## 2022 TRAFFIC SIGNAL STANDARDS

**DEPARTMENT OF TRANSPORTATION & INFRASTRUCTURE**

**CITY AND COUNTY OF DENVER**

**TRANSPORTATION DESIGN**

### SHEET NAME | STD DWG NO
--- | ---
2022 TRAFFIC SIGNAL STANDARD DRAWINGS INDEX | 16.1.0.1
2022 TRAFFIC SIGNS AND PAVEMENT MARKINGS INDEX | 16.1.0.2
TRAFFIC SIGNAL NOTES | 16.1.1
LEGEND | 16.1.2.1
KEY NOTES | 16.1.2.2
SPAN WIRE SIGNAL DESIGN | 16.1.3
MOUNTING HARDWARE | 16.1.4
VIDEO AND LOOP DETECTION | 16.1.5.1
LOOP DETECTION DETAILS | 16.1.5.2
CONDUIT DETAILS | 16.1.6
PULL BOXES | 16.1.7
SIGNAL POLE FOUNDATION | 16.1.8
MAST ARM POLE LOADS SHEET 1 | 16.1.9.1
MAST ARM POLE LOADS SHEET 2 | 16.1.9.2
MOUNTING DETAILS SHEET 1 | 16.1.10.1
MOUNTING DETAILS SHEET 2 | 16.1.10.2
MAST ARM AND POLE TABLE DATA | 16.1.11
SIGNAL POLE DETAILS -- NO MAST ARM SHEET 1 | 16.1.12.1
SIGNAL POLE DETAILS -- NO MAST ARM SHEET 2 | 16.1.12.2
PEDESTAL POLE DETAILS SHEET 1 | 16.1.13.1
PEDESTAL POLE DETAILS SHEET 2 | 16.1.13.2
PED PUSH/EMBEDDED POLE FOUNDATION DETAILS | 16.1.14
FOUNDATIONS FOR XCEL FACILITIES AND MID BLOCK POLES | 16.1.15
FOUNDATION FOR NO MAST ARM TRAFFIC SIGNAL POLE | 16.1.16
"P" CABINET & BASE SHEET 1 | 16.1.17.1
"P" CABINET & BASE SHEET 2 | 16.1.17.2
"M" CABINET BASE | 16.1.18
METER PEDESTAL CABINET DETAILS | 16.1.19

### SHEET NAME | STD DWG NO
--- | ---
METER PEDESTAL CABINET FOUNDATION AND BASE | 16.1.20
FLASHING BEACON DETAIL | 16.1.21
DRIVER FEEDBACK SIGN DETAILS | 16.1.22
FLASHING BEACON & SIGN | 16.1.23
BUS FLASHER SIGN DETAIL | 16.1.24.1
VARIABLE MESSAGE SIGN DETAIL | 16.1.24.2
RRFB DETAIL & SIGN SHEET 1 | 16.1.25.1
RRFB DETAIL & SIGN SHEET 2 | 16.1.25.2
PEDESTRIAN HYBRID BEACON CROSSWALK (HAWK) | 16.1.26
LIGHTING CONTROL CABINET & PULL BOX DETAIL | 16.1.27
BLANK OUT SIGN DETAILS | 16.1.28

---

**2022 TRAFFIC SIGNAL STANDARDS**

**APPROVED:**

Elly Gloeckner, City Traffic Engineer

2/24/2022
<table>
<thead>
<tr>
<th>SHEET NAME</th>
<th>STD DWG NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPICAL CROSSWALK LAYOUT DETAIL</td>
<td>16.2.1</td>
</tr>
<tr>
<td>PAVEMENT MARKING DETAILS SHEET 1</td>
<td>16.2.2.1</td>
</tr>
<tr>
<td>PAVEMENT MARKING DETAILS SHEET 2</td>
<td>16.2.2.2</td>
</tr>
<tr>
<td>NOT USED</td>
<td>16.2.3</td>
</tr>
<tr>
<td>SPECIALTY PAVING CROSSWALK PAVEMENT MARKING DETAILS</td>
<td>16.2.4</td>
</tr>
<tr>
<td>SINGLE SIGN POST MOUNTING DETAILS</td>
<td>16.2.5</td>
</tr>
<tr>
<td>MULTIPLE SIGN POST MOUNTING DETAILS</td>
<td>16.2.6</td>
</tr>
<tr>
<td>ONE-WAY SIGN PLACEMENT DETAILS</td>
<td>16.2.7</td>
</tr>
<tr>
<td>TRAFFIC SIGN UTILITY POLE MOUNTING DETAIL</td>
<td>16.2.8</td>
</tr>
<tr>
<td>GROUND MOUNT STREET NAME SIGN INSTALLATION DETAIL</td>
<td>16.2.9</td>
</tr>
<tr>
<td>GROUND MOUNT STREET NAME SIGN DETAIL</td>
<td>16.2.10</td>
</tr>
<tr>
<td>OVERHEAD STREET NAME SIGN &amp; DETAILS</td>
<td>16.2.11</td>
</tr>
<tr>
<td>NEIGHBORHOOD BIKEWAY BRANDING SIGN</td>
<td>16.2.12</td>
</tr>
<tr>
<td>PARKING METER POST INSTALLATION</td>
<td>16.2.13</td>
</tr>
<tr>
<td>BARRICADE DETAILS</td>
<td>16.2.14</td>
</tr>
<tr>
<td>GENERAL REQUIREMENTS FOR HORIZONTAL POSITION OF BIKE RACKS INSTALLED ABOVE THE CURB</td>
<td>16.2.15</td>
</tr>
<tr>
<td>BIKE RACK DETAILS</td>
<td>16.2.16</td>
</tr>
<tr>
<td>BIKE CORRAL INSTALLATION DETAIL (BELOW CURB)</td>
<td>16.2.17</td>
</tr>
</tbody>
</table>
REMOVALS
1. REMOVE SIGNAL HEAD
2. REMOVE SIGNAL POLE
3. REMOVE SIGNAL CABINET, CONTROLLER, PULL BOXES AND WATER VALVE PULL BOXES
4. REMOVE MAST ARM
5. REMOVE SPAN WIRE, CABLE AND ALL ATTACHED SIGNAL HEADS AND EQUIPMENT
6. REMOVE PUSH BUTTON
7. ELECTRIC UTILITY COMPANY TO REMOVE EXISTING POLE
8. ELECTRIC UTILITY COMPANY TO REMOVE, RELOCATE OR RAISE EXISTING OVERHEAD POWERLINE
9. REMOVE AND REPLACE COMMUNICATIONS PULL BOX SUCH THAT NEW LD IS SEATED FLUSH WITH PROPOSED SIDEWALK OR FINISH SURFACE
10. REMOVE AND SALVAGE DETECTION CAMERA
11. REMOVE EXISTING POLE FOUNDATION TO MINIMUM DEPTH OF 1' BELOW FINISHED GRADE
12. REMOVE EXISTING PULL BOX (SPECIAL) FOR SIGNAL SYSTEM COMMUNICATIONS

RESETS
2. RESET SIGNAL HEAD
3. RESET SIGNAL POLE
4. RESET SIGNAL CONTROLLER, CABINET AND ASSOCIATED EQUIPMENT
5. RESET PUSH BUTTON
6. RESET SPAN WIRE
7. RESET SPAN WIRE AND ALL ATTACHED SIGNAL EQUIPMENT
8. RESET DETECTOR
9. ELECTRIC UTILITY COMPANY TO RESET EXISTING POLE

