 | 86.6 | 1.052 | 1.318 |

**Notes:**
1. For additional notes see sheet B-30.1.3.
2. For details not shown and drainage requirements see sheets B-30.1.3 thru B-30.1.5.
3. Roughen construction joint surface to 1/4 inch amplitude.
4. Geotechnical Engineer will verify maximum allowable bearing pressures for active soil conditions.

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**Typical Section: Types 1B & 1C**

**STANDARD BEND LIMITS**

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**State of Nevada**

**Department of Transportation**

**Cantilever Retaining Wall**

**Type 1B and 1C**

---

**Signed Original On File**

---

**Chief Bridge Engineer**
### TABLE OF DIMENSIONS AND REINFORCING STEEL

#### TYPE 2A - REINFORCED CONCRETE RETAINING WALL

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</tbody>
</table>

### TYPICAL SECTION: TYPE 2

- For 1'-6" key, add 4.5 ft²/ft concrete and 0.5 lb/ft reinforcement.
- For T-8" key, add 3 ft²/ft concrete and 1 lb/ft reinforcement.
**DETAIL A**

**WEAKENED PLANES**

- Cut or built every other front face horizontal bar at weakened planes.
- Joint may be formed with 3/4" hardwood and cut back to the root of the chamfer on the exposed face.
- 1 1/2" Chamfer
- See Detail A

**SECTION**

**DETAIL C**

**WEEP HOLE**

- 2 1/4" Min Thickness
- 1/4" Min Thickness
- 3 Bar
- 3 Bar
- 1/4" Min Thickness
- 1/4" Min Thickness
- See Note 2
- See Note 3
- Weep Hole
- See Note 1 & Detail C
- See Note 3
- See Note 2
- See Note 1
- Weep Hole
- See Note 3

**WALL EXPANSION JOINTS AND WEAKENED PLANES**

- Top of Wall
- Expansion Joint
- See Weep Hole Details B
- 90° Max
- Weakened Planes
- Expansion Joint
- 1° Min
- Top of Footing

**WEEP HOLE NOTES:**

1. 4 inch dia. drains at 25 feet maximum center to center.
2. Exposed drains shall be located 3 inches above finish grade.
3. 2 cubic feet of type 2 drain backfill encapsulated in a geotextile fabric securely tied. Geotextile shall meet the following:
   - A. Meet at least class 2 strength requirement per AASHTO M288 test method.
   - B. Have an ADS not greater than U.S. sieve No. 40.
   - C. Have a permittivity of at least 0.5 Sec.⁻¹
4. 6 inch square aluminum or galvanized steel wire mesh hardware cloth (12 openings per inch and minimum wire diameter 0.03 inches).

**WATERSTOP NOTES:**

1. Holes will be permitted in the outer 1/4 inch of the web for wire, rings, etc., in web to No.3 reinforcing bars @ 16 inch maximum intervals to support the waterstop in proper position during concrete placement. Alternative detail may be submitted for approval of the engineer.
2. Waterstop to have 3 or more pairs of raised ribs to provide 0.1 square inches minimum rib cross-section area on each half of the waterstop.

**STATE OF NEVADA**

**DEPARTMENT OF TRANSPORTATION**

**CANTILEVER CONCRETE RETAINING WALL**

**DETAILS NO. 2**

**B-301.4 (05/21)**

**CHIEF BRIDGE ENG.**
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SECTION A-A

TYPE 1
3-CENTERED CURVE

26' Unless Otherwise Noted on Plans

SECTION B-B

TYPE 4 TYPICAL PLAN

SECTION C-C

APPROACH TYPES

TYPE 4 AND 5 TYPICAL PROFILE

NOTE 3

See Note 3

PLAN

TYPE 2 AND 3

UNLESS OTHERWISE NOTED ON PLANS

6" AGGREGATE BASE UNLESS OTHERWISE NOTED ON PLANS

SECTION D-D

TYPE 5 TYPICAL PLAN

6" AGGREGATE BASE MIN.

6" AGGREGATE BASE MIN.

6" AGGREGATE BASE MIN.

3" SURFACING UNLESS OTHERWISE NOTED ON PLANS

SECTION A-A

TYPE 4 TYPICAL PLAN

SECTION D-D

NOTES:

1. See the current adopted edition of the AASHTO "A Policy on Geometric Design of Highways and Streets" for further information on at-grade intersections and design vehicles.

2. Paved approaches shall have a seal coat unless otherwise noted.

3. Approaches to be paved to the throat or right-of-way, whichever occurs first, unless otherwise noted in the plans.

4. Approaches may require the standard stop sign and stop bars as directed by the Engineer.
LEGEND:

- Limits of removal (Cold Milling)
- * - Angle of Repose
- ** - Safety Edge

AS CONSTRUCTED

NEW CONSTRUCTION

SECTION OF IMPROVEMENT
CULVERT INSTALLATION IN ROUGH TERRAIN

CULVERT INSTALLATION WITH UNSUITABLE FOUNDATIONS

SLOPE Rounding

Normal Roadway Slope

Cut Slopes Steeper than 5:1 will be Rounded, Except in Rock

ROUNDED OR TRANSITION SLOPES

TYPE 7 DROP INLET

TYPE 8 DROP INLET

NOTES:
1. Excavations for multiple pipe installations 12 feet and over in width will be paid as channel or roadway excavation.
2. Structure excavation and backfill in excavation to be paid below subgrade and within designated limits.
3. Embankment to be constructed to flowline prior to installation.
4. Backfill embankment to be paid from flowline to the designated maximum limits.
5. Roadway excavation to be paid to subgrade.
6. CMP, HPE or RCP – when the pipe is laid in a trench in rock, hard clay, shale or other hard material, the unsuitable material must be removed to a depth of not less than 6 inches for CMP and 12 inches for HPE below the bottom of the pipe grade and the trench backfilled with a suitable material. In no place shall the pipe be laid directly on unsuitable material. See sheet R-1.1.6.
7. No additional excavation is necessary under headwalls when rock or other hard material is encountered.
8. When a firm foundation is not encountered all soft, spongy or other unsuitable material under the culvert shall be removed, and the space filled with foundation fill to depth of foundation. See indicated on the plans or ordered by the engineer, but not less than 1'-6".
9. Grade to this elevation prior to installation.

LEGEND:
- STRUCTURE EXCAVATION
- CHANNEL EXCAVATION
- GRANULAR BACKFILL
- DRAINAGE EXCAVATION
- ROADWAY EXCAVATION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

METHOD OF MEASUREMENT
1. Trenches more than 4 feet deep shall be shored, laid back to at least the angle of repose for existing fill conditions, or some other means of protection shall be provided.

2. If hazardous field conditions indicate ground movement may be expected, trenches less than 4 feet deep shall also be protected as indicated in Note 1.

3. For the purpose of payment, structure excavation and backfill quantities are based on these standard drawings and no additional payment will be made for shoring.

4. If shoring is used, payment will be made for structure excavation and backfill based on these standard drawings and no additional payment will be made for shoring.

5. Trench excavation shoring shall conform to OSHA Regulations 29 CFR Part 1926, Subpart P, Appendix C.

6. The quantity of structure excavation and backfill measured for payment shall be the number of cubic yards calculated minus any duplication of limits which overlap.

7. The limits of structure excavation and backfill shown herein shall be used for the method of measurement and payment only. There shall be no additional compensation for any additional excavation or backfill required for excavations to meet OSHA regulations.

8. Select borrow limits shall be used in all abutment locations. Coordinate with Bridge Engineer.

9. Rock Mulch shall be placed as shown on slopes flatter than 2:1. Class 150 Riprap shall be used for slopes 2:1 or steeper. Bedding is not required.

LEGEND:

- Structure Excavation
- Gravel Backfill
- Embankment
- Rock Mulch or Riprap

**Note:** Excavations to meet OSHA Regulations 29 CFR Part 1926, Subpart P, Appendix C. Coordinate with Bridge Engineer.

Notes:

- Structure Excavation
- Gravel Backfill
- Embankment

- Rock Mulch or Riprap

Open Abutment Bridges

- With Spread Footing
- On Piles

Closed Abutment Bridges

Limits of Select Borrow

- At Bridge Open Abutments

Footing Width

- Is 6' or Less
- Greater Than 6'

Open Abutment Bridges

- With Spread Footing
- On Piles

Closed Abutment Bridges

Method of Measurement

- Structure Excavation
- Backfill

State of Nevada
Department of Transportation

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Rev. 4-20-21

Page 3 of 10
NOTES:

1. Trenches more than 4 feet deep shall be shored, laid back to at least the angle of repose for existing field conditions, or some other means of protection shall be provided.

2. If hazardous field conditions indicate ground movement may be expected, trenches less than 4 feet deep shall also be protected as indicated in Note 1.

3. For the purpose of payment, structure excavation and backfill quantities are based on these standard drawings and no additional payment will be made for shoring.

4. Trench excavation shoring shall conform to OSHA Regulations 29 CFR Part 1926, Subpart P, Appendix C.

5. The quantity of structure excavation and backfill measured for payment shall be the number of cubic yards calculated minus any duplication of limits which overlap.

6. The limits of structure excavation and backfill shown herein shall be used for the method of measurement and payment only. There shall be no additional compensation for any additional excavation or backfill required for excavations to meet OSHA regulations.

7. Bedding material shall be granular backfill or Type 2 Class B aggregate meeting the resistivity requirements for granular backfill. Bedding material will be paid for as granular backfill.
METHOD OF MEASUREMENT

1. Trenches more than 4 feet deep shall be shored, laid back to at least the angle of repose for existing field conditions, or some other means of protection shall be provided.

2. If hazardous field conditions indicate ground movement may be expected, trenches less than 4 feet deep shall be protected as indicated in Note 1.

3. For purposes of payment, structure excavation and backfill quantities are based on these standard drawings minus any duplication in quantities which overlap. If shoring is used, payment will be made for the structure excavation and backfill based on these standard drawings and no additional payment will be made for shoring.

4. Trench excavation and shoring shall conform to current OSHA regulations. Payment will be made based on these standard drawings and no additional compensation for any additional excavation or backfill required for excavations to meet OSHA regulations.

5. Granular backfill shall be placed for a minimum depth of 6" above the top of pipe for the length of the trench. Complete the trench backfill with backfill, granular backfill may be used at no additional payment.

6. Provide adequate temporary cover over pipe to protect pipe from damage during construction.

7. For installations in excavation, the quantities for excavation and backfill shall be calculated and paid from either existing grade or sub/finished grade, whichever is lower.

NOTES:

- Structure excavation and backfill for pipes shall be calculated and paid from either existing grade or sub/finished grade, whichever is lower.

LEGEND:

- Structure Excavation
- Granular Backfill
- Roadway Embankment
- Backfill
- Bedding See Sheet R-1.16

H EQUALS 6' OR LESS

H EQUALS greater than 6'
### Notes:
1. Minimum depths as specified on sheet R-1.1.1. Notes 6 and 8 will prevail when these conditions are encountered.
2. Concrete shall be class A or AA. Additional excavation for class A bedding to be included in the unit bid price per cubic yard of concrete.
3. Class C bedding shall be carefully shaped to fit pipe prior to installation.
4. See sheet R-2.1.1 or headwall details for appropriate pipe separation.

### Legend:
- GRANULAR BACKFILL
- CLASS A SLURRY BACKFILL

### Bedding for Multiple HE RCP Culverts

### Allowable Fill Height

#### For Reinforced Concrete Pipe

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**STATE OF NEVADA DEPARTMENT OF TRANSPORTATION**

**CULVERT BEDDING AND ALLOWABLE FILL HEIGHT FOR RCP AND HE RCP**

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### Round Corrugated Steel Pipe 2 2/3" & 3" Corrugations

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#### Corrugated Steel Pipe Arch

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</table>

#### Notes:

1. Contact Hydraulics Engineer for materials or sizes not listed.

### Legend:

- RIVETED OR HELICAL FABRICATION
- **- TOP OF PIPE TO TOP OF FINISHED GRADE AT SHOULDER LINE FOR 2 TONS PER FT.**
- ***- SMALL BASIS ONLY AFTER FOUNDATION INVESTIGATION***
- **- FOR FIELD STUDY COMMENTARY SEE SHEET R-2.11**

### Maximum Height of Cover

#### For Structural Steel Pipe Arch with 31" Corner Radius

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<th>Span (Ft)</th>
<th>12&quot; Diameter</th>
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</table>

#### All Allowable Fill Heights

- The above fill heights are for 5% elongation of the pipe over 42" in diameter and
- For other diameters, consult the engineer.

### Allowable Fill Heights for Steel Culverts

- See Standard Specification Sec. 604.03.02

---

*Corrugated Steel Pipe Arch 5" x 1" & 3" x 1" Corrugations*

*Round Corrugated Steel Pipe 2 2/3" & 3" Corrugations*
NOTES:
1. Location of ditches as indicated in the plans are approximate. Construct ditches to follow the natural shape of the terrain as directed by the Engineer.
2. W, H, T and SS as indicated in the plans.
3. Construct triangular shape ditch when W=0 or is not specified.
4. Ditch lining materials will be paid for under the appropriate section of the specifications.
ROCK MULCH OR
RIPRAP BEDDING DITCH

See Sheet R-3.1.5
For Riprap and Bedding Thickness

RIPRAP DITCH

Materials Specified in The
Plans and/or Special Provisions

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
AND DIKES
DRAINAGE DITCHES

CHIEF HYDRAULICS ENGR.

R-11

R-14.1.1
(203)
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AUG 69
CHIEF HYDRAULICS ENGR.
2. Drain sections shall be assembled with the coupling band shown.

3. The cross bar spacer shall be welded to the top of the grate bars in such a manner as to develop a minimum tensile strength of 12,000 lbs. normal to the longitudinal axis of the bearing bars.

4. The maximum variance from a straight line between the extreme top corners of the bearing bars shall be 1/2 inch in 20 feet.

5. For continuous runs of CMP in excess of 200 feet, cleanout DI or standard flushing inlets shall be installed as shown on the plans.

6. Spot weld shall develop minimum required strength of strap.

7. Dimensions shown are minimums.

8. Contractor to provide an adequate method of keeping the plant mix out of the plant during paving operations.

9. Design shall be in accordance with the latest edition of the AASHTO Standard Specifications for Highway Bridges, Section 12. Minimum live load to be 20k.

10. Concrete shall be class A or AA.

11. Hydraulics Engineer will state pipe size.

12. The spacer plates shall be welded on both sides to each bearing bar with four 11/4 inch long 3/8 inch fillet welds.

13. H = height of bearing bar (2" or 6") - 1/4 inch corrugation - gage of pipe in inches.

14. The grate shall be welded with a 1/8 inch fillet weld minimum 1 inch long to the corrugated steel pipe on each side of the grate at every other corrugation.

Notes:

1. Drain pipe seams may be continuous helical lock seam or helical weld seam.

2. The cross bar spacer shall be welded to the top of the grate bars in such a manner as to develop a minimum tensile strength of 12,000 lbs. normal to the longitudinal axis of the bearing bars.

3. The maximum variance from a straight line between the extreme top corners of the bearing bars shall be 1/2 inch in 20 feet.

4. For continuous runs of CMP in excess of 200 feet, cleanout DI or standard flushing inlets shall be installed as shown on the plans.

5. Spot weld shall develop minimum required strength of strap.

6. Dimensions shown are minimums.

8. Contractor to provide an adequate method of keeping the plant mix out of the plant during paving operations.

9. Design shall be in accordance with the latest edition of the AASHTO Standard Specifications for Highway Bridges, Section 12. Minimum live load to be 20k.

10. Concrete shall be class A or AA.

11. Hydraulics Engineer will state pipe size.

12. The spacer plates shall be welded on both sides to each bearing bar with four 1 1/4 inch long 3/8 inch fillet welds.

13. H = height of bearing bar (2" or 6") - 1/4 inch corrugation - gage of pipe in inches.

14. The grate shall be welded with a 1/8 inch fillet weld minimum 1 inch long to the corrugated steel pipe on each side of the grate at every other corrugation.
Normal Roadway Slope

1:1

Culvert

Break Slope Only When Normal Roadway Slope is Flatter Than 2:1

See Note 1

Finished Roadway

Shoulder Line

Normal Roadway Slope

See Note 5

See Note 5

See Note 5

See Note 2

Culvert

NOTES:

1. Length of culvert shall be increased as follows:
   Consider each side separately. Measure pipe from roadway centerline to the intersection of pipe flow
   line and fill slope. To this dimension add 2 feet when cover at shoulder is 1 foot to 10 feet add an additional 6 inches
   for each succeeding 5 feet of cover or portion thereof.

2. Length of culverts shall be increased as follows:
   Consider each side separately. Measure pipe from roadway centerline to the intersection of the top
   of pipe and fill slope plus headwall thickness. To this dimension add 1 foot when cover at shoulder
   is 5 feet to 10 feet, add an additional 6 inches for each succeeding 5 feet of cover or portion thereof.

3. Length of culvert shall be increased as follows:
   Consider each side separately. Measure pipe from roadway centerline to the intersection of the top
   of pipe and fill slope. To this dimension add 1 foot when cover at shoulder is 1 foot to 10 feet add an
   additional 6 inches for each succeeding 5 feet or portion thereof.

4. Contour this area to provide the minimum amount of obstruction exposure.

5. When less than 1 foot - 6 inches make modifications as determined by the Engineer.

LEGEND:

** - FOR INFORMATIONAL PURPOSES ONLY

SAFETY CULVERT INSTALLATION

SECTION A-A

WITHOUT HEADWALL

WITH CONCRETE HEADWALL

PRECAST CONCRETE END SECTION

METAL END SECTION

MINIMUM CULVERT INSTALLATION

METHOD OF CONTOURING OVER CULVERTS

NOTES:

1. If, after extending the culvert and/or warping the fill slope
   for safety and/or aesthetics, the extension does not fulfill
   the requirements for a clear roadside recovery area, then
   vehicular traffic may be protected by some other means, such
   as guardrail, barrier rail or another acceptable safety feature.
### STANDARD CONNECTIONS

#### TYPE 1
For 12" Thru 24" CMP Only

#### TYPE 2
- For 30" Thru 84" CMP
- 17" x 13" Thru 57" x 38" CMAP, 13" Thru 60" HDPE and RCP

#### TYPE 3
For 64" x 43" Thru 83" x 57" CMAP or 42" Thru 84" CMP (Optional)

---

**PLAN**

- **ELEVATION**
  - Length of Toe Plate To Be W + 10" Min. For 12" to 30" Dia. Pipe Inclusive and W + 22" Min. For 36" Diameter Pipes and Larger.

**SECTION**

- **ELEVATION**
  - Length of Toe Plate To Be W + 10" Min. For Pipe Arches With Rise of 13" to 29" Inclusive and W + 18" Min. For Pipe Arches With Rise of 33" and Larger.

---

**ANCHOR BLOCK DETAIL**

- See Note 6 Thru 9

---

**LEGEND**

- Connector Section
- See Detail B For Attaching To HDPE & RCP Pipe

---

**DETAIL A**

- 3/4" x 6" Hex.
- Bolt and Nut

- No. 4 Bar Tied to Bolts

---

**STATE OF NEVADA**

**DEPARTMENT OF TRANSPORTATION**

**SHEET 1 OF 2**

**SIGNED ORIGINAL ON FILE**

**REVISED** 8/75

**ADOPTED**

**CHIEF HYDRAULICS ENGR.**
### NOTES:

1. The concrete lengths shown on the plans and structure list shall be the pay length as indicated on the standard sheet including connector section lengths when used.

2. Pipe on skew shall be mitered. Sufficient additional length of pipe shall be allowed to provide clearance for end sections.

3. Toe plates required on round pipe 24 inches and over in diameter and on arch pipe (28" x 20") and over unless otherwise specified on the plans or in the special provisions.

4. Toe plates shall be punched with 1/4" inch holes to match holes in lip of end section and bolted with 3/8" galvanized bolts.

5. Reinforced edges to be supplemented with galvanized stiffener angles for the 60 inch thru 84 inch round, pipe-arch sizes (77" x 52") and (83" x 57"). The angles for the 60 inch thru 72 inch round will be (2" x 2" x 3/8") and for 78 inch thru 84 inch round (2½" x 2½" x 3/8"). The angles to be attached by 3/8" galvanized nuts and bolts.

6. Anchor block shall be used on inlet end only for 48 inch CMP and over and for CMAP (57" x 38") and over unless otherwise specified (see anchor block details).

7. Concrete shall be class A or AA.

8. Toe plates to be eliminated when anchor block is used.

9. Reinforcing steel to be allowed to provide clearance for end sections.

10. Actual dimensions of end section may vary by manufacturer. Provide appropriate metal end sections to specifically fit either HDPE or CMP as recommended by the manufacturer.

11. Metal end sections installed on HDPE pipe shall engage 2 corrugations or be installed with a tapered sleeve - See Detail B.

---

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### Diagram

**Detail B**

Tapered Sleeve for Attaching Steel End Sections to RCP and HDPE

See sheet R-2.2.3 for details not shown.
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FOR METAL PIPES

SAFETY TYPE

10/15
REVISED
9/00
ADOPTED

CHIEF HYDRAULICS ENGR.

Sheet 1 of 2

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Revised
9/00

Chief Hydraulics Engr.
### SAFETY SLOPE END SECTIONS FOR ROUND PIPES

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### NOTES:

1. Galvanized steel shall meet A53H10 specifications.
2. Connector sizes thru 24 inch diameter attach to pipe with Type 1 straps. All other sizes attach with Type 2 rods and lugs.
3. When required, toe plate extensions are to be 8 inches high by overall width less 6 inches. Do not include unless specified.
4. Fabricate transverse bars and longitudinal bars from steel pipe conforming to ASTM A53 Grade B Schedule 40 Specifications. Hot dip galvanize bars after fabrication. Slotted holes for transverse bar attachment shall be provided for all end sections.
5. Longitudinal bars shown are for cross drainage structures for pipes larger than 30 inches. Longitudinal bar required where open span (as measured perpendicular to the flow line) exceeds 30 inches on larger end sections. Where the open span of any cross drainage structure is 30 inches or smaller, no bars are required. Weld longitudinal bars to transverse bars.
6. All references made to pipe diameter apply to round pipe diameters and their arched equivalents.
TAPERED SLEEVE FOR ATTACHING STEEL END SECTIONS TO RCP AND HDPE

SECTION B B

TRANVERSE BAR DETAIL

EDGE OF SIDEWALL SHEET ROLLED SNUGLY AGAINST STEEL ROD

SECTION A A

PARALLEL DRAINAGE STRUCTURE

CROSS DRAINAGE STRUCTURE
SAFETY SLOPE END SECTIONS FOR ROUND PIPES

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NOTES:

1. Galvanized steel shall meet AASHTO specifications.
2. Connector sizes thru 24 inch diameter attach to pipe with Type 1 straps. All other sizes attach with Type 2 rods and lugs.
3. When required, toe plate extensions are to be 8 inches high by overall width less 6 inches. Do not include unless specified.
4. Fabricate transverse bars and longitudinal bars from steel pipe conforming to ASTM A53 Grade B Schedule 40. Specify ize hot dip galvanize bars after fabrication. Slotted holes for transverse bar attachment shall be provided for all end sections.
5. Longitudinal bars shown are for cross drainage structures for pipes larger than 30 inches. Longitudinal bar required where open span (as measured perpendicular to the flow line) is greater than 30 inches. Use additional longitudinal bars if after placement of one longitudinal bar the open spacing still exceeds 30 inches on larger end sections. Where the open span of any cross drainage structure is 30 inches or smaller, no bars are required. Use longitudinal bars to transverse bars.
6. All references made to pipe diameter apply to round pipe diameters and their arched equivalents.
NOTES:
1. Class and type of concrete shall be as specified for reinforced concrete pipe.
2. Structural design of end sections shall conform to that of standard reinforced concrete culvert pipe.
3. Length of pipe shown on the design plans does not include connector section (length C).
4. Contact hydraulics Engineer for sizes not listed.
5. Actual dimensions of end sections may vary by manufacturer. Adjust pipe lengths as necessary to accommodate precast end sections used. See sheets R-1.1.2 and R-2.1.4 for extension beyond fill slope and pipe pay lengths.

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* For Reference Only
QUANTITY AND LENGTH OF No. 4 REINFORCING BARS

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<th>DIA. OF PIPE</th>
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| 3/4" | 5" | 5" |
| 1" | 7" | 7" |
| 1 1/4" | 9" | 9" |
| 1 1/2" | 11" | 11" |
| 2" | 13" | 13" |

TABLE G

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NOTES:
1. Concrete shall be class A or class AA.
2. Reinforcing steel shall be deformed bars with the maximum spacing of 12 inches set 2 inches clear of surface of concrete. Reinforcing bars may be cut and bent in field.
Culverts should be installed on 5° increments where it is feasible. Over 55°, calculate quantities required.

41° to 55° - use quantities for 45° skew.
26° to 40° - use quantities for 30° skew.
11° to 25° - use quantities for 15° skew.

NOTEs:
1. Concrete shall be class A or AA.
2. Reinforcing steel shall be deformed bars with minimum spacing of 18 inches set 2 1/2 inches clear of surface of concrete except as noted. Bars may be cut and bent in field.
3. Footings shown are of minimum depth and shall be extended if soil is unsuitable or liable to scour.
4. Culvert pipes to be set on a skew shall be mitered when headwalls are constructed. When headwalls are not constructed the pipes shall not be mitered except in overflow section.
5. For estimating headwall quantities on skewed culverts:
   - 0° to 10° - use quantities for 0° skew.
   - 11° to 25° - use quantities for 15° skew.
   - 26° to 40° - use quantities for 30° skew.
   - 41° to 55° - use quantities for 45° skew.
   - Over 55° - calculate quantities required.
   - Culverts should be installed on 5° increments where it is feasible.
### QUANTITIES SHOWN ABOVE ARE FOR ONE HEADWALL.

### QUANTITIES SHOWN BELOW ARE FOR TWO HEADWALLS.

### NOTES:

1. Concrete shall be class A or AA.
2. Reinforcing steel shall be deformed bars with maximum spacing of 18 inches set 2½ inches deep of surface of concrete except as noted. Bar ends shall be kept 1½ inches clear of surface of concrete. Reinforcing bars may be cut and bent in field.
3. Footings shown are of minimum depth and shall be extended if soil is unsuitable or liable to scour.
4. Culvert pipes to be set on a skew shall be mitered when headwalls are constructed. When headwalls are not constructed, the pipes shall not be mitered except in overflow section.
5. For estimating needed quantities on skewed culverts, 0° to 10° - use quantities for 0° skew, 11° to 25° - use quantities for 15° skew, 26° to 40° - use quantities for 30° skew, 41° to 55° - use quantities for 45° skew, over 55° - calculate quantities required. Culverts should be installed on 5° increments where it is feasible.
6. No direct payment for anchor bolts.

---

### LENGTH OF REINFORCING BARS

#### SINGLE CMP

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### QUANTITIES SHOWN ABOVE ARE FOR ONE HEADWALL.

### QUANTITIES SHOWN BELOW ARE FOR TWO HEADWALLS.

---

### SHEET 2 OF 2

**DEPARTMENT OF TRANSPORTATION**

**STATE OF NEVADA**

**CHIEF HYDRAULICS ENG.**

**NOTES:**

1. Concrete shall be class A or AA.
2. Reinforcing steel shall be deformed bars with maximum spacing of 18 inches set 2½ inches deep of surface of concrete except as noted. Bar ends shall be kept 1½ inches clear of surface of concrete. Reinforcing bars may be cut and bent in field.
3. Footings shown are of minimum depth and shall be extended if soil is unsuitable or liable to scour.
4. Culvert pipes to be set on a skew shall be mitered when headwalls are constructed. When headwalls are not constructed, the pipes shall not be mitered except in overflow section.
5. For estimating needed quantities on skewed culverts, 0° to 10° - use quantities for 0° skew, 11° to 25° - use quantities for 15° skew, 26° to 40° - use quantities for 30° skew, 41° to 55° - use quantities for 45° skew, over 55° - calculate quantities required. Culverts should be installed on 5° increments where it is feasible.
6. No direct payment for anchor bolts.
QUANTITIES SHOWN BELOW ARE FOR ONE HEADWALL.

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QUANTITIES SHOWN BELOW ARE FOR TWO HEADWALLS.

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<thead>
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</tr>
</tbody>
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NOTES:

1. Concrete shall be class A or AA.
2. Reinforcing steel shall be deformed bars with maximum spacing of 18 inches set 1½ inches clear of surface of concrete except as noted. Bar ends shall be kept 1½ inches clear of surface of concrete. Reinforcing bars may be cut and bent in field.
3. Footings shown are of minimum depth and shall be extended if soil is unsuitable or liable to scour.
4. Culvert pipes to be set on a skew shall bemitered when headwalls are constructed. When headwalls are not constructed the pipes shall not bemitered except in overflow section.
5. For estimating headed quantities on skewed culverts:
   - 0° to 10° = use quantities for 10° skew.
   - 11° to 25° = use quantities for 15° skew.
   - 26° to 40° = use quantities for 30° skew.
   - 41° to 55° = use quantities for 45° skew.
   - Over 55° = calculate quantities required.
   - Culverts should be installed on 5° increments where it is feasible.
6. Dimensions X, Y, L and h to remain constant regardless of minor variations in wall thickness due to class or type of pipe used.
7. See sheet R-2.9.1 for details if connecting to HDPE pipe.
CULVERT HEADWALLS
42" TO 72" RCP AND
42" TO 60" HDPE

QUANTITIES SHOWN BELOW ARE FOR ONE HEADWALL.

<table>
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NOTES:
1. Concrete shall be class A or AA.
2. Reinforcing steel shall be deformed bars with maximum spacing of 18 inches set 2 by 2 inches clear of surface of concrete except as noted. Bars shall be kept 1/2 inch clear of surface of concrete. Reinforcing bars may be cut and bent in field.
3. Footings shown are of minimum depth and shall be extended if soil is unsuitable or liable to scour.
4. Culvert pipes to be set on a skew shall be mitered when headwalls are constructed. When headwalls are not constructed the pipes shall not be mitered except in overflow section.
5. For estimating headwall quantities on skewed culverts: 5° to 10° = use quantities for 0° skew, 10° to 20° = use quantities for 5° skew, 20° to 40° = use quantities for 10° skew, 40° to 50° = use quantities for 20° skew, over 50° = calculate quantities required. Culverts should be installed on 5° increments where it is feasible.
6. Dimensions X, Y, L, and h to remain constant regardless of minor variations in wall thickness due to class or type of pipe used.
7. See sheet 2-1.1 for details. Sheet 2-1.1 for details. Sheet 2-1.1 for details.
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**QUANTITIES SHOWN BELOW ARE FOR ONE HEADWALL**

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**QUANTITIES SHOWN BELOW ARE FOR TWO HEADWALLS**

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<td>45°</td>
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</table>

**NOTES:**

1. Concrete shall be class A or AA.
2. Reinforcing steel shall be deformed bars with maximum spacing of 18 inches set 2 1/2 inches clear of surface of concrete except as noted. Bar ends shall be kept 1 1/8 inches clear of surface of concrete. Reinforcing bars may be cut and bent in field.
3. Footings shown are of minimum depth and shall be extended if so required or to carry loads.
4. Culvert pipes to be set on a skew shall be mitered when headwalls are constructed. When headwalls are not constructed the pipes shall not be mitered except in overflow sections.
5. For estimating headwall quantities on skewed culverts:
   - For 0° to 10° use quantities for 0° skew.
   - For 11° to 25° use quantities for 10° skew.
   - For 26° to 45° use quantities for 25° skew.
   - For 46° to 55° use quantities for 45° skew.
   - For 56° and over 55° calculate quantities required.

**SHEET 2 OF 2**
CULVERT HEADWALLS 23" x 14" OVAL RCP TO 60" x 38" OVAL RCP  
R-2.7.11  (022)  Signed Original on File
ADAPTED  REVISED 1/20  CHIEF HYDRAULICS ENGR.

**QUANTITIES SHOWN BELOW ARE FOR ONE HEADWALL.**

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<tr>
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<td></td>
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<td>48&quot; x 36&quot;</td>
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**QUANTITIES SHOWN BELOW ARE FOR TWO HEADWALLS.**

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<tr>
<td>48&quot; x 36&quot;</td>
<td>84&quot;</td>
<td>2.45</td>
<td>3.05</td>
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**NOTES:**

1. Concrete shall be class A or M.
2. Reinforcing steel shall be deformed bars with maximum spacing of 18 inches set 2 1/2 inches clear of surface of concrete except as noted. Bar ends shall be kept 1/2 inches clear of surface of concrete. Reinforcing bars may be cut and bent in field.
3. Footings shown are of minimum depth and shall be extended if soil is unsuitable or liable to scour.
4. Culvert pipes to be set on a skew shall be mitered when headwalls are constructed. When headwalls are not constructed the pipes shall not be mitered except as over the section.
5. Dimensions X, Y, L, and h to remain constant regardless of minor variations in wall thickness due to class of pipe used.
6. For estimating headwall quantities on skewed culverts:
   - All 0° - use quantities for 0° skew.
   - 1° to 15° - use quantities for 0° skew.
   - 16° to 25° - use quantities for 15° skew.
   - 26° to 40° - use quantities for 30° skew.
   - 41° to 55° - use quantities for 45° skew.
   - Over 55° - calculate quantities required.
   - Culverts should be installed on 5° increments where feasible.
**COUPLING BAND DETAILS - CMP AND PIPE ARCHES**

1. All coupling band connecting hardware shall be galvanized.
2. For pipe arches use same width band as for round pipe of equal periphery.
3. For watertight and siphon joints on alternative annular coupling band, place mastic sealant strip ½ inch thick x 1½ inches wide x 5 inches long in lap between bands.
4. For alternative annular coupling band, 2 bar and strap assemblies are required for pipe greater than 42 inches in diameter, optional for sizes less than 42 inches.

**NOTES:**

**TWO PIECE INTEGRAL FLANGE**

Die formed for use on 6", 8", and 10" HCMP

---

**UNIVERSAL COUPLING BAND FOR USE ON CMP THRU 36" INCLUSIVE**

To be used only for existing helically corrugated pipe.

---

**ALTERNATIVE ANNULAR COUPLING BAND FOR HCMP THRU 84"**

For HCMP Down Drains & Slotted Drains

---

**BAR AND STRAP DETAIL**

---

**Dimple Detail**

---

**Notes:**

- All coupling band connecting hardware shall be galvanized.
- For pipe arches use same width band as for round pipe of equal periphery.
- For watertight and siphon joints on alternative annular coupling band, place mastic sealant strip ½ inch thick x 1½ inches wide x 5 inches long in lap between bands.
- For alternative annular coupling band, 2 bar and strap assemblies are required for pipe greater than 42 inches in diameter, optional for sizes less than 42 inches.
### Coupling Type

<table>
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<tr>
<th>Angle</th>
<th>Corrugation</th>
<th>Pipe Size</th>
<th>H or A</th>
<th>Thickness</th>
<th>Bar and Strap</th>
<th>Angle</th>
<th>Wedge and Strap</th>
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<tbody>
<tr>
<td>TWO PIECE INTEGRAL FLANGE</td>
<td>3/4&quot; x 3/4&quot;</td>
<td>6&quot; to 10&quot;</td>
<td>7&quot;</td>
<td>0.064 - 0.079</td>
<td>0.138</td>
<td>0.064</td>
<td>2 - 1/2&quot;</td>
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<tr>
<td>UNIVERSAL</td>
<td>2 1/2&quot; x 2 1/2&quot;</td>
<td>36&quot; to 72&quot;</td>
<td>15&quot;</td>
<td>0.064 - 0.138</td>
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<td>0.079</td>
<td>0.064</td>
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<td>ANNULAR</td>
<td>2 1/2&quot; x 2 1/2&quot;</td>
<td>72&quot; to 120&quot;</td>
<td>23&quot;</td>
<td>0.109</td>
<td>0.064</td>
<td>0.079</td>
<td>0.064</td>
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<td>CHANNEL</td>
<td>2 1/2&quot; x 2 1/2&quot;</td>
<td>24&quot; to 60&quot;</td>
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<td>0.109</td>
<td>0.064</td>
<td>0.079</td>
<td>0.064</td>
</tr>
</tbody>
</table>

**NOTES:**

1. All coupling band connection hardware shall be galvanized or electroplated in accordance with standard specifications.
2. For pipe arches, use same width band as for round pipe of equal periphery.
3. Two piece band is required for pipe greater than 42 inches in diameter.
4. Tension strap may be connected to band or sheet with either spot welds or fillet welds that develop minimum required strength or strap.
5. Use 1/4" inch gage line dimension on attached angle leg for rivets and spot welds.
6. Band thickness shall not be less than 3 standard thicknesses lighter than the thickness of the pipe.
7. Dimensions and thickness shown are minimum.
8. Angle 2 inch long with 0.064 inch x 2 inch strap.
9. Fillet welds of equivalent strength may be substituted for spot welds or rivets.

**SECTION A-A**

Channel Coupling Band Shall Be Two Piece

Channel Coupling Band For Use on Flanged End CMP
ELEVATION

Corrugation Valley
Outer Corrugated Liner
Liner
Smooth Inner
1″ Min. at 0° Skew
Structure Wall
HDPE Pipe (Type S)
Structure Drop Inlet, or Other Concrete Headwall,
HDPE Pipe (Type S)
1″ Min. (See Note 1 and 2)
HDPE Pipe (Type S)
Perpendicular Pipe End Cut
Structure Drop Inlet, or Other Concrete Headwall,
3″ Min. (See Notes 3 and 4)

HALF-SECTION C-C

HDPE Pipe (Type S)
Outer Corrugated Liner
Incorporated
I nner Smooth Liner
1/8″ Stainless Anchor Bolts, Nuts, and Oversized Fender Washers.
1 1/2 ″ x 8″ (D 24″)
(See Notes 3 and 4)

ELEVATION

HDPE PIPE CONNECTION FOR:
- 0° -5° Skew (D.I.'s and Other Enclosed Structures)
HDPE PIPE CONNECTION FOR:
- All Skewed Headwalls Connections
- 5° -45° Skew (D.I.'s and Other Enclosed Structures)

MAXIMUM HEIGHT OF COVER FOR HDPE PIPE (TYPE S)

PIPE DIAMETER
MINIMUM COVER *
MAXIMUM COVER **

12″-18″
1’
19’

24″-42″
1’
15’

48″
1’
14’

* At Bottom of Flexible Pavement or Top of Rigid Pavement.
** Based on class 2 backfill material at 90% compaction in accordance with ASTM D2321. Consult Hydraulic Engineer for larger fill height requirements.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

NOTES:
1. For skew angles ±5 degrees, make a perpendicular pipe end-cut and allow long side of pipe to project into structure (excluding headwall). For headwall connections, pipe shall be trimmed flush with face of headwall for all skew angles.
2. HDPE pipe end-cuts shall be made in the center of nearest corrugation valley where possible. Adjust non-circular structure positions 1/2″ max so structure face corresponds with corrugation valley where appropriate and as directed by engineer.
3. Install 1/2″ stainless anchor bolts, nuts, and oversized fender washers 12" o.c. around circumference of pipe. Adjust anchor position to fall in either the valley or rib of the corrugated outer liner. Attach bolt anchors perpendicular to pipe wall and bend anchor outside of pipe attachments as necessary to fill in concrete wall with a minimum of 1 1/2″ concrete cover. No direct payment for anchor bolts.
4. Do not over tighten nuts. Tighten nuts against oversize washers and HDPE pipe wall without crushing or deforming pipe wall. Stake or peen non-embedded nuts to prevent loosening.
5. No special treatment is required for connecting HDPE pipe to circular manholes. Make perpendicular HDPE pipe end-cut in center of corrugation valley.
6. For all other HDPE pipe terminations (i.e., plane end pipes, end-sections, etc.), pipe end-cuts shall be centered in the nearest corrugation valley.
7. Water-tight connections can only be used for 0° skews. Install embedded water stop gasket supplied by manufacturer only when water tight joints and connections are specified.
8. Trim inner pipe liner flush with structure wall. Removable water-stop gasket shall be centered in the nearest corrugation valley.
9. Skew angles between HDPE pipes and structures should be avoided. Position HDPE pipes and structures at 0 degree skews where possible and practical.

1/4″ Stainless Anchor Bolts, Nuts, and Oversized Fender Washers.
1 1/2 ″ x 8″ (D 24″)
(See Notes 3 and 4)
NOTES:
1. All concrete shall be class A or AA.
2. Reinforcing bars shall be No. 4 bars with maximum spacing at 18 inch centers. Bars to be embedded a minimum of 2 inches and bar ends must clear surface by 1/2 inch.
3. All exposed concrete edges shall be chamfered 1 inch.
4. Grate and frame angle to be welded at all contact points.
5. 1/2 inch maximum clearance between grate and frame on each side.
6. Slope catch basin floors 10:1 from all directions toward outlet pipe. If basin is used as a junction shape, weld to outlet pipe, and provide a 10:1 slope to downhill.
7. 12 inch down drain pipe shown, can be upsized to 15 inch or 18 inch with 3 inch or 6 inch increase in the basin depth respectively. Down drain pipe to be CMP or HDPE or as specified.
8. If optional drain is installed, adjust rebar to accommodate drain.
9. Riprap can be increased to class 300 with a 6 inch increase in riprap thickness.
10. Additional pipe/drain penetrations for slotted drain, trench drain, or pipes may be placed in any wall.

