**GENERAL NOTES**

1. ALL SIGN PANELS USED ON FLASHER BEACONS ARE CLASS 3 AND SHALL BE FABRICATED IN ACCORDANCE WITH:
   - A. PANELS SHALL BE SINGLE SHEET ALUMINUM 0.006 MINIMUM THICKNESS.
   - B. BACKING ZEES ARE 3 IN X 216 IN. 2.33 LBS./FT. ALUMINUM.
   - C. ALL SIGN PANELS ARE TO BE FABRICATED USING RETROREFLECTIVE SHEETING CONFORMING TO ASTM D4956. THE TYPE SHALL BE DESCRIBED IN THE STANDARD SPECIFICATIONS AND/OR AS SHOWN ON THE PLANS.
   - D. BOLTS, U-CLAMPS, NUTS AND METAL WASHERS SHALL BE GALVANIZED OR CUSCRAUM.

2. INSTALLATION DESIGN-conforms with ASHTO "STANDARD SPECIFICATIONS FOR STRUCTURAL 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 ASHTO A-325 AND SHALL BE GALVANIZED OR CUSCRAUM PLATED.
   - B. HIGH STRENGTH BOLTS, NUTS AND WASHERS SHALL CONFORM TO ASTM 490 AND SHALL BE GALVANIZED OR CUSCRAUM PLATED.
   - C. HOLES SHALL BE DRILLED AND CUTS SHALL BE PROTECTED WITH SAW CUTS; 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 AWS SPECIFICATIONS.
   - E. A "KEEPER" PLATE OF THEN 26 GAUGE GALVANIZED SHEET METAL, FABRICATED TO MATCH BREAK-AWAY PLATE DIMENSIONS BUT WITH HOLES RATHER THAN SLITS, SHALL BE USED TO RESTRAIN BOLT LOOSENING DUE TO WIND VARIATION.

   - F. PIPE LENGTH VARIES WITH VERTICAL PLACEMENT; MINIMUM GROUND CLEARANCE (7 FT. AND THE SIGN PANEL REQUIRED WILL BE AS SHOWN ON THE PLANS OR AS DETERMINED BY CROSS SECTION OR AS DIRECTED BY THE ENGINEER FOR EACH LOCATION MAXIMUM LENGTH IS APPROXIMATELY 20 FT. 2 IN. AND MINIMUM LENGTH IS APPROXIMATELY 7 FT. 4 IN. IF LENGTH IS NOT SPECIFIED MAXIMUM MAY REQUIRE FIELDS CUT TO CONFORM TO TYPICAL SIGN PLACEMENT DETAILS.

3. CONCRETE FOOTINGS FOR FLASHING BEACON INSTALLATIONS SHALL CONFORM TO "CONCRETE CASTING" AND "STRUCTURAL CONCRETE" AS SHOWN ON THE PLANS.

4. ALL ELECTRICAL MATERIALS AND WORKSHOPS SHALL CONFORM TO THE LATEST REQUIREMENTS OF THE NEC, NEMA-UL OR CSA WHEREVER APPLICABLE, THE COLORADO PUC AND ANY LOCAL CODES OR ORDINANCES WHICH MAY APPLY AND THE FOLLOWING:
   - A. THE CONTRACTOR IS TO PROVIDE ALL NECESSARY WIRING WITHIN THE BEACON AND FROM THERE TO THE POWER SOURCE PROVIDED BY THE UTILITY COMPANY. THE UTILITY COMPANY WILL HAVE THE CONNECTION TO THE CONTRACTOR'S WIRING.
   - B. THE ELECTRICAL SERVICE BETWEEN THE POWER SOURCE AND THE FLASHING BEACON SHALL BE UNDERGROUND UNLESS AN AERIAL JUMP AUTHORIZED BY THE ENGINEER, ALL WIRING EXCLUDING THE AERIAL JUMP WIRE SHALL BE IN CONCUL.
   - C. THE "FLASHER" SHALL BE HOUSED IN A SUITABLE ENCLOSURE ON THE UTILITY POLE AT THE POWER SOURCE UNLESS THE ENGINEER DIRECTS THAT THE ENCLOSURE BE MOUNTED ON THE BEACON PIPE OR THAT THE DEVICE MAY BE CONTAINED WITHIN THE SIGNAL HEAD ITSELF.
   - D. A SUITABLE ENCLOSURE FOR THE FLASHER SHALL BE IN ACCORDANCE WITH "A RAIN TIGHT JUNCTION BOX OR CAN, APPROXIMATELY 9 IN X 9 IN X 4 3/4 SURFACE MOUNT, WITH A FLANGED SCREW ATTACHING COVER AND FABRICATED FROM NOT LESS THAN 16 GAGE GALVANIZED STEEL." A BUILT-IN RADI OINTERFERENCE SUPPRESSION DEVICE AND A PHOTOCELL SENSOR TYPE SIGNAL LAMP COVER SHALL BE PROVIDED FOR EACH FLASHING BEACON.
   - E. BEACONS SHALL FLASH AT A RATE OF NOT LESS THAN 50 AND NOT MORE THAN 60 TIMES PER MINUTE.
   - F. BREAK-AWAY BASE INSTALLATION SHALL BE USED FOR INTER-ANGULAR CONFINEMENT ONLY PEDESTAL FOUNDATION (AS SHOWN ON SHEET 3) MAY BE USED FOR BOTH ONE-DIRECTIONAL AND TWO-DIRECTIONAL CONFINEMENTS.
   - G. WHEN SPECIFIED IN THE PLANS, DOLLAR POWERED SYSTEM MAY BE USED IN PLACE OF AC POWER SYSTEM SHOWN ON THIS SHEET.