INSTALLATIONS
14. INSTALL SIGNAL HEAD OR HEADS
15. INSTALL SIGNAL CABINET, CONTROLLER AND ASSOCIATED EQUIPMENT
16. INSTALL PUSH BUTTON
17. INSTALL CONDUIT
18. INSTALL TWO 3-INCH CONDUITS
19. INSTALL SIGNAL POLE
20. INSTALL MAST ARM — LENGTH AS SHOWN
21. INSTALL SPAN WIRE
22. (COMMON/SPECIAL) INSTALL PULL BOX MARKED "TRAFFIC COMM" ON LD
23. INSTALL ONE PULL BOX MARKED "TRAFFIC" ON LD
24. INSTALL LOOP DETECTOR
25. INSTALL CLOSED CIRCUIT CAMERA
26. ELECTRIC UTILITY COMPANY TO INSTALL POWER FEED, CONTRACTOR TO EXTEND TO SIGNAL CABINET
27. INSTALL LUMINARIE
28. INSTALL WATER VALVE PULL BOX
29. NO CHANGE
30. INSTALL STREET LIGHT STANDARD
31. INSTALL EMERGENCY VEHICLE PREDETECTION DETECTOR
32. INSTALL INTERCONNECT (SIZE & TYPE AS SHOWN)
33. INSTALL VIDEO DETECTION CAMERA (FLIR OR VIDEO)
34. INSTALL ELECTRIC METER
35. YOU ARE DETECTED (SIGN)
**Detail "A"**

SPAN WIRE MOUNTING

- 18' MAX
- 9" DOUBLE LOOP TAPPED TOGETHER

**Detail "B"**

CABLE INSTALLATION WITHOUT INSULATOR-STEEL POLE

- POLE PLATE WITH 1/2" BUSHING
- 1/2" DIA HOLE

**Detail "C"**

CABLE INSTALLATION ELECTRIC UTILITY POLE

- 1/2" TOMAHAWK EVERLOT (LENGTH AS REQUIRED)
- LONG-SUEDED CLAMPS (TYP)
- CABLE RINGS

**Detail "D"**

TEMPORARY CABLE INSTALLATION

- GUY HOOK
- SPAN WIRE POLE CLAMP

**Fire Pre-Eruption Detection Unit**

- MAST ARM MOUNTING
- BOTTOM VIEW

**POLE PLATE**

- 1 1/2" DIA HOLE
- 1/2" DIA HOLE

**POLE MOUNT**

- 1 1/2" NIPPLE TO POLE CAP
- USE ONLY 1/2" CLOSE NIPPLE (DO NOT USE ELECTRICAL LOCK NUTS)
- 1/2" STEAD THREAD ORNAMENTAL PLUG

**SLIP FITTER**

- USE NO HOLLOW TO POLE CAP
- USE ONLY 1/2" CLOSE NIPPLE (DO NOT USE ELECTRICAL LOCK NUTS)
- 1/2" STEAD THREAD ORNAMENTAL PLUG

---

**Notes:***

- HUB PLATE (PELCO SHOWN MAY SUBSTITUTE APPROVED EQUAL)
- HUB PLATE, UNIVERSAL, 1-1/2" NPS, ALUM / 1 1/4" DIA HOLE IN REAR
- HUB PLATE, UNIVERSAL, 1-1/2" NPS, ALUM / 1-1/2" DIA HOLE IN REAR

---

**Riser Installation**

- FOR INTERCONNECT CABLE
- BASE BOX SHOWN FOR WOOD POLE, PIPE OR STEEL POLE, INSTALLATION. INTERCONNECT CABLE WILL GO TO CONTROLLER THROUGH SAME WEATHERHEAD AND CONDUIT AS SIGNAL CABLE.

---

**MOUNTING HARDWARE**

- **Substitute Approved Equal**
- **SE-4071**
- **SE-4108**
SECTION A-A

ONE PART SEALER
(NO FILLER)

SECTION B-B

ONE PART SEALER
(NO FILLER)

SAWED SLOT DETAILS

LEAD-IN WIRE
PULL BOX
WATERPROOF SPOUSE
OF CONNECT AT TERMINAL AT STRIP
WATER VALVE
FULL BOX
CONDUIT TO NEXT FULL BOX

Curb & Gutter

Replace pavement per specifications

Detector Water
In Saw Cut

Each pair of loop lead-in detector wires shall
be twisted 3 turns per foot through conduit.

LOOP DETECTOR LEAD-IN
FOR WATER VALVE PULL BOX

TYPICAL LOOP WIRING SCHEMATIC

Direction
of Traffic

Water Valve
Pull Box (WV)

Pull Box

2" Conduit

2" DA

Drill detector loop
corners 3" deep then
saw pavement slots
to form loop

Overlap the sawed slots
to ensure equal depth
at drilled corners

DRILLED CORNER DETAIL
**STANDARD DESIGN CRITERIA:**

The standard signal mast arm traffic structures shown on these drawings have been designed in accordance with the loading and nominal strength requirements of the 2015 ASHMO A770 specifications for structural supports for highway signs, luminaires, and traffic signals. First edition 06/25/11 including latest interim.

The structures have been designed for wind loads using an ultimate wind velocity of 120 MPH with a mean recurrence interval of 700 years. All structures have been designed for a fatigue natural wind gust yearly mean wind velocity of 11.2 MPH and a truck-induced gust pressure of 18.8 psf.

**FATIGUE CATEGORY II:**

Structures with mitigation devices have been designed for fatigue category II loading without galloping loads.

**FATIGUE CATEGORY III:**

Structures without a mitigation device have been designed for fatigue category II with galloping loads. A mitigation device is not required for single and double mast arms on structures meeting all of the following conditions:

- Arm lengths less than or equal to 55 feet
- Cape runways with posted speed limits less than or equal to 35 MPH

**GENERAL NOTES:**

Detail numbers refer to standard drawings 16.1.10.1 and 16.1.10.3.
DETAIL 1
POLE TOP

DETAIL 2
LUMINAIRE ARM DATA

DETAIL 3
CAMERA COUPLING

DETAIL 4
LUMINAIRE ARM ATTACHMENT

DETAIL 5
SIGNAL ARM ATTACHMENT

DETAIL 6
DOUBLE SIGNAL ARM ATTACHMENT

DETAIL 7
ARM PLATE WELD

NOTES:
SEE POLE DATA ON SHEET 16.1.11 FOR DIMENSIONS.
<table>
<thead>
<tr>
<th>Item</th>
<th>Base Section</th>
<th>End Section</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Base Section</td>
<td>End Section</td>
</tr>
<tr>
<td></td>
<td>Length</td>
<td>Cause</td>
</tr>
<tr>
<td>45</td>
<td>19.42&quot;</td>
<td>.2500</td>
</tr>
<tr>
<td>50</td>
<td>19.54&quot;</td>
<td>.2500</td>
</tr>
<tr>
<td>55</td>
<td>19.54&quot;</td>
<td>.2612</td>
</tr>
<tr>
<td>60</td>
<td>24.30&quot;</td>
<td>.3125</td>
</tr>
<tr>
<td>65</td>
<td>30.25&quot;</td>
<td>.3125</td>
</tr>
<tr>
<td>70</td>
<td>35.61&quot;</td>
<td>.3125</td>
</tr>
<tr>
<td>75</td>
<td>44.54&quot;</td>
<td>.3438</td>
</tr>
</tbody>
</table>