1. All concrete shall be class A or AA.
2. Reinforcing bars shall be No. 4 bars with maximum spacing at 18 inch centers. Bars to be embedded a minimum of 2 inches and bar ends must clear surface by 1/2 inch.
3. All exposed concrete edges shall be chamfered 1 inch.
4. Grate and frame angle to be welded at all contact points.
5. 1/2 inch maximum clearance between grate and frame on each side.
6. Slope catch basin floors 10:1 from all directions toward outlet pipe. If basin is used as a junction shape, weld to outlet pipe, and provide a 10:1 slope to downhill.
7. 12 inch down drain pipe shown, can be upsized to 15 inch or 18 inch with 3 inch or 6 inch increase in the basin depth respectively. Down drain pipe to be CMP or HDPE or as specified.
8. If optional drain is installed, adjust rebar to accommodate drain.
9. Riprap can be increased to class 300 with a 6 inch increase in riprap thickness.
10. Additional pipe/drain penetrations for slotted drain, trench drain, or pipes may be placed in any wall.
ANCHOR ASSEMBLY DETAIL

NOTES:
1. All concrete shall be class A or AA.
2. Reinforcing bars shall be No. 4 bars with maximum spacing at 18 inch centers. Bars to be embedded a minimum of 2 inches and bar ends must clear surface by 1½ inches.
3. All exposed concrete edges shall be chamfered 1 inch.
4. Grate and frame angle to be welded at all contact points.
5. ¾ inch maximum clearance between grate and frame on each side.
6. Slope catch basin (bars 10 to 1) from all directions toward outlet pipe. If basin is used as a junction shape (bowfins) to outlet pipe, and provide a 10:1 slope to bowfins.
7. 12 inch down drain pipe shown, can be upsized to 15 inch or 18 inch with 3 inch or 6 inch increase in the basin depth respectively. Down drain pipe to be CMP or MSE, or as specified.
8. If optional drain is installed, adjust rebar to accommodate drain.
9. Riprap can be increased to class 300 with a 6 inch increase in riprap thickness.
10. Additional pipe/drain penetrations for slotted drain, trench drain, or pipes may be placed in any wall.
LACING SINGLE BASKET

When full, close lid and lace to basket. Optional wire ring fasteners allowed as per special provisions.

LACING BASKET TO BASKET

Place lid this direction at lifts.

Begin and end only.

WIRE MESH LACING DETAIL

INTERNAL CONNECTING WIRE DETAIL
FOR WIRE MESH GABIONS

<table>
<thead>
<tr>
<th>BASKET HEIGHT</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/3H and 2/3H</td>
<td>NONE</td>
</tr>
</tbody>
</table>

2 Mesh Openings
NOTES:

1. When no end section is used, additional riprap shall be as required by the Hydraulic Engineer.

2. For multiple pipe or RCB installations, this dimension shall be adjusted according to the pipe separation information on sheet R-2.1.1 or in the headwall details.

3. Transition end of riprap apron to downstream channel. Apron may be skewed and dimensions adjusted to match and line up with downstream channel.

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>RC</th>
<th>RCB</th>
</tr>
</thead>
<tbody>
<tr>
<td>12” to 36”</td>
<td>3D</td>
<td>4D</td>
</tr>
<tr>
<td>42” to 84”</td>
<td>4H *</td>
<td>*</td>
</tr>
</tbody>
</table>
NOTES:

1. All concrete shall be class A or AA.

2. Reinforcing steel shall be No. 4 bars with maximum spacing of 30 inch centers, welded tightly at all intersections and embedded 2 inches clear of all concrete surfaces.

3. Exposed edges of concrete shall be chamfered 1 inch.

4. Structural steel weight includes the 2 inch nominal diameter pipe standard weight and frame angles 13/4" x 13/4" x 3/8") and 1/2" x 1/2" x 1/2".

5. For 2 inch nominal diameter pipe see ASTM A53.

6. See sheet R-2.9.1 for details if connecting HDPE pipe.

7. Slope catch basin floors 10:1 from all directions toward outlet pipe if basin is used as a junction. Shape flow line(s) to outlet pipe and provide a 10:1 slope to flow line(s).

8. Run rebar continuous thru construction joint. Joint must be a minimum 3 inches from horizontal bars.

9. Additional pipe penetrations may be placed in any wall.
The concrete and reinforcing quantities are based on the H Min. shown. Increase the concrete and reinforcing base quantity by the corresponding add rate (per foot of increased height if the H specified is larger than H Min).

- **NOTES:**
  1. All concrete shall be class A or AA.
  2. Reinforcing steel shall be No. 4 bars with maximum spacing at 18 inch centers, wired tightly at all intersections and embedded 2 inches clear of all concrete surfaces.
  3. Exposed edges of concrete shall be chamfered 1 inch.
  4. Structural steel weight includes the 2 inch nominal diameter pipe standard weight and frame angles (3" x 3" x 3/8") and (3 1/2" x 3 1/2" x 3/8").
  5. For 2 inch nominal diameter pipe see ASTM A53.
  6. See sheet R-2.8.1 for details if connecting HDPE pipe.
  7. Slope catch basin floors 10:1 from all directions toward outlet pipe. If basin is used as a junction, shape flow line(s) to outlet pipe and provide a 10:1 slope to flow line(s).
  8. Run rebar continuous thru construction joint. Joint must be a minimum 3 inches from horizontal bars.
  9. Additional pipe penetrations may be placed in any wall.

---

**SECTION A-A**

- 3" x 3" x 3/8" Grate Angle Around Perimeter of Drop Inlet and Grate
- See Detail A

**SECTION C-C**

- 1" x 1/4" x 4" Bar Welded to Frame Angle (2 Tabs Each Side Set 6" From Corner of Frame)
- **Typ. 1/4"**

**SECTION B-B**

- 1/2" x 3 1/2" x 3/8" Frame Angle Around Perimeter of Drop Inlet and Grate
- **Typ. 1/4"**

**PLAN**

- 1/2" x 3 1/2" x 3/8" Frame Angle Welded to Stock
- Station/Offset
  - See Tab Detail

**SECTION B-B**

- 10:1 (Typ.)
- **Typ. 1/4"**

**TAB DETAIL**

- Permissible 1/2" Max. Joint if Continuous Bar Not Used
- **Typ. 1/4"**

**GRATE DETAIL**

- (4) 2" Nom. Dia. Pipe @ 60° Ck's Evenly Spaced
- 1" x 1/4" Bars Welded to 2" Pipe and Frame Angles

**GRATE DETAIL**

- (1) 2" Nom. Dia. Pipe
- 60° Ck's
- Evenly Spaced

---

**NOTES:**

- All concrete shall be class A or AA.
- Reinforcing steel shall be No. 4 bars with maximum spacing at 18 inch centers, wired tightly at all intersections and embedded 2 inches clear of all concrete surfaces.
- Exposed edges of concrete shall be chamfered 1 inch.
- Structural steel weight includes the 2 inch nominal diameter pipe standard weight and frame angles (3" x 3" x 3/8") and (3 1/2" x 3 1/2" x 3/8").
- For 2 inch nominal diameter pipe see ASTM A53.
- See sheet R-2.8.1 for details if connecting HDPE pipe.
- Slope catch basin floors 10:1 from all directions toward outlet pipe. If basin is used as a junction, shape flow line(s) to outlet pipe and provide a 10:1 slope to flow line(s).
- Run rebar continuous thru construction joint. Joint must be a minimum 3 inches from horizontal bars.
- Additional pipe penetrations may be placed in any wall.
**TABLE A**

**INK SIZE**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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<th></th>
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<td>12&quot;</td>
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<td>24&quot;</td>
<td>30&quot;</td>
<td>36&quot;</td>
<td>42&quot;</td>
<td>48&quot;</td>
<td>54&quot;</td>
<td>6&quot; X 3&quot; X 4&quot;</td>
<td>6&quot; X 3&quot; X 4&quot;</td>
<td>5 1/2&quot; X 3&quot; X 4&quot;</td>
<td>5 1/2&quot; X 3&quot; X 4&quot;</td>
</tr>
<tr>
<td>229</td>
<td>232</td>
<td>246</td>
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<td>205</td>
<td>205</td>
<td>205</td>
<td>205</td>
<td></td>
</tr>
</tbody>
</table>

The "A" and "J" values represent the minimum side dimension of the drop inlet (see sheet R-4.2.31) when a pipe penetrates the "A" or "J" side of that drop inlet. If no pipe penetrates the "A" side, use A=24". If no pipe penetrates the "J" side, use J=24". If pipes penetrate both sides, use the values above for each side of the drop inlet, depending on the size of the penetrating pipe.

When installing an arch or elliptical pipe, using the horizontal dimension (span), choose the equivalent or next larger round diameter dimension as described in the table above.

Maximum H is based upon the drop inlet having No. 4 bars at 12" on center.

* Varies with "A" dimension only.

---

**NOTES:**

1. All concrete shall be class A or AA.
2. All reinforcing steel shall be tightly wired and embedded 1/2" inches clear of concrete surface. Except, all reinforcing shall be No. 4 bars with maximum spacing of 12" inches center, for all values of "H" to the maximum as shown in Table A. If "H" exceeds these maximums, drop inlet will require special design.
3. Exposed edges of concrete shall be chamfered 1 inch.
4. Where pipe intersects drop inlet on a 12° or larger skew increase J to 2'2" and redesign for skews at A.
5. Where pipe intersects drop inlet on a 12° or larger skew increase span to 3'6" and redesign for skews at A.
6. For values of "H" see the plans.
7. "H" is the difference in elevation between the out flow pipe and the normal gutter grade line at the curb face minus 3 inches.
8. Pipe(s) can be placed in any wall.
9. For drop inlet configurations with 2 pipes-inflow pipe invert elevation shall be 0.1 feet above outflow pipe invert elevation.
10. Extreme low cover situations to be reviewed by the hydraulics engineer.
11. Slope catch basin floors 10:1 from all directions toward outlet pipe. If basin is used as a junction, shape flow line(s) to outlet pipe, and provide a 10:1 slope to flow lines.
12. Station/offset distance listed in plans is measured to the face of curb at the gutter flow line.
13. See sheet R-2.9.1 for details if connecting to HDPE pipe.
14. Grate is to fit in the frame and be easily removed. If the gap between the grate and frame is greater than 1/2", the grate and frame shall be removed and reconstructed to the tolerances specified or, with approval of the Engineer, a filler strip up to 1/2" thickness may be welded flush to the top of the frame to reduce the gap to a maximum of 1/4".
NOTES:

1. For details and dimensions not shown see sheet R-4.2.1.
2. Reuse existing grate if competent (as determined by Engineer).

LEGEND:

- LIMITS OF REMOVAL

---

ELEVATION

- Construct Top of Inlet per Standard Plan Requirements
- Leave 6" of Exposed Vertical Reinforcement for Connection to New #4 Bars
- Adjust Drop Inlet to Grade
TABLE OF QUANTITIES

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>H</th>
<th>Concrete (Cu. Yd.)</th>
<th>Rein. Steel</th>
<th>Str. Stl. Grate</th>
</tr>
</thead>
<tbody>
<tr>
<td>16&quot;</td>
<td>3&quot;</td>
<td>1.89</td>
<td>81</td>
<td>17</td>
</tr>
<tr>
<td>24&quot;</td>
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<td>86</td>
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<td>102</td>
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<td>106</td>
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<tr>
<td>48&quot;</td>
<td>5&quot;</td>
<td>2.63</td>
<td>125</td>
<td>17</td>
</tr>
</tbody>
</table>

NOTES:
1. All concrete shall be class A or AA.
2. Reinforcing bars shall be No. 4 bars at 18 inch centers.
3. All exposed concrete edges shall be chamfered 1 inch.
4. Dimensions may be varied to fit local conditions as directed by the engineer.
5. No deductions in concrete shall be made for 2 inch crossbars.
6. Steelstrap and pipe for crossbars are included in the structural steel grate quantities.
7. Slope catch basin floors 10:1 from all directions toward outlet pipe if basin is used as a junction. Slope flow lines to outlet pipe, and provide a 10:1 slope to flow lines.
8. Pipe penetration may be placed in any wall.
10. See sheet R-2.9.1 for details if connecting to HDPE pipe.
**TABLE OF QUANTITIES**

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Concrete (Cu. Yd.)</th>
<th>Rein. Steel (lb)</th>
<th>Str. Stl Grate (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3&quot;</td>
<td>2.89</td>
<td>197</td>
<td>628</td>
</tr>
<tr>
<td>4&quot;</td>
<td>3.17</td>
<td>135</td>
<td>688</td>
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<td>5&quot;</td>
<td>3.38</td>
<td>146</td>
<td>568</td>
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<td>6&quot;</td>
<td>3.59</td>
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<td>568</td>
</tr>
<tr>
<td>7&quot;</td>
<td>3.83</td>
<td>172</td>
<td>688</td>
</tr>
</tbody>
</table>

**NOTES:**

1. All concrete shall be class A or AA.
2. Reinforcing bars shall be No. 4 bars at 18 inch centers embedded 2 inches clear of concrete surface and wired tightly at all intersections, unless otherwise shown.
3. All exposed concrete edges shall be chamfered 1 inch.
4. Dimensions may be varied to fit local conditions as directed by the engineer.
5. No deductions in concrete shall be made for 2 inch crossovers.
6. Steel straps and pipe for crossovers are included in the structural steel grate quantities.
7. Slope catch basin means 10:1 from all directions toward outlet pipe. If basin is used as a junction, shape flow line to outlet pipe, and provide a 10:1 slope to flow line.
8. Pipe penetration may be placed in any wall.
10. See sheet R-2.9.1 for details if connecting to HDPE pipe.
Extend Curb under Frame to Fit.

Non-Skid Pattern on Frame and Cover

Flow Line of Curb

Grout Or Concrete

Grout

State / Offset

See Plan For Cross Drain Size and Slope

Flow

View C-C

VIEW C-C

Plan View

SECTION A-A

SECTION B-B

WEDGE LOCK HOLD DOWN

NOTES:
1. Concrete shall be class A or AA.
2. Forming of the base will not be required.
3. Station/Offset distance listed in plans is measured to curb flow line.
4. T = wall thickness.
NOTES:
1. Concrete shall be class A or AA.
NOTES:

1. Revisions require approval by the Engineer in writing prior to construction.
2. Construction of the trench drain shall follow the manufacturers recommendations.
3. Trench drain grate to be 1/4 inch to 1/2 inch below adjacent pavement surface.
4. L, W, H1, and H2 as specified on plans.
5. All concrete shall be class A or AA.
6. If retrofitting to an existing drop inlet preserve existing rebar during removal of side walls as needed to tie to trench drain reinforcement. Install additional rebar to facilitate connection to drop inlet and replace damaged existing rebar. Doweling perpendicular to side wall in lieu of connecting to existing rebar is not permitted.

LEGEND:
- LIMITS OF REMOVAL

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
CONNECTION AND DROP INLET TRENCH DRAIN

10/15 REVISED
5/09 ADOPTED
CHIEF HYDRAULICS ENGR.

Signed Original On File
NOTES:

1. Station and offset approximate, verify location of under drain with Engineer.

2. All concrete shall be class A or AA.

3. All exposed metal parts shall be galvanized and all galvanizing damaged by fabrication or installation shall receive two coats of aluminum paint (galvonox or equal).

4. Details shown are for standard typical construction of two sidewalk under drain cells. Sidewalk under drains can be constructed with any number of cells as specified with the construction of detail D components between each cell.

LEGEND:

L = SIDEWALK WIDTH
NOTES:
1. For cast-in-place concrete base all reinforcing steel to be No. 4 bars at 18" inch
   centers lightly wound at all intersections and embedded in concrete at least 2 inches and bar ends must clear concrete surfaces by 1/2 inches.
   Precast concrete base may be used in lieu of cast-in-place base.
2. All concrete shall be class A or AA.
3. Inflow pipe invert elevations shall be 2 0.1 foot above outflow pipe elevation.
4. For values of "H" see plans. "H" is the difference in elevation between the outflow pipe invert elevation and the top of manhole elevation at street grade.
5. Do not place pipes in tapered section.
6. Manhole cover shall bear entity identification and system function (if applicable).
7. Precast concrete pipe sections, tapered sections, lids, grade rings, bases, and steps shall conform to AASHTO M 199 (ASTM C-478).
8. Shape flow line in manhole to outlet pipe, and provide a 10:1 minimum slope from all directions toward flow line.
9. T = manhole pipe wall thickness.
10. Rotate precast lid or eccentric RCP tapered section to locate ladder away from pipe openings and to keep manhole cover out of the wheel path or other undesirable locations as directed by the engineer.
11. See sheet R-4.3.3 for use in minimum cover situation where tapered section will not fit.
NOTES:

1. All concrete shall be class A or AA.
2. Inflow pipe invert elevations shall be greater than or equal to 0.1 feet above the outflow pipe invert elevation.
3. For values of "H", see plans. "H" is the difference in elevation between the outflow pipe invert elevation and the top of manhole elevation at street grade.
4. Precast concrete pipe sections, tapered sections, lids, grade rings, bases, and steps shall conform to AASHTO M 199 (ASTM C-478).
5. Manhole cover shall bear entity identification and system function (if applicable).
6. Shape flowline in manhole to outlet pipe, and provide a 10:1 slope from all directions toward flow line.
7. Refer to sheet R-2.9.1 for details if connecting to HDPE pipe.
NOTES:

1. The weight of frame shall be 250 lb. minimum, and the weight of cover shall be 300 lb. minimum. Traffic-strength manhole frame and cover shall comply with AASHTO M306 H-20 wheel loads. Equivalent manhole frames and covers other than shown may be used upon approval by the Engineer.

2. The frame seat and cover edge shall be machined to a true bearing surface all around. The frame and cover shall be compatible to the manufacturer's specifications.

3. The surface shown is for illustration only. Any surface design, other than smooth, may be used upon approval.

4. Frames and covers shall conform to ASTM A48, Class 40 for gray iron castings.

5. A cast-in-place concrete collar shall be placed around a manhole frame unless otherwise directed.

6. Manhole cover shall bear name of entity and system function (if applicable).

7. Concrete shall be class A or AA.

8. Concrete collars may be poured round, or any other appropriate shape when approved by the Engineer.

9. Commercial prefabricated grade rings for manholes shall conform to AASHTO M 199 (ASTM C-478).

10. Manhole cover and frame shown. Other shapes may apply to utility and valve covers and frames.

SECTION B-B

TRAFFIC-STRENGTH MANHOLE FRAME AND COVER
GLUE DOWN CURBS

SECTION TYPE A

SECTION TYPE B

Epoxy Cement May Be Omitted When Installation Is Temporary

Omit Rounding When Curbs Are Back To Back

P.C.C. or Dense Graded

GLUE DOWN CURBS

SECTION TYPE 2

SECTION TYPE 3

SECTION TYPE 4

SECTION TYPE 5

SECTION TYPE 6

SECTION TYPE 7

SECTION TYPE 8

CURB AND GUTTERS

CURB

VALLEY GUTTER

TYPICAL TRANSITION FROM ROLLED CURB TO VERTICAL FACE

LEGEND:

1. When distance between back of curb on islands 6 ft. or less use 4 inches of class A or AA concrete (island paving) and 2 inches of aggregate base.
2. Concrete shall be class A or AA.
3. Concrete unit volume for information only.
4. No expansion joint necessary

NOTES:

1. Concrete shall be class A or AA.
2. Concrete unit volume for information only.
NOTES:
1. Concrete shall be class A or AA.
2. Locate flat obstructions to maintain a 4 foot minimum pedestrian access route. If a 4 foot pedestrian access route cannot be maintained use slip resistant covers.
3. Locate upright obstructions to maintain a 4 foot minimum pedestrian access route.
4. If locating flat obstructions per Method 3 and the sidewalk has a buffer zone then locate the obstructions in the buffer zone.
5. Upright obstructions are not allowed in new sidewalks.
6. If flat obstructions are located within a crosswalk use slip resistant covers.

LEGEND:
- FLAT OBSTRUCTION
  SLIP RESISTANT COVER OPTIONAL
- FLAT OBSTRUCTION
  SLIP RESISTANT COVER REQUIRED
- UPRIGHT OBSTRUCTIONS
  FE, utility poles, sign supports, fire hydrant, signal cabinets, bus stops, light poles, etc.
- PEDESTRIAN ACCESS ROUTE

METHOD 1
Always Use if Obstruction can be Located Completely Out of Sidewalk

METHOD 2
Use Only if Method 1 Can Not be Achieved

METHOD 3
Use Only if Method 2 Can Not be Achieved
(See Note 4)

METHOD 4
Use Only if Method 3 Can Not be Achieved
(See Note 4)

LOCATING OBSTRUCTIONS
(FLAT)

LOCATING OBSTRUCTIONS
(UPRIGHT)

SECTION A-A
Curb and Gutter
6" Min. Aggregate Base
4" Aggregate Base
5' Min.
1. Extend detectable warning the full width of the curb ramp (exclusive of flared sides).
2. Grates for storm drains shall not be placed in the crosswalk or in front of the curb ramp.
3. Transitions from ramps to gutters or roadway surface shall be flush and free of abrupt changes.
4. Plantmix bituminous open-graded surface shall be flush with the edge of the gutter pan.
5. Rough broom texture on curb ramps and wings. Texture shall provide a visual contrast to the sidewalk.
6. For crosswalk markings see sheet T-38.1.3.
7. Hit ramps shall be 8.3% or flatter, 15 foot maximum length. Engineer should be notified for assessment if the curb ramp exceeds 15 foot in length due to the longitudinal roadway grade.
8. All slope rates are relative to level.
9. Concrete should be class A or AA.
10. Rate gutter flowline 2 inch maximum, when required to prevent ponding at the ramp and maintain positive drainage.
11. If there are R/W restrictions the sidewalk width can be reduced to a listed less than 4 foot with approval of the Assistant Chief Road Design Engineer. If the sidewalk width is less than 5 foot then 5 foot by 5 foot passing zones are required at 200 foot intervals.
12. No direct payment for neat line saw cut. An additional 1 foot of pavement shall be required. No adjustment to the plan quantities for removal and patching
13. Shared use path ramps, excluding the flared sides, shall be as wide as the share use path.

**NOTES:**

**TABLE 1 - TRANSITIONS**

Lengths for 8.3% side slopes

<table>
<thead>
<tr>
<th>GRADE</th>
<th>MIN.</th>
<th>MAX.</th>
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<tbody>
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<tr>
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</tbody>
</table>

**TABLE 2 - TRANSITIONS**

Lengths for 10% side slopes

<table>
<thead>
<tr>
<th>GRADE</th>
<th>A MIN.</th>
<th>B MIN.</th>
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<tbody>
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</tr>
<tr>
<td>4.00</td>
<td>4&quot;</td>
<td>32&quot;</td>
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</tbody>
</table>

Notes apply to curb with 6" curb face.
If curb has greater than a 6" curb face a special detail is required.
NOTES:
1. If buffer zone is wider than 6 feet, the side flares may be omitted and a returned curb option may be used.
2. For additional notes see sheet R-5.2.1

1.5% 1.5% 1.5% 1.5% 1.5% 1.5%

2'. 4' 4' 6'

CURB RAMP WITH SIDE FLARES
CURB RAMP WITH RETURN CURB

DEPARTMENT OF TRANSPORTATION
STATE OF NEVADA

SIGNED ORIGINAL ON FILE

REVISED 7/96
ADOPTED
CHIEF ROAD DESIGN ENGR.
CURB RAMP WITHIN RADIUS

CURB RAMP OUTSIDE RADIUS

CONSTRANDED TURNING SPACE

DETECTABLE WARNING PLACEMENT

NOTES:
1. See sheet R-5.2.1 for notes.

DETECTABLE WARNING PLACEMENT

GRADE BREAK IS PERPENDICULAR TO DIRECTION OF TRAVEL.

BOTTOM OF THE RAMP
PARALLEL CURB RAMP DETAIL

SECTION A-A (With Back Curb)

4" Aggregate Base
Detectable Warning

SECTION B-B

4" Concrete
Detectable Warning
4" Aggregate Base

NOTES:
1. See sheet R-5.2.1 for notes.
NOTES:
1. For additional notes see sheet R-5.2.1
2. 5 foot sidewalk width shall not include 6 inch back curb.

CURB RAMP WITHIN RADIUS

CURB RAMP OUTSIDE RADIUS

MODIFIED CURB RAMP WITHIN RADIUS
MEDIAN CROSSING PLAN VIEW (CUT-THROUGH)

SECTION A-A

SECTION C-C

SECTION B-B

SECTION D-D

NOTES:
1. All curb ramps shall be 8.3% or flatter. All slope rates are relative to level.
2. Grates, manholes, valve covers or similar appurtenances shall not be located in area at the base of the curb ramp or landing area.
3. Transitions from ramps to gutters or roadway surface shall be flush and free of abrupt changes.
4. Plantmix bituminous open-graded surface shall be flush with the edge of the gutter pan in the area of the curb ramp.
5. Rough broom texture on curb ramps and wings. Texture shall provide a visual contrast to the median island.
6. Concrete shall be class A or AA.
7. Avoid drainage pockets in crosswalk areas.
8. See plans for location of curb ramps.
9. 15 foot maximum to accommodate 8.3% or flatter concrete ramp.
10. When the island width is less than 6 feet, no detectable warnings are required.
NOTES:
1. See sheet R-5.2.3 for notes.
1. 4 inch sloping concrete combined curb and gutter should be used between circulatory roadway and truck apron unless otherwise noted. Curb and gutter should be used between the truck apron and central island.

2. The cross slope of the landing area shall not exceed 2% in the sidewalk area.

3. Splitter island size and shape will be determined by the roadway deflection.

4. Splitter island should be a raised median with concrete hardscaping (preferred). Splitter island should extend a minimum of 50 feet from the yield line.

5. Detectable warning surface shall be installed at both sides of the splitter island pedestrian refuge area.

6. When circulatory roadway is concrete, the transverse contraction joints should line up with contraction joints in the truck apron. The joints in the truck apron should not be dowelled. The combined curb and gutter should be tied to the roadway concrete.
NOTES:
1. Concrete shall be Class A or AA.
2. Ramped median island nose will be paid for with concrete island paving.

Concrete Quantity (cu. yd.)
\[ 261 + 1.2X \times 1.39 \]

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

RAMPED MEDIAN ISLAND NOSE

R-5.2.5 (03)  Signed Original On File
ADOPTED  10/15  REVISED  CHIEF ROAD DESIGN ENGR.
**NOTES:**

1. Driveways shall be constructed in accordance with sheet R-5.3.3.
2. The total width of driveway curb openings shall not exceed 65% of front footage.
3. No driveway shall be located within 6 feet of a light pole, fire hydrant, mail box, above-ground electrical transfer box, or block wall higher than 2 feet.
4. The centerlines of driveways on opposite sides of the street at a median opening shall be 10 feet from each other. When a property line falls in a median opening a joint driveway agreement shall be required, or no driveway will be allowed.
5. ADA Accessible Facilities shall be provided. See sheets R-5.2.1 to R-5.2.2.3 and R-5.3.3.
6. For actual dimensions see structure list.
7. Driveway spacing, clearances, and return radii shall be in accordance with NDOT Access Management System and Standards.

**LEGEND:**

- **W** = Width of Driveway, 12' minimum
  - For 1-2 Car Garage, 15' maximum
  - For 3-Car Garage, 25' maximum

**COMMERCIAL, INDUSTRIAL, AND MULTI-FAMILY DRIVEWAY**

**RESIDENTIAL DRIVEWAY**

**STATE OF NEVADA DEPARTMENT OF TRANSPORTATION**

**DRIVEWAY GEOMETRICS**

**R-5.3.1**

Signed Original On File

ADMITTED: [Signature]

REVISED: [Signature]

CHIEF ROAD DESIGN ENGR.
NOTES:
1. All ramps shall be 12:1 or flatter.
2. Concrete driveway can be poured monolithically with curb and gutter.
3. All slope rates are relative to level.
4. Length varies according to curb and gutter profile.
5. Retaining curbs and acquisition of construction easement may be necessary.
6. If there are R/W restrictions, sidewalk width can be reduced to 4 feet with prior approval from Assistant Chief Roadway Design Engineer. A 5 foot by 5 foot passing zone is required every 200 feet.
7. Concrete shall be Class A or AA.
NOTES:
1. See sheet R-5.3.2 for notes.

PLAN VIEW

SECTION A-A

ISOMETRIC VIEW

METHOD B

SECTION B-B
NOTES:
1. See sheet R-5.3.2 for notes.
NOTES:
1. Spacing of No. 4 bars less than 16 inches to meet local codes shall be noted in the structure list.
2. When constructing driveways where curb and gutter exists, completely remove existing sections. Driveway may be poured monolithic to A.C. line in which case the bars shall be continuous. If optional sectional pour is used, expansion joints and rear end clearance shall apply as shown.
3. Concrete shall be class A or AA.
4. Curb ramps shall be constructed in accordance with sheets R-5.2.1 to R-5.2.2.3.
5. For grade changes greater than 3%, vertical curves of at least 10 feet must be used.
6. Driveway geometrics shall go to the P.C.
7. For actual dimensions, see structure list.
8. Avoid drainage dimensions, see structure list.

LEGEND:
- SEE NOTE 1
- SEE NOTE 2
- FOR OPTIONAL SECTIONAL POUR
- DETECTABLE WARNINGS

DIMENSION LIMITS (SEE NOTE 7)
- 12" MINIMUM FOR ONE-WAY DRIVEWAYS
- 24" MINIMUM FOR TWO-WAY DRIVEWAYS
- 40" MAXIMUM

- WIDTH OF SIDEWALK - 4 FOOT MINIMUM
- WIDTH OF VALLEY GUTTER
- (FROM EDGE OF GUTTER TO BACK OF SIDEWALK)

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

MULTI-FAMILY, COMMERCIAL AND INDUSTRIAL
DRIVEWAY DETAILS

CHIEF ROAD DESIGN ENGR.

Signed Original On File

R-5.3.3
07/96
3/96
REVISED
7/96
CHIEF ROAD DESIGN ENGR.

SECTION A-A

FOR DETAIL, SEE SECTION A-A

REQUIRED FOR DRAINAGE.

CROSS GUTTER WHEN NEEDED

FOR DETAIL, SEE SECTION A-A
NOTES:
1. Minimum 42 inches cover over top of conduit at shoulder line.
2. 12 gage bare copper detection wire to lay in trench adjacent to conduit and attach to location marker at each end.
3. Location marker shall be 2 inch PVC or 5 foot steel fence posts.
NOTES:
1. Fence to consist of 8 foot tall 12.5 gauge woven wire animal exclusionary game fence (field fence). Fence to be a minimum of 7.5 feet at lowest point.
2. Fence wire to be placed on the field side of posts.
3. At each location where an electric transmission, distribution or secondary line crosses fence, the contractor shall furnish and install a ground conforming to section 9 of the national electric safety code (NESC handbook 81).
4. Main support post shall be spaced at 48 feet. The steel posts shall be 12 feet long with 2-1/2 inch diameter (615 lbs/ft) minimum.
5. Cross members shall be steel posts with a 2-1/2 inch diameter minimum.
6. 10 foot steel t-posts (grade 133) are to be used between main supports at 30 foot intervals (see line post detail).
7. End post, corner post, and line brace post shall be assembled by the unit and paid for as such; all work and material associated with each assembly shall be included in the unit price for the assembly.
8. Pipe connectors, as well as fasteners to attach fence to pipe, are to be included in the unit price for each assembly.
9. All fence wire ties, brace wires, staples, and other wire appurtenances shall be furnished in accordance with AASHTO M 232.
10. Fence posts located within 30 feet minimum (clear zone) of solid white shoulder stripe shall utilize 12 foot long, 8 inch diameter wooden fence posts with a 2 inch diameter hole drilled through the post at 4 inches above ground level.
11. Concrete shall be class A or AA.
1. Tortoise fence to be attached on the habitat side of the fence.
2. Top of tortoise fence to be attached to bottom strand smooth wire with hog rings at 1 foot maximum spacing.
3. Tie tortoise fence to all posts at original ground and 9 inch max. spacing with wire ties.
4. For details not shown see sheets R-6.1.1.
5. Fence can be moved a maximum of 2 feet inside R/W to accommodate locations where any portion of tortoise fence may encroach upon public or private lands.
6. Tie fence into new or existing culverts and tortoise guards when determined necessary to allow tortoise passage underneath roadways.
7. When attaching tortoise fence to existing R/W fence adjust height of wire strand so that it can be attached to the top of the tortoise fence using hog rings.
8. Ditch shall be backfilled with excavated material and compacted as directed by the engineer. (ditch work may require hand digging)
9. In areas of difficult trenching tortoise fence is to be bent 90° towards the habitat side of the fence and covered with a minimum of 4 inches native material.
10. Metal drive gates shall be constructed as shown on sheet R-6.1.3.
11. Tortoise fence to be installed on the habitat side of the gate and attached with hog rings at 1 foot max. spacing.
12. Bottom of tortoise fence to be installed 1 inch maximum from ground on the gate.

NOTES:

1. Cover with 4" depth of native material.
2. Must achieve a 0" to 2" ground clearance at bend.
3. 3-Strand Smooth Wire or Existing R/W Fence
4. 1" x 2" mesh 16 gauge galvanized steel hardware fence
5. Metal Drive Gate

DETAIL A

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

WITH TORTOISE FENCE

R-6.1.1.2
Signed Original On File
(06/24/10) REVISED 10/2
CHIEF ROAD DESIGN ENGR.
NOTES:
1. Design is in accordance with AASHTO LRFD Bridge Design Specifications 6th Edition.
4. No.4 Reinforcement may be spliced with 24 inch lap.
5. F62 Inserts - bolt diameter & threads/in. 1 inch 8nc with 4 1/2 inch height.
6. F62 Inserts will be wired or welded to internal rebar to ensure they do not pullout when lifting foundation base.
7. F60 Cap plugs will be installed in F62 inserts to keep out dirt, concrete, etc.

ANCHOR CLIP
2 3/8 x 3/8 x 5/8 x 3/8

F62 Insert
* - End Bay Spacing For:
W= 12' is 1'-10 1/2"
W= 14' is 1'-9"
W= 16' is 1'-10 1/2"

C8 x 13.7 End Beam
A992 or A572 GR. 50

W= 12', 14' or 16'
W-beams Spaced @ 1'-9" O/C

F62 Inserts with Caps
See Notes 5-7
NOTES:
1. Stress panels shall be placed every 1320 feet on tangents.
2. Stress panels shall be placed every 660 feet on curves.
3. End panels shall be used wherever a break in the fence occurs (i.e. gates, cattle guards), and at beginning and ending of all curves.
4. See Table A for wood post spacing on curves.
5. Barbed wire shall be used for bottom strand when required by Nevada Department of Wildlife or Bureau of Land Management.
6. Wires are to be tied off at stretch points. Wrap and splice to self with at least 4 turns at opposite end of panels.
7. Wood posts shall be 6 inch nominal diameter.
8. Add additional strand of barbed wire and/or rock deadman (minimum weight 50 lb) when space between bottom wire and ground exceeds 20 inches.
9. Steel post deadman driven approximately 3 feet into ground may be used in lieu of rock deadman.

TABLE A: WOOD POST SPACING ON CURVED FENCE LINES

<table>
<thead>
<tr>
<th>RADIUS OF CURVE AT FENCE LINE (FT)</th>
<th>RADIUS OF CURVE AT FENCE LINE (FT)</th>
<th>WOOD POST (WOOD POST)</th>
</tr>
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<tr>
<td>1,000</td>
<td></td>
<td>1:1</td>
</tr>
<tr>
<td>1,000 TO 2,000</td>
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</tr>
<tr>
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<tr>
<td>5,000 TO 10,000</td>
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<tr>
<td>NOTE:</td>
<td></td>
<td>IN WOOD POST DESIGN REFERS TO STRESS PANEL AT 2,000 FT.</td>
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<tr>
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<td>TREAT CURVE AS TANGENT</td>
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</table>

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

NEVADA 4-WIRE FENCE PANEL DETAILS
TYPE C-NV-4B

R-6.1.2  (6/6/74)
SIGNED: Original On File
ADOPTED: NEVADA ROAD DESIGN ENG.
**SAME AS THE MAIN FENCE**

**WIRE DESIGN AND SPACING**

**END PANEL**

- **36"-Twisted Wire Stay**
- **2" Min.**

**MINOR DEPRESSION OR INTERMITTENT STREAM**

**WIRE DESIGN AND SPACING**

**MINOR DRAINAGE CROSSING**

- **Steel Line Post**
- **T-Section Post**
- **Fence Type as Specified**
- **Hinge post shall be 8 feet in length and shall be buried 3 feet in ground.**
- **Deadman, See Notes 5, 6**
- **Wood stay 1/2" Nominal Dia.**
- **1'-4"**

**MAJOR DRAINAGE CROSSING**

- **8'-3"**
- **See Note 7**
- **3-9 Gage Smooth Wire Loops**

**NOTES:**

1. Hinge post shall be 8 feet in length and shall be buried 3 feet in ground.
2. Barbed wire shall be used for bottom strand when required by Nevada Department of Wildlife or Bureau of Land Management.
3. Wires are to be tied off at stretch points. Wrap and splice to self with at least 4 turns at opposite end of panels.
4. Wood posts shall be 6 inch nominal diameter.
5. Add additional strand of barbed wire and/or a rock deadman (minimum weight 50 lb.) when space between bottom wire and ground exceeds 20 inches.
6. Steel post deadman driven approximately 3 feet into ground may be used in lieu of rock deadman.
7. Steel line posts at 8 feet 3 inch spacing to maintain bottom wire clearance.
NOTES:
1. Spacing between wires on Missouri gate shall be the same as wires on adjacent fence.
2. Gate latch shall be lag bolted firmly to the gate post.
3. Hinge posts, latch posts, and cattle guard wing attachment posts shall be 8 feet in length and shall be buried 3 feet in ground.
4. For end panel details, see sheet R-6.1.2.
5. Wire may be used in lieu of metal strap for connection of cattle guard wing to fence post.
6. Use rectangular mesh or 2 inch diamond mesh on metal drive gate.

PLAN

TYPICAL GATE LATCH

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

NEVADA 4-WIRE FENCE
GATE DETAILS
TYPE C-NV-4B
NOTES:
1. All pipes shall be black steel pipes, outside dia. (O.D.) and all joints welded.
2. All steel shall be painted with two coats of primer and two coats yellow enamel.
3. Provide two 3 inch O.D. steel tie down post for locking gate in open or closed position. Install with concrete footing as shown.
4. Concrete shall be Class A or AA.
NOTES:

1. End posts and line posts are recommended to be mechanically driven into the ground where soil conditions permit, to be determined by the Engineer.

2. Maximum post spacing is 60 feet on level terrain with droppers at 15 foot centers. Post spacing may be decreased due to terrain conditions. Dropper spacing shall remain on 15 foot max. centers. Minimum line post spacing will be on 15 foot centers without droppers, with 4 inch diameter, small end, line post when needed.

3. Placement of in-line strainers shall be as close to the center of the fence run as possible. Placement of tension indicator spring shall be on the second wire from the top. Compression of the indicator spring by 1 inches will indicate a tension of approximately 250 lb (+ 10 lb).

4. Maximum length of wire per in-line strainer on level terrain is 5000 feet, 30 foot corner: 3000 feet, 2-90 degree corners: 2000 feet, 1-90 degree corner: 1000 feet, 4-90 degree corners: 1000 feet. For uneven terrain reduce distances by 500 feet for each major rise and dip. Dip or rise posts shall be a minimum of 4 inch diameter, 8 feet long, positioned at high points of ridges and low points of gullies.

5. Except for fastening line wire, which has been strung around the outsides of wood posts in corners and curves. Fence staples should not be driven vertically into wood posts. Rotating staples slightly away from slash cut points will provide improvement in resistance to pullout.

6. Ground rods of galvanized steel (†"x8'), shall be placed every 150 feet in dry soils, or every 300 feet in moist soils. Specific rod positioning to be determined by the Engineer. Fence under power lines shall be grounded at 3 points, one directly under power line and one each side 25 feet to 50 feet away.

7. It is recommended for tying off wires on end posts to use two (2) Nicopress Sleeves Cat. No. FW-2-3, manufactured by the National Telephone Supply Company or acceptable equal.

8. It is recommended for splicing wires to use three (3) Nicopress Sleeves or 1 Reliable Wirelink, Number 5057V, manufactured by Reliable Electric Company or acceptable equal.

9. Proper tension on the brace wire in the end assembly is accomplished by twisting the brace wire a minimum of 6 turns, to a maximum of 8 turns. The twitch stick should be securely fastened to the top horizontal brace post.

10. Line wires should be stapled to the line post only after taking up preliminary tension (about 150 lb), on each wire. Staples shall not bind on the second wire from the top. Compression of the indicator spring by 1 inches will indicate a tension of approximately 250 lb (+ 10 lb).

11. Construction notes may be found in United States Steel Catalog No. 111575, "How to build fences with United States Steelmax ten 200 high-tensile fence wire".

12. Concrete shall be class A or AA.

13. Farm gate 12 feet or less may be installed on post after final wire tensioning.

14. All wood posts and droppers shall be pressure treated in accordance with AASHTO designation or equivalent state specification.

15. All fence wire, end and corner brace assembly wire shall consist of high tensile fence wire 12½ gage, with a minimum of 200,000 lb/in tensile strength and conforms with the requirements for Class 3 Zinc Coating of ASTM A166.

16. Brace pins, dropper clips, tension indicator springs, and in-line strainers shall conform with the requirements for Class 3 Zinc Coating of ASTM A166.