5. FOR ADVANCE PLACEMENT OF FLASHING SIGNS SEE MOUTION SECTION 20-05 AND TABLE 20-4.

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**TYPICAL ELEVATION FACING TRAFFIC**

**TYPICAL SIGN PLACEMENT**

**TYPICAL SIGNAL HEAD - 12 INCH LENS**

**TYPICAL PANEL ATTACHMENT DETAILS**

**LATERAL PLACEMENT ("A")**

**TABLE OF DIMENSIONS FOR PANELS NOT ILLUSTRATED**

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BREAK-AWAY ASSEMBLY BOLTING PROCEDURE

1. ASSEMBLE POST TO FOOTING WITH BOLTS-ONE FLAT WASHER ON EACH BOLT TOP AND BOTTOM, AND ONE FLAT WASHER AND THE KEEPER PLATE BETWEEN THE BREAK-AWAY PLATES. USE BRASS SHIMS TO PLUMB THE POST.
2. TIGHTEN ALL BOLTS TO MAXIMUM POSSIBLE WITH A 12 TO 15 INCH PIPE WRENCH TO BED WASHERS AND SHIMS TO CLEAN BOLT THREADS, THEN LOOSEN EACH BOLT IN TURN AND RETIGHTEN IN A SYSTEMATIC ORDER TO 450 INCH-POUNDS TORQUE.
3. BURR THREADS AT JUNCTION WITH NUT USING A CENTER PUNCH TO PREVENT NUT LOOSENING.

**TYPICAL BREAK-AWAY ASSEMBLY DETAILS**

**POST ANCHOR DETAILS**

**TYPICAL ELECTRICAL SERVICE DETAIL**

**FLASHERS**

**UNDERGROUND VIEWS AT BEACON**

**FLASHING BEACON AND SIGN INSTALLATIONS**

**STANDARD PLAN NO.**

S-614-14

**Issued By:** Traffic & Safety Engineering Branch July 31, 2019.

**Project Sheet Number:**

Standard Sheet No. 2 of 4
GE NERAL NO T ES

S O LAR PAN E L

SOLAR PANEL (AC POWERED SYSTEM MAY ALSO BE USED WHEN SPECIFIED)

I. THE RRFB SYSTEMS SHALL ADHERE TO ALL ASPECTS OF THE FEDERAL HIGHWAY ADMINISTRATION, INTERIM APPROVAL, 2-RECTANGULAR RAPID-FLASHING BEACONS AT UNCONTROLLED MARKED CROSSINGS (FHWA A-20).

2. AN RRFB SHALL ONLY BE USED TO SUPPLEMENT A POST-MOUNTED W-2, S-11, OR W-10-2 SIGN WITH 36"-7 PLaque, LOCATED IMMEDIATELY ADJACENT TO AN UNCONTROLLED MARKED CROSSING.

3. PEDESTRIAN PUSHBUTTON AND SIGN ASSEMBLY MAY BE SEPARATE PARTS. USE RR2-25 (9" X 12") SIGN IN ACCORDANCE WITH 2009 MUTCD. SIGN MAY INCLUDE INTEGRATED WARNING LIGHTS.

4. TERMINATE RRFB CONNECTIONS PER MANUFACTURER'S RECOMMENDATION.

5. CONTROL CABINET ENCLOSURE SHALL BE SIZED BY THE RRFB MANUFACTURER.

6. BEACON ASSEMBLY MAY BE MOUNTED ON THE SIDE OF THE POLE AS SHOWN OR ON THE TOP OF THE POLE IF SPECIFIED.

7. RRFB DISPLAYS SHALL BE LED TYPE MEETING THE INTENSITY REQUIREMENTS OF SAE J935 FOR CLASS 1 YELLOW, BUT SHALL NOT EXCEED 1000 CANDLERS DURING DAYLIGHT AND 500 CANDLERS AFTER DARK.