**NOTE:**
- See the pole data on Sheet 16.1.11 for dimensions.
### TABLE 1: POLE DATA

<table>
<thead>
<tr>
<th>POLE SERIES</th>
<th>DESIGN NUMBER</th>
<th>SINGLE ARM SPAN (FT)</th>
<th>DOUBLE MAST ARMS</th>
<th>POLE TUBE</th>
<th>POLE BASE</th>
<th>ANCHOR BOLT</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC15</td>
<td>1</td>
<td>22, 25, 30, 35, 40</td>
<td>N.A. N.A.</td>
<td>15.50</td>
<td>10.60</td>
<td>35.00</td>
</tr>
<tr>
<td>DC15</td>
<td>2</td>
<td>45, 50, 55</td>
<td>N.A. N.A.</td>
<td>17.00</td>
<td>12.10</td>
<td>35.00</td>
</tr>
<tr>
<td>DC15</td>
<td>3</td>
<td>60, 65, 70</td>
<td>N.A. N.A.</td>
<td>19.50</td>
<td>14.60</td>
<td>35.00</td>
</tr>
<tr>
<td>DC15</td>
<td>4</td>
<td>20 THRU 40</td>
<td>N.A. N.A.</td>
<td>15.50</td>
<td>10.60</td>
<td>35.00</td>
</tr>
<tr>
<td>DC15</td>
<td>5</td>
<td>75°</td>
<td>N.A. N.A.</td>
<td>19.50</td>
<td>14.60</td>
<td>35.00</td>
</tr>
</tbody>
</table>

#### MAXIMUM ARM LENGTH COMBINATION
FOR DUAL CONFIGURATION ARE 40°-0° / 40°-0°. ARM LENGTHS EXCEEDING THESE WILL REQUIRE A SPECIAL POLE DESIGN.

### TABLE 2: SIGNAL ARM DATA

<table>
<thead>
<tr>
<th>SIGNAL ARM TUBE</th>
<th>SIGNAL ARM SIMPLEX</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAXIMUM ARM SPAN (FT)</td>
<td>FIXED END DIA. (IN)</td>
</tr>
<tr>
<td>20</td>
<td>9.00</td>
</tr>
<tr>
<td>25</td>
<td>10.00</td>
</tr>
<tr>
<td>30</td>
<td>12.00</td>
</tr>
<tr>
<td>35</td>
<td>12.50</td>
</tr>
<tr>
<td>40</td>
<td>13.00</td>
</tr>
<tr>
<td>45</td>
<td>14.00</td>
</tr>
<tr>
<td>50</td>
<td>15.00</td>
</tr>
<tr>
<td>55</td>
<td>15.00</td>
</tr>
<tr>
<td>60</td>
<td>15.75</td>
</tr>
<tr>
<td>65</td>
<td>16.50</td>
</tr>
<tr>
<td>70</td>
<td>17.25</td>
</tr>
<tr>
<td>75</td>
<td>17.50</td>
</tr>
</tbody>
</table>

#### WHEN A MITIGATION DEVICE IS REQUIRED BY THESE STANDARDS (SEE SHEET 16.1.9.1), THE FOLLOWING TABLE SHALL BE FOLLOWED:

<table>
<thead>
<tr>
<th>ARM LENGTH (FT)</th>
<th>ACCEPTABLE MITIGATION DEVICES</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-55</td>
<td>STOCKBRIDGE TYPE FREY MAST ARM DAMPER, VALMON TR-1 MITIGATOR, OR APPROVED EQUAL</td>
</tr>
<tr>
<td>&gt;55</td>
<td>FREY MAST ARM DAMPER, VALMON TR-1 MITIGATOR, OR APPROVED EQUAL</td>
</tr>
</tbody>
</table>

### Diagram

- **Mounting Hardware**
- **Mast Arm**
- **Mitigation Device**
  - To be installed per manufacturer's installation instructions near the last signal mounted on the arm. See Sheet 16.1.9.2

**Detail 16** DAMPER TYPE MITIGATOR
NOTE:
ANCHOR BOLTS SHALL BE PER DETAIL 3 ON SHEET 20

DETAIL 4  FOUNDATION BASE - 10' PEDESTAL POLE

NOTE:
ANCHOR BOLTS SHALL BE PER DETAIL 3 ON SHEET 20

DETAIL 5  FOUNDATION BASE - 15' PEDESTAL POLE
DETAIL 6

CONCRETE FOUNDATION FOR EMBEMDED STEEL POLE

HANG HOLE
4" W X 8" H
OVAL

TYPE II PULL BOX

20" SQ METAL PLATE

DETAIL 7

FOUNDATION - PEDESTAL MOUNTED PEDESTRIAN PUSH BUTTON POLE DETAIL

POST CAP, ALUMINUM (PELCO OR APPROVED EQUIVALENT)

PEDESTRIAN ACTUATED SIGNAL SIGN
R10-3E

PEDESTRIAN PUSH BUTTON

POLE, SPUN ALUMINUM SCHEDULE
40, 48" O.D. x .237" WALL
(PELCO PS100 OR APPROVED EQUIVALENT)

ALUMINUM SQUARE BASE ASSEMBLY
WITH ALUMINUM DOOR AND GROUNDING LUG (PELCO PB-5335 OR APPROVED EQUIVALENT).
SEE DETAIL 2 SHEET 16.1.13.1 1".

ANCHOR BOLT SET OF 4
5/8" INCH DIAMETER X 18
INCH LENGTH (PELCO PB-5335 OR APPROVED EQUIVALENT).

2" PVC SCHEDULE 40 CONDUIT (30' DEPTH)

24 INCH DIAMETER
24 INCH DEPTH.
PRE-CAST OR CAST-IN-PLACE FOUNDATION

CONSTRUCTION NOTES:
1. ALL SEPARATELY GROUNDED ELEMENTS AT AN INTERSECTION SHALL BE BONDED TOGETHER TO FORM AN INTERSECTION GROUNDING NETWORK.
2. GROUND WIRE SHALL BE #6 STRANDED.
3. REFERENCE LATEST MUTCD FOR GUIDELINES FOR PUSH BUTTON PLACEMENT, POLE HEIGHT, REACH DISTANCE, AND ADDITIONAL FEATURES.
**NOTES:**

1. **SUBMIT ONLY THE XCEL ENERGY OWNED AND MAINTAINED STREET LIGHT POLES TO XCEL ENERGY FOR APPROVAL. ALL OTHER FOUNDATION DETAILS SHALL BE SUBMITTED TO THE CITY & COUNTY OF DENVER EARTH TRANSPORTATION OPERATIONS. NO FOUNDATIONS SHALL BE INSTALLED UNTIL SUBMITTALS HAVE BEEN ACCEPTED.**

2. **CONCRETE SHALL BE 6000 PSI. FINISH SHALL BE SMOOTH.**

3. **CONCRETE VOLUME SHOULD BE APPROX. 0.458 CUBIC YARDS.**

4. **3 - 2" POLYETHYLENE TUBING OR 20' CABLE ENTRANCES.**

**DETAIL 8**

**STREET LIGHT POLE BASE**

**SECTION A-A**

**PLAN**

- **12" BOLT PATTERN**
- **20" #4 STEEL RING w/ 12" OVERLAP (5 RETD.)**
- **36" HOLE**
- **1" x 36" ANCHOR BOLTS**
- **20" HOLE (4 RETD.)**
- **4" x 41 P-522**
- **90° CHAMFER (RETD. AT 4 QUADRANTS)**
- **FINAL GRADE**
- **MIN. 10" PROJECTION**
- **5" x 3 1/2" ANCHOR BOLTS**