17. Staples are 1½ inch, 9 gage with slash cut points and shall conform with the requirements for Class 3 Zinc Coating of ASTM A166.
NOTES:
1. All posts and braces shall be 50 pound crane rail or
   angle (4" x 4" x 13 pound), 9' long.
2. Install line braces at intervals not exceeding 275 feet.
3. All posts shall be at 16 foot centers.
4. Posts and braces to be set in concrete as shown, except
   in rock they may be grouted in drill holes.
5. 3 galvanized crosby clips or equal and 1 galvanized wire
   rope thimble shall be used to attach wire rope to eye bars.
6. Cut groove in flange of braces for wire rope and eye bars.
7. Secure mesh to line posts with 7 wire ties per post, and
to each wire rope with 1 wire tie per 3 linear feet.
8. Concrete shall be class A or AA.

SECTION D-D

PLAN

CATTLE PASS FENCING

SECTIONS A-A, B-B, C-C

DETAILS A, B, C

NOTES:
1. Pipe shall be fastened to the Wingwall with galv. rod (1/2" x 1').
2. Use galv. nuts and washers with 7 galv. clamps per post.
3. Method of attaching fence wire to pipe shall be approved by
   the engineer.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

BENCH FENCE AND CATTLE PASS FENCING

Signed Original On File
CHIEF ROAD DESIGN ENGR.

R-8.2.1 (5/69) REVISED 8/80
Chief Road Design Engr.
NOTES:
1. Fence to consist of 8 foot tall, 12.5 gauge woven wire animal exclusionary game fence (field fence).
2. Fence wire to be placed on the field side of posts.
3. Thrie-Beam guardrail panels that retain fill material for jump outs are to be secured to posts on the road side.
4. Jump outs will utilize 6 inch diameter wood posts and cross members at the spacing indicated.
5. Fence posts located within clear zone will utilize 12 foot long, 6 inch diameter wooden fence posts with a 2 inch diameter hole drilled through the post 4 inches above ground level.
6. All fence wire ties, brace wires, staples, and other wire appurtenances shall be galvanized in accordance with AASHTO M 232.
7. Ramps to be composed of borrow compacted to 90%.
8. All wood is to be treated per Section 718.
9. Call Environmental Services at 775-888-7035, ten days prior to construction for location.
NOTES:

1. Diameters and weights listed above are minimums. Larger sizes may be used on approval of engineer.

2. Type II post 1.5" x 3/4" (4.65 lb/ft) can be used in place of 2.875 inch o.d. round gate post.

3. Concrete shall be class A or AA.

4. 3/4 inch adjustable truss rods shall be installed on all gates over 6 feet in width. See Detail B, sheet R-6.1.3, for truss tightening detail.
1. Chain-link fencing shall consist of galvanized chain-link fabric on steel posts, tubular, or C-section.

2. All posts shall be set in class A or AA concrete.

3. All post tops shall be fitted with suitable finials.

4. Braces shall be spaced approximately 12 inches below top of terminal posts and shall extend from end, gate, or corner posts to first adjacent line post.

5. All fittings shall be hot-dipped galvanized malleable, cast iron, or pressed steel.

6. Fabric shall be fastened to line posts with fabric bands spaced approximately 18 inches apart, and to top tension wire and bottom tension wire with hog rings spaced approximately 24 inches apart.

7. For alternate post and brace rail details see sheets R-6.3.2 thru R-6.3.3.

---

### TYPICAL CHAIN LINK FENCE

**INTERMEDIATE BRACED POST**

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<th>Size of Posts</th>
<th>Brace Clamps as Specified</th>
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<td>Brace Post/Brace Rail</td>
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**DETAIL E**

- Brace Clamp
- Brace Rail
- Post
- Alternate
- Galv. Pipe or Alternate
- "Galv. Rod

**DETAIL F**

- Support Arm
- Fixed Type
- 3 Strands
- Barb Wire
- Wire Tension
- Barb Base
- Eye Top

**DETAIL G**

- See Detail E
- Brace Clamp
- Alternate
- Galv. Pipe or Alternate
- "Galv. Rod

---

**NOTES:**

- Fabric shall be fastened to line posts with fabric bands spaced approximately 18 inches apart, and to top tension wire and bottom tension wire with hog rings spaced approximately 24 inches apart.

- For alternate post and brace rail details see sheets R-6.3.2 thru R-6.3.3.
NOTES:
1. Diameters and mass listed above are minimums. Larger sizes may be used on approval of engineer.
2. Type II post (3/4" x 3/4") (4.65 lbs/ft) can be used in place of 2.875 inch o.d. round gate post.
3. Concrete shall be class A or AA.
4. 3/8 inch adjustable truss rods shall be installed on all gates over 6 feet in width. See detail B, sheet R-6.1.3, for truss tightener detail.

GATE POST

GATE OPENING

IN FEET

SINGLE GATE

DOUBLE GATE

ROUTE

MINIMUM

Pounds

LINE

FT.

CLASS 1

CLASS 2

Up to 6

7 thru 13

14 thru 18

2.875

13 thru 26

27 thru 36

4.000

9.11

6.625

18.97

4.64

6.66

9.69

6.56

18.97

4.64

6.66

9.69

6.56

18.97

4.64

6.66

9.69

6.56

18.97

4.64

6.66

9.69

6.56

18.97
### Reinforcing

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### 20' Roadbed

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### Bill of Materials

- **Concrete**
  - Item: 12'-Roadbed; 14'-Roadbed; 16'-Roadbed; 20'-Roadbed
  - No. 4 bars welded to 8'-beams

- **Steel Cattle Guard 12' to 20' Roadbed**

### Notes:

1. All concrete to be class A or AA.
2. Standard metal or timber gates shall be constructed when shown on plans or ordered by the engineer.
3. All connections to be welded.
4. All timber shall be painted white per standard specifications.
5. Metal wings are optional. See detail A for additional details and quantities. See sheets R-7.1.3 and R-7.1.3.1.
6. All wings shall be painted white per standard specifications.
**PLAN OF WINGS**

1. **Type.**
   - 2"x6"x3' for 26' Cattle Guard
   - 2"x6"x4' for 32' Cattle Guard
   - 2"x6"x5' for 40' Cattle Guard

**ELEVATION OF WINGS**

1. **Typ.**
   - No.4 Bars

**Typical Connection**

- Grind Smooth
- Buffer Block

**Plan**

- 26', 32', or 40' Cattle Guards

**Elevation**

- For Use With Optional Metal Wings Only. This Connection Shall Be Made To Second 54x7.7 Beam At 8.33" From Impact Buffer Blocks, Top Foot Removed For Clarity.

**Detail A**

- 6-S8x18.4 @ 2'-5" = 19'-6" for 40' Cattle Guard
- 7-S8x18.4 @ 2'-7" = 15'-6" for 32' Cattle Guard
- 9-S8x18.4 @ 2'-6" = 12'-6" for 26' Cattle Guard

**Typical Connection**

- Weld 8"/4" Plates Together After Erecting

**Section A-A**

- See Note 5

**Section B-B**

- No.4 Bars Bent Into End Walls 1'-10"

**Detail B**

- 9-S8x18.4 @ 2'-5" = 19'-6" for 40' Cattle Guard
- 7-S8x18.4 @ 2'-7" = 15'-6" for 32' Cattle Guard
- 6-S8x18.4 @ 2'-6" = 12'-6" for 26' Cattle Guard

**Elevation of Wings**

- 26', 32', or 40' Roadbeds

**Steel Cattle Guard**

- 26', 32', and 40' Roadbeds

**State of Nevada**

- Department of Transportation

**Sheet 1 of 2**

- Chief Road Design Engr.

- Signed Original On File
**REINFORCING**

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**STRUCTURAL STEEL**

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**CONCRETE**

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**ALL ROADBEDS WITH**

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**PIPE LENGTH AND DRAINAGE DITCH SHALL BE AS INDICATED ON THE PLANS, SACKED ROCK AT END OF PIPE WILL NOT BE ALLOWED.**

**NOTES:**

1. All concrete shall be class A or AA.
2. Standard metal or timber gates shall be constructed when shown on plans or ordered by the engineer.
3. All connections to be welded.
4. All timber shall be painted white per standard specifications.
5. Metal wings are optional, see Detail A. For additional details and quantities see sheets R-7.1.3 and R-7.1.3.1.
6. All wings shall be painted white per standard specifications.
### Notes:
1. All concrete shall be class A or AA.
2. Alternative design may be substituted by the contractor for approval by the engineer.
3. Live loading: H-20
4. Cattle guard slope is to conform to the roadway cross slope and grade.
5. *Frame Width* combinations may be varied to obtain the specified width of cattle guards.
6. Extend 4 inch drains to facilitate drainage of structure.
7. All wings shall be painted white per standard specification.

### Material Lists

#### Material List for Wings

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<td>Braces</td>
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<td>2&quot;x2&quot;x10 GA</td>
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<td>Braces</td>
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<td>2'-3/4&quot;</td>
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<td>2&quot;x2&quot;x10 GA</td>
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#### Material List for All Sizes

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<td>Anchor Bolt Clip</td>
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### Concrete and Reinforcing Steel

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#### Structural Steel

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### Notes for Structural Steel

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<td>ANCHOR BOLTS</td>
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<td>3'/&quot;</td>
<td>9'</td>
<td>9.0</td>
</tr>
<tr>
<td>STEEL STRAPS</td>
<td>3</td>
<td>4'/2&quot;x'/&quot;</td>
<td>7'-1&quot;</td>
<td>73.3</td>
</tr>
<tr>
<td>END PLATES</td>
<td>2</td>
<td>7'/6&quot;x'/&quot;</td>
<td>9'-1/&quot;</td>
<td>118.5</td>
</tr>
<tr>
<td>OD. SLEEVES</td>
<td>8</td>
<td>2'/&quot;</td>
<td>6'</td>
<td>14.6</td>
</tr>
<tr>
<td>CONNECTION PLATES</td>
<td>AS REQUIRED</td>
<td>9'/4&quot;x'/&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONNECTION BOLTS</td>
<td>AS REQUIRED</td>
<td>1'x'</td>
<td></td>
<td></td>
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</tbody>
</table>

### Reinforcing Steel

<table>
<thead>
<tr>
<th>Item</th>
<th>NO. REQUIRED</th>
<th>Size</th>
<th>Length</th>
<th>WT. LBS</th>
</tr>
</thead>
<tbody>
<tr>
<td>HORIZONTAL BARS</td>
<td>12</td>
<td>NO.4</td>
<td>9'-6&quot;</td>
<td>76</td>
</tr>
<tr>
<td>HORIZONTAL BARS</td>
<td>18</td>
<td>NO.4</td>
<td>9'-9&quot;</td>
<td>117</td>
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<tr>
<td>HORIZONTAL BARS</td>
<td>18</td>
<td>NO.4</td>
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<td>84</td>
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<tr>
<td>VERTICAL BARS</td>
<td>44</td>
<td>NO.4</td>
<td>2'-9&quot;</td>
<td>7</td>
</tr>
<tr>
<td>LIFTING LUGS</td>
<td>4</td>
<td>NO.4</td>
<td>2'-9&quot;</td>
<td>7</td>
</tr>
<tr>
<td>U BARS</td>
<td>18</td>
<td>NO.6</td>
<td>9'-6&quot;</td>
<td>239</td>
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<tr>
<td>TOTAL</td>
<td></td>
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### Galvanized Hardware

<table>
<thead>
<tr>
<th>Item</th>
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<th>Size</th>
<th>Length</th>
<th>WT. LBS</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOLTS</td>
<td>8</td>
<td>3/4&quot; DK.</td>
<td>12&quot;</td>
<td>15</td>
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<tr>
<td>WASHERS</td>
<td>8</td>
<td>3/4&quot;</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>NAILS</td>
<td>50</td>
<td>40d</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>NAILS</td>
<td>72</td>
<td>40d</td>
<td></td>
<td>2/4</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
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<td>26/4</td>
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### Concrete

<table>
<thead>
<tr>
<th>Item</th>
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<th>Size</th>
<th>Length</th>
<th>WT. LBS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1'-10&quot;-0&quot; COMPONENT</td>
<td></td>
<td>1.94 CU. YDS.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**NOTES:**

1. All concrete shall be class DA.
2. All connections to be welded.
3. When gate is not specified:
   - Install the required type of intermediate braced post adjacent to the wing post. Fence wires to be tied to braced post only.
4. Extend drain pipes to facilitate drainage of structure.
5. Wings shall be painted white per standard specifications.

---

**Steel Cattle Guard Type C**

**Signed Original On File**

---
Timber Foundation Details

Cattle Guard

Without Cattle Guard

End Elevation

With Cattle Guard

Material List for All Sizes

Material List is for Information Only

Material List for Wings

Galvanized Hardware

Notations:
1. Alternate design may be substituted by the contractor for approval by the engineer.
3. Cattle guard is to be placed on level grade across roadway. roadway cross slope is to transition from normal section to level section 25 feet back on line and 25 feet ahead on line from edge of cattle guard.
4. Frame Width combinations may be varied to obtain specified width of cattle guards.
5. Use self-locking nuts on removable panel.
6. All wings shall be painted white per standard specifications.
7. Use single layer foundation unit for each cattle guard frame.
8. Timbers used in foundations shall be treated.

Bill of Materials

Frame Size

Longitudinal Stringers

Structural Steel

Notes:

1. Alternate design may be substituted by the contractor for approval by the engineer.
3. Cattle guard is to be placed on level grade across roadway. roadway cross slope is to transition from normal section to level section 25 feet back on line and 25 feet ahead on line from edge of cattle guard.
4. Frame Width combinations may be varied to obtain specified width of cattle guards.
5. Use self-locking nuts on removable panel.
6. All wings shall be painted white per standard specifications.
7. Use single layer foundation unit for each cattle guard frame.
8. Timbers used in foundations shall be treated.
1. Precast concrete shall reach Fc' = 4500 psi at 28 days. All other concrete shall be Class A or AA.
2. Reinforcing steel shall be Grade 40 (Fy = 20,000 psi).
4. Minimum soil bearing pressure of 4000 lb/ft² shall be obtained by placing a fine aggregate (section 706.03.03) bed 3" thick over soil compacted to not less than 95% density and hand levered.
5. Structural steel shall conform to ASTM A36.
6. Fasteners shall be galvanized.
7. Bearing pads shall be 50 diameter hardness.
8. Cattle guard shall be sloped to conform to the roadway cross section.
9. When cattle guard is installed adequate drainage shall be provided to ensure against possible subgrade damage. Drainage details shall be as shown on the plans. 6 inch CMP to be installed at low end. See structure list for length of CMP, 2 foot minimum.
10. Approved alternate designs may be used.
11. Metal wings shall be painted white per standard specifications.
12. Shop drawings showing the details of fabrication and the proposed layout of units shall be submitted to the engineer for approval.

NOTES:
1. Precast concrete shall reach Fc' = 4500 psi at 28 days. All other concrete shall be Class A or AA.
2. Reinforcing steel shall be Grade 40 (Fy = 20,000 psi).
4. Minimum soil bearing pressure of 4000 lb/ft² shall be obtained by placing a fine aggregate (section 706.03.03) bed 3" thick over soil compacted to not less than 95% density and hand levered.
5. Structural steel shall conform to ASTM A36.
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7. Bearing pads shall be 50 diameter hardness.
8. Cattle guard shall be sloped to conform to the roadway cross section.
9. When cattle guard is installed adequate drainage shall be provided to ensure against possible subgrade damage. Drainage details shall be as shown on the plans. 6 inch CMP to be installed at low end. See structure list for length of CMP, 2 foot minimum.
10. Approved alternate designs may be used.
11. Metal wings shall be painted white per standard specifications.
12. Shop drawings showing the details of fabrication and the proposed layout of units shall be submitted to the engineer for approval.
NOTES:
1.  3/8" x 5/8" x 8 1/2" plate with ferrule and studs attached is to be cast in the concrete frame. After the concrete frame has been manufactured. The 3/8" inch dia A307 threaded rod(2) is to be tightened into the ferrule. The rod is then to be welded(3) to the plate. The elastomeric pad is then bonded to the plate. The steel grate is then placed and adjusted to its specified position. The metal clamps are placed and the nuts tightened. The first nut is just to be snug tight. The second nut is to be tight against the first nut to lock it in place. After a final check that the steel grate is still in its specified position, the metal clamping plate is welded(3) to the frame of the steel grate. All welding shall be done at the place of the fabrication. If steel grate and concrete frame are shipped separately, they shall be match marked.

2.  Alternative use of J-bolt(617) 3/8" x 5/8" x 8 1/2" plate with 3/8" inch dia A307 J-bolt(1) and studs attached is to be cast in the concrete frame. The J-bolt is to be welded to both faces of the plate. The elastomeric pad is bonded to the plate. The steel grate is placed and adjusted to its specified position. The metal clamps are placed and the nuts tightened. The first nut is just to be snug tight. The second nut is to be tight against the first nut to lock it in place. After a final check that the steel grate is still in its specified position, the metal clamping plate is welded(3) to the frame of the steel grate. All welding shall be done at the place of fabrication. If steel grate and concrete frame are shipped separately, they shall be match marked.

3.  Precast concrete shall reach Fc' = 4500 psi at 28 days. All other concrete shall be class A or AA.
NOTES:

1. Precast concrete shall reach Fc' = 4500 psi at 28 days. All other concrete shall be class A or AA.

2. Standard nuts and washers shall be furnished with each foundation unit including anchor angles. Weld or bolt anchor angles to cattle guard.

3. On earth-surfaced roads, set top of cattle guard eight inches above subgrade unless plans or stakes indicate another elevation. Taper fill back from cattle guard approx. 50 feet in both directions.

4. No. 4 reinforcement may be spliced with 24 inch lap unless prohibited.

5. See project plans for width (W).

6. Bolts are to be supplied with standard nuts and washers.

7. Rails shall be placed adjacent to the header plates.

8. Provide four (7' 10" x 2" x 7/8") torque bars equally spaced, welded by ⁵⁄₈ inch fillet welds perpendicular to the top of the rails when alternate rectangular tube rails are provided.

9. Steel for components shall be ASTM A36, unless indicated otherwise on the drawing.

10. Design loading of grid shall conform to AASHTO H-20.

LEGEND:

- LIMITS OF BACKFILL

GRID

DETAIL D

ESTIMATED QUANTITIES FOR FOUNDATION

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>14&quot;</th>
<th>16&quot;</th>
<th>24&quot;</th>
<th>28&quot;</th>
<th>32&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONCRETE</td>
<td>2.3 C.Y.</td>
<td>2.5 C.Y.</td>
<td>3.8 C.Y.</td>
<td>4.4 C.Y.</td>
<td>5.0 C.Y.</td>
</tr>
<tr>
<td>STEEL</td>
<td>276 LF</td>
<td>311 LF</td>
<td>471 LF</td>
<td>543 LF</td>
<td>624 LF</td>
</tr>
</tbody>
</table>
TYPICAL GUARDRAIL INSTALLATION

NOTES:

1. For details and dimensions not shown see sheets R-8.1.1 thru R-8.4.3.
2. See sheet R-8.2.1 for special guardrail terminal.
3. See sheet R-8.2.2 for trailing end anchor.
4. Minimum installation:
   - Guardrail-Bridge rail connector: 1'-6" or 50'
   - Nested beam section: 1'-6" or 50'
   - Transition panel: 6'-3"
   - Approved NCHRP 350 terminal: 37'-6" or 50'

   Any other variation that reduces the minimum length shall require approval of the Chief Road Design Engineer.

5. No direct payment for the additional guardrail panel.
6. The length of the transition panel shall be added to the estimated length of the thrie beam, see sheet R-8.4.1.
7. For grating details not shown, see sheet R-8.2.1. For other approved NCHRP 350 terminals not shown, refer to manufacturer's drawings.
8. On retrofit installations if minimum cannot be met and the distance between back of post and hinge point is less than 2 feet, the post shall be lengthened 1 foot min.
9. When guardrail is placed at normal edge of pavement, the tangent guardrail treatment shall be flared at 50:1 taper.
10. Approved guardrail terminals are listed on the NDOT QPL.
11. A reflectorized object marker shall be installed on the impact head per manufacturer's recommendations.
12. All wood/steel posts shall be stamped with the length on or near the top surface in a conspicuous place. The stamped lettering shall be 1-1/2 inches high and 1/8 inch deep for wood and 1/4 inch or 1/8 inch in height for steel. If the lettering is disturbing during installation it shall be re-stamped.
NOTES:

1. For guardrail terminals not shown, refer to manufacturer's drawings.
2. Use of shoulder dikes, down drains, and curbs in these areas require
   Chief Roadway Design Engineer approval.
3. See sheet R-8.2.2 for details not shown.
4. Galvanized guardrail (Thrie-Beam): See sheet R-8.4.1 and
   R-8.4.1.1.
5. Crash cushion or tangent end treatment (bi-directional) can be
   flared at 50:1 taper.
6. Recoverable slopes required behind gating portion of end
   treatment or crash cushion.
7. On retrofit installations when distance between back of post and
   hinge point is less than 2 feet, the post shall be lengthened 1 foot
   minimum.
8. Guardrail heights on stage construction projects shall be governed
   by final surfacing height.
10. Clear zone shall be based on design year traffic volumes.
11. Recoverable slopes are 4:1 or flatter.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
INSTALLATION
TYPICAL GUARDRAIL INSTALLATION
10/15
REVISED 7/96
ADOPTED

CHIEF ROAD DESIGN ENGR.
Signed Original On File
TABLE 1

<table>
<thead>
<tr>
<th>Terminal Ends</th>
<th>W (Flare)</th>
<th>X (Widening)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method A</td>
<td>7'-3/8&quot;</td>
<td>7'-3/8&quot;</td>
</tr>
<tr>
<td>Method B</td>
<td>7'-3/8&quot;</td>
<td>5'-5/8&quot; to 9'-9/16&quot;</td>
</tr>
<tr>
<td>Method C</td>
<td>7'-3/8&quot;</td>
<td>7'-3/8&quot; to 2'-9/16&quot;</td>
</tr>
<tr>
<td>Method D</td>
<td>7'-3/8&quot; to 3'-11/16&quot;</td>
<td>7'-3/8&quot; to 9'-11/16&quot;</td>
</tr>
</tbody>
</table>

NOTES:
1. For typical guardrail installation, see sheet R-8.1.1.
2. For details not shown, including heights of posts for soil tube installation on posts 1 and 2, see manufacturer’s drawings.
3. Approved guardrail terminals are listed on the NDOT QPL.
4. "W" is to the center of post, excluding posts 1 and 2. Use table 1 for breakaway posts with blocks, excluding posts 1 and 2.
NOTES:
1. Anchor cable shall be parallel to guardrail for straight run of rail. Anchor cable may have angle point at anchor plate is guardrail is curved.
2. Anchor rod hooks to be in contact with anchor reinforcement when concrete is placed. Wire ties may be used to position anchor rods.
3. Cable clip connection (Detail A) or clevis and bolt connection (Detail B) to be used with wood post guardrail installations. For steel post guardrail installations, clevis and bolt connection (Detail B) is to be used. Other alternatives for attaching cable to anchor rod must be approved by the engineer.
4. For trailing end anchor concept, refer to plan view shown on sheets R-8.1.2 and R-8.3.1.
5. Concrete shall be class A or AA.
6. The trailing end anchor shall be installed outside the clear zone for opposing traffic.
7. Cable shall be restrained from moving during tightening.

CABLE CLIP INSTALLATION

1. Wire ties may be used to position anchor rods.
2. Anchor rod hooks to be in contact with anchor reinforcement when concrete is placed.
3. Cable clip connection (Detail A) or clevis and bolt connection (Detail B) to be used with wood post guardrail installation. For steel post guardrail installations, clevis and bolt connection (Detail B) is to be used. Other alternatives for attaching cable to anchor rod must be approved by the engineer.
4. For trailing end anchor concept, refer to plan view shown on sheets R-8.1.2 and R-8.3.1.
5. Concrete shall be class A or AA.
6. The trailing end anchor shall be installed outside the clear zone for opposing traffic.
7. Cable shall be restrained from moving during tightening.

CABLE ANCHOR ASSEMBLY STEEL POST GUARD RAIL

1. Anchor cable to be parallel to guardrail for straight runs of rail. Anchor cable may have angle point at anchor plate is guardrail is curved.
2. Anchor rod hooks to be in contact with anchor reinforcement when concrete is placed. Wire ties may be used to position anchor rods.
3. Cable clip connection (Detail A) or clevis and bolt connection (Detail B) to be used with wood post guardrail installations. For steel post guardrail installations, clevis and bolt connection (Detail B) is to be used. Other alternatives for attaching cable to anchor rod must be approved by the engineer.
4. For trailing end anchor concept, refer to plan view shown on sheets R-8.1.2 and R-8.3.1.
5. Concrete shall be class A or AA.
6. The trailing end anchor shall be installed outside the clear zone for opposing traffic.
7. Cable shall be restrained from moving during tightening.
TABLE A

<table>
<thead>
<tr>
<th>Radius</th>
<th>Number of CRT Posts</th>
<th>Clear Area</th>
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<tbody>
<tr>
<td>8'-6&quot;</td>
<td>3</td>
<td>25' x 15'</td>
</tr>
<tr>
<td>10'-0&quot;</td>
<td>6</td>
<td>30' x 20'</td>
</tr>
<tr>
<td>25'-6&quot;</td>
<td>8</td>
<td>40' x 25'</td>
</tr>
<tr>
<td>35'-0&quot;</td>
<td>11</td>
<td>50' x 30'</td>
</tr>
</tbody>
</table>

STATE HIGHWAY

NOTES:
1. Use of this detail requires Chief Roadway Design Engineer approval.
2. See contract structure list and standard plans for transition and terminal connector type.
3. The slope from the edge of the shoulder into the face of the guardrail should be 10:1 or flatter. See sheet R-8.2.1.
4. Guardrail installation shall be W-beam guardrail with breakaway CRT posts and without blocks. CRT controlled release terminal transition posts are shown as item "M129" in the AASHTO-AGC-ARTBA joint committee Task Force 13 report "A Guide to Standardized Highway Barrier Hardware".
5. Radius in feet shall be etched into plate replacing the letters "MM" shown on the identification plate detail. Digits shall be 1½ inch minimum height and ¾ inch maximum width. Plate shall be galvanized after etching.
6. The guardrail identification plate shall be mounted at the lower splice ball on the back side of the rail element of the pc of the guardrail radius.
7. Anchor terminal to be used only when there is not enough room to accommodate guardrail terminal.

DESIGN CRITERIA:
A. Design criteria is from a FHWA Technical Advisory T 5040.32, dated April 13, 1992 called "Curved W-beam Guardrail Installations at Minor Roadway Intersections".
B. This installation is acceptable for lower speed (up to and equal to 50 mph), low-volume through roadways intersected by low-speed, low-volume cross roads and/or driveways.
C. A flat approach to the curved guardrail installation is necessary to ensure proper performance of the system. The cross slope should not exceed 15:1. When adjacent to a superelevated section on the mainline, an analysis should be performed to evaluate the potential for vaulting of an errant vehicle.
D. In table A, radii are not to be interpolated nor extrapolated. This installation is based on intersection angles near 90 degrees.
E. See contract structure list and standard plans for transition and terminal connector type.
F. For the 8 foot 6 inch radius layout, the guardrail panel is bolted to the one CRT post at the center of the curved nose area.
G. For other layouts using larger radii up to 35 feet, the guardrail panel is bolted to the CRT posts and wood blocks. CRT(controlled release terminal) timber posts are shown as item "PDE09" in the state of Nevada AASHTO M129-ARTBA joint committee Task Force 13 report "A Guide to Standardized Highway Barrier Hardware".
H. Clear area sizes are shown in table A. The clear area must be kept free of fixed objects. For emergency egress, the hinge point should be 2 feet behind the back of posts. The guardrail panel will be bolted to the CRT post at the center of the curved nose area.
I. Use the anchor terminal with low-speed, low-volume facilities with a stop condition on cross road or approach.
NOTES:
1. Use of this detail requires Chief Roadway Design Engineer approval.
2. To be used only with special guardrail installation. See sheet R-8.2.4.
3. Outside nut shall be torqued against inside nut a minimum of 100 ft/lb.
4. Toenail plate at corners with 10d nails.

1. Use of this detail requires Chief Roadway Design Engineer approval.
2. To be used only with special guardrail installation. See sheet R-8.2.4.
3. Outside nut shall be torqued against inside nut a minimum of 100 ft/lb.
4. Toenail plate at corners with 10d nails.

1. Use of this detail requires Chief Roadway Design Engineer approval.
2. To be used only with special guardrail installation. See sheet R-8.2.4.
3. Outside nut shall be torqued against inside nut a minimum of 100 ft/lb.
4. Toenail plate at corners with 10d nails.

1. Use of this detail requires Chief Roadway Design Engineer approval.
2. To be used only with special guardrail installation. See sheet R-8.2.4.
3. Outside nut shall be torqued against inside nut a minimum of 100 ft/lb.
4. Toenail plate at corners with 10d nails.
NOTES:

1. Use nested Three-Beam, see Detail N sheet R-8.1.1.

2. An approved guardrail terminal shall be used if the one-way facility is to be used as a two-way detour. The terminal should be left in place once the detour is removed.

3. For details of Three-Beam, guardrail see sheet R-8.4.1.

4. For information not shown refer to the most current adopted AASHTO Roadside Design Guide.

5. Concrete barrier rail is preferred. Check for vehicle rollover angle (top of taller vehicles hitting the obstructions).

6. Spacer material may be wood block or formed structural tubing by prior approval of the Engineer. For spacer block details see sheet R-8.4.1.
NOTES:

1. These details are to be used only when guardrail post cannot be installed to avoid underground obstructions with guardrail posts.

2. See sheet R-8.4.1 for detail on galvanized guardrail (Thrie-Beam) not shown.

3. Check feasibility of removing obstacle or extending culvert outside clear zone versus cost of removal.

4. If guardrail splice occurs on the posts which are adjacent to the modified post, then three contiguous sections (37'-6") of nested guardrail are required, with the middle section being centered at the location of the modified post.
TYPICAL GUARDRAIL INSTALLATIONS

BACK-UP PLATE

TRANSITION SECTION

PLAN VIEW

FRONT ELEVATION

SECTION THROUGH RAIL ELEMENT

TYPICAL GUARDRAIL INSTALLATIONS

NOTES:
1. When distance between back of guardrail post and hinge point is less than 2 feet, the post shall be lengthened. Minimum.
2. Guardrail heights on stage construction projects shall be governed by final surfacing elevations. Height measured at face of rail element.
3. All hardware to be galvanized.

LEGEND:
* - Auxiliary hole to be used when roadway surface to rail bottom is less than 10".

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
WOOD POST

THREE-BEAM

GALVANIZED GUARDRAIL

5/09
REVISED
11/86
ADOPTED

CHIEF ROAD DESIGN ENGR.

Signed Original On File
NOTES:
1. When distance between back of guardrail post and hinge point is less than 2 feet, the post shall be lengthened 1' minimum.
2. Guardrail heights on stage construction projects shall be governed by final surfacing elevations. Height measured at face of rail element.
3. Attach guardrail to wood block and steel post with two bolts on approaching traffic side of block and post web.
4. Top of guardrail to be 32 inches above ground line or shoulder surfacing.
5. For details of the cross section of thrie beam, rail element, surfacing, transition section, and backup plate, see sheet R-8.4.1.
6. All hardware to be galvanized.
1. All holes $\frac{3}{8}$ inch dia.
2. For metal posts - rail mounts to block with bolt on approaching traffic side of block and post web.
3. On retrofit installations when distance between back of guardrail post and hinge point is less than 2 feet, the post shall be lengthened 1 foot min.
4. Guardrail heights on staged construction projects shall be governed by final surfacing elevations.
5. Not to be used on new or retrofit construction, for repair purposes only.

Wood Post and Block

- $6'_{\text{min}}$
- $6'_{\text{Wood Post}}$
- $6_{\text{Wx8.5}}$ or $6_{\text{Wx9}}$

Metal Post and Wood Block

- $6_{\text{Wx8.5}}$ or $6_{\text{Wx9}}$
- $5/8$ Splice Bolt
- $5/8$ Receded Nut

Rail Splice

- $3/4$ x $1\frac{1}{2}$" Post Bolt Slot
- $3/4$ x $2\frac{1}{2}$" Post Bolt Slot
- $3/4$ x $1\frac{1}{2}$" Safety Bolt Slot

Plan

- $6"_{\text{Wx8.5}}$
- $6"_{\text{Wx8.5}}$

Notes:

1. All holes $\frac{3}{8}$ inch dia.
2. For metal posts - rail mounts to block with bolt on approaching traffic side of block and post web.
3. On retrofit installations when distance between back of guardrail post and hinge point is less than 2 feet, the post shall be lengthened 1 foot min.
4. Guardrail heights on staged construction projects shall be governed by final surfacing elevations.
5. Not to be used on new or retrofit construction, for repair purposes only.
NOTES:

1. Concrete shall be class A or AA.
2. Median barrier rail shall be scored 1/2 inch deep vertically every 15 feet.
3. All contact joints shall be at planned scored joint locations.
4. All joints and other locations needing sealing shall follow requirement set in sheet R-8.6.1.
5. For impact attenuator attachment details, see manufacturers drawing. Median end treatments shall be 8-directional.
6. Refer to the currently adopted roadside design guide for further design information not shown here.
7. Expansion joints at all structures. Joints in barrier rail over a structure shall be at the same location and of the same dimensions as those in the structure. Joint filler not required in expansion joint in barrier rail.
8. Length 3 feet minimum or length of obstruction, whichever is greater. See contract plans for exact dimensions.
9. Depth of 6 inch base shall be checked and increased as needed for foundation stability. When barrier rail sits on pavement, the base can be eliminated. Barrier rail end anchors shall be required. See sheet R-8.6.1.
10. The 42 inch Type FA barrier rail may also be considered on the outside curve next to sensitive areas such as schools, housing developments, and problem areas that need extra protection.
11. Concrete shall be class A or AA.
12. Varies = 2/19 x H + 12".
13. For transitions for heights, see sheet R-8.6.3.
14. For details not shown, see sheet R-8.6.1.
15. See sheet R-8.6.2 when concrete barrier rail is protecting bridge substructures.

SECTION A-A

SECTION B-B
NOTES:
1. Concrete shall be class A or AA modified with f'c = 4000 psi @ 28 days.
2. All contact joints shall be all planned scored joint locations.
3. All joints and other locations needing sealing shall follow requirement set in sheet R-8.6.1.
4. For impact attenuator attachment details, see manufacturers drawings.
5. Length 5 feet from edge of obstruction. See contract plans for exact dimensions.
6. Depth of 6 inch foundation shall be checked and increased as needed for foundation stability. Dowels are required for full length of the special concrete barrier rail including transition, regardless of paving type.
7. For Type FA concrete barrier rail see sheet R-8.6.2.
8. Joint sealer shall be a single component hot applied sealant 1 inch thick.
9. The height of the barrier rail shall be measured from the top of the plantmix bituminous surface or the top of concrete pavement.
10. Extend reinforcing at height transition until the end of the reinforcing is 2½" clear from the face of concrete.

ELEVATION

SECTION A-A

SECTION B-B

CONCRETE BARRIER RAIL
LATERAL FLARE RATES

<table>
<thead>
<tr>
<th>DESIGN SPEED</th>
<th>FLARE RATE</th>
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<tbody>
<tr>
<td>75 MPH</td>
<td>221</td>
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<td>60 MPH</td>
<td>197</td>
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<td>40 MPH</td>
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<tr>
<td>30 MPH</td>
<td>81</td>
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</tbody>
</table>

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
CONCRETE BARRIER RAIL
54 INCH
5.24 Sqft Per Lin Ft:
0.1765 yd³ Per Lin Ft. With Foundation

12:1 Transition

Pay Limit

No. 6 Bars @ 12"-
6 = 6 No. 6 Bars Equally Spaced
2" Chf. Typ.
8" x 1" Dowel Steel Bars @ 12"-
6" Min. Foundation
See Note 6

ELEVATION

LATERAL FLARE RATES

See Flare Rate Table

DEPARTMENT OF TRANSPORTATION

54 INCH
CONCRETE BARRIER RAIL

Signed Original On File

REVISED

CHIEF ROAD DESIGN ENGR.

R-8.6.2.1 (022)
NOTES:

1. Concrete shall be class A or AA.

2. For details not shown, see sheets R-8.6.1 and R-8.6.2.

3. Vertical joints shall have a single component hot applied sealant full depth of joint.

4. Joint seal shall be a single component hot applied sealant 1 inch thick.

5. The height of the barrier rail shall be measured from the top of the plinth to the bituminous surface or the top of the concrete pavement.

6. For details not shown, see sheets R-8.6.1 and R-8.6.2.

7. Reinforcing Steel: Use 4 - No. 4 bars continuous in Type A and Type FA, concrete barrier rail.
   a. Use 8 - No. 4 bars continuous thru the joint into the gore transition.
   b. Use 4 - No. 4 bars continuous thru the end of the structure.

8. Bituminous Paving Requirements: The anchor pads shall be constructed under the entire structure. At the contractors option, anchor pad and barrier gore transition may be placed monolithically, in which case the dowels may be eliminated.

   Concrete Paving Requirements: Dowels are required under the entire structure. The surface of the concrete shall be cleaned prior to placement of the barrier gore transition. At the contractors option, concrete pavement and barrier gore transition may be placed monolithically, in which case the dowels may be eliminated.

9. For impact attenuator attachment details, see manufacturer’s drawings. Dimensions of this section may vary due to manufacturer’s requirements. Approval at the discretion of the engineer.

10. Match barrier gore transition dimensions to barrier rail type. When both Type A rail and Type FA rail are used, match gore transition dimensions to Type FA rail and use a Type A rail to Type FA rail transition to connect the Type A rail. See special detail. If partially precast concrete barrier rails are used, the rail must be drilled and pinned at the barrier gore transition. See sheet R-8.7.1 for details.

11. Depth of anchor pad shall be checked and increased as needed for foundation stability.
NOTES:

1. Concrete shall be class A or AA.
2. The height of the barrier rail shall be measured from the top of the plantmix bituminous surface or the top of concrete pavement.
3. Roughen contact face of existing rail to 1/4 inch relief prior to pouring new rail transition.
4. At the indicated reinforcing locations, drill 1/4 inch holes in contact face of existing rail to a minimum depth of 9 inches and inclined 5 degrees from the horizontal. Secure No. 4 reinforcing bars in the drilled holes with an epoxy conforming to Section 728 of the standard specifications.
5. Place straight and/or bent No. 4 reinforcing bars in rail transitions as indicated. Splices in reinforcing steel at transition ends are permitted (minimum 9 inch lap length).
6. For details not shown, see sheets R-8.6.1 to R-8.6.2.
NOTES:

1. Concrete shall be class A or AA.

2. The height of the barrier rail shall be measured from the top of the plant mix bituminous surface or the top of concrete pavement.

3. Roughen contact face of existing rail to 1/4 inch relief prior to pouring new rail transition.

4. At the indicated reinforcing locations, drill 1/8 inch holes in contact face of existing rail to a minimum depth of 9 inches and inclined 5 degrees from the horizontal. Secure No. 4 reinforcing bars in the drilled holes with an epoxy conforming to Section 728 of the standard specifications.

5. Place straight and/or bent No. 4 reinforcing bars in rail transitions as indicated. Splices in reinforcing steel at transition ends are permitted (minimum 9 inch lap length).

6. For details not shown, see sheets R-8.6.1 to R-8.6.2.

1. Concrete shall be class A or AA.

2. The height of the barrier rail shall be measured from the top of the plant mix bituminous surface or the top of concrete pavement.

3. Roughen contact face of existing rail to 1/4 inch relief prior to pouring new rail transition.

4. At the indicated reinforcing locations, drill 1/8 inch holes in contact face of existing rail to a minimum depth of 9 inches and inclined 5 degrees from the horizontal. Secure No. 4 reinforcing bars in the drilled holes with an epoxy conforming to Section 728 of the standard specifications.

5. Place straight and/or bent No. 4 reinforcing bars in rail transitions as indicated. Splices in reinforcing steel at transition ends are permitted (minimum 9 inch lap length).

6. For details not shown, see sheets R-8.6.1 to R-8.6.2.
NOTES:

1. Use only when specific criteria is met. The criteria factors are the clear zone, direction of traffic, offset distances, and speed zones. Approach and trailing end criteria are treated separately.

Approach End Criteria: Requires Chief Roadway Design Engineer approval. May only be used for approach ends when outside clear zone or speeds are less than or equal to 40 mph.

Trailing End Criteria: May be used for trailing end for all speeds when traffic is one-way traffic and beyond the opposing direction clear zone, e.g., some on-ramps, off-ramps, and divided highways.

2. Concrete shall be class A or AA. Transverse joints with 1 inch premolded expansion joint filler or 1 inch open transverse joints shall be placed at structures. Joints in barrier rail over a structure shall be at the same location and of the same dimension as those in the structure.

3. 6 inch deep barrier end anchors shall be constructed in the first and last 10 linear feet of the full height barrier rail run. If transitions are used, the anchor shall be extended under the transition section.

4. Vertical joints shall have a single component hot applied sealant full depth of joint.

5. Joint sealer shall be a single component hot applied sealant 1 inch thick.

6. The height of the barrier rail shall be measured from the top of the open grooved (asphaltic bituminous surface), or the top of the finish grade (P.C.C.P.).