8. SEE SHEET 1, 2, AND 4 FOR STANDARD BASE AND FOUNDATIONS DETAILS.

9. WHEN SPECIFIED IN THE PLANS, AC POWER SYSTEM AS SHOWN ON SHEET 3 MAY BE USED IN PLACE OF SOLAR POWERED SYSTEM SHOWN ON THIS SHEET.


11. PEDESTAL FOUNDATION MAY BE USED FOR BOTH UN-DIRECTIONAL AND BI-DIRECTIONAL CONFIGURATIONS. BREAKWAY BASE INSTALLATION AS SHOWN ON SHEET 1 SHALL BE USED FOR UN-DIRECTIONAL CONFIGURATION ONLY.

COLORADO DEPARTMENT OF TRANSPORTATION

FlashinG BeaCON A N D S IGN INSTAllATIONS

STANDARD PLAN NO.
S-614-14

STANDARD SHEET NO. 3 OF 4

Traffic & Safety Engineering
MKB

GENERAL NOTES

1. POLE AND PEDESTAL MUST BE DESIGNED TO MEET THE REQUIREMENTS OUTLINED IN THE "STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS LUMINARIES AND TRAFFIC SIGNALS" PUBLISHED BY AASHTO, FOR A WIND VELOCITY OF 100 MPH.

THE CONTRACTOR SHALL SUBMIT TWO SETS OF WORKING DRAWINGS, SIGNED AND SEALED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF COLORADO, IN ACCORDANCE WITH SECTION 105.02 OF THE STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION.

DESIGN DATA

THE DESIGNS HERIN ASSUME THAT FLASHING BEACONS ARE INSTALLED WITHIN THE ROADWAY PRISM WITH THE FOLLOWING SOIL PARAMETERS:

SOIL DENSITY \( \rho = 120 \, \text{LB./CU.FT.} \)

SOIL COHESION \( C = 750 \, \text{LBS./SQ.FT. FOR MEDIUM STIFF COHESIVE SOIL} \)

SOIL ANGLE \( \phi = 30^\circ \) FOR MEDIUM DENSE INERTLESS SOIL

SF = 3.0 FOR FLEXURAL RESISTANCE.

CONTACT THE ENGINEER IF THE FLASHING BEACON WILL NOT BE INSTALLED WITHIN THE ROADWAY PRISM OR IF ANY OF THE FOLLOWING SOIL CONDITIONS ARE ENCOUNTERED DURING DRILLING:

a) The soil has a high organic content or consists of saturated silt and clay.

b) The site won't support the weight of the drilling rig.

c) The foundation soils are not homogenous.

d) Firm bedrock is encountered.

e) A high groundwater table is encountered.

f) Large boulders are encountered.

FOOTING DESIGN IS BASED ON 100 MPH WIND LOAD ON A 48 IN. X 48 IN. DIAMOND SIGN PANEL MOUNTED 9 FT. ABOVE THE GROUND, WITH A 24 IN. X 24 IN. RECTANGULAR PLATE UNDERNEATH AND A FLASHING BEACON 12 IN. ABOVE. IF A SIGN CONFIGURATION IS PROPOSED THAT EXCEEDS THESE DIMENSIONS, THE FOOTING DESIGN MUST BE ENGINEERED AND SIGNED AND SEALED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF COLORADO.

FOOTING NOTES

1. HEX NUTS
2. SQUARE NUTS
3. HARD HOLE SHALL BE PROVIDED.
4. 4 IN. NON-SHRINKABLE GROUT OVER ROUGH FOUNDATION
5. SCHEDULE 80 PVC (2 IN. MIN. DEPTH, 30 IN. MIN. DEPTH UNDER ROADWAY) CONDUIT Stub FROM PULL BOX TO POLE SHALL BE 2 IN. DIAMETER
6. INSTALL ANCHOR BOLTS (FURNISHED WITH POLE) PER MANUFACTURER'S TEMPLATE PRINT (FURNISHED WITH BOLTS)
7. MINIMUM OVERLAP OF 12 IN.
8. 1-1/2 IN CLEARANCE FOR HOPS
9. STANDARD PULL BOX... TYPE ???

Caisson designs require that the caisson be founded in compact sands, clay or sandy clay. If, by visual inspection of the hole, other material is present, the caisson design shall be modified as determined by the engineer.