**SECTION A-A**

**PLAN**

**NOTES:**

1. **TO BE USED ONLY ON XCEL OWNED TRAFFIC STREET LIGHT POLE (NO MAST ARM) AT A SIGNALIZED INTERSECTION. CITY OWNED TRAFFIC STREET LIGHT POLE (NO MAST ARM) FOUNDATION MUST FOLLOW STANDARD DETAIL SHEET 16.1.15.**

2. **ENCADREMENTS PVC ENTRANCES POLYETHYLENE TUBING ON 20' CABLE ENTRANCES.**

3. **2" DEEP RECESS AROUND TUBING**

4. **4" x 4" BOLT PATTERN (4 RETD.)**

5. **5 3/4" x 3 1/2" ANCHOR BOLTS WITH 3" BEND PER XCEL SPEC 12520003-9**

**DETAIL 9**

**PREFAB FOUNDATION**

**NO MAST ARM**

**SECTION A-A**

**PLAN**

**NOTES:**

1. **FOR INFORMATION ONLY**

2. **12½" BOLT PATTERN**

3. **20" #4 STEEL RING w/ 12" OVERLAP (5 RETD.)**

4. **24"**

5. **5" x 3 1/2" ANCHOR BOLTS**

6. **1" x 36" ANCHOR BOLTS w/ 3" BEND PER XCEL SPEC 12520000-5.**

7. **CONCRETE SHALL BE 6000 PSI. FINISH SHALL BE SMOOTH.**

8. **CONCRETE VOLUME SHOULD BE APPROX. 0.458 CUBIC YARDS.**

9. **3 - 2" POLYETHYLENE TUBING OR 20' CABLE ENTRANCES.**

**DETAIL 9**

**PREFAB STREET LIGHT FOUNDATION WITH POLE MOUNTS TRAFFIC SIGNAL POLE (NO MAST ARM)**

**SECTION A-A**

**PLAN**

- **12½" BOLT PATTERN**
- **20" #4 STEEL RING w/ 12" OVERLAP (5 RETD.)**
- **24"**
- **5" x 3 1/2" ANCHOR BOLTS**
- **1" x 36" ANCHOR BOLTS w/ 3" BEND PER XCEL SPEC 12520003-9**
- **4" x 4" BOLT PATTERN (4 RETD.)**
- **5 3/4" x 3 1/2" ANCHOR BOLTS WITH 3" BEND PER XCEL SPEC 12520000-5.**

**DETAIL 9**

**PREFAB STREET LIGHT FOUNDATION WITH POLE MOUNTS TRAFFIC SIGNAL POLE (NO MAST ARM)**

**SECTION A-A**

**PLAN**

- **12½" BOLT PATTERN**
- **20" #4 STEEL RING w/ 12" OVERLAP (5 RETD.)**
- **24"**
- **5" x 3 1/2" ANCHOR BOLTS**
- **1" x 36" ANCHOR BOLTS w/ 3" BEND PER XCEL SPEC 12520003-9**
- **4" x 4" BOLT PATTERN (4 RETD.)**
- **5 3/4" x 3 1/2" ANCHOR BOLTS WITH 3" BEND PER XCEL SPEC 12520000-5.**
NOTES:
2. FOUNDATION SHALL BE 7 FT. FOR LIGHT STANDARDS 20 FT. THRU 40 FT. AND 6 FT. FOR LESS THAN 20 FT.
   THE FOUNDATION DEPTHS AND FACTORABLE CAPACITIES HEREIN ASSUME THAT SIGNALS ARE INSTALLED WITHIN THE ROADWAY PAVEMENT WITH THE FOLLOWING SOIL PARAMETERS:
   - SOIL DENSITY \( \gamma \) = 110 LF/2000 FT.
   - SOIL CONSOLIDATION = 750 LF/2000 FT. FOR MEDIUM SOFT COHESIVE SOIL WITH N > 8 (ASTM D1586 STANDARD PENETRATION TEST)
   - SOIL \# ANGLE = 35° FOR MEDIUM SOFT COHESIVE SOIL WITH N > 15 (ASTM D1586 STANDARD PENETRATION TEST)
   - SF = 1.25 FOR TORSIONAL RESISTANCE AND 3.0 FOR FLEXURAL RESISTANCE.
   MAXIMUM LOADINGS OF THE ABOVE REFERENCED POLES WAS DETERMINED USING BROWN'S OVERTURNING METHOD AND SHALL BE AS FOLLOWS:

<table>
<thead>
<tr>
<th>FOUNDATION DEPTHS</th>
<th>6 FT</th>
<th>7 FT</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAXIMUM POLE HEIGHT (FT)</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>FACTORED FLEXURE CAPACITY (K - F)</td>
<td>20</td>
<td>.35</td>
</tr>
<tr>
<td>FACTORED SHEAR CAPACITY (K - F)</td>
<td>2</td>
<td>.5</td>
</tr>
</tbody>
</table>

3. CONCRETE SHALL BE OF AN ENHANCED CEMENT MIX CONCRETE IN ACCORDANCE WITH SECTION 503 OF THE STANDARD SPECIFICATIONS. REINFORCING STEEL SHALL BE GRADE 60.
4. FOUNDATIONS FOR LIGHT STANDARDS HIGHER THAN 40 FT. OR LIGHT STANDARDS WITH MULTIPLE LUMINARIES OR MANHOLE, OR HAVING SOIL ON OR UNDER CONSTRUCTION SHALL BE DESIGNED BY THE CONTRACTOR'S ENGINEER AND SHOWN ON THE PLANS.
   WHERE FOUNDATION IS LOCATED IN THE SIDEWALK, THE TOP OF THE FOUNDATION SHALL BE FLUSH WITH THE TOP OF THE SIDEWALK CONFORMING TO ADA REQUIREMENTS.

TRAFFIC SIGNAL LIGHT POLE - STEEL (NO MASTARM)

TYPICAL FOUNDATION SECTION

DENVER
THE MILE HIGH CITY
NOTES:
1. BASE DETAILS ARE FOR A NEMA P-44 CABINET ONLY.
2. BASE SHALL BE CONSTRUCTED FROM LIGHTWEIGHT POLYMER CONCRETE ONLY.
3. BASE SHALL MEET OR EXCEED ASTM D-2444 IMPACT RESISTANCE TESTING.
4. BASE SHALL MEET OR EXCEED ASTM METHOD D-543, SECTION 7, PROCEDURE 1 FOR CHEMICAL RESISTANCE.
5. BASE SHALL BE "UL" LISTED.
**NOTES:**

1. **ALL MATERIALS AND CONSTRUCTION SHALL CONFORM TO THE REQUIREMENTS OF THE SPECIFICATIONS.**

2. **UNSTABLE SOIL OR STEEP SLOPE MAY REQUIRE DEEPER FOUNDATIONS, SEE SPECIFICATIONS. CABINETS SHALL NOT BE LOCATED IN DRAINAGE AREAS, UNLESS THEY ARE ELEVATED.**

3. **CONDUIT SIZE SHALL BE 2" SCHEDULE 80 PVC.**

4. **ANCHOR BOLTS SHALL BE GALVANIZED, 1/2" x 18" x 1/4" COMPLETE WITH NUTS AND WASHERS.**

5. **CONDUIT PROJECTS ABOVE FOUNDATION SHALL BE 2" MIN. TO 4" MAX. CONDUITS SHALL BE CAPPED.**

6. **1" SLEEVE FOR GROUND ROOD, EXACT LOCATION PER CABINET MANUFACTURES REQUIREMENTS.**

7. **IN UNPAVED AREAS A RAISED PCC PAD 36" x 4" x 36" SHALL BE PlACED IN FRONT OF THE CABINET. THE PAD SHALL BE SET 2" BELOW THE FOUNDATION ELEVATION AND SLOPED AWAY FROM CABINET.**