7. Joint filler shall be placed in open joints in the barrier as required to match joints in the approach slab detail.

8. Dowels and reinforcing steel to extend into end sections. Adjust locations and terminate bars as necessary to maintain 2 inch minimum cover.

9. For details not shown, see sheet R-8.6.1.

LEGEND:

- 1" x 8" STEEL DOWEL @ 2' CENTERS (IF NEEDED SEE NOTE 3)
**PORTABLE PRECAST CONCRETE BARRIER RAIL**

**STATE OF NEVADA DEPARTMENT OF TRANSPORTATION**

**CHIEF ROAD DESIGN ENGR.**

**Sheet 1 of 2**

**Signed Original On File**

---

**NOTES:**

1. Reinforcing steel shall be grade 60. A minimum clearance of 2 inches from reinforcing steel exterior to concrete surface, see detail section c-c.  
2. For edge of bridges, back spacing from the back of the barrier rail to the edge of the bridge shall be 4 feet. For the edge of shoulders, back spacing shall be 3 feet. If back spacing cannot be obtained, anchor pin all sections adjacent to the bridge or shoulder, (4) anchor pins per section.  
3. Place reflectors as shown on sheet R-9.2.2.  
4. Top washer shall be forged as integral part of rod or shall be welded as shown.  
5. Rods that conform to critical dimensions, (rod length and diameter, washer diameter and thickness) are acceptable if an approved top configuration for lifting the rod is provided.  
6. Concrete shall be class A or AA.  
7. See ASTM D 1785.  
8. Drill 1 inch diameter holes, after placement of rail, for anchor pinning through the pavement. Drilling operation is not to damage the pavement.  
9. The weight per barrier rail panels is approximately 3 tons.  
10. Anchor pin first and last units of each run (long term stationary as defined by MUTCD, part 6).  
11. Rectangular pockets may be used in lieu of conical pockets.  
12. Each ¾ inch diameter loop bar to be hot-dip galvanized after fabrication.  
13. When used as a permanent installation, all sections shall be anchor pinned, except in medians wider than 10 feet.

---

**PLAN**

**ELEVATION**

**TOP VIEW**

**SIDE VIEW**

---

**STATE OF NEVADA DEPARTMENT OF TRANSPORTATION**

**CONCRETE BARRIER RAIL PORTABLE PRECAST**

**R-8.7.1**

**Signed Original On File**

---

**REVISED 8/98 ADPTED CHIEF ROAD DESIGN ENGR.**
TYPICAL F SHAPE

ELEVATION VIEW @ ANCHOR PINS
SECTION D-D

SECTION A-A
SECTION B-B
SECTION C-C

For Dimensions Not Shown, See Typical F-Shape

ELEVATION VIEW @ 2" DEEP NOTCHED BASE

WELDED OPTION
FORGED OPTION
* Not Required if Barrier Rod is to be Used to Anchor Barrier Rail to Pavement.

Also See SECTION D-D and SECTION E-E
BARRIER ROD DETAIL

SECTION E-E

ROD AND LOOP CONNECTION (PLAN VIEW)

For Details Not Shown, See SECTION A-A and SECTION B-B
SCREEN ANCHORAGE DETAILS

ALTERNATIVE A

PORTABLE PRECAST BARRIER RAIL F-SHAPES

PLAN

ELEVATION

ANCHOR PLATE DETAIL (ALTERNATIVE A)

ALTERNATIVE B

ALTERNATIVE C

NOTES:
1. Straight nails 1 1/2 inch diameter may be used in lieu of the tapered holes.
2. Resin capsule-type anchorage devices may be substituted for threaded rods.
3. Place screen on work area side of temporary railing where traffic will only be on one side of the temporary railing. The screen may be placed on either side of the pipe support where traffic will be on both sides of the temporary railing.
4. Clinched 8d box nails may be substituted for screws. The nails shall be clinched on the work area side of the screen where traffic will only be on one side of the temporary railing.
5. 1/4 inch u-bolts may be substituted for 1/4 inch diameter bolts.
6. Openings in the screen area of 3 feet shall be provided at 200 foot intervals.
Table 1: Maximum Spacing for Guideposts On Horizontal Curves Less Than or Equal To 10,000' *Distances Shown in Feet and Rounded to The Nearest 5'

<table>
<thead>
<tr>
<th>Radius of Curve (in Curves: 1st, 2nd, 3rd)</th>
<th>Spacing in Advance of and Beyond Curve</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
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<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Spacing for specific radius shown may be interpolated from Table 1. Computed from the formula: S = R x 0.100, where S refers to the distance in feet between the center of the guidepost, and R refers to the radius of the curve. The minimum spacing should be 20 feet in advance of a curve and 50 feet beyond the curve. Guidepost spacing should not exceed 50 feet beyond the curve. Guidepost spacing should not exceed 300 feet from the end of the curve.

Notes:
1. Guidepost reflector color shall conform to the color of adjacent striped edge line.
2. Guidepost Spacing:
   - A. Tangent sections and curves with radii greater than 10,000 feet—spacing shall be 400 feet both sides of roadway.
   - B. Curves with radii at 10,000 feet—spacing shall be 300 feet maximum.
   - C. Guidepost spacing shall be measured along centerline of roadway and projected perpendicularly across to inside and outside of curve.
   - D. Guidepost spacing shall be placed at beginning and end of curve, with spacing transitioned within the tangent as shown in Table 1. "1st" indicates guidepost nearest curve, "2nd" is furthest away.
   - E. Spacing within curve as shown in Table 1.
   - F. Guidepost spacing shall be 50 feet maximum—tangents and curves.
   - G. Truck escape ramps spacing 50 feet.
   - H. A. Island, curb and shoulder absence spacing 20 feet maximum.
3. Guideposts installed on exit ramps shall have red reflective sheathing installed on the back of flexible guide posts and conform to Type XI as specified in ASTM D4956 and a red cat eye reflectors installed on the back of rigid guide posts.

RIGID POST/REFLECTOR

Typical Installations:
- Without Curb and Gutter
- With Curb and Gutter

State of Nevada Department of Transportation
Guide Posts

Chief Road Design Engr.

Signed Original On File

Approved

R-9.1.1
NOTES:
1. All reflectors shall be selected and installed pursuant to the project plans and specifications or at the direction of the Engineer. The depicted reflectors are for mounting location information only.
2. Spacing: See "Reflector Placement on Guardrail" notes and table "A", of this sheet.
3. Reflectors shall be mounted at the angle specified by the manufacturer or as directed by the engineer.
4. Color: Shall comply with the guidelines established by the currently adopted MUTCD edition.
5. Guideposts installed on exit ramps shall have red reflective sheeting installed on the back of flexible guide posts and conform to Type XI as specified in ASTM D4956 and a red cat eye reflectors installed on the back of rigid guide posts.

REFLECTOR PLACEMENT SPACING ON GUARDRAIL/BARRIER RAIL:
Spacing shall be:
A. 50 foot on tangents and on curves of 300 foot radius or greater. If less than 300 foot radius see table A.
B. Reflectors shall be omitted on the flared sections of guardrail.
C. No direct payment for reflectors on barrier rail

<table>
<thead>
<tr>
<th>Radius of Curve</th>
<th>Reflector Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 50'</td>
<td>20'</td>
</tr>
<tr>
<td>50' - 100'</td>
<td>30'</td>
</tr>
<tr>
<td>100' - 200'</td>
<td>40'</td>
</tr>
<tr>
<td>200' - 300'</td>
<td>50'</td>
</tr>
<tr>
<td>≥ 300'</td>
<td></td>
</tr>
</tbody>
</table>

TYPICAL GUARDRAIL/GUIDE POST INSTALLATION

GUARDRAIL/GUIDE POST LOCATION
**NOTES:**

1. For sign foundation see sheet T-34.2.1.

2. Panel must be placed within 50 feet of milepost location detailed in plans. Coordinate with the Engineer for installations at locations where 50 foot placement is not feasible.

---

**PLACEMENT:**

1. Urban Roads: Adhesive backed vinyl mileposts should be directly applied to traffic signal poles at intersecting routes that cross the highway that are functionally classified as minor and principal arterials. (Alternative aluminum panels could be band-strapped to traffic signal poles.)

2. Undivided Roads: Mount two milepost panels back to back on a square metal post placed on the right side of the roadway in the direction of increasing milepost.

3. Divided and Multilane Roads with Barrier Separation: Aluminum mileposts should be mounted double sided on square metal post and installed on the median barrier.

4. Divided and Multilane Roads without Barrier Separation: Aluminum mileposts should be mounted on both sides of the roadway.

---

**TYPICAL MILEPOST INSTALLATION**
**TYPE 1**

**MEDIAN OBSTRUCTIONS**

- **Solid White Back:**
- **PLAN:**

**TYPE 2**

USE ON APPROACH END OF MEDIAN ISLANDS ONLY

- **Type 3 Reflective Plate Mounted Horizontally:**
- **Sheeting Replaced Material Facing Traffic:**

**TYPE 2 MODIFIED**

MEDIAN CROSSOVER

- **10 or 11 Gage:**
- **Sheeting Reflective Blue:**

**NOTES:**

1. Markers may be erected to define withdrawn area of material sites, and shall be set at all corners or irregular lines, and approximately ½ mile apart on long tangents.
2. These markers are spaced so as to be clearly visible and erected so that the withdrawn area may easily be established.
3. Markers shall be omitted where the withdrawn area is fenced.

**MATERIAL SITE BOUNDARY MARKERS**

**METHOD OF PLACEMENT**

**PIT AREA**

**TYPE 3**

BRIDGES, PIERS, ABUTMENTS

**NOTES:**

1. Object markers shall be installed to delineate bridge ends, underpass abutments and all other obstructions closely adjacent to the edges of the roadway. Object markers may be omitted when guardrail or barrier rail protects the obstruction.

**STATE OF NEVADA**

DEPARTMENT OF TRANSPORTATION

**OBJECT MARKERS**

R-9.3

REV: 8/69

CHIEF ROAD DESIGN ENGR.
NOTES:
1. Center the 72 inch long by 4 inch wide markings with rail reflectors or guide post.
2. Markings shall be placed on outside of the radius from P.C. to the P.T.
3. Omit markings for a radius of curve greater than 1250 feet.
4. See standard plan R-9.1.2 for reflector spacing on guardrail / barrier rail.
5. Color shall comply with the guidelines established by the currently adopted MUTCD.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FACE OF RAIL MARKINGS

R-9.4 (5.32) Signed Original
Revised 10/09
Chief Road Design Engr.
NOTES:
1. Concrete shall be class A or AA.
2. Monuments may be poured square or round.
3. Monument stamping shall be done according to Location Division's "Special Instructions for Survey, Mapping, or GIS Consultants" manual.

SURVEY COVER AND RING
CAST IRON

ALTERNATE PLACEMENT
CAST IRON

CAST IRON SURVEY COVER AND RING
 ALTERNATE PLACEMENT
CAST IRON

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
SURVEY MONUMENTS

CHIEF ROAD DESIGN ENGR.

R-9.5 (621) Signed Original On File
REVISED 7/96
CHIEF ROAD DESIGN ENGR.
NOTES:

1. All weakened plane joints shall be sawed diagonally as shown, except as indicated in the end anchor and structure approach details. When only one lane is being constructed alongside existing lanes, joints shall be sawed either diagonally or as directed by the engineer. Offset is 1 in 6 and skewed counterclockwise.

2. Spacing of weakened plane joints shall be successively, 15 feet, 12 feet, 12 feet, 12 feet and repeat, except for the first joint at pavement end anchors and at reinforced structure approaches.

3. Transverse contact joints shall be constructed at least 6 ft from any transverse weakened plane joint.

4. Longitudinal weakened plane joint shall be cut at one lane and shoulder lines except where lane plus adjacent shoulder width is less than or equal to 10 feet.

5. All transverse contact joints shall be sawed and joint sealer used per respective contact joint detail on this sheet.

6. All tie bars to be epoxy coated except in Clark Co. Tie bars to be placed in middle 1/3 of slab thickness.

7. Transverse contact joints with dowel bars shall be used on all construction joints and elsewhere if ordered by the engineer.

8. Pavement and anchors shall be constructed as the terminal panels at all pavement not abutting existing concrete pavements or structures, and elsewhere if ordered by the engineer.

9. Initial 1/4 inch weakened plane joint saw cut to be done within specified time limit. Reservoir cut shall be done at a later time.

10. Ratio of depth to width of joint sealant shall be 1:1

11. Dowel bars shall be located within 1 inch of the planned transverse and depth location and within 2 inches of the planned longitudinal location.

12. The dowel bars shall be parallel to the pavement surface and centerline within a tolerance of 1/2 inch in 18 inches.

13. Dowel bars shall not be placed within 12 inches of longitudinal joints.

14. Δ = slab thickness.
WEAKENED PLANE JOINTS LOCATION

1. Shoulder transverse joints shall be the same pattern as main roadway.
2. See typical section for width of shoulder and longitudinal weakened plane joint location.
3. See sheet R-10.1.9 for concrete pavement rumble strip.

NOTES:
NOTES:
1. Rumble strips shall be used on all outside shoulders that are 4 feet wide or wider on both rural and rural divided highways. Rumble strips shall be used on all the inside shoulders of rural divided highways with shoulder width of 2 feet or more.
2. Rumble strips shall not be placed in urban locations or on ramp shoulders, bridges, or bridge approach slabs, unless specifically designated in the plans.
3. Rumble strips may be continuous through all minor approaches, but shall be omitted across principal intersecting roadways.
4. Rumble strips can be placed on existing rolled in rumble strips if present.
5. For ramps and structures, see sheet R-10.1.5.
6. On concrete pavements, due to transverse joints, rumble strips shall be omitted across principal intersecting roadways.
7. Stripping shall be placed over edge line rumble strip.

SHOULDER SECTION

RUMBLE STRIP CORRUGATIONS
SECTION A-A

TYPICAL RUMBLE STRIP PLACEMENT

LEGEND:

- PLANTMIX BITUMINOUS SURFACE

RUMBLE STRIP DETAIL

LEGEND:

- PLANTMIX BITUMINOUS SURFACE
NOTES:

1. Rumble strips shall be used on all outside shoulders that are 4 feet wide or wider on both rural and rural divided highways. Rumble strips shall be used on all inside shoulders of rural divided highways with shoulder width of 2 feet or more.

2. Rumble strips shall not be placed in urban locations, nor on ramp shoulders, bridges, or bridge approach slabs, unless specifically designated in the plans.

3. Rumble strips may be continuous through all minor approaches, but shall be omitted across principal intersecting roadways.

4. Rumble strips can be placed on existing rolled-in rumble strips if present.

5. For rural non-freeway highways, see standard plan sheet R-10.1.4.

6. On concrete pavements, due to transverse joints, rumble strips will require a special detail.

7. Striping shall be placed over edgeline rumble strip.

LEGEND:

- PLANTMIX BITUMINOUS SURFACE

DIVIDED HIGHWAY LAYOUT

TYPICAL RUMBLE STRIP PLACEMENT
ENTRANCE AND EXIT RAMPS
NOTES:
1. Centerline rumble strips shall not be placed in urban locations, nor on bridges, railroad R/W, or bridge approach slabs unless specifically noted in the plans.
2. Centerline rumble strips shall be placed in passing and non-passing zones.
3. Centerline rumble strips shall be continuous through all minor approaches, but shall be omitted across principal arterial intersecting roadways and major driveways where the centerline strip has been omitted.
4. Centerline rumble strips may be omitted within 1000 feet of residences.
5. Striping shall be placed over the centerline rumble strips.

LEGEND:
- PLANTMIX BITUMINOUS SURFACE

RUMBLE STRIP DETAIL

RUMBLE STRIP CORRUGATIONS
SECTION A-A

CENTERLINE SECTION

LAYOUT AT BRIDGE STRUCTURE

WITH TWO WAY LEFT TURN

WITHOUT TWO WAY LEFT TURN
NOTES:
1. Rumble strips shall be used on all outside shoulders that are 4 feet or wider on both rural and rural divided highways.
   Rumble strips shall be used on all inside shoulders of rural divided highways with shoulder width of 2 feet or more.
2. Rumble strips shall not be placed in urban locations, nor on ramp shoulders, bridges, or bridge approach slabs, unless specifically designated in the plans.
3. Rumble strips may be continuous through all minor approaches, but shall be omitted across principle intersecting roadways.
4. Rumble strips can be placed on existing rolled in rumble strips if present.
5. For ramps and structures, see sheet R-10.5.
6. Striping shall be placed over edgeline rumble strip.

LEGEND:
- = PLANTMIX BITUMINOUS SURFACE

SHOULDER SECTION

RUMBLE STRIP CORRUGATIONS
SECTION A-A

TYPICAL RUMBLE STRIP PLACEMENT
**NOTES:**

1. Rumble strips shall be used on all outside shoulders that are 4 feet or wider on both rural and rural divided highways. Rumble strips shall be used on all inside shoulders of rural divided highways with shoulder width of 2 feet or more.

2. Rumble strips shall not be placed in urban locations, nor on ramp shoulders, bridges, or bridge approach slabs, unless specifically designated in the plans.

3. Rumble strips may be continuous through all minor approaches, but shall be omitted across principle intersecting roadways.

4. Rumble strips can be placed on existing rolled in rumble strips if present.

5. For ramps and structures, see sheet R-10.1.5.

6. Striping shall be placed over edgeline rumble strip.

**LEGEND:**

- PLANTMIX BITUMINOUS SURFACE

- MILLING DEPTHS MUST VARY EACH RUMBLE FROM \( \frac{5}{8} \)" TO \( \frac{3}{8} \)"

**RUMBLE STRIP CORRUGATIONS SECTION A-A**

**SHOULDER SECTION**

**TWO WAY TRAFFIC LAYOUT**

**TYPICAL RUMBLE STRIP PLACEMENT**
NOTES:
1. All rumble strip corrugation shall be 6 inch minimum from any concrete joint.
2. For details not shown, see sheet R-10.1.4 and R-10.1.5.
TYPICAL INSTALLATION

1. Spacing between rumble strips may be changed as directed by the Engineer.

HIGH SPEED STOP SIGN APPROACH

SECTION A-A

CUT GROOVE
TRANSVERSE RUMBLE STRIP
**MAILBOX TURNOUT**

**TABLE 1**

<table>
<thead>
<tr>
<th>HIGHWAY TYPE AND TRAFFIC CONDITIONS</th>
<th>PREFERRED (FEET)</th>
<th>MINIMUM (FEET)</th>
<th>PREFERRED (INCH)</th>
<th>MINIMUM (INCH)</th>
<th>DEPTH BASE AGGREGATE</th>
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</thead>
<tbody>
<tr>
<td>RURAL HIGHWAY</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>ADT = OVER 10,000 vpd</td>
<td>&gt; 12</td>
<td>12</td>
<td>8 TO 12</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>ADT = 5,000 TO 10,000 vpd</td>
<td>12</td>
<td>10</td>
<td>8 TO 12</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>ADT = 1,000 TO 5,000 vpd</td>
<td>12</td>
<td>10</td>
<td>8 TO 12</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>RURAL ROAD ADT UNDER 100 vpd - RESIDENT STREET</td>
<td>8</td>
<td>6**</td>
<td>8 TO 12</td>
<td>0</td>
<td>4</td>
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<tr>
<td>RESIDENT STREET CURRED</td>
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<td>N/A</td>
<td>8 TO 12</td>
<td>0</td>
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</table>

*IF TURNOUT IS PROVIDED, THIS MAY BE REDUCED TO ZERO. **RESIDENT STREET WITHOUT CURB MAY BE REDUCED TO ZERO.

**MINIMUM CLEARANCE DISTANCES TO NEAREST MAILBOX IN MAIL STOPS AT INTERSECTIONS**

<table>
<thead>
<tr>
<th>Through Road Speed M.P.H.</th>
<th>D1 (Feet)</th>
<th>100 &gt; 2000</th>
<th>2000 &gt; 4000</th>
<th>4000 &gt; 4000</th>
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<td>70</td>
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</tr>
<tr>
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**NOTES:**
1. For further information on mailboxes see AASHTO "A Guide for Erecting Mailboxes on Highways, 1994 Edition".
2. Mailboxes within the clear zone shall be the types shown in sheets R-12.1.2 and R-12.1.3 or an approved equal.
3. ADT = average daily traffic, vpd = vehicles per day.
4. For mailbox spacing and variable length see sheets R-12.1.2 and R-12.1.3.
5. Mailbox material may be used in lieu of aggregate base.
6. Install mailboxes on flat surface without undulations.

---

**STATE OF NEVADA**
**DEPARTMENT OF TRANSPORTATION**

**MAILBOX TURNOUTS**
NOTES:


2. Installation of Type C mailbox assemblies shall be in accordance with manufacturer's instructions.

3. The direction of the mailbox opening in relation to the travel lanes shall be set by the U.S. Postal Service.

4. White reflectorized sheeting (3" x 8") shall be placed facing traffic 36 inches +/- 3 inches from ground on all mailbox support structures.

5. Lightweight newspaper boxes may be mounted below the mailbox on the mailbox support.

6. Heavy gauge steel mailboxes (11 lb) are not allowed on high-speed highways.

7. Install mailboxes on flat surface without undulations.

SUPPORT FRAME AND FOUNDATION ARE PROPRIETARY SIDE OF POST IS ALLOWABLE BUT NOT PREFERRED OPPOSITE ORIENTATION WITH WEDGE ON TRAFFIC APPROACH

NOTES:


2. Installation of Type C mailbox assemblies shall be in accordance with manufacturer's instructions.

3. The direction of the mailbox opening in relation to the travel lanes shall be set by the U.S. Postal Service.

4. White reflectorized sheeting (3" x 8") shall be placed facing traffic 36 inches +/- 3 inches from ground on all mailbox support structures.

5. Lightweight newspaper boxes may be mounted below the mailbox on the mailbox support.

6. Heavy gauge steel mailboxes (11 lb) are not allowed on high-speed highways.

7. Install mailboxes on flat surface without undulations.
<table>
<thead>
<tr>
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<th>EXISTING</th>
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<td>ITS CABINET CONTROLLER</td>
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<td>CONDUIT DIRECTIONAL SERIES (ARROWS INDICATE LIMITS)</td>
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<td>TRANSFORMER PAD</td>
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</table>

**SIGNAL, LIGHTING, AND ITS SYMBOLS**

- **NEW**
- **EXISTING**
- **DESCRIPTION**

- **SYMBOLS**
- **DESCRIPTION**

Note: existing identified on plans by alternate color.
NOTES:
1. Supply circuit breaker and contactors as indicated on plans.
2. Supply photoelectric (PE) cell as indicated on plans.
3. Label all circuit breakers and contactors.

Service Pedestal

Equipment Mounting Panel, 12 gage Sheet Metal Body and Equipment Mounting Panel, 14 gage Front Cover(s) and 10 gage Min. For All Other Panels, All Sheet Metal Shall Be Finished With Zinc Chromate Primer and Green Baked Epoxy Powder Coat Finish. Metering Section Per P.U.E.S.E.R. Standards.

Utility Meter Section, 100, 125, or 200 Amp. As indicated, On Plans, 120/240 Volt, 1 Phase. The Section Shall Have a Hinged Cover with Padlock Tab.

Circuit Breaker Distribution Section, 125 or 200 Amp. As needed, 120/240 Volt, 1 Phase. The Section Shall Be Complete With Separate Dead Front, Copper Bussing, Space for a Minimum of Ten 1" 2/3 Type Plug-In Circuit Breakers (Excluding Main Breaker), Copper.

Neutral/Grounding Bus and Main Breaker as specified by the Engineer. The Section Shall Be Factory Wired to the Meter Section with the Appropriate Size Copper Conductors.

Equipment Mounting Panel, 10" H x 12" W Min., Open or Enclosed, for Lighting Contactors as Needed. Distribution and Equipment Section Door with Hinge and Padlock Tab.

Utility Meter Section

Circuit Breaker Distribution Section

Equipment Mounting Panel

Utility Service Entrance Conductor Pull Space Per Serving Utility Requirements

Full Space Access Door With Handle, Per Serving Utility

Separate Pedestal Enclosure Mounting Base (Optional)

Typical Mounting Base Detail

Dimensions May Vary Depending On Manufacturer

Single Meter Service Pedestal

Service Pedestal Foundation

NOTES:
1. Bare copper grounding conductor shall be looped around anchor bolts one time and connected to each anchor bolt before continuing down to the grounding plate.
2. Cabinet covers shall be parallel with curb.
3. In areas where R/W permits, the concrete base shall be placed at the back edge of the sidewalk.
4. Cabinet covers shall be open towards the street when cabinets are located at back of walk. Cabinet covers shall open parallel to the sidewalk facing the direction of traffic when located within the sidewalk.
5. Ground plates shall be made of nonferrous materials (typically brass or copper).
6. Grounding Plate - grounding resistance shall not exceed NEC. Add additional grounding as needed. Supply final grounding test results to Engineer.

Service Pedestal Setback Within R/W Limits

* Where Insufficient Public Right-of-Way is Available to Locate Street Fixtures Outside the 5 Foot Normal Sidewalk Width, The Pedestrian Access May Be Reduced to 4 Feet for a Length of 2 Feet.
NOTES:

1. See plans for additional conduits not related to transformer system.

2. Increase cabinet and foundation size as needed to fit transformer called out on plans.

POWER CONDUIT CONFIGURATION DETAIL FOR TRANSFORMER CABINET INSTALLATION

STEP-UP TRANSFORMER

120 or 240 V (as indicated on plans)

Neutral

Ground (Green)

STEP-DOWN TRANSFORMER

600 V

Neutral

Ground (Green)

Install Cabinet Anchor Bolts for Cabinet Bolt Pattern

NOTES:

Apply Adhesive Backed NDOT Label. Centered Horizontally on Top Portion of Transformer Cabinet Door.

Cabinet Finish Shall be Painted the Same Color as a Standard NDOT Service Pedestal Cabinet.

TRANSFORMER CABINET ISOMETRIC VIEW

CABINET AND FOUNDATION

TRANSFORMER WIRING
NOTES:
1. Barrier posts are to be used only where pad mounted transformers are installed in areas subject to damage by vehicular traffic. Coordinate installation with the serving utility company to determine the exact number of posts required.
2. Footings to be drilled holes, as shown, and filled with Class A or AA concrete.
3. Post constructed of 6 inch standard pipe (well casing) primed and painted yellow, and concrete filled.

TRANSFORMER PAD BARRIER POST

- Permanent Post
- Removable Post

As Shown on Plans

Footings to be drilled holes, as shown, and filled with Class A or AA concrete.

Post constructed of 6 inch standard pipe (well casing) primed and painted yellow, and concrete filled.

 Coordinate installation with the serving utility company to determine the exact number of posts required.
NOTES:

1. Remove existing pavement and replace with new approved material of same type. Match existing structural section (including open grade) and existing pavement depth but not less than 5 inches, and seal new surface as directed by the Engineer.

2. Recompact existing base material around trench to meet compaction requirements for that material type and location.

3. New asphalt and concrete pavement material shall be approved by the Engineer and obtained from an approved source.

4. Unless otherwise provided for in the base and surface summaries, new pavement material and trenching shall be paid for directly but included in the price for the conduit.

5. Total trench width shall be 6 inches wider than the outside edges of conduit(s) installed. Use conduit spacers to separate multiple conduits in trench by at least 1 inch. Place spacers at intervals of 5 feet maximum. Conduits shall be centered in trench.

6. For trenching in a non-NDOT-owned facility, use the owner's standards for trenching, compaction, and patching.

7. Longitudinal trenching in shoulder: If shoulder is 4 foot wide or less, remove all surface material from edge of road to shoulder stripe and replace.

8. Engineer may for good cause, require wider patch sections or otherwise alter the requirements.

9. If saw cut is within 2 feet of an existing pavement edge or existing patch, remove existing pavement to that edge and replace entire section.

10. If sawcut edges for trench fall within a wheel path, sawcut shall be extended to, and removal made to edge of the travel lane. Optionally, the entire travel lane can be rumbled to a depth of 2 inches and overlaid with 2 inches of bituminous pavement as directed by the Engineer.

11. Contractor shall be responsible for replacement of loop detectors, adjustments of utilities and survey monuments to grade and installation of temporary pavement markings.

12. Performed resurfacing shall not be placed on trenches backfilled with concrete slurry for a minimum of 7 days after placement of the concrete slurry or similar material. Provide temporary cover or backfill as directed by the Engineer.

13. Use of rock wheel trenching machines or similar equipment may be permitted within paved areas or within 1 foot of the edge of paving, as directed by the Engineer.

14. Sand bedding shall conform to gradation requirements in Subsection 706.03.03.

15. If installing underground electrical facilities or supplies, refer to NAC 408.447 and 408.453.

16. Use of rock wheel trenching machines or similar equipment may be permitted within paved areas or within 1 foot of the edge of paving, as directed by the Engineer.

17. Longitudinal trenching in shoulder: If shoulder is 4 foot wide or less, remove all surface material from edge of road to shoulder stripe and replace.

18. Engineer may for good cause, require wider patch sections or otherwise alter the requirements.

19. If saw cut is within 2 feet of an existing pavement edge or existing patch, remove existing pavement to that edge and replace entire section.

20. Performed resurfacing shall not be placed on trenches backfilled with concrete slurry for a minimum of 7 days after placement of the concrete slurry or similar material. Provide temporary cover or backfill as directed by the Engineer.
NOTES:
1. NDOT approved fiber optic markers shall be installed along fiber optic conduit runs at:
   - Each side of road crossings
   - Conduit turn points
   - As needed to see from one marker to another or at 500 foot spacing
   - At buried pull box locations

2. Reflective sheathing fiber optic marker stickers shall be installed on flexible guide markers. Flexible guide markers shall be approximately 4 inches wide and 66 inches in height, with an 18 inch installation depth. Each marker shall be orange in color and have 3 inch x 12 inch reflective sheathing at the top of each side of the marker. Reflective sheathing shall meet Section 716 requirements. Each marker and sticker shall be provided and installed by the contractor.

3. The contractor shall contact NDOT for the phone number to be shown on sticker.

4. A layout of the sticker shall be provided for approval.

5. Stickers, markers and installation shall be included in the unit price for the installation of conduit.

DISTRICT I

DISTRICT II AND III

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FIBER OPTIC MARKER

CHIEF TRAFFIC OPS ENGR.

Signed Original On File
NOTES:

1. Use a back pulled or installation method that does not rotate or twist multiple conduits during installation.

2. Conduit deflection shall not exceed 1 foot in the horizontal or vertical direction per 10 feet in longitudinal direction (typ).

3. Conduit shall be routed no closer than 24 inches to any obstruction.

4. Core drilling through an obstruction may be used as an alternative method, subject to approval.

5. Backfill under footing shall be Class B slurry cement conforming to Subsection 207.02.02.

TYPICAL HORIZONTAL ROUTING OF CONDUIT AROUND AN OBSTRUCTION

TYPICAL VERTICAL ROUTING OF CONDUIT UNDER AN OBSTRUCTION

TYPICAL DIRECTIONAL DRILLING INSTALLATION

NOTES:

1. Use a back pulled or installation method that does not rotate or twist multiple conduits during installation.

2. Conduit deflection shall not exceed 1 foot in the horizontal or vertical direction per 10 feet in longitudinal direction (typ).

3. Conduit shall be routed no closer than 24 inches to any obstruction.

4. Core drilling through an obstruction may be used as an alternative method, subject to approval.

5. Backfill under footing shall be Class B slurry cement conforming to Subsection 207.02.02.
PULL BOX REPLACEMENT DETAIL

SECTION A-A
Pull Box May Also Be Placed Near the Back of Curb with an 8" Min Clearance

NOTES:
1. Pull box shall be installed for the communications per applicable standards.
2. Pull box cover shall be inscribed as indicated on plans.
3. Approximate locations of the proposed communication pull boxes are shown on the plans. The contractor shall be responsible for marking the locations of the proposed communication pull boxes in the field per specification.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CONDUIT AND PULL BOX DETAIL
(EXISTING SIDEWALK)

CHIEF TRAFFIC OPS ENGR.
Signed Original On File

T-30.4.1
(523)
NOTES FOR PULL BOXES:

1. All traffic rated pull boxes shall be HS-20 loading rating per AASHTO Standards.
2. Steel cover shall have embossed non-slip pattern.
3. Steel reinforcing shall be per manufacturer's requirements.
4. Top of pull boxes shall be flush with surrounding grade or top of adjacent curb, except that in unpaved areas where pull box is not immediately adjacent to and protected by a concrete foundation, pole or other construction, the box shall be placed with its top 1 inch above surrounding grade. Where practicable, pull boxes shown in the vicinity of curbs shall be placed adjacent to the back of curb, and pull boxes shown adjacent to standards shall be placed on side of foundation facing away from traffic, unless otherwise noted. When pull box is installed in sidewalk area, the depth of the pull box shall be adjusted so that the top of the pull box is flush with the top of sidewalk.
5. The nominal dimensions of the opening in which the cover sets shall be the same as the cover dimensions except the length and width dimensions shall be 1/2 inch greater.
6. All covers and boxes shall be interchangeable with Nevada standard male and female gages. When interchanged with a standard male or female gage, the top surfaces shall be flush with 1/2 inch. Top outside edge of all concrete covers and pull boxes shall have a 1/2 inch minimum radius.
7. Pull box shall not be installed within the boundaries of new or existing curb ramps.
8. Pull boxes for electroliers and signal standards shall be located at the same station (6.5 feet) as the adjacent electrolier or signal standard. Pull boxes shall be placed adjacent to back of curb or edge of shoulder except where this is impractical, a box may be placed in another suitable protected and accessible location.
9. In areas where the possibility of material eroding from around the pull box exists, the pull box shall be placed in drain backfill on each side and 1 foot depth, as directed by the Engineer.
10. Use modified pull boxes only when indicated on the plans.
11. Install conduit plug on each unused conduit or in conduit.
12. Ground Rod - All metal pull box lids shall be grounded. Install a stranded #4 THW wire, 7 feet in length, from the lid to the bonding ground. Fasten the #4 conductor to the lid by cad welding. All pull boxes shall receive a ground rod.
13. All conduits shall have a minimum of 6 inch clearance from the top of the conduit to the cover. Seal all conduit ends with a duct sealing compound.
14. Modified pull box No. 3, No. 5, No. 7, and No. 9 shall be placed in drain backfill on each side and 1 foot depth, as directed by the Engineer.
15. Modified pull box No. 3, No. 5, No. 7, and No. 9 include pull box plus at least one extension.
16. Grounding resistance shall not exceed NEC. Add additional grounding as needed. Supply finding grounding test results to Engineer.
17. The contractor shall install electronic marker system in all buried pull boxes. Install a red marker for power pull boxes and orange for communications pull boxes.

NOTES FOR ELECTRICAL MANHOLE:

1. A compacted base and a concrete footing support shall be constructed prior to placement at the cast iron frame as directed by the Engineer.
2. Adjustments to elevations shall be made with collar/risers as required. Minimum depth 18 inches.
3. Refer to Sheet R-4.3.3 for concrete collar details.
NOTES:

1. Numbers in circles refer to items in table.
2. Backfill according to plans and specifications.
3. Trunk line conductors from the typical trench section shall not deflect by more than one foot per 10 feet in the alignment preceding or following the pull box.
4. See plan sheets for number and size of conduits.
5. New trunk line fiber optic conduits shall pass under No. 7 pull boxes. At conduit transition locations (bridge structures, metal conduit to HDPE or PVC, etc.) all conduits shall enter pull box. At locations where power conductors, detector cables, loop lead-in cables, detector cable, ramp meter signal cables or branch fiber optic cables enter or pass through, all other conduits shall enter the pull box.
6. Bottom of conduit centerline shall be aligned to exit top of pull box to facilitate cable pulling.
7. Use felt paper to block opening between conduits.
8. Install conduit plug on each empty conduit entering pull box.
9. Seal ends of all conduits with conductors or cables with approved material.
10. A pull box extension can be eliminated if the pull box is supplied with a depth of 24 inches or greater.
11. Pull box height above finished grade shall permit 4 inches of surface landscaping, if applicable, to match existing conditions.
12. This pull box shall be designed for traffic areas. Sheet covers shall be used. Cover and box shall support AASHTO H20-44 truck loading.
13. "NDOT" shall be the title engraved in the lid unless noted otherwise. Bend and ground 4" per Subsection 623.02.17.
14. Ground conductors shall be bonded and grounded per standard specifications (as required).
15. Pull box lid bonding/ground conductor shall be 4 awg stranded ground wire, cad welded to the lid. Ground wire shall be coiled for future bonding and grounding. If pull box installation is replacing an existing pull box, then the conductor shall be bonded to the existing grounding system.
16. Cover top of pull box with 30 pounds felt paper to help protect metal lid.
18. The contractor shall install electronic marker system in all buried pull boxes. Install a red marker for power pull boxes and orange for communications pull boxes.

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TABLE

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<thead>
<tr>
<th>ITEM</th>
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<tbody>
<tr>
<td>1</td>
<td>WARNING TAPE</td>
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<td>2</td>
<td>30 lb FELT PAPER</td>
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<td>3</td>
<td>No. 7 PULL BOX WITH EXTENSION WITH EXCEPTIONS AS DRAWN</td>
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<tr>
<td>4</td>
<td>BEDDING MATERIAL PER SHEET T-30.4.3</td>
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<tr>
<td>5</td>
<td>SCH 40 PVC OR HDPE CONDUITS (SEE PLANS FOR SIZE AND QUANTITY)</td>
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<tr>
<td>6</td>
<td>45 DEGREE PVC ELBOW OR HOPE BEND 36&quot; RADIUS</td>
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<tr>
<td>7</td>
<td>90 DEGREE PVC ELBOW OR HOPE BEND 15° RADIUS</td>
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<tr>
<td>8</td>
<td>CONDUIT BELL END (TYPICAL)</td>
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<tr>
<td>9</td>
<td>KNOCK OUT 8&quot; x 12&quot;</td>
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<td>10</td>
<td>BURIAL MARKER / LOCATOR (SEE NOTE 18)</td>
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FIBER OPTIC CABLE, AS REQUIRED

POWER CONDUCTORS (SEE NOTE 12)

RACK & HOOK ASSEMBLY (SEE NOTE 6)

90 DEGREE ELBOW, 15" RADIUS

SUITABLE FOR USE AT FIBER OPTIC SPlice POINTS.

INSIDE DIMENSIONS = 30"x48"x36"

FOR USE AT FIBER OPTIC SPlice POINTS.
**NOTES:**

1. All dimensions are minimal.

2. Rubber tapes shall be rolled after application.

3. When PVC tape is used as a final layer, paint finished surface with electrical insulating coating.

4. Concrete shall be Class A or AA.

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**PILE FOUNDATION TABLE**

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<th>POLE TYPE</th>
<th>MAST ARM LENGTH</th>
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<th><strong>W</strong></th>
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<td>6&quot;</td>
<td>2-6&quot;</td>
<td>3/4&quot; x 3/4&quot; x 4&quot;</td>
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<td>Steel Post, 20 ft</td>
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<td>3/4&quot; x 3/4&quot; x 5&quot;</td>
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<tr>
<td>Steel Post, 30 ft</td>
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<td>5-6&quot;</td>
<td>3/4&quot; x 3/4&quot; x 5&quot;</td>
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<td>30A and 35A</td>
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<td>9&quot;</td>
<td>2-6&quot; x 2-6&quot; x 2-6&quot;</td>
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<td>30B and 35B</td>
<td>78&quot;</td>
<td>15&quot;</td>
<td>9&quot;</td>
<td>2-6&quot; x 2-6&quot; x 2-6&quot;</td>
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</tbody>
</table>

**Unless otherwise shown on plans:**

- Not applicable when mounted on structures.
- * - When "W" = 2'-0" use 4 - # 5 bars
  - When "W" = 2'-6" use 8 - # 5 bars
  - When "W" = 3'-0" use 12 - # 5 bars
  - When "W" = 4'-0" use 16 - # 5 bars

---

**POLE GROUNDING DETAIL**

1. Connect Bonding Wire to the reinforcing Steel Cage near the midpoint of the Foundation or Anchor Bolts.

2. Ground Plate shall be made of Nonferrous Material (Typically Brass or Copper). Grounding plate grounding resistance shall not exceed 10 Ohms. Add additional grounding as needed. Supply final grounding test results to Engineer.
**LOOP INSTALLATION PROCEDURE:**

1. Circular loops are required for all detector loops unless noted in the contract.
2. Saw slots in pavement for loop conductors as shown in details. Blow out and dry thoroughly with compressed air.
3. Install termination pull box.
4. Install No. 14 AWG loop conductor in slots using a \( \frac{3}{4} \) inch to \( \frac{1}{2} \) inch thick wood paddle (see "loop winding patterns"). Allow additional length for the run to termination pull box plus 5 feet of slack in pull box. This additional length of conductor for each loop circuit shall be twisted together into a pair (at least 5 turns per foot) before being run to pull box.
5. Identify loop circuit pairs. Identify start and finish of conductor.
6. Splice loop conductors to lead-in cable. All splices shall be soldered using 60/40 resin core solder.
7. All splices and tapings shall be provided a sound environmental seal.
8. Where loop conductors are not to be spliced to a lead-in cable, ends of conductors shall be taped.
9. Fill slots as shown in details.
10. No more than four loop detector conductors shall be installed in one sawed slot. All loop conductors in one slot shall be for same signal phase.
11. Lead-in cable shall not be spliced between the termination pull box and the controller cabinet.
12. Distance between side of loop and lead-in saw cut shall be 2 foot minimum. Distance between lead-in saw cuts shall be 6 inch minimum.
13. When lead-in saw cuts are for sampling detectors or for left turn lane detectors where saw cuts cross other traffic lanes, conductors shall be paired for each loop circuit and twisted five turns per foot between loop and pull box.

**LEGEND:**
- **S** = Center of Travel Lane
- **F** = Lane Stripe
- **I** = Curb or Pavement Edge
- **B** = Roadway
- **C** = Conduit 2" thickness
- **-** = Symbol

**CONDUIT INSTALLATION**

All pull box locations where there is no curb and gutter the conduit shall extend from the pull box to 12 inches inside the edge of the pavement.
NOTES:
1. All pull boxes shall be No. 5 (Modified). See Sheet T-30.4.3 for details not shown.
2. Payment will be made under conduit, pull box, and loop detector items.
3. Alternate loop detector configuration may be 6 foot x 6 foot square with 3 turns of wire when indicated on plans.

PAVEMENT JOINT CROSSING DETAILS
No Direct Payment

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

No. 5 (MODIFIED) PULL BOX & PAVEMENT JOINT LOOP CROSSING AND OTHER DETAILS

T-30.6.2 (623) Signed Original On File
REVISED 4/97 CHIEF TRAFFIC OPS ENG.
AVC DETECTOR PLACEMENT DETAIL
OPPOSITE LANE DETAIL NOT SHOWN FOR CLARITY

PULL BOX TO M-1 CABINET
CONNECTION DETAIL

1 LANE EACH DIRECTION
CABINET LOCATED TO THE OUTSIDE

2 LANES SAME DIRECTION
WITH CABINET LOCATED TO THE OUTSIDE

3 OR MORE LANES SAME DIRECTION
CABINET LOCATED TO THE OUTSIDE

NOTES:

1. Five working days prior to placement of any and all sensors, the Engineer shall notify the Traffic Operations Section for assistance in establishing the exact locations.

2. All loops shall be 6 foot diameter round loops with 4 turns of wire.

3. Each loop shall be a continuous run to the special M-1 cabinet with no splices and shall be labeled with proper lane designation and sensor placement (i.e., leading, middle, trailing sensor).

4. Loop wire homerun pairs shall be twisted no less than 4 times per foot for the entire home run to No. 5 modified pull box and special M-1 cabinet.

5. Loops shall be centered in all travel lanes and turn lanes.

6. Loop cuts shall be 3/4 inch wide and 2-1/2 inch to 3 inch maximum depth.

7. Loop wire shall be AWG-14 stranded, meeting IMSA-51-1 or higher standard.

8. No more than four (4) sensors leads can occupy a single saw cut, for greater detail see sheet T-30.6.1.

9. Loop wire leads and Class 1 Piezoelectric sensor cable leads shall be carried in separate 2 inch conduit from E.O.P. to No. 5 modified pull box and special M-1 cabinet.

10. Loop wire leads and Class 1 Piezoelectric sensor cable leads shall be carried in separate 4 inch conduit going under pavement areas and/or from No. 5 modified pull box to special M-1 cabinet.

11. Class 1 Piezoelectric sensor length shall be equal to half of the lane width, and installed in accordance with manufacturer's specifications unless otherwise specified here.

12. Class 1 Piezoelectric sensor cable shall be a continuous run to the special M-1 cabinet with no splices and labeled with proper lane designation and sensor placement (i.e., leading, middle, trailing sensor).

13. AVC detector shall include all conductors and saw cutting necessary for installation.

14. If guardrail/barrier rail is provided, the special M-1 cabinet shall be placed a minimum of 24 inches behind rail.

15. For special M-1 cabinet only, in accordance with the National Electric Code 350-56 when the grounding plate does not have a resistance to ground of 25 ohms or less, it shall be augmented with one additional electrode, preferably a 1/2 inch x 96 inch copper ground rod.
NOTES:

1. All loops shall be 6 foot diameter round loops with 4 turns of wire.

2. Loop wire pairs from loop proper to pull box shall be twisted no less than four times per foot.

3. Loop wire pairs shall be twisted no less than four times per foot for the entire home run.

4. Loop cuts shall be 1/4 inch wide x 21/2 inch to 3 inch maximum depth.

5. Loops shall be centered in all travel and turn lanes.

6. Loop wire shall be AWG 14 stranded IMSA-51-1.

7. Each individual conductor shall be a continuous run with no splices and shall be labeled at each end with the lane assignment.

8. It shall be the contractors responsibility to ascertain that the loop placement is not in conflict with other items of work.

9. Five working days prior to placement of loop detectors, the Engineer shall notify the Traffic Operations Section for assistance in establishing the exact location.

10. Detectors shall be installed after dense grade paving or profile grade is established.

11. Loop location shall be marked on the edge of the pavement by painting the word "loop" in white.

12. See Sheet T-30.6.2 for pavement joint details.

LEGEND:

* No. 5 Pull Box (Modified)

SPEED DETECTOR LOOP PLACEMENT DETAIL
(OPPOSITE LANE LOOPS NOT SHOWN FOR CLARITY)
SIDE BRACKET MOUNTINGS
(S) Special 3-Section with Bumps

MAST ARM MOUNTINGS

SIDE MOUNTINGS

TOP MOUNTINGS

MAST ARM MOUNT

VEHICULAR SIGNALS AND MOUNTINGS

PEDESTRIAN SIGNAL—INTERNATIONAL SYMBOL
To be Used Unless Otherwise Specified

POLE PLATE
TERMINAL COMPARTMENT

CLAMSHELL MOUNTING HARDWARE (CS)
PEDESTRIAN SIGNALS AND MOUNTINGS
To be Used Only when Specified

NOTES:
1. All signal heads shall have backplates.
2. All signal heads shall have heads. Heads shall be tunnel type, open at the bottom.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
PEDESTRIAN SIGNALS

SIGNAL MOUNTING

PEDESTRIAN SIGNALS

T-31.2.1
Signed Original On File
ADOPTED 7/96
CHIEF TRAFFIC OPS ENGR.
LIST OF MATERIALS

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<td>90° ELBOW WITH LOCKING DEVICE</td>
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<td>TEE DRILL AND TAP FOR SETSCREW</td>
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<tr>
<td></td>
<td>2</td>
<td>NEOPRENE WASHER OR GASKET</td>
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<td>FLAT WASHER</td>
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<td>1</td>
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<td>CONDUIT LOCK NUT (FOR CONFIGURATIONS USING 2 3C HEADS)</td>
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<td>MALLEABLE HEX NUT (FOR CONFIGURATIONS USING 2 3C HEADS)</td>
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<td>FLAT WASHER</td>
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* Special Pipe Length for use only with Red Signal Single Head Unit.

** FINDING PIPE LENGTH TABLE TO BE USED FOR COMBINATION SIGNAL FACE UTILIZING 2 3C HEADS.**

WHEN REQUIRED THE MOUNT ASSEMBLIES SHALL INCLUDE THE NECESSARY CASSETTE, CASSETTE WASHERS AND PHYSICAL FEATURES TO MAKE ALL CONNECTIONS WEATHER-PROOF. THE CASSETTE MATERIAL SHALL BE NEOPRENE OR SIMILAR SUITABLE SYNTHETIC RUBBER CASSETTE MATERIAL, WHICH IS RATED FOR OUTDOOR USE.
NOTES:

1. Retroreflective borders shall be constructed from 2-inch yellow retroreflective adhesive sheeting border on the entire outer perimeter of the backplate panels.

2. Retroreflective sheeting shall be fluorescent yellow, Type IX or XI.

3. The retroreflective border shall be placed no closer than 1/4 inch from all louvers. No sheeting is allowed over any louvered area.

4. Backplate shall be secured to signal head with four 1/4" x 20 x 1" bolts per side. One split lock washer and one USS washer per bolt.

REAR VIEW BACKPLATE
(All Mast Arm Backplates Shall Be Louvered.)

Mounting Brackets Drill Signal Head and Attach Backplate with (4) 10 x 32 Min. Self-Tapping/Locking Stainless Steel Machine Screws or Per Maintaining Agency Requirements.

0.001" Thickness or Heavier 3003-T-23 Aluminum Sheet

BACKPLATE RETROREFLECTIVE BORDER
MAST ARM SIGNAL AND SIGN PLACEMENT

"L" as shown on plans

12" x 1" Straps

Signal Mast Arm

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL
SIGN PLACEMENT

T-31.2.4

Signed Original On File

REVISED 10/19

CHIEF TRAFFIC OPS ENGR.
NOTES:
1. Islands shall be placed only on slopes greater than 10:1.
2. When using safety bases, the top of the foundation shall be placed flush with the top of the foundation island.
3. Concrete shall be Class A or AA.
4. Where detector loops are cut into pavement, 6 foot x 6 foot square loops may be used in lieu of 6 foot round loop detectors.
5. Placement of loops per maintaining agency or as indicated on plans.

SECTION A-A

FOUNDATION ISLAND

SIGNAL POLE AND LOOP DETECTOR LOCATIONS

TOP OF FOOTING LEVEL WITH

Pavement Edge of 5'

A

NOTES:
1. Islands shall be placed only on slopes greater than 10:1.
2. When using safety bases, the top of the foundation shall be placed flush with the top of the foundation island.
3. Concrete shall be Class A or AA.
4. Where detector loops are cut into pavement, 6 foot x 6 foot square loops may be used in lieu of 6 foot round loop detectors.
5. Placement of loops per maintaining agency or as indicated on plans.

TYPICAL SIGNAL POLE AND LOOP DETECTOR LOCATIONS

EDGE OF PAVEMENT

1" Chamfer

Top of Foundation Level with Finished Roadway, See Note 2

Normal roadway edge See Note 1

Pavement Edge of 5'

A

NOTES:
1. Islands shall be placed only on slopes greater than 10:1.
2. When using safety bases, the top of the foundation shall be placed flush with the top of the foundation island.
3. Concrete shall be Class A or AA.
4. Where detector loops are cut into pavement, 6 foot x 6 foot square loops may be used in lieu of 6 foot round loop detectors.
5. Placement of loops per maintaining agency or as indicated on plans.

TYPICAL SIGNAL POLE AND LOOP DETECTOR LOCATIONS

EDGE OF PAVEMENT

1" Chamfer

Top of Foundation Level with Finished Roadway, See Note 2

Normal roadway edge See Note 1

Pavement Edge of 5'

A

NOTES:
1. Islands shall be placed only on slopes greater than 10:1.
2. When using safety bases, the top of the foundation shall be placed flush with the top of the foundation island.
3. Concrete shall be Class A or AA.
4. Where detector loops are cut into pavement, 6 foot x 6 foot square loops may be used in lieu of 6 foot round loop detectors.
5. Placement of loops per maintaining agency or as indicated on plans.

TYPICAL SIGNAL POLE AND LOOP DETECTOR LOCATIONS

EDGE OF PAVEMENT

1" Chamfer

Top of Foundation Level with Finished Roadway, See Note 2

Normal roadway edge See Note 1

Pavement Edge of 5'

A

NOTES:
1. Islands shall be placed only on slopes greater than 10:1.
2. When using safety bases, the top of the foundation shall be placed flush with the top of the foundation island.
3. Concrete shall be Class A or AA.
4. Where detector loops are cut into pavement, 6 foot x 6 foot square loops may be used in lieu of 6 foot round loop detectors.
5. Placement of loops per maintaining agency or as indicated on plans.

TYPICAL SIGNAL POLE AND LOOP DETECTOR LOCATIONS

EDGE OF PAVEMENT

1" Chamfer

Top of Foundation Level with Finished Roadway, See Note 2

Normal roadway edge See Note 1

Pavement Edge of 5'

A

NOTES:
1. Islands shall be placed only on slopes greater than 10:1.
2. When using safety bases, the top of the foundation shall be placed flush with the top of the foundation island.
3. Concrete shall be Class A or AA.
4. Where detector loops are cut into pavement, 6 foot x 6 foot square loops may be used in lieu of 6 foot round loop detectors.
5. Placement of loops per maintaining agency or as indicated on plans.
1. All fasteners and associated hardware shall be stainless steel.

2. Two No. 10 AWG conductors shall be installed between the internally illuminated street name sign and the pole luminaire. The photo electric (PE) control for the luminaire or electrical service shall operate the internally illuminated sign.

3. Wire connections shall be made with insulated compression wire nuts.

4. Street name sign wiring to run through two water-tight 90° fittings with flexible conduit. Use a drip loop sufficient enough to allow sign movement. Use watertight rubber grommet or bushing at pole entry.

5. Clamp-on details shall be used for internally illuminated street name sign support arm assembly.

6. Pin bolts shall be A325 with threads excluded from the shear plane.

Notes:

- Letters shall be 8/6 E Mod Series
- Face Colors: Legend and Border-White Background-Green
- May have Maintaining Agency Logo as indicated on Plans.
- Orientation has been approved by the Engineer.
- clamp-on detail B
- see note 5
**NOTES:**

1. Locate WNV2-1 sign vertically on mast arm no lower than 18 feet 6 inches from the roadway surface. Distance is measured from the bottom edge of the sign to the actual travel lane surface. Locate the sign horizontally on mast arm centered over the travel lanes.

2. Submit shop drawings and structural calculations for the pole, mast arm, sign lighting fixture mount and connections for approval.

---

**STATE OF NEVADA**

**DEPARTMENT OF TRANSPORTATION**

**SCHOOL ZONE FLASHER AND FLASHING WARNING SIGN**

**5/09 REVISED**

**CHIEF TRAFFIC OPS ENGR. Signed Original On File**
NOTES:

1. Locate WNV2-1 sign vertically on mast arm no lower than 18 feet 6 inches from the roadway surface. Distance is measured from the bottom edge of the sign to the actual travel lane surface. Locate the sign horizontally on mast arm centered over the travel lanes.

2. Submit shop drawings and structural calculations for the pole, mast arm, sign lighting fixture mount and connections for approval.
NOTES:

1. For pedestrian push button and sign see sheet T-31.4.2.
2. For foundation details see sheet T-30.5.2.
3. Mounting heights of signal and pedestrian heads and pedestrian push buttons shall be applicable to installations on Pole Types 28, 30 and 35.

SECTION B-B WITH PIPE

POST TOP MOUNTED  SIDE BRACKET MOUNTED  TERMINAL COMPARTMENTS  MOUNTING DETAIL  OPTICAL DETECTOR

Base Plate  4.1" O.D. Min.  Pedestrian Signal  (When Specified)

Pedestrian Push Button  (When Specified)

2" x 5" Hand Hole and Cover

5" I.D. Min. at Base

See Detail F

TYPE 1A

TYPE 1B

NOTES:

1. For pedestrian push button and sign see sheet T-31.4.2.
2. For foundation details see sheet T-30.5.2.
3. Mounting heights of signal and pedestrian heads and pedestrian push buttons shall be applicable to installations on Pole Types 28, 30 and 35.

SECTION B-B WITH PIPE

POST TOP MOUNTED  SIDE BRACKET MOUNTED  TERMINAL COMPARTMENTS  MOUNTING DETAIL  OPTICAL DETECTOR

Base Plate  4.1" O.D. Min.  Pedestrian Signal  (When Specified)

Pedestrian Push Button  (When Specified)

2" x 5" Hand Hole and Cover

5" I.D. Min. at Base

See Detail F

TYPE 1A

TYPE 1B

NOTES:

1. For pedestrian push button and sign see sheet T-31.4.2.
2. For foundation details see sheet T-30.5.2.
3. Mounting heights of signal and pedestrian heads and pedestrian push buttons shall be applicable to installations on Pole Types 28, 30 and 35.

SECTION B-B WITH PIPE

POST TOP MOUNTED  SIDE BRACKET MOUNTED  TERMINAL COMPARTMENTS  MOUNTING DETAIL  OPTICAL DETECTOR

Base Plate  4.1" O.D. Min.  Pedestrian Signal  (When Specified)

Pedestrian Push Button  (When Specified)

2" x 5" Hand Hole and Cover

5" I.D. Min. at Base

See Detail F

TYPE 1A

TYPE 1B

NOTES:

1. For pedestrian push button and sign see sheet T-31.4.2.
2. For foundation details see sheet T-30.5.2.
3. Mounting heights of signal and pedestrian heads and pedestrian push buttons shall be applicable to installations on Pole Types 28, 30 and 35.

SECTION B-B WITH PIPE

POST TOP MOUNTED  SIDE BRACKET MOUNTED  TERMINAL COMPARTMENTS  MOUNTING DETAIL  OPTICAL DETECTOR

Base Plate  4.1" O.D. Min.  Pedestrian Signal  (When Specified)

Pedestrian Push Button  (When Specified)

2" x 5" Hand Hole and Cover

5" I.D. Min. at Base

See Detail F

TYPE 1A

TYPE 1B

NOTES:

1. For pedestrian push button and sign see sheet T-31.4.2.
2. For foundation details see sheet T-30.5.2.
3. Mounting heights of signal and pedestrian heads and pedestrian push buttons shall be applicable to installations on Pole Types 28, 30 and 35.
PUSH BUTTON POSITIONING DETAIL

Contractor to verify pole size with Resident Engineer for correct pedestrian push button installation.

NOTES:

1. Arrow to be left or right or both as required.
2. Per plans or maintaining agency, 5" x 7" or 9" x 12" sign, black symbols on white background.

PEDESTRIAN PUSH BUTTON POST

SECTION A-A WITH PIPE

PEDESTRIAN PUSH BUTTON POST

DETAIL E

DETAIL B

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

PEDESTRIAN PUSH BUTTON DETAILS

10/15
REVISED
8/98
ADOPTED
CHIEF TRAFFIC OPS ENGR.

Signed Original On File
1. 1/2" inch radius on all corners, smooth and neatly round exposed edges to a 1/16" radius.

2. All materials shall conform to the standard specifications for road and bridge construction. Unless otherwise specified.

3. 1 1/2" inch NPS steel pipe use schedule 40 and 2 inch NPS steel pipe use schedule 80. 2 inch NPS pipe is only used with the adjustable extender.

4. Drill and tap holes 20TPI into signal pole.

5. Attach push button to mounting plate per manufactures recommendations.

6. Drill 1/4" inch holes in mounting plates at lower extension pipe for conductors. Smooth edges to prevent damage to insulation.

* No Direct Payment. To be Included on Pedestrian Push Button When Required to Meet ADA Requirements.
NOTES:

1. 1/8" inch radius on all corners. Smooth and neatly round exposed edges to a 1/8" radius.

2. All materials shall conform to the Standard Specifications for Road and Bridge Construction. Unless otherwise specified.

3. 1 1/2" inch NPS steel pipe use schedule 40 and 2 inch NPS steel pipe use schedule 80. 2 inch NPS pipe is only used with the adjustable extender.

4. Drill and tap holes 20TPI into signal pole.

5. Attach push button to mounting plate per manufacturer's recommendations.

6. Drill 1/4" inch holes in mounting plates at lower extension pipe for conductors. Smooth edges to prevent damage to insulation.

* No Direct Payment. To be included on Pedestrian Push Button when required to meet ADA Requirements.
Tamper Resistant Screws Shall Be Mounted With 4" x 7" Min. (Inside Dim.)

LOCATED 180° OPPOSITE MAST ARM HANDHOLE AND COVER

DETAIL A - Mast Arm Located 180° Opposite Hand Hole Located Terminal Block

Mounting Height (Standard or High Rise)

Tapered Mast Arm

Base Cover

Provide Wire Guide Into Shaft

Round tapered arm

Tapered Mast Arm

Removable Cap

As Shown On Plans

NOTES:

1. DESIGN SPECIFICATIONS:

2. LOADING:
   A. Wind Importance Factor, Ir = 1.0
   B. Recurrence Interval = 50 years
   C. Wind Speed = 90 mph
   D. Ice Load = 3 psf
   E. Fatigue Design Loads Specified in Chapter 11 are not required.

3. Shop drawings and structural calculations shall be submitted and approved prior to fabrication.

4. If indicated in the plans, all poles shall be prime painted by manufacturer and finish painted by the contractor. Section 714

5. The distance from the roadway surface to the bottom of the mast arm signal heads shall be 17 feet.

6. Cold galvanize all field welds.

7. For pole foundation see sheet T-30.5.2.

8. For additional details see sheet T-31.5.3.

POLE TYPE 35 (MAST ARMS 45' AND LESS)
POLE TYPE 35-A (MAST ARMS 50' TO 60')
POLE TYPE 35-B (MAST ARMS 65' TO 85')

POLE TYPE 30 (MAST ARMS 45' AND LESS)
POLE TYPE 30-A (MAST ARMS 50' TO 60')
POLE TYPE 30-B (MAST ARMS 65' TO 85')

DETAIL A

HANDHOLE AND COVER
LOCATED 180° OPPOSITE MAST ARM
### Device Description

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### Luminaire Arm Data

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**Type 30 and 35**

The Alternate Loading Shown Above.

65' THRU 85' SPANS

### Type 30B and 35B

**Loading Information**

- **Type 30, 30A, and 30B**
- **Type 35, 35A, and 35B**

**Signed Original On File**

**State of Nevada Department of Transportation**

**Chief Traffic Ops Engr.**

**Rev. 10/94 Adopted 10/15 Revised 10/94**

**T-315.3 (623)**

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**Notes:**
- Type 30A and 35A Pole Supports
- The Alternate Loading Shown Above.

**Type 30A and 35A**
NOTES:

1. RRFB must include pedestrian indication side flasher that faces crosswalk.

2. Install push button on side of pole facing pedestrian ramp.

1. See Sheet T-30.5.2 for Foundation
2. See Sheet T-33.4.1 and T-33.4.2 for Steel Post, 30-Foot

See Sheet T-31.6.5 for Midblock Crosswalk Lighting Detail.
Align Post Such That it is Tangent to the Sock of the Sidewalk and Tangent to the Detectable Warning Joint.
NOTES:
1. RRFB must include pedestrian indication side flasher that faces crosswalk.
2. Install push button on side of pole facing pedestrian ramp.

1. See Sheet T-30.5.2 for Foundation
2. See Sheet T-33.4.1 and T-33.4.2 for Steel Post, 30-Foot

Solar Photovoltaic Array (Pole Mounted)

W11-2 (36" x 36" Shown) for Dual Mount Only

Rectangular Rapid Flashing Beacon for Dual Mount Only

Pedestrian Indication Side Flasher

W16-7PL (24" x 12" Shown) for Dual Mount Only

See Sheet T-31.6.5 for Midblock Crosswalk Lighting Detail.
Align Post Such That it is Tangent to the Block of the Sidewalk and Tangent to the Detectable Warning Joint.
NOTES:
1. Locate RRFB vertically on mast arm no lower than 18 feet 6 inches from the roadway surface. Distance is measured from the bottom edge of the RRFB to the actual travel lane surface. Locate RRFB and sign horizontally on mast arm centered over the travel lanes.
2. RRFB must include a pedestrian indication side flasher that faces crosswalk.
3. See sheet T-31.5.2 for connection and base plate details.
4. See sheet T-30.5.2 for foundation details.
5. Install push button on side of pole facing pedestrian ramp.

See Sheet T-31.6.5 for Midblock Crosswalk Lighting Detail. Align pole such that it is tangent to the back of the sidewalk and tangent to the detectable warning joint.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPE 2 (RRFB)
RECTANGULAR RAPID FLASHING BEACON

T-31.6.3 (623) Signed Original On File
ADCOMM: 09/06
DEPT: TRAFFIC OPS ENGR.
1. Locate RRFB vertically on mast arm no lower than 18 feet 6 inches from the roadway surface. Distance is measured from the bottom edge of the RRFB to the actual travel lane surface. Locate RRFB and sign horizontally on mast arm centered over the travel lanes.

2. RRFB must include a pedestrian indication side flasher that faces crosswalk.

3. See sheet T-31.6.5 for connection and base plate details.

4. See sheet T-30.5.2 for foundation details.

5. Install push button on side of pole facing pedestrian ramp.

NOTES:

1. See Sheet T-31.6.5 for Midblock Crosswalk Lighting Detail. Align pole such that it is tangent to the back of the sidewalk and tangent to the detectable warning joint.

2. RRFB must include a pedestrian indication side flasher that faces crosswalk.

3. See sheet T-31.6.5 for Midblock Crosswalk Lighting Detail. Align pole such that it is tangent to the back of the sidewalk and tangent to the detectable warning joint.
NOTES:
1. See sheet T-32.1.1 for Type 7 pole details.
2. See sheet T-38.1.3 for crosswalk pavement markings.
NOTES FOR ALL POLE TYPES:

DESIIGN CRITERIA:

Basic wind speed = 90 mph.

GALVANIZING:
1. Poles shall be galvanized as per ASTM A-123. Hardware shall be galvanized as per ASTM A-153.

STEEL SIGNAL AND LUMINAIRE ARMS:
1. The last 3 inches of the luminaire arm shall be straight and horizontal with luminaire attached.
2. Connection between arms and poles shall be made by means of a rain tight socket or a design permitting simple removal of the arms.

ANCHOR BOLTS:
1. Provide 4 ASTM F595 Grade 36 anchor bolts, ASTM A 563 Heavy hex nuts, and 8 ASTM F-436 hardened steel washers for each pole.
2. Threads may be cut or rolled. Bolts shall be galvanized or plated after threads are formed. Each bolt shall be provided with 6 inches of threads.
3. When using a safety base, anchor bolts shall not extend above the slip bolt gasket.

STEEL POLES:
1. The last 3 inches of the luminaire arm shall be straight and horizontal with luminaire attached.
2. A reduced gage for shaft of pole will be acceptable above signal arm attachment similar to pole Type 28.
3. When using a safety base, anchor bolts shall not extend above the slip bolt gasket.
4. Connection between arms and poles shall be made by means of a rain tight socket or a design permitting simple removal of the arms.

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1. Provide 4 ASTM F595 Grade 36 anchor bolts, ASTM A 563 Heavy hex nuts, and 8 ASTM F-436 hardened steel washers for each pole.
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3. When using a safety base, anchor bolts shall not extend above the slip bolt gasket.

STEEL POLES:
1. The last 3 inches of the luminaire arm shall be straight and horizontal with luminaire attached.
2. A reduced gage for shaft of pole will be acceptable above signal arm attachment similar to pole Type 28.
3. When using a safety base, anchor bolts shall not extend above the slip bolt gasket.

WELDS:
1. Longitudinal welds by submerged ARC or ERW circumferential butt welds shall have permanent back-up rings. All exposed butt welds shall be ground flush.
2. Connection between arms and poles shall be made by means of a rain tight socket or a design permitting simple removal of the arms.
4. For weld sizes not shown, use minimum size weld as specified by the latest welding code.
5. Break all sharp edges for wire protection.

FOUNTAIN:
1. At locations behind curb, all signal and lighting poles shall be located at the back edge of sidewalk or of the R.W. lane, to obtain a minimum setback distance of 5 feet behind the back edge of curb or center of pole. See sheet T-31.3.1 for typical locations.
2. At locations without curb, poles shall be placed in a minimum distance of 6 feet from shoulder or a minimum of 10 feet from travel way, whichever is greater.
3. For foundation detail see sheet T-30.5.2.
4. For foundation island see sheet T-31.3.1.
5. Concrete shall be class A or AA.

SAFETY BASES:
1. Type 7 and type 14 poles shall require safety base assemblies unless mounted on structure behind barrier rail or noted otherwise on the plans, see sheet T-32.1.2 for details.

NOTES FOR ALL POLE TYPES:

DESIIGN CRITERIA:

Basic wind speed = 90 mph.

GALVANIZING:
1. Poles shall be galvanized as per ASTM A-123. Hardware shall be galvanized as per ASTM A-153.

STEEL SIGNAL AND LUMINAIRE ARMS:
1. The last 3 inches of the luminaire arm shall be straight and horizontal with luminaire attached.
2. Connection between arms and poles shall be made by means of a rain tight socket or a design permitting simple removal of the arms.

ANCHOR BOLTS:
1. Provide 4 ASTM F595 Grade 36 anchor bolts, ASTM A 563 Heavy hex nuts, and 8 ASTM F-436 hardened steel washers for each pole.
2. Threads may be cut or rolled. Bolts shall be galvanized or plated after threads are formed. Each bolt shall be provided with 6 inches of threads.
3. When using a safety base, anchor bolts shall not extend above the slip bolt gasket.

STEEL POLES:
1. The last 3 inches of the luminaire arm shall be straight and horizontal with luminaire attached.
2. A reduced gage for shaft of pole will be acceptable above signal arm attachment similar to pole Type 28.
3. When using a safety base, anchor bolts shall not extend above the slip bolt gasket.
4. Connection between arms and poles shall be made by means of a rain tight socket or a design permitting simple removal of the arms.

ANCHOR BOLTS:
1. Provide 4 ASTM F595 Grade 36 anchor bolts, ASTM A 563 Heavy hex nuts, and 8 ASTM F-436 hardened steel washers for each pole.
2. Threads may be cut or rolled. Bolts shall be galvanized or plated after threads are formed. Each bolt shall be provided with 6 inches of threads.
3. When using a safety base, anchor bolts shall not extend above the slip bolt gasket.

STEEL POLES:
1. The last 3 inches of the luminaire arm shall be straight and horizontal with luminaire attached.
2. A reduced gage for shaft of pole will be acceptable above signal arm attachment similar to pole Type 28.
3. When using a safety base, anchor bolts shall not extend above the slip bolt gasket.
4. Connection between arms and poles shall be made by means of a rain tight socket or a design permitting simple removal of the arms.

WELDS:
1. Longitudinal welds by submerged ARC or ERW circumferential butt welds shall have permanent back-up rings. All exposed butt welds shall be ground flush.
2. Connection between arms and poles shall be made by means of a rain tight socket or a design permitting simple removal of the arms.
4. For weld sizes not shown, use minimum size weld as specified by the latest welding code.
5. Break all sharp edges for wire protection.

FOUNTAIN:
1. At locations behind curb, all signal and lighting poles shall be located at the back edge of sidewalk or of the R.W. lane, to obtain a minimum setback distance of 5 feet behind the back edge of curb or center of pole. See sheet T-31.3.1 for typical locations.
2. At locations without curb, poles shall be placed in a minimum distance of 6 feet from shoulder or a minimum of 10 feet from travel way, whichever is greater.
3. For foundation detail see sheet T-30.5.2.
4. For foundation island see sheet T-31.3.1.
5. Concrete shall be class A or AA.

SAFETY BASES:
1. Type 7 and type 14 poles shall require safety base assemblies unless mounted on structure behind barrier rail or noted otherwise on the plans, see sheet T-32.1.2 for details.
NOTES:

1. Place bottom plate with spacer plate on leveling nuts on anchor bolts and fasten in place.

2. Top plate shall be furnished by light pole fabricator as light pole base plate with dimensions as shown in plan view.

3. All steel plate assemblies shall be hot-dip galvanized after fabrication.

4. All nuts, bolts and washers shall be electro-plated cadmium in accordance with ASTM B766, Type NS.

5. All contact areas of plates shall be free of galvanizing beads or runs.

6. Safety bases shall be utilized on all steel light poles except on structures or if placed behind barrier or guardrail.

7. Grouting shall be done after light pole has been located in final position.

8. Anchor bolt shall not extend above slip base gasket.

9. Slip bolt torquing requirements:
   - A. Torque all bolts to 80 ft/lb.
   - B. Loosen bolts.
   - C. Retighten to final torque using the following sequences:
      3 1 4 2
      60 ft/lb, 55 ft/lb then 70 ft/lb, 60 ft/lb, 65 ft/lb, then 70 ft/lb.
      Redo each bolt for 70 ft/lb.
   - D. Caulk areas around slip base gasket. Material shall conform to Federal Spec. No. TT-S-230, Type III or equivalent.
   - E. Flat cement-bonded granules shall be used as galvanizing compound or equivalent.

10. Slip bolts shall be furnished by light pole fabricator as light pole base plate with dimensions as shown in plan view.

11. Grouting shall be done after light pole has been located in final position.

12. Anchor bolt shall not extend above slip base gasket.

13. Slip bolt torquing requirements:
   - A. Torque all bolts to 80 ft/lb.
   - B. Loosen bolts.
   - C. Retighten to final torque using the following sequences:
      3 1 4 2
      60 ft/lb, 55 ft/lb then 70 ft/lb, 60 ft/lb, 65 ft/lb, then 70 ft/lb.
      Redo each bolt for 70 ft/lb.
   - D. Caulk areas around slip base gasket. Material shall conform to Federal Spec. No. TT-S-230, Type III or equivalent.
   - E. Flat cement-bonded granules shall be used as galvanizing compound or equivalent.

14. Slip bolts shall be furnished by light pole fabricator as light pole base plate with dimensions as shown in plan view.

15. Grouting shall be done after light pole has been located in final position.

16. Anchor bolt shall not extend above slip base gasket.

17. Slip bolt torquing requirements:
   - A. Torque all bolts to 80 ft/lb.
   - B. Loosen bolts.
   - C. Retighten to final torque using the following sequences:
      3 1 4 2
      60 ft/lb, 55 ft/lb then 70 ft/lb, 60 ft/lb, 65 ft/lb, then 70 ft/lb.
      Redo each bolt for 70 ft/lb.
   - D. Caulk areas around slip base gasket. Material shall conform to Federal Spec. No. TT-S-230, Type III or equivalent.
   - E. Flat cement-bonded granules shall be used as galvanizing compound or equivalent.

18. Slip bolts shall be furnished by light pole fabricator as light pole base plate with dimensions as shown in plan view.

19. Grouting shall be done after light pole has been located in final position.

20. Anchor bolt shall not extend above slip base gasket.

21. Slip bolt torquing requirements:
   - A. Torque all bolts to 80 ft/lb.
   - B. Loosen bolts.
   - C. Retighten to final torque using the following sequences:
      3 1 4 2
      60 ft/lb, 55 ft/lb then 70 ft/lb, 60 ft/lb, 65 ft/lb, then 70 ft/lb.
      Redo each bolt for 70 ft/lb.
   - D. Caulk areas around slip base gasket. Material shall conform to Federal Spec. No. TT-S-230, Type III or equivalent.
   - E. Flat cement-bonded granules shall be used as galvanizing compound or equivalent.

22. Slip bolts shall be furnished by light pole fabricator as light pole base plate with dimensions as shown in plan view.

23. Grouting shall be done after light pole has been located in final position.


25. Slip bolt torquing requirements:
   - A. Torque all bolts to 80 ft/lb.
   - B. Loosen bolts.
   - C. Retighten to final torque using the following sequences:
      3 1 4 2
      60 ft/lb, 55 ft/lb then 70 ft/lb, 60 ft/lb, 65 ft/lb, then 70 ft/lb.
      Redo each bolt for 70 ft/lb.
   - D. Caulk areas around slip base gasket. Material shall conform to Federal Spec. No. TT-S-230, Type III or equivalent.
   - E. Flat cement-bonded granules shall be used as galvanizing compound or equivalent.

26. Slip bolts shall be furnished by light pole fabricator as light pole base plate with dimensions as shown in plan view.

27. Grouting shall be done after light pole has been located in final position.

28. Anchor bolt shall not extend above slip base gasket.

29. Slip bolt torquing requirements:
   - A. Torque all bolts to 80 ft/lb.
   - B. Loosen bolts.
   - C. Retighten to final torque using the following sequences:
      3 1 4 2
      60 ft/lb, 55 ft/lb then 70 ft/lb, 60 ft/lb, 65 ft/lb, then 70 ft/lb.
      Redo each bolt for 70 ft/lb.
   - D. Caulk areas around slip base gasket. Material shall conform to Federal Spec. No. TT-S-230, Type III or equivalent.
   - E. Flat cement-bonded granules shall be used as galvanizing compound or equivalent.

30. Slip bolts shall be furnished by light pole fabricator as light pole base plate with dimensions as shown in plan view.

31. Grouting shall be done after light pole has been located in final position.

32. Anchor bolt shall not extend above slip base gasket.

33. Slip bolt torquing requirements:
   - A. Torque all bolts to 80 ft/lb.
   - B. Loosen bolts.
   - C. Retighten to final torque using the following sequences:
      3 1 4 2
      60 ft/lb, 55 ft/lb then 70 ft/lb, 60 ft/lb, 65 ft/lb, then 70 ft/lb.
      Redo each bolt for 70 ft/lb.
   - D. Caulk areas around slip base gasket. Material shall conform to Federal Spec. No. TT-S-230, Type III or equivalent.
   - E. Flat cement-bonded granules shall be used as galvanizing compound or equivalent.

34. Slip bolts shall be furnished by light pole fabricator as light pole base plate with dimensions as shown in plan view.

35. Grouting shall be done after light pole has been located in final position.

36. Anchor bolt shall not extend above slip base gasket.

37. Slip bolt torquing requirements:
   - A. Torque all bolts to 80 ft/lb.
   - B. Loosen bolts.
   - C. Retighten to final torque using the following sequences:
      3 1 4 2
      60 ft/lb, 55 ft/lb then 70 ft/lb, 60 ft/lb, 65 ft/lb, then 70 ft/lb.
      Redo each bolt for 70 ft/lb.
   - D. Caulk areas around slip base gasket. Material shall conform to Federal Spec. No. TT-S-230, Type III or equivalent.
   - E. Flat cement-bonded granules shall be used as galvanizing compound or equivalent.

38. Slip bolts shall be furnished by light pole fabricator as light pole base plate with dimensions as shown in plan view.

39. Grouting shall be done after light pole has been located in final position.

40. Anchor bolt shall not extend above slip base gasket.

41. Slip bolt torquing requirements:
   - A. Torque all bolts to 80 ft/lb.
   - B. Loosen bolts.
   - C. Retighten to final torque using the following sequences:
      3 1 4 2
      60 ft/lb, 55 ft/lb then 70 ft/lb, 60 ft/lb, 65 ft/lb, then 70 ft/lb.
      Redo each bolt for 70 ft/lb.
   - D. Caulk areas around slip base gasket. Material shall conform to Federal Spec. No. TT-S-230, Type III or equivalent.
   - E. Flat cement-bonded granules shall be used as galvanizing compound or equivalent.

42. Slip bolts shall be furnished by light pole fabricator as light pole base plate with dimensions as shown in plan view.

43. Grouting shall be done after light pole has been located in final position.

44. Anchor bolt shall not extend above slip base gasket.

45. Slip bolt torquing requirements:
   - A. Torque all bolts to 80 ft/lb.
   - B. Loosen bolts.
   - C. Retighten to final torque using the following sequences:
      3 1 4 2
      60 ft/lb, 55 ft/lb then 70 ft/lb, 60 ft/lb, 65 ft/lb, then 70 ft/lb.
      Redo each bolt for 70 ft/lb.
   - D. Caulk areas around slip base gasket. Material shall conform to Federal Spec. No. TT-S-230, Type III or equivalent.
   - E. Flat cement-bonded granules shall be used as galvanizing compound or equivalent.

46. Slip bolts shall be furnished by light pole fabricator as light pole base plate with dimensions as shown in plan view.

47. Grouting shall be done after light pole has been located in final position.

48. Anchor bolt shall not extend above slip base gasket.

49. Slip bolt torquing requirements:
   - A. Torque all bolts to 80 ft/lb.
   - B. Loosen bolts.
   - C. Retighten to final torque using the following sequences:
      3 1 4 2
      60 ft/lb, 55 ft/lb then 70 ft/lb, 60 ft/lb, 65 ft/lb, then 70 ft/lb.
      Redo each bolt for 70 ft/lb.
   - D. Caulk areas around slip base gasket. Material shall conform to Federal Spec. No. TT-S-230, Type III or equivalent.
   - E. Flat cement-bonded granules shall be used as galvanizing compound or equivalent.

50. Slip bolts shall be furnished by light pole fabricator as light pole base plate with dimensions as shown in plan view.

51. Grouting shall be done after light pole has been located in final position.

52. Anchor bolt shall not extend above slip base gasket.
### Pole and Foundation Details

<table>
<thead>
<tr>
<th>Height (H) (ft)</th>
<th>Min Pole (D_0) (in) Note 5</th>
<th>Min Pole (D_0) Wall Thickness (in)</th>
<th>Diameter (in)</th>
<th>Thickness (in)</th>
<th>Total</th>
<th>Size ( &quot;D&quot;) (in)</th>
<th>BC</th>
<th>&quot;H&quot; (in)</th>
<th>&quot;D&quot; (in)</th>
<th>Base plate reinforcement</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>14</td>
<td>⅝</td>
<td>30½</td>
<td>2½</td>
<td>8</td>
<td>1½</td>
<td>25</td>
<td>8</td>
<td>84</td>
<td>42</td>
</tr>
<tr>
<td>100</td>
<td>18½</td>
<td>¾</td>
<td>30½</td>
<td>2½</td>
<td>8</td>
<td>1½</td>
<td>25</td>
<td>8</td>
<td>84</td>
<td>42</td>
</tr>
<tr>
<td>120</td>
<td>21</td>
<td>¾</td>
<td>37½</td>
<td>2½</td>
<td>8</td>
<td>1½</td>
<td>32</td>
<td>8</td>
<td>84</td>
<td>46</td>
</tr>
</tbody>
</table>

**Note 5:** Increase "L" by 2’ for all heights \(H\) and **site foundation material:** For construction on or within 2’ of sloping ground (slopes up to 1:1.5H:1V) Adjust height to accommodate concrete barrier rail.