8. **CONFIRM ACTUAL ANCHOR BOLT LAYOUT DIMENSIONS AS SHOWN PER THE TABLE ON THIS DRAWING PRIOR TO CONSTRUCTION.**

9. A **METER PEDESTAL SHALL BE PROVIDED FOR ELECTRICAL SERVICES FOR TRAFFIC SIGNALS WHEN A SEPARATE SERVICE CABINET IS SPECIFIED. THIS CABINET CAN BE USED FOR OTHER PURPOSES AS WELL, SEE PLN.**

10. **CABINETS SHALL BE OFFSET A MINIMUM OF 6 FT. FROM ANY ROADWAY AND 5 FT. FROM CONTROLLER CABINET, UPS CABINET, SERVICE POLE OR PAD MOUNTED TRANSFORMER.**

11. **PRE-FORMED CONCRETE BASE FOR THE METER PEDESTAL SHALL BE USED ONLY WITH THE ENGINEER'S APPROVAL.**

---

**DEPARTMENT OF TRANSPORTATION & INFRASTRUCTURE**

**METER PEDESTAL CABINET FOUNDATION AND BASE**

**STANDARD DRAWING NO.**

**SHEET NO.** 29 of 39
COMPLETE INSTALLATION WITH DIAMOND PANEL

WITH OCTAGON PANEL

TYPICAL SIGNAL HEAD - 12 INCH LENS

TYPICAL PANEL ATTACHMENT DETAILS

GENERAL NOTES

1. ALL SIGNS PANELS USED ON FLASHING BEACONS ARE CLASS II AND SHALL BE FABRICATED IN ACCORDANCE WITH:
   a. PANELS SHALL BE SINGLE SHEET ALUMINUM 0.100 MINIMUM THICKNESS.
   b. BACKING ZEES ARE 3 IN. X 2 IN. 2.33 LBS PER FT. ALUMINUM.
   c. ALL SIGNS SHALL BE FABRICATED USING RETROREFLECTIVE SHEETING CONFORMING TO ASTM D4956. THE TYPE SHALL BE DESCRIBED IN THE STANDARD SPECIFICATIONS AND/OR SHOWN ON THE PLANS.
   d. BOLTS, U-C_CLAMPS, NUTS AND METAL WASHERS SHALL BE GALVANIZED OR CADMIUM PLATED.

2. INSTALLATION DESIGN CONFORMS WITH ANSI Z21.200-2010 "STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINARIES AND TRAFFIC SIGNALS" AND SHALL BE FABRICATED IN ACCORDANCE WITH:
   a. STEEL PIPE, POST ANCHOR PLATES AND BREAK-AWAY PLATES SHALL CONFORM TO ANSI Z21.200-2010 (ASTM A709) GRADE 35.
   b. HIGH STRENGTH BOLTS, NUTS AND WASHERS SHALL CONFORM TO ASTM A490 AND SHALL BE GALVANIZED OR CADMIUM PLATED.
   c. HOLES SHALL BE DRILLED AND CUTS SHALL BE PREPARED AS REQUIRED. HOWEVER, FLAME CUTTING WILL BE PERMITTED PROVIDED ALL EDGES ARE GROUND. METAL SHALL NOT PROJECT BEYOND THE PLANE OF THE PLATE FACE ON BREAK-AWAY PLATES.
   d. ALL WELDING IS TO BE CONTINUOUS AND IN ACCORDANCE WITH CURRENT AND SPECIFICATIONS.
   e. A "KEEPER PLATE" OF THIN (28 GAUGE) GALVANIZED SHEET METAL (FABRICATED TO MATCH BREAK-AWAY PLATE DIMENSIONS BUT WITH HOLES RATHER THAN SLOTS) SHALL BE USED TO RESTRAIN BOLT LOOSENING DUE TO WIND VIBRATION.

3. FLASHING BEACON CAN BE INSTALLED WITH SOLAR POWERED SIGNAL HEADS. REFER TO DETAIL "A".

TYPICAL SIGNAL HEAD - 12" RED LENS

- Standard Drawing No. 20.1.21
- Sheet Revisions
- Department of Transportation & Infrastructure
- Flashing Beacon Detail
- Sheet No. 30 of 39
TYPICAL ELEVATION FACING TRAFFIC

SCHOOL
SPEED LIMIT XX
WHEN FLASHING

2'-0" 2'-0"
12'-0"

TYPICAL SIGNAL HEAD
12" YELLOW HEAD
FRONT AND BACK OF POLE

SEE STD Dwg NO W20.7 FOR TRAFFIC SIGN MOUNTING DETAIL

(2) TYPICAL SIGNAL HEADS
12" YELLOW HEAD
FRONT AND BACK OF POLE

SEE NOTE 3)

2'-0" TO 0'-0" AM SCHOOL HOLIDAYS
2'-4" TO 0'-0" PM SCHOOL HOLIDAYS

2'-0" TO 0'-0" AM SCHOOL HOLIDAYS

SPECIAL

2'-4" TO 0'-0" PM SCHOOL HOLIDAYS

POLE SPUN ALUMINUM SEE DESIGN TABLE SHEET 16.1.1.3.1

COLLAR ALUMINUM (PELCO OR APPROVED EQUIVALENT)

ALUMINUM SQUARE BASE ASSEMBLY WITH ALUMINUM DOOR AND GROUNDING LUG (PELCO OR APPROVED EQUIVALENT)
SEE DETAIL 2 SHEET 16.1.1.3.1

2'-0" ELECTRICAL CONDUITS (SEE NOTE 1)
FULL BOX NEED BE LOCATED AND LOCATION TO BE DETERMINED AT SPECIFIC SITE LOCATIONS
SEE DETAIL 5 SHEET 16.1.1.3.2 FOR 15" PENDANT POLE FOUNDATION

TYPICAL SIGNAL HEAD SECTION - 12" LENS

12" YELLOW HEAD

NOTES
1. AS DETERMINED BY THE ENGINEER AT EACH SPECIFIC SITE LOCATION, FOR POWER, EITHER SOLAR PANEL OR HARD-WIRE ELECTRICAL CONNECTION SHALL BE MADE
2. AS DETERMINED BY THE ENGINEER AT EACH SPECIFIC SITE LOCATION, EITHER DIRECTORIAL ANTENNA OR HARD-WIRE TRAFFIC SIGNAL CONNECTION SHALL BE MADE
3. TEMPORARY SIGN PLACARD TO BE INSTALLED OVER 35-1 "WHEN FLASHING" TEXT UNTIL BEACONS ARE OPERATIONAL
4. THE SIGN INSTALLATION HAS BEEN DESIGNED FOR A 120 MPH WIND VELOCITY
WHEN FLASHING RIGHT TURNS AND ONLY BUSES

BUS LANE SIGN & SIGNAL FLASHER:
20'–35' MAST ARM DESIGN
N.T.S.