**Notes:**
2. Pole details shall suit the lowering device and this foundation plan. Pole details shall be submitted to the engineer for approval. All high mast luminaires are bottom hinging with an internal winch assembly and external motor. Pole shall have a minimum taper of 0.017 ft/ft.
3. All materials to be galvanized after fabrication.
4. For number of luminaires to be mounted on the pole, see electrical plans.
5. Foundation, pole, base plate, and anchor bolt design is based on a maximum of 8 luminaires and a maximum effective projected area (EPA) of 8 (32.1.5), and a maximum weight of 38 lb (including fixtures, hood, and lowering ring). Increase minimum pole diameter if required to accommodate lowering device. Limit the design deflection at the top of the pole to 10% of the pole height. See sheet T-30.5.2 for pole grounding detail.
6. Design wind pressures are based on a 3 second gust speed of 90 mph and a 50 year design life.
7. Fatigue design based on natural wind gust loads and fatigue importance category I.
8. Slip fit length shall not be less than 1.5 DL.
9. Base plate shape optional, either round or hexagonal as shown.
10. Anchor bolts shall be made from steel bar conforming to AASHTO M 314 Grade 30 including SI supplementary requirements.
11. The following soil parameters were used to determine pile length, \(L\):

<table>
<thead>
<tr>
<th>Site Foundation Material</th>
<th>Minimum Dry Unit Weight (pcf)</th>
<th>Internal Friction Angle (deg)</th>
<th>Cohesion (psf)</th>
<th>Subgrade Modulus (E_s) (psf)</th>
<th>Rock Constant (k_m)</th>
<th>Rock Quality Designation (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soft Clay</td>
<td>100</td>
<td>n/a</td>
<td>5000</td>
<td>n/a</td>
<td>0.01</td>
<td>10</td>
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<tr>
<td>Sand</td>
<td>110</td>
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<td>50</td>
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<tr>
<td>Gravel</td>
<td>125</td>
<td>35</td>
<td>n/a</td>
<td>175</td>
<td>n/a</td>
<td>10</td>
</tr>
<tr>
<td>Soft Clay</td>
<td>90</td>
<td>n/a</td>
<td>250</td>
<td>n/a</td>
<td>0.01</td>
<td>10</td>
</tr>
</tbody>
</table>

**Notes:**
1. Pile length, \(L\), based on maximum \(0.5\) inch lateral deflection at top of pile under Group II loads.
2. Access opening shall be fitted with a lockable hinged handhole cover; the handhole shall be gasketed to make waterproof. Access opening shall be reinforced as required in the standard specifications and shall suit the lowering device. Follow provisions of Section 5.14.6 of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, Sixth Edition 2013, with 2015 Interim Revisions. See sheet T-32.1.5 for hand hole orientation.
INSTALLATION WITHIN CONCRETE BARRIER RAIL

INSTALLATION WITHIN GUARDRAIL

Base & Surface (Typ.)
Concrete Barrier Rail (Typ.)
Top of Concrete Barrier Rail (Typ.)
Concrete Barrier Rail (Typ.)
Orientation of Handhole
3" Conduit
Pole Foundation

Pole
Handhole
Pull Box
No. 5
Pull Box
No. 5
Pull Box

Pole Foundation

PLAN
INSTALLATION WITHIN CONCRETE BARRIER RAIL

PLAN
INSTALLATION WITHIN GUARDRAIL
NOTES:
1. Junction box and cover shall be 16 gauge steel.
2. Galvanize assembly after fabrication.
3. Box shall be flush with bottom of structure.
4. Fasten cover by drill and tap with eight (8) #10-24 UNC brass screws.
5. Cover shall be on box during pouring.
6. An equivalent approved manufacturer's box may be used in lieu of detail J junction box.
7. ** Knock out for 1 inch conduit. Bottom shall be min. of 3 1/2 inches above cover to clear structural steel.

**Per Plan recommendations or Mount per manufacturer as shown.**

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

UNDERPASS LUMINAIRES
AND JUNCTION BOX

T-32.1.6  (6/23)  Signed Original On File

REVISED 10/10  9/10
CHIEF TRAFFIC OPS ENGR.
NOTES:

1. All cabinets shall have a thirteen-digit identification code. Identification plate and identification plate installation are incidental to cabinet installation.

2. See plan sheets for cabinet identification code. Letters and numbers shall be placed in such a manner that the entire identification code is centered horizontally on the side of the cabinet facing traffic.

3. Install adhesive backed NDOT or FAST labels centered on cabinet side facing traffic.

4. Adhesive backed black letters with white reflective background FHWA Series C letters centered on cabinet side facing traffic.

EXAMPLES:

Possible Device Types:
- DMS = Dynamic Message Sign
- CTV = Closed Circuit Television
- DET = Detector Station (Regardless of type of detection)
- HAR = Highway Advisory Radio
- CAB = Controller Cabinet (Any type of Cabinet)
- RWS = Road Weather Information System
- RMP = Ramp Meter
- SVS = Service Drop Location (Metered Service)

Possible Routes:
- 015 = Interstate 15
- 095 = US 95 (in most areas, not in area with I-515 designation)
- 515 = Interstate 515 (US 95 in some areas)
- 215 = Interstate 215
- 587 = State Route

Possible Directions:
- N = Northbound Roadway
- S = Southbound Roadway
- E = Eastbound Roadway
- W = Westbound Roadway

Possible Milepost:
Mileposts should be calculated to the nearest hundredth of a mile. Use 5 digits with decimal point.
Example:
123.45 = milepost 123.45

Exception to the above address system:
Devices not on a Freeway, Highway, or route 11. Use actual street address (NEVADA) 6.935
Limited to 10 characters
2. Use intersection names (NEVADA) 6.935
Limited to 10 characters
1. Concrete shall be class A or AA.
2. Rough broom texture on front and rear pads.
3. Install ground rod wire conduit in all cabinet foundations. Ground rod wire conduit to be used when an additional ground rod is required.
4. See plans for cabinet identification code and cabinet identification code details.
NOTES:
1. Concrete shall be class A or AA.
2. Structure excavation and backfill shall conform to sections 206 and 207 of the standard specifications.
3. See plans for number and size of conduits.
4. Exposed edges of concrete shall be chamfered 1 inch.
5. See plans for conduit configuration.
6. For guardrail see Method 3 sheet B-8.3.1.
7. Type 2 cabinet foundation with pedestrian rail to be used on slopes of 3:1 or steeper.
NOTES:

1. Conduit holes in cabinet may be field drilled or factory drilled.

2. All ground wires entering the cabinet shall be terminated on the grounding lug. Grounding shall be in accordance with NDOT Standard Specifications and the National Electrical Code.

3. For Cabinets: Three 2½-inch holes and a handhole opposite the travel lanes shall be fabricated with poles but shall be field drilled on all other poles. Handhole and cover shall match others on pole. Deburr all edges after field drilling.

4. Location of pole mounted cabinets to be field verified by the engineer prior to installation.

5. Cabinet type may vary depending on installation requirements.

6. See cabinet identification code details.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

T-33.1.4
COMMUNICATION CABINET
POLE MOUNTED

TYPICAL CABINET ORIENTATION
NOTES:

1. An additional 120 V outlet to be installed on side rail near top, for equipment on either side of cabinet. Location to be approved by agency engineer before installation. Maximum of four outlets per cabinet.
NOTES:


2. LOADING:
   A. Importance Factors (I f & I r): 1.0
   B. Drag Coefficient (C d): 0.45 ± 2.0 Depending on shape of member and wind velocity
   C. Maximum Wind Load: 23.4 psf \times C d \times I
   D. Natural Wind Gusts: 5.2 psf \times C d \times I
   E. Wind Speed: 90 mph
   F. Ice Load: 3 psf
   G. Fatigue Category: 1

3. STRUCTURAL STEEL:
   A. Pole material is ASTM A53, Grade B Steel
   B. Steel tubing shall conform to ASTM A250, Grade C.
   C. Steel angle shall conform to ASTM A36.
   D. Hot dip galvanize structural steel after fabrication in accordance with ASTM A123.
   E. Hardware shall be galvanized as per ASTM A153.

4. MATERIAL REQUIREMENTS:
   A. Structural Steel:
   B. Drilled Shaft:
   C. Reinforcing Steel: ASTM A615 Grade 60
   D. Hot-dip galvanize all steel parts in accordance with ASTM A153. Lubricate threads with a dyed lubricant.
   E. High strength bolts shall be hot-dip galvanized in accordance with ASTM A325.
   F. Use prequalified joints.

5. WELDED CONNECTIONS:
   A. Welds shall be continuous unless otherwise noted on the plans.
   B. Use a hardened flat washer between the nut and the connected part.
   C. Use high strength bolts with DTI's or tension control indicators installed, Section 506.
   D. High strength bolts shall be hot-dip galvanized in accordance with ASTM A325.
   E. Use a hardened flat washer between the nut and the connected part.
   F. Use prequalified joints.

6. WELDED CONNECTIONS:
   A. Welds shall be continuous unless otherwise noted on the plans.
   B. Use a hardened flat washer between the nut and the connected part.
   C. Use high strength bolts with DTI's or tension control indicators installed, Section 506.
   D. High strength bolts shall be hot-dip galvanized in accordance with ASTM A325.
   E. Use a hardened flat washer between the nut and the connected part.
   F. Use prequalified joints.

7. FOUNDATION: Drilled shaft.
   A. Pole material is ASTM A53, Grade B Steel.
   B. Drilled Shaft: F'c=4000 psi
   C. Maximum Wind Load: 23.4 psf \times C d \times I
   D. Natural Wind Gusts: 5.2 psf \times C d \times I
   E. Wind Speed: 90 mph
   F. Ice Load: 3 psf
   G. Fatigue Category: 1

8. MATERIAL REQUIREMENTS:
   A. Structural Steel: See Above
   B. Drilled Shaft:
   C. Reinforcing Steel: ASTM A615 Grade 60
   D. Hot-dip galvanize all steel parts in accordance with ASTM A153. Lubricate threads with a dyed lubricant.
   E. Hardware shall be galvanized as per ASTM A153.

9. WELDED CONNECTIONS:
   A. Welds shall be continuous unless otherwise noted on the plans.
   B. Use a hardened flat washer between the nut and the connected part.
   C. Use high strength bolts with DTI's or tension control indicators installed, Section 506.
   D. High strength bolts shall be hot-dip galvanized in accordance with ASTM A325.
   E. Use prequalified joints.

10. FOUNDATION: Drilled shaft.

11. MATERIAL REQUIREMENTS:
    A. Structural Steel: See Above
    B. Drilled Shaft:
    C. Reinforcing Steel: ASTM A615 Grade 60
    D. Hot-dip galvanize all steel parts in accordance with ASTM A153. Lubricate threads with a dyed lubricant.
    E. Hardware shall be galvanized as per ASTM A153.
NOTES:

1. Drilled shaft shall be constructed according to Section 623.

2. Pile shall be formed 6-inch minimum below ground surface. Remainder to be placed against undisturbed material.

3. For number and size of conduit in foundation, see electrical plan sheets.

4. Depth of foundation (drilled shafts) will be measured from the lowest point on finished grade and length of pile will change accordingly.

5. Terminate No. 3 spiral reinforcement with 135 degree hook around main vertical reinforcement.

6. Before placing the foundation, contact the NDOT Geotechnical Engineering for further investigation when the following soil conditions:
   - (A) Soils with high organic content
   - (B) The site cannot support the drill rig
   - (C) Firm bedrock is encountered

7. Bonding and grounding shall meet the national electric code and NDOT standards. See pole grounding detail sheet T-30.5.2.

8. Structural bolts and other steel hardware shall be hot dipped galvanized in accordance with ASTM A 153 (AASHTO M 232).
NOTES:


2. LOADING:
   A. Importance factors \( W_i \) and \( k_i \):
      - 1.0
   B. Drag coefficient (Cd): 0.45 = 2.0 depending on shape of member and wind velocity.
   C. Maximum wind load: 23.4 psf \( \times \) Cd = 1
   D. Natural wind gusts: 5.2 psf \( \times \) Cd = 1
   E. Wind speed: 90 Mph
   F. Ice load: 2 psf
   G. Fatigue category: II

3. STRUCTURAL STEEL:
   A. Pole material: ASTM A53 Grade B Steel, \( F_y = 35 \) Ksi.
   B. Hot dip galvanize structural steel after fabrication in accordance with ASTM A123.
   C. Hardware shall be galvanized as per ASTM A153.

4. MATERIAL REQUIREMENTS:
   A. Structural steel thicker than \( \frac{1}{2} \) in: \( F_y = 36 \) ksi
   B. Drilled shells: \( F_y = 4000 \) psi
   C. Reinforcing steel:
      - ASTM A615 Grade 60
      - Hot dip galvanize all structural steel parts in accordance with ASTM A135 (AASHTO M232).
      - High strength bolts shall be hot-dip galvanized in accordance with ASTM A153 Class C, or mechanically galvanized in accordance with ASTM B695, Class 50.
      - Washers, nuts, and bolts in any assembly shall be galvanized by the same process. Lubricate threads with a dyed lubricant.
   D. Use only prequalified joints.
   E. Test all full penetration groove welds ultrasonically in accordance with Section 6, Part F of ANSI/AASHTO/AWS D1.1-2000.

5. BOLTED CONNECTIONS:
   A. Accomplish all structural high strength bolting, using AASHTO M164 bolts.
   B. Use a hardened flat washer between the nut and the connected part.
   C. Use high strength bolts with DTI's or tension control indicators installed per Section 506.
   D. High strength bolts shall be hot-dip galvanized in accordance with ASTM A153 (AASHTO M232).
   E. Use only welders qualified according to ANSI/AASHTO/AWS D1.1-2000, Section 4 for the type of joint, electrode, position of the joint, and the material thickness.
   F. Test all full penetration groove welds ultrasonically in accordance with Section 6, Part F of ANSI/AASHTO/AWS D1.1-2000. Accept or reject each weld discontinuity on the basis of its indication rating and its length in accordance with Section 9.3.
   G. All welds found to have incomplete fusion, overlap or cracks will be rejected.

6. REINFORCED CONCRETE:
   A. Concrete shall be continuous unless otherwise noted on the plans.
   B. Drilled shell: \( F_c = 4000 \) psi
   C. Reinforcing steel: \( F_y = 36 \) ksi
   D. Drilled shells: \( F_y = 4000 \) psi
   E. Ice load: 3 psf
   F. Wind speed: 90 Mph
   G. Natural wind gusts: \( 5.2 \) psf \( \times \) Cd = 1

7. FOUNDATION:
   A. Drilled shaft:
      - Fc = 4000 psi
      - Drilled shaft:
      - Drilled shaft:
      - Drilled shaft:

8. ATTACHMENT NOTES:
   A. Provide cable strain relief for all cables. Attach to top of pole when provided.
   B. All parts and hardware shall be galvanized as per Section 715.
   C. Use extra strong weight pipe for sleeves. See ASTM A 53.
   D. See slip base top and bottom plate details on sheet T-33.2.2

9. MATERIALS:
   A. Pole material: ASTM A53 Grade B Steel, \( F_y = 35 \) Ksi.
   B. Hot dip galvanize structural steel after fabrication in accordance with ASTM A123.
   C. Hardware shall be galvanized as per ASTM A153.

10. BOLT DETAIL:
    A. Bolt detail:
       - Type 1 ASTM A325 \( \frac{3}{4} \) x \( \frac{3}{4} \) " Bolt
    B. Bolt detail:
       - Type 1 ASTM A449 \( \frac{3}{4} \) x \( \frac{3}{4} \) " Bolt

11. ELEVATION:
    A. Elevation:
       - Pole Cap
       - Slip Base Support
       - Ground Line
       - Chord Line
       - Ground Line

12. SLIP BASE HEIGHT REQUIREMENT:
    A. Slip base height requirement:
NOTES:

1. Drilled shaft shall be Class "S" PCC as specified in the special provisions.

2. Prior to erection of the pole, backfill which is equivalent to the surrounding material shall be in place and compacted according to contract standards.

3. Pile shall be formed 6 inches minimum below ground surface. Remainder to be placed against undisturbed material.

4. If native soils are disturbed prior to erection of the pole, backfill which is equivalent to the surrounding material shall be in place and compacted according to contract standards.

5. Foundation depth (drilled shaft) will be measured from the lowest point on finished grade and length of pile will change accordingly.


7. Terminate No. 3 spiral reinforcement with 135 degree hook around main vertical reinforcement, with 1½ turns @ top and bottom.

8. If soil consists of organics or saturated silt and clay, contact Engineer before placing foundation.

9. Structural bolts and other steel hardware shall be hot dipped galvanized in accordance with AASHTO M 232 (ASTM A 153).

10. If slope of 2H:1V to 1.5H:1V (DEG) angle, contact Engineer before placing foundation.

SOILS CONDITIONS (FLAT TO 2H:1V)

<table>
<thead>
<tr>
<th>SITE FOUN. MATERIAL</th>
<th>DRAY UNIT WEIGHT (lb/ft³)</th>
<th>MAX. FRICTION ANGLE (DEG.)</th>
<th>MAX. COHESION (psf)</th>
<th>STRAIN</th>
<th>E50</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLAY</td>
<td>100</td>
<td>N/A</td>
<td>N/A</td>
<td>1000</td>
<td>0.007</td>
</tr>
<tr>
<td>SAND</td>
<td>100</td>
<td>30 (35+)</td>
<td>25</td>
<td>N/A</td>
<td>N/A</td>
</tr>
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</table>

* IN CASE THE SLOPE OF 2H:1V TO 1.5H:1V

SECTION A-A

SECTION B-B

SLIP BASE ASSEMBLY NOTES:

1. All parts and hardware shall be hot dipped galvanized as per Section 715.

2. Multi-directional slip bases are not required behind concrete barrier rail or guardrail where the sign post is greater than 2 feet 6 inches from the back side of the guardrail post.

3. Use extra strong weight pipe for pipe and sleeve, see ASTM A53.

4. For details on sign location post type panel bracing and sign brackets, see sheets T-34.1.1 thru T-34.1.6.

5. Stiffener shall be 2½" X 2½" X ½" on both sides of slip bolts, top and bottom.

PLAN VIEW

TOP/BOTTOM PLATE

STIFFENER DETAIL

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

Signed Original On File

DEPARTMENT OF TRANSPORTATION
STEEL POST
20 FOOT

T-33.3.2
(625)
NOTES:


2. LOADING:
   A. Importance factors (I f & I r): 1.0
   B. Drag coefficient (Cd): 0.45 - 2.0 depending on shape of member and wind velocity
   C. Maximum wind load: 23.4 psf Cd = 1
   D. Natural wind gust: 5.2 psf Cd = 1
   E. Wind speed: 90 Mph
   F. Ice load: 3 psf
   G. Fatigue category: II

3. STRUCTURAL STEEL
   A. Pole material: ASTM A53 Grade B Steel (Fy = 35 Ksi)
   B. Hot dip galvanize structural steel after fabrication in accordance with ASTM A123.
   C. Hardware shall be galvanized as per ASTM A153.

4. MATERIAL REQUIREMENTS:
   A. Structural steel (other than post) (ASTM A36): Fy = 36 ksi
   B. Drilled shaft:
   C. Reinforcing steel: ASTM A615 Grade 60
   D. Use only prequalified joints.
   E. High strength bolts shall be hot-dip galvanized in accordance with ASTM A490 (AASHTO M232).
   F. Use a hardened flat washer between the nut and the connected part.
   G. All parts and hardware shall be galvanized as per Section 715.

5. BOLTED CONNECTIONS:
   A. Accomplish all structural high strength bolting, using AASHTO M164 bolts.
   B. Use high strength bolts with DTI's or tension control indicators installed per Section 506.
   C. Use high strength bolts with DTI's or tension control indicators, galvanized by the same process. Lubricate threads with a dyed lubricant.
   D. Hot-dip galvanize all steel parts in accordance with ASTM A153 (AASHTO M232).

6. WELDED CONNECTIONS:
   A. Accomplish all structural high strength bolting, using AASHTO M164 bolts.
   B. Use a hardened flat washer between the nut and the connected part.
   C. Use high strength bolts with DTI's or tension control indicators installed per Section 506.
   D. Use only welders qualified according to ANSI/AASHTO/AWS D1.1-2000, Section 4 for the type of joint, electrode, position of the joint, and the material thicknesses.
   E. Fatigue category: II

7. FOUNDATION Drilled shaft.

8. Ground all structures in accordance with applicable electrical codes.

### BOLT DETAIL

- **ATTACHMENT NOTES:**
  1. Provide cable strain relief for all cables. Attach to "J" hook at top of pole, when provided.
  2. All parts and hardware shall be galvanized as per Section 715.
  3. Use extra strong weight pipe for sleeve. See ASTM A53.
  4. See slip base top and bottom plate details.

### SLIP BASE HEIGHT REQUIREMENT

### ELEVATION

### MAXIMUM CONFIGURATION

<table>
<thead>
<tr>
<th>Item</th>
<th>Area (SQFT)</th>
<th>Weight (LBS)</th>
<th>Distance From Bottom (FT)</th>
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<tr>
<td>Radar Speed Sign</td>
<td>8.75</td>
<td>36.00</td>
<td>23.00</td>
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<tr>
<td>Radar Speed Sign</td>
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<td>10.96</td>
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<tr>
<td>Display Housing</td>
<td>6.55</td>
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<td>8.11</td>
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<td>Solar Panel</td>
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<td>41.30</td>
<td>6.62</td>
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</tbody>
</table>

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

30 FOOT STEEL POST

<table>
<thead>
<tr>
<th>SHEET 1 OF 2</th>
</tr>
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<tbody>
<tr>
<td>T-33.4.1</td>
</tr>
<tr>
<td>(623)</td>
</tr>
<tr>
<td>Signed Original On File</td>
</tr>
<tr>
<td>CHIEF TRAFFIC OPS ENGR.</td>
</tr>
</tbody>
</table>
NOTES:
1. Drilled shaft shall be class "S" PCC as specified in the special provisions.
2. Pile shall be formed 6 inch min below ground surface. Remainder to be placed against undisturbed material.
3. If native soils are disturbed prior to retraction of the pile, backfill which is equivalent to the surrounding material shall be in place and compacted according to contract standards.
4. For number and size of conduit in foundation, see electrical plan sheets.
5. Depth of foundation (drilled shaft) will be measured from the lowest point on finished grade and length of pile will change accordingly.
6. Terminate No. 4 spiral reinforcement with 135 degree hook around main vertical reinforcement, with 1/2 turns @ top & bottom.
7. If soil consists of organics or saturated silty clay, contact Engineer before placing foundation.
8. Bonding and grounding shall meet the national electric code and NDOT standards. See pole grounding detail on sheet T-30.5.2.
9. Structural bolts and all steel hardware shall be hot dipped galvanized in accordance with AASHTO M 232 (ASTM A 153).

SOILS CONDITIONS (FLAT TO 2% HV)

<table>
<thead>
<tr>
<th>SITE FOUNDATION MATERIAL</th>
<th>MINIMUM DRY UNIT WEIGHT (pcf)</th>
<th>MAX DRY UNIT WEIGHT (pcf)</th>
<th>MAX DRY UNIT WEIGHT (pcf)</th>
<th>MODULUS OF ELASTICITY (kips/in²)</th>
<th>COHESION (kips/ft²)</th>
<th>DRAINAGE CLASS</th>
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<tr>
<td>CLAY</td>
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<td>N/A</td>
<td>N/A</td>
<td>1000</td>
<td>0.007</td>
<td>S</td>
</tr>
<tr>
<td>SAND</td>
<td>100</td>
<td>30 (35%)</td>
<td>25</td>
<td>N/A</td>
<td>N/A</td>
<td>NSF</td>
</tr>
</tbody>
</table>

* IN CASE THE SLOPE OF 2% HV TO 5% HV

POLE GROUNDING NOTES:
1. Connect bonding wire to the reinforcing steel cage near the midpoint of the foundation or anchor bolts.
2. Ground plate shall be made of nonferrous material typically brass or copper. Install NSF ground plate or equivalent.

PLAN VIEW
TOP/BOTTOM PLATE
Plate Thickness = 3/8"
GENERAL NOTES:

1. DESIGN SPECIFICATIONS:
   AASHTO Standard Specifications for Structural
   Supports for Highway Signs, Luminaires, and Traffic

2. LOADING:
   A. Importance Factors (I f & I r): 1.0
   B. Drag Coefficient (C d): 0.45 - 2.0 depending on
      shape of member and wind velocity
   C. Maximum Wind Load: 23.4 psf * C d * I
   D. Natural Wind Gusts: 5.3 psf * C d * I
   E. Wind Speed: 90 mph
   F. Ice Load: 3 psf
   G. FATIGUE CATEGORY: 1

3. SERVICEABILITY:
   Maximum 1 inch displacement for 30 mph wind speed.

4. STRUCTURAL STEEL:
   A. Pole material is ASTM A572 GRADE 50 STEEL.
   B. Steel tubing shall conform to ASTM A500, Grade C.
   C. Hot dip galvanize structural steel after fabrication in
      accordance with ASTM A123.
   D. Fabricate anchor bolts from material conforming to ASTM
      F1554 Grade 55.
   E. Weld in accordance with Section 506.
   F. Use only welders qualified according to ANSI/AASHTO/AWS
      D1.1-2000. Accept or reject each weld discontinuity on
      the basis of its indication rating and its length in
      accordance with section 9.3.
   G. Test all full penetration groove welds ultrasonically in
      accordance with section 6, Part F of ANSI/AASHTO/AWS
      D1.1-2000. Accept or reject each weld discontinuity on
      the basis of its indication rating and its length in
      accordance with section 9.3.
   H. Use only qualified joints.
   I. Have all fillet welds visually inspected by qualified
      personnel. Any welds found to have incomplete fusion,
      overlap or cracks will be rejected.

5. MATERIAL REQUIREMENTS:
   A. STRUCTURAL STEEL: Fy = 50 ksi
   B. DRILLED SHAFT: F'c = 4000 psi
   C. REINFORCING STEEL: ASTM A615 Grade 60
      All bends and hooks shall meet the requirements of the AASHTO
   D. Fabricate anchor bolts from material conforming to ASTM
      F1554 Grade 55.
   E. Hot-dip galvanize all steel parts in accordance with
      ASTM A153
   F. High strength bolts shall be hot-dip galvanized in accordance
      with ASTM A153, Grade C, or mechanically galvanized in accordance with
      ASTM B695, Class 50. Washers, nuts, and bolts in any assembly shall be
      galvanized by the same process. DTI shall be mechanically galvanized
      in accordance with ASTM B695. Lubricate threads with a dyed lubricant.

7. WELDED CONNECTIONS:
   A. Welds shall be continuous unless otherwise noted on the plans.
   B. Welds shall be continuous unless otherwise noted on the plans.
   C. Use only welders qualified according to ANSI/AASHTO/AWS
      D1.1-2000, Section 4 for the type of joint, electrode,
      position of the joint, and the material thickness.
   D. Use only prequalified joints.
   E. Use only prequalified joints.
   F. Have all fillet welds visually inspected by qualified
      personnel. Any welds found to have incomplete fusion,
      overlap or cracks will be rejected.

8. GROUTING
   A. Shim base plates to finish elevation and completely fill
      plate area with a high strength, non-ferrous, non-shrink
      grout.
   B. Formulate grout to comply with the ASTM C187.
   C. Taper all finished surfaces at 45 degree +/-.

9. FOUNDATION:
   A. Drilled shaft.
   B. Drilled shaft.
   C. Drilled shaft.
   D. Drilled shaft.
   E. Drilled shaft.
   F. Drilled shaft.
   G. Drilled shaft.
   H. Drilled shaft.
   I. Drilled shaft.
   J. Drilled shaft.

10. Ground all structures in accordance with applicable electrical codes.
NOTES:

1. Device mount assemblies to be installed and mounted per manufacturer's specification and recommendations.

2. See plan sheets and network diagrams for installation locations and equipment to be installed.

3. Install steel rain tight removable cap on top of pole if pole top device is not specified in plans.

4. Sweeps for conduit shall not be less than minimum bending radius of fiber.
NOTES:

1. For anchor bolt layout, refer to pole manufacturer's specifications.
2. Confirm base plate elevation with engineer prior to pouring of foundation.
3. Drilled shaft shall be constructed according to Section 623.
4. Pile shall be formed 6 inch min below ground surface. Remainder to be placed against undisturbed material.
5. For number and size of conduit in foundation, see electrical plan sheets, unless noted otherwise.
6. Depth of foundation (drilled shaft) will be measured from the lowest point on finished grade and length of pile will change accordingly.
7. Terminate No. 4 spiral reinforcement with 135 degree hook around main vertical reinforcement.
8. All anchor bolts and nuts shall conform to specifications ASTM Designation F1554 Gr.55 and shall be furnished with commercial quality washers.
9. Thread upper 8 inches of anchor bolts and galvanize entire bolt in accordance with ASTM A153 (AASHTO M232).
10. Before placing the foundation, contact the NDOT Geotechnical Engineering for further investigation when the following soil conditions are encountered:
   (A) Soils with high organic content
   (B) Firm bedrock is encountered
   (C) The site cannot support the drill rig
11. Bonding and grounding shall meet the national electric code and NDOT standards. See pole grounding detail sheet T-30.5.2.
12. Structural bolts and other steel hardware shall be hot dipped galvanized in accordance with ASTM A153 (AASHTO M232).

### Table

<table>
<thead>
<tr>
<th>ITS POLE</th>
<th>ANCHOR BOLTS DIA.</th>
<th>ANCHOR BOLT LENGTH</th>
<th>VERTICAL REINFORCING STEEL</th>
<th>DRILLED SHAFT DIAMETER</th>
<th>FOUNDATION DEPTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>30'</td>
<td>1'</td>
<td>44&quot;</td>
<td>12 - No. 7</td>
<td>38&quot;</td>
<td>7'</td>
</tr>
</tbody>
</table>

### Diagrams

**Detail 1**
- Foundation Depth = 7'
- Anchor Bolt Layout
- Vertical Reinforcement

**Detail 2**
- Ground Surface Away From Traffic
- Anchor Bolt Details

**Detail 3**
- No. 4 Spiral Reinforcement
- 4" Cover
- Ground Surface Away From Traffic
- Hex Nut and Flat Washer

**Section A-A**
- Base Plate
- Leveling Nut
- 4-1" Dia. ASTM F1554 Gr.55

**Notes**
- See Note 2
- See Note 5
- See Note 6

**Table Notes**
- See Table
- Equally Spaced
- Undisturbed Earth
GENERAL NOTES:

1. DESIGN SPECIFICATIONS:

2. LOADING:
   A. Importance Factors (I f & I r): 1.0
   B. Drag Coefficient (C d): 0.45 - 2.0 depending on shape of member and wind velocity
   C. Maximum Wind Load: 23.4 psf * C d * I
   D. Natural Wind Gust: 5.2 psf * C d * I
   E. Wind Speed: 90 mph
   F. Ice Load: 3 psf

3. SERVICEABILITY:
   Maximum 1 inch displacement for 30 mph wind speed.

4. STRUCTURAL STEEL:
   A. Pole material is ASTM A36 steel.
   B. Steel tubing shall conform to ASTM A500, Grade C.
   C. Hot dip galvanize structural steel after fabrication in accordance with ASTM A153.
   D. Hardware shall be galvanized as per ASTM A153 according to ASTM A123.

5. MATERIAL REQUIREMENTS:
   A. STRUCTURAL STEEL:
      F y = 36 ksi
   B. DRILLED SHAFT:
      F' c = 4000 psi
   C. REINFORCING STEEL:
      ASTM A615 Grade 60
   D. Hardware shall be galvanized as per ASTM A153.

6. BOLTED CONNECTIONS:
   A. Accomplish all structural high strength bolting, except anchor bolts, using AASHTO M164. Bolts.
   B. Use a hardened flat washer between the nut and the connected part.
   C. Use high strength bolts with DTIs or tension control indicators installed per Section 506.
   D. Fabricate anchor bolts from material conforming to ASTM F1854 Grade 36.
   E. Hot-dip galvanize all steel parts in accordance with ASTM A153 (AASHTO M232), except as shown for only the top 12 inches for anchor bolts, and as specified for high strength bolting.
   F. High strength bolts shall be hot-dip galvanized in accordance with ASTM A153, Class C, or mechanically galvanized in accordance with ASTM B695, Class 50. Washers, nuts, and bolts in any assembly shall be galvanized by the same process. DTI shall be mechanically galvanized in accordance with ASTM B695. Lubricate threads with a dyed lubricant.

7. WELDED CONNECTIONS:
   A. Welds shall be continuous unless otherwise noted on the plans.
   B. Weld in accordance with Section 506.
   C. Use only welders qualified according to ANSI/AASHTO/AWS D1.1-2000, Section 4 for the type of joint, electrode, position of the joint, and the material thickness.
   D. Use only prequalified joints.
   E. Test all full penetration groove welds ultrasonically in accordance with section 6, Part F of ANSI/AASHTO/AWS D1.1-2000. Accept or reject each weld discontinuity on the basis of its indication rating and its length in accordance with section 9.3.
   F. Have all fillet welds visually inspected by qualified personnel. Any welds found to have incomplete fusion, overlap or cracks will be rejected.

8. GROUTING:
   A. Shim base plates to finish elevation and completely fill plate area with a high strength, non-ferrous, non-shrink grout.
   B. Formulate grout to comply with the ASTM C107.
   C. Taper all finished surfaces at 45 degree +/-.

9. FOUNDATION: Drilled shaft.
10. Ground all structures in accordance with applicable electrical codes.
NOTES:
1. Device mount assemblies to be installed and mounted per manufacturer's specification and recommendations.
2. See plan sheets and network diagrams for installation locations and equipment to be installed.
3. Install steel rain tight removable cap on top of pole if pole top device is not specified in plans.
4. Sweeps for conduit shall not be less than minimum bending radius of fiber.
5. If VID is not specified in plans, do no install mast arm and install steel rain tight removable plate over mast arm connection.
NOTES:

1. Contractor shall coordinate with CCTV lowering device vendor for lowering device mounting requirements before CCTV pole fabrication.

Typical CCTV Pole Top Mount Plate

(For Tenon Mount) See Detail B

16" Diameter Bolt Circle

14" Diameter Bolt Circle

Pole Top Dia + ½"

(8) - ½" Dia Bolt Holes

1½" Thick Tenon Plate
With 5½" O.D. Center Hole

(4) - ½" x 2½" A325 Bolt W/Hex Nut, (1) Washer, and (1) Lock Washer

5½" x 1½" Slot
Cut in Pole Wall for Cable and Pulley Access

(2) - ½" Dia Holes

6" O.D. x ½" Wall x 12" Long Tenon

¼"

¼"

1½" Thick Tenon Plate
With 5½" O.D. Center Hole

(4) - ½" x 2½" A325 Bolt W/Hex Nut, (1) Washer, and (1) Lock Washer

5½" x 1½" Slot
Cut in Pole Wall for Cable and Pulley Access

(2) - ½" Dia Holes

6" O.D. x ½" Wall x 12" Long Tenon
NOTES:
1. Confirm base plate elevation with engineer prior to pouring of foundation.
2. Drilled shaft shall be constructed according to Section 509.
3. Pile shall be formed 6 inches minimum below ground surface. Remainder to be placed against undisturbed material.
4. For number and size of conduit in foundation, see electrical plan sheet, unless noted otherwise.
5. Depth of foundation (drilled shaft) will be measured from the lowest point on finished grade and length of pile will change accordingly.
6. Terminate No. 4 spiral reinforcement with 135 degree hook around main vertical reinforcement.
7. All anchor bolts and nuts shall conform to ASTM designation F1554 Gr. 55 and shall be furnished with commercial quality washers.
8. Thread upper 8 inches of anchor bolts and galvanize entire bolt in accordance with ASTM A153 (AASHTO M232).
9. Before placing the foundation, contact the NDOT Geotechnical Engineering for further investigation when the following soil conditions are encountered:
   (A) Soils with high organic content
   (B) The site cannot support the drilling rig
   (C) Firm bedrock is encountered
10. Bonding and grounding shall meet the National Electrical Code and NDOT Standards. See pole grounding detail on sheet T-30.5.2.
11. Structural bolts and other steel hardware shall be hot dipped galvanized in accordance with ASTM A153 (AASHTO M232).

<table>
<thead>
<tr>
<th>ITS POLE</th>
<th>ANCHOR BOLTS DIA</th>
<th>ANCHOR BOLT LENGTH</th>
<th>VERTICAL REINFORCEMENTS STEEL</th>
<th>DRILLED SHAFT DIAMETER</th>
<th>FOUNDATION DEPTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>55'</td>
<td>9/4&quot;</td>
<td>58&quot;</td>
<td>12 - No. 10</td>
<td>42&quot;</td>
<td>11'</td>
</tr>
</tbody>
</table>

See Note 8

Away From Traffic Ground Surface

Hex Nut and Flat Washer Base Plate

12-No. 10 Bars

No. 4 Spiral Reinforcement

Depth

SECTION A-A

DETAIL 1

DETAIL 2

DETAIL 3

SEE NOTE 8
GENERAL NOTES:

1. DESIGN SPECIFICATIONS:

2. LOADING:
   A. Importance Factors (IF & IR): 1.0
   B. Drag Coefficient (Cd): 0.45 - 2.0 depending on shape of member and wind velocity
   C. Maximum Wind Load: 23.4 psf * Cd * I
   D. Natural Wind Gusts: 5.2 psf * Cd * I
   E. Wind Speed: 90 mph
   F. Ice Load: 3 psf
   G. Fatigue Category: I

3. SERVICEABILITY:
   Maximum 1 inch displacement for 30 mph wind speed.

4. STRUCTURAL STEEL:
   A. Pole material is ASTM A572 Grade 50 steel.
   B. Steel tubing shall conform to ASTM A500, Grade C.
   C. Hot dip galvanize structural steel after fabrication in accordance with ASTM A123.
   D. Hardware shall be galvanized as per ASTM A153.

5. MATERIAL REQUIREMENTS:
   A. STRUCTURAL STEEL: \( F_y = 50 \text{ ksi} \)
   B. DRILLED SHAFT: \( F_c = 4000 \text{ psi} \)
   C. REINFORCING STEEL: ASTM A615 Grade 60
   D. anchors and hooks shall meet the requirements of the AASHTO LRFD Bridge Design Specifications, 5th Edition 2010 Article 5.10. All bend dimensions for reinforcing steel shall be out-to-out of bars.
   E. All placement dimensions for reinforcing steel shall be to center of bars unless noted otherwise.

6. BOLTED CONNECTIONS:
   A. Accomplish all structural high strength bolting, except anchor bolts, using AASHTO M154 Bolts.
   B. Use a hardened flat washer between the nut and the connected part.
   C. Use high strength bolts with DTHs or tension control indicators installed per Section 506.
   D. Fail-cote anchor bolts from material conforming to ASTM F1554 Grade 55.
   E. High strength bolts shall be hot-dip galvanized in accordance with ASTM A153, Class C, or mechanically galvanized in accordance with ASTM B695, Class 50. washers, nuts, and bolts in any assembly shall be galvanized by the same process. DTI shall be mechanically galvanized in accordance with ASTM B695. Lubricate threads with a dyed lubricant.

7. WELDED CONNECTIONS:
   A. Welds shall be continuous unless otherwise noted on the plans.
   B. Weld in accordance with Section 506.
   C. Use only welders qualified according to ANSI/AASHTO/AWS D1.1-2000, Section 4 for the type of joint, electrode, position of the joint, and the material thickness.
   D. Use only prequalified joints.
   E. Test all full penetration groove welds ultrasonically in accordance with section 6, Part F of ANSI/AASHTO/AWS D1.1-2000. Accept or reject each weld discontinuity on the basis of its indication rating and its length in accordance with section 9.3.
   F. Have all flat welds visually inspected by qualified personnel. Any welds found to have incomplete fusion, overlap, or cracks will be rejected.

8. GROUTING:
   A. Shim base plates to finish elevation and completely fill plate area with a high strength, non-ferrous, non-shrink grout.
   B. Formulate grout to comply with the ASTM C1107.
   C. Taper all finished surfaces at 45 degree +/-.

9. FOUNDATION: Drilled shaft.

10. Ground all structures in accordance with applicable electrical codes.
NOTES:
1. Device mount assemblies to be installed and mounted per manufacturer's specification and recommendations.
2. See plan sheets and network diagrams for installation locations and equipment to be installed.
3. Install steel iron tight removable cap on top of pole if pole top device is not specified in plans.
4. Sweeps for conduit shall be less than minimum bending radius of fiber.
NOTES:

1. Contractor shall coordinate with CCTV lowering device vendor for lowering device mounting requirements before CCTV pole fabrication.

2. For Wire Tie Off " Dia. (Varies by Manufacturer)

3. Typical CCTV Pole Top Mount Plate

4. Typical CCTV Pole Top Mount Plate (For Tenon Mount) See Detail B

5. Pole Top Dia + ½"

6. 17" Diameter Bolt Circle

7. 19" Diameter Bolt Circle

8. (8) - ¾" Dia Bolt Holes

9. Tube THK.

10. Base Plate

11. Bolt Holes (8) - ⅜" Dia

12. (1) Lock Washer


14. (4) - ⅝" x 2½" A325 Bolt W/Hex

15. 6" O.D. x ⅝" Wall x 12" Long Tenon

16. ⅝" Thick Tenon Plate With 5½" Dia Center Hole

17. (2) - ⅜" Dia Holes

18. 5½" Dia Tenon Plate ½" Thick (Typ)
NOTES:

1. For anchor bolt layout, refer to pole manufacturer's specifications.
2. Confirm base plate elevation with engineer prior to pouring of foundation.
3. Drilled shaft shall be constructed according to Section 509.
4. Pile shall form 6 inch minimum below ground surface. Remainder to be placed against undisturbed material.
5. For number and size of conduit in foundation, see electrical plan sheets, unless noted otherwise.
6. Depth of foundation (drilled shaft) will be measured from the lowest point on finished grade and length of pile will change accordingly.
7. Terminate No. 4 spiral reinforcement with 135 degree hook around main vertical reinforcement.
8. All anchor bolts and nuts shall conform to ASTM designation F1554 Gr. 55 and shall be furnished with commercial quality washers.
9. Thread upper 6 inches of anchor bolts and galvanize entire bolt in accordance with ASTM A153 (AASHTO M232).
10. Before placing the foundation, contact the NDOT Geotechnical Engineering for further investigation when the following soil conditions are encountered:
   (A) Soil with high organic content
   (B) Site cannot support the drill rig
   (C) Firm bedrock is encountered
11. Bonding and grounding shall meet the National Electric Code and NDOT Standards. See pole grounding detail on sheet T-30.5.2.
12. Structural bolts and other steel hardware shall be hot dipped galvanized in accordance with ASTM A153 (AASHTO M232).

<table>
<thead>
<tr>
<th>ITS POLE</th>
<th>ANCHOR BOLTS DIA</th>
<th>ANCHOR BOLT LENGTH</th>
<th>VERTICAL REINFORCEMENT STEEL</th>
<th>DRILLED SHAFT DIAMETER</th>
<th>FOUNDATION DEPTH</th>
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</thead>
<tbody>
<tr>
<td>80&quot;</td>
<td>1 1/2&quot;</td>
<td>58&quot;</td>
<td>12 - No. 10</td>
<td>48&quot;</td>
<td>16&quot;</td>
</tr>
</tbody>
</table>

- Place Concrete Against Undisturbed Earth
- Hex Nut and Flat Washer
- Leveling Nut
- Anchor Bolt 1 1/2" Dia. ASTM F1554 Gr.55 (Total of 6)
### General Notes:

1. **Design Specifications:**

2. **Loading:**
   - A. Importance Factors (If & Ir): 1.0
   - B. Drag Coefficient (Cd): 0.45 – 2.0 depending on shape of member and wind velocity
   - C. Maximum Wind Load: 23.4 psf \( \times \) Cd \( \times \) I
   - D. Natural Wind Gust: 5.2 psf \( \times \) Cd \( \times \) I
   - E. Wind Speed: 90 mph
   - F. Ice Load: 3 psf
   - G. Fatigue Category: 1

3. **Serviceability:**
   - Maximum 1 inch displacement for 30 mph wind speed.

4. **Structural Steel:**
   - A. Pole material is ASTM A572 Grade 50 steel.
   - B. Steel tubing shall conform to ASTM A500, Grade C.
   - C. Hot dip galvanize structural steel after fabrication in accordance with ASTM A123.
   - D. Fabricate anchor bolts from material conforming to ASTM F1554 Grade 55.

5. **Material Requirements:**
   - A. Structural Steel: \( F_y = 50 \text{ ksi} \)
   - B. Drilled Shaft: \( F_c = 4000 \text{ psi} \)
   - C. Reinforcing Steel: ASTM A615 Grade 60
   - D. Hardware shall be galvanized as per ASTM A153 in accordance with ASTM A123.
   - E. Hot dip galvanize structural steel after fabrication in accordance with ASTM A123.
   - F. Use only welders qualified according to ANSI/AASHTO/AWS D1.1-2000, Section 4 for the type of joint, electrode, position of the joint, and the material thickness.
   - G. Fatigue Category: I

6. **Bolted Connections:**
   - A. Accomplish all structural high strength bolting, except anchor bolts, using AASHTO MR4 Bolts.
   - B. Use a hardened flat washer between the nut and the connected part.
   - C. Use high strength bolts with DTI's or tension control indicators installed per Section 506.
   - D. Use only welders qualified according to ANSI/AASHTO/AWS D1.1-2000, Section 4 for the type of joint, electrode, position of the joint, and the material thickness.
   - E. Test all full penetration groove welds ultrasonically in accordance with section 6, Part F of ANSI/AASHTO/AWS D1.1-2000. Accept or reject each weld discontinuity on the basis of its indication rating and its length in accordance with section 9.3.

7. **Welded Connections:**
   - A. Welds shall be continuous unless otherwise noted on the plans.
   - B. Welds in accordance with Section 506.
   - C. Use only welders qualified according to ANSI/AASHTO/AWS D1.1-2000, Section 4 for the type of joint, electrode, position of the joint, and the material thickness.
   - D. Use only prequalified joints.
   - E. Test all full penetration groove welds ultrasonically in accordance with section 6, Part F of ANSI/AASHTO/AWS D1.1-2000. Accept or reject each weld discontinuity on the basis of its indication rating and its length in accordance with section 9.3.
   - F. Have all fillet welds visually inspected by qualified personnel. Any welds found to have incomplete fusion, overlap or cracks will be rejected.

8. **Grouting:**
   - A. Shim base plates to finish elevation and completely fill plate area with a high strength, non-ferrous, non-shrink grout.
   - B. Formulate grout to comply with the ASTM C1107.
   - C. Taper all finished surfaces at 45 degree \( \pm \). Align and level all finished surfaces with a high strength, non-ferrous, non-shrink grout.

9. **Foundation:** Drilled shaft.

10. **Ground all structures in accordance with applicable electrical codes.**

### Pole Attachments

<table>
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<tr>
<th>Description</th>
<th>QTY</th>
<th>Height (ft)</th>
<th>EA/AREA (sq.ft)</th>
<th>Height on Pole (ft)</th>
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<td>CCTV Camera</td>
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<td>300</td>
<td>2.5</td>
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<td>85.5</td>
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<tr>
<td>3' ROUND DISH ANTENNA</td>
<td>1</td>
<td>300</td>
<td>85.5</td>
<td>20</td>
</tr>
</tbody>
</table>
NOTES:

1. CCTV mount assembly to be installed and mounted per manufacturer's specification.
2. Wireless antenna assemblies to be installed and mounted per manufacturer's recommendations.
3. See plan sheets and network diagrams for installation locations and equipment to be installed at each location.
4. Install extremum light removable cap on top of CCTV mounting plate if CCTV is not specified in plans.
5. Sweeps for conduit shall not be less than minimum bending radius of fiber.
NOTES:

1. Contractor shall coordinate with CCTV lowering device vendor for lowering device mounting requirements before CCTV pole fabrication.

**Notes on Diagram:**
- 3/8" Dia. Rod for Wire Tie Off
- 3/4" Dia. Hole
- 5/8" x 1 1/4" Slot: Cut in Pole Wall for Cable and Pulley Access
- (4) - 5/8" Dia Holes: Center Hole
- 3/16" Thick Tenon Plate with 5/8" Dia Center Hole
- Type THK.
- 3/4" (Typ)
NOTES:

1. For anchor bolt layout, refer to pole manufacturer's specifications.
2. Confirm base plate elevation with engineer prior to pouring of foundation.
3. Drilled shaft shall be constructed according to Section 509.
4. Pole shall be formed 6 inch minimum below ground surface. Remainder to be placed against undisturbed material.
5. For number and size of conduit in foundation, see electrical plan sheets, unless noted otherwise.
6. Depth of foundation (drilled shaft) will be measured from the lowest point on finished grade and length of pile will change accordingly.
7. Terminate No. 4 spiral reinforcement with 135 degree hook around main vertical reinforcement.
8. All anchor bolts and nuts shall conform to ASTM designation F1554 Gr. 55 and shall be furnished with commercial quality washers.
9. Thread upper 8 inches of anchor bolts and galvanize entire bolt in accordance with ASTM A153.
10. Before placing the foundation, contact the NDOT Geotechnical Engineering for further investigation when the following soil conditions are encountered:
   (A) Soils with high organic content
   (B) The site cannot support the drill rig
   (C) Firm bedrock is encountered
11. Bonding and grounding shall meet the National Electric Code and NDOT Standards. See pole grounding detail on sheet T-30.5.2.
12. Structural bolts and other steel hardware shall be hot dipped galvanized in accordance with ASTM A153.

<table>
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<tr>
<th>N5 POLE</th>
<th>ANCHOR BOLTS DIA</th>
<th>ANCHOR BOLT LENGTH</th>
<th>VERTICAL REINFORCEMENT STEEL</th>
<th>DRILLED SHAFT DIAMETER</th>
<th>FOUNDATION DEPTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>80&quot;</td>
<td>1 1/2&quot;</td>
<td>58&quot;</td>
<td>12 - No. 10</td>
<td>48&quot;</td>
<td>20&quot;</td>
</tr>
</tbody>
</table>

SECTION A-A

DETAIL 1

DETAIL 2

DETAIL 3

SEE NOTE 8

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
COMMUNICATION POLE
NOTES:

1. Concrete shall be class A or AA.
2. All equipment to be installed to manufacturer recommendations.
3. See item typicals for details.
5. Use 2:1 max for narrow right-of-ways or 6:1 preferred for all others.
6. Site placement shall avoid drainage features.
7. Maintenance vehicle access composed of 6 inches of aggregate base or approved equivalent.

SECTION A-A

Maximum Clearance
Clear Zone of Protection

MINIMUM

SECTION B-B

Minimum Clear Zone Distance

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

RWIS SITE
WITH AC POWER

CHIEF TRAFFIC OPS ENGR.

T-33.9.1 (623)
Signed Original On File

REVISED 10/15

T-74
NOTES:
1. Concrete shall be class A or AA.
2. All equipment to be installed to manufacturer recommendations.
3. See item typicals for details.
5. Use 2:1 max for narrow right-of-ways or 6:1 preferred for all others.
6. Site placement shall avoid drainage features.
7. Maintenance vehicle access composed of 6 inches of aggregate base or approved equivalent.
NOTES:

1. Concrete shall be class A or AA.
2. All equipment to be installed to manufacturer recommendations.
4. Use 2:1 max for narrow right-of-ways or 6:1 preferred for all others.
5. Site placement shall avoid drainage features.
6. Maintenance vehicle access composed of 8 inches of aggregate base or approved equivalent.
SUPPLEMENTAL GROUND ROD SYSTEM INSTALLATION NOTES:

1. Auger a 5 inch wide by 20 foot deep hole for ground rod placement.
2. Remove protective tape at the bottom of the ground rod prior to installing ground rod in augered hole.
3. Install ground rod 12½ ft by 20½ ft. Type “K” copper, with 0.083 wall thickness.
4. Fill void around outside of ground rod with bentonite clay slurry.
5. Remove protective tape at the top of the ground rod once the bentonite clay slurry is installed.
6. Fill inside of hollow ground rod with non-hazardous calsoil mixture.
7. Exothermically weld pigtail to #4 AWG bare copper wire.
8. Install junction box (standard size) over top of ground rod.
9. Test ground rod system in accordance with HAR System requirements.
10. System to be installed per manufacturer's recommendation.

INSET A

NOTES:

1. Remove bonding jumper in equipment cabinet if installed between ac neutral and equipment grounds.
2. Bond all rigid galvanized steel conduit for coaxial cable.
3. Ensure equipment ground is electrically bonded to cabinet.

SECTION A-A

TRIAD GROUND ROD PLACEMENT DETAIL (TYPICAL EACH POLE)
GROUND RODS “A, B, C” ARE SUPPLEMENTAL GROUND RODS MAKING UP THE TRIAD GROUNDING SYSTEM.

1. Central Ground Rod 3½ ft X 10 ft
   - See Ground Rod Placement Detail
2. Ground Rod A
   - 1½ in. Min
   - See Ground Rod System Installation Notes
3. Ground Rod B
   - 1½ in. Min
   - See Ground Rod System Installation Notes
4. Ground Rod C
   - 1½ in. Min
   - See Ground Rod System Installation Notes

10° Radius Each Sphere of Influence

Central Ground Rod Located Next to Poles

TRIAD GROUND RODS “A, B, C” ARE SUPPLEMENTAL GROUND RODS MAKING UP THE TRIAD GROUNDING SYSTEM.
1. Size pole diameter and height per plans. Accommodating all equipment attachments.

2. Provide per manufacturer requirements cabinet, mounting brackets and wiring details. All other cabinets to be contractor furnished.

3. All ground wires entering the cabinet shall be terminated on the grounding lug. Grounding shall be in accordance with NDOT Standard Specifications and the National Electric Code.

4. Cabinet type may vary depending on installation requirements.

5. See cabinet identification code details.
CCTV Camera
NDOT Pole Data
Traffic Signal Pole
Accessory (Female) Connects to Camera Cable
Pole Cap / Camera Base
Part of Camera Accessory Cable and Connector:
MS Style Connector Weather Proof
STainless Steel Nuts Top and Bottom with Double Stainless Steel Nuts
$\frac{1}{2}"$ Stainless Steel All Thread w/ Single Stainless Steel Flat Washer and Double Stainless Steel Nuts (Each Side) to Extend Completely Through Pole and Cap 12-All-Thread Bolts Required Per Pole with Each Offset to Extend Through Pole.
Street Name
Camera and Lens Housing
$NDOT$ Pole Data
Traffic Signal/Pole
$\frac{1}{2}"$ Stainless Steel Bolts with Single Stainless Steel Washer Top and Bottom with Double Stainless Steel Nuts
Weather Proof MS Style Connector
Connects to Camera Accessory (Pole)
Cable
See Pole Data

See Detail A

See Detail B

See Detail C

CAMERA EXTENSION POLE

CAMERA MOUNTING

REVIEWED

CHIEF TRAFFIC OPS ENGR.
NOTES:
1. Contractor to coordinate with lowering device vendor for pole mounting design and hardware.
2. 2 inch internal riser conduit shall be provided and installed by the contractor. Install 2 inch LB conduit at the bottom of the pole to take the weight of the riser conduit. Allow a minimum of 5 feet of composite cable at the bottom of the pole for a service loop. Riser conduit and conduit are incidental to the CCTV lowering device.
3. Composite cable shall be provided by the lowering device manufacturer and shall run from the upper camera connection box to the CCTV controller cabinet without splices. Provide a 15 foot minimum service loop in the CCTV controller cabinet.

ORIENTATION VIEW
All Angles Measured Clockwise from Hand Hole as Viewed from Top End of Pole
MINIMUM MOUNTING HEIGHTS (MH)

<table>
<thead>
<tr>
<th>Freeways And Expressways</th>
<th>Single Signs</th>
<th>Double Signs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freeways And Expressways</td>
<td>7' (M) 5' (S)</td>
<td>8' (M) 6' (S)</td>
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<td>Commercial, Residential, Curb and Gutter</td>
<td>7' (M) 6' (S)</td>
<td>7' (M) 6' (S)</td>
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<td>Freeway Entrance Assembly</td>
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<tr>
<td>Chevrons &amp; One Way</td>
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</tr>
</tbody>
</table>

NOTES:
1. Horizontal clearance (HC) shall not be less than 12 feet from the edge of travelway. If a shoulder wider than 6 feet exists the minimum HC shall be 6 feet from the edge of the shoulder. In urban areas, a lesser clearance may be used when necessary.

2. For sign panel bracing details, see sheets T-34.1.4 and T-34.1.5.

3. All sign supports shall be of breakaway design, except when protected by longitudinal barriers or is placed outside clear zone.

4. For double post brace supports, maintain HC clear zone width, except when protected by guardrail or barrier rail.

5. Sign island required when h > 15 feet, or sign slope is steeper than 6:1, or when required in contract plans. Except when protected by guardrail or barrier rail or is placed beyond clear zone.

6. See sheet T-34.1.6 for sign island construction.

7. For sign posts, see post selection charts on sheet T-34.1.2.

8. Prepaint the exposed portion of fastening hardware on the face of the sign panels with baked enamel to match the sign face.
### POST SELECTION CHART

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<tr>
<th>SIGN AREA (SQ. FT.)</th>
<th>0-6.5</th>
<th>6.5-8.5</th>
<th>8.5-10.5</th>
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<td>Brace-3&quot; Dia Round Metal Post</td>
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<td>Double Post Unbraced 3&quot; Dia Round Metal Post</td>
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</table>

**NOTES:**
1. Sign area is total of major and secondary signs.
2. Alternate posts must be approved by Traffic Operations.
TYPICAL SINGLE PANEL BRACING

NOTES:
1. Brace(s) required if W > 18 inches. Install as shown.
2. Brace: ½" x 1½" aluminum alloy.
3. Cost for bracing is included in sign.
2 STRINGER MOUNTING

3 STRINGER MOUNTING

4 STRINGER MOUNTING

VERTICAL JOINT CLOSURE STRIP

NOTES:
1. Stringers: (3" x 2½" x ½") or (2½" x 2½" x ½") aluminum alloy Z-bar.
2. Stringers required on all signs requiring multiple posts.
3. Tubular stiffeners required when W > 10 feet.
4. Cost for bracing is included in sign.
5. One vertical joint if W exceeds 12 feet. Two vertical joints if W exceeds 24 feet.
6. For alternate steel tube bracing, see sheet T-34.1.5.

To obtain desired panel width, Max of 2 Panels May Be Cut Less Than 4', (1'-6" Min. Each)

SUB PANEL ASSEMBLY AND Z BAR BRACING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
ROADSIDE SIGNS
GENERAL SIGN PANEL BRACING

T-34.1.4
627
10/04
REVISED 8/69
ADOPTED
CHIEF TRAFFIC OPS ENGR.
TABLE 1
(Steel Tubing)

<table>
<thead>
<tr>
<th>PIPE DIA.</th>
<th>O.D.</th>
<th>A</th>
<th>B</th>
<th>CLAMP STOCK</th>
</tr>
</thead>
<tbody>
<tr>
<td>3” Nom.</td>
<td>3½”</td>
<td>3½”</td>
<td>6½”</td>
<td>1/4” x 1/2”</td>
</tr>
</tbody>
</table>

TABLE 2
(Tubing Size)

<table>
<thead>
<tr>
<th>SIGN WIDTH (W)</th>
<th>TUBING SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>24” or Less</td>
<td>3½” x 1/2”</td>
</tr>
<tr>
<td>24” to 28”</td>
<td>4½” x 1/2”</td>
</tr>
</tbody>
</table>

TABLE 3
(Truss Sizes)

<table>
<thead>
<tr>
<th>POST SIZE</th>
<th>W”</th>
<th>BOLT SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>4’ x 3”</td>
<td>3/8”</td>
<td>3/8” Dia. x 3/4”</td>
</tr>
<tr>
<td>4’ x 4”</td>
<td>5/16”</td>
<td>5/16” Dia. x 3/4”</td>
</tr>
<tr>
<td>6’ x 5”</td>
<td>5/16”</td>
<td>5/16” Dia. x 3/4”</td>
</tr>
<tr>
<td>6’ x 6”</td>
<td>7/32”</td>
<td>5/16” Dia. x 10/32”</td>
</tr>
</tbody>
</table>

NOTES:
1. For sub-panel assembly, and vertical joint closure strip details, see sheet T-34.1.4.

DETAIL A
STEEL TUBE BRACING ON ROUND METAL POSTS

DETAIL B
STEEL TUBE BRACING ON WOOD POSTS

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
ROADSIDE SIGNS
GENERAL
SIGN PANEL BRACING

CHIEF TRAFFIC OPS ENGR.
NOTES:
1. Sign islands to be compacted to 95%.
2. Undivided routes use 10:1. All divided routes use 6:1.
3. Use 2:1 max for narrow R/W or 6:1 preferred for all others.
NOTES:
1. Footings to be drilled holes as shown, and filled with class A or AA concrete.
2. Anchor post included in cost of sign.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ROADSIDE SIGNS
SQUARE METAL POSTS

Signed Original On File

CHIEF TRAFFIC OPS ENGR.
NOTES:
2. Maximum Panel Area: 32 Sqft
   Maximum Post Height: 11 ft
   Post Size: 3" x 3" x 0.25" Square Metal Post
3. Post Material: ASTM A53, Grade B
4. Steel Plate Material: ASTM A36
5. Welding Specifications: AASHTO/AWS D1.1
6. All hardware shall be "Hot-Dipped" galvanized after fabrication

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

6 INCH BARRIER SADDLE BRACKET
(SQUARE POST)
DOUBLE POST UNBRACED

SINGLE POST

NOTES:
1. Anchor post included in cost of sign.
2. Inner posts are those closest to roadway, and the outer posts are those farthest away.

\[ \frac{3}{4}" \times 4" \text{ Round Head, Square Neck} \\
\text{Corrosion Bolt, Hex Nut w/ Flange} \\
\text{Insert, Flat Washer Through Sign & Post} \]

\[ \text{Sign Summary Sheet} \\
\text{Post Length As Estimated In Plan T-34.2.8} \\
\text{See Standard Plan T-34.2.8} \]

\[ \text{MULTI-DIRECTIONAL Slip Base & Footing} \\
\text{See Standard Plan T-34.2.5} \]

\[ \text{Roadway} \]
NOTES:

1. Design Specifications:

2. Maximum Panel Area: 32 Sqft
   Maximum Post Height: 11 ft
   Post Size: 3 inch Dia, Round Metal Post (X-Strong).

3. Pipe Material: ASTM A53, Grade B.

4. Steel Plate Material: ASTM A36

5. Welding Specifications: AWS/D1.1

6. All hardware shall be "Hot-Dipped" galvanized after fabrication

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

BARRIER SADDLE BRACKET
(ROUND POST)

6 INCH BARRIER RAIL TYPE

<table>
<thead>
<tr>
<th>TYPE</th>
<th>DIRECTION</th>
<th>4&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td>8&quot;</td>
</tr>
<tr>
<td>FA</td>
<td></td>
<td>9&quot;</td>
</tr>
<tr>
<td>FD</td>
<td></td>
<td>9½&quot;</td>
</tr>
</tbody>
</table>

6. All  hardware shall be "Hot-Dipped" galvanized after fabrication.
FOOTING DETAIL

ASSEMBLY ELEVATION VIEW

1/2" x 3/8" Bolt, Type 1 ASTM A 325 or Type 1 ASTM A 449 (Grade 5); Each With Three USS Through-Hardened Washers ASTM F 436 Type 1 and One Nylon Insert Stop Nut ASTM A 563 DH. All Parts Shall Be Galvanized As Per Manufacturer's Specifications. Torque Within the Range of 24-29 FT-Lb. See Bolt Detail.

NOTES:
1. All parts and hardware shall be galvanized as per section 715 of the standard specifications, except as noted.
2. Multi-directional slip bases are not required behind concrete barrier rail or behind guardrail where the sign post is greater than 2 feet 6 inches from the back side of the guardrail post.
3. Use standard weight pipe for sign post and sleeve. See ASTM A 53.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
ROADSIDE SIGNS
ROUND METAL POSTS
MULTI-DIRECTIONAL SLIP BASE
T-34.2.5 (027,715) Signed Original On File
A-90150 7/16
CHIEF TRAFFIC OPS ENGR.
NOTES:

1. Footings to be drilled holes as shown, and filled with class A or AA concrete.
2. Anchor post and bracing included in cost of sign.
3. Inner posts are those closest to the roadway, and the outer posts are those farthest away.
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
ROADSIDE SIGNS
ROUND METAL POSTS
BRACED

ANCHOR BOLTS

DETAIL D
BRACE

DETAIL E
POST

Top Plate
Bottom Plate
Length of Brace Post Figured To This Point
1 1/4" Dia. x 2 1/2" Hex Head Bolts, Hex Nut w/ Fiber Inserts, & 4 Flat Washers Per Bolt
Torque to 240 in-lbs or 20 ft-lbs

2 Anchor Bolts
See DETAIL H

ANCHOR BOLTS

DETAIL H

Length of Post Figured To This Point
1 1/4" Dia. x 2 1/2" Hex Head Bolts, Hex Nut w/ Fiber Inserts, & 4 Flat Washers Per Bolt
Torque to 240 in-lbs or 20 ft-lbs

4 Anchor Bolts
See DETAIL H

No. 4 Reinforcing Steel Welded to Bolt (3" Min.)

Hex Nut w/ Fiber Insert & Flat Washer

Anchor Bolt

State of Nevada
Department of Transportation
Roadside Signs
Round Metal Posts
Braced

Anchor Bolts

Detail D
Brace

Detail E
Post

Length of Brace Post Figured To This Point
1 1/4" Dia. x 2 1/2" Hex Head Bolts, Hex Nut w/ Fiber Inserts, & 4 Flat Washers Per Bolt
Torque to 240 in-lbs or 20 ft-lbs

2 Anchor Bolts
See DETAIL H

ANCHOR BOLTS

DETAIL H

Length of Post Figured To This Point
1 1/4" Dia. x 2 1/2" Hex Head Bolt

4 Anchor Bolts
See DETAIL H

No. 4 Reinforcing Steel Welded to Bolt (3" Min.)

Hex Nut w/ Fiber Insert & Flat Washer

Anchor Bolt

Anchor Bolts

Detail D
Brace

Detail E
Post

Length of Brace Post Figured To This Point
1 1/4" Dia. x 2 1/2" Hex Head Bolts, Hex Nut w/ Fiber Inserts, & 4 Flat Washers Per Bolt
Torque to 240 in-lbs or 20 ft-lbs

2 Anchor Bolts
See DETAIL H

ANCHOR BOLTS

DETAIL H

Length of Post Figured To This Point
1 1/4" Dia. x 2 1/2" Hex Head Bolt

4 Anchor Bolts
See DETAIL H

No. 4 Reinforcing Steel Welded to Bolt (3" Min.)

Hex Nut w/ Fiber Insert & Flat Washer

Anchor Bolt
NOTES:
1. All posts with cross sectional area larger than (4" x 4") are to be drilled as shown.
2. Z-bars will be used on all signs requiring two posts.
3. For double post installations, inner posts are those closest to roadway, and outer posts are those farthest away.

RECTANGULAR TIMBER POST SELECTION

TABLE of HOLE DIAMETERS

<table>
<thead>
<tr>
<th>Post Size</th>
<th>Hole Dia</th>
<th>No Hole</th>
<th>2&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>W x H</td>
<td>x 4&quot;</td>
<td>4&quot;</td>
<td>4&quot;</td>
</tr>
</tbody>
</table>

FIELD DRILLED HOLES

- 2" Dia. Hole Axis Parallel to the Axis of the Sign Support
- Field Drilled Holes (See Table)

DETAIL A

- 3/8" Hex Head Bolt, Nut w/ Fiber Insert, and 2 Flat Washers and Lockwasher: Length of Bolt to be as Required by Post Dimension
- 1/2" x 1/2" Round Head, Square Neck, Carriage Bolt, Hex Nut w/ Fiber Inserts, at 1" Spacing
- 3/8" x 3/4" Aluminum Alloy Straps w/ 1/4" Carriage Bolt, Hex Nut w/ Fiber Insert, 2 Flat Washers Through Sign, Post, 
  & Straps: For W = 8"
NOTES:
1. All drilled holes in timber to be 5/16 inch diameter unless otherwise noted.
2. Back brace hole in 4" x 4" post to be drilled and fitted in field. All other holes may be shop drilled in standard position.
3. Footings to be drilled 1 foot - 6 inches diameter, 3 foot - 6 inches deep, filled with class A or AA concrete.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
T-34.3.2
(627)
Signed Original On File
## Taper Length and Channelizing Device Spacing

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>Line Width (ft)</th>
<th>Taper Length (L)</th>
<th>Channelizing Device Spacing (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>80</td>
<td>80</td>
<td>20</td>
</tr>
<tr>
<td>25</td>
<td>125</td>
<td>125</td>
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<td>30</td>
<td>150</td>
<td>180</td>
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<td>210</td>
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<td>715</td>
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</tr>
<tr>
<td>70</td>
<td>700</td>
<td>770</td>
<td>70</td>
</tr>
<tr>
<td>75</td>
<td>750</td>
<td>825</td>
<td>75</td>
</tr>
</tbody>
</table>

* On rural interstate highways where the speed limit is 65 mph or greater, the taper length of channelizing device spacing (except for tapers) may be increased to 60 feet when increased device spacing is used, 3 drums will be placed diagonally at 0.5 mile increments to indicate the lane is closed.

### Notes:
1. Projects with an existing speed limit greater than 55 mph may be temporarily reduced by 10 mph or to 55 mph, whichever is lower, with the concurrence from the Chief Traffic Operations Engineer. Any temporary reductions to a speed lower than 55 mph may be reduced with concurrence from the Chief Traffic Operations Engineer and a recommendation forwarded by Traffic Operations to the Director for approval.
2. The W1-3 signs shall be used when the recommended speed on curves is 30 mph or less, the W1-4 signs shall be used when the recommended speed is 35 mph or greater.
3. The W1-3 and W1-1 signs shall be installed alternately at 0.5 mile intervals when the lengths of crossovers exceed 0.5 mile.
4. All regulatory signs (R series) shall be black on retroreflective white.
5. All warning signs (W series) shall be black on retroreflective orange.
6. Warning signs shall be a minimum of 13' x 3' for speeds of 45 mph or less, R2-1 shall be 13' x 4'.
7. Warning signs shall be a minimum of 14' x 4' for speeds of 50 mph or greater, R2-1 shall be 14' x 5'.

### Typical Applications:
NDOT Standard Sheets T-35.1.2 thru T-35.1.17 include a variety of traffic control methods, but do not include a layout for every conceivable work situation. Typical applications should be altered when necessary to fit the conditions of a particular temporary traffic control zone. For additional information refer to the latest edition of the Manual on Uniform Traffic Control Devices (MUTCD) and revisions.

### Advance Warning Arrow Panel
- **Type A**
  - Minimum Size: 48 X 24
  - Posted Speed: 30 MPH OR LESS
- **Type B**
  - Minimum Size: 60 X 30
  - Posted Speed: 35 MPH TO 50 MPH
- **Type C**
  - Minimum Size: 96 X 48
  - Posted Speed: 55 MPH OR MORE
LEGEND:
- WORK AREA
- CHANNELIZING DEVICES
- ARROW BOARD
- 2.45 MPH
- OPTIONAL
* - SEE NOTE 1 ON SHEET T-35.1.4
□ - TRUCK MOUNTED ATTENUATOR (OPTIONAL)

SEE SHEET T-35.1.4 FOR TABLES AND NOTES
LEGEND:
- WORK AREA
- CHANNELIZING DEVICES
- ARROW BOARD
- 45 MPH
- OPTIONAL
- SEE NOTE 1 ON SHEET T-35.1.1
- SEE NOTE 2 ON SHEET T-35.1.1
SEE SHEET T-35.1.1 FOR TABLES AND NOTES
LEGEND:

- Work Area
- Channelizing Devices
- Barrier Rail Flare Rates
- 250' Min.
- Taper
- Shift Taper
- Taper
- Shldr.
- Flare
- Buffer
- Solid Yellow Line
- Existing Striping
- Temporary Stripping
- Temporary Impact Attenuator
- Temporary Barrier Rail

BARBER RAIL FLARE RATES

<table>
<thead>
<tr>
<th>Design Speed</th>
<th>Flare Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>70 mph</td>
<td>20:1</td>
</tr>
<tr>
<td>60 mph</td>
<td>18:1</td>
</tr>
<tr>
<td>55 mph</td>
<td>16:1</td>
</tr>
<tr>
<td>50 mph</td>
<td>14:1</td>
</tr>
<tr>
<td>45 mph</td>
<td>12:1</td>
</tr>
<tr>
<td>40 mph</td>
<td>10:1</td>
</tr>
<tr>
<td>35 mph</td>
<td>8:1</td>
</tr>
</tbody>
</table>

MULTILANE SHIFT SIGNS

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPICAL TRAFFIC CONTROL
FOR MULTILANE SHIFT

T-35.1.6
SIGNED ORIGINAL ON FILE
REVISED 3/02
ADOPTED 10/15
CHIEF TRAFFIC OPS ENGR.
TYPICAL PLACEMENT OF LOOSE GRAVEL/DUST HAZARD SIGNS

TYPICAL PLACEMENT OF BUMP SIGNS

TYPICAL PLACEMENT OF SHOULDER DROP OFF SIGNS

TYPICAL PLACEMENT OF UNEVEN LANES SIGNS

LEGEND:
- - Optional
* - See Note 1 on Sheet T-35.1.1

SEE SHEET T-35.1.1 FOR TABLES AND NOTES

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPICAL TRAFFIC CONTROL
FOR SHLDR. DROP-OFF/
UNEVEN LANES/DUST HAZARD
/LOOSE GRAVEL AND BUMP

T-35.1.11 (6/25) Signed Original On File
ADOPTED 6/25 REVISED 6/25
CHIEF TRAFFIC OPS ENGR.
FLAGGER (LOCATIONS TO BE DETERMINED BY THE FIELD ENGINEER)

WORK ZONE

CHANNELIZING DEVICES

CHANNELIZING DEVICES @ 6.0 ft SPACING LOCATION TO BE DETERMINED BY FIELD ENGINEER

TWO LANE FACILITY.

NOTE - REMOVE MEDIAN TRAFFIC CONTROL SIGNS ON A ROAD WORK AHEAD PREPARE TO STOP

MATCH LINE "A"

DOUBLE IN WORK ZONES PENALTY

RIGHT LANE CLOSED AHEAD

TAPER TAPER

LEGEND:

- WORK ZONE
- CHANNELIZING DEVICES @ 5.0 ft SPACING
- CHANNELIZING DEVICES
- FLATGER LOCATIONS TO BE DETERMINED BY THE FIELD ENGINEER
- ARROW BOARD
- USE WHEN SPEEDS ARE > 45mph
- LOCATION TO BE DETERMINED BY FIELD ENGINEER

NOTE - REMOVE MEDIAN TRAFFIC CONTROL SIGNS ON A TWO LANE FACILITY.

SEE SHEET T-35.1.1 FOR TABLES AND NOTES

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPICAL TRAFFIC CONTROL
INTERSECTION WORK ONLY (OUTSIDE LANE)

T-35.1.12
ADOPTED 6/16
REVISED: 10/02
SIGNED ORIGINAL ON FILE

CHEF TRAFFIC OPS ENGR.
ROAD WORK AHEAD
PREPARE TO STOP

DOUBLE IN WORK ZONES PENALTY

MATCH LINE "A"

LEGEND:
- WORK ZONE
- CHANNELIZING DEVICES @ 6.0 ft. SPACING
- CHANNELIZING DEVICES
- FLAGGERS (LOCATIONS TO BE DETERMINED BY THE FIELD ENGINEER)
- USE WHEN SPEEDS ARE > 45 mph

NOTE - REMOVE MEDIUM TRAFFIC CONTROL SIGNS ON A TWO LANE FACILITY.

SEE SHEET T-35.1.1 FOR TABLES AND NOTES

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPICAL TRAFFIC CONTROL
INTERSECTION WORK ONLY
(MEDIAN WITH ISLAND)

T-35.1.13 (025)
Signed Original On File
ADOPTED 9/2002
REvised 6/2006
CHIEF TRAFFIC OPS ENGR.
ROAD WORK AHEAD  PREPARE TO STOP

MATCH LINE "A"

DOUBLE IN WORK ZONES PENALTY

LEGEND:

- WORK ZONE
- CHANNELING DEVICES @ 6.0 ft SPACING
- CHANNELING DEVICES
- FLAGGER LOCATIONS TO BE DETERMINED BY THE FIELD ENGINEER
- ARROW BOARD
- USE WHEN SPEEDS ARE 2.45mph

NOTE - REMOVE MEDI AN TRAFFIC CONTROL SIGNS ON A TWO LANE FACILITY.

SEE SHEET T-35.1.1 FOR TABLES AND NOTES

STATE OF NEVADA DEPARTMENT OF TRANSPORTATION

TYPICAL TRAFFIC CONTROL INTERSECTION WORK ONLY (MEDIAN WITH NO ISLAND)

T-35.1.14 (6/25)  SIGNED ORIGINAL ON FILE
REVISED 6/26  CHIEF TRAFFIC ONS ENGR.
LEGEND:

- WORK ZONE
- CHANNELIZING DEVICES @ 6.0 ft SPACING
- ARROW BOARD
- CHANNELIZING DEVICES
- LOCATION TO BE DETERMINED BY FIELD ENGINEER

NOTE - REMOVE MEDIAN TRAFFIC CONTROL SIGNS ON A ROAD WORK AHEAD
MATCH LINE "A"
DOUBLE IN WORK ZONES PENALTY
RIGHT LANE CLOSED AHEAD

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPICAL TRAFFIC CONTROL
INTERSECTION WORK ONLY
NO FLAGGERS (OUTSIDE LANE)

SEE SHEET T-35.1.1 FOR TABLES AND NOTES

CHIEF TRAFFIC OPS ENGR.
LEGEND:

- WORK ZONE
- CHANNELING DEVICES @ 6.0 ft SPACING
- CHANNELING DEVICES
- USE WHEN SPEEDS ARE < 45mph

NOTE - REMOVE MEDIAN TRAFFIC CONTROL SIGNS ON A TWO LANE FACILITY

SEE SHEET T-35.1.1 FOR TABLES AND NOTES
ROAD WORK AHEAD

MATCH LINE "A"

DOUBLE IN WORK ZONES PENALTY

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPICAL TRAFFIC CONTROL INTERSECTION WORK ONLY
NO FLAGGERS
(MEDIAN WITH NO ISLAND)

NOTE - REMOVE MEDIAN TRAFFIC CONTROL SIGNS ON A TWO LANE FACILITY.
SEE SHEET T-35.1.1 FOR TABLES AND NOTES
**NOTES:**

1. Approved barricades are listed on the NDOT QPL.

2. Type III B barricades used for temporary sign supports, signs shall be mounted 1 foot minimum from ground and comply with MUTCD current edition.

3. Markings for barricade rails shall be retroreflective fluorescent orange and white stripes sloping downward at an angle of 45 degrees in the direction of traffic as shown.

<table>
<thead>
<tr>
<th>TYPE I BARRICADE</th>
<th>TYPE II BARRICADE</th>
<th>TYPE III B BARRICADE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width of Stripes</td>
<td>Roll Length &lt; 3' = 4&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>Number of Retroreflective Rails</td>
<td>Roll Length ≥ 3' = 6&quot;</td>
<td>2 (One Each Direction) 4 (Two Each Direction) 3 (One Direction Only)</td>
</tr>
</tbody>
</table>

**TRAFFIC DRUMS**

**ORANGE TRAFFIC CONES**

Shall Have a Minimum of 2-White and 2-Retroreflective Fluorescent Orange Bands

* 2" Max. Non-Retroreflective Material
** 4" Min. – 6" Max. Retroreflective Material

Traffic Side

Roadway/Ground Surface

Traffic Side

Roadway/Ground Surface

Traffic Side

Roadway/Ground Surface

Traffic Side

Roadway/Ground Surface
NOTES:
1. One railroad crossing kit per travel lane.
2. If needed, supplemental railroad pavement marking symbol(s) may be placed between the first railroad pavement marking symbol and the railroad crossing, but should be at least 50 feet from the stop/yield lines.
3. A three-lane roadway should be marked with a centerline for two-lane approach operation on the approach to a railroad crossing.
4. On multi-lane roads, the transverse bands should extend across all approach travel lanes, and individual RxR symbols should be used in each approach travel lane.
5. Pavement markings for stop/yield lines, transverse bands and center lines are required in addition to pavement markings as shown in detail A.
6. Additional information on railroad grade crossings can be found in the current MUTCD, Part VIII.
7. Stop/yield lines shall be perpendicular to roadway and shall be white.
8. For sign mounting details, see sheets T-34.1.1 thru T-34.1.3, T-34.1.6 and T-34.2.1.
9. The distance X shall be noted in the plans and/or structure list.
10. At a passive crossing a yield sign and line shall be used unless an engineering study or judgement determines a stop sign and line is appropriate.
11. The edge of the detectable warning nearest to a railroad crossing shall be 15 feet from the nearest rail. Where there is no pedestrian gate, the edge of the detectable warning nearest to the railroad crossing shall be 10 feet from the nearest rail.

LEGEND:
- SEN
- RR/R CROSSING SIGNAL AND GATE (TYPICAL)
- STOP BAR (TYPICAL) (24" SOLID WHITE)
- YIELD LINE (TYPICAL) SEE SHEET T-38.1.3
- DETECTABLE WARNING

Table for Minimum Spacing of Advance Warning Sign

<table>
<thead>
<tr>
<th>SPEED (MPH)</th>
<th>D (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
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<tr>
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STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
RAILROAD CROSSING:
SIGNAL AND GATE PLACEMENT
PAVEMENT MARKINGS
DETECTABLE WARNINGS
T-35.3 (627,634)
Signed Original On File
ADOPTED 7/96
REVISED 7/06
CHIEF TRAFFIC OPS ENGR.
NOTES:
1. Ring type guardrail may be installed to provide protection for the signal assembly in industrial or other areas involving only low-speed highway traffic and where signals are vulnerable to damage by turning truck traffic. Use of ring type guardrail requires approval by the Chief Safety Engineer or the Chief Roadway Design Engineer.
2. For railroad-highway grade crossings marking details refer to sheet T-35.3.
3. For W-beam details see sheet R-8.5.1.
4. For triple corrugation guardrail details, see sheet R-8.4.1.
5. Special guardrail terminal to be installed on guardrail end nearest to railroad.
6. No post holes shall be drilled next to the signal apparatus without first notifying the railroad inspector.
7. For signals with less than 7 feet refer to sheet R-8.3.1 and 1996 AASHTO Roadside Design Guide Table 5.3 for alternate post spacing.
8. For triple corrugation terminal connector details not shown refer to Standardized Highway Barrier Hardware by AASHTO-AGC-ARTBA report may 1995.
9. Form concrete around 15" x 8" post wrapped with 1 layer of 1/4 inch to 1/2 inch thick expanded polystyrene foam sheeting. Don't nail polystyrene foam to post.