BUS FLASHER SIGN & SIGNAL NOTES:
1. INSTALL CABLE (5 CONDUCTOR #14 AWG) W/OA TO SIGNAL BOX, FM. (BY CCQ)
2. FLASHER WORK SHALL BE PERFORMED BY A QUALIFIED SIGNAL CONTRACTOR.
3. INSTALL NEW 12" YELLOW LED FLASHERS (2 EACH)
4. CONTACT TRAFFIC OPERATIONS AT 720-865-4000 FOR SIGN SPECIFICATIONS.
5. CONTRACTOR TO FURNISH AND INSTALL POLES
6. DURING MOUNTING OF SIGN PANEL, NO TRAFFIC WILL BE ALLOWED IN THE AFFECTED LANE
7. REFER TO STANDARD DRAWING NUMBERS 16.1.9 THROUGH 16.1.11 FOR FOUNDATION POLE AND MAST ARM DETAILS. FLASHING REAVERS & SIGN POLE AND MAST ARM ARE DESIGNED FOR FATIGUE CATEGORY I WITH GALLOPING (WITHOUT A MITIGATION DEVICE)
VARIABLE MESSAGE SIGN DETAIL (VMS)

1. INSTALL CABLE (5 CONDUCTOR #4 AWG) INS TO SIGNAL BOX, FM. (BY COO)
2. CONTACT TRAFFIC OPERATIONS AT 720-865-4000 FOR SIGN SPECIFICATIONS.
3. CONTRACTOR TO FURNISH AND INSTALL POLES
4. DURING MOUNTING OF SIGN PANEL, NO TRAFFIC WILL BE ALLOWED IN THE AFFECTED LANE
5. REFER TO STANDARD DRAWING NUMBERS 16.1.18 THROUGH 16.1.11 FOR FOUNDATION POLE AND MAST ARM DETAILS. VARIOUS MESSAGE SIGN POLE AND MAST ARM ARE DESIGNED FOR FATIGUE CATEGORY I WITH GALVANIZING (WITHOUT A WIRING DEVICE)
PUSH BUTTON TO TURN ON WARNING LIGHTS

NOTES
1. A 30"x30" W11-15 FYS sign should be used at trail crossings.
2. A W3R-1/5 (L or R) SP should be used at trail crossings. R1-5 signage should be placed in a manner that does not obstruct the flashing beacons to ensure RFB is visible from each approach.
3. R1-5(WC) and R1-6/5(SP) signage shall only be used for multilane approaches.
4. In order to meet ADA and WUCC requirements, push button may be required to be mounted on pole. Reference push button pole detail 7 on sheet 16.14.1. Push button may be wired or wireless.

DEPARTMENT OF TRANSPORTATION & INFRASTRUCTURE
201 WEST COLfax AVENUE DENVER, CO 80202
PHONE: (720) 913-6591 FAX: (720) 913-6544
Issued By:

RRFB DETAIL & SIGN SHEET 2

STANDARD DRAWING NO. 16.1.25.2
Sheet No. 36 of 39
TABLE 1
GUIDELINES FOR ADVANCE PLACEMENT OF PEDESTRIAN CROSSING WARNING SIGNS

<table>
<thead>
<tr>
<th>POSTED SPEED</th>
<th>MINIMUM ADVANCE PLACEMENT DISTANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-35 MPH</td>
<td>100 FT</td>
</tr>
<tr>
<td>40 MPH</td>
<td>125 FT</td>
</tr>
<tr>
<td>45 MPH</td>
<td>175 FT</td>
</tr>
<tr>
<td>50 MPH</td>
<td>250 FT</td>
</tr>
</tbody>
</table>

LEGEND

- ▲: 12" DIAMETER HYBRID BEACON
- △: MAINTENANCE OF WAY
- □: MAINTAIN OR SIGNAL POLE MOUNTED SIGN
- ⊙: COUNTERDOWN PEDESTRIAN SIGNAL HEAD WITH PUSH BUTTON AND SIGN
- ▶: DETECTABLE WALKING SURFACE
- ⬇️: GROUND MOUNT SIGN

NOTES
1. DO NOT PLACE RETROACTIVE/REFLECTIVE TAPE ON HYBRID BEACON BACKPLATES.
2. INCREASE MOUNTING HEIGHT OF W11-2 SIGN AND W18-7P.L PLACARD IF BLOCKED BY OTHER SIGNS OR OBSTRUCTIONS.
3. SEE SHEET 16.2.1 FOR CROSSWALK MARKING DETAILS.
4. A 30.0X30.0 W11-15 FIG PYS SIGN SHOULD BE USED AT TRAIL CROSSINGS.
5. REFER TO STANDARD DRAWING NUMBERS 16.1.8 THROUGH 16.1.11 FOR FOUNDATION POLE AND MAST ARM DETAILS.

DESIGN-ONLY NOTES
A. INSTALL STREET LIGHTING UNLESS DIRECTED OTHERWISE BY CITY TRAFFIC ENGINEER.
B. PROVIDE REQUIRED SCHOOL CROSSING SIGNAGE AND PAVEMENT MARKINGS AT SCHOOL CROSSWALKS.
C. CENTER HYBRID BEACON OVER EACH THRU LANE.
D. REMOVE TWO-WAY LEFT TURN LANE AND INSTALL DOUBLE YELLOW LINES WHEN REQUIRED BY CITY TRAFFIC ENGINEER.
E. INTERCONNECT SIGNAL TO CDC NETWORK. CODOMINATE NEW PEDESTRIAN HYBRID BEACON WITH ADJACENT TRAFFIC SIGNALS ON EITHER SIDE.
F. PLACE NO PARKING SIGNS TO PROHIBIT PARKING BETWEEN THE STOP BAR AND CROSSWALK, AND TO BOTH SIDES OF THE CROSSWALK ON BOTH APPROACHES. ALL ACCESS IS ALLOWED IN THIS AREA.
G. MEET MINIMUM TRAFFIC SIGNAL SPACING REQUIREMENTS.
H. PLACE HYBRID BEACON ASSEMBLIES ON A SINGLE OR TWO SEPARATE MAST ARMS.
I. POLE MUST BE INSTALLED WITHIN 5' OF RAMP PER ADA REQUIREMENTS.
J. HAWK SIGNAL SHALL BE DESIGNED AND CONSTRUCTED TO INCLUDE ALL EQUIPMENT OF A FULL SIGNAL, CAMERA, EYE LEVEL PRESS BUTTON, and any other items not explicitly listed here.

**VARIES BASED ON LOCATION. ACTUAL DISTANCE TO BE DETAILLED ON PLANS OR AS DIRECTED BY CDC DTS TRANSPORTATION MINIMUM OF 40"**
**NOTES:**

1. All Pull or Splice boxes shall be traffic rated 22,500 PSI minimum.
2. Box dimensions shown are for 2 inch conduits maximum. For conduits larger than 2 in., refer to N.E.C. Section 314.22A for box size requirements.
3. Pull box shall be per detail 16.1.7.

**NOTE:**

Lighting control cabinet shall be for Lighting Control on decorative/vehicular lighting and street lights operated by a Business Improvement District.

**CABINET COMPONENT LIST**

- 30 in. W x 48 in. H x 12 in. D. NEMA 3R Hinged enclosure with 6 in. less anchored to the concrete foundation pad. The back of the cabinet shall be located 6 in. maximum from the edge of the concrete pad.
- NEMA 1, 105A, 400VA, 120/240V, 4-Wire Center (see panel schedule). Minimum spaces as required plus a minimum of two available spaces for future use. Install in cabinet with full-size ground cover, and branch breakers as listed on the schedule.
- Electrically held lighting contractor furnished with 120-Volt coil and number of poles required. Install inside cabinet.
- 20-amp Spc Maint. receptacle in a 1-gang back box with cover. Install inside the cabinet.
- 125A, 125/240V, meter housing conforming to the Utility Provider's requirements.
- NEMA 3R, 105A, 2-pole fused disconnect, UL listed for service equipment and fuses rated as shown on one-line diagram with neutral and ground bars. Mounted on back side of enclosure.
- 1/8" x 80-7/8" copper-clad driven ground rod with approved ground rod clamp.

**NOT SHOWN IN THE DETAIL:**

1. Voltage surge arrester, 500V A.C. to ground max.
2. "Hand-Off-Auto" Key Switch. Revers for Agency responsible for the maintenance of the system.
NOTES:
1. HARD-WIRE ELECTRICAL CONNECTIONS SHALL BE MADE FOR POWER.
2. SINGLE-SIDED INSTALLATION DETAILS ARE SHOWN IN THESE DRAWINGS. BACK-TO-BACK SIGNS ARE PERMISSIBLE.
3. DESIGN EXTREME FEAR WHO VELOCITY = 120 MPH @ 1700 YEARS RECURRENCE.
4. STANDARD BLANK OUT SIGN DESIGN IS BASED ON THE MAXIMUM SIGN DIMENSIONS AND MINIMUM SPACING SHOWN ON THESE DRAWINGS. ADDITIONAL SIGNS, LARGER SIGNS, OR REduced SPACING WILL Require a SPECIAL DESIGN BY THE CONTRACTOR.

TYPICAL ATTACHMENT DETAILS

SINGLE BLANK OUT SIGN DETAIL

DOUBLE BLANK OUT SIGN DETAIL
1. SETBACK SIDEWALKS

2. SETBACK SIDEWALK, ONE SIDE ATTACHED SIDEWALK OTHER SIDE
   ALINE WITH CURB

3. ATTACHED SIDEWALK 5' TO 15' CORNER RADIUS
   ALINE WITH CURB LINE EXTENDED

4. ATTACHED SIDEWALK 20' TO 30' CORNER RADII
   5' FROM CURB LINE EXTENDED (TYP.)

5. ATTACHED SIDEWALK WIDER THAN 10'
   ALINE WITH BACK OF SIDEWALK

6. MID-BLOCK CROSSWALK
   CENTER ON SIDEWALK, PEDESTRIAN RAMP
   MARK WITH CHALK LINES

7. INSTALL STOP LINE 4' IN ADVANCE OF AND PARALLEL TO THE NEAREST CROSSWALK LINE UNLESS OTHERWISE SHOWN

NOTES:

1. CROSSWALK BAR DIMENSIONS
   USE 18" WIDTH FOR CROSSWALK BARS.

2. KEEP BARS PARALLEL TO LANE LINES EVEN IF THE CROSSWALK IS SHROUDED. (SEE EXAMPLE FAR LEFT)

3. ALL BARS IN EACH CROSSWALK MUST BE SAME WIDTH.

4. ADJUST ALIGNMENT IF NECESSARY TO ALIGN PROPERLY WITH PEDESTRIAN RAMPS. CROSSWALKS SHOULD CENTER ON PEDESTRIAN RAMPS WHEN POSSIBLE.

5. CROSSWALKS SHOULD NOT EXTEND PAST THE CURB LINE OF ADJACENT ROADWAY.

6. DIRECTION RAMPS SHALL BE USED ON ALL NEW RAMPS UNLESS APPROVED BY THE CITY ENGINEER.

EXAMPLE:
TYPICAL CROSSWALK BAR LAYOUT FOR SHROUDED CROSSWALK

SPACERS TO BE SIMILAR TO ADJACENT SPACERS APPROX. 1/2 TO 3/4 CENTER TO CENTER

15' MAX

DEPARTMENT OF TRANSPORTATION & INFRASTRUCTURE
201 WEST CHEROKEE AVENUE
DENVER, CO 80202
PHONE: (720) 913-4001 FAX: (720) 913-4544

TYPICAL CROSSWALK LAYOUT DETAILS

STANDARD DRAWING NO. 16.2.1

Sheet No. 01 of 18
Pavement Marking Legend and Notes

A. Transverse markings only to be used in situations where standard continental crosswalks cannot be installed such as in areas of brick/specialty paving downtown.

B. Traffic lane markings — material shall be modified epoxy marking material unless otherwise specified.
   1. 4" strip white lane line, 1/2" line, 2" gap
   2. 8" solid white right edge line or turn lane line

C. Specialty markings — material shall be reflectorized preformed thermoplastic full width without seams unless otherwise specified.
   1. 18" white transverse crosswalk line
   2. 24" white stop line, only when shown on plans.

D. Any final pavement marking quantities shall include removal of any conflicting previous or set-in markings as necessary.


F. All removals shall be by grinding, sandblasting or water blasting methods provided that the pavement surface shall not be materially damaged. The pavement markings shall be removed to the extent that they shall not be visible under day or night conditions.

Specialty Paving Crosswalk
Pavement Marking Details

Turn lane line should intersect the lane line which will provide the turn lane with two lanes going away from the intersection, except where only two through lanes are available.
NOTE: ALL SIGNS SHALL BE FABRICATED FROM ASTM TYPE XL 4000 SERIES SKIN FACED SHEETING MATERIAL. ALL SIGNS ARE 0.080 GAUGE, 6061-T6 OR 5052-H32 ALUMINUM ALLOY. TREATED WITH ALUMINUM 1200 CONVERSION COATING, 3/8 INCH DIAMETER HOLES PUNCHES, CENTERED ON TOP AND BOTTOM, HORIZONTAL AXIS WITH STANDARD 1-1/2 INCH RADIUS CORNERS. ALL SIGNS SHALL BE ACCOMPANIED WITH A WASH COMPONENT SYSTEM WITH ACRYLIC FILM THAT MATCHES THE WARRANTY OF THE BASE REFLECTIVE SHEETING, INKS SHALL NOT BE PERMITTED FOR IMAGING.

NOTE: POSTS SHOULD BE INSTALLED TO PROVIDE 4' MINIMUM CLEAR WIDTH ALONG EXISTING SIDEWALK PATH FOR ADA COMPLIANCE.
NOTE: All signs shall be fabricated from ASTM Type 1-4050 Series Sign Face Sheet Metal. All signs are 0.080 gauge 5052-T6 or 5083-H112 aluminum alloy, treated with anodized 3000 conversion coating, 0.25 inch diameter holes punched, centered top and bottom, horizontal axis with standard 1/2 inch radius corners. All signs shall be accompanied with a metal component system with acrylic film that warrants the warranty of the base reflective sheeting. Signs shall not be permitted formapped.

NOTE: Posts should be installed to provide 4' minimum clear width along existing sidewalk path for ADA compliance.

NOTE: Maximum number of signs per telespar post to be determined by manufacturer allowable wind loading.

DETAIL 1
MOUNTED IN DIRT

DETAIL 2
MOUNTED IN SOIL/VEGETATION

DETAIL 3
MOUNTED IN SIDEWALK/HARDSCAPE
STANDARD SIGN PLACEMENT FOR STOP CONTROLLER INTERSECTIONS ALONG (EAST–WEST) ONE WAY STREETS

STANDARD SIGN PLACEMENT FOR STOP CONTROLLER INTERSECTIONS ALONG (NORTH – SOUTH) ONE WAY STREETS

NOTES:
1. ONE WAY AND STREET NAME SIGNS SHOULD BE INSTALLED WITH BACK TO BACK SIGN PANELS.
   (STOP SIGNS ARE NOT REQUIRED TO BE BACK TO BACK – SEE SHEET 16.2.10)
MOUNTING DETAIL FOR ADDING SIGNS TO EXISTING UTILITY POLES

PLAN VIEW

1.5" x 1.0"

1.0"

1.0"

3/4" GALVANIZED STRAPPING

STEEL, ALUMINUM OR WOOD POLE

SIGN MOUNTING SADDLE BRACKET

SIGN BOLT
OVERHEAD STREET NAME SIGN NOTES:

1. ALL OVERHEAD STREET NAME SIGNS SHALL BE FABRICATED USING WHITE RETRO-REFLECTIVE SHEETING MATERIALS AS BACKGROUND WITH LETTERS AND BORDER FORMED BY GREEN TRANSPARENT ELECTRO-CUT FILM APPLIED OVER THE BACKGROUND MATERIAL THROUGH A PRESSURE SENSITIVE ADHESION PROCESS. THE CITY OF DENVER "D" LOGO IS TO BE MADE USING THE SAME SHEETING MATERIAL. THE LOGO MAY BE FABRICATED SEPARATELY AND THEN ADDED TO THE SIGN AS AN OVERLAY USING THE SAME ADHESION PROCESS APPROVED BY THE SHEETING MATERIAL MANUFACTURER. THE SHEETING MATERIAL AND TRANSPARENT ELECTRO-CUT FILM SHALL CONFORM TO THE FOLLOWING PRODUCT SPECIFICATIONS:

A. U.S. DEPARTMENT OF TRANSPORTATION, FEDERAL HIGHWAY ADMINISTRATION, STANDARD SPECIFICATIONS FOR TYPE XI SIGN FACE SHEETING, A VERY-HIGH INTENSITY MICRO-PRISMATIC SHEETING DESIGNED TO PROVIDE REFLECTIVE HIGH SIGN FACE RETRO-REFLECTIVITY FOR OVERHEAD SIGNS THAT ARE TO BE VIEWED BY DRIVERS AT DISTANCES OF 1000 FEET OR LESS. ELECTRO-CUT FILM USED IN CONJUNCTION WITH THE TYPE XI SHEETING MATERIAL SHALL BE ELECTRO-CUT FILM #1172C OR AN EQUIVALENT APPROVED BY THE ENGINEER.

B. THE ASTM TYPE XI SHEETING MATERIAL AND TRANSPARENT ELECTRO-CUT FILM USED SHALL INCLUDE A WARRANTY WHICH GUARANTEES AN EFFECTIVE FIELD PERFORMANCE LIFE OF AT LEAST 12 YEARS.

2. THE PREFIX E AND W (FOR STREETS EAST AND WEST OF BROADWAY) AND N AND S (FOR STREETS NORTH AND SOUTH OF ELLSWORTH AVENUE) SHALL BE USED ON ALL STREET NAME SIGNS. THE PREFIX SHALL BE CENTERED BETWEEN THE DENVER "D" LOGO AND THE STREET NAME.

3. STREET NAME SIGNS TO BE BOLTED ON TELEPIAR OR APPROVED EQUAL EXTENSION WHICH CONNECTS TO W/STRAH BY USE OF ADAPTER SCREWED INTO COUPLING. SIGN SHALL BE INSTALLED LEVEL TO THE GROUND. SIGN SHALL BE FREE OF ANY HORIZONTAL OR VERTICAL DEFORMATION OR DEFORMATIONS.

4. ALL STREET NAME SIGNS SHALL USE THE DENVER "D" LOGO EXCEPT IN NEIGHBORING JURISDICTIONS AT TYPICAL CITY LIMIT INTERSECTIONS OR AS APPROVED BY (CYD) DOT ENGINEER. SEE TYPICAL SIGNS INSTALLATION DETAILS.

5. ALL MOUNTING BOLTS FOR STREET NAME SIGNS SHALL BE ZINC OR CADMIUM PLATED.

6. USE TYPE STANDARD HIGHWAY FONT

7. PLATE LENGTH MAY BE EXTENDED TO MAXIMUM LENGTH OF 108" FOR LONGER STREET NAMES.

8. ON NUMBERED STREETS, THE SUFFIX FOLLOWING THE NUMBER SHALL BE LOWER CASE LETTERS.
KNOX CT
NEIGHBORHOOD
BIKEWAY

NOTES:
1. STREET N-WE TEXT SHALL BE 2.75 POINT HEAVY "G" FONT.
2. ALL OTHER TEXT SHALL BE 2.75 POINT HEAVY "G" FONT.
PARKING NO ANY TIME TOW AWAY ZONE

MATERIALS REQUIRED:

1. Type III 10" long hollow plastic panels
2. 18 OMC-3 (end of roadway marker) 10" in size
3. 2" x 2" flat - drilled steel sign post, 8" - 6" long plus concrete and mounting hardware

ELEVATION - END OF ROADSIDE TYPE III BARRIcade DETAIL

SECTION A

PER MUTCD 28.67.C2 REFLECTIVE SHEETING WHITE & RED

PER MUTCD 20.66.C2 OBJECT MARKER TYPE 4

SEE DETAIL TYPE 1 FOR MOUNTING DETAIL

SLOPE TO DRAIN

2" TELESPAR TUBING (OR APPROVED EQUAL)

26" ROTATED HOLE THROUGH SIDEWALK

FILL WITH SAND CAP WITH 5/8" GROUT

4" SIDEWALK

DETAIL - TYPE 1

R7-10A
12" X 18"

HAMMER HEAD END OF ROADWAY

STANDARD DRAWING NO. BARRICADE DETAILS

DEPARTMENT OF TRANSPORTATION & INFRASTRUCTURE
201 W. AURORA AVE. DENVER, CO 80202
PHONE (720) 913-4301 FAX (720) 913-4344

Issued By:

Sheet No. 15 of 18

16.2.14
NOTES:
1. Design and manufacturer shall be in accordance with the American Institute of Steel Construction (AISC).
2. Inverted-U shape shall be formed from one segment of steel pipe using methodology that maintains the structural integrity of the steel pipe.
3. Alternate bike racks shall be acceptable by Denver Department of Transportation and Infrastructure (DOTI) prior to installation.

INSTALLATION NOTES FOR BIKE RACKS MOUNTED TO CONCRETE OR CONCRETE PAVERS:
1. Bike rack shall be mounted to finished concrete surface using post-installed wedge anchors with tamper-resistant security nut or accepted alternate.
2. Bike rack shall be set firm and installed within a vertical tolerance of 1/4-inch from plumb. Steel sleeves may be installed to achieve vertical tolerance.

INSTALLATION NOTES FOR BIKE RACKS MOUNTED TO CONCRETE FOUNDATION BENEATH MASONRY PAVERS:
1. Remove masonry paver and bedding material and preserve for reinstallation.
2. Construct unreinforced concrete footing or unreinforced concrete slab to support bike rack. Concrete shall be 5,000 psi compressive strength (28-day strength).
   a. Concrete footings shall be 12-inches diameter and 24-inches deep (minimum). Concrete footing shall be constructed for each bike rack base plate.
   b. Alternatively, construct a 4-inch-thick unreinforced concrete slab that extends 1-foot (minimum) outside footprint of bike rack on all sides.
   c. Excavate surface as necessary to maintain top of concrete foundation at bottom of bedding material. Dispose of excavated material at accepted off-site location.
3. Mount bike rack to concrete using instructions provided on this sheet.
4. Replace bedding material.
5. Reinstall masonry pavers. Masonry pavers shall be cut to accommodate bike rack (1/2-inch installation tolerance).