SPECIAL GUARDRAIL TERMINAL END
NOTES:

1. Mounting height to bottom of "Authorized Vehicles Only" sign shall be 6 feet from original ground.

2. Type III reflective sheeting shall be used on sign installations and Type 2 (modified) object markers.

3. Place (6) Type 2 (modified) object markers one 500 feet in advance of median crossover and one on each side of crossover as shown on drawing.

4. Place Type 2 (modified) object markers 6 feet from edge of pavement. See Sheet R-9.2.1 for dimensions not shown.
**Notes:**

1. For details 1 thru 4 see "Structural Frame Details" sht. T-36.1.6.
2. For sign panel frames see "Removable Sign Panel Frames" sht. T-36.1.8.
3. For connection of frame to post see "Frame Juncture Details" sht. T-36.1.7.
4. For walkway see "Standard Walkway Details No. 1 and No. 2" shs. T-36.1.9 and T-36.1.10.
5. For typical walkway arrangement, special instructions, and examples, see "Instructions and Examples" sht. T-36.1.1.
6. Minimum length of frame = 12 feet. Maximum length of frame = 60 feet.
7. For arm lengths 35 feet to 40 feet and sign depths 80 inches thru 160 inches:
   A. Use 1 1/4 x 1 1/4 x 3/4 inch wind bracing.
   B. Frame width = cap plate + 3/8 inch.
8. On single post sign structures, the post shall be raked out of plumb, with the use of the leveling nuts to make the bottom of the sign frame level.
9. At final position of post all top and bottom nuts shall be tightened against base plate.
10. Diagonal not required if arm length is equal to or less than shown in this column of Table IV.

**Table IV**

<table>
<thead>
<tr>
<th>Sign Panel Depth</th>
<th>Frame Depth</th>
<th>Maximum Vertical Spacing</th>
<th>Arm Length Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>70&quot;</td>
<td>6&quot;-4&quot;</td>
<td>30&quot;x6&quot;</td>
<td>4&quot;</td>
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<tr>
<td>80&quot;</td>
<td>6&quot;</td>
<td>30&quot;x6&quot;</td>
<td>4&quot;</td>
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<tr>
<td>90&quot;</td>
<td>6&quot;</td>
<td>30&quot;x6&quot;</td>
<td>4&quot;</td>
</tr>
<tr>
<td>100&quot;</td>
<td>6&quot;</td>
<td>30&quot;x6&quot;</td>
<td>4&quot;</td>
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<td>110&quot;</td>
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<td>30&quot;x6&quot;</td>
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<td>4&quot;</td>
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<td>10'-6&quot;</td>
<td>30&quot;x6&quot;</td>
<td>4&quot;</td>
</tr>
<tr>
<td>180&quot;</td>
<td>10'-6&quot;</td>
<td>30&quot;x6&quot;</td>
<td>4&quot;</td>
</tr>
</tbody>
</table>

* Use 5 x 3 x ‡" for 160" sign panel depth (arm length = 46').
* Use 5 x 3 x ‡" for 160" sign panel depth (arm lengths = 44' to 45').
* Use 5 x 3 x ‡" for 150" sign panel depth (arm lengths = 45' to 46').
* Use 5 x 3 x ‡" for 140" sign panel depth (arm length = 46').

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**State of Nevada**

DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS

SINGLE POST

STRUCTURAL FRAME MEMBERS

T-36.1.4 (627) Signed Original On File

CHIEF BRIDGE ENGR.
### Plate C-10

**SINGLE POST TYPE**

**Rev**

**Adopted**

**Signed Original On File**

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**Frame Juncture Details**

**Upper Chord Connection to Post**

**Notes (Single Post Type)**

1. Drilled holes for unfinished bolts shall not exceed nominal bolt diameter by more than 1/8 inch.
2. All bolts, nuts and washers shall be galvanized.
3. In all cases, sign frame shall be supported at top of post. Bearing surface at top of post shall be finished true.
4. At lower juncture connection, shims may be galvanized steel cut washers, where any clearance exists between bottom of frame and post. Prior to tightening of bolts in lower connection, shims may be galvanized steel cut washers.

---

**Support Details**

**T-36.1.2 for Cap Plate Dimensions**

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**T-36.1.7**

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**Overhead Signs Frame Juncture Details**

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**State of Nevada Department of Transportation**

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ALTERNATIVE CONNECTIONS AT TOP CHORD

SECTION C-C

SECTION D-D

NOTES:
1. For steel removable sign panel frame details, see sheet T-36.1.8.
2. Minimum fillet weld is ¼ inch for clip angles welded to chord member of truss.
3. Maximum spacing of bottom clip angle is (5'-6").
4. Top clip required for each vertical member or removable sign panel frame.
NOTE:
1. Sign struts shall be installed along each of the removable sign frames vertical members. All new angles and W-shapes shall conform to ASTM A36. Sign struts may be cut to length on site. Sign struts, mounting clips and all mounting hardware shall be hot dip galvanized after fabrication. Touch up of field cuts with a zinc rich paint.
2. Sign panel may be adjusted horizontally to avoid existing mounting brackets. If existing mounting brackets need to be removed use care during cutting operation. Do not gouge existing cord angles, grind weld areas smooth, touch up grind area with a zinc rich paint.
3. Discard all existing 1/2-inch bolts, nuts and washers.
4. All holes to be 1/8-inch in diameter unless otherwise noted. All new bolts shall be a 1/2-inch diameter hex bolt head with nut, flat washer and lock washer. All bolts to be galvanized per ASTM A153.
5. The cost of removing existing panel, manufacturing sign struts, mounting brackets, mounting hardware, reinstallation of the existing and/or new sign panel and any other related work in relocating the existing sign panel shall be included in the bid item 627 0022 "Permanent Overhead Sign Panel Reconstruct", each.
6. Remove existing sign fixtures to be paid for under bid item 202 0318 "Remove Lighting Fixture", each. Any additional conduit and/or conductor needed to install light fixtures, to be paid for under bid item 623 0144 "Sodium Vapor Luminaire, 150 watt", each.
7. Install new 150 watt high pressure sodium vapor sign lighting fixtures, use holophane "PANL15AHP*24DG" or an approved equal. Item includes cost of any additional conduit and/or conductor needed to install light fixtures, to be paid for under bid item 623 0144 "Sodium Vapor Luminaire, 150 watt", each.
8. Walkway grating and safety railing to be removed if luminaire retrieval system is to be installed.
9. For Pile Foundation and Pole Grounding Details see sheet T-30.5.2

PROCEDURE:
1. Field measure existing sign H = height.
2. Cut W 6 x 12 to length needed, generally (H + 1'-4"
3. Remove existing sign panel. Discard existing 1/2-inch bolts.
4. Install new sign struts and mounting brackets.
5. Reinstall existing sign panel.
6. Remove and discard existing sign lighting fixture when noted.
7. Install new sign lighting fixtures and luminaire retrieval system as noted in plans.
8. For Pile Foundation and Pole Grounding Details see sheet T-30.5.2
NOTES:

1. Ensure vertical clearance to mounting hardware is not less than vertical clearance to bridge soffit.
2. Discard all existing bolts, nuts, and washers.
3. Use all new bolts, flat and locking washers, and nuts.
4. All bolts to be galvanized per ASTM A153.
5. Cost of removing existing light fixture mounting channel (if required) and reinstalling it shall be included in the cost of the new light fixture (no additional payment).
6. Remove existing light fixtures to be paid for under bid item 202-0348 “Remove Lighting Fixture”, each.
7. Install new 150 watt high pressure sodium vapor sign lighting fixtures, item includes cost of any additional conduit and/or conductor needed to install light fixtures. To be paid for under bid item 623-0144 “Sodium Vapor Luminaire, 150 watt”, each.
8. On structures with existing high pressure sodium vapor luminaries, remove and reset lights as shown. All work associated with removing and resetting luminaires including any new conduit or conductor shall be paid for under bid item 623-0840, “Remove and Reset Luminaire”, each.

 See Table of Spacing For Spacing of Lighting Fixtures, Sheet T-30.1.16.1
DETAIL 12

SECTION V-V

DETAIL 13

NOTES:

1. Welded-type grating shall have (1/4"x1/3") bearing bars @ 1-3/4 inch centers with 1/4 inch diameter for equal cross bars @ 4 inch centers, see detail 12. If mechanical lock grating is used it shall be equal in strength to the welded-type. Alternate hold down clips may be submitted for approval.

2. For spacing of lighting fixtures see table of spacings on sheet T-30.1.9.1.

3. Walkway grating and light fixture mounting channels to be continuous (no splices) over as many walkway brackets as practicable, consistent with fabrication, ease of handling and assembling. See contract plans to determine if walkway grating and safety railing is required.

4. Bolts, nuts, washers, etc. to be galvanized.
ON STRUCTURE MOUNTED SIGNS REPLACE GUTTER WITH 2" X 2" X 1/4" POSITIONED WITH GAGE LINE 7" FROM MOUNTING BRACKET 23 5/8" X 3 5/8".

SAFETY ANGLE DETAILS

NOTE: GUTTER SECTION
1. Gutter sections to be made in convenient lengths and welded or brazed together in the field.
2. On sign bridges where panels face two directions, and gutters 1 inch past edge of panels nearest to span.

TYPICAL GUTTER SECTION

FOR DOUBLE-FACED SIGN FRAMES

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

WALKWAY DETAILS NO. 2

OVERHEAD SIGNS

WALKWAY DETAILS

See contract plans to determine if fixed lighting, safety rail and walkway grating or luminaire retrieval system is required.
**State of Nevada Department of Transportation**

**Overhead Signs Luminaire Retrieval System Mounting Detail**

10/15 REVISED 1/09

**Section A-A**

- Light Fixture
- S 4 x 7.7
- Members
- Lower Chord
- Mounting Clip Angle
- Sign Panel Frame
- 7" Gutter
- 3'-0" Face of Sign to Center of Luminaire
- 4'-0" Linear Feet Payment
- See Manufacturer Shop Drawings
- Luminaire Retrieval System - See Manufacturer Shop Drawings
- Linear Feet Payment
- Right Edge of Shoulder
- Left Edge of Shoulder
- 2'-6" Max.
- Maximum Spacing L to L = 5'-6" (Typ.)
- Minimum Number of Brackets, Spacing May Be Varied to Utilize a
- Manufacturer Shop Drawings
- Luminaire Retrieval System
- See Manufacturer Shop Drawings
- Sign Panel Frame
- Mounting Clip Angle
- Lower Chord Members
- Stiffener Plate
- W12 x 19 Spacer Block
- 1/2" Holes for 5/16" Bolt
- 4'-0" Hole For 5/16" Bolt

Signed Original On File

Chief Bridge Eng.
NOTES:

1. Special care shall be taken to ensure that the completed hinge and latch assembly will hold the safety railing in a steady manner, free of wobble while in the raised position. Maximum allowable displacement from vertical at top of railing when latched shall be 1 inch.

2. Details for bolting hinge base P to walkway bracket may be submitted for approval.

3. Alternative details approved by the engineer may be substituted for the safety chain connections shown.

4. Special care shall be taken to ensure the proper installation of construction details and proper functioning of the finished product. Alignment and connection of parts shall be done accurately and securely to ensure the integrity of the finished product.

5. Elevation and plan views are shown for reference. Actual dimensions and materials may vary depending on the specific application and requirements.

6. See Detail 15 and Detail 16 for further information on the components and connections.

7. Contact the engineer for any necessary changes or modifications to the design.

8. The finished product must meet all applicable safety standards and regulations.

9. Use appropriate materials and construction techniques to ensure the longevity and durability of the finished product.

10. The use of safety equipment and proper work practices is required during the installation process to prevent accidents and injuries.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
WALKWAY SAFETY RAILING DETAILS

T-35, 1.11 (627) Signed Original On File
ADOPTED: REVISED: 11/95
CHIEF BRIDGE ENG.
NOTES:
1. For anchor bolt layout see sheet T-36.1.2 and T-36.1.3.
2. For base plate elevation, see contract plans.
3. Pedestal shall be class A or AA concrete. Pile concrete shall be class D or DA.
4. Longer side of base plates and pedestals shall be oriented perpendicular to the sign axis.
5. Prior to erection of the post, backfill which is equivalent to the surrounding material shall be in place.
6. Pedestal shall be formed 6 inch minimum below ground surface. Remainder may be placed against undisturbed material.
7. Slope protection required when indicated on the contract plans.
8. For Pile Foundation and Pole Grounding Details see sheet T-30.5.2.

Detail C

- No. 11 Bars
- 18
- T-36.1.2 and T-36.1.3
- See "Anchorage Details" On Sheets T-36.1.2 and T-36.1.3
- Slope protection required when indicated on the contract plans.
- For Pile Foundation and Pole Grounding Details see sheet T-30.5.2.

Ground Surface Adjacent To Traffic

Vertical Reinforcement

Spaced (See Table)
NOTES:
UNLESS NOTED OTHERWISE ON THE DRAWINGS, CONSTRUCT THE SIGN STRUCTURE TO CONFORM WITH THE FOLLOWING REQUIREMENTS:

3. LOADING
   A. Importance factors (li and lb):
      li = 1.0
   B. Drag coefficient (Cd): 0.45 - 2.0 Depending on shape of member and wind velocity
   C. Maximum dead load of DMS: 4000 lb
   D. Maximum wind load: 23.4 psf \times \text{ Cd } \times b
   E. Live load: 500 lb
   F. Natural wind gust: 5.2 psf \times \text{ Cd } \times b
   G. Seismic load: 21.0 psf = b
   H. Truck gusting: 18.8 psf \times \text{ Cd } \times b
   I. Walkway load: Dead load + 500 lb
   J. Wind speed: 90 mph
   K. Ice load: 3 psi
   L. Seismic acceleration coefficient: 0.40
   M. Soil Type for seismic design: III

4. STRUCTURAL STEEL
   A. Structural steel plates and shapes shall conform to AASHTO M270, grade 36 or ASTM A36.
   B. Steel pipe shall conform to ASTM A53, type S, grade B.
   C. Steel tubing shall conform to ASTM A500, grade B.
   D. Hot dip galvanize structural steel after fabrication in accordance with ASTM A525, class C, or mechanically galvanized in accordance with ASTM 6969, class 50. Washers, nuts, and bolts in any assembly shall be galvanized by the same process. Lubricate threads with a dyed lubricant.
   E. Test all full penetration groove welds ultrasonically in accordance with ASTM A462, section 2.2.1. Accept or reject in accordance with the Department of Transportation Specifications.
   F. Natural wind gusts: 5.2 psf \times \text{ Cd } \times b
   G. Ice load: 3 psi
   H. Wind speed: 90 mph
   I. Seismic acceleration coefficient: 0.40

5. UNIT STRESSES
   A. Structural steel: F_y = 36 ksi
   B. Concrete pedestal class A or AA: F_y = 4000 psi
   C. Reinforcing Steel: F_y = 4000 psi
   D. Footing for structural steel: ASTM A615 grade 60

6. BOLTED CONNECTIONS
   A. Accomplish all structural high strength bolting, except anchor bolts, using AASHTO M134 bolts.
   B. Use a hardened flat washer between the nut and the connected part.
   C. Use high strength bolts with OTIs or tension control indicators installed per subsection 506.03.07 of the standard specifications.

7. WELDED CONNECTIONS
   A. Arc weld all structural high strength bolting, except anchor bolts.

8. GROUTING
   A. Shim base plates to finish elevation and completely fill plate area with a high strength, non-shrink grout.
   B. Use a hardened flat washer between the nut and the connected part.
   C. Use high strength bolts with OTIs or tension control indicators installed per subsection 506.03.07 of the standard specifications.
   D. Fabricate anchor bolts from material conforming to AASHTO M314 grade 36 and supplementary requirement 51.
   E. Hot dip galvanize all steel parts in accordance with ASTM A123.
   F. High strength bolts shall be hot-dip galvanized in accordance with ASTM A525, class C, or mechanically galvanized in accordance with ASTM 6969, class 50. Washers, nuts, and bolts in any assembly shall be galvanized by the same process. Lubricate threads with a dyed lubricant.

9. UNIT STRESSES
   A. Structural steel: F_y = 36 ksi
   B. Concrete pedestal class A or AA: F_y = 4000 psi
   C. Reinforcing Steel: F_y = 4000 psi
   D. Footing for structural steel: ASTM A615 grade 60

12. LOADING
   A. Importance factors (li and lb):
      li = 1.0
   B. Drag coefficient (Cd): 0.45 - 2.0 Depending on shape of member and wind velocity
   C. Maximum dead load of DMS: 4000 lb
   D. Maximum wind load: 23.4 psf \times \text{ Cd } \times b
   E. Live load: 500 lb
   F. Natural wind gust: 5.2 psf \times \text{ Cd } \times b
   G. Seismic load: 21.0 psf = b
   H. Truck gusting: 18.8 psf \times \text{ Cd } \times b
   I. Walkway load: Dead load + 500 lb
   J. Wind speed: 90 mph
   K. Ice load: 3 psi
   L. Seismic acceleration coefficient: 0.40

15. LOADING
   A. Importance factors (li and lb):
      li = 1.0
   B. Drag coefficient (Cd): 0.45 - 2.0 Depending on shape of member and wind velocity
   C. Maximum dead load of DMS: 4000 lb
   D. Maximum wind load: 23.4 psf \times \text{ Cd } \times b
   E. Live load: 500 lb
   F. Natural wind gust: 5.2 psf \times \text{ Cd } \times b
   G. Seismic load: 21.0 psf = b
   H. Truck gusting: 18.8 psf \times \text{ Cd } \times b
   I. Walkway load: Dead load + 500 lb
   J. Wind speed: 90 mph
   K. Ice load: 3 psi
   L. Seismic acceleration coefficient: 0.40

18. LOADING
   A. Importance factors (li and lb):
      li = 1.0
   B. Drag coefficient (Cd): 0.45 - 2.0 Depending on shape of member and wind velocity
   C. Maximum dead load of DMS: 4000 lb
   D. Maximum wind load: 23.4 psf \times \text{ Cd } \times b
   E. Live load: 500 lb
   F. Natural wind gust: 5.2 psf \times \text{ Cd } \times b
   G. Seismic load: 21.0 psf = b
   H. Truck gusting: 18.8 psf \times \text{ Cd } \times b
   I. Walkway load: Dead load + 500 lb
   J. Wind speed: 90 mph
   K. Ice load: 3 psi
   L. Seismic acceleration coefficient: 0.40

21. LOADING
   A. Importance factors (li and lb):
      li = 1.0
   B. Drag coefficient (Cd): 0.45 - 2.0 Depending on shape of member and wind velocity
   C. Maximum dead load of DMS: 4000 lb
   D. Maximum wind load: 23.4 psf \times \text{ Cd } \times b
   E. Live load: 500 lb
   F. Natural wind gust: 5.2 psf \times \text{ Cd } \times b
   G. Seismic load: 21.0 psf = b
   H. Truck gusting: 18.8 psf \times \text{ Cd } \times b
   I. Walkway load: Dead load + 500 lb
   J. Wind speed: 90 mph
   K. Ice load: 3 psi
   L. Seismic acceleration coefficient: 0.40

24. LOADING
   A. Importance factors (li and lb):
      li = 1.0
   B. Drag coefficient (Cd): 0.45 - 2.0 Depending on shape of member and wind velocity
   C. Maximum dead load of DMS: 4000 lb
   D. Maximum wind load: 23.4 psf \times \text{ Cd } \times b
   E. Live load: 500 lb
   F. Natural wind gust: 5.2 psf \times \text{ Cd } \times b
   G. Seismic load: 21.0 psf = b
   H. Truck gusting: 18.8 psf \times \text{ Cd } \times b
   I. Walkway load: Dead load + 500 lb
   J. Wind speed: 90 mph
   K. Ice load: 3 psi
   L. Seismic acceleration coefficient: 0.40

27. LOADING
   A. Importance factors (li and lb):
      li = 1.0
   B. Drag coefficient (Cd): 0.45 - 2.0 Depending on shape of member and wind velocity
   C. Maximum dead load of DMS: 4000 lb
   D. Maximum wind load: 23.4 psf \times \text{ Cd } \times b
   E. Live load: 500 lb
   F. Natural wind gust: 5.2 psf \times \text{ Cd } \times b
   G. Seismic load: 21.0 psf = b
   H. Truck gusting: 18.8 psf \times \text{ Cd } \times b
   I. Walkway load: Dead load + 500 lb
   J. Wind speed: 90 mph
   K. Ice load: 3 psi
   L. Seismic acceleration coefficient: 0.40

NOTES:
1. Field verify elevations and controlling dimensions prior to ordering or
   fabricating any materials.
2. Verify all post heights and span lengths prior to ordering the fabrication
   of posts and truss assemblies.
3. See vendor requirements for DMS mounting bracket details. Contractor
   is responsible for fabrication and installation of DMS attachment vertical
   supports.
4. Place top of pedestal elevation between 2 1/2 inches and 4 inches below
   bottom of base plate elevation. See sheet T-36.2.9 for foundation details.
5. Install foundation cap maintenance pad for 3:1 slope or steeper.
   See sheet T-36.2.10 for details.
**TABLE 1**

<table>
<thead>
<tr>
<th>SPAN (ft)</th>
<th>Frame Width (ft)</th>
<th>Frame Depth (ft)</th>
<th>CHORD Δ V</th>
<th>VERTICAL Δ V</th>
<th>DIAGONAL Δ V</th>
<th>WIND BRACING Δ V</th>
<th>INT BAY BRAACING Δ V</th>
<th>INT BAY CROSS TIE Δ V</th>
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<tr>
<td>39'-9&quot;</td>
<td>3'-9&quot;</td>
<td>10'-6&quot;</td>
<td></td>
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</table>

**NOTES:**
1. For details 1 thru 5 see sheet T-36.2.4.
2. For connection of frame to post see frame juncture details on sheet T-36.2.6.
3. For walkway details see sheet T-36.2.8.
WELDED CHORD SPlice

Chord { 2" x ‡"

Backing Plate

Diagonal { Chord { Vertical { Typ.

Bracing Cross Tie { Vertical { Diagonal { Chord { Chord { Typ.

Prepare Edges By Beveling To Angle Shown, Weld To 100% Full Penetration & Grind Flush With Base Metal.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
STRUCTURAL FRAME DETAILS
SINGLE POST

DMS OVERHEAD SIGN

REVISED 12/06

CHIEF BRIDGE ENGR.

T-36.2.4
(623) Signed Original On File
ADOPTED 9/29

CHIEF BRIDGE ENGR.
**NOTES:**

1. For additional notes see sheet T-36.1.
2. Set base plates and longer side of pedestals normal to axis of sign.
3. Place backfill in place prior to erection of post.
4. Thread upper 12 inches of anchor bolts and galvize upper 12 inches.
5. For reinforcement, embedment is clear to outside of bar and is 2 inches to the main reinforcement, except as noted.
6. Retain anchor plates with hex nut or formed head.
7. Rake the post out of plumb, with the use of the leveling nuts to make the bottom of the sign frame level.
8. At final position of post tighten all top and bottom nuts against base plate.

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**ANCHORAGE DETAILS**

- **Post Details**
  - For additional notes see sheet T-36.1
  - Set base plates and longer side of pedestals normal to axis of sign.
  - Place backfill in place prior to erection of post.
  - Thread upper 12 inches of anchor bolts and galvanize upper 12 inches.
  - For reinforcement, embedment is clear to outside of bar and is 2 inches to the main reinforcement, except as noted.
  - Retain anchor plates with hex nut or formed head.
  - Rake the post out of plumb, with the use of the leveling nuts to make the bottom of the sign frame level.
  - At final position of post tighten all top and bottom nuts against base plate.

**DETAILS**

- **SECTION C-C**
  - Backing Ring
  - 3/8" Dia. Galv. Drain Hole (2 Permitted)
  - 2" x 3" x 1" Gusset Plate See Gusset Detail

- **SECTION D-D**
  - Cut Off Heat of Gusset Plate 1" x 45°
  - Pipe Wall 1/4" x 1/4"

**DETAIL A**

- Anchor Plate
  - 5" x 1" Plate
  - 5" x 1" Plate
  - 5" x 1" Plate
  - 5" x 1" Plate

**DETAIL B**

- Anchor Plate
  - 5" x 1" Plate
  - 5" x 1" Plate
  - 5" x 1" Plate

**PLAN**

- 6" x 4" x 3" x 2"
  - Post or Mast Arm
  - 6" x 4" x 3" x 2"
  - Post or Mast Arm
  - 6" x 4" x 3" x 2"
  - Post or Mast Arm

**ELEVATION**

- Hand Nut (Typ.)
  - Tack Weld Hex Head Nut (Typ.)
  - Cover Plate Not Shown
  - 10 Gage Cover Plate

**ANCHORAGE DETAILS**

- Face Handhole Away From Traveled Way, See Handhole and Cover Detail
- (18) Anchor Bolts 1/4" Diameter
- Hex Nut, Leveling Nut and Washer
- (2) 3" Conduits
- See Anchorage Details

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**STATE OF NEVADA DEPARTMENT OF TRANSPORTATION**

**DMS OVERHEAD SIGN SINGLE POST POST DETAILS**

**T-36.2.5 (623) Signed Original On File**

**REVISED 12/06 ADOPTED BY CHIEF BRIDGE ENGR.**
NOTES:

1. When drilling holes for unfinished bolts, do not exceed nominal bolt diameter by more than 1/16 inch.

2. Use only galvanized bolts, nuts, and washers.

3. In all cases, support sign frame at top of post. Finish the bearing surface true at the top of the post.

4. At lower juncture connection, use shims where any clearance exists between bottom of frame and post plate prior to tightening of bolts in lower connection. Shims may be galvanized sheet steel washers.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FRAME JUNCTURE DETAILS
SINGLE POST

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
DMS OVERHEAD SIGN
SINGLE POST FRAME JUNCTURE DETAILS

T-362.6 (623) Signed Original On File

CHIEF BRIDGE ENGR.
NOTES:
1. Unless otherwise noted herein, refer to sheets T-36.1.9 and T-36.1.11 for walkway drip pan and safety rail details.
2. Field verify elevations prior to fabrication.
3. Verify walkway layout before fabrication.
4. Coordinate the connection of the DMS to the truss with the DMS fabricator.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

DMS OVERHEAD SIGN
SINGLE POST
CATWALK LAYOUT

T-36.2.8
(623) Signed Original On File
ADOPTED
12/06
REVISED
12/06
CHIEF BRIDGE ENGR.
NOTES:
1. For anchor bolt layout, see sheet T-36.2.5.
2. For top of base plate elevation, see sheet T-36.2.2.
3. Use class A or AA concrete ($f_c = 4000$ psi).
4. Longer side of base plates, pedestals and footings shall be oriented perpendicular to the sign axis.
5. Place backfill equivalent to the surrounding material prior to erection of the post.
6. Form pedestal 6 inches minimum below ground surface.
7. For Pile Foundation and Pole Grounding Details see sheet T-30.5.2.

1" Min., 6" Max.

3" Pitch (Length 16' - 6"

4'-5"

2' - 5"

3' - 10"

6"

3" Min.

3" Max.

2' - 6"

4' - 4"

6"

6"

6"

6" Max.

25/" Min. - 7" Bolt Extension Needed

4'/" Max. - 8'/" Bolt Extension Needed

1/2" Beyond

2" Bolt Diameter

4" Diameter

10/11 Bars

No. 11 Bars

No. 11 Bars

No. 1 Bar Spiral @ 6" Pitch

121 3/" No. Consults

See Anchorage Details on Sheet T-30.15

(6) No. 4 Bars

Permissible Construction Joint

Ground Surface Away From Traffic

No. 4 Bar Spiral @ 6" Pitch

SECTION D-D

SECTION E-E

DMS PEDESTAL BENT BARS
NOTES:

1. Refer to DMS elevation sheets for installation locations.
2. For pile pedestal and pile details, see sheet T-36.2.9.
3. For post and base plate details, see sheet T-36.2.5.
4. For DMS control cabinet installation details, see sheet vendor requirements.
5. Install railing per "Pedestrian Rail Type "R" Modified" details on sheet B-25.1.6.
6. Install a foundation cap maintenance pad at all locations where a DMS control cabinet is above a 3:1 or steeper slope. Install a concrete pad (48" x 48" x 4") in front of DMS control cabinet on slopes flatter than 3:1. Pad shall slope 2% in direction of existing drainage.

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For installation details, see sheet T-36.2.10.

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STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

DMS OVERHEAD SIGN
MAINTENANCE PAD

T-36.2.10
(6/23)
Signed Original On File

ASSISTED
REVISED
CHIEF BRIDGE ENGR.
NOTES:
1. Tubular stiffeners to be added when "A" exceeds 10 feet.
2. Position sign panel so that mounting beams will clear truss connections and arm to post joints. Where interference cannot be avoided, 3/8 inch Ø holes to pass the 5/8 inch Ø U-bolts may be drilled through mast arm angles or truss connection members as necessary.
3. Torque aluminum sign panel mounting bolt to 100 in/lb.
4. 11 inches for type C-1 and C-2, others 4 inches.
5. Flat washers required on C4 bolts, 1 or 2 as necessary.
6. All nuts to have fiber inserts.
7. To obtain desired panel width, max. of 2 panels may be cut less than 4 feet (18 inch min. each).
8. Tubular stiffeners required only when panel overhang exceeds 2 feet.
**SIDE VIEW - SINGLE FACED SIGN TYPE A**

**FRONT VIEW**

**LIGHT FIXTURE MOUNTING DETAIL**

**NOTE**

- Square Structural Tubing May be Used in Place of 2-Bar.

**SEE DETAIL A**

- Max. A - 4".
- C + D + 4" For 15' Thru 18' Panels,
- Min. C + 4" For 8' Thru 14' Panels,

**Light Fixture Mounting Channel**

- ½" x ½" of 0.1046" Continuous-Slot Channel
- Length As Required

**Drill**

- For Mounting Screws
- Provide 3/16" x 1" Long Machine Screws, Hex Nuts, Flat Washers, and Lock Washers.

**Continuous Slot Channel**

- ½" x ½" Stainless Steel Washer
- 3" x 3" x ½"
- 1¼" x 1¼" Stainless Steel Machine Bolt, Nut With ½"-20 Stainless Steel Lock Washer
- Shall Be Grooved, Serrated and Beveled Washer and Lock Washer

**Cadmium-Plated Steel**

- Clamping Nut With ½"-20 x ½" Stainless Steel Machine Bolt, Nut

**SEE DETAIL A**

**Photoelectric Control Unit**

- 3-Prong, EE-NEMA Std., Twist Lock Plug Receptacle
- Top Of Sign Panel
- 3½" Std. Pipe

**Twist Lock Plug Receptacle**

- 2" Dia. Hole

**STATE OF NEVADA**

**DEPARTMENT OF TRANSPORTATION**

**OVERHEAD SIGNS**

**LIGHTWEIGHT LIGHT FIXTURE MOUNTING DETAILS**

- T-36.3.3 REV. 7/96

**SIGNED ORIGINAL ON FILE**

**CHIEF TRAFFIC ENGR.**
ELEVATION

PLAN

HANDHOLE AND COVER DETAILS

SECTION B-B
6" THRU 12" POST

SECTION C-C
14" POST

BASE PLATE DETAILS

ANCHOR BOLT

ANCHORAGE DETAILS

NOTES:

1. Footings shall be placed with long dimensions normal to axes of sign.
2. On single post signs the post shall be raked out of plumb with the use of the leveling nuts to make the bottom of the sign frame level.
3. 2 inch 8 anchor bolts may be substituted for 1 ½ inch 8 bolts.
4. 5 inch 12 anchor bolts may be substituted for 2 ½ inch 8 bolts.

SPECIFICATIONS:

CONSTRUCTION
State of Nevada Standard Specifications

DETAILED SPECIFICATIONS:

CONSTRUCTION SPECIFICATIONS:
For Road and Bridge Construction, current edition and the special provisions thereto.

BASE PLATE DETAILS

ANCHOR BOLT

ANCHORAGE DETAILS

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BASE PLATE DETAILS

ANCHOR BOLT

ANCHORAGE DETAILS

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ANCHOR BOLT

ANCHORAGE DETAILS

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For Road and Bridge Construction, current edition and the special provisions thereto.

BASE PLATE DETAILS

ANCHOR BOLT

ANCHORAGE DETAILS

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DETAILED SPECIFICATIONS:

CONSTRUCTION SPECIFICATIONS:
For Road and Bridge Construction, current edition and the special provisions thereto.

BASE PLATE DETAILS

ANCHOR BOLT

ANCHORAGE DETAILS

NOTE:

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4. 5 inch 12 anchor bolts may be substituted for 2 ½ inch 8 bolts.

SPECIFICATIONS:

DETAILED SPECIFICATIONS:

CONSTRUCTION SPECIFICATIONS:
For Road and Bridge Construction, current edition and the special provisions thereto.
NOTES:

1. Backfill shall be in place prior to erection of post.
2. Slope protection required when indicated on the plans.
3. Pile pedestal shall be formed 6 inches minimum below ground surface, remainder shall be placed against undisturbed material.
4. For Pile Foundation and Pole Grounding Details see sheet T-30.5.2.
NOTES:

1. Flat washers required on all bolts, 1 or 2 as necessary.
2. All nuts to have fiber inserts.
3. High strength bolts shall be hot-dipped galvanized in accordance with ASTM A153, Class C, or mechanically galvanized in accordance with ASTM B695, Class 50. Washers, nuts, and bolts in any assembly shall be galvanized by the same process. Lubricate the threads with a dyed lubricant.
4. For additional details see sheet T-36.3.1.
5. For sign post details see sheet T-36.3.4.
6. For foundation details see sheet T-36.3.5.

1. Flat washers required on all bolts, 1 or 2 as necessary.
2. All nuts to have fiber inserts.
3. High strength bolts shall be hot-dipped galvanized in accordance with ASTM A153, Class C, or mechanically galvanized in accordance with ASTM B695, Class 50. Washers, nuts, and bolts in any assembly shall be galvanized by the same process. Lubricate the threads with a dyed lubricant.
4. For additional details see sheet T-36.3.1.
5. For sign post details see sheet T-36.3.4.
6. For foundation details see sheet T-36.3.5.
PAVEMENT MARKINGS

RAISED PAVEMENT MARKINGS
RPMs Run Full Length to Gore
* See Sheet T-37.1.1 for Rural or Urban configuration
XING ONLY

Placement of Merge Arrows

Typical Parallel Acceleration Lane

Typical Lane Reduction

Merge Arrow

For Further Details on "Parallel Acceleration Lane" See Part III of the MUTCD

For Further Details on "Lane Reduction" See Part III of the MUTCD

Permanent Pavement Markings

Bicycle/HOV/Arrows

State of Nevada
Department of Transportation
NOTES:
1. Start with an arrow at the entrance of the storage lane.
2. The arrow/only closest to crosswalk shall be installed 8 feet prior to the stop bar.
3. The storage line is equal to the storage length plus the deceleration length.
4. When calculating distance between markings, round to the nearest whole number.

LEGEND:
* = RIGHT ARROWS WHERE APPLICABLE
** = RAISED PAVEMENT MARKERS WHERE APPLICABLE.
FOR DETAILS SEE STANDARD PLAN T-37.1.1.

### Storage Line Placement Details

- **Storage Line**: Markings for storage. 
- **Arrow/ONLY**: Markings for direction.
- **D**: Distance between markings.
- **L**: Storage Length.
- **M**: Number of Markings.

### Table: Storage Line Markings

<table>
<thead>
<tr>
<th>Storage Line (Feet)</th>
<th>Number of Markings</th>
</tr>
</thead>
<tbody>
<tr>
<td>96 to 192</td>
<td>3</td>
</tr>
<tr>
<td>130 to 280</td>
<td>4</td>
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<tr>
<td>216 to 456</td>
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<td>457 to 544</td>
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<td>545 to 632</td>
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<td>633 to 720</td>
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<tr>
<td>721 to 808</td>
<td>9</td>
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<tr>
<td>809 to 896</td>
<td>10</td>
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<tr>
<td>897 to 984</td>
<td>11</td>
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<tr>
<td>985 to 1072</td>
<td>12</td>
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<tr>
<td>1337 to 1424</td>
<td>16</td>
</tr>
<tr>
<td>1425 to 1512</td>
<td>17</td>
</tr>
</tbody>
</table>

### Formula

\[ D = \frac{L - (M+1) \times R}{(M-1)} \]

- **D**: Distance between Markings
- **L**: Storage Length
- **M**: Number of Markings
- **R**: Whole number.

### Diagram Notes

- **TWO-WAY LEFT TURN LANE**: Diagram showing storage line placement details.
- **L-Number of Markings**: Storage line details.
- **M-Number of Markings**: Storage line details.
- **D-Distance between Markings**: Storage line details.
- **8' to 16' Typical Spacing**: Diagram showing typical spacing.

### Diagram Elements

- **Storage Line**: Line marking for storage.
- **Arrow/ONLY**: Arrow or only marking.
- **8' Solid White Line**: Solid white line marking.
- **L-Distance between Markings**: Distance between markings.
- **M-Number of Markings**: Number of markings.

### Diagram Legends

- **D**: Distance between Markings.
- **L**: Storage Length.
- **M**: Number of Markings.
- **R**: Whole number.

### Diagram Sections

- **STATE OF NEVADA DEPARTMENT OF TRANSPORTATION**: Logo.
- **PERMANENT STORAGE LANES, TURN ARROWS AND ONLY'S**: Diagram title.
- **T-38.1.2**: Standard plan number.

### Diagram Details

- **VARIES**: Diagram notes indicating variability.
- **TOTAL STORAGE LANE**: Total storage lane details.
- **8' SOLID WHITE LINE**: Solid white line marking.
- **VARIES**: Diagram notes indicating variability.

### Diagram Components

- **LANE-DROP TURN POCKET**: Diagram showing lane-drop turn pocket.
- **DEDICATED TURN POCKET**: Diagram showing dedicated turn pocket.

### Diagram Annotations

- ** See Marking & Placement Details**: Annotation for additional details.
- **FOR DETAILS SEE STANDARD PLAN T-37.1.1**: Annotation for further details.

### Diagram Text

- **LEFT TURN LANE TWO-WAY**: Diagram title indicating two-way left turn lane.
TEMPORARY CROSSWALK MARKINGS

PERMANENT (TYPICAL) NON-SIGNALIZED, NON-STOP CONTROLLED CROSSWALK

Legend:

1. 4 FEET BY 4 FEET CLEAR SPACE

2. 3 FEET (TYP.) CAN BE ADJUSTED FROM 0 TO 6 FEET MAX.

3. 2 FEET (TYP.) CAN BE ADJUSTED FROM 0 TO 4 FEET MAX.

Notes:

1. Place stop bar (shown) or yield bar as specified on plans.

2. Intersections with a signalized or stop condition, stop bars shall be used.

3. Intersections with a non-signalized or non-stop condition, yield bars shall be used.

4. Beyond the grade break, a clear space shall be provided within the width of the pedestrian street crossing and wholly outside the parallel vehicle travel lane.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

PAVEMENT MARKINGS
CROSSWALKS
STOP AND YIELD BARS

T-381.3 (634) Signed Original On File
ADOPTED 10/15 REVISED 12/04
CHIEF TRAFFIC OPS ENG
NOTES:
1. The entire median shall be painted from the median nose back 5 feet or to the first P.C. or P.T., whichever is greater.
2. See sheet R-9.2.1 for Type 2 object marker.
3. See sheet T-37.1.1 for Type D raised pavement marker.

LEGEND:

1' to 2'

2' to 3'

3' to 4'

4'

5'

6'

7'

8'

9'

10'

11'

12'

13'

14'

15'

16'

17'

18'

19'

20'

21'

22'

23'

24'

25'

26'

27'

28'

29'

30'

31'

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74'

75'

76'

77'

78'

79'

80'

81'

82'

83'

84'

85'

86'

87'

88'

89'

90'

91'

92'

93'

94'

95'

96'

97'

98'

99'

100'
NOTES:
1. The HOV symbol closest to stop bar shall be installed 13 feet prior to the stop bar.
2. When calculating distance between markings, round to the nearest whole number.
3. When raised pavement markers (RPM) are specified, use RPM stop bar.
4. When a typical lane reduction begins at the stop bar, omit merge arrows and lane ends sign (W4-2). See sheet T-38.1.1.
5. For HOV marking details see sheet T-38.1.1

MARKING AND PLACEMENT DETAILS

D = \frac{L - [(M+1) \times 13]}{(M-1)}

D = Distance between Markings
L = Storage Length as Directed by the Engineer
M = Number of Markings

FREEWAY HOV MARKING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
Pavement Markings
RAMP METERING AND HOV
T-38.1.7 (634) Signed Original On File
APPROVED 5/09 REVISED 5/09 CHEF TRAFFIC OPS ENGR.
T = Taper Length
S = Posted Speed
W = Offset in Feet
44 MPH and Less  T = WS²/60
45 MPH and Greater  T = WS

D = Advance Warning Distance
(See MUTCD Section 2C.05, Table 2C-4 Guidelines for Advance Placement of Warning Signs, use Condition A)
# REVISION INDEX

## BRIDGE DESIGN

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## PEDESTRIAN RAIL

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## SLOPE PAVING, GIRDER, APPROACH SLAB

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## CANTILEVER RETAINING WALLS